Final Report
Additional Environmental Investigation

Haines Area Sites
(PMP 17.7, 19.5, and 25.5)

Haines-Fairbanks Pipeline
Formerly Used Defense Site

Haines, Alaska

F10AK1016-03 (PMP 19.5 and 25.5) and F10AK1016-14 (PMP 17.7)

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation and Public Facilities
AP&T	Alaska Power & Telephone
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
BTOC	below top of casing
CD	Compact Disk
CDQR	Chemical Data Quality Review
CEMML	Center for Environmental Management of Military Lands
COC	contaminants of concern
CRREL	Cold Regions Research and Engineering Laboratory
CSM	Conceptual Site Model
1,2-DCA	1,2 dichloroethane
DO	dissolved oxygen
DRO	diesel range organics
EDB	1,2-dibromoethane
ENSR	ENSR Corporation
EPA	Environmental Protection Agency
FES	Fairbanks Environmental Services
FUDS	Formerly Used Defense Site
GNSS	Global Navigation Satellite System
GPR	ground-penetrating radar
GPS	Global Positioning System
GRO	gasoline range organics
GW	groundwater
HFP	Haines-Fairbanks Pipeline
HI	Hazard Index
IDW	Investigative Derived Waste
IPEC	Inside Passage Electric Cooperative
JP-4	jet propulsion fuel No. 4
LOD	Limit of Detection
LOQ	Limit of Quantitation
MED	Manual for Electronic Deliverables
NA	Not Applicable
NAVD88	North American Vertical Datum of 1988
ND	Not Detected
NGS	National Geodetic System
NOAA	National Oceanic and Atmospheric Administration
NTU	Nephelometric Turbidity Units

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

OIT	Organic Incineration Technology Units
OPUS	Online Positioning User Services
ORP	oxidation-reduction potential
PAH	polycyclic aromatic hydrocarbons
PEL	Probable Effects Level
PID	photo-ionization detector
PMP	pipeline milepost
PQL	Practical Quantitation Limit
PVC	polyvinyl chloride
RI	Remedial Investigation
ROE	right-of-entry
ROST	Rapid Optical Screening Tool
ROW	right-of-way
RRO	residual range organics
RTK	real-time kinematic
SDG	Sample Data Group
SGS	SGS-North America Inc. of Anchorage, Alaska
SIM	select ion monitoring
SQG	Sediment Quality Guidelines
SQuiRTs	Screening Quick Reference Tables
TAH	total aromatic hydrocarbons
TAL-D	Test America Laboratories, Inc. of Arvada, Colorado
TAqH	total aqueous hydrocarbons
TEL	Threshold Effects Level
TOC	total organic carbon
TPH	Total Petroleum Hydrocarbons
UFP-QAPP	Uniform Federal Policy for Quality Assurance Project Plans
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
WGS84	World Geodetic System of 1984

UNITS OF MEASUREMENT

cy	cubic yards
°F	degrees Fahrenheit
ft/ft	feet per foot
mg/Kg	milligrams per Kilogram
mg/L	milligrams per Liter
ppm	parts per million
%	percent
sq. ft.	square feet

EXECUTIVE SUMMARY

Fairbanks Environmental Services (FES) conducted an Environmental Investigation at three Haines-Fairbanks Pipeline (HFP) Formerly Used Defense Sites (FUDS) during July and August 2014. The sites are identified as pipeline milepost (PMP) 17.7, PMP 19.5, and PMP 25.5 (also known as Gate Valve #4). The sites are located at varying distances from Haines along the Haines Highway. The investigation involved the drilling and collection of soil samples, installation of monitoring wells, and groundwater sampling at all three sites. Surface water and sediment sampling were conducted at PMP 17.7 and PMP 19.5. The investigation was conducted to fill data gaps from the Remedial Investigation (RI) conducted during 2012.

PMP 17.7

An estimated 33,600 gallon fuel release from the HFP occurred at this site in 1968. The HFP was located along the base of steep hillside with a wetland to west that is intersected by the Haines Highway. Fuel was released to the wetland with some of the fuel recovered and burned on site. Subsequent investigations identified areas of contaminated soil, sediment, and surface water. The 2012 RI identified a soil and groundwater plume that extended to the west side of the highway; however, the contaminant plumes were not fully delineated. Due to frozen conditions, surface water and sediment sampling was not completed.

Twelve soil borings were drilled and a total of twenty-three primary soil samples were collected in July 2014. Gasoline range organics (GRO); diesel range organics (DRO); benzene, toluene, ethylbenzene, and xylenes (BTEX); 1-methylnapthalene; and 2-methylnapthalene exceeded cleanup levels in one or more soil samples. The horizontal extent of soil contamination exceeding cleanup levels covers approximately 69,000 square feet (sq. ft.). Based on an average contaminant soil thickness of approximately 8 ft., the estimated volume of contaminated soil is 20,000 cubic yards (cy).

Eight monitoring wells were installed and sampled. Sample data indicates a weathered gasoline source. GRO, DRO, and benzene exceed Alaska Department of Environmental Conservation (ADEC) cleanup levels. In addition, surface water criteria for total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH) were exceeded in groundwater samples. The horizontal extent of groundwater contamination exceeding cleanup levels covers approximately 89,000 sq. ft.

Free product was identified in one well following installation, near the location where product was identified during the 2012 RI. The well contained insufficient product to attempt a product recovery evaluation. Well points were driven surrounding the location of 17-MW2 in an attempt to delineate the extent of a product plume; however, product was not measured in any of the well points. During the August re-sampling event, no product was measured and the well was sampled. The presence of measurable free product would be expected to be less during time periods with a higher water table as the smear zone pore space is saturated with water, limiting fuel accumulation on top of the water table.

Groundwater elevation contours showed the groundwater flow direction towards the east. This differs from the northwesterly groundwater flow direction determined by the 2012 RI. The Chilkat River water level, measured near the PMP 25.5 site, was approximately 4 feet higher in July 2014 than during the 2012 RI. Groundwater elevations were similarly higher in 2014. Presumably during periods of high river flow the river discharges to groundwater, and the reverse may occur during periods of low river flow. The groundwater gradient was very low during both investigations, approximately 0.0025 feet per foot (ft/ft) during 2014.

Groundwater geochemistry is generally highly reduced, which is likely a result of mixing with surface water and contaminant biodegradation processes. As a result aerobic biodegradation is limited and anaerobic biodegradation of contaminants is likely very slow.

Groundwater contamination resulted in cumulative carcinogenic and noncarinogenic risks exceeding benchmark values. However, there is no current risk as the contaminated groundwater is not being used. Cumulative risks for direct contact and inhalation of soil contamination do not exceed acceptable levels.

Excavation of contaminated soil would be possible but surface water control would be necessary. Excavation of the contaminated soil would likely reduce groundwater contamination. Due to the potential for presence of contaminants above ecological screening benchmarks, the presence of aquatic receptors in the wetland and Chilkat River, and the presence of a nearby critical habitat area, the potential risk to ecological receptors should be evaluated further.

PMP 19.5

An estimated 75,000 gallon fuel release from the HFP occurred at this site during 1970, although the exact location of the release has been unclear. Previous investigations have not identified significant fuel contamination. The 2012 RI identified a very limited area of soil contamination (GRO and DRO) in the vicinity of a pipeline valve, not believed to be within the area of the pipeline fuel release. Subsequent to the 2012 RI, a spill report was located which was written by a fisheries biologist who conducted an assessment of the impact of the fuel spill. The report provided information regarding the location of the pipeline break and the fuel release. The 2014 investigation focused on determining whether fuel contamination was present in soil, sediment, groundwater, and surface water in the impacted area identified by the 1970 spill report.

One soil sample was collected from each of ten soil borings that were drilled during July 2014. Only one soil boring identified any signs of soil contamination and while the fuel concentrations were elevated in the soil sample collected from the boring, contaminant concentrations were below ADEC cleanup levels. Four monitoring wells were installed and sampled; groundwater samples did not identify fuel contamination. With the exception of residual range organics (RRO) in one surface water sample located upstream of the suspected fuel release area, none of the surface water or sediment samples identified fuel contamination; none of the surface water samples exceeded surface water criteria or groundwater cleanup levels. The chromatogram of the elevated RRO result in the upgradient surface water sample did not appear to be consistent with fuel contamination and may be attributed to naturally occurring organics.

No additional investigation or remedial activities are recommended at PMP 19.5. The exact location of the pipeline break could not be definitively determined, but extensive investigation has been performed across the fuel release area and no cleanup or screening level exceedances were observed in any matrix (with the exception of one 2012 soil boring). Site closure should be pursued with ADEC.

PMP 25.5 (Gate Valve #4)
The PMP 25.5 site, located adjacent to the Haines Highway, consists of a buried gate valve associated with the HFP. The 2012 RI identified fuel contamination consistent with a leaded gasoline source in soil and groundwater contamination that is directly adjacent the gate valve.

Ten soil borings were drilled and nineteen primary soil samples were collected during July 2014. Six monitoring wells were installed and groundwater samples were collected. Soil contaminants of concern (COCs) include DRO, GRO, 1,2-dibromoethane (EDB), 1-methylnaphthalene, and 2-methylnaphthalene; benzene and 1,2-dichloroethane (1,2-DCA) were detected above cleanup levels in 2012 but not in 2014. Groundwater COCs include GRO, DRO, EDB, and lead; benzene and 2-methylnaphthalene were detected above cleanup levels in 2012 but not in 2014.

The extent of soil contamination was delineated and estimated to be approximately 4,300 sq. ft. Fuel appears to have emanated from the gate valve vault and migrated downward through the soil column, and migrated horizontally near the groundwater interface. An estimated 2,000 cy of soil exceeds the most stringent ADEC Method Two soil cleanup levels (over 40-inch zone).

The groundwater plume appears to have originated from the gate valve area and migrated south and west in the direction of groundwater flow. The estimated extent of groundwater contamination is approximately 7,000 sq. ft. The groundwater flow direction was determined to be towards the southwest and the Chilkat River. However, considering that fuel releases occurred over 40 years ago, there has been limited contaminant migration. Groundwater geochemistry indicates that the aquifer is reduced in the contaminated area near the gate valve, indicating that biodegradation has occurred at the site. Additional groundwater sampling should be conducted to evaluate contaminant trends, the potential for contaminant migration, and the effectiveness of natural attenuation as a remedial option.

Groundwater contamination resulted in cumulative carcinogenic and noncarinogenic risks exceeding benchmark values. However, there is no current risk as the contaminated groundwater is not being used. Cumulative risks for direct contact and inhalation of soil contamination do not exceed acceptable levels and are further minimized due to the depth of soil contamination. A drinking water well is present on the property adjacent the valve pit. Although the well is not currently being used as a drinking water source, the potential exists for groundwater to be used in the area. However, as the well is located cross-gradient and approximately 700 feet from the gate valve, migration of contamination to the well is very unlikely.

An ecoscoping evaluation was completed for the site and no further ecological evaluation is necessary.

The current preferred alternative for the highway realignment would move the highway north, overlying the location of the gate valve. Remedial options would need to consider the highway alignment and the timeframe of the construction project. A limited amount of shallow subsurface soil contamination (probably less than 10 cy) could be removed along with the valve pit during the highway construction project. However, the bulk of the soil contamination is too deep to practically excavate, particularly considering the proximity to the highway.

1.0 INTRODUCTION

This report documents an Environmental Investigation that was conducted at three sites along the Haines-Fairbanks Pipeline (HFP) Formerly Used Defense Sites (FUDS) near Haines, Alaska (pipeline milepost [PMP] 17.7, PMP 19.5, and PMP 25.5). PMP 17.7, PMP 19.5, and PMP 25.5 sites are located along the Haines Highway at approximate highway mileposts 15.5, 17.5, and 23.5, respectively (Figure 1-1). Fairbanks Environmental Services (FES) is providing this service under contract to the U.S. Army Corps of Engineers (USACE) Contract Number W911KB-12-D-0001 (Task Order 29). All work was performed in accordance with the 2014 Work Plan (FES, 2014) and the Scope of Work (SOW; USACE, 2014a), except where noted.

1.1 Project Objectives

Objectives of the 2014 investigation were as follows:

- Characterize the nature and extent of contamination in the surface and subsurface soil and groundwater at two sites (PMP 17.7 and PMP 25.5).
- Determine whether a previously uninvestigated portion of the PMP 19.5 may have been the fuel release location and contains residual contamination.
- Collect sediment and surface water samples at the PMP 17.7 and PMP 19.5 sites and compare to regulatory standards.
- Conduct a screening evaluation of human health and ecological risks related to fuel releases at the PMP 17.7 site.

1.2 Haines-Fairbanks Pipeline

The HFP FUDS extends a total of 626 miles from Haines, Alaska, through the Canadian provinces of British Columbia and the Yukon Territory, through Tok, Alaska, to Fairbanks, Alaska. Approximately 52 percent (%) of the HFP route lies within United States. The pipeline route generally parallels the Haines Highway from Haines, Alaska, to Haines Junction, Yukon Territory, following the Alaska and Richardson Highways to Delta Junction, Alaska, and continues along the Richardson Highway to Fort Wainwright, Alaska.

1.3 Project Site Locations

The sites investigated under this project are summarized in Table 1-1 on the following page. All three sites investigated are included under Alaska Department of Environmental Conservation (ADEC) File #900.38.001. The locations of these sites are shown on Figure 1-1.

Table 1-1 Summary of HFP Sites Investigated in 2014

Site Name	Section of Report	Coordinates	Pipeline Milepost	Haines Highway Milepost	ADEC Hazard ID
PMP 17.7	3.0	59.34818 N, 135.77139 W	17.7	15.5	4426
PMP 19.5	4.0	59.36702 N, 135.80330 W	19.5	17.5	-
PMP 25.5 (Gate Valve #4)	5.0	59.41605 N, 135.92923 W	25.5	23.5	4428

Coordinates are in latitude, longitude in decimal degrees.

1.4 Regional Setting

1.4.1 Land Use

The sites are within or near the Haines Highway right-of-way (ROW), and are located within various types of development and ownership. Sections 3 through 5 provide detailed information about the individual project sites.

1.4.2 Climate

All of the HFP sites being investigated under this project are located near Haines, Alaska. Haines is located on the western shore of the Lynn Canal, at the northern end of the Chilkat Peninsula between Chilkat and Chilkoot Inlets in Southeast Alaska, approximately 75 air miles northwest of Juneau.

Haines experiences a maritime climate characterized by cool summers and mild winters. Summer temperatures range from 50 to 70 degrees Fahrenheit (°F); winter temperatures range from 10 to 35 °F. The average annual precipitation in Haines is 48 inches, with an average annual snowfall of 113 inches. October is typically the rainiest month of the year.

1.4.3 Regional Geology and Hydrogeology

The HFP follows the Haines Highway, constructed at the base of the Takshanuk Mountains adjacent to the Chilkat River. The Haines Highway is a National Scenic Byway that traverses the Chilkat Bald Eagle Preserve (highway milepost 8 through 31). Wetlands are present at sites PMP 17.7 (emergent – permanently flooded) and at PMP 19.5 (scrub shrub emergent) (DOWL HKM, 2012).

Local geology is dominated by the Chilkat River Fault. Underlying bedrock in the area is composed of ultramafic and igneous rocks of Cretaceous and Tertiary age. Surficial deposits are generally fine grained marine deposits that are thought to have been glacially-derived and deposited in a fjord environment (DOWL HKM, 2009).

Groundwater in the Chilkat River basin occurs within bedrock and alluvium. Unconfined groundwater is usually found in alluvium in valleys. Confined conditions may occur in alluvium overlain by clay and silt, at the base of steep alluvial fans on the sides of mountains, and in fractured bedrock beneath valleys (U.S. Geological Survey [USGS], 1988). Alluvial aquifers in the Chilkat River Valley are very thick with the depth to bedrock near Klukwan being greater than 850 feet. The Chilkat River generally discharges to groundwater during periods of high streamflow and groundwater recharges the river during periods of low streamflow.

1.5 Pipeline History

The HFP, its five pumping stations, and two associated bulk storage terminals were constructed in 1953 and 1954 by the U.S. military. The HFP was built to transport fuels from the port at Haines, Alaska, to the military bases in interior Alaska.

Originally, the HFP was constructed with five pump stations located at Haines and Tok, Alaska, and Border, Haines-Junction, and Donjek in Yukon Territory, Canada. Bulk fuel storage facilities were also constructed at Haines and Tok, Alaska. Six new pump stations were added to the HFP in 1962 in response to increased military fuel demands. The new pump stations were located at Blanchard River, Destruction Bay, and Beaver Creek in Yukon Territory, Canada, and at Lakeview, Sears Creek, and Timber, Alaska.

The pipeline began operation in 1956. Four types of fuel were conveyed over the 626-mile route including diesel, automotive gas, jet fuel, and aviation gas. The vast majority of fuel transported was jet propulsion fuel No. 4 (JP-4). When operating at maximum capacity, the pipeline could deliver 27,500 barrels of fuel a day, most of which was for Air Force use (Center for Environmental Management of Military Lands [CEMML], 2003). Much of the 8-inch diameters pipeline was laid on the ground surface, although most of the 42 miles of HFP between the Haines Fuel Terminal and the Canadian border was buried. In 2002, the HFP ROW (25 feet to either side of the pipeline) was determined by the USACE to be eligible for investigation under the FUDS Program.

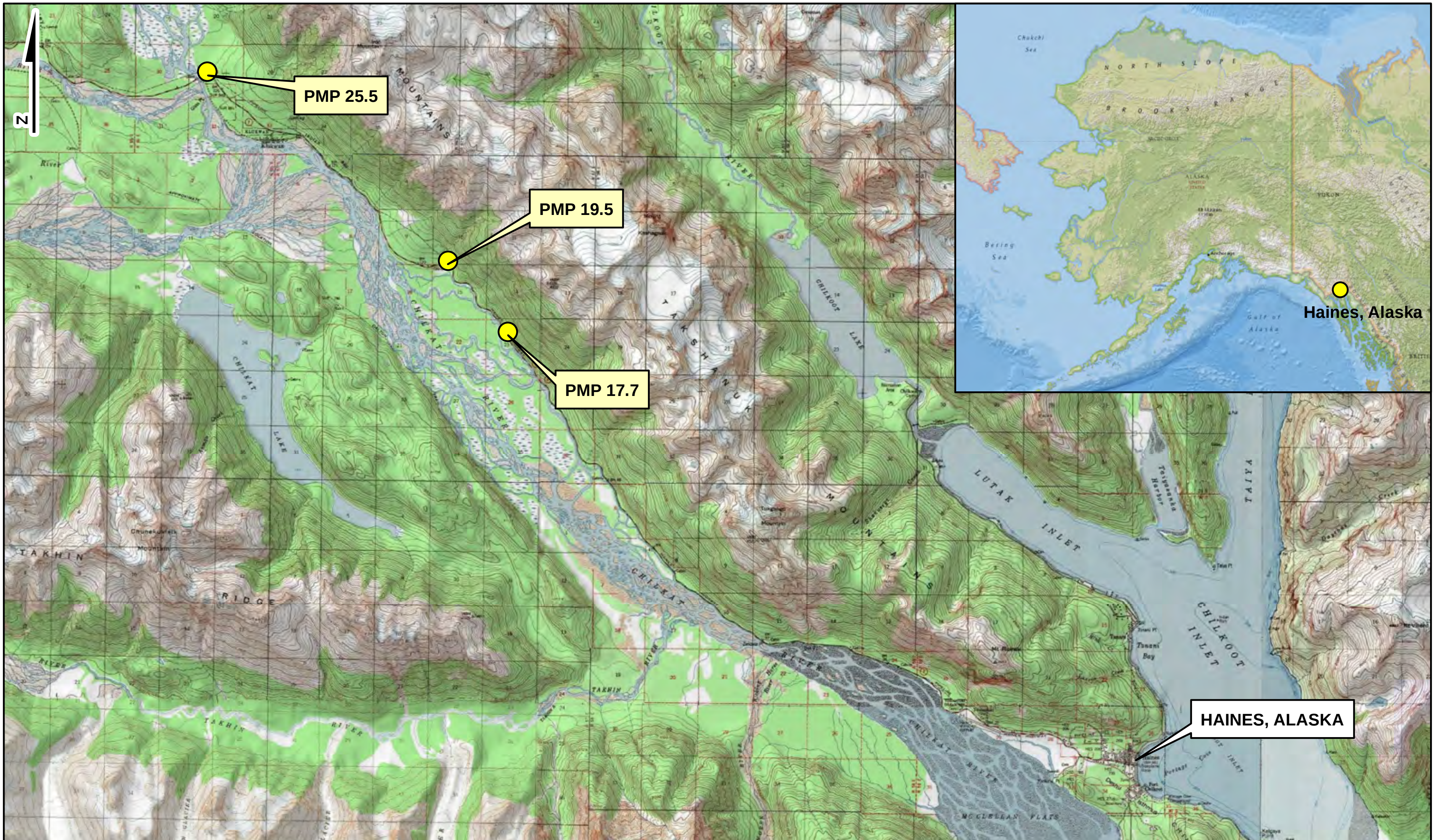
The Haines-to-Tok section of the pipeline was shut down in July 1971. In 1973, the Tok-to-Eielson section of the HFP was deactivated. The Tok-to-Fairbanks section of the HFP was briefly reactivated to pump the remaining fuel from the station. All of the fuel was removed from the Tok terminal in July 1979 and the pipeline was shut down. Only a small section of the Eielson-to-Fairbanks pipeline remains operational today. Most of the unused pipeline has been removed or salvaged by nonmilitary entities.

The HFP had numerous leaks from corrosion, ice damage, and vandalism (e.g., bullet holes) throughout its operational history. Underground portions of the pipeline experienced damage from broken welds and at least one accidental breach from borehole drilling. Ice plugs formed in the pipeline during system startup and resulted in spills at a number of sites; however, most of these ice plugs were located in Canadian sections of the pipeline and are not part of this investigation.

1.6 Previous Investigations

Several limited environmental investigations and cleanup activities have been performed at various locations along the HFP since its closure in 1973. The following documents were consulted for site information and past investigations of the HFP sites.

- *Preliminary Investigations of Petroleum Spillage, Haines-Fairbanks Military Pipeline, Alaska,* prepared by the Cold Regions Research and Engineering Laboratory (CRREL) in 1972.
- *Trip Report, Haines-Fairbanks Pipeline Area Site Visit,* prepared by ENSR Corporation (ENSR) in 2006.
- *Final Report, Haines-Fairbanks Pipeline (Haines to Canada Section), Site Investigation, Haines, Alaska,* prepared by ENSR in 2007.
- *Final Report, 2007 Haines-Fairbanks Pipeline Site Investigation,* prepared by CH2M HILL in 2008.
- *Final Remedial Investigation (RI) Report, Haines Area Sites (PMP 1.9, 17.7, 19.5, and 25.5), Haines-Fairbanks Pipeline FUDS, Haines, Alaska, Project # F10AK1016-01 and Project #s F10AK1016-02 (PMP 1.9), F10AK1016-03 (PMP 19.5 and 25.5), and F10AK1016-14 (PMP 17.7),* prepared by FES, April 2013.



LEGEND:

SITES INVESTIGATED DURING 2014

0 1.25 2.5 5 Miles

Coordinate System - Projection: UTM Zone 8N, feet; Datum: WGS84.

Basemaps "USA Topo Map" and "National Geographic" provided by ESRI and the National Geographic Society © 2011. Sources include National Geographic, Esri, DeLorme, NAVTEQ, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, iPC.

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Haines Area Site Map
Pipeline Mileposts 17.7, 19.5, and 25.5
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS, Alaska
Project #: F10AK1016-03 and F10AK1016-14

Contract: W911KB-12-D-0001, TO29	Figure: 1-1	Date: 12/14

2.0 FIELD PROCEDURES AND DATA EVALUATION METHODS

The following field procedures were applied during the 2014 Investigation. Fieldwork was performed in accordance with the 2014 Work Plan (FES, 2014), except where noted. Site photographs are included in Appendix A, and field notes are included in Appendix E.

2.1 Permitting/Utility Locates

Right-of-entry (ROE) permits were obtained by the USACE. ROW authorizations from the Alaska Department of Transportation and Public Facilities (ADOT&PF) were also obtained due to the proximity of drilling operations to the Haines Highway.

Alaska Power and Telephone (AP&T) and Inside Passage Electric Cooperative (IPEC) were contacted for utility locates prior to drilling and excavation activities. Utility locates were performed at all three sites on June 14, 2014.

2.2 Drilling and Soil Sampling

Drilling and soil sampling were performed by GeoTek Alaska using a Geoprobe® 6620DT drill rig and direct push technology. Traffic flagging was conducted when equipment was moving near or across the highway. Continuous soil cores were collected in 5-foot long, 2-inch diameter plastic liners. Soil samples were field-screened using a photo-ionization detector (PID). Samples having the highest PID readings and/or representing an upper or lower contaminant extent from each boring were submitted for laboratory analysis. Additionally, samples were generally collected at the groundwater interface. Upon completion, soil boring locations were marked with pin flags or survey lathe. Borings not used for well installations were filled with hydrated bentonite. Boring logs are included in Appendix C.

Soil samples were submitted for the following analyses:

- Gasoline range organics (GRO) by Method SW5035A/AK101
- Diesel range organics (DRO) by Method SW3550C/AK102
- Residual range organics (RRO) by Method SW3550C/AK103
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) by Environmental Protection Agency (EPA) Method SW5035A/8260B
- Polycyclic aromatic hydrocarbons (PAH) by Method SW3550C/8270D-SIM
- Lead by Method SW3050B/6020A

In addition to the analysis listed above, soil samples collected from the PMP 19.5 and 25.5 sites were analyzed for:

- 1,2-Dichloroethane (1,2-DCA) by EPA Method SW5035A/8260B
- 1,2-Dibromoethane (EDB) by Method SW8011

2.3 Monitoring Well Installation and Development

Monitoring wells were installed in select soil boring locations at PMP 17.7, PMP 19.5, and PMP 25.5 upon completion of soil sample collection. Wells were installed within the DT45 drill rod as the tooling was extracted from the borehole, and were generally constructed of 2-inch diameter polyvinyl chloride (PVC) with 10-foot pre-pack screens (0.010-inch slots with 20/40 sand). Wells located in wetland areas at PMP 17.7 and PMP 19.5 used 5-foot screen due to the shallow water table. The annular space around the screen interval (and two feet above) was filled with 10/20 sand. Benseal (bentonite crumbles) were placed on top of the sand pack and hydrated with potable water. Wells were completed as flushmounts or stick-ups with lockable caps (lock combinations set to 0911). Well logs are included in Appendix C.

Wells were developed to remove fine-grained material from the filter pack and to facilitate natural groundwater movement from the formation into the well through the well screen. Monitoring wells were developed on July 24 and 25, 2014 using a Waterra pump. Well development procedures followed the ADEC Monitoring Well Guidance (ADEC, 2013a) and procedures detailed in the Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP). The well development process involved a series of surging and pumping beginning at the top of the screen interval and working towards the bottom of the well. Well development was considered complete when the turbidity was less than 50 Nephelometric Turbidity Units (NTU) or approximately 10 casing volumes were removed, whichever came first. Final turbidity ranged from 19 to 188 NTU after removing between 3 and 10 gallons of water from the wells. Purge water from development was containerized as described in Section 2.8. Details of development of each well are provided on the well development forms included in Appendix D. Fuel odor and/or sheen were identified in the purge water from four wells at PMP 17.7 and three wells from PMP 25.5. No sheen or odor was identified in purge water from PMP 19.5.

2.4 Groundwater Sampling

Groundwater samples were collected from monitoring wells installed at PMP 17.7, PMP 19.5, and PMP 25.5. Peristaltic pumps were used for purging and sampling groundwater at the PMP 17.7 and PMP 19.5 sites; three of the wells at the PMP 25.5 site were sampled using a peristaltic pump, and three wells utilized bladder pumps due to deeper groundwater. Purging and sampling of wells followed the low-flow sampling protocol (Puls and Barcelona, 1996). Samples were collected from monitoring wells after groundwater parameters met the stabilization criteria described in the UFP-QAPP and ADEC Draft Field Sampling Guidance (ADEC, 2010a. Groundwater sampling forms are provided in Appendix D.

Groundwater samples were submitted to the project laboratory for the following analyses:

- GRO by Method SW5030B/AK101
- DRO by Method SW3520C/AK102SV
- RRO by Method SW3520C/AK103SV
- BTEX by EPA Method SW5030B/8260B
- PAH by EPA Method SW3520C/8270D-SIM
- Total Lead by Method SW3010A/6020A
- Total Nitrates/Nitrites as N by SM4500NO3-F
- Sulfate by EPA Method 300.0
- Dissolved Iron and Manganese (field-filtered) by Method SW3010A/6020A

In addition to the analysis listed above, groundwater samples collected from the PMP 19.5 and 25.5 sites were also analyzed for:

- 1,2-DCA by EPA Method SW3050B/8260B
- EDB by Method SW8011

2.5 Surface Water and Sediment Sampling

Surface water and sediment samples were collected from the PMP 17.7 and PMP 19.5 sites. For co-located surface water/sediment samples, water samples were collected first to minimize disturbance of sediments that could impact surface water samples. Surface water samples were collected directly into an unpreserved one liter sample jar and then decanted into the various sample containers, with volatile containers filled first. Surface water samples were analyzed by the same methods as listed for groundwater in Section 2.4, with the exception of nitrogen, sulfate, iron and manganese analyses. Surface water analysis for PMP 19.5 included 1,2-DCA and EDB analysis.

Sediment samples were collected using new, stainless steel spoons at PMP 19.5 and the samples located along the Chilkat River slough at PMP 17.7. Sediment samples collected from the PMP 17.7 pipeline trench and wetland areas utilized a hand auger to collect samples underneath the vegetative mat. The hand auger was decontaminated in-between sample collection, and an equipment rinsate was collected (equipment rinsate results are presented with surface water results on Table 3-9). Sediment samples were analyzed by the same methods as listed for soil in Section 2.2, including 1,2-DCA and EDB analysis at PMP 19.5. Sediment from each sample location was also collected and placed inside a Ziploc bag for PID analysis. Following analytical sample collection, the Ziploc bags were warmed and the PID was inserted inside; readings were recorded on field forms (Appendix D) and are presented in Drilling Summary tables in each site section.

2.6 Re-collection of Groundwater, Sediment, and Surface Water Samples

Samples were originally collected from all three sites in July 2014; however, all coolers from a large sample shipment arrived at the SGS laboratory above acceptable temperature. The issue was noted at the laboratory immediately and the samples were not analyzed. The affected samples included all groundwater samples, all sediment samples, and all surface water samples except for the containers for PAH analysis. The surface water PAH samples were shipped ahead to the laboratory due to their shorter 7-day hold time and were received within acceptable temperature. Water samples shipped to TAL-D for EDB analysis and all subsurface soil samples were shipped separately and were not affected.

Groundwater samples from PMP 25.5 were re-collected before demobilizing on July 30 and 31, 2014. The remaining groundwater, surface water, and sediment samples from PMP 17.7 and PMP 19.5 were re-collected August 8 through 10, 2014.

2.7 Borehole and Well Surveys

Boring and monitoring well locations were marked with pin flags immediately following drilling. Horizontal and vertical surveys were conducted by Windy Creek Surveys (a Professional Land Surveyor) at PMP 17.7, 19.5, and 25.5 on July 27 and 28, 2014. Post-processed data were used in all maps and figures generated for the report. Survey data are included in Appendix F and supporting data from the surveys, including post-processing information, are included in the Supplemental folder on the compact disk (CD) accompanying this report.

Each site survey followed a similar work flow. To complete the horizontal portion of the surveys, two real-time kinematic (RTK) base stations were situated on separate monuments and set to broadcast RTK corrections with coordinates from 15 minutes of occupation on the initial base station. Each receiver was then set to broadcast RTK corrections on a different frequency. Soil borings and monitoring wells were positioned from both base stations and two sets of points were recorded utilizing three JAVAD Triumph-1 Global Navigation Satellite System (GNSS) receivers. In order to determine if the survey accuracy was within the Manual of Electronic Deliverables (MED) requirements (USACE, 2011), field inverse checks were performed between the two series points. Accuracy was within MED requirements and found a maximum positional variance range from 0.17 feet (at PMP 17.7), to 0.10 feet (at PMP 19.5) to 0.24 feet (at PMP 25.5). Online Positioning User Services (OPUS) solutions were established based upon the static observation data obtained from one of the base stations. JAVAD Justin software was utilized to post process the static Global Positioning System (GPS) data. Series point set selection was based on which base station the OPUS solution was established at. Reported coordinates were shifted horizontally and vertically using the OPUS solution for the primary control location at each site, in order to be in accordance with the corresponding Universal Transverse Mercator (UTM) Zone, North American Vertical Datum of 1988 (NAVD88) OPUS solution. Horizontal coordinates were projected into UTM Zone 8N, meters in the World Geodetic System of 1984 (WGS84) Datum for mapping purposes. Coordinates are also provided in geodetic latitude and longitude coordinates.

The vertical control survey established elevations on the top of the PVC pipe of each well. A Leica DNA03 digital level and a fiberglass Leica bar code level rod were utilized to complete the level loops that established these elevations. Leica Geo Office 7.0 software was utilized to process the level loops which originated using National Geodetic System (NGS) Monuments when available, or from primary control points.

2.8 IDW Management

Investigative derived waste (IDW) included contaminated wastewater, soil cuttings, and solid wastes generated during field activities. Soil cuttings exhibiting visual and olfactory evidence (i.e., staining and hydrocarbon odor) and/or soils with field screening results above 20 parts per million (ppm) were containerized. Clean soil cuttings were spread on site. Debris and municipal wastes, including used sample gloves and well casings, were disposed of in Haines.

GeoTek Alaska maintained custody of the three 5-gallon buckets containing contaminated soil cuttings from borings at the PMP 17.7 and 25.5 sites until they could be transported back to Anchorage with drilling equipment. FES personnel obtained the buckets and delivered them to the Anchorage Soil Recycling thermal treatment facility on October 3, 2014. IDW transport and disposal documentation is included in the Supplemental Folder included on the CD with this report.

Purge water from wells was filtered through carbon filtration units and then discharged to the ground. The used carbon was disposed of at Organic Incineration Technology, Inc. (OIT) in Moose Creek, Alaska (transport and disposal documentation included in the Supplemental Folder).

2.9 Chemical Data Quality

The chemical data generated by the project laboratories, SGS-North America Inc. (SGS) and Test America Laboratories of Arvada, Colorado (TAL-D), were evaluated in order to assess if data quality objectives were met and if the data were acceptable for project use. The findings of the review are documented in the Chemical Data Quality Review (CDQR) and ADEC Laboratory Data Review Checklists (Appendix B). Analytical data summarized in tables and figures were qualified based on those findings. Overall, the completeness goals were met and the review process deemed the chemical data acceptable for project use. No data were rejected pursuant to the data quality review, and all data may be used as qualified for project purposes. Notable data quality concerns and impacts are discussed in Sections 3.6, 4.8, and 5.5.

2.10 Contaminant Screening Level Determination

2.10.1 Soil and Groundwater Cleanup and Screening Level Comparisons

Soil contaminant concentrations were compared to ADEC's Method Two cleanup levels, using the most stringent criteria (Tables B1 and B2, Title 18 of the Alaska Administrative Code [AAC] 75.341; ADEC, 2012a) for the "Over 40-Inch" precipitation zone.

Groundwater contaminant concentrations were compared to ADEC Table C concentrations (ADEC, 2012a). Groundwater matrix sample results from PMP 17.7 and PMP 19.5 were also compared to water quality standards presented in 18 AAC 70 (ADEC, 2012b), including total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH), due to the potential for contact with surface water at these sites. TAH and TAqH values were calculated in accordance to ADEC guidelines (ADEC, 2012c).

2.10.2 Surface Water Screening Level Comparisons

Surface water sample results from PMP 17.7 and PMP 19.5 were compared to water quality standards presented in 18 AAC 70 (ADEC, 2012b), including TAH and TAqH. To allow a comparison to groundwater contaminant concentrations, surface water concentrations of groundwater COCs are presented on surface water result figures.

2.10.3 Sediment Screening Level Comparisons

Sediment contaminant concentrations were compared to the National Oceanic and Atmospheric Administration Probable Effects Level/Threshold Effects Levels (NOAA PEL/TEL) for Freshwater Sediment following ADEC's Sediment Quality Guidelines (SQGs; ADEC, 2013b). The SQGs recommended the use of the TEL and PEL, as published in the NOAA Screening Quick Reference Tables (SQuiRTs), and defined as follows:

- TEL – Threshold Effects Level; represents the concentration below which adverse effects are expected to occur only rarely.
- PEL – Probable Effects Level; represents the concentartion above which adverse effects are frequently expected.

Analytes which do not have NOAA PEL/TELs were compared to soil cleanup levels for the over 40-inch zone.

2.11 Development of Conceptual Site Models and Ecoscoping Forms

Human Health Conceptual Site Models (CSMs) were developed for each site in accordance with the ADEC's Policy Guidance on Developing Conceptual Site Models (ADEC, 2010b) during the 2012 RI; these CSMs were updated for this report. CSM summaries are discussed in Sections 3.9, 4.11, and 5.8; CSM graphics forms and scoping forms are included in Appendix H.

A screening evaluation of potential ecological risks was conducted following ADEC's Ecoscoping Guidance (ADEC, 2014). Findings of the ecological risk screening are discussed in Sections 3.9, 4.11, and 5.8; and completed ADEC Ecoscoping Forms are included in Appendix I.

3.0 PMP 17.7

3.1 Site Description

The PMP 17.7 site is located along the Haines Highway between highway mileposts 15 and 16, northwest of Haines, Alaska (Figure 1-1). The 2014 investigation area is approximately 500 feet long and is located on both sides of the highway.

A release at PMP 17.7 was reported in December 1968. A small corrosion leak in a buried portion of the pipe resulted in an estimated loss of 800 barrels (33,600 gallons) of fuel product. The pipe had to be excavated for a great distance before the pipeline leak could be located. Fuel soon filled the excavated trench and was subsequently pumped into a tank and burned off numerous times throughout the winter in a steel vault or burn box. During a 1971 site visit, several large cottonwoods and alders were found dead or dying apparently from the effects of the fuel release (CRREL, 1972).

The pipeline remains in the trench on the northeast side of the highway and is used as a utility conduit in this area (CH2M HILL, 2008). The trench follows the toe of the hill slope to the south and ends at a green utility box near highway mile 15.5. Trenching spoils remain mounded on the highway side of the pipeline trench.

3.2 Previous Investigations

3.2.1 2006 Geotechnical Drilling

Geotechnical drilling associated with the Haines Highway Improvement Project was conducted at the PMP 17.7 site in April 2006. Two soil borings were drilled near the highway shoulder on either side of the highway. Both borings identified presumed fuel contamination, although samples were not submitted for analytical testing. Fuel contamination was identified at a depth of 5 feet below ground surface (bgs) in Test Boring 102 (TB-102) on the east side of the highway in the PMP 17.7 release area and at a depth of 2 feet bgs in TB-101 on the west side of the highway (DOWL HKM, 2009). Groundwater was encountered at a depth of approximately 5 feet at the time of drilling in TB-102; however, the groundwater depth in a PVC probe installed in TB-102 rose to approximately 1 foot bgs the following day.

3.2.2 2006 Site Investigation

A site investigation was conducted in May 2006 and included the collection of four soil samples, five sediment samples, and two surface water samples (ENSR, 2007). Sampling was focused within the pipe trench, although samples were also collected within/adjacent to the burn box. A "background" sediment/surface water sample on the west side of the highway was also collected. With the exception of one surface water sample, the trench samples did not show an indication of fuel contamination. The burn box samples indicated fuel contamination in sediment and surface water. The “background” sediment sample (approximately 100 feet west of the highway) had elevated DRO/RRO but this may have been due to inferences from biogenic sources.

3.2.3 2007 Site Investigation

A second site investigation was conducted in 2007 and utilized soil gas sorbers that were installed along three transects. Two transects were located on each side of the highway and the third was located along the trenching spoils mound. The soil gas sorber analysis showed elevated soil gas contaminant concentrations in the central and northern portions of the sites, although the results were not consistent between the BTEX and the total petroleum hydrocarbon (TPH) analyses (CH2M HILL, 2008).

3.2.3 2012 Remedial Investigation

An RI was conducted during 2012 and involved the collection and analysis of 31 soil samples from drilled and hand augured soil borings. Nine groundwater samples were collected from temporary wells and well points. The investigation approach was modified since unusually cold temperatures caused surface water to freeze across the site, which enabled greater access for the drill rig across wetland areas. However, the freezing conditions prevented surface water and sediment samples from being collected.

Soil contaminants of concern (COCs) included DRO, GRO, and benzene. Groundwater COCs included DRO, GRO, benzene, and possibly lead (although lead results were suspect due to the high turbidity of samples). Sample data indicated that the contaminant source was a weathered gasoline. The depth of soil contamination on the west side of the highway was not fully delineated due to limitations of hand boring techniques in areas inaccessible to the drill rig. Groundwater contamination roughly mirrored the area of soil contamination; however, the extent of groundwater contamination towards the west and north was not completely delineated (FES, 2013). Soil and groundwater sample results for selected analytes are presented on Figures 3-1 and 3-3, respectively.

3.3 2014 Investigation Approach

The focus of the 2014 investigation was to fill the following data gaps resulting from previous investigations.

- Collect surface water and sediment samples that could not be collected in 2012 due to freezing conditions at the site.
- Drill soil borings and collect soil samples on the west side of the Haines Highway to delineate the horizontal and vertical extent of soil contamination.
- Delineate the extent of groundwater contamination to the west and north.
- Install permanent monitoring wells and determine the groundwater flow direction across the site.

3.4 Soil Sampling

Drilling and soil sampling at the PMP 17.7 site occurred between July 19 and 20, 2014.

3.4.1 Drilling and Soil Sampling

Drill rig access was originated from a pullout along the highway at the northeast end of the site. Soil borings 17-BH12 through 17-BH16 were drilled in locations on the east side of the highway, as specified in the work plan. Soil boring 17-BH22 was drilled as an attempt to identify the southeastern extent of soil contamination as field observations of 17-BH12 indicated potential for the presence of soil contamination. Soil borings 17-BH17 through 17-BH21 were drilled in locations specified in the work plan. An additional soil boring, 17-BH23, was added to the west of 17-BH17 to delineate the western extent of soil contamination since field observations indicated potential for the presence of soil contamination in 17-BH17.

Soil lithology varied greatly across the site but was generally comprised of intermixed layers of peat, silt, sand, and gravel. Boring locations are shown on Figure 3-1, and boring logs are presented in Appendix C. Table 3-1 summarizes drilling and associated soil sampling activities.

Table 3-1 Drilling Summary (PMP 17.7)

Soil Boring	Well Number	Date Drilled	Total Depth (feet bgs)	Number of Soil Samples	Sample Interval (feet bgs)	PID Range (ppm)
17-BH12	17-MW1	7/19/14	10	2	3 - 4, 5 - 6	0.0 - 1,269
17-BH13	17-MW2	7/19/14	10	2	4 - 5, 9 - 10	16.7 - 1,340
17-BH14	-	7/19/14	10	2	4 - 5, 9 - 10	2.0 - 1,203
17-BH15	-	7/19/14	20	4	4 - 5, 9 - 10 14 - 15, 18 - 19	0.0 - 1,050
17-BH16	17-MW3	7/19/14	15	3	4 - 5, 6 - 7, 14 - 15	0.0 - 1,356
17-BH17	-	7/20/14	10	1	4 - 5	13.4 - 350
17-BH18	17-MW5	7/20/14	15	2	5 - 6, 14 - 15	0.0 - 1,609
17-BH19	17-MW6	7/20/14	15	2	5 - 6, 10 - 11	0.0 - 915
17-BH20	17-MW7	7/20/14	10	1	7 - 8	0.0
17-BH21	17-MW8	7/20/14	15	1	7 - 8	0.0 - 9.1
17-BH22	-	7/19/14	15	2	5 - 6, 14 - 15	2.5 - 1,246
17-BH23	17-MW4	7/20/14	10	1	6 - 7	0.0

3.4.2 Soil Sample Results

A total of 26 soil samples, including 23 primary samples and 3 field duplicates, were collected from the PMP 17.7 site. Soil samples were submitted for analysis of BTEX, GRO, DRO, RRO, PAH, and lead. All soil samples were shipped in one sample data group (SDG) and assigned the SGS report number 1143328. A sample summary is presented as Table 3-4 and a soil analytical results table is included as Table 3-5. Soil sample results for analytes exceeding ADEC cleanup levels are summarized on Figure 3-1. Comparing sample results to the most stringent ADEC Method Two Migration to Groundwater soil cleanup levels (over 40-inch zone), GRO, DRO, BTEX, 1-methylnapthalene, and 2-methylnapthalene exceeded in one or more soil samples. Soil sample results are summarized below:

- GRO concentrations exceeded the ADEC cleanup level (260 milligrams per kilogram [mg/Kg]) in seven primary samples from five different borings. The maximum GRO concentration was 2,460 mg/Kg, detected in the sample collected from 9 feet bgs from soil boring 17-BH14.
- DRO concentrations exceeded the ADEC cleanup level (230 mg/Kg) in eight samples from six different borings. The maximum DRO concentration was 2,470 mg/Kg, detected in the sample collected from a 9 feet bgs in soil boring 17-BH14.
- Benzene concentrations exceeded the ADEC cleanup level (0.025 mg/Kg) in seven primary samples from four different borings. The maximum benzene concentration was 4.16 mg/Kg, detected in the sample collected from 4 feet bgs in soil boring 17-BH15.
- Toluene concentrations exceeded the ADEC cleanup level (6.5 mg/Kg) in one primary sample. The maximum toluene concentration was 71.2 mg/Kg, detected in the sample collected from 4 feet bgs in soil boring 17-BH15.
- Ethylbenzene concentrations exceeded the ADEC cleanup level (6.9 mg/Kg) in three primary samples from three different borings. The maximum ethylbenzene concentration was 27.8 mg/Kg, detected in the sample collected from 4 feet bgs in soil boring 17-BH15.
- Total xylene concentrations exceeded the ADEC cleanup level (63 mg/Kg) in two primary samples from two different borings. The maximum total xylene concentration was 143.2 mg/Kg, detected in the sample collected from 4 feet bgs in soil boring 17-BH15.
- 1-Methylnapthalene concentrations exceeded the ADEC cleanup level (6.2 mg/Kg) in three primary samples from three different borings. The maximum 1-methylnapthalene concentration was 7.85 mg/Kg, detected in the sample collected from 5 feet bgs in soil boring 17-BH18.
- 2-Methylnapthalene concentrations exceeded the ADEC cleanup level (6.1 mg/Kg) in four primary samples from four different borings. The maximum 2-methylnapthalene concentration was 13.4 mg/Kg, detected in the sample collected from 5 feet bgs in soil boring 17-BH18.

Contaminant concentrations were significantly higher in 2014 soil samples compared to those collected in similar locations during the 2012 investigation. DRO and GRO concentrations were typically one order of magnitude higher in 2014 samples, while VOC and SVOC analytes were up to three orders of magnitude higher. As a result, several contaminants were identified at concentrations above cleanup levels in 2014 that were below cleanup levels in 2012. Contaminant concentrations in 2012 samples collected from the PMP 17.7 site were suspected to be too low based upon field observations (FES, 2013).

3.5 Groundwater Sampling

3.5.1 Monitoring Well Installation and Development

Monitoring wells were installed and developed as detailed in Section 2.3. With the exception of three locations, 5-foot well screens were used due to the groundwater being present near the surface. All of the wells at PMP 17.7 were completed as stick-ups. Well locations are shown on Figures 3-2 and 3-3. Completion details of the monitoring wells are presented in Appendix C. Final turbidity ranged from 26 to 48 NTU after removing between 3 and 8 gallons of water from the wells. Details of development of each well are provided on the well development forms included in Appendix D. Fuel odor and/or sheen was identified in the purge water from 17-MW3, 17-MW5, 17-MW6 (slight), and 17-MW8 (slight). Well 17-MW2 was not developed due to the presence of product.

Monitoring well installations were challenged by shallow groundwater and the presence of surface water. To prevent surface water from directly entering the well screen, a sufficient surface seal (at least 0.5-foot) was needed, which prevented wells from being screened too near the ground surface. Holes or slits were drilled / grinded into well overcasings where the groundwater was within a foot of the surface (all wells except 17-MW3). The intent of this was to give the groundwater a natural path to flow and not be impeded by the overcasing around the screen.

3.5.2 Groundwater Elevations and Flow Direction

Groundwater depth measurements were collected from each of the wells on July 28, 2014. Using the well survey data (Appendix F), groundwater elevations were calculated. Groundwater contours shown on Figure 3-2 indicate the general flow direction is to the east. Groundwater contours from November 2012 depicted groundwater flow roughly towards the northwest in the northern part of the site. Groundwater elevations were approximately 3.8 feet higher during July 2014 than measured in November 2012 at similar site locations.

Table 3-2 Groundwater Elevations on July 28, 2014 (PMP 17.7)

Well	Screen Interval (feet BTOC)	GW Depth (feet BTOC)	Top of Casing Elevation (NAVD88, feet)	Screen Elevation (NAVD88, feet)	GW Elevation (NAVD88, feet)
17-MW1	1.95 – 6.95	2.09	64.90	62.95 – 57.95	62.81
17-MW2	1.40 – 6.40	1.89	64.96	63.56 – 58.56	63.07
17-MW3	1.95 – 6.95	3.05	65.96	64.01 – 59.01	62.91
17-MW4	1.92 – 6.92	1.38	65.52	63.60 – 58.60	64.14[1]
17-MW5	2.30 – 12.30	2.46	65.68	63.38 – 53.38	63.22
17-MW6	2.35 – 12.35	3.01	66.30	63.95 – 53.95	63.29
17-MW7	3.70 – 13.70	4.20	67.51	63.81 – 53.81	63.31
17-MW8	3.22 – 13.22	2.84	66.17	62.95 – 52.95	63.34[1]

BTOC – below top of casing; GW – groundwater
[1] Water level above top of screen

A comparison of Chilkat River elevations revealed an approximate four-foot river level drop between August and November (NOAA, 2014). River elevations were obtained from the USGS station near PMP 25.5, so are not necessarily representative of the Chilkat Slough near the PMP 17.7 site, but it can be expected that a similar seasonal change of water elevations would also occur within the slough. The horizontal hydraulic gradient at this site is very flat, approximately 0.0003 feet per foot (ft/ft) in 2012 and 0.0025 ft/ft in 2014. Because of the flat gradient and seasonal drop in river elevations, changes in groundwater flow direction could be expected.

3.5.3 Free Product Evaluation

Following installation of well 17-MW2, 0.03 feet of floating product was measured in the well, so the well was not sampled during the July sampling event. This well was near the location of temporary well 17-TW4 that contained 0.24 feet of product in 2012. Well 17-MW2 contained insufficient product to attempt a product recovery evaluation. Well points were driven surrounding the location of 17-MW2 in an attempt to delineate the extent of a product plume; however, product was not measured in any of the well points. During the August re-sampling event, no product was measured and the well was sampled.

The presence of measurable free product would be expected to be less during time periods of a higher water table as the smear zone pore space is saturated with water, limiting fuel accumulation on top of the water table. Greater thickness and extent of free product would be expected during winter months when groundwater elevations are typically lower.

3.5.4 Groundwater Contaminant Results

Groundwater samples were initially collected at the PMP 17.7 site in July 2014, but were received at the laboratory above acceptable temperature (as described in Section 2.6). Samples were re-collected at the PMP 17.7 site on August 9 and 10, 2014. A total of eight primary samples, one field duplicate, and one trip blank were submitted to the project laboratory. Water samples were shipped in one SDG and assigned the SGS report number 1143761. Samples were submitted for analysis of BTEX, GRO, DRO, RRO, PAH, total lead, dissolved iron and manganese, sulfate, and total nitrate/nitrite. Groundwater samples are summarized on Table 3-4. Groundwater field parameters are summarized in Table 3-6. Analytical results are included as Table 3-7. Groundwater results for select analytes are shown on Figure 3-3. Groundwater sample results are summarized below:

- Well 17-MW2 initially contained 0.03 feet of product and was not sampled during the initial July sampling event. However, no product was identified in the well when it was re-sampled on August 10, 2014.
- GRO concentrations exceeded the groundwater cleanup level of 2.2 milligrams per liter (mg/L) in four wells. The maximum GRO concentration was detected in the sample from well 17-MW2 at a concentration of 12.7 mg/L.
- DRO concentrations exceeded the groundwater cleanup level of 1.5 mg/L in two wells. The maximum GRO concentration was detected in the sample from well 17-MW2 at a

concentration of 1.72 mg/L.

- Benzene concentrations exceeded the groundwater cleanup level of 0.005 mg/L in five wells. The highest benzene concentration of 0.65 mg/L was found in well 17-MW3.
- Calculated TAH and TAqH values exceeded the surface water criteria of 0.010 and 0.015 mg/L, respectively, in six wells at the site. The well nearest the Chilkat River slough, 17-MW7, had TAH and TAqH concentrations below the surface water criteria. The next closest well, 17-MW8, had TAH and TAqH values of 0.0148 and 0.0153 mg/L, just slightly above the surface water criteria.

3.5.5 Groundwater Geochemical Results

Groundwater samples were analyzed for natural attenuation parameters as part of the groundwater investigation to evaluate the potential for biodegradation of petroleum contamination at the PMP 17.7 site. Natural attenuation parameters included sulfate, total nitrate/nitrite, field-filtered (dissolved) iron and manganese, dissolved oxygen (DO), and oxidation-reduction potential (ORP). Results for these natural attenuation parameters are summarized on Table 3-6.

Geochemical data indicates that generally groundwater is strongly reduced across the site. Due to possible seasonal changes in the groundwater flow direction, there may not be a true upgradient well that isn't influenced by the contaminant plume. Therefore, it's difficult to directly correlate geochemical and contaminant plume concentrations. Additionally, groundwater geochemistry is likely influenced by discharge from the Chilkat River slough and contact with surface water in wetland areas of the site. Surface water in marshy areas, such as the PMP 17.7 site, tends to have reduced geochemistry.

The following summarizes groundwater geochemistry at the site.

- ORP was negative in every well.
- DO was between 0 and 1 mg/L in every well.
- Elevated dissolved iron concentrations were observed in all wells, ranging from 2.93 to 67.8 mg/L.
- Sulfate concentrations were low (below 2 mg/L) in all but one well and are indicative of reduced conditions.
- Total nitrate/nitrite and manganese concentrations were very low in all wells.

There was not a strong correlation between wells having reduced geochemistry (lowest ORP and dissolved iron, and highest sulfate) and highest contaminant concentrations. Due to the lack of dissolved oxygen, little aerobic biodegradation of groundwater contamination would be expected. The elevated dissolved iron and low sulfate concentrations in groundwater samples provide possible evidence of anaerobic biodegradation; however, the lack of a background well and the surface water influence, limit this assessment.

3.6 Sediment and Surface Water Sampling

3.6.1 Sediment and Surface Water Sample Collection

A total of 20 primary sediment samples and 2 field duplicate samples were collected from the PMP 17.7 site on August 9 and 10, 2014. Ten of the sediment samples were co-located with surface water samples. A total of 20 primary surface water samples and 3 field duplicate samples were collected; however, only 10 different locations were sampled since samples were re-collected for the non-PAH analyses. Surface water samples were collected on July 21 and 22, 2014 and August 9, 2014; all analytes except for surface water PAHs were re-collected in August due to elevated cooler temperatures (as described in Section 2.6). Sediment and surface water collection procedures are detailed in Section 2.5.

Sediment and surface samples were collected from the Chilkat River slough, the wetland on the northeast side of the highway, and the pipeline trench, as summarized in Table 3-3. Sediment sample locations within the wetland area were selected in likely areas of contamination based upon soil and groundwater sampling and the presence of nearby dead trees.

Table 3-3 Sediment and Surface Water Sample Details (PMP 17.7)

Location	Sediment Sample	Co-Located Surface Water Sample	Sediment PID Result (ppm)	Notes
Chilkat River Slough	17-SE1	-	0.0	No signs of contamination in surface water or sediment. Samples consisted primarily of silt.
	17-SE2	17-WS1	0.0	
	17-SE3	-	0.0	
	17-SE4	17-WS2	0.0	
	17-SE5	-	0.0	
Pipeline Trench	17-SE7	17-WS4	43.9	Collected within trench with approximately one foot of standing water. Sediment samples collected underneath grass/weeds; 2” organics; 4” gravelly organics; angular, brown sand; 4” gray sandy silt. Samples had varying hydrocarbon odor and staining.
	17-SE8	17-WS5	276.2	
	17-SE9	17-WS6	40.2	
	17-SE10	17-WS7	146.1	
	17-SE11	17-WS8	12.1	
Wetland (East side of Haines Highway)	17-SE6	17-WS3	295.9	Wetland sediment samples were collected from areas of standing water (0.5 to 1 foot deep). Samples were collected directly below the vegetative layer and primarily consisted of a gray gravelly silt. All samples had hydrocarbon odor and staining. Aquatic organisms (primarily mosquito larvae) were observed in surface water.
	17-SE12	17-WS9	269.7	
	17-SE13	17-WS10	529.1	
	17-SE14	-	2,678	
	17-SE15	-	174.2	
	17-SE16	-	72.3	
	17-SE17	-	214	
	17-SE18	-	95.1	
	17-SE19	-	1400	
	17-SE20	-	353.5	

3.6.2 Sediment Contaminant Results

Sediment samples were shipped in one SDG and assigned the SGS report number 1143760. Samples were submitted for analysis of BTEX, GRO, DRO, RRO, PAH, and total lead, and are summarized on Table 3-4. Analytical results are included as Table 3-8. Results for select analytes are shown on Figure 3-4. Sediment sample results were compared to NOAA PEL/TEL levels, as described in Section 2.10, and are summarized below:

- No exceedances of NOAA PEL/TEL levels were observed in sediment samples collected from the Chilkat River slough.
- Two sediment samples from the pipeline trench exceeded the NOAA TEL level for at least one analyte; one sample exceeded the NOAA PEL level.
- All ten sediment samples collected from the wetland area exceeded the NOAA TEL levels for at least one analyte. Seven of these samples exceeded the NOAA PEL levels.
- Acenaphthalene concentrations exceeded the NOAA TEL value (0.00671 mg/Kg) in three primary samples. The maximum acenaphthalene concentration of 0.0354 mg/Kg was detected in sample 17-SE12. No results exceeded the NOAA PEL value of 0.0889 mg/Kg.
- Fluorine concentrations exceeded the NOAA TEL value (0.0212 mg/Kg) in seven primary samples; fluorine was not detected in the field duplicate sample from 17-SE6. The maximum fluorine concentration of 0.069 mg/Kg was detected in sample 17-SE16. No results exceeded the NOAA PEL value of 0.144 mg/Kg.
- Naphthalene concentrations exceeded the NOAA PEL/TEL (0.391 mg/Kg and 0.0346 mg/Kg, respectively) in eleven primary samples and one field duplicate sample. The maximum naphthalene concentration of 1.81 mg/Kg was detected in 17-SE19. All exceedances were above both the PEL and TEL values.

Sediment sample results were compared to the most stringent ADEC Method Two Migration to Groundwater cleanup levels (over 40-inch zone) for fuel related analytes which do not have established NOAA PEL/TEL values for sediment.

- DRO and GRO did not exceed the soil cleanup levels in any samples collected in the pipeline trench.
- DRO exceeded the soil cleanup level (230 mg/Kg) in six primary samples collected from the wetland area. The maximum DRO cleanup level was 1,480 mg/Kg in 17-SE13.
- GRO exceeded the soil cleanup level (260 mg/Kg) in one primary sample (17-SE12) collected from the wetland area, with a concentration of 583 mg/Kg.
- Benzene exceeded the soil cleanup level (0.025 mg/Kg) in six primary samples. The maximum concentration (0.688 mg/Kg) was observed in 17-SE8 collected from the pipeline trench.

3.6.3 Surface Water Contaminant Results

Surface water samples were shipped in two SDGs and assigned the SGS report numbers 1143338 and 1143761. Samples in SDG 1143338 were submitted for analysis of PAH only; samples in SDG

1143761 were submitted for BTEX, GRO, DRO, RRO, and total lead. Surface water samples are summarized on Table 3-4. Analytical results are included as Table 3-9. Results for select analytes are shown on Figure 3-4. Surface water sample results were compared to surface water criteria TAH and TAqH, as described in Section 2.10, and are summarized below:

- Three of the five pipeline trench samples exceeded the surface water criteria for both TAH and TAqH (10 mg/L and 15 mg/L, respectively). The exceedances were in the three most northern samples. The highest concentrations of TAH and TAqH were observed in samples 17-WS5 and 17-WS4, respectively.
- None of the samples collected from the Chilkat River slough or the wetland exceeded either the TAH or TAqH criteria.

Benzene was detected in four of five pipeline trench samples with a maximum concentration of 0.0031 mg/L. Benzene was detected in one of three wetland surface water samples at a concentration of 0.0008 mg/L.

3.7 Data Quality Summary

The chemical data were evaluated in order to assess data quality and usability. The findings of the review are documented in the CDQR and ADEC Checklists (Appendix B). Analytical data presented in Tables 3-5 through 3-9 were qualified based on those findings. Overall, the completeness goals were met and the review process deemed the soil, sediment, surface water, and groundwater data acceptable for project use. Notable issues associated with PMP 17.7 data are summarized below:

- Two wells (17-MW3 and 17-MW5) exhibited excessive drawdown during well purging and the results from the corresponding samples (14HF1701WG and 14HF1705WG) that were qualified (QN) as estimates. Impact to data quality is minor since the drawdown measured in the four wells was either marginally over the 0.3 foot limit and/or was stable over the last several intervals.
- Due to sample dilution, the reported limits of detection (LODs) for several non-detect PAH analytes did not meet the NOAA TEL in sediment samples 14HF1712SE, 14HF1713SE, 14HF1715SE, 14HF1720SE, and 14HF1722SE. Consequently, the absence of these PAH analytes at levels exceeding the TEL at those locations cannot be confirmed.

3.8 Work Plan Deviations

Within and adjacent to wetland areas where groundwater was very shallow, 5-foot long well screens were used in lieu of the 10-foot screens identified in the work plan. Less groundwater level fluctuations are expected in these areas, reducing the risk of having insufficient water within the well to sample. Additionally, longer screens would potentially result in groundwater from deeper, non-contaminated depths, influencing contaminant concentrations. Also, as noted in Section 3.5.1, in a couple instances wells were screened below the water table due to the shallow groundwater table and need for a sufficient surface seal to prevent surface water from entering wells.

Well 17-MW2 was not developed prior to sampling. The well contained product in July 2014 when well development was conducted, and when it was noted that the well did not contain product in August 2014 no development was completed. Approximately three casing volumes were removed prior to collecting samples from this well.

As discussed in Section 2.6, all surface water PAH analyses were performed on samples that were collected on a different date than the samples submitted for the other analyses. Thus, the calculated TAqH values (i.e., summation of BTEX and PAH results) should be considered estimates since the calculations were made using two separate samples.

3.9 Nature and Extent of Contamination

3.9.1 Contaminants of Concern

Based upon detected sample contaminants and a review of soil sample chromatograms, the contaminant source appears to have been weathered unleaded gasoline. Lead did not exceed the cleanup level in samples from any matrix in 2014. In addition, EDB and 1,2-DCA (fuel additives used in leaded gas) were not detected in 2012 samples (and were not analyzed for in 2014). Based on historic and 2014 results, the following COCs have been identified for each matrix:

- Soil – GRO, DRO, benzene, toluene, ethylbenzene, xylenes, 1-methylnapthalene, and 2-methylnapthalene
- Groundwater – GRO, DRO, benzene, and TAH/TAqH (for wells near the Chilkat River slough)
- Sediment – Acenaphthalene, fluorine, and naphthalene
- Surface Water – TAH and TAqH (pipeline trench only)

3.9.2 Extent of Soil Contamination

Soil contamination at the PMP 17.7 site was fairly well delineated. Contamination appears to have originated from a pipeline rupture along the northern half of the investigative area and migrated north and west towards the Haines Highway. The horizontal extent of soil contamination (approximately 69,000 square feet [sq. ft.]) is depicted on Figure 3-1. Cross-sectional views of soil contamination located on the west and east sides of the Haines are shown on Figures 3-5 and 3-6, respectively. A third cross-sectional view (Figure 3-7) shows soil contamination perpendicular to the Haines Highway.

The vertical extent of soil contamination is as deep as 14 feet in the vicinity of 17-BH15 and 17-BH16. Assuming the estimated horizontal extent of 69,000 sq. ft. and an average contaminated soil thickness of 8 feet, the volume of contaminated soil exceeding ADEC cleanup levels is estimated at 20,000 cubic yards (cy).

3.9.3 Extent of Groundwater Contamination

The estimated extent of groundwater contamination is depicted on Figure 3-3 and covers approximately 89,000 sq. ft. The groundwater contamination roughly mirrors the extent of soil contamination, but extends further to the west and north. The extent of groundwater contamination was fairly well delineated with clean wells installed to the west and south. It was not possible to delineate the northern extent of groundwater contamination due to the narrowing between the rock cliff and the Haines Highway. In addition, the extent of groundwater contamination towards the Chilkat River slough and monitoring well 17-MW8 was not determined, due to the dense forest.

3.10 Conceptual Site Model and Risk Evaluation

3.10.1 Human Health CSM

A Human Health CSM was prepared in accordance with ADEC's Policy Guidance on Developing CSMs (ADEC, 2010b). Completed Human Health CSM forms are included in Appendix H. The following summarizes the Human Health CSM at the PMP 17.7 site.

Potential Contaminant Sources and Impacted Media
Potential contaminant sources at this site include potential releases from the HFP. The HFP has been out of service for 40 years and was drained of fuel and, therefore, does not represent a continuing source. Data indicate that fuel releases resulted in contamination of surface and subsurface soils, groundwater, surface water, and sediments.

Potential Sensitive Receptors and Exposure Scenarios
Since the PMP 17.7 site is located adjacent to the Haines Highway, current receptors include construction workers and local residents or tourists who may visit the site for recreational purposes. A significant exposure risk exists if the planned highway construction work involves excavation in this area.

Future land use scenarios could include either industrial or residential uses, although no current plans for either use are known at this time. Future development of the site is unlikely due to the proximity to the highway, much of the site lies within seasonal wetlands, and the western section of the site lies within the Chilkat Bald Eagle Preserve. The most conservative human health exposure scenario would be for residential use, which has been factored into the applicable cleanup levels identified for site COCs.

Completed Exposure Pathways
Due to the presence of soil contamination, soil and groundwater ingestion, dermal absorption of contaminants, and inhalation of outdoor air are completed exposure pathways. Since

contamination is present in groundwater and surface water, receptors may also be exposed to site contaminants through ingestion of, inhalation of volatiles from, or dermal absorption of groundwater and surface water. Contamination was found in sediment in the wetland and pipeline trench; direct contact with sediment is a completed exposure pathway.

3.10.2 Cumulative Risk Evaluation

The cumulative carcinogenic and noncarinogenic risks for the PMP 17.7 site were calculated using ADEC's Web-Based Method Three & Cumulative Risk Calculator. The calculation used the maximum concentrations of all analytes detected in 2014 soil and groundwater samples and the default total organic carbon (TOC) concentration (0.1%). Per ADEC guidance, petroleum ranges are not included in cumulative risk (ADEC, 2008).

Cumulative cancer risk for PMP 17.7 was calculated to be 4 x 10^{-4}, exceeding the benchmark of 1 x 10^{-5}. Additionally, the cumulative non-carcinogenic Hazard Index was 6 and above the threshold of 1. The cumulative risks were driven by high groundwater contaminant concentrations, primary benzene. The cumulative cancer risk and cumulative hazard index were significantly higher than determined in 2012, a result of the higher contaminant concentrations identified in 2014. The cumulative risk outputs from the ADEC calculator are included with the CSMs in Appendix H.

3.10.3 Ecological Risk Evaluation

The area east of the Haines Highway is comprised primarily of a wetland while the western half is forested. A site visit conducted within a few years of the 1970 fuel release identified trees (presumably on the eastern section of the site) that may have been killed due to the fuel exposure (CRREL, 1972). Dead trees remain on both sides of the highway but some of this may be due to rotting from surface water infusion. Other than the dead trees, there is currently no visual indication of contaminant impact to vegetation at the site.

Ecological scoping was performed per the ADEC guidance document (ADEC, 2014) to determine if a more in-depth ecological risk evaluation is required. A completed Ecoscoping Form for the PMP 17.7 site is included in Appendix I. Important findings of the ecoscoping process include:

- The PMP 17.7 site is approximately 2 miles downstream of the Chilkat River State Critical Habitat Area and within the Alaska Chilkat Bald Eagle Preserve, which is considered a critical habitat.
- Several PAHs (acenaphthene, fluorine, and naphthalene) exceed NOAA's PEL and/or TEL screening level in sediment samples collected from the wetland and pipeline trench on the east section of the site.
- The extent of sediment and/or near surface petroleum-contaminated soil is approximately 1 ½ acres, significantly more than the ½ acre screening criteria.

- Based upon contaminant concentrations in well 17-MW8, groundwater contamination extends to within 100 feet of the Chilkat River slough. Thus, there is potential for contaminated groundwater to be in seasonal contact with a slough to the Chilkat River, potentially completing a second aquatic exposure route. Contaminants were not detected above applicable standards in surface water and sediment samples collected from the Chilkat River slough.

Due to the presence of contaminants above ecological screening benchmarks, possible migration of contaminated groundwater to the Chilkat River slough, the presence of aquatic receptors in the wetland and Chilkat River, and the site's location within the Alaska Chilkat Bald Eagle Preserve, further ecological assessment should be conducted.

3.11 Conclusion and Recommendations

Extensive soil and groundwater contamination was identified at the site. The extent of soil and groundwater contamination was delineated with the exception of the northern extent which was limited by the narrowness between the highway and the hillside. Sample data indicates a weathered gasoline source.

GRO, DRO, BTEX, 1-methylnapthalene, and 2-methylnapthalene exceeded cleanup levels in one or more soil samples. The horizontal extent of soil contamination exceeding cleanup levels covers approximately 69,000 sq. ft. Based on an average contaminant soil thickness of approximately 8 ft., the estimated volume of contaminated soil is 20,000 cy.

Groundwater concentrations of GRO, DRO, and benzene exceeded ADEC cleanup levels in several wells across the site. In addition, surface water criteria TAH and TAqH were exceeded in groundwater samples. The horizontal extent of groundwater contamination exceeding cleanup levels covers approximately 89,000 sq. ft.

Free product was identified in one well following installation, near the location where product was identified during the 2012 RI. Well points installed around the well did not identify free product and the product was not measureable when the well was sampled a couple of weeks following installation. The presence of measurable free product would be expected to be less during time periods with a higher water table as the smear zone pore space is saturated with water, limiting fuel accumulation on top of the water table.

A slough of the Chilkat River runs approximately 75 feet northwest of contaminated soil along the west side of the highway. Groundwater appears to flow towards the slough in the winter and from the slough in the summer; the groundwater flow gradient is extremely flat at the site. Surface water and sediment sampling of the Chilkat River slough did not reveal any evidence of contamination.

Groundwater geochemistry is generally highly reduced which is likely a result of mixing with surface water and contaminant biodegradation processes. As a result aerobic biodegradation is limited and anaerobic biodegradation of contaminants is likely very slow.

Groundwater contamination resulted in cumulative carcinogenic and noncarinogenic risks exceeding benchmark values. However there is no current risk as the contaminated groundwater is not being used. Cumulative risks for direct contact and inhalation of soil contamination do not exceed acceptable levels. The ecological risk screening, following the ADEC Ecoscoping Guidance, indicated that contamination at the site results in the potential for ecological risks that should be further evaluated.

Table 3-4 Sample Summary
PMP 17.7
Haines-Fairbanks Pipeline FUDS

Sample ID	Location ID	Depth (ft bgs)	Sample Date	Sample Time	Sampler's Initials	Sample Type	Sample Matrix	BTEX (8260B)	GRO (AK101)	DRO/RRO (AK102/ AK103)	PAHs (8270D-SIM)	Total Lead (6020A)	Fe/Mn (6010B)	SO_4 (300.0)	Total NO_2/NO_3 as Nitrogen (353.2)	Associated Coolers	Sample Data Group
SOIL SAMPLE SUMMARY																	
14HF1701SO	17-BH1203	3	7/19/2014	1315	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1702SO	17-BH1205	5	7/19/2014	1325	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1703SO	17-BH1304	4	7/19/2014	1415	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1704SO	17-BH1309	9	7/19/2014	1425	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1705SO	17-BH13	9	7/19/2014	1435	CM/CB	Field Dup (-04SO)	Soil	X	X	X	X	X				FES-03	1143328
14HF1706SO	17-BH1404	4	7/19/2014	1500	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1707SO	17-BH1409	9	7/19/2014	1510	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1708SO	17-BH1504	4	7/19/2014	1525	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1709SO	17-BH1509	9	7/19/2014	1535	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1710SO	17-BH1514	14	7/19/2014	1545	CM/CB	Primary/MS/MSD	Soil	X	X	X	X	X				FES-03	1143328
14HF1711SO	17-BH1518	18	7/19/2014	1600	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1712SO	17-BH2205	5	7/19/2014	1635	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1713SO	17-BH2214	14	7/19/2014	1645	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1714SO	17-BH22	14	7/19/2014	1655	CM/CB	Field Dup (-13SO)	Soil	X	X	X	X	X				FES-03	1143328
14HF1715SO	17-BH1604	4	7/19/2014	1715	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1716SO	17-BH1606	6	7/19/2014	1730	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1717SO	17-BH1614	14	7/19/2014	1740	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1718SO	17-BH1905	5	7/20/2014	1120	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1719SO	17-BH1910	10	7/20/2014	1130	CM/CB	Primary/MS/MSD	Soil	X	X	X	X	X				FES-03	1143328
14HF1720SO	17-BH2007	7	7/20/2014	1200	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1721SO	17-BH2107	7	7/20/2014	1530	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1722SO	17-BH1805	5	7/20/2014	1635	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1723SO	17-BH1814	14	7/20/2014	1650	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1724SO	17-BH1704	4	7/20/2014	1740	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
14HF1725SO	17-BH17	4	7/20/2014	1750	CM/CB	Field Dup (-24SO)	Soil	X	X	X	X	X				FES-03	1143328
14HF1726SO	17-BH2306	6	7/20/2014	1755	CM/CB	Primary	Soil	X	X	X	X	X				FES-03	1143328
SEDIMENT SAMPLE SUMMARY																	
14HF1701SE	17-SE5	NA[1]	8/9/2014	1150	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1702SE	17-SE4	NA[1]	8/9/2014	1210	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1703SE	17-SE3	NA[1]	8/9/2014	1215	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1704SE	17-SE2	NA[1]	8/9/2014	1225	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1705SE	17-SE1	NA[1]	8/9/2014	1235	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1706SE	17-SE7	NA[1]	8/9/2014	1325	AS/CB	Primary/MS/MSD	Sediment	X	X	X	X	X				FES-35	1143760
14HF1707SE	17-SE71	NA[1]	8/9/2014	1330	AS/CB	Field Dup (-06SE)	Sediment	X	X	X	X	X				FES-35	1143760
14HF1708SE	17-SE8	NA[1]	8/9/2014	1410	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1709SE	17-SE9	NA[1]	8/9/2014	1440	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1710SE	17-SE10	NA[1]	8/9/2014	1510	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1711SE	17-SE11	NA[1]	8/9/2014	1545	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1712SE	17-SE6	NA[1]	8/9/2014	1725	AS/CB	Primary/MS/MSD	Sediment	X	X	X	X	X				FES-35	1143760
14HF1713SE	17-SE61	NA[1]	8/9/2014	1730	AS/CB	Field Dup (-12SE)	Sediment	X	X	X	X	X				FES-35	1143760
14HF1714SE	17-SE15	NA[1]	8/10/2014	1005	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1715SE	17-SE16	NA[1]	8/10/2014	1030	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1716SE	17-SE17	NA[1]	8/10/2014	1045	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1717SE	17-SE18	NA[1]	8/10/2014	1055	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1718SE	17-SE19	NA[1]	8/10/2014	1305	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1719SE	17-SE12	NA[1]	8/9/2014	1915	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1720SE	17-SE20	NA[1]	8/10/2014	1315	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1721SE	17-SE13	NA[1]	8/9/2014	1830	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
14HF1722SE	17-SE14	NA[1]	8/10/2014	945	AS/CB	Primary	Sediment	X	X	X	X	X				FES-35	1143760
GROUNDWATER SAMPLE SUMMARY																	
14HF1701WG	17-MW3	NA	8/10/2014	1455	CB	Primary	Groundwater	X	X	X	X	X	X	X	X	FES-39, 40	1143761
14HF1702WG	17-MW31	NA	8/10/2014	1510	CB	Field Dup (-01 WG)	Groundwater	X	X	X	X	X	X	X	X	FES-39, 40	1143761
14HF1703WG	17-MW5	NA	8/9/2014	1615	JK	Primary	Groundwater	X	X	X	X	X	X	X	X	FES-39, 41	1143761
14HF1704WG	17-MW4	NA	8/9/2014	1800	JK	Primary	Groundwater	X	X	X	X	X	X	X	X	FES-39, 41	1143761
14HF1705WG	17-MW7	NA	8/9/2014	1125	JK	Primary	Groundwater	X	X	X	X	X	X	X	X	FES-39, 41	1143761
14HF1706WG	17-MW6	NA	8/9/2014	1250	JK	Primary/MS/MSD	Groundwater	X	X	X	X	X	X	X	X	FES-39, 41	1143761
14HF1707WG	17-MW8	NA	8/9/2014	1510	JK	Primary	Groundwater	X	X	X	X	X	X	X	X	FES-39, 40	1143761
14HF1708WG	17-MW1	NA	8/9/2014	1950	JK	Primary	Groundwater	X	X	X	X	X	X	X	X	FES-39, 40	1143761
14HF1709WG	17-MW2	NA	8/10/2014	1435	AS	Primary	Groundwater	X	X	X	X	X	X	X	X	FES-39, 40	1143761
SURFACE WATER SAMPLE SUMMARY																	
14HF1701WS	17-WS2	NA	7/21/2014	1130	VR/CB	Primary	Surface Water				X					FES-04	1143338
14HF1702WS	17-WS1	NA	7/21/2014	1220	VR/CB	Primary	Surface Water				X					FES-04	1143338
14HF1703WS	17-WS3	NA	7/21/2014	1310	VR/CB	Primary	Surface Water				X					FES-04	1143338
14HF1704WS	17-WS31	NA	7/21/2014	1320	VR/CB	Field Dup (-03 WS)	Surface Water				X					FES-04	1143338
14HF1705WS	17-WS4	NA	7/22/2014	1050	VR/CB	Primary	Surface Water				X					FES-04	1143338
14HF1706WS	17-WS5	NA	7/22/2014	1220	VR/CB	Primary	Surface Water				X					FES-05	1143338
14HF1707WS	17-WS6	NA	7/22/2014	1315	VR/CB	Primary	Surface Water				X					FES-05	1143338
14HF1708WS	17-WS7	NA	7/22/2014	1345	VR/CB	Primary	Surface Water				X					FES-05	1143338
14HF1709WS	17-WS8	NA	7/22/2014	1420	VR/CB	Primary	Surface Water				X					FES-05	1143338
14HF1710WS	17-WS9	NA	7/22/2014	1545	VR/CB	Primary/MS/MSD	Surface Water				X					FES-06	1143338
14HF1711WS	17-WS10	NA	7/22/2014	1700	VR/CB	Primary	Surface Water				X					FES-06	1143338
14HF1713WS	17-WS2	NA	8/9/2014	1200	AS/CB	Primary	Surface Water	X	X	X		X				FES-32	1143761
14HF1714WS	17-WS1	NA	8/9/2014	1220	AS/CB	Primary	Surface Water	X	X	X		X				FES-32	1143761
14HF1715WS	17-WS4	NA	8/9/2014	1320	AS/CB	Primary	Surface Water	X	X	X		X				FES-32	1143761
14HF1716WS	17-WS5	NA	8/9/2014	1400	AS/CB	Primary	Surface Water	X	X	X		X				FES-32	1143761
14HF1717WS	17-WS6	NA	8/9/2014	1430	AS/CB	Primary	Surface Water	X	X	X		X				FES-32	1143761
14HF1718WS	17-WS7	NA	8/9/2014	1500	AS/CB	Primary	Surface Water	X	X	X		X				FES-32	1143761
14HF1719WS	17-WS8	NA	8/9/2014	1535	AS/CB	Primary	Surface Water	X	X	X		X				FES-32	1143761
14HF1720WS	17-WS3	NA	8/9/2014	1715	AS/CB	Primary	Surface Water	X	X	X[2]		X				FES-32, 33	1143761
14HF1721WS	17-WS9	NA	8/9/2014	1905	AS/CB	Primary/MS/MSD	Surface Water	X	X	X[2]		X				FES-32, 33	1143761
14HF1722WS	17-WS10	NA	8/9/2014	1820	AS/CB	Primary	Surface Water	X	X	X[2]		X				FES-32, 33	1143761
14HF1723WS	17-WS11	NA	8/9/2014	1825	AS/CB	Field Dup (-21 WS)	Surface Water			X[2]						FES-33	1143761
14HF1724WS	17-WS81	NA	8/9/2014	1605	AS/CB	Field Dup (-19 WS)	Surface Water	X	X	X		X				FES-32	1143761
QUALITY CONTROL SAMPLES																	
Rinsates																	
14HF1712WQ	Sample Was Not Used - Disregard																
14HF1725WQ	Rinsate	NA	8/10/2014	1355	CB	Rinsate (Sediment)	Water	X	X	X	X					FES-32	1143761
Trip Blanks																	
14HF1727SQ	Trip Blank	NA	7/19/2014	800	NA	Trip Blank	Soil	X	X							FES-03	1143328
14HF1723SQ	Trip Blank	NA	8/9/2014	800	NA	Trip Blank	Sediment	X	X							FES-35	1143760
14HF1710WQ	Trip Blank	NA	8/9/2014	800	NA	Trip Blank	Groundwater	X	X							FES-39	1143761
14HF1726WQ	Trip Blank	NA	8/9/2014	800	NA	Trip Blank	Surface Water	X	X							FES-32	1143761

All samples were analyzed by SGS North America Inc, Alaska (standard turn-around time). NPDL #14-030.

[1] Sediment samples were collected under the vegatative mat (mat is ~4-6 inches thick).

[2] DRO/RRO were analyzed before and after a silica gel cleanup (both results are reported)

°C - degrees Celsius
CB - Chris Boese; CM - Craig Martin; AS - Aaron Swank;
VR - Vanessa Ritchie; JK - Josh Klynstra
MS/MSD - matrix spike/matrix spike duplicate
NA - not applicable
HDPE - high density polyethylene
L - liter
mL - milliliter
VOA - volatile organic analysis
ft bgs - feet below ground surface

BTEX - Benzene, Toluene, Ethylbenzene, Total Xylenes
DRO - diesel range organics
RRO - residual range organics
GRO - gasoline range organics
Fe - iron
Mn - manganese
NO2/NO3 - nitrite/nitrate
PAHs - polynuclear aromatic hydrocarbons

Groundwater and Surface Water
BTEX - three HCl-preserved, 40 mL VOA vials
PAH - two non-preserved, 1L amber bottles
GRO - three HCl-preserved, 40 mL VOA vials
DRO/RRO - two HCl-preserved, 250 mL amber bottles
DRO/RRO SILICA GEL CLEANUP - two HCl-preserved, 1000 mL amber bottles
Lead - one HNO3-preserved, 250 mL HDPE bottle
Fe/Mn - one HNO3-preserved, 250 mL HDPE bottle, field-filtered
SO4 - one non-preserved, 250 mL HDPE bottle
NO2/NO3 - one H2SO4 preserved, 125 mL bottle

Soil and Sediment
Soil/Sediment Sample Collection (all samples were field-preserved at 4±2°C)
BTEX/GRO - one surrogated methanol-preserved, 4 oz amber jar
PAH/DRO/RRO/Lead - one non-preserved, 8 oz jar

Table 3-5 Soil Sample Results

PMP 17.7

Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS			Sample ID	14HF1701SO	14HF1702SO	14HF1703SO	14HF1704SO	14HF1705SO	14HF1706SO	14HF1707SO
			Location ID	17BH1203	17BH1205	17BH1304	17BH1309	17BH13	14BH1404	17BH1409
			Sample Data Group	1143328	1143328	1143328	1143328	1143328	1143328	1143328
			Laboratory	SGS	SGS	SGS	SGS	SGS	SGS	SGS
			Sample Type	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary
			Collection Date	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014
			Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Analyte	Method	Units	*Cleanup Level* [a]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/Kg	*260*	204 [4] QH	172 [15.2]	**1880 [162]**	2.28 [1.4] J,B	2.87 [1.47] J,B	**273 [23.1]**	**2460 [143]**
Diesel Range Organics	AK102	mg/Kg	*230*	18.6 [14.2] J,B	23.8 [11.4] B	**1750 [47.5]**	ND [11.1]	ND [22.4]	**516 [13.6]**	**2470 [44.8]**
Residual Range Organics	AK103	mg/Kg	*8,300*	119 [14.2]	15.6 [11.4] J,B	21.5 [11.9] J	ND [11.1]	ND [22.4]	32.5 [13.6]	ND [44.8]
Lead	SW6020A	mg/Kg	*400*	6.93 [0.136]	2.56 [0.102]	3.24 [0.108]	2.11 [0.11]	1.54 [0.0995]	7.04 [0.124]	2.66 [0.093]
Benzene	SW8260B	mg/Kg	*0.025*	ND [0.02]	ND [0.0076]	ND [0.405]	ND [0.0069]	0.0056 [0.0073] J,QH	**0.436 [0.0575] QH**	**0.601 [0.0358] QH**
Ethylbenzene	SW8260B	mg/Kg	*6.9*	0.194 [0.04] QH	0.0612 [0.0152]	**26.3 [0.81]**	ND [0.0139]	ND [0.0147]	4.59 [0.116] QH	1.5 [0.0715] QH
Toluene	SW8260B	mg/Kg	*6.5*	ND [0.04]	ND [0.0152]	0.825 [0.81] J	0.0103 [0.0139] J	0.0147 [0.0147] J,QH	6.17 [0.116] QH	0.124 [0.0715] J,QH
o-Xylene	SW8260B	mg/Kg	*63 (total xylenes)*	0.0463 [0.04] J,QH	0.0118 [0.0152] J	15.3 [0.81]	ND [0.0139]	ND [0.0147]	5.73 [0.116] QH	1.55 [0.0715] QH
Xylene, Isomers m & p	SW8260B	mg/Kg		0.773 [0.08] QH	0.213 [0.0303]	**101 [1.62]**	0.0365 [0.0279] J	0.0361 [0.0293] J,QH	18 [0.231] QH	6.79 [0.143] QH
1-Methylnaphthalene	8270SIM	mg/Kg	*6.2*	0.0241 [0.0035]	0.0565 [0.0028]	4.34 [0.147]	0.008 [0.0028]	0.0078 [0.0056] J	2.86 [0.169]	**7.02 [1.4]**
2-Methylnaphthalene	8270SIM	mg/Kg	*6.1*	0.0169 [0.0035]	0.0884 [0.0028]	**8.58 [1.48]**	0.0111 [0.0028]	0.0114 [0.0056]	4.47 [0.169]	**10.6 [1.4]**
Acenaphthene	8270SIM	mg/Kg	*180*	ND [0.0035]	0.0022 [0.0028] J	0.137 [0.147] J	ND [0.0028]	ND [0.0056]	0.0445 [0.0034]	0.221 [0.14] J
Acenaphthylene	8270SIM	mg/Kg	*180*	ND [0.0035]	ND [0.0028]	ND [0.147]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.14]
Anthracene	8270SIM	mg/Kg	*3,000*	ND [0.0035]	ND [0.0028]	ND [0.147]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.14]
Benzo(a)anthracene	8270SIM	mg/Kg	*3.6*	ND [0.0035]	ND [0.0028]	ND [0.0029]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.0028]
Benzo(a)pyrene	8270SIM	mg/Kg	*0.4*	ND [0.0035]	ND [0.0028]	ND [0.0029]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.0028]
Benzo(b)fluoranthene	8270SIM	mg/Kg	*4*	ND [0.0035]	ND [0.0028]	ND [0.0029]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.0028]
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*1,100*	ND [0.0035]	ND [0.0028]	ND [0.0029]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.0028]
Benzo(k)fluoranthene	8270SIM	mg/Kg	*40*	ND [0.0035]	ND [0.0028]	ND [0.0029]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.0028]
Chrysene	8270SIM	mg/Kg	*360*	ND [0.0035]	ND [0.0028]	ND [0.0029]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.0028]
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.4*	ND [0.0035]	ND [0.0028]	ND [0.0029]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.0028]
Fluoranthene	8270SIM	mg/Kg	*1,400*	ND [0.0035]	ND [0.0028]	0.0057 [0.0029] J	ND [0.0028]	ND [0.0056]	0.0034 [0.0034] J	0.0035 [0.0028] J
Fluorene	8270SIM	mg/Kg	*220*	ND [0.0035]	0.0032 [0.0028] J	0.188 [0.147] J	ND [0.0028]	ND [0.0056]	0.0679 [0.0034]	0.354 [0.14]
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*4*	ND [0.0035]	ND [0.0028]	ND [0.0029]	ND [0.0028]	ND [0.0056]	ND [0.0034]	ND [0.0028]
Naphthalene	8270SIM	mg/Kg	*20*	0.026 [0.0035]	0.0253 [0.0028]	4.33 [0.147]	0.0046 [0.0028] J	0.0056 [0.0056] J	2.77 [0.169]	5.83 [0.14]
Phenanthrene	8270SIM	mg/Kg	*3,000*	ND [0.0035]	ND [0.0028]	ND [0.147]	ND [0.0028]	ND [0.0056]	0.02 [0.0034]	ND [0.14]
Pyrene	8270SIM	mg/Kg	*1,000*	ND [0.0035]	ND [0.0028]	0.0059 [0.0029] J	ND [0.0028]	ND [0.0056]	0.0037 [0.0034] J	0.0039 [0.0028] J
Total Solids	A2540G	Percent	*NA*	70.8	87.9	84.2	88.2	89.4	73.4	89

Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

Gray highlighted results had LODs that were greater than associated cleanup levels.

[a] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

ADEC - Alaska Department of Environmental Conservation

LOD - limit of detection

LOQ - limit of quantitation

mg/Kg - milligrams per kilogram

SGS - SGS North America Inc. of Anchorage Alaska.

Data Qualifiers:

B - analyte was also detected in a blank; result may be due to cross-contamination

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

M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues

ND - analyte not detected

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

Table 3-5 Soil Sample Results
PMP 17.7
Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS			Sample ID	14HF1708SO	14HF1709SO	14HF1710SO	14HF1711SO	14HF1712SO	14HF1713SO	14HF1714SO
			Location ID	17BH1504	17BH1509	17BH1514	17BH1518	17BH2205	17BH2214	17BH22
			Sample Data Group	1143328	1143328	1143328	1143328	1143328	1143328	1143328
			Laboratory	SGS	SGS	SGS	SGS	SGS	SGS	SGS
			Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate
			Collection Date	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014
			Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Analyte	Method	Units	*Cleanup Level* [a]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/Kg	*260*	**1860 [28.8]**	11.5 [1.61]	127 [1.87] QH	1.52 [1.59] J,B	203 [17.4]	9.19 [1.78] B	7.55 [1.79] B
Diesel Range Organics	AK102	mg/Kg	*230*	**1090 [59]**	9 [11.6] J,B	ND [12.5]	ND [11.5]	94.7 [16.1]	ND [12.1]	ND [12.1]
Residual Range Organics	AK103	mg/Kg	*8,300*	95.9 [59] J	35.8 [11.6] B	ND [12.5]	ND [11.5]	14.1 [16.1] J,B	ND [12.1]	ND [12.1]
Lead	SW6020A	mg/Kg	*400*	6.31 [0.14]	2.44 [0.113]	2.04 [0.12]	1.81 [0.11]	2.12 [0.115]	2.56 [0.113]	2.43 [0.12]
Benzene	SW8260B	mg/Kg	*0.025*	**4.16 [0.288]**	**0.0915 [0.008]**	**0.0697 [0.0093]**	0.0083 [0.008] J	ND [0.0087]	0.0071 [0.0089] J	0.0086 [0.0089] J
Ethylbenzene	SW8260B	mg/Kg	*6.9*	**27.8 [0.575]**	0.0642 [0.0161]	0.509 [0.0187]	ND [0.0159]	ND [0.0174]	0.021 [0.0178] J	0.0154 [0.0179] J
Toluene	SW8260B	mg/Kg	*6.5*	**71.2 [0.575]**	0.0157 [0.0161] J	0.708 [0.0187]	ND [0.0159]	ND [0.0174]	0.0291 [0.0178] J	0.0186 [0.0179] J
o-Xylene	SW8260B	mg/Kg	*63 (total xylenes)*	35.2 [0.575]	0.0157 [0.0161] J	0.629 [0.0187]	ND [0.0159]	ND [0.0174]	0.022 [0.0178] J	0.019 [0.0179] J
Xylene, Isomers m & p	SW8260B	mg/Kg		**108 [1.15]**	0.682 [0.0321]	2.22 [0.0373] ML	ND [0.0318]	ND [0.0348]	0.0811 [0.0355]	0.0516 [0.0358] J
1-Methylnaphthalene	8270SIM	mg/Kg	*6.2*	**6.51 [0.379] QH**	0.0346 [0.0029]	0.254 [0.0279]	ND [0.0029]	ND [0.0022]	0.0027 [0.0031] J	0.0022 [0.003] J
2-Methylnaphthalene	8270SIM	mg/Kg	*6.1*	**10.3 [0.379] QH**	0.046 [0.0029]	0.392 [0.0279]	ND [0.0029]	ND [0.0022]	0.0056 [0.0031] J	0.0036 [0.003] J
Acenaphthene	8270SIM	mg/Kg	*180*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Acenaphthylene	8270SIM	mg/Kg	*180*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Anthracene	8270SIM	mg/Kg	*3,000*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Benzo(a)anthracene	8270SIM	mg/Kg	*3.6*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Benzo(a)pyrene	8270SIM	mg/Kg	*0.4*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Benzo(b)fluoranthene	8270SIM	mg/Kg	*4*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*1,100*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Benzo(k)fluoranthene	8270SIM	mg/Kg	*40*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Chrysene	8270SIM	mg/Kg	*360*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.4*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Fluoranthene	8270SIM	mg/Kg	*1,400*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Fluorene	8270SIM	mg/Kg	*220*	0.168 [0.0189] QH	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*4*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Naphthalene	8270SIM	mg/Kg	*20*	6.55 [0.379] QH	0.0279 [0.0029]	0.117 [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Phenanthrene	8270SIM	mg/Kg	*3,000*	0.0406 [0.0189] QH	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Pyrene	8270SIM	mg/Kg	*1,000*	ND [0.0189]	ND [0.0029]	ND [0.0279]	ND [0.0029]	ND [0.0022]	ND [0.0031]	ND [0.003]
Total Solids	A2540G	Percent	*NA*	65.4	85.6	80.1	86.8	82.7	81.6	81.7

Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

Gray highlighted results had LODs that were greater than associated cleanup levels.

[a] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

ADEC - Alaska Department of Environmental Conservation
LOD - limit of detection
LOQ - limit of quantitation
mg/Kg - milligrams per kilogram
SGS - SGS North America Inc. of Anchorage Alaska.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 3-5 Soil Sample Results
PMP 17.7
Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS			Sample ID	14HF1715SO	14HF1716SO	14HF1717SO	14HF1718SO	14HF1719SO	14HF1720SO	14HF1721SO
			Location ID	17BH1604	17BH1606	17BH1614	17BH1905	17BH1910	17BH2007	17BH2107
			Sample Data Group	1143328	1143328	1143328	1143328	1143328	1143328	1143328
			Laboratory	SGS	SGS	SGS	SGS	SGS	SGS	SGS
			Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Primary
			Collection Date	7/19/2014	7/19/2014	7/19/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014
			Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil
Analyte	Method	Units	*Cleanup Level* [a]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/Kg	*260*	**378 [6.4] QH**	**396 [46.4]**	8.15 [2.17] B	90.7 [2.46] QH	2.8 [1.92] J,B	2.07 [2.19] J,B	8.06 [2.01] B
Diesel Range Organics	AK102	mg/Kg	*230*	**674 [19.1]**	**267 [13.4]**	8.79 [13] J,B	**265 [14.2]**	10.5 [12.5] J,B	10.8 [13.2] J,B	10.3 [13.2] J,B
Residual Range Organics	AK103	mg/Kg	*8,300*	451 [19.1]	22.3 [13.4] J,B	ND [13]	65.3 [14.2] B	9.81 [12.5] J,B	51.2 [13.2] B	44.1 [13.2] B
Lead	SW6020A	mg/Kg	*400*	10.1 [0.174]	4.82 [0.126]	4.83 [0.13]	4.55 [0.128]	1.94 [0.11]	4.49 [0.124]	4.33 [0.13]
Benzene	SW8260B	mg/Kg	*0.025*	ND [0.0321]	ND [0.058]	**0.0334 [0.0109]**	ND [0.0124]	0.0169 [0.0096] J	ND [0.011]	0.0233 [0.0101]
Ethylbenzene	SW8260B	mg/Kg	*6.9*	0.136 [0.064]	5.49 [0.116]	0.0491 [0.0217]	0.198 [0.0246]	0.0142 [0.0192] J	ND [0.0219]	ND [0.0201]
Toluene	SW8260B	mg/Kg	*6.5*	ND [0.064]	0.132 [0.116] J	0.0538 [0.0217]	0.0163 [0.0246] J	ND [0.0192]	ND [0.0219]	ND [0.0201]
o-Xylene	SW8260B	mg/Kg	*63 (total xylenes)*	0.077 [0.064] J	4.64 [0.116]	0.0356 [0.0217] J	ND [0.0246]	ND [0.0192]	ND [0.0219]	ND [0.0201]
Xylene, Isomers m & p	SW8260B	mg/Kg		2.05 [0.129]	24.7 [0.232]	0.246 [0.0434]	0.638 [0.0493]	0.129 [0.0385]	ND [0.0438]	0.0704 [0.0402] J
1-Methylnaphthalene	8270SIM	mg/Kg	*6.2*	0.148 [0.0047]	0.74 [0.0337]	0.0024 [0.0032] J	0.451 [0.0353]	0.0033 [0.0031] J	ND [0.0032]	0.0051 [0.0033] J
2-Methylnaphthalene	8270SIM	mg/Kg	*6.1*	0.0926 [0.0047]	1.15 [0.0337]	0.0029 [0.0032] J	0.633 [0.0353]	0.0049 [0.0031] J	ND [0.0032]	0.0049 [0.0033] J
Acenaphthene	8270SIM	mg/Kg	*180*	ND [0.0047]	0.0189 [0.0034]	ND [0.0032]	0.0136 [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Acenaphthylene	8270SIM	mg/Kg	*180*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Anthracene	8270SIM	mg/Kg	*3,000*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Benzo(a)anthracene	8270SIM	mg/Kg	*3.6*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Benzo(a)pyrene	8270SIM	mg/Kg	*0.4*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Benzo(b)fluoranthene	8270SIM	mg/Kg	*4*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*1,100*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Benzo(k)fluoranthene	8270SIM	mg/Kg	*40*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Chrysene	8270SIM	mg/Kg	*360*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.4*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Fluoranthene	8270SIM	mg/Kg	*1,400*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Fluorene	8270SIM	mg/Kg	*220*	0.0231 [0.0047]	0.0331 [0.0034]	ND [0.0032]	0.0184 [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*4*	ND [0.0047]	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Naphthalene	8270SIM	mg/Kg	*20*	0.0896 [0.0047]	0.525 [0.0337]	ND [0.0032]	0.345 [0.0353]	0.0027 [0.0031] J	ND [0.0032]	0.0097 [0.0033]
Phenanthrene	8270SIM	mg/Kg	*3,000*	0.0102 [0.0047]	0.013 [0.0034]	ND [0.0032]	0.0056 [0.0035] J	ND [0.0031]	ND [0.0032]	ND [0.0033]
Pyrene	8270SIM	mg/Kg	*1,000*	0.0044 [0.0047] J	ND [0.0034]	ND [0.0032]	ND [0.0035]	ND [0.0031]	ND [0.0032]	ND [0.0033]
Total Solids	A2540G	Percent	*NA*	52.2	74.1	76.8	70.5	79.1	75.7	75.7

Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

Gray highlighted results had LODs that were greater than associated cleanup levels.

[a] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

ADEC - Alaska Department of Environmental Conservation
LOD - limit of detection
LOQ - limit of quantitation
mg/Kg - milligrams per kilogram
SGS - SGS North America Inc. of Anchorage Alaska.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 3-5 Soil Sample Results

PMP 17.7

Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS			Sample ID	14HF1722SO	14HF1723SO	14HF1724SO	14HF1725SO	14HF1726SO	14HF1727SQ
			Location ID	17BH1805	17BH1814	17BH1704	17BH17	17BH2306	Trip Blank
			Sample Data Group	1143328	1143328	1143328	1143328	1143328	1143328
			Laboratory	SGS	SGS	SGS	SGS	SGS	SGS
			Sample Type	Primary	Primary	Primary	Field Duplicate	Primary	Trip Blank
			Collection Date	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/19/2014
			Matrix	Soil	Soil	Soil	Soil	Soil	Soil
Analyte	Method	Units	*Cleanup Level* [a]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/Kg	*260*	**935 [260]**	5.5 [1.8] B	30.2 [2.14] QN	60.2 [2.38] QN	3.56 [2.42] J,B	1.12 [1.28] J,B
Diesel Range Organics	AK102	mg/Kg	*230*	**2410 [58]**	7.74 [11.9] J,B	66.2 [13.9]	44.4 [13.9]	12.6 [13.8] J	-
Residual Range Organics	AK103	mg/Kg	*8,300*	174 [58]	26.2 [11.9] B	44.8 [13.9]	33.2 [13.9]	29.9 [13.8]	-
Lead	SW6020A	mg/Kg	*400*	5.77 [0.71]	1.9 [0.555]	5.63 [0.63]	6.1 [0.685]	3.34 [0.655]	-
Benzene	SW8260B	mg/Kg	*0.025*	**0.0457 [0.013]**	0.0108 [0.009] J	ND [0.0107]	ND [0.0119]	ND [0.0121]	ND [0.0064]
Ethylbenzene	SW8260B	mg/Kg	*6.9*	**11.7 [0.26]**	0.0242 [0.0181] J	0.208 [0.0214] QN	0.353 [0.0238] QN	ND [0.0241]	ND [0.0128]
Toluene	SW8260B	mg/Kg	*6.5*	5.86 [0.26]	0.0159 [0.0181] J	ND [0.0214]	0.02 [0.0238] J	ND [0.0241]	ND [0.0128]
o-Xylene	SW8260B	mg/Kg	*63 (total xylenes)*	13.1 [0.26]	0.0202 [0.0181] J	0.0188 [0.0214] J	0.0252 [0.0238] J	ND [0.0241]	ND [0.0128]
Xylene, Isomers m & p	SW8260B	mg/Kg		47.5 [0.52]	0.222 [0.036]	0.529 [0.0427]	0.83 [0.0476]	ND [0.0483]	ND [0.0256]
1-Methylnaphthalene	8270SIM	mg/Kg	*6.2*	**7.85 [0.725]**	0.0067 [0.003]	0.239 [0.0035]	0.24 [0.0346]	ND [0.0035]	-
2-Methylnaphthalene	8270SIM	mg/Kg	*6.1*	**13.4 [0.725]**	0.0064 [0.003]	0.385 [0.0035]	0.379 [0.0346]	ND [0.0035]	-
Acenaphthene	8270SIM	mg/Kg	*180*	ND [0.0725]	ND [0.003]	0.0055 [0.0035] J	0.006 [0.0035] J	ND [0.0035]	-
Acenaphthylene	8270SIM	mg/Kg	*180*	ND [0.0725]	ND [0.003]	ND [0.0035]	0.0023 [0.0035] J	ND [0.0035]	-
Anthracene	8270SIM	mg/Kg	*3,000*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Benzo(a)anthracene	8270SIM	mg/Kg	*3.6*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Benzo(a)pyrene	8270SIM	mg/Kg	*0.4*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Benzo(b)fluoranthene	8270SIM	mg/Kg	*4*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*1,100*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Benzo(k)fluoranthene	8270SIM	mg/Kg	*40*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Chrysene	8270SIM	mg/Kg	*360*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.4*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Fluoranthene	8270SIM	mg/Kg	*1,400*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Fluorene	8270SIM	mg/Kg	*220*	0.202 [0.0725]	ND [0.003]	0.007 [0.0035]	0.0086 [0.0035]	ND [0.0035]	-
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*4*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Naphthalene	8270SIM	mg/Kg	*20*	11 [0.725]	0.0122 [0.003]	0.195 [0.0035]	0.144 [0.0035]	ND [0.0035]	-
Phenanthrene	8270SIM	mg/Kg	*3,000*	ND [0.0725]	ND [0.003]	0.0032 [0.0035] J	0.0036 [0.0035] J	ND [0.0035]	-
Pyrene	8270SIM	mg/Kg	*1,000*	ND [0.0725]	ND [0.003]	ND [0.0035]	ND [0.0035]	ND [0.0035]	-
Total Solids	A2540G	Percent	*NA*	67.9	82.5	71.2	71.5	71.5	-

Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

Gray highlighted results had LODs that were greater than associated cleanup levels.

[a] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

ADEC - Alaska Department of Environmental Conservation

LOD - limit of detection

LOQ - limit of quantitation

mg/Kg - milligrams per kilogram

SGS - SGS North America Inc. of Anchorage Alaska.

Data Qualifiers:

B - analyte was also detected in a blank; result may be due to cross-contamination

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

M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues

ND - analyte not detected

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

Table 3-6 Groundwater Field Parameters and COC Concentrations
PMP 17.7
Haines-Fairbanks Pipeline FUDS

Field Parameters										Geochemical Results				Contaminants of Concern			
Well ID	**Sample ID**	**Sample Date**	**Well Drawdown (feet)**	**Temp. (°C)**	**Conductivity (µS/cm)**	**DO (mg/L)**	**pH**	**ORP (mv)**	**Turbidity (NTU)**	**Sulfate (mg/L)**	**NO_2/NO_3 as Total N (mg/L)**	**Fe (mg/L)**	**Mn (mg/L)**	**DRO (mg/L)**	**GRO (mg/L)**	**Benzene (mg/L)**	**Lead (mg/L)**
ADEC Cleanup Levels (Table C of Title 18 Alaska Administrative Code, Chapter 75.345)														**1.5**	**2.2**	**0.005**	**0.015**
17-MW1	14HF1708WG	8/9/2014	0.04	10.41	1.196	0.23	7.49	-142.50	2.95	0.085 J	ND(0.05)	2.93	0.382	0.334 J	1.73	0.00474	ND(0.0005)
17-MW2	14HF1709WG	8/10/2014	0.13	10.69	1.087	0.27	7.24	-91.80	42.96	0.061 J	ND(0.05) ML	17.5	0.992	**1.72**	**12.7**	**0.0079**	ND(0.0005)
17-MW3	14HF1701WG	8/10/2014	1.20	9.13	1.681	0.32	6.46	-82.90	7.71	0.544 QN	0.255 QN	67.8 QN	2.07 QN	**1.7 QN [1]**	**11.5 QN [1]**	**0.65 QN [1]**	0.0012 QN
17-MW4	14HF1704WG	8/9/2014	0.04	10.20	1.067	0.43	7.03	-97.60	2.98	0.243	ND(0.05)	8.14	1.58	ND(0.313)	0.233 B	0.00047	ND(0.0005)
17-MW5	14HF1703WG	8/9/2014	0.04	8.14	1.019	0.26	6.99	-107.20	2.86	0.104	ND(0.05)	12.5	0.571	0.473 J	**3.37 QH**	**0.0261**	ND(0.0005)
17-MW6	14HF1706WG	8/9/2014	0.05	7.22	1.209	0.24	7.20	-109.70	33.82	0.087 J	ND(0.05) ML	4.52	0.362	0.262 J	**2.39 ML**	**0.0332**	0.0004 J
17-MW7	14HF1705WG	8/9/2014	0.48	8.17	1.205	0.78	6.21	-30.60	10.44	1.27 QN	ND(0.05) QN	34.1 QN	1.89 QN	ND(0.3) QN	0.0856 J,B,QN	0.00094 QN	ND(0.0005) QN
17-MW8	14HF1707WG	8/9/2014	0.13	10.43	1.005	0.40	6.63	-55.80	3.31	14.2	ND(0.05)	7.09	2.5	0.301 J	0.18 B	**0.0124**	ND(0.0005)

Note: Yellow highlighted and **bolded** values exceed ADEC Table C groundwater cleanup levels.

[1] Field duplicate result shown when it exceeded the Primary result.

°C - degree Celsius
DO - dissolved oxygen
DRO - diesel range organics
Fe - iron
GRO - gasoline range organics
LOD - limit of detection
LOQ - limit of quantitation

µS/cm - microsiemens per centimeter
mg/L - milligrams per liter
Mn - manganese
mv - millivolts
NO_2/NO_3 as N - nitrite/nitrate as nitrogen
NTU - nephelometer turbidity units
ORP - oxidation reduction potential

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 3-7 Groundwater Sample Results
PMP 17.7
Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS			Sample ID	14HF1701WG	14HF1702WG	14HF1703WG	14HF1704WG	14HF1705WG	14HF1706WG	14HF1707WG	14HF1708WG	14HF1709WG	14HF1710WQ
			Location ID	17-MW3	17-MW31	17-MW5	17-MW4	17-MW7	17-MW6	17-MW8	17-MW1	17-MW2	Trip Blank
			Sample Data Group	1143761	1143761	1143761	1143761	1143761	1143761	1143761	1143761	1143761	1143761
			Laboratory	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS
			Sample Type	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Trip Blank
			Collection Date	8/10/2014	8/10/2014	8/9/2014	8/9/2014	8/9/2014	8/9/2014	8/9/2014	8/9/2014	8/10/2014	8/9/2014
			Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Water
Analyte	Method	Units	*Screening or Cleanup Level* [a,b]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/L	*2.2*	**11.1 [0.5] QN**	**11.5 [0.5] QN**	**3.37 [0.05] QH**	0.233 [0.05] B	0.0856 [0.05] J,B,QN	**2.39 [0.05] ML**	0.18 [0.05] B	1.73 [0.05]	**12.7 [0.5]**	ND [0.05]
Diesel Range Organics	AK102	mg/L	*1.5*	1.23 [0.3] QN	**1.7 [0.3] QN**	0.473 [0.313] J	ND [0.313]	ND [0.3] QN	0.262 [0.313] J	0.301 [0.313] J	0.334 [0.319] J	**1.72 [0.3]**	-
Residual Range Organics	AK103	mg/L	*1.1*	ND [0.25] QN	ND [0.25] QN	ND [0.261]	ND [0.261]	ND [0.25] QN	ND [0.261]	ND [0.261]	ND [0.266]	0.259 [0.25] J	-
TAH[c]	SW8260B[b]	mg/L	*0.010*	**3.3942**	**3.6080**	**0.5107**	0.0028	0.0030	**0.2561**	**0.0148**	**0.0315**	**2.2908**	-
TAqH[c]	SW8260B/8270SIM[b]	mg/L	*0.015*	**3.4547**	**3.6833**	**0.5312**	0.0035	0.0036	**0.2692**	**0.0153**	**0.0366**	**2.3865**	-
Sulfate	E300.0	mg/L	*NA*	0.544 [0.05] QN	0.185 [0.05] QN	0.104 [0.05]	0.243 [0.05]	1.27 [0.05] QN	0.087 [0.05] J	14.2 [0.5]	0.085 [0.05] J	0.061 [0.05] J	-
Nitrogen, Nitrate-Nitrite	A4500F	mg/L	*NA*	0.255 [0.05] QN	0.232 [0.05] QN	ND [0.05]	ND [0.05]	ND [0.05] QN	ND [0.05] ML	ND [0.05]	ND [0.05]	ND [0.05] ML	-
Iron	SW6020A	mg/L	*NA*	67.6 [0.25] QN	67.8 [0.25] QN	12.5 [0.25]	8.14 [0.25]	34.1 [0.25] QN	4.52 [0.25]	7.09 [0.25]	2.93 [0.25]	17.5 [0.25]	-
Manganese	SW6020A	mg/L	*NA*	2.04 [0.001] QN	2.07 [0.001] QN	0.571 [0.001]	1.58 [0.001]	1.89 [0.001] QN	0.362 [0.001]	2.5 [0.001]	0.382 [0.001]	0.992 [0.001]	-
Lead	SW6020A	mg/L	*0.015*	0.0012 [0.0005] QN	0.001 [0.0005] J,QN	ND [0.0005]	ND [0.0005]	ND [0.0005] QN	0.0004 [0.0005] J	ND [0.0005]	ND [0.0005]	ND [0.0005]	-
Benzene	SW8260B	mg/L	*1.000*	**0.62 [0.004] QN**	**0.65 [0.004] QN**	**0.0261 [0.002]**	0.00047 [0.0002]	0.00094 [0.0002] QN	**0.0332 [0.0008]**	**0.0124 [0.0002]**	0.00474 [0.0002]	**0.0079 [0.002]**	ND [0.0002]
Ethylbenzene	SW8260B	mg/L	*0.7*	0.338 [0.01] QN	0.361 [0.01] QN	0.0426 [0.005]	0.00037 [0.0005] J	ND [0.0005] QN	0.0172 [0.002]	ND [0.0005]	0.00461 [0.0005]	0.438 [0.005]	ND [0.0005]
Toluene	SW8260B	mg/L	*1*	0.0612 [0.01] QN	0.063 [0.01] QN	0.0132 [0.005]	ND [0.0005]	0.00045 [0.0005] J,QN	0.00332 [0.002] J	0.00036 [0.0005] J	0.00104 [0.0005]	0.0269 [0.005]	ND [0.0005]
o-Xylene	SW8260B	mg/L	*10*	0.335 [0.01] QN	0.344 [0.01] QN	0.0138 [0.005]	ND [0.0005]	ND [0.0005] QN	0.00236 [0.002] J	ND [0.0005]	0.00196 [0.0005]	0.378 [0.005]	ND [0.0005]
Xylene, Isomers m & p	SW8260B	mg/L	*NA*	2.04 [0.02] QN	2.19 [0.02] QN	0.415 [0.01]	ND [0.001]	0.00064 [0.001] J,QN	0.200 [0.004]	0.00101 [0.001] J	0.0191 [0.001]	1.44 [0.025]	ND [0.001]
1-Methylnaphthalene	8270SIM	mg/L	*0.15*	0.00954 [0.000526] QN	0.0116 [0.00129] QN	0.00318 [0.000284]	0.0000718 [0.0000263]	ND [0.0000284] QN	0.00218 [0.0000238] ML	ND [0.000029]	0.00145 [0.0000281]	0.0161 [0.000555]	-
2-Methylnaphthalene	8270SIM	mg/L	*0.15*	0.0145 [0.000526] QN	0.0164 [0.00129] QN	0.0041 [0.000284]	0.0000985 [0.0000263]	ND [0.0000284] QN	0.0019 [0.0000238] ML	ND [0.000029]	0.00195 [0.0000281]	0.0251 [0.000555]	-
Acenaphthene	8270SIM	mg/L	*2.2*	0.00011 [0.0000263] QN	0.000134 [0.0000257] QN	0.0000334 [0.0000284] J	ND [0.0000263]	ND [0.0000284] QN	0.0000238 [0.0000238] J,ML	ND [0.000029]	0.0000371 [0.0000281] J	0.000184 [0.0000278]	-
Acenaphthylene	8270SIM	mg/L	*2.2*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238] ML	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Anthracene	8270SIM	mg/L	*11*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238] ML	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Benzo(a)anthracene	8270SIM	mg/L	*0.0012*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Benzo(a)pyrene	8270SIM	mg/L	*0.0002*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Benzo(b)fluoranthene	8270SIM	mg/L	*0.0012*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Benzo(g,h,i)perylene	8270SIM	mg/L	*1.1*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Benzo(k)fluoranthene	8270SIM	mg/L	*0.012*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Chrysene	8270SIM	mg/L	*0.12*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Dibenzo(a,h)anthracene	8270SIM	mg/L	*0.00012*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Fluoranthene	8270SIM	mg/L	*1.5*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Fluorene	8270SIM	mg/L	*1.5*	0.000137 [0.0000263] QN	0.000165 [0.0000257] QN	0.0000208 [0.0000284] J	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238] ML	ND [0.000029]	0.0000433 [0.0000281] J	0.000252 [0.0000278]	-
Indeno(1,2,3-cd)pyrene	8270SIM	mg/L	*0.0012*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-
Naphthalene	8270SIM	mg/L	*0.73*	0.0359 [0.00106] QN	0.0467 [0.00258] QN	0.0128 [0.00057]	0.0000477 [0.0000525] J	ND [0.000057] QN	0.00864 [0.00053]	0.0000547 [0.000058] J	0.00135 [0.000056]	0.0537 [0.00111]	-
Phenanthrene	8270SIM	mg/L	*11*	0.0000282 [0.0000263] J,QN	0.0000264 [0.0000257] J,QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	0.0000435 [0.0000278] J	-
Pyrene	8270SIM	mg/L	*1.1*	ND [0.0000263] QN	ND [0.0000257] QN	ND [0.0000284]	ND [0.0000263]	ND [0.0000284] QN	ND [0.0000238]	ND [0.000029]	ND [0.0000281]	ND [0.0000278]	-

Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels or surface water criteria.

[a] Groundwater cleanup levels are from ADEC Title 18 Alaska Administrative Code, Chapter 75.345, Table C.

[b] Surface water criteria are from ADEC Title 18 Alaska Administrative Code, Chapter 70.020.

[c] Total aromatic hydrocarbons (TAH) is the sum of BTEX compounds, and total aqueous hydrocarbons (TAqH) is the sum of BTEX plus the sum of U.S. Environmental Protection Agency's 16 priority PAH pollutants.

ADEC - Alaska Department of Environmental Conservation
BTEX - benzene, toluene, ethylbenzene, and xylenes
LOD - limit of detection
mg/L - milligrams per liter
PAH - polynuclear aromatic hydrocarbons
SGS - SGS North America Inc. of Anchorage Alaska.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 3-8 Sediment Sample Results

PMP 17.7

Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS				**Sample ID**	**14HF1701SE**	**14HF1702SE**	**14HF1703SE**	**14HF1704SE**	**14HF1705SE**	**14HF1706SE**	**14HF1707SE**
				Location ID	**17-SE5**	**17-SE4**	**17-SE3**	**17-SE2**	**17-SE1**	**17-SE7**	**17-SE71**
				Sample Data Group	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**
				Laboratory	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**
				Sample Type	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Field Duplicate**
				Collection Date	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**
				Matrix	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**
Analyte	Method	Units	*Sediment Screening Level* [a]	*Soil Clean-up Level* [b]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/Kg	*NE*	*260*	1.87 [2.57] J,B	1.74 [2.54] J,B	ND [2.58]	ND [2.55]	1.81 [2.17] J,B	5.61 [2.64] B,QN	10.5 [2.71] QN
Diesel Range Organics	AK102	mg/Kg	*NE*	*230*	ND [14.9]	ND [14.5]	ND [14.8]	ND [14.6]	ND [13.7]	53.8 [15.1]	34.9 [15]
Residual Range Organics	AK103	mg/Kg	*NE*	*8,300*	33.6 [14.9]	30.5 [14.5]	27.5 [14.8] J	37.7 [14.6]	16.9 [13.7] J	36.6 [15.1]	35.9 [15]
Lead	SW6020A	mg/Kg	*91.3/35*	*400*	4.52 [0.63]	4.39 [0.67]	5.53 [0.66]	4.02 [0.685]	3.11 [0.665]	7.97 [0.72]	7.9 [0.725]
Benzene	SW8260B	mg/Kg	*NE*	*0.025*	ND [0.0129]	ND [0.0127]	ND [0.0129]	ND [0.0128]	ND [0.0109]	0.01 [0.0132] J	0.0135 [0.0136] J
Ethylbenzene	SW8260B	mg/Kg	*NE*	*6.9*	ND [0.0257]	ND [0.0255]	0.031 [0.0258] J,B	ND [0.0255]	ND [0.0216]	ND [0.0264]	ND [0.0271]
Toluene	SW8260B	mg/Kg	*NE*	*6.5*	ND [0.0257]	ND [0.0255]	ND [0.0258]	ND [0.0255]	ND [0.0216]	ND [0.0264]	ND [0.0271]
o-Xylene	SW8260B	mg/Kg	*NE*	*63*	ND [0.0257]	ND [0.0255]	ND [0.0258]	ND [0.0255]	ND [0.0216]	ND [0.0264]	ND [0.0271]
Xylene, Isomers m & p	SW8260B	mg/Kg			ND [0.0515]	ND [0.051]	ND [0.0515]	ND [0.051]	ND [0.0434]	ND [0.053]	ND [0.054]
1-Methylnaphthalene	8270SIM	mg/Kg	*NE*	*6.2*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	0.0042 [0.0037] J,QN	0.0097 [0.0037] QN
2-Methylnaphthalene	8270SIM	mg/Kg	*NE*	*6.1*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	0.0023 [0.0037] J,QN	0.0063 [0.0037] J,QN
Acenaphthene	8270SIM	mg/Kg	*0.0889/0.00671*	*180*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Acenaphthylene	8270SIM	mg/Kg	*0.128/0.00587*	*180*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Anthracene	8270SIM	mg/Kg	*0.245/0.0469*	*3,000*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Benzo(a)anthracene	8270SIM	mg/Kg	*0.385/0.0317*	*3.6*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Benzo(a)pyrene	8270SIM	mg/Kg	*0.782/0.0319*	*0.4*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Benzo(b)fluoranthene	8270SIM	mg/Kg	*NE*	*4*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	0.0032 [0.0037] J,QL	0.004 [0.0037] J,QH
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*NE*	*1,100*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Benzo(k)fluoranthene	8270SIM	mg/Kg	*NE*	*40*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Chrysene	8270SIM	mg/Kg	*0.862/0.0571*	*360*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	0.0039 [0.0037] J,QL	0.0049 [0.0037] J,QH
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.135/0.00622*	*0.4*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Fluoranthene	8270SIM	mg/Kg	*2.23/0.111*	*1,400*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	0.0037 [0.0037] J,QH
Fluorene	8270SIM	mg/Kg	*0.144/0.0212*	*220*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*NE*	*4*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Naphthalene	8270SIM	mg/Kg	*0.391/0.0346*	*20*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QL	ND [0.0037]
Phenanthrene	8270SIM	mg/Kg	*0.515/0.0419*	*3,000*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	ND [0.0037] QN	0.0065 [0.0037] J,QH
Pyrene	8270SIM	mg/Kg	*0.875/0.053*	*1,000*	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0037]	ND [0.0035]	0.0034 [0.0037] J,QL	0.004 [0.0037] J,QH
Total Solids	A2540G	Percent	*NA*	*NA*	68	68.3	67.5	68.9	73.8	67.3	66.8

Yellow highlighted and **bolded** results exceed sediment screening levels.

Orange highlighted and **bolded** results exceed soil cleanup levels.

Gray highlighted results had LODs that were greater than associated screening/cleanup levels.

[a] Sediment screening levels are the National Oceanic and Atmospheric Administration PEL/TEL for Freshwater Sediment.

[b] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

No analytes which exceed their more stringent PEL/TEL exceeded their soil cleanup levels

LOD - limit of detection

LOQ - limit of quantitation

mg/Kg - milligrams per kilogram

NA - not applicable

NE - not established

PEL - Probable Effects Level

SGS - SGS North America Inc. of Anchorage Alaska.

TEL - Threshold Effects Level

Data Qualifiers:

B - analyte was also detected in a blank; result may be due to cross-contamination

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

M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues

ND - analyte not detected

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

Table 3-8 Sediment Sample Results

PMP 17.7

Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS				**Sample ID**	**14HF1708SE**	**14HF1709SE**	**14HF1710SE**	**14HF1711SE**	**14HF1712SE**	**14HF1713SE**	**14HF1714SE**	**14HF1715SE**
				Location ID	**17-SE8**	**17-SE9**	**17-SE10**	**17-SE11**	**17-SE6**	**17-SE61**	**17-SE15**	**17-SE16**
				Sample Data Group	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**
				Laboratory	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**
				Sample Type	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Field Duplicate**	**Primary**	**Primary**
				Collection Date	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/10/2014**	**8/10/2014**
				Matrix	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**
Analyte	Method	Units	*Sediment Screening Level* [a]	*Soil Clean-up Level* [b]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/Kg	*NE*	*260*	34.5 [2.59]	17.8 [2.2]	11 [2.27]	3.35 [2.12] J,B	6.26 [8.75] J,B,QL	ND [7.7]	72.3 [6.05] QH	9.6 [4] B
Diesel Range Organics	AK102	mg/Kg	*NE*	*230*	33.3 [14.8]	ND [12.9]	229 [13.8]	ND [13.1]	125 [31.3]	122 [29.6]	**315 [15.7]**	**377 [18]**
Residual Range Organics	AK103	mg/Kg	*NE*	*8,300*	44.2 [14.8]	9.22 [12.9] J	ND [13.8]	ND [13.1]	171 [31.3]	238 [29.6]	85.6 [15.7]	214 [18]
Lead	SW6020A	mg/Kg	*91.3/35*	*400*	6.26 [0.66]	5.55 [0.615]	4.05 [0.675]	4.6 [0.7]	29.3 [1.59] QN	15.6 [1.35] QN	11.9 [0.64]	6.96 [0.91]
Benzene	SW8260B	mg/Kg	*NE*	*0.025*	**0.688 [0.013]**	**0.619 [0.011]**	**0.0508 [0.0114]**	**0.175 [0.0106]**	ND [0.0437]	ND [0.0386]	ND [0.0304]	ND [0.02]
Ethylbenzene	SW8260B	mg/Kg	*NE*	*6.9*	0.51 [0.0259]	0.361 [0.022]	ND [0.0227]	ND [0.0212]	ND [0.0875]	ND [0.077]	1.59 [0.0605]	0.282 [0.04]
Toluene	SW8260B	mg/Kg	*NE*	*6.5*	0.0357 [0.0259] J	0.0405 [0.022] J	0.0241 [0.0227] J	ND [0.0212]	0.0716 [0.0875] J,QH	0.0602 [0.077] J	0.608 [0.0605]	0.0376 [0.04] J
o-Xylene	SW8260B	mg/Kg	*NE*	*63*	0.194 [0.0259]	0.0858 [0.022]	ND [0.0227]	ND [0.0212]	ND [0.0875]	ND [0.077]	1.02 [0.0605]	0.056 [0.04] J
Xylene, Isomers m & p	SW8260B	mg/Kg			2.69 [0.052]	1.36 [0.044]	0.249 [0.0454]	0.119 [0.0424]	ND [0.175]	ND [0.155]	6.71 [0.122]	1.25 [0.08]
1-Methylnaphthalene	8270SIM	mg/Kg	*NE*	*6.2*	0.382 [0.0372]	0.122 [0.0034]	0.019 [0.0034]	0.0194 [0.0034]	0.519 [0.0402] QN	0.289 [0.0359] QN	0.879 [0.081]	0.806 [0.0233]
2-Methylnaphthalene	8270SIM	mg/Kg	*NE*	*6.1*	0.573 [0.0372]	0.15 [0.0034]	ND [0.0034]	0.0198 [0.0034]	0.789 [0.0402] QN	0.435 [0.0359] QN	1.2 [0.081]	1.58 [0.117]
Acenaphthene	8270SIM	mg/Kg	*0.0889/0.00671*	*180*	**0.0105 [0.0037]**	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402]	ND [0.0359]	ND [0.004]	ND [0.0233]
Acenaphthylene	8270SIM	mg/Kg	*0.128/0.00587*	*180*	ND [0.0037]	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402]	ND [0.0359]	ND [0.004]	ND [0.0233]
Anthracene	8270SIM	mg/Kg	*0.245/0.0469*	*3,000*	ND [0.0037]	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402]	ND [0.0359]	ND [0.004]	ND [0.0233]
Benzo(a)anthracene	8270SIM	mg/Kg	*0.385/0.0317*	*3.6*	ND [0.0037]	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402]	ND [0.0359]	ND [0.004]	ND [0.0233]
Benzo(a)pyrene	8270SIM	mg/Kg	*0.782/0.0319*	*0.4*	ND [0.0037]	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402] MN	ND [0.0359]	ND [0.004]	ND [0.0233]
Benzo(b)fluoranthene	8270SIM	mg/Kg	*NE*	*4*	0.0038 [0.0037] J	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402] MN	ND [0.0359]	ND [0.004]	ND [0.0233]
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*NE*	*1,100*	ND [0.0037]	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402] MN	ND [0.0359]	ND [0.004]	0.0299 [0.0233] J
Benzo(k)fluoranthene	8270SIM	mg/Kg	*NE*	*40*	ND [0.0037]	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402] MN	ND [0.0359]	ND [0.004]	ND [0.0233]
Chrysene	8270SIM	mg/Kg	*0.862/0.0571*	*360*	0.0031 [0.0037] J	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402]	ND [0.0359]	ND [0.004]	ND [0.0233]
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.135/0.00622*	*0.4*	ND [0.0037]	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402] MN	ND [0.0359]	ND [0.004]	ND [0.0233]
Fluoranthene	8270SIM	mg/Kg	*2.23/0.111*	*1,400*	0.003 [0.0037] J	ND [0.0034]	0.0028 [0.0034] J	ND [0.0034]	ND [0.0402]	ND [0.0359]	0.0036 [0.004] J	ND [0.0233]
Fluorene	8270SIM	mg/Kg	*0.144/0.0212*	*220*	0.0137 [0.0037]	0.0042 [0.0034] J	ND [0.0034]	ND [0.0034]	**0.0368 [0.0402] J,ML**	ND [0.0359]	**0.0304 [0.004]**	**0.069 [0.0233]**
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*NE*	*4*	ND [0.0037]	ND [0.0034]	ND [0.0034]	ND [0.0034]	ND [0.0402] MN	ND [0.0359]	ND [0.004]	ND [0.0233]
Naphthalene	8270SIM	mg/Kg	*0.391/0.0346*	*20*	**0.416 [0.0372]**	**0.191 [0.0169]**	ND [0.0034]	0.0103 [0.0034]	**0.708 [0.0402] QN**	**0.38 [0.0359] QN**	**1.44 [0.081]**	**0.443 [0.0233]**
Phenanthrene	8270SIM	mg/Kg	*0.515/0.0419*	*3,000*	0.0063 [0.0037] J	0.0025 [0.0034] J	0.0034 [0.0034] J	ND [0.0034]	ND [0.0402]	ND [0.0359]	0.011 [0.004]	0.0237 [0.0233] J
Pyrene	8270SIM	mg/Kg	*0.875/0.053*	*1,000*	0.0052 [0.0037] J	ND [0.0034]	0.0028 [0.0034] J	ND [0.0034]	ND [0.0402]	ND [0.0359]	0.0054 [0.004] J	ND [0.0233]
Total Solids	A2540G	Percent	*NA*	*NA*	67.7	72.7	71.8	73.6	30.9	34.6	62.7	53.4

Yellow highlighted and **bolded** results exceed sediment screening levels.

Orange highlighted and **bolded** results exceed soil cleanup levels.

Gray highlighted results had LODs that were greater than associated screening/cleanup levels.

[a] Sediment screening levels are the National Oceanic and Atmospheric Administration PEL/TEL for Freshwater Sediment.

[b] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

No analytes which exceed their more stringent PEL/TEL exceeded their soil cleanup levels

LOD - limit of detection
LOQ - limit of quantitation
mg/Kg - milligrams per kilogram
NA - not applicable

NE - not established
PEL - Probable Effects Level
SGS - SGS North America Inc. of Ancho
TEL - Threshold Effects Level

Data Qualifiers:

B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 3-8 Sediment Sample Results

PMP 17.7

Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS				**Sample ID**	**14HF1716SE**	**14HF1717SE**	**14HF1718SE**	**14HF1719SE**	**14HF1720SE**	**14HF1721SE**	**14HF1722SE**	**14HF1723SQ**
				Location ID	**17-SE17**	**17-SE18**	**17-SE19**	**17-SE12**	**17-SE20**	**17-SE13**	**17-SE14**	**Trip Blank**
				Sample Data Group	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**	**1143760**
				Laboratory	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**
				Sample Type	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Trip Blank**
				Collection Date	**8/10/2014**	**8/10/2014**	**8/10/2014**	**8/9/2014**	**8/10/2014**	**8/9/2014**	**8/10/2014**	**8/9/2014**
				Matrix	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Solid**
Analyte	Method	Units	*Sediment Screening Level [a]*	*Soil Clean-up Level [b]*	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/Kg	*NE*	*260*	9.38 [2.48] B	77.5 [5.4] QH	110 [2.59] QH	**583 [29.3]**	129 [2.28] QH	79.1 [3.17]	159 [2.75] QH	0.925 [1.28] J
Diesel Range Organics	AK102	mg/Kg	*NE*	*230*	59.3 [14.1]	25.4 [15.1] J	**707 [14.7]**	**798 [15.7]**	155 [13.6]	**1480 [65.5]**	**415 [14.9]**	-
Residual Range Organics	AK103	mg/Kg	*NE*	*8,300*	22.7 [14.1] J	26.4 [15.1] J,B	41 [14.7] B	47.4 [15.7]	23.9 [13.6] J	150 [65.5]	106 [14.9]	-
Lead	SW6020A	mg/Kg	*91.3/35*	*400*	7.21 [0.645]	6.54 [0.73]	9.07 [0.67]	6.43 [0.705]	6.25 [0.635]	7.86 [0.75]	5.86 [0.685]	-
Benzene	SW8260B	mg/Kg	*NE*	*0.025*	ND [0.0124]	ND [0.136]	ND [0.13]	ND [0.146]	**0.292 [0.114]**	**0.101 [0.159] J**	ND [0.138]	ND [0.0064]
Ethylbenzene	SW8260B	mg/Kg	*NE*	*6.9*	ND [0.0249]	2.74 [0.271]	3.48 [0.259]	0.89 [0.292]	3.93 [0.228]	2.24 [0.317]	1.15 [0.276]	0.0085 [0.0129] J
Toluene	SW8260B	mg/Kg	*NE*	*6.5*	ND [0.0249]	0.201 [0.271] J	ND [0.259]	ND [0.292]	0.77 [0.228]	ND [0.317]	0.231 [0.276] J	ND [0.0129]
o-Xylene	SW8260B	mg/Kg	*NE*	*63*	ND [0.0249]	ND [0.271]	ND [0.259]	ND [0.292]	3.69 [0.228]	0.273 [0.317] J	ND [0.276]	ND [0.0129]
Xylene, Isomers m & p	SW8260B	mg/Kg			ND [0.0497]	10.6 [0.54]	6.64 [0.52]	1.54 [0.585]	14.1 [0.456]	8.78 [0.635]	3 [0.55]	ND [0.0256]
1-Methylnaphthalene	8270SIM	mg/Kg	*NE*	*6.2*	0.0919 [0.0036]	0.16 [0.0037]	1.91 [0.183]	1.73 [0.078]	1.28 [0.0685]	0.12 [0.004]	0.663 [0.0372]	-
2-Methylnaphthalene	8270SIM	mg/Kg	*NE*	*6.1*	0.144 [0.0036]	0.288 [0.0374]	3.04 [0.183]	2.47 [0.078]	1.97 [0.0685]	0.173 [0.004]	1.06 [0.0372]	-
Acenaphthene	8270SIM	mg/Kg	*0.0889/0.00671*	*180*	**0.007 [0.0036] J**	0.004 [0.0037] J	ND [0.0037]	**0.0354 [0.0039]**	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Acenaphthylene	8270SIM	mg/Kg	*0.128/0.00587*	*180*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Anthracene	8270SIM	mg/Kg	*0.245/0.0469*	*3,000*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Benzo(a)anthracene	8270SIM	mg/Kg	*0.385/0.0317*	*3.6*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Benzo(a)pyrene	8270SIM	mg/Kg	*0.782/0.0319*	*0.4*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Benzo(b)fluoranthene	8270SIM	mg/Kg	*NE*	*4*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*NE*	*1,100*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Benzo(k)fluoranthene	8270SIM	mg/Kg	*NE*	*40*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Chrysene	8270SIM	mg/Kg	*0.862/0.0571*	*360*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.135/0.00622*	*0.4*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Fluoranthene	8270SIM	mg/Kg	*2.23/0.111*	*1,400*	ND [0.0036]	ND [0.0037]	ND [0.0037]	0.0025 [0.0039] J	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Fluorene	8270SIM	mg/Kg	*0.144/0.0212*	*220*	0.0132 [0.0036]	0.0069 [0.0037] J	**0.0442 [0.0037]**	**0.0518 [0.0039]**	**0.0534 [0.0685] J**	0.0105 [0.004]	**0.0276 [0.0372] J**	-
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*NE*	*4*	ND [0.0036]	ND [0.0037]	ND [0.0037]	ND [0.0039]	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Naphthalene	8270SIM	mg/Kg	*0.391/0.0346*	*20*	ND [0.0036]	**0.194 [0.0374]**	**1.81 [0.183]**	**0.828 [0.078]**	**1.2 [0.0685]**	**0.0784 [0.004]**	**0.722 [0.0372]**	-
Phenanthrene	8270SIM	mg/Kg	*0.515/0.0419*	*3,000*	0.0045 [0.0036] J	ND [0.0037]	0.01 [0.0037]	0.0132 [0.0039]	ND [0.0685]	0.0028 [0.004] J	ND [0.0372]	-
Pyrene	8270SIM	mg/Kg	*0.875/0.053*	*1,000*	ND [0.0036]	ND [0.0037]	ND [0.0037]	0.0029 [0.0039] J	ND [0.0685]	ND [0.004]	ND [0.0372]	-
Total Solids	A2540G	Percent	*NA*	*NA*	69.5	66.3	67.9	63.5	72.2	61.1	66.1	-

Yellow highlighted and **bolded** results exceed sediment screening levels.

Orange highlighted and **bolded** results exceed soil cleanup levels.

Gray highlighted results had LODs that were greater than associated screening/cleanup levels.

[a] Sediment screening levels are the National Oceanic and Atmospheric Administration PEL/TEL for Freshwater Sediment.

[b] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

No analytes which exceed their more stringent PEL/TEL exceeded their soil cleanup levels

LOD - limit of detection

LOQ - limit of quantitation

mg/Kg - milligrams per kilogram

NA - not applicable

NE - not established

PEL - Probable Effects Level

SGS - SGS North America Inc. of Ancho

TEL - Threshold Effects Level

Data Qualifiers:

B - analyte was also detected in a blank; result may be due to cross-contamination

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

M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues

ND - analyte not detected

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

Table 3-9 Surface Water Sample Results
PMP 17.7
Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS															
			Sample ID	**14HF1701WS**	**14HF1702WS**	**14HF1703WS**	**14HF1704WS**	**14HF1705WS**	**14HF1706WS**	**14HF1707WS**	**14HF1708WS**	**14HF1709WS**	**14HF1710WS**	**14HF1711WS**	**14HF1712WQ**
			Location ID	**17-WS2**	**17-WS1**	**17-WS3**	**17-WS31**	**17-WS4**	**17-WS5**	**17-WS6**	**17-WS7**	**17-WS8**	**17-WS9**	**17-WS10**	**Rinsate**
			Sample Data Group	**1143338**	**1143338**	**1143338**	**1143338**	**1143338**	**1143338**	**1143338**	**1143338**	**1143338**	**1143338**	**1143338**	**1143338**
			Laboratory	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**
			Sample Type	**Primary**	**Primary**	**Primary**	**Field Duplicate**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**
			Collection Date	**7/21/2014**	**7/21/2014**	**7/21/2014**	**7/21/2014**	**7/22/2014**	**7/22/2014**	**7/22/2014**	**7/22/2014**	**7/22/2014**	**7/22/2014**	**7/22/2014**	**7/22/2014**
			Matrix	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**
Analyte	Method	Units	*Screening Level[a]*	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-
Diesel Range Organics	AK102	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-
Residual Range Organics	AK103	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-
TAH[b]	-	mg/L	*0.010*	-	-	-	-	-	-	-	-	-	-	-	-
TAqH[b]	-	mg/L	*0.015*	0.0032	0.0032	0.0104	-	**0.0202**	**0.0183**	**0.0173**	0.0041	0.0130	0.0066	0.0085	-
Lead	SW6020A	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	SW8260B	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	SW8260B	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-
Toluene	SW8260B	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	SW8260B	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-
Xylene, Isomers m & p	SW8260B	mg/L		-	-	-	-	-	-	-	-	-	-	-	-
1-Methylnaphthalene	8270SIM	mg/L	*NA*	0.000022 [0.0000257] J	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	0.00207 [0.000025]	0.000133 [0.0000263]	0.000359 [0.0000266]	ND [0.0000272]	0.00143 [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
2-Methylnaphthalene	8270SIM	mg/L	*NA*	0.0000171 [0.0000257] J	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	0.000467 [0.000025]	ND [0.0000263]	0.0000964 [0.0000266]	ND [0.0000272]	0.000135 [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Acenaphthene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	0.0000656 [0.000025]	ND [0.0000263]	0.0000228 [0.0000266] J	ND [0.0000272]	0.00007 [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Acenaphthylene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	0.0000561 [0.0000266] QH	ND [0.0000266]
Anthracene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Benzo(a)anthracene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Benzo(a)pyrene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Benzo(b)fluoranthene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Benzo(g,h,i)perylene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Benzo(k)fluoranthene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Chrysene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Dibenzo(a,h)anthracene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Fluoranthene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	0.0000167 [0.0000263] J	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Fluorene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	0.0000946 [0.000025]	0.0000194 [0.0000263] J	0.000027 [0.0000266] J	ND [0.0000272]	0.0000854 [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Indeno(1,2,3-cd)pyrene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Naphthalene	8270SIM	mg/L	*NA*	ND [0.0000515]	ND [0.000053]	ND [0.00005]	ND [0.0000525]	0.00147 [0.00005]	0.000171 [0.0000525]	0.000351 [0.000053]	ND [0.0000545]	0.000931 [0.000052]	ND [0.000053]	ND [0.000053]	ND [0.000053]
Phenanthrene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	0.0000271 [0.000025] J	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	0.000182 [0.0000261] J	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]
Pyrene	8270SIM	mg/L	*NA*	ND [0.0000257]	ND [0.0000266]	ND [0.000025]	ND [0.0000263]	ND [0.000025]	ND [0.0000263]	ND [0.0000266]	ND [0.0000272]	ND [0.0000261]	ND [0.0000266]	ND [0.0000266]	ND [0.0000266]

Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

[a] Surface water criteria are from ADEC Title 18 Alaska Administrative Code, Chapter 70.020.

[b] Total aromatic hydrocarbons (TAH) is the sum of BTEX compounds, and total aqueous hydrocarbons (TAqH) is the sum of BTEX plus the sum of EPA's 16 priority PAH pollutants. Since the original samples submitted for 8260B analysis were cancelled, TAH/TAqH were calculated from data obtained from two separate dates.

ADEC - Alaska Department of Environmental Conservation
EPA - U.S. Environmental Protection Agency
LOD - limit of detection
LOQ - limit of quantitation
mg/L - milligrams per liter
SGS - SGS North America Inc. of Anchorage Alaska.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 3-9 Surface Water Sample Results
PMP 17.7
Haines-Fairbanks Pipeline FUDS

PMP 17.7 Haines-Fairbanks Pipeline FUDS			**Sample ID**	**14HF1713WS**	**14HF1714WS**	**14HF1715WS**	**14HF1716WS**	**14HF1717WS**	**14HF1718WS**	**14HF1719WS**	**14HF1720WS**	**14HF1721WS**	**14HF1722WS**	**14HF1723WS**	**14HF1724WS**	**14HF1725WQ**	**14HF1726WQ**
			Location ID	**17-WS2**	**17-WS1**	**17-WS4**	**17-WS5**	**17-WS6**	**17-WS7**	**17-WS8**	**17-WS3**	**17-WS9**	**17-WS10**	**17-WS11**	**17-WS81**	**Rinsate**	**Trip Blank**
			Sample Data Group	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**	**1143761**
			Laboratory	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**	**SGS**
			Sample Type	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Field Duplicate**	**Rinsate**	**Trip Blank**
			Collection Date	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/9/2014**	**8/10/2014**	**8/9/2014**
			Matrix	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Surface Water**	**Water**	**Water**
Analyte	Method	Units	*Screening Level* [a]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/L	*NA*	ND [0.05]	ND [0.05]	0.558 [0.05]	0.424 [0.05]	0.415 [0.05]	0.0875 [0.05] J,B	0.284 [0.05] B	0.0618 [0.05] J,B	0.0748 [0.05] J,B	0.0535 [0.05] J,B,QL	-	0.246 [0.05] B	0.0516 [0.05] J,B	0.0323 [0.05] J,B
Diesel Range Organics	AK102	mg/L	*NA*	ND [0.3]	ND [0.3]	0.398 [0.306] J	0.298 [0.306] J	0.379 [0.313] J	0.3 [0.3] J	0.29 [0.3] J	ND [0.64]	ND [0.64]	ND [0.645]	ND [0.625]	0.271 [0.3] J	ND [0.3]	-
Residual Range Organics	AK103	mg/L	*NA*	ND [0.25]	ND [0.25]	ND [0.255]	ND [0.255]	ND [0.261]	ND [0.25]	ND [0.25]	ND [0.535]	ND [0.535]	ND [0.54]	ND [0.52]	ND [0.25]	ND [0.25]	-
TAH[b]	-	mg/L	*0.010*	0.0027	0.0027	**0.0157**	**0.0176**	**0.0161**	0.0036	0.0099	0.0099	0.0061	0.0080	-	-	-	-
TAqH[b]	-	mg/L	*0.015*	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	SW6020A	mg/L	*NA*	0.0026 [0.0005]	0.0022 [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	0.0038 [0.0005]	0.0003 [0.0005] J	0.0007 [0.0005] J	-	0.0005 [0.0005] J	ND [0.0005]	-
Benzene	SW8260B	mg/L	*NA*	ND [0.0002]	ND [0.0002]	0.00294 [0.0002]	0.00304 [0.0002]	0.00309 [0.0002]	0.0003 [0.0002] J	0.00189 [0.0002]	ND [0.0002]	ND [0.0002]	0.0008 [0.0002]	-	0.00197 [0.0002]	ND [0.0002]	ND [0.0002]
Ethylbenzene	SW8260B	mg/L	*NA*	ND [0.0005]	ND [0.0005]	0.00257 [0.0005]	0.00251 [0.0005]	0.00208 [0.0005]	ND [0.0005]	0.00113 [0.0005]	ND [0.0005]	0.00052 [0.0005] J	ND [0.0005]	-	0.00087 [0.0005] J	ND [0.0005]	ND [0.0005]
Toluene	SW8260B	mg/L	*NA*	ND [0.0005]	ND [0.0005]	0.00036 [0.0005] J	0.00045 [0.0005] J	0.00041 [0.0005] J	0.00147 [0.0005]	0.00038 [0.0005] J	0.00774 [0.0005]	0.00398 [0.0005]	0.00518 [0.0005]	-	0.00032 [0.0005] J	0.00078 [0.0005] J	ND [0.0005]
o-Xylene	SW8260B	mg/L	*NA*	ND [0.0005]	ND [0.0005]	0.00071 [0.0005] J	0.00208 [0.0005]	0.00152 [0.0005]	ND [0.0005]	0.00092 [0.0005] J	ND [0.0005]	ND [0.0005]	ND [0.0005]	-	0.00094 [0.0005] J	ND [0.0005]	ND [0.0005]
Xylene, Isomers m & p	SW8260B	mg/L		ND [0.001]	ND [0.001]	0.00912 [0.001]	0.00956 [0.001]	0.00897 [0.001]	0.00085 [0.001] J	0.00554 [0.001]	ND [0.001]	0.00089 [0.001] J	ND [0.001]	-	0.00571 [0.001]	ND [0.001]	ND [0.001]
1-Methylnaphthalene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
2-Methylnaphthalene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	0.0000179 [0.0001] J	-
Acenaphthene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Acenaphthylene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Anthracene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Benzo(a)anthracene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Benzo(a)pyrene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Benzo(b)fluoranthene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Benzo(g,h,i)perylene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Benzo(k)fluoranthene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Chrysene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Dibenzo(a,h)anthracene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Fluoranthene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Fluorene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Indeno(1,2,3-cd)pyrene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Naphthalene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	0.0000664 [0.0001] J	-
Phenanthrene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-
Pyrene	8270SIM	mg/L	*NA*	-	-	-	-	-	-	-	-	-	-	-	-	ND [0.0001]	-

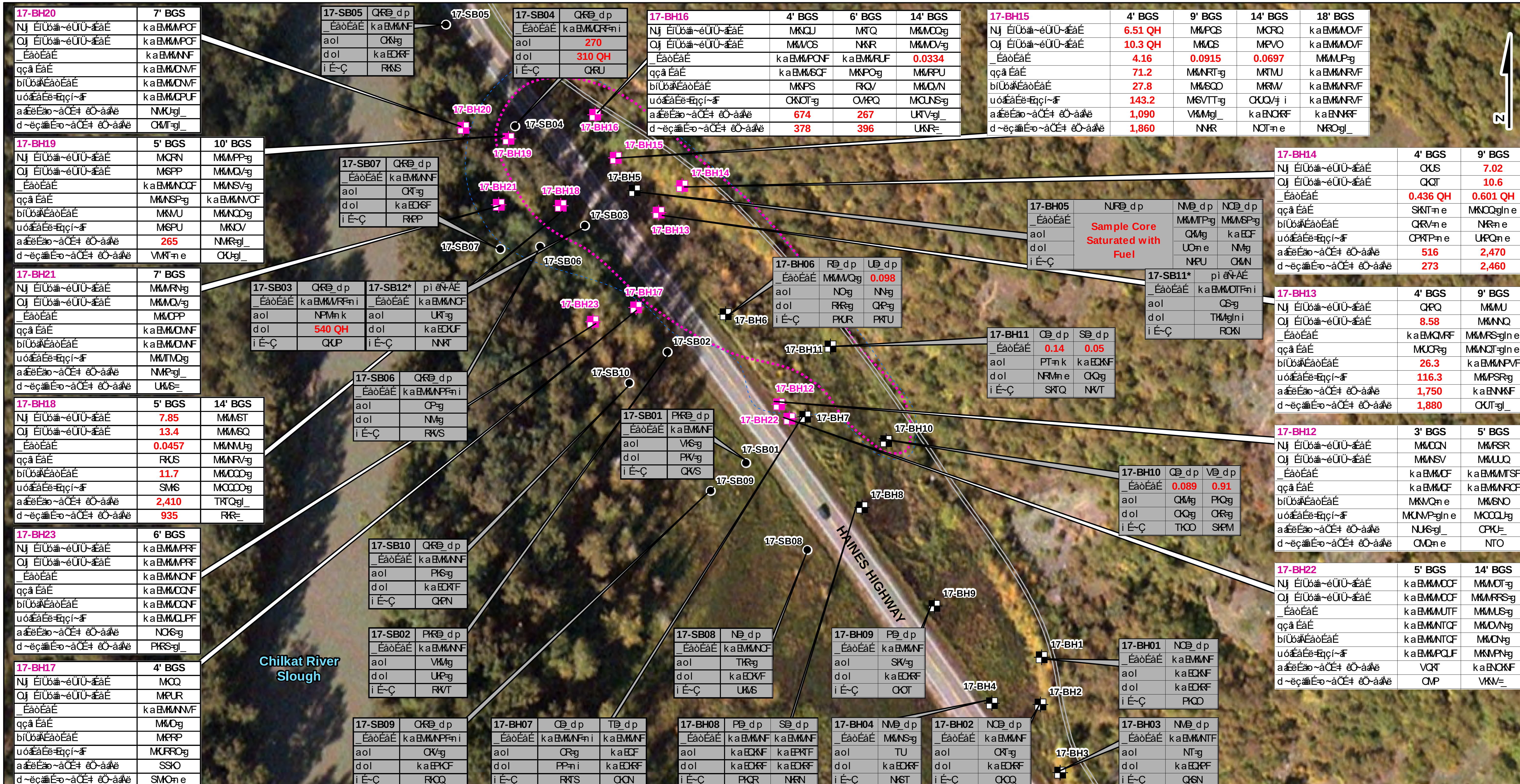
Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

[a] Surface water criteria are from ADEC Title 18 Alaska Administrative Code, Chapter 70.020.

[b] Total aromatic hydrocarbons (TAH) is the sum of BTEX compounds, and total aqueous hydrocarbons (TAqH) is the sum of BTEX plus the sum of EPA's 16 priority PAH pollutants. Since the original samples submitted for 8260B analysis were cancelled, TAH/TAqH were calculated from data obtained from two separate dates.

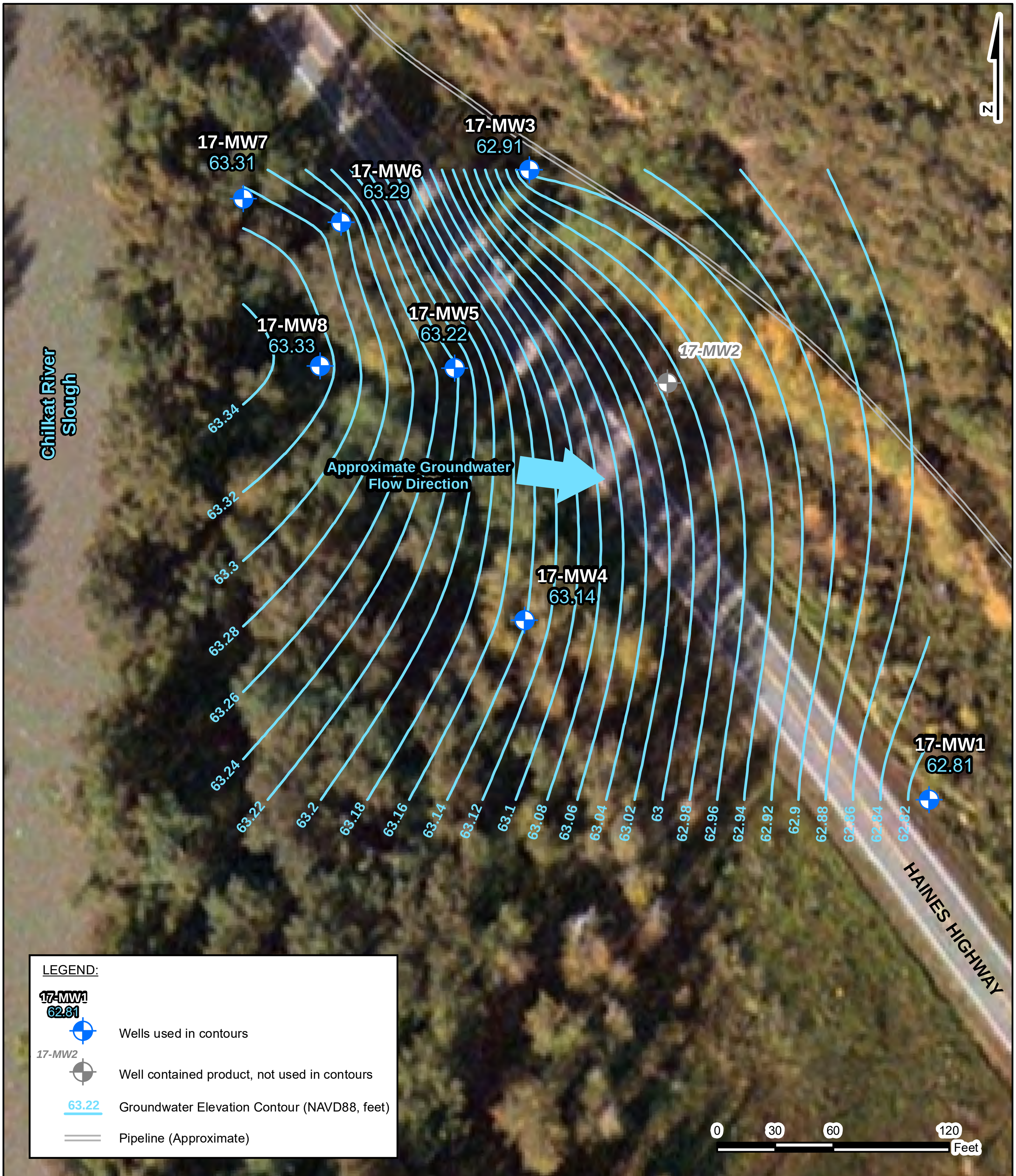
ADEC - Alaska Department of Environmental Conservation
EPA - U.S. Environmental Protection Agency
LOD - limit of detection
LOQ - limit of quantitation
mg/L - milligrams per liter
SGS - SGS North America Inc. of Anchorage Alaska.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as estiamte because it is less than the LOQ.
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure



Cleanup Levels	
Analyte	18 AAC 75
Nj ÉíÜóä~éÜíÜ~äÉ	SKO
Oj ÉíÜóä~éÜíÜ~äÉ	SKN
_ÉåòÉåÉ	MKMCR
qçäìÉåÉ	SKR
bíÜóäÄÉåòÉåÉ	SKV
uóäÉåÉë=EíçíÇäF	SP
aáÉëÉä=o~åÖÉ=lêÖ~åáÅë	OPM
d~ëçäáåÉ=o~åÖÉ=lêÖ~åáÅë	OSM

Contaminant Concentrations in Soil Samples



NOTES:

1. Contours generated in Surfer v.10 from groundwater elevations collected on July 28, 2014. Well 17-MW2 was not used in contouring as it contained 0.03 feet of product.

2. The pipeline is digitized based on the aerial imagery and previous mapping (ENSR 2006, DOWL 2006).

3. Coordinate System - Projection: UTM Zone 8N, meters (shown in feet); Horizontal Datum: WGS84. Vertical Datum: NAVD88, feet.

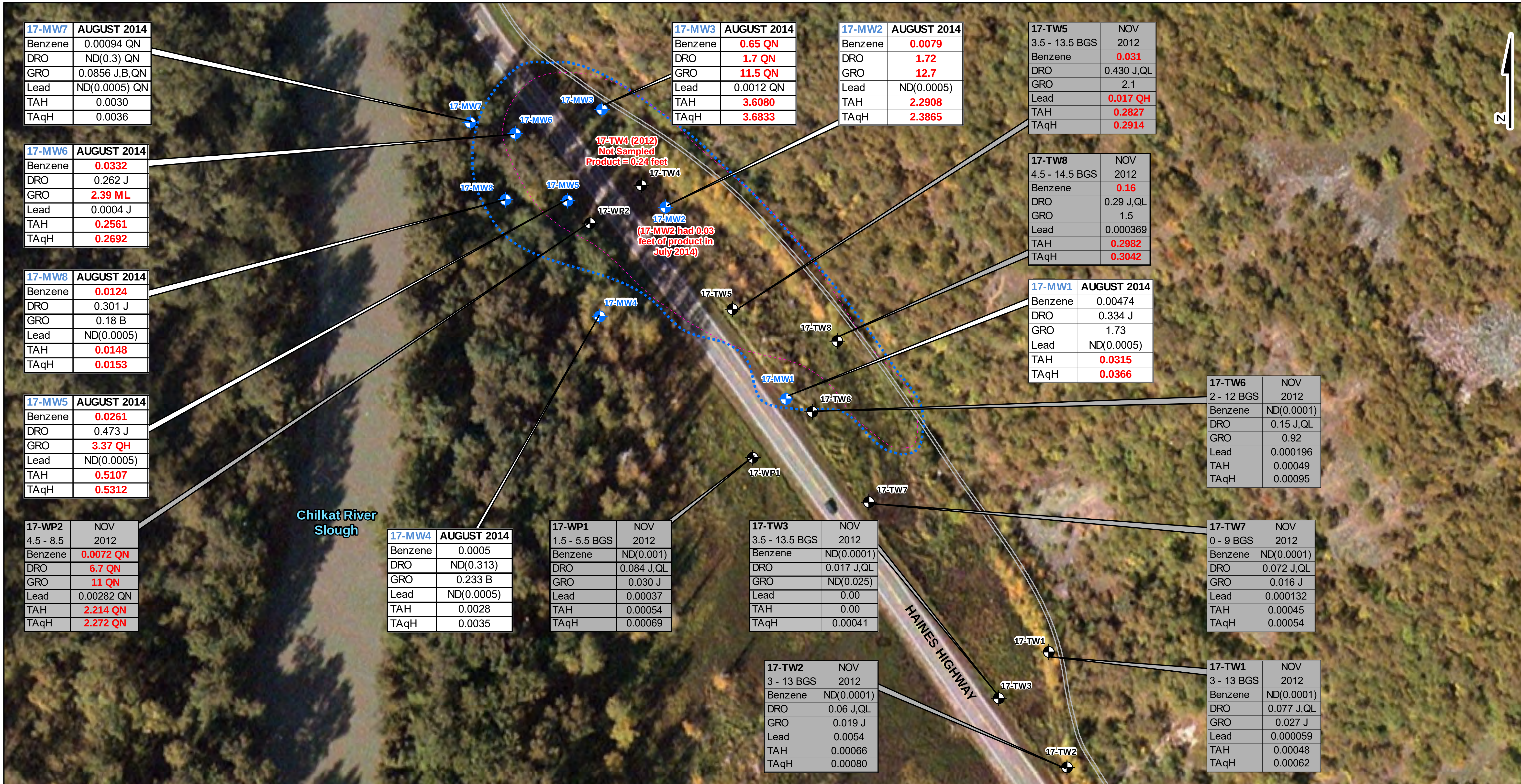
4. Imagery provided by Aero-Metric, 2004.

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

2014 Groundwater Elevation Contours
Pipeline Milepost 17.7
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS Alaska
Project #: F10AK1016-14

Contract: W911KB-12-D-0001, TO29	Figure: 3-2	Date: 12/14



17-MW7	AUGUST 2014
Benzene	0.00094 QN
DRO	ND(0.3) QN
GRO	0.0856 J,B,QN
Lead	ND(0.0005) QN
TAH	0.0030
TAqH	0.0036

17-MW6	AUGUST 2014
Benzene	0.0332
DRO	0.262 J
GRO	2.39 ML
Lead	0.0004 J
TAH	0.2561
TAqH	0.2692

17-MW8	AUGUST 2014
Benzene	0.0124
DRO	0.301 J
GRO	0.18 B
Lead	ND(0.0005)
TAH	0.0148
TAqH	0.0153

17-MW5	AUGUST 2014
Benzene	0.0261
DRO	0.473 J
GRO	3.37 QH
Lead	ND(0.0005)
TAH	0.5107
TAqH	0.5312

17-WP2	NOV
4.5 - 8.5	2012
Benzene	0.0072 QN
DRO	6.7 QN
GRO	11 QN
Lead	0.00282 QN
TAH	2.214 QN
TAqH	2.272 QN

17-MW4	AUGUST 2014
Benzene	0.0005
DRO	ND(0.313)
GRO	0.233 B
Lead	ND(0.0005)
TAH	0.0028
TAqH	0.0035

17-WP1	NOV
1.5 - 5.5 BGS	2012
Benzene	ND(0.001)
DRO	0.084 J,QL
GRO	0.030 J
Lead	0.00037
TAH	0.00054
TAqH	0.00069

17-TW3	NOV
3.5 - 13.5 BGS	2012
Benzene	ND(0.0001)
DRO	0.017 J,QL
GRO	ND(0.025)
Lead	0.00
TAH	0.00
TAqH	0.00041

17-TW2	NOV
3 - 13 BGS	2012
Benzene	ND(0.0001)
DRO	0.06 J,QL
GRO	0.019 J
Lead	0.0054
TAH	0.00066
TAqH	0.00080

17-MW3	AUGUST 2014
Benzene	0.65 QN
DRO	1.7 QN
GRO	11.5 QN
Lead	0.0012 QN
TAH	3.6080
TAqH	3.6833

17-MW2	AUGUST 2014
Benzene	0.0079
DRO	1.72
GRO	12.7
Lead	ND(0.0005)
TAH	2.2908
TAqH	2.3865

17-TW5	NOV
3.5 - 13.5 BGS	2012
Benzene	0.031
DRO	0.430 J,QL
GRO	2.1
Lead	0.017 QH
TAH	0.2827
TAqH	0.2914

17-TW8	NOV
4.5 - 14.5 BGS	2012
Benzene	0.16
DRO	0.29 J,QL
GRO	1.5
Lead	0.000369
TAH	0.2982
TAqH	0.3042

17-MW1	AUGUST 2014
Benzene	0.00474
DRO	0.334 J
GRO	1.73
Lead	ND(0.0005)
TAH	0.0315
TAqH	0.0366

17-TW6	NOV
2 - 12 BGS	2012
Benzene	ND(0.0001)
DRO	0.15 J,QL
GRO	0.92
Lead	0.000196
TAH	0.00049
TAqH	0.00095

17-TW7	NOV
0 - 9 BGS	2012
Benzene	ND(0.0001)
DRO	0.072 J,QL
GRO	0.016 J
Lead	0.000132
TAH	0.00045
TAqH	0.00054

17-TW1	NOV
3 - 13 BGS	2012
Benzene	ND(0.0001)
DRO	0.077 J,QL
GRO	0.027 J
Lead	0.000059
TAH	0.00048
TAqH	0.00062

NOTES:

1. 2012 groundwater results shown in gray scale.
2. Wells installed in 2012 were temporary wells. They were decommissioned after the site investigation.
3. Concentrations are in milligrams per Liter (mg/L).
4. The highest result is shown when field duplicates were analyzed.
6. The pipeline is digitized based on the aerial imagery and previous mapping (ENSR 2006, DOWL 2006).
7. Coordinate System - Projection: UTM Zone 8N, meters (shown in feet); Horizontal Datum: WGS84. Vertical Datum: NAVD88, feet.
8. Imagery provided by Aero-Metric, 2004.

LEGEND:

17-MW1 Monitoring Well Installed in 2014

17-TW4 Temporary Monitoring Well - Installed and Decommissioned in 2012

Pipeline (Approximate)

Approximate Extent of Contaminated Groundwater

Approximate Extent of Contaminated Soil

J Result qualified as an estimate because it is less than the LOQ

B Analyte was also detected in a blank; result may be due to cross-contamination

Q Result considered an estimate (biased L-low; H-high; N-unknown) due to a QC failure

M Result considered an estimate (biased L-low; H-high; N-unknown) due to matrix effects

ADEC Cleanup Levels

Analyte	Table C
Benzene	0.005
DRO	1.5
GRO	2.2
Lead	0.015
TAH	0.010
TAqH	0.015

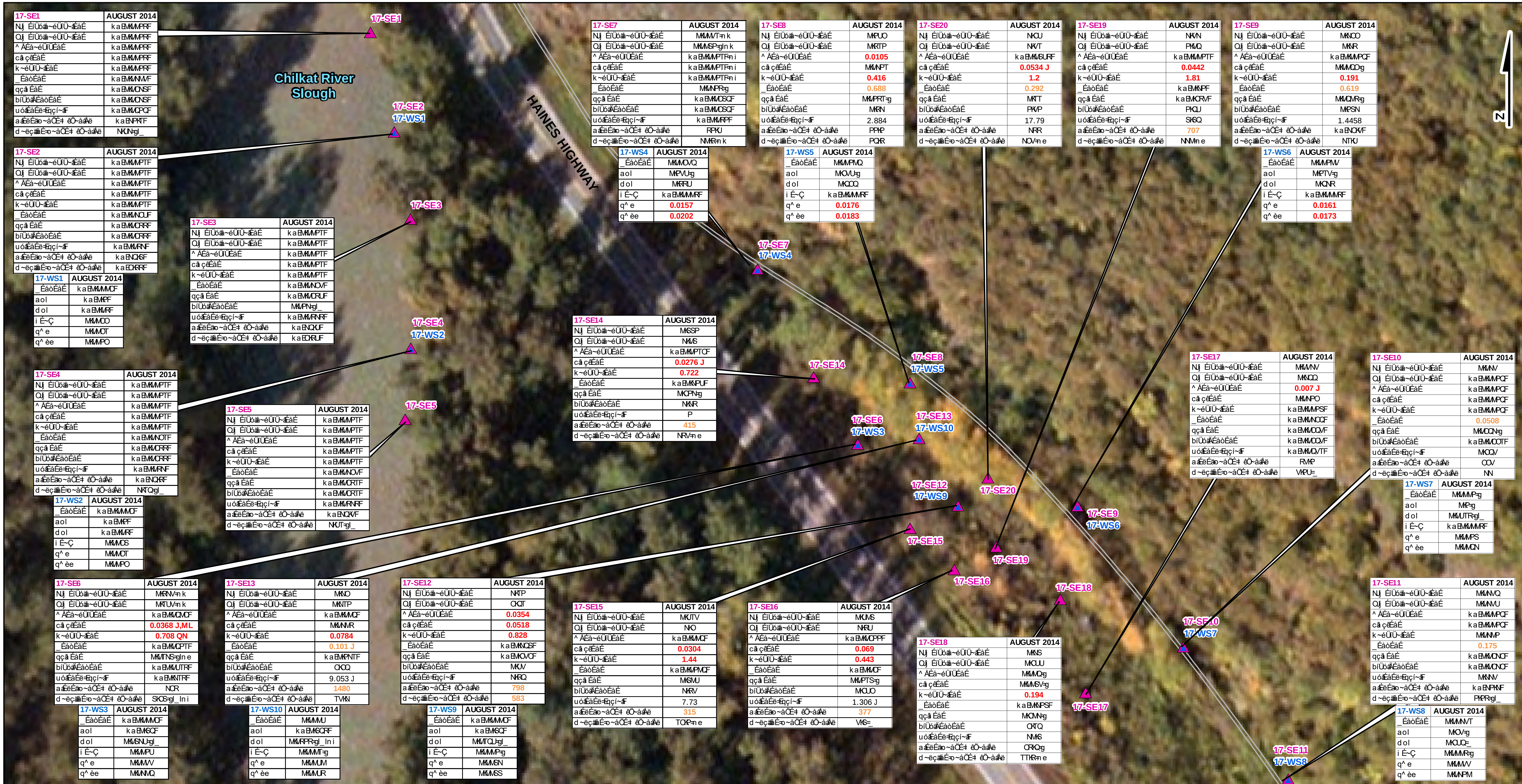
0 50 100 200 Feet

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

Contaminant Concentrations in Groundwater Samples
Pipeline Milepost 17.7
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS Alaska
Project #: F10AK1016-14

Contract: W911KB-12-D-0001, TO29 | Figure: 3-3 | Date: 12/14



17-SE12
17-WS9

17-SE15

Surface Water Cleanup Levels

Analyte	18 AAC 70

Sediment Screening Levels

Analyte	NOAA (Sediment) PEL / TEL

Soil Cleanup Levels

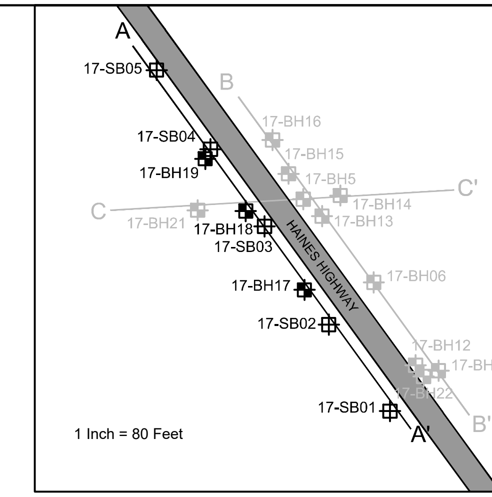
Analyte	18 AAC 75

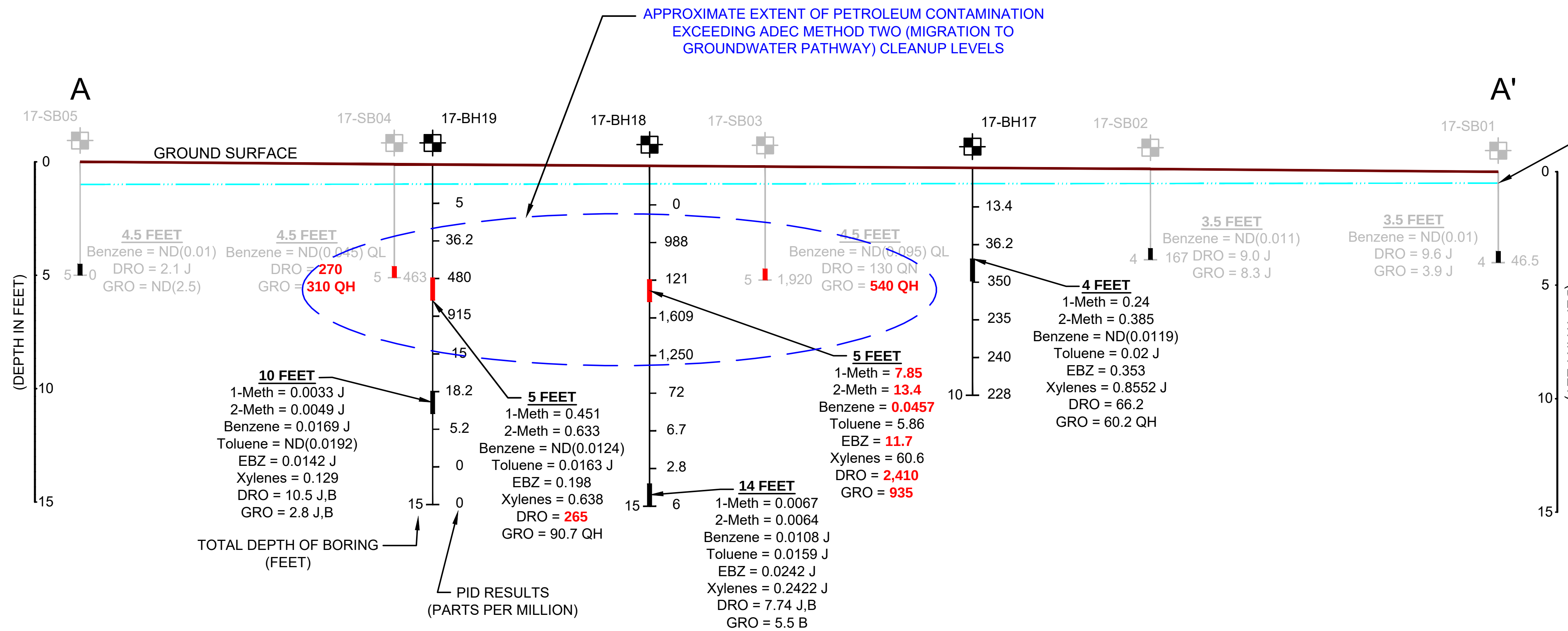
Contaminant Concentrations in Surface Water and Sediment Samples

NORTH

ADEC CLEANUP LEVELS (>40 inch zone):

Analyte	Method Two (Migration to Groundwater) mg/Kg
1-Methylnaphthalene	6.2
2-Methylnaphthalene	6.1
Benzene	0.025
Toluene	6.5
Ethylbenzene	6.9
Xylenes (Total)	63
DRO	230
GRO	260





LEGEND:

Symbol	Description
17-BH19 (symbol)	Soil Boring
Red bar	Lab Sample Interval with at least one analyte exceedance
Black bar	Lab Sample Interval with no analyte exceedances
J	Result is estimated because it was reported below LOQ
Q	Result is estimated (L - Low; H - High ; N - Neutral) due to Quality Control failure
B	Analyte was also detected in a blank; result may be due to cross-contamination
PID	Photoionization Detector
mg/Kg	Milligrams per Kilogram
1-Meth	1-Methylnaphthalene
2-Meth	2-Methylnaphthalene
EBZ	Ethylbenzene
Xylenes	Xylenes (Total)

NOTES:

1. Concentrations are in mg/Kg
2. Concentrations exceeding ADEC Method Two (Migration to Groundwater) cleanup levels are shown in RED.
3. The highest result is shown when field duplicates were analyzed.
4. Grayscale results are from 2012.
5. Vertical Scale only applies to the boring depths. Ground surface elevations are based on the horizontal scale.

HORIZONTAL
0 60 120
0 6 12
SOIL BORING
SCALE IN FEET

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

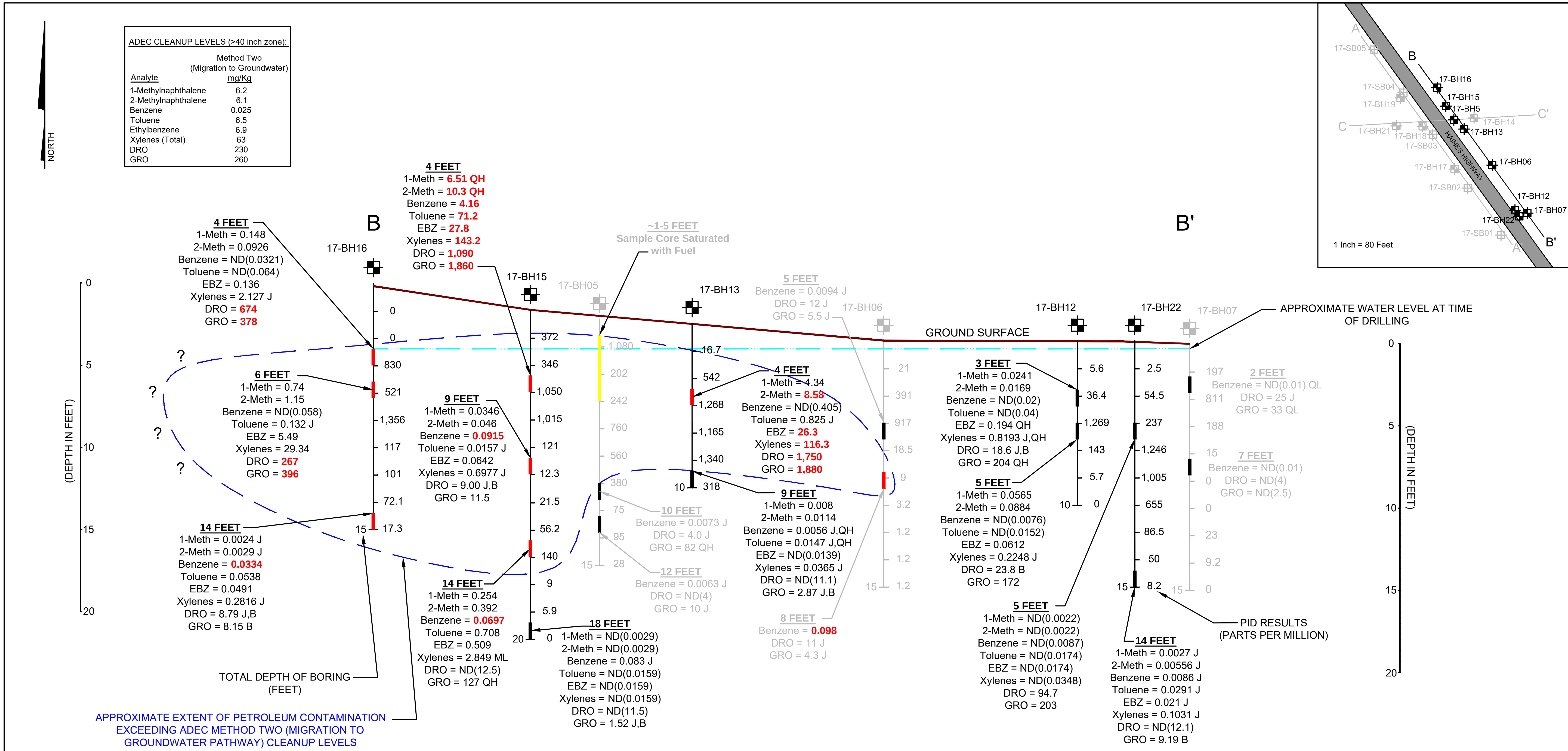
Cross Section A - A' Soil Boring Sample Results
Pipeline Milepost 17.7
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS, Alaska
Project #: F10AK1016-14

CONTRACT:	FIGURE:	DATE:
W911KB-12-D-0001, TO 29	3-5	12/14

17.7 A-A'

ADEC CLEANUP LEVELS (>40 inch zone):

Analyte	Method Two (Migration to Groundwater) mg/Kg
1-Methylnaphthalene	6.2
2-Methylnaphthalene	6.1
Benzene	0.025
Toluene	6.5
Ethylbenzene	6.9
Xylenes (Total)	63
DRO	230
GRO	260



LEGEND:

17-BH19 (symbol)	Soil Boring	B	Analyte was also detected in a blank; result may be due to cross-contamination
(red bar)	Lab Sample Interval with at least one analyte exceedance	PID	Photoionization Detector
(black bar)	Lab Sample Interval with no analyte exceedances	mg/Kg	Milligrams per Kilogram
J	Result is estimated because it was reported below LOQ	1-Meth	1-Methylnaphthalene
Q	Result is estimated (L - Low; H - High ; N - Neutral) due to Quality Control failure	2-Meth	2-Methylnaphthalene
		EBZ	Ethylbenzene
		Xylenes	Xylenes (Total)

NOTES:

1. Concentrations are in mg/Kg
2. Concentrations exceeding ADEC Method Two (Migration to Groundwater) cleanup levels are shown in RED.
3. The highest result is shown when field duplicates were analyzed.
4. Grayscale results are from 2012.
5. Vertical Scale only applies to the boring depths. Ground surface elevations are based on the horizontal scale.

HORIZONTAL 0 60 120
0 6 12
SOIL BORING SCALE IN FEET

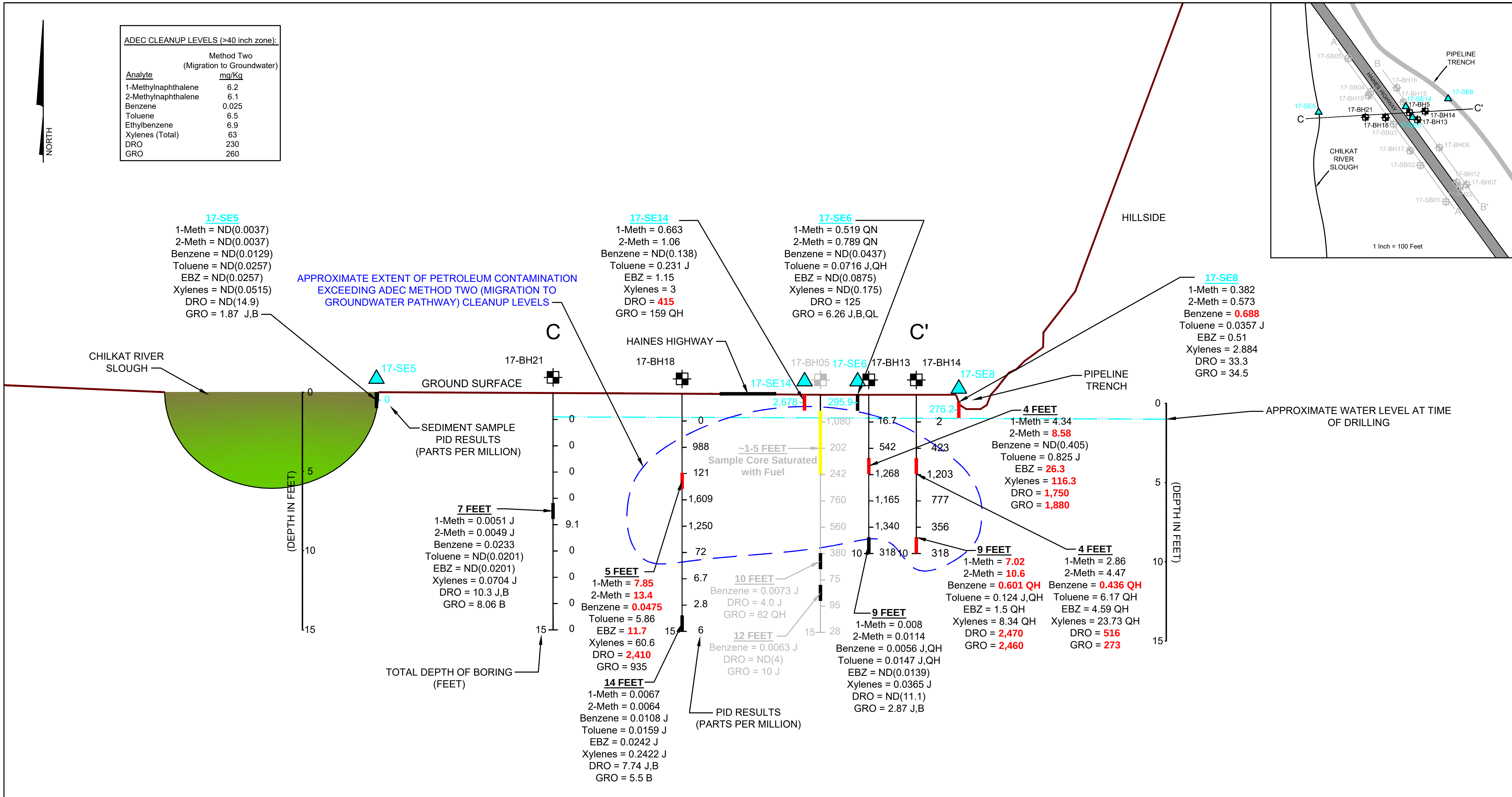
FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Cross Section B - B' Soil Boring Sample Results
Pipeline Milepost 17.7
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS, Alaska
Project #: F10AK1016-14

CONTRACT: W911KB-12-D-0001, TO 29 | FIGURE: 3-6 | DATE: 12/14

17.7 B-B'



LEGEND:

17-BH19 Soil Boring	J	Result is estimated because it was reported below LOQ	2-Meth	2-Methylnaphthalene
Lab Sample Interval with at least one analyte exceedance	Q	Result is estimated (L - Low; H - High ; N - Neutral) due to Quality Control failure	EBZ	Ethylbenzene
Lab Sample Interval with no analyte exceedances	B	Analyte was also detected in a blank; result may be due to cross-contamination	Xylenes	Xylenes (Total)
17-SE5 Sediment Sample	PID	Photoionization Detector		
	mg/Kg	Milligrams per Kilogram		
	1-Meth	1-Methylnaphthalene		

NOTES:

1. Only Sediment analytes that matched soil analytes are shown.
2. Concentrations are in mg/Kg
3. Concentrations exceeding ADEC Method Two (Migration to Groundwater) cleanup levels are shown in RED.
4. The highest result is shown when field duplicates were analyzed.
5. Grayscale results are from 2012.
6. Vertical Scale only applies to the boring depths. Ground surface elevations are based on the horizontal scale.

HORIZONTAL
0 60 120
0 6 10
SOIL BORING
SCALE IN FEET

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Cross Section C - C' Soil Boring Sample Results
Pipeline Milepost 17.7
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS, Alaska
Project #: F10AK1016-14

CONTRACT: W911KB-12-D-0001, TO 29 | FIGURE: 3-7 | DATE: 12/14

17.7 C-C'

4.0 PMP 19.5

4.1 Site Description and Characteristics

The PMP 19.5 site is located at PMP 19.5 and Haines Highway milepost 17.5, northwest of Haines, Alaska (Figure 1-1). The HFP is located on the north side of the Haines Highway.

4.2 1970 Fuel Spill

A release at PMP 19.5 was reported in September 1970 from a pipeline rupture caused by corrosion. An estimated release of 1,775 barrels (75,000 gallons) of jet fuel (JP-4) occurred. Fuel flowed directly into a small unnamed stream resulting in some fish kill and damage to spawning beds and bottom life (CRREL, 1972).

During previous investigations, the suspected release area was believed to be along a private road, approximately 500 feet northwest of the intersection with the Haines. East of the intersection of the private road and the Haines Highway are several green utility boxes where contaminated soil was reportedly encountered during installation of the utilities. Subsequent to the 2012 investigation, documentation from the 1970 spill response was located (Mattson, 2007). The following are excerpts from the spill response memo.

> "[The spill was] located about 60 meters south of the highway turnoff to the cabin, an estimated 6 meters off the edge of the paved highway, and 20 meters above a highway culvert that passes a small mountain stream beneath the highway."

> "At the break the pipeline is buried about 5 feet deep in clay and glacial till that was saturated with water. A buried ACS telephone cable lies adjacent, within 24 inches and at the same approximate depth, to the pipeline."

Based upon the spill response reports it is believed that the pipeline break actually occurred further to the southeast than previously investigated, between the utility boxes and the creek.

4.3 Previous Investigations

4.3.1 1971 Site Visit

CRREL conducted a site visit in 1971. It was reported at that time that vegetation along the stream appeared to be undamaged (CRREL, 1972).

4.3.2 2005 ROST Site Investigation and 2006 Site Investigation

A Rapid Optical Screening Tool (ROST) investigation was conducted by USACE in 2005. Seven ROST points were completed and several soil samples were collected. No contaminant concentrations above practical quantitation limits (PQLs) were detected by laboratory analysis from the samples. The ROST logs did not indicate the presence of petroleum contamination (ENSR, 2007).

Four shallow test holes were installed and sampled during the June 2006 investigation. GRO, DRO, and RRO were found in all samples collected from near the pipeline valve and DRO and RRO were found in samples collected near the ROST test pit. However, none of the soil samples collected at this location had contaminant concentrations exceeding cleanup levels (ENSR, 2007).

4.3.3 2012 Remedial Investigation

An RI was conducted during 2012 and involved the collection and analysis of 13 soil samples from 6 soil borings and installation and sampling of 5 temporary wells. The GRO and DRO concentrations of one soil sample exceeded ADEC cleanup levels. No groundwater samples exceeded ADEC cleanup levels (FES, 2013). Following the investigation, the 1970 Spill Report (described in Section 4.2) was obtained, which indicated that the 2012 (and previous) investigation did not occur in the vicinity of the pipeline release.

4.4 Geophysical Survey of HFP

A geophysical survey was conducted to locate the pipeline in the vicinity of the PMP 19.5 site. The pipeline is buried approximately 5 feet deep in the area but the exact route of the pipeline from the valve along the dirt access route to the where it crosses underneath the creek was not known. An Electromagnetic Geonics EM61-MK2 metal detector was used to locate the pipeline, and the ground-penetrating radar (GPR) survey grid was then surveyed using RTK-GPS by Windy Creek Surveys. Figures 4-1 through 4-3 show the area of the pipeline located during the geophysical survey; the pipeline route outside of this area was adjusted to match the survey. The survey report is included in Appendix G.

4.5 Soil Sampling

4.5.1 Drilling and Soil Sampling

Drilling and soil sampling activities at the PMP 19.5 site occurred between July 16 and 17, 2014. A total of ten borings were advanced to below groundwater. Soil lithology varied greatly between borings and primarily consisted of intermixed layers of sand, silt, and gravel with cobbles and schist. Boring locations are shown on Figure 4-1, and boring logs are presented in Appendix C. Table 4-1 summarizes drilling and soil sampling activities that were completed in 2014.

Table 4-1 Drilling Summary (PMP 19.5)

Soil Boring	Well Number	Date Drilled	Total Depth (feet bgs)	Number of Soil Samples	Sample Interval (feet bgs)	PID Range (ppm)
19-BH08	19-MW1	7/16/14	10	1	4 – 5	0.1 - 3.9
19-BH09	-	7/16/14	10	1	4 - 5	0.0
19-BH10	-	7/16/14	10	1	5 - 6	0.0
19-BH11	-	7/16/14	10	1	5 - 6	0.0
19-BH12	19-MW2	7/16/14	20	1	11 - 12	0.0
19-BH13	-	7/17/14	10	1	4 - 5	0.0 - 0.1
19-BH14	19-MW3	7/17/14	10	1	4 - 5	0.0
19-BH15	-	7/17/14	10	1	5 - 6	0.0
19-BH16	-	7/17/14	10	1	3 - 4	0.0
19-BH17	19-MW4	7/17/14	10	1	4 - 5	0.0

4.5.2 Soil Sample Results

A total of 11 soil samples, including 10 primary samples and 1 field duplicate, were collected from the PMP 19.5 site. Soil samples were shipped in two SDGs. EDB samples were analyzed by TAL-D and assigned the report number 280-58134; BTEX, GRO, DRO, RRO, PAHs, and lead were analyzed by SGS and assigned the report number 1143326. A sample summary table is included as Table 4-4 and an analytical results table for soil samples is included as Table 4-5.

Comparing sample results to the most stringent ADEC Method Two soil cleanup levels, no contaminant exceedances were found in any soil sample. One boring, 19-BH8 (in which well 19-MW1 was completed), had slightly elevated PID readings and slight hydrocarbon odor. The sample collected from this boring at a depth of 4 feet had GRO, DRO, and RRO concentrations of 89, 35.2, and 172 mg/Kg, all below their respective cleanup levels.

4.6 Groundwater Sampling

4.6.1 Monitoring Well Installation and Development

Monitoring wells were installed and developed as detailed in Section 2.3. Wells at PMP 19.5 were completed as flushmounts, with the exception of 19-MW1 (adjacent Horse Farm Creek) which was completed as a stick-up (since it is in low lying area with no vehicular traffic). Well locations are shown on Figures 4-2 and 4-3. Completion details of the monitoring wells are presented in Appendix C. Final turbidity ranged from 41 to 188 NTU after removing between 4 and 8 gallons of water from the wells. Details of development of each well are provided on the well development forms included in Appendix D. Fuel odor and sheen was not identified in the purge water from any well.

Similar to what was described for PMP 17.7, monitoring well installations were challenged by shallow groundwater and the presence of surface water. To stop surface water from directly entering the well screen, a sufficient surface seal was needed which prevented wells from being screened very near the ground surface. This contributed to the water level being above the top of the well screen in two wells (19-MW1 and 19-MW4).

4.6.2 Groundwater Elevations and Flow Direction

Groundwater depth measurements were collected from each of the wells on July 27, 2014. Using the survey data (Appendix F), groundwater elevations were calculated (Table 4-2). As indicated by the groundwater surface elevation contours included on Figure 4-2, the groundwater flow direction in this area of the site follows the surface topography and Horse Farm Creek flow direction to the south-southeast. The horizontal hydraulic gradient was relatively flat, approximately 0.008 ft/ft.

The 2012 RI identified groundwater flow in a different direction, towards the northwest. However, that investigation was conducted to the north and west of the area investigated in 2014 and may not reflect groundwater flow in the vicinity of the 2014 study area. The groundwater elevation of 19-MW2 was comparable to the 2012 groundwater elevation of 19-TW1, located approximately 100 feet to the west.

Table 4-2 Groundwater Elevations on July 27, 2014 (PMP 19.5)

Well	Screen Interval (feet BTOC)	GW Depth (feet BTOC)	Top of Casing Elevation (NAVD88, feet)	Screen Elevation (NAVD88, feet)	GW Elevation (NAVD88, feet)
19-MW1	3.67 – 8.67	2.50	89.69	86.02 – 81.02	87.19[1]
19-MW2	6.73 – 16.73	9.34	98.71	91.98 – 81.98	89.37
19-MW3	0.04 – 5.04	0.32	81.46	81.42 – 76.42	81.14
19-MW4	0.91 – 5.91	0.23	85.46	84.55 – 79.55	85.23[1]

[1] Water level above top of screen

4.6.3 Groundwater Contaminant Results

Groundwater samples were initially collected at the PMP 19.5 site in July 2014, but were received at the laboratory above acceptable temperature (as described in Section 2.6). Groundwater samples were re-collected at the PMP 19.5 site on August 8, 2014. A total of four primary samples, one field duplicate, and one trip blank were submitted to the project laboratory. Groundwater samples were shipped in two SDGs. EDB samples were analyzed by TAL-D and assigned the report number 280-58924; BTEX, GRO, DRO, RRO, PAHs, total lead, dissolved iron and manganese, sulfate, and total nitrate/nitrite were analyzed by SGS and assigned the report number 1143745. Groundwater samples are summarized on Table 4-4. Groundwater field parameters are summarized in Table 4-6. Analytical results are included as Table 4-7. Groundwater results for select analytes are shown on Figure 4-3. No exceedances were observed in any well; the majority of analytes were not detected or detected below the limit of quantitation (LOQ).

4.6.4 Groundwater Geochemical Results

Groundwater samples were analyzed for natural attenuation parameters as part of the groundwater investigation to evaluate the potential for biodegradation of petroleum contamination. Natural attenuation parameters included sulfate, total nitrate/nitrite, dissolved iron and manganese, DO, and ORP. Results for these natural attenuation parameters are summarized on Table 4-6.

Monitoring wells 19-MW1, 19-MW3, and 19-MW4 all had reduced groundwater geochemistry, evidenced by negative ORP, low DO, and elevated dissolved iron. However, these wells are located in marshy areas and groundwater is likely influenced by surface water.

4.7 Sediment and Surface Water Sampling

4.7.1 Sediment and Surface Water Sample Collection

Seven co-located sediment and surface water samples were collected from Horse Farm Creek, upstream and downstream of the suspected release area, as indicated on Table 4-3. A total of seven primary sediment samples and one field duplicate sample were collected from the PMP 19.5 site on August 8, 2014; collection procedures are detailed in Section 2.5. Surface water samples were collected on July 23, 2014 and August 8, 2014; all analytes except for PAHs were re-collected in August due to elevated cooler temperatures. A total of 14 primary surface water samples and 2 field duplicate samples were collected; however, only seven different locations were represented by these samples due to the re-sampling effort. Surface water collection procedures are detailed in Section 2.5.

In addition to the sediment and surface water samples, two surface soil samples were collected from a seasonal drainage that runs along the pipeline corridor, to the west of Horse Farm Creek. The samples were collected along the presumed path where fuel from the 1970 release may have flowed to creek.

Table 4-3 Sediment and Surface Water Sample Details (PMP 19.5)

<table>
<tr><th>Location</th><th>Sediment Sample</th><th>Co-Located Surface Water Sample</th><th>Notes</th></tr>
<tr><td rowspan="2">Drainage Ditch Along Pipeline</td><td>19-SS1</td><td>-</td><td rowspan="10">No noticeable odor in any surface water or sediment samples.

PID readings all 0.0.

Surface water depth 0.5-1'.</td></tr>
<tr><td>19-SS2</td><td>-</td></tr>
<tr><td rowspan="4">Horse Farm Creek (North of Highway)</td><td>19-SE1</td><td>19-WS1</td></tr>
<tr><td>19-SE2</td><td>19-WS2</td></tr>
<tr><td>19-SE3</td><td>19-WS3</td></tr>
<tr><td>19-SE4</td><td>19-WS4</td></tr>
<tr><td rowspan="4">Horse Farm Creek (South of Highway)</td><td>19-SE5</td><td>19-WS5</td></tr>
<tr><td>19-SE6</td><td>19-WS6</td></tr>
<tr><td>19-SE7</td><td>19-WS7</td></tr>
<tr><td>19-SE8</td><td>19-WS8</td></tr>
</table>

4.7.2 Sediment and Surface Soil Sample Contaminant Results

Sediment and surface soil samples were shipped in two SDGs. EDB samples were analyzed by TAL-D and assigned the report number 280-58942; BTEX, GRO, DRO, RRO, PAHs, and total lead were analyzed by SGS and assigned the report number 1143476. Samples are summarized on Table 4-4. Analytical results are included as Table 4-8. Results for select analytes are shown on Figure 4-4. Sediment sample results were compared to NOAA PEL/TEL levels, as described in Section 2.9; no analytes exceeded sediment standards or soil cleanup levels (for analytes that do not have established NOAA PEL/TEL values). Neither of the two surface soil samples had contaminant exceedances of ADEC cleanup levels.

4.7.3 Surface Water Contaminant Results

Surface water samples were shipped in three SDGs. Samples were submitted to SGS in July and August 2014 and assigned the report numbers 1143338 and 1143745, respectively; samples in SDG 1143338 were submitted for analysis of PAH only and samples in 1143745 were submitted for BTEX, GRO, DRO, RRO, and total lead. Samples were also submitted to TAL-D for EDB analysis and assigned the report number 280-58942. Surface water samples are summarized on Table 4-4. Analytical results are included as Table 4-9. Results for select analytes are shown on Figure 4-4. There were no BTEX or PAH detections in any of the surface water samples, thus all TAH and TAqH concentrations were below surface water criteria. Elevated DRO and RRO concentrations, 1.29 and 0.581 mg/L, respectively, were detected in the most upstream sample (19-WS1). The laboratory indicated that the chromatograms do not indicate a petroleum source and may be naturally occurring organics. Documentation of laboratory communication regarding this sample is included in the Supplemental Folder on the CD that accompanies this report. Silica gel cleanup was not conducted on the surface water samples from the 19.5 site since the creek was a clear flowing stream without obvious organics.

4.8 Data Quality Summary

The chemical data were evaluated in order to assess data quality and usability. The findings of the review are documented in the CDQR and ADEC Checklists (Appendix B). Analytical results summarized in Tables 4-5 through 4-9 were qualified based on those findings. Overall, the completeness goals were met and the review process deemed the soil, sediment, surface water, and groundwater data acceptable for project use. Two wells (19-MW1 and 19-MW4) exhibited excessive drawdown during well purging and the results from the corresponding samples (14HF1903WG and 14HF1904WG) that were qualified (QN) as estimates. Impact to data quality is minor since the drawdown measured in the four wells was either marginally over the 0.3 foot limit and/or was stable over the last several intervals.

4.9 Work Plan Deviations

In three of the four wells at PMP 19.5, 5-foot long well screens were used in lieu of the 10-foot screens identified in the work plan. Also, as noted in Section 4.6.1, in a couple instances wells were screened below the water table due to the shallow groundwater table and need for a sufficient surface seal to prevent surface water from entering wells.

As discussed in Section 2.6, all surface water PAH analyses were performed on samples that were collected on a different date than the samples submitted for the other analyses. Thus, the calculated TAqH values (i.e., summation of BTEX and PAH results) should be considered estimates since the calculations were made using two separate samples.

4.10 Nature and Extent of Contamination

No evidence of contamination was identified in soil, groundwater, surface water, or sediment during the 2014 investigation or previous investigations (with the exception of one sample from the 2012 RI). The location of the pipeline break could not be definitively determined, but the area surrounding its likely location (based upon information included in the 1970 spill report) was well delineated.

The 1970 spill report indicated that a significant amount of the fuel release entered the creek and was transported at least 350 meters downstream and may have entered the Chilkat River. The spill report also indicates that there had been heavy rains prior to the spill and soils were saturated in the area of the spill. Thus, it is possible that the majority of the fuel may have been transported away from the site via surface water and did not significantly impact soils and groundwater at the site.

4.11 Conceptual Site Model and Risk Evaluation

4.11.1 Human Health CSM

A Human Health CSM was prepared in accordance with ADEC's Policy Guidance on Developing CSMs (ADEC, 2010b). Completed Human Health CSM forms are included in Appendix H. The following summarizes the Human Health CSM at the PMP 19.5 site.

Potential Contaminant Sources and Impacted Media
Potential contaminant sources at this site include releases from the valve and the HFP. The HFP has been out of service for 40 years and was drained of fuel, and therefore does not represent a continuing source. Data collected during the 2012 RI indicated that fuel releases resulted in a limited amount of subsurface soil and the potential for petroleum-impacted groundwater.

Potential Sensitive Receptors and Exposure Scenarios
Since the soil contamination is at depth (26 to 36 ft. bgs), there are no current receptors. Future

land use scenarios could include either industrial or residential uses, although no current plans for either use are known at this time. The most conservative human health exposure scenario would be for residential use, which has been factored into the applicable cleanup levels identified for site COCs.

Completed Exposure Pathways

Soil contamination is likely too deep to potentially become an exposure media. However, since contamination has reached groundwater, receptors may be exposed to site contaminants through ingestion or dermal absorption of groundwater if a drinking water well were ever constructed near the 2012 boring 19-BH04.

4.11.2 Ecological Risk Evaluation

The 1970 spill response memo (Mattson, 2007) documented that the fuel spill resulted in a massive fish kill in Horse Farm Creek, with approximately 100 fish mortalities identified. The long term impact of the fuel release on aquatic life is unknown; however, no evidence of the fuel release to the creek was identified during the 2014 investigation.

Site observations were made to identify potential ecological impacts resulting from fuel releases from the HFP. No direct impacts, such as visibly stressed or dead biota, were identified at the site in 2012 or 2014. The potential for ecological impact is considered to be insignificant due to lack of contamination. A completed Ecoscoping Form is included in Appendix I. No complete ecological exposures were identified, and in accordance with ADEC's Ecoscoping Guidance, a more in-depth ecological risk evaluation is not required (ADEC, 2014).

4.12 Conclusion and Recommendations

No additional investigation or remedial activities are recommended at PMP 19.5. The exact location of the pipeline break could not be definitively determined, but extensive investigation has been performed across the fuel release area and no cleanup or screening level exceedances were observed in any matrix (with the exception of the one 2102 soil boring). Site closure should be pursued with ADEC.

Table 4-4 Sample Summary
PMP 19.5
Haines-Fairbanks Pipeline FUDS

Sample ID	Location ID	Depth (ft bgs)	Sample Date	Sample Time	Sampler's Initials	Sample Type	Sample Matrix	BTEX (8260B) +1,2 DCA	GRO (AK101)	EDB (SW8011)	DRO/RRO (AK102/ AK103)	PAHs (8270D-SIM)	Total Lead (6020A)	Fe/Mn (6010B)	SO_4 (300.0)	Total NO_2/NO_3 as Nitrogen (353.2)	Associated Coolers	Sample Data Group
SOIL SAMPLE SUMMARY																		
14HF1901SO	19-BH0804	4	7/16/2014	1430	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1902SO	19-BH0904	4	7/16/2014	1515	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1903SO	19-BH1005	5	7/16/2014	1600	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1904SO	19-BH1105	5	7/16/2014	1625	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1905SO	19-BH1211	11	7/16/2014	1655	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1906SO	19-BH1304	4	7/17/2014	1135	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1907SO	19-BH1404	4	7/17/2014	1200	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1908SO	19-BH14	4	7/17/2014	1210	CM/CB	Field Dup (-07SO)	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1909SO	19-BH1505	5	7/17/2014	1240	CM/CB	Primary/MS/MSD	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1910SO	19-BH1603	3	7/17/2014	1310	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
14HF1911SO	19-BH1704	4	7/17/2014	1330	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-01A, FES-01B	1143326, 280-58134
SEDIMENT SAMPLE SUMMARY																		
14HF1901SE	19-SE4	NA	8/8/2014	1410	AS/CB	Primary/MS/MSD	Sediment	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
14HF1902SE	19-SE3	NA	8/8/2014	1425	AS/CB	Primary	Sediment	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
14HF1903SE	19-SE31	NA	8/8/2014	1435	AS/CB	Field Dup (-02SE)	Sediment	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
14HF1904SE	19-SE5	NA	8/8/2014	1655	AS/CB	Primary	Sediment	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
14HF1905SE	19-SE6	NA	8/8/2014	1715	AS/CB	Primary	Sediment	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
14HF1906SE	19-SE7	NA	8/8/2014	1730	AS/CB	Primary	Sediment	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
14HF1907SE	19-SE1	NA	8/8/2014	1815	AS/CB	Primary	Sediment	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
14HF1908SE	19-SE2	NA	8/8/2014	1830	AS/CB	Primary	Sediment	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
SURFACE SOIL SAMPLE SUMMARY																		
14HF1901SS	19-SS1	NA	8/8/2014	1835	AS/CB	Primary	Surface Soil	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
14HF1902SS	19-SS2	NA	8/8/2014	1840	AS/CB	Primary/MS/MSD	Surface Soil	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
14HF1903SS	19-SS3	NA	8/8/2014	1845	AS/CB	Field Dup (-02SS)	Surface Soil	X	X	X	X	X	X				FES-31, 081201	1143476, 280-58942
GROUNDWATER SAMPLE SUMMARY																		
14HF1901WG	19-MW2	NA	8/8/2014	1600	JK	Primary/MS/MSD	Groundwater	X	X	X	X	X	X	X	X	X	FES-36, 37, 38, 081201	1143745, 280-58942
14HF1902WG	19-MW21	NA	8/8/2014	1615	JK	Field Dup (-01 WG)	Groundwater	X	X	X	X	X	X	X	X	X	FES-36, 37, 38, 081201	1143745, 280-58942
14HF1903WG	19-MW1	NA	8/8/2014	1900	JK	Primary	Groundwater	X	X	X	X	X	X	X	X	X	FES-36, 37, 38, 081201	1143745, 280-58942
14HF1904WG	19-MW4	NA	8/8/2014	1400	JK	Primary	Groundwater	X	X	X	X	X	X	X	X	X	FES-36, 37, 081201	1143745, 280-58942
14HF1905WG	19-MW3	NA	8/8/2014	1345	AS	Primary	Groundwater	X	X	X	X	X	X	X	X	X	FES-36, 37, 081201	1143745, 280-58942
SURFACE WATER SAMPLE SUMMARY																		
14HF1901WS	19-WS1	NA	7/23/2014	1225	VR/CB	Primary	Surface Water					X					FES-07	1143338
14HF1902WS	19-WS2	NA	7/23/2014	1255	VR/CB	Primary/MS/MSD	Surface Water					X					FES-07	1143338
14HF1903WS	19-WS3	NA	7/23/2014	1520	VR/CB	Primary	Surface Water					X					FES-07	1143338
14HF1904WS	19-WS4	NA	7/23/2014	1545	VR/CB	Primary	Surface Water					X					FES-08	1143338
14HF1905WS	19-WS41	NA	7/23/2014	1600	VR/CB	Field Dup (-04 WS)	Surface Water					X					FES-08	1143338
14HF1906WS	19-WS5	NA	7/23/2014	1740	VR/CB	Primary	Surface Water					X					FES-08	1143338
14HF1907WS	19-WS6	NA	7/23/2014	1725	VR/CB	Primary	Surface Water					X					FES-08	1143338
14HF1908WS	19-WS7	NA	7/23/2014	1710	VR/CB	Primary	Surface Water					X					FES-08	1143338
14HF1909WS	19-WS4	NA	8/8/2014	1400	AS/CB	Primary/MS/MSD	Surface Water	X	X	X	X		X				FES-30, 081201	1143745, 280-58942
14HF1910WS	19-WS3	NA	8/8/2014	1420	AS/CB	Primary	Surface Water	X	X	X	X		X				FES-30, 081201	1143745, 280-58942
14HF1911WS	19-WS31	NA	8/8/2014	1430	AS/CB	Field Dup (-10 WS)	Surface Water	X	X	X	X		X				FES-30, 081201	1143745, 280-58942
14HF1912WS	19-WS5	NA	8/8/2014	1645	AS/CB	Primary	Surface Water	X	X	X	X		X				FES-30, 081201	1143745, 280-58942
14HF1913WS	19-WS6	NA	8/8/2014	1705	AS/CB	Primary	Surface Water	X	X	X	X		X				FES-30, 081201	1143745, 280-58942
14HF1914WS	19-WS7	NA	8/8/2014	1720	AS/CB	Primary	Surface Water	X	X	X	X		X				FES-30, 081201	1143745, 280-58942
14HF1915WS	19-WS1	NA	8/8/2014	1805	AS/CB	Primary	Surface Water	X	X	X	X		X				FES-30, 081201	1143745, 280-58942
14HF1916WS	19-WS2	NA	8/8/2014	1820	AS/CB	Primary	Surface Water	X	X	X	X		X				FES-30, 081201	1143745, 280-58942
QUALITY CONTROL SAMPLES																		
Trip Blanks																		
14HF1912SQ	Trip Blank	NA	7/16/2014	800	NA	Trip Blank	Soil	X	X								FES-01A	1143326
14HF1909SQ	Trip Blank	NA	8/8/2014	800	NA	Trip Blank	Sediment	X	X								FES-31	1143476
14HF1910SQ	Trip Blank	NA	8/8/2014	800	NA	Trip Blank	Surface Soil	X	X								FES-31	1143476
14HF1906WQ	Trip Blank	NA	8/8/2014	800	NA	Trip Blank	Groundwater	X	X								FES-36	1143745
14HF1917WQ	Trip Blank	NA	8/8/2014	800	NA	Trip Blank	Surface Water	X	X								FES-30	1143745
14HF1917WQ	Trip Blank	NA	8/8/2014	800	NA	Trip Blank	Groundwater / Surface Water			X							081201	280-58942

All samples except EDB were analyzed by SGS North America Inc, Alaska (standard turn-around time). NPDL #14-030.
EDB samples were analyzed by Test America, Denver

°C - degrees Celsius
CB - Chris Boese; CM - Craig Martin; AS - Aaron Swank;
JK - Josh Klynstra
MS/MSD - matrix spike/matrix spike duplicate
NA - not applicable
HDPE - high density polyethylene
L - liter
mL - milliliter
VOA - volatile organic analysis
ft bgs - feet below ground surface

BTEX - Benzene, Toluene, Ethylbenzene, Total Xylenes
DRO - diesel range organics
RRO - residual range organics
GRO - gasoline range organics
1,2-DCA - 1,2-dichloroethane
EDB - 1,2-dibromoethane
Fe - iron
Mn - manganese
NO2/NO3 - nitrite/nitrate
PAHs - polynuclear aromatic hydrocarbons

Groundwater and Surface Water
BTEX+1,2-DCA - three HCl-preserved, 40 mL VOA vials
EDB - three Na2S2O3-preserved, 40 mL VOA vials
PAH - two non-preserved, 1L amber bottles
GRO - three HCl-preserved, 40 mL VOA vials
DRO/RRO - two HCl-preserved, 250 mL amber bottles
DRO/RRO SILICA GEL CLEANUP - two HCl-preserved, 1000 mL amber bottles
Lead - one HNO3-preserved, 250 mL HDPE bottle
Fe/Mn - one HNO3-preserved, 250 mL HDPE bottle, field-filtered
SO4 - one non-preserved, 250 mL HDPE bottle
NO2/NO3 - one H2SO4 preserved, 125 mL bottle

Soil and Sediment
Soil/Sediment Sample Collection (all samples were field-preserved at 4±2°C)
BTEX/GRO - one surrogated methanol-preserved, 4 oz amber jar
EDB - one non-preserved, 4 oz amber jar
PAH/DRO/RRO/Lead - one non-preserved, 8 oz jar

Table 4-5 Soil Sample Results
PMP 19.5
Haines-Fairbanks Pipeline FUDS

PMP 19.5 Haines-Fairbanks Pipeline FUDS			Sample ID	14HF1901SO	14HF1902SO	14HF1903SO	14HF1904SO	14HF1905SO	14HF1906SO	14HF1907SO	14HF1908SO	14HF1909SO	14HF1910SO	14HF1911SO	14HF1901SS	14HF1902SS	14HF1903SS	14HF1912SQ
			Location ID	19BH0804	19BH0904	19BH1005	19BH1105	19BH1211	19BH1304	19BH1404	19BH14	19BH1505	19BH1603	19BH1704	19-SS1	19-SS2	19-SS3	Trip Blank
			Sample Data Groups	1143326/280-58134	1143326/280-58134	1143326/280-58134	1143326/280-58134	1143326/280-58134	1143326/280-58134	1143326/280-58134	1143326/280-58134	1143326/280-58134	1143326/280-58134	1143326/280-58134	1143746/280-58942	1143746/280-58942	1143746/280-58942	1143326
			Laboratory	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS
			Sample Type	Primary	Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Trip Blank
			Collection Date	7/16/2014	7/16/2014	7/16/2014	7/16/2014	7/16/2014	7/17/2014	7/17/2014	7/17/2014	7/17/2014	7/17/2014	7/17/2014	8/8/2014	8/8/2014	8/8/2014	7/16/2014
			Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Surface Soil	Surface Soil	Surface Soil	Solid
Analyte	Method	Units	*Clean-up Level[a]*	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/Kg	*260*	89 [2.08] QH	1.85 [1.56] J,B	1.54 [1.6] J,B	1.53 [1.66] J,B	1.03 [1.52] J,B	ND [1.79]	ND [1.79]	ND [1.87]	1.35 [1.59] J,B	1.14 [1.6] J,B	0.937 [1.22] J,B	1.76 [2] J,B	1.39 [1.64] J,B	1.08 [1.47] J,B	1.06 [1.28] J
Diesel Range Organics	AK102	mg/Kg	*230*	35.2 [12.7]	ND [11.6]	ND [11.6]	ND [11.6]	ND [11.4]	ND [12.1]	ND [12]	ND [12.2]	ND [11.5]	ND [11.7]	ND [11.7]	10.3 [12.9] J	ND [11.9]	ND [11.4]	-
Residual Range Organics	AK103	mg/Kg	*8,300*	172 [12.7]	ND [11.6]	14.7 [11.6] J	ND [11.6]	ND [11.4]	34.1 [12.1]	ND [12]	ND [12.2]	ND [11.5]	ND [11.7]	ND [11.7]	54.5 [12.9]	43.6 [11.9] QN	15 [11.4] J,QN	-
Lead	SW6020A	mg/Kg	*400*	1.69 [0.62]	0.649 [0.107]	1.08 [0.515]	1.12 [0.535]	0.988 [0.115]	1.38 [0.59]	1.26 [0.595]	1.29 [0.61]	1.34 [0.54]	1.48 [0.53]	1.29 [0.114]	1.1 [0.123]	0.965 [0.115]	0.644 [0.107]	-
1,2-Dibromoethane[1]	SW8011	mg/Kg	*0.00016*	ND [0.000062] QL	ND [0.000056] QL	ND [0.000057] QL	ND [0.000059] QL	ND [0.000057] QL	ND [0.000058] QL	ND [0.000059] QL	ND [0.000061] QL	ND [0.000068] QL	ND [0.000060] QL	ND [0.000061] QL	ND [0.000071]	ND [0.000060]	ND [0.000054]	-
1,2-Dichloroethane	SW8260B	mg/Kg	*0.016*	ND [0.0208]	ND [0.0156]	ND [0.016]	ND [0.0166]	ND [0.0152]	ND [0.0179]	ND [0.0179]	ND [0.0187]	ND [0.0159]	ND [0.0159]	ND [0.0122]	ND [0.0199]	ND [0.0164]	ND [0.0147]	ND [0.0128]
Benzene	SW8260B	mg/Kg	*0.025*	ND [0.0104]	ND [0.0078]	ND [0.008]	ND [0.0083]	ND [0.0076]	ND [0.0089]	ND [0.0089]	ND [0.0093]	ND [0.008]	ND [0.008]	ND [0.0061]	ND [0.01]	ND [0.0082]	ND [0.0073]	ND [0.0063]
Ethylbenzene	SW8260B	mg/Kg	*6.9*	ND [0.0208]	ND [0.0156]	ND [0.016]	ND [0.0166]	ND [0.0152]	ND [0.0179]	ND [0.0179]	ND [0.0187]	ND [0.0159]	ND [0.0159]	ND [0.0122]	0.0168 [0.0199] J	ND [0.0164]	ND [0.0147]	ND [0.0128]
Toluene	SW8260B	mg/Kg	*6.5*	ND [0.0208]	ND [0.0156]	ND [0.016]	ND [0.0166]	ND [0.0152]	ND [0.0179]	ND [0.0179]	ND [0.0187]	ND [0.0159]	ND [0.0159]	ND [0.0122]	ND [0.0199]	ND [0.0164]	ND [0.0147]	ND [0.0128]
o-Xylene	SW8260B	mg/Kg	*63*	ND [0.0208]	ND [0.0156]	ND [0.016]	ND [0.0166]	ND [0.0152]	ND [0.0179]	ND [0.0179]	ND [0.0187]	ND [0.0159]	ND [0.0159]	ND [0.0122]	ND [0.0199]	ND [0.0164]	ND [0.0147]	ND [0.0128]
Xylene, Isomers m & p	SW8260B	mg/Kg		ND [0.0415]	ND [0.0312]	ND [0.032]	ND [0.033]	ND [0.0303]	ND [0.0358]	ND [0.0357]	ND [0.0372]	ND [0.0318]	ND [0.0319]	ND [0.0244]	ND [0.0399]	ND [0.0327]	ND [0.0294]	ND [0.0255]
1-Methylnaphthalene	8270SIM	mg/Kg	*6.2*	0.0145 [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
2-Methylnaphthalene	8270SIM	mg/Kg	*6.1*	0.0091 [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Acenaphthene	8270SIM	mg/Kg	*180*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Acenaphthylene	8270SIM	mg/Kg	*180*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Anthracene	8270SIM	mg/Kg	*3,000*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Benzo(a)anthracene	8270SIM	mg/Kg	*3.6*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Benzo(a)pyrene	8270SIM	mg/Kg	*0.4*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Benzo(b)fluoranthene	8270SIM	mg/Kg	*4*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*1,100*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Benzo(k)fluoranthene	8270SIM	mg/Kg	*40*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Chrysene	8270SIM	mg/Kg	*360*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.4*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Fluoranthene	8270SIM	mg/Kg	*1,400*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Fluorene	8270SIM	mg/Kg	*220*	0.0027 [0.0032] J	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*4*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Naphthalene	8270SIM	mg/Kg	*20*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Phenanthrene	8270SIM	mg/Kg	*3,000*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Pyrene	8270SIM	mg/Kg	*1,000*	ND [0.0032]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.003]	ND [0.003]	ND [0.003]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0033]	ND [0.003]	ND [0.0028]	-
Total Solids	A2540G	Percent	*NA*	-	-	-	-	-	-	-	-	-	-	-	76.6	83.1	87.1	

Gray highlighted results had LODs that were greater than associated cleanup levels.

[a] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

[b] Method SW8011 was performed by TA, all other analyses were performed by SGS.

ADEC - Alaska Department of Environmental Conservation
LOD - limit of detection
LOQ - limit of quantitation
mg/Kg - milligrams per kilogram
SGS - SGS North America Inc. of Anchorage Alaska.
TA - Test America Laboratories Inc. of Arvada, Colorado.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ.
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 4-6 Groundwater Field Parameters and COC Concentrations
PMP 19.5
Haines-Fairbanks Pipeline FUDS

Field Parameters										Geochemical Results				Contaminants of Concern			
Well ID	**Sample ID**	**Sample Date**	**Well Drawdown (feet)**	**Temp. (°C)**	**Conductivity (µS/cm)**	**DO (mg/L)**	**pH**	**ORP (mv)**	**Turbidity (NTU)**	**Sulfate (mg/L)**	**NO_2/NO_3 as Total N (mg/L)**	**Fe (mg/L)**	**Mn (mg/L)**	**DRO (mg/L)**	**GRO (mg/L)**	**Benzene (mg/L)**	**Lead (mg/L)**
ADEC Cleanup Levels (Table C of Title 18 Alaska Administrative Code, Chapter 75.345)														**1.5**	**2.2**	**0.005**	**0.015**
19-MW1	14HF1903WG	8/8/2014	1.49	10.86	0.221	0.46	6.35	-41.00	4.29	16.5 QN	0.321 QN	12.5 QN	0.313 QN	ND(0.338) QN	0.23 B,QN	ND(0.0002) QN	0.0006 J,QN
19-MW2	14HF1901WG	8/8/2014	0.07	6.50	0.161	3.59	6.08	103.0	2.50	30 [1]	0.596	0.35 J [1]	0.0265	ND(0.319)	0.0361 J,B [1]	ND(0.0002)	ND(0.0005)
19-MW3	14HF1905WG	8/8/2014	0.18 [2]	11.79	0.259	0.16	6.83	-33.80	1.76	1.98	0.0715 J	4.89	0.457	ND(0.321)	0.0548 J,B	ND(0.0002)	ND(0.0005)
19-MW4	14HF1904WG	8/8/2014	0.50	11.13	0.273	0.33	6.21	-33.20	2.83	7.99 QN	0.12 QN	7.47 QN	0.296 QN	ND(0.326) QN	0.0436 J,B,QN	ND(0.0002) QN	ND(0.0005) QN

[1] Field duplicate result shown when it exceeded the Primary result.
[2] Initial depth of water was estimated

°C - degree Celsius
DO - dissolved oxygen
DRO - diesel range organics
Fe - iron
GRO - gasoline range organics

µS/cm - microsiemens per centimeter
mg/L - milligrams per liter
Mn - manganese
mv - millivolts
NO_2/NO_3 as N - nitrite/nitrate as nitrogen

Data Qualifiers:
J - result qualified as an estimate because it is less than the LOQ
ND - analyte not detected
Q - result considered an estimate(biased L-low; H-high; N-unknown) due to a quality control failure

Table 4-7 Groundwater Sample Results
PMP 19.5
Haines-Fairbanks Pipeline FUDS

PMP 19.5 Haines-Fairbanks Pipeline FUDS			**Sample ID**	**14HF1901WG**	**14HF1902WG**	**14HF1903WG**	**14HF1904WG**	**14HF1905WG**	**14HF1906WQ**
			Location ID	**19-MW2**	**19-MW21**	**19-MW1**	**19-MW4**	**19-MW3**	**Trip Blank**
			Sample Data Groups	**1143745/280-58942**	**1143745/280-58942**	**1143745/280-58942**	**1143745/280-58942**	**1143745/280-58942**	**1143745**
			Laboratory	**SGS/TA**[b]	**SGS/TA**[b]	**SGS/TA**[b]	**SGS/TA**[b]	**SGS/TA**[b]	**SGS**
			Sample Type	**Primary**	**Field Duplicate**	**Primary**	**Primary**	**Primary**	**Trip Blank**
			Collection Date	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**
			Matrix	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Groundwater**	**Water**
Analyte	Method[a]	Units	*Clean-up Level*[b]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	MG/L	*2.2*	0.0314 [0.05] J,B	0.0361 [0.05] J,B	0.23 [0.05] B,QN	0.0436 [0.05] J,B,QN	0.0548 [0.05] J,B	0.0357 [0.05] J
Diesel Range Organics	AK102	MG/L	*1.5*	ND [0.319]	ND [0.338]	ND [0.338] QN	ND [0.326] QN	ND [0.321]	-
Residual Range Organics	AK103	MG/L	*1.1*	ND [0.266]	ND [0.281]	ND [0.281] QN	0.262 [0.272] J,QN	ND [0.267]	-
Sulfate	E300.0	MG/L	*NA*	29.8 [0.05]	30 [0.05]	16.5 [0.05] QN	7.99 [0.05] QN	1.98 [0.05]	-
Nitrogen, Nitrate-Nitrite	A4500F	MG/L	*NA*	0.596 [0.05]	0.554 [0.05]	0.321 [0.05] QN	0.12 [0.05] QN	0.0715 [0.05] J	-
Iron	SW6020A	MG/L	*NA*	ND [0.25] QN	0.35 [0.25] J,QN	12.5 [0.25] QN	7.47 [0.25] QN	4.89 [0.25]	-
Manganese	SW6020A	MG/L	*NA*	0.0265 [0.001]	0.0263 [0.001]	0.313 [0.001] QN	0.296 [0.001] QN	0.457 [0.001]	-
Lead	SW6020A	MG/L	*0.015*	ND [0.0005]	ND [0.0005]	0.0006 [0.0005] J,QN	ND [0.0005] QN	ND [0.0005]	-
1,2-Dibromoethane	SW8011	MG/L	*0.00005*	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	-
1,2-Dichloroethane	SW8260B	MG/L	*0.005*	ND [0.00025]	ND [0.00025]	ND [0.00025] QN	ND [0.00025] QN	ND [0.00025]	ND [0.00025]
Benzene	SW8260B	MG/L	*0.005*	ND [0.0002]	ND [0.0002]	ND [0.0002] QN	ND [0.0002] QN	ND [0.0002]	ND [0.0002]
Ethylbenzene	SW8260B	MG/L	*0.7*	ND [0.0005]	ND [0.0005]	ND [0.0005] QN	ND [0.0005] QN	ND [0.0005]	ND [0.0005]
Toluene	SW8260B	MG/L	*1*	ND [0.0005]	ND [0.0005]	ND [0.0005] QN	ND [0.0005] QN	0.0004 [0.0005] J	ND [0.0005]
o-Xylene	SW8260B	MG/L	*10*	ND [0.0005]	ND [0.0005]	ND [0.0005] QN	ND [0.0005] QN	ND [0.0005]	ND [0.0005]
Xylene, Isomers m & p	SW8260B	MG/L		ND [0.001]	ND [0.001]	ND [0.001] QN	ND [0.001] QN	ND [0.001]	ND [0.001]
1-Methylnaphthalene	8270SIM	MG/L	*0.00*	0.0000182 [0.0000296] J,QN	ND [0.000029] QN	0.0000255 [0.0000284] J,QN	ND [0.0000285] QN	ND [0.0000278] QL	-
2-Methylnaphthalene	8270SIM	MG/L	*0.15*	ND [0.0000296] QL	ND [0.000029] QL	0.0000212 [0.0000284] J,QN	ND [0.0000285] QN	ND [0.0000278] QL	-
Acenaphthene	8270SIM	MG/L	*2.2*	ND [0.0000296] QL	ND [0.000029] QL	ND [0.0000284] QN	ND [0.0000285] QN	ND [0.0000278] QL	-
Acenaphthylene	8270SIM	MG/L	*2.2*	ND [0.0000296] QL	ND [0.000029] QL	ND [0.0000284] QN	ND [0.0000285] QN	ND [0.0000278] QL	-
Anthracene	8270SIM	MG/L	*11*	ND [0.0000296] QL	ND [0.000029] QL	ND [0.0000284] QN	ND [0.0000285] QN	ND [0.0000278] QL	-
Benzo(a)anthracene	8270SIM	MG/L	*0.0012*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-
Benzo(a)pyrene	8270SIM	MG/L	*0.0002*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-
Benzo(b)fluoranthene	8270SIM	MG/L	*0.0012*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-
Benzo(g,h,i)perylene	8270SIM	MG/L	*1.1*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-
Benzo(k)fluoranthene	8270SIM	MG/L	*0.012*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-
Chrysene	8270SIM	MG/L	*0.12*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-
Dibenzo(a,h)anthracene	8270SIM	MG/L	*0.00012*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-
Fluoranthene	8270SIM	MG/L	*1.5*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-
Fluorene	8270SIM	MG/L	*1.5*	ND [0.0000296] QL	ND [0.000029] QL	ND [0.0000284] QN	ND [0.0000285] QN	ND [0.0000278] QL	-
Naphthalene	8270SIM	MG/L	*0.73*	0.0000713 [0.000059] J,B,QL	ND [0.000058] QL	ND [0.000057] QN	ND [0.000057] QN	ND [0.0000278] QL	-
Indeno(1,2,3-cd)pyrene	8270SIM	MG/L	*0.0012*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-
Phenanthrene	8270SIM	MG/L	*11*	ND [0.0000296] QL	ND [0.000029] QL	ND [0.0000284] QN	ND [0.0000285] QN	ND [0.0000278] QL	-
Pyrene	8270SIM	MG/L	*1.1*	ND [0.0000296]	ND [0.000029]	ND [0.0000284] QN	ND [0.000285] QN	ND [0.0000278]	-

[a] Method SW8011 was performed by TA, all other analyses were performed by SGS.
[b] Groundwater cleanup levels are from ADEC Title 18 Alaska Administrative Code, Chapter 75.345, Table C.

ADEC - Alaska Department of Environmental Conservation
BTEX - benzene, toluene, ethylbenzene, and xylenes
LOD - limit of detection
LOQ - limit of quantitation
mg/L - milligrams per liter
PAH - polynuclear aromatic hydrocarbons
SGS - SGS North America Inc. of Anchorage Alaska.
TA - Test America Laboratories Inc. of Arvada, Colorado.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 4-8 Sediment Sample Results
PMP 19.5
Haines-Fairbanks Pipeline FUDS

PMP 19.5 Haines-Fairbanks Pipeline FUDS				**Sample ID**	**14HF1901SE**	**14HF1902SE**	**14HF1903SE**	**14HF1904SE**	**14HF1905SE**	**14HF1906SE**	**14HF1907SE**	**14HF1908SE**	**14HF1909SQ**	**14HF1910SQ**
				Location ID	**19-SE4**	**19-SE3**	**19-SE31**	**19-SE5**	**19-SE6**	**19-SE7**	**19-SE1**	**19-SE2**	**Trip Blank**	**Trip Blank**
				Sample Data Groups	**1143746 280-58942**	**1143746 280-58942**	**1143746 280-58942**	**1143746 280-58942**	**1143746 280-58942**	**1143746 280-58942**	**1143746 280-58942**	**1143746 280-58942**	**1143746**	**1143746**
				Laboratory	**SGS/TA**[b]	**SGS/TA**[b]	**SGS/TA**[b]	**SGS/TA**[b]	**SGS/TA**[b]	**SGS/TA**[b]	**SGS/TA**[b]	**SGS/TA**[b]	**SGS**	**SGS**
				Sample Type	**Primary**	**Primary**	**Field Duplicate**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Trip Blank**	**Trip Blank**
				Collection Date	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**	**8/8/2014**
				Matrix	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Sediment**	**Solid**	**Solid**
Analyte	Method[a]	Units	*Sediment Screening Level*[b]	*Soil Clean-up Level*[c]	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/Kg	*NA*	*260*	2.36 [3.39] J,B	1.93 [2.42] J,B	1.57 [2.29] J,B	ND [2.27]	2.29 [2.94] J,B	1.95 [2.06] J,B	1.43 [1.87] J,B	2.09 [2.4] J,B	0.957 [1.26] J	0.872 [1.27] J
Diesel Range Organics	AK102	mg/Kg	*NA*	*230*	30.8 [17.1] J	ND [14.1]	ND [13.8]	ND [13.8]	13.9 [15.6] J	13.3 [13.2] J	ND [12.7]	ND [14.1]	-	-
Residual Range Organics	AK103	mg/Kg	*NA*	*8,300*	148 [17.1]	19.9 [14.1] J	25.1 [13.8] J	36.6 [13.8]	112 [15.6]	49.6 [13.2]	22.9 [12.7] J	40.8 [14.1]	-	-
Lead	SW6020A	mg/Kg	*91.3/35*	*400*	1.97 [0.825]	1.1 [0.134]	1.07 [0.129]	0.965 [0.132]	1.66 [0.154]	1.26 [0.122]	1.07 [0.123]	1.1 [0.138]	-	-
1,2-Dibromoethane	SW8011	mg/Kg	*NA*	*0.00016*	ND [0.000080]	ND [0.000072]	ND [0.000071]	ND [0.000074]	ND [0.000083]	ND [0.000069]	ND [0.000068]	ND [0.000072]	-	-
1,2-Dichloroethane	SW8260B	mg/Kg	*NA*	*0.016*	ND [0.0339]	ND [0.0242]	ND [0.0229]	ND [0.0227]	ND [0.0295]	ND [0.0206]	ND [0.0187]	ND [0.0239]	ND [0.0126]	ND [0.0127]
Benzene	SW8260B	mg/Kg	*NA*	*0.025*	ND [0.017]	ND [0.0121]	ND [0.0115]	ND [0.0114]	ND [0.0148]	ND [0.0103]	ND [0.0094]	ND [0.0119]	ND [0.0063]	ND [0.0063]
Ethylbenzene	SW8260B	mg/Kg	*NA*	*6.9*	ND [0.0339]	ND [0.0242]	ND [0.0229]	ND [0.0227]	ND [0.0295]	ND [0.0206]	ND [0.0187]	ND [0.0239]	ND [0.0126]	ND [0.0127]
Toluene	SW8260B	mg/Kg	*NA*	*6.5*	ND [0.0339]	ND [0.0242]	ND [0.0229]	ND [0.0227]	ND [0.0295]	ND [0.0206]	ND [0.0187]	ND [0.0239]	ND [0.0126]	ND [0.0127]
o-Xylene	SW8260B	mg/Kg	*NA*	*63*	ND [0.0339]	ND [0.0242]	ND [0.0229]	ND [0.0227]	ND [0.0295]	ND [0.0206]	ND [0.0187]	ND [0.0239]	ND [0.0126]	ND [0.0127]
Xylene, Isomers m & p	SW8260B	mg/Kg			ND [0.068]	ND [0.0484]	ND [0.0459]	ND [0.0455]	ND [0.059]	ND [0.0413]	ND [0.0375]	ND [0.0479]	ND [0.0251]	0.0244 [0.0254] J
1-Methylnaphthalene	8270SIM	mg/Kg	*NA*	*6.2*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	0.0048 [0.0035] J,B	-	-
2-Methylnaphthalene	8270SIM	mg/Kg	*NA*	*6.1*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	0.0067 [0.0035] J,B	-	-
Acenaphthene	8270SIM	mg/Kg	*0.0889/0.00671*	*180*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Acenaphthylene	8270SIM	mg/Kg	*0.128/0.00587*	*180*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Anthracene	8270SIM	mg/Kg	*0.245/0.0469*	*3,000*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Benzo(a)anthracene	8270SIM	mg/Kg	*0.385/0.0317*	*3.6*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Benzo(a)pyrene	8270SIM	mg/Kg	*0.782/0.0319*	*0.4*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Benzo(b)fluoranthene	8270SIM	mg/Kg	*NA*	*4*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*NA*	*1,100*	ND [0.0042] MN	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Benzo(k)fluoranthene	8270SIM	mg/Kg	*NA*	*40*	ND [0.0042] MN	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Chrysene	8270SIM	mg/Kg	*0.862/0.0571*	*360*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.135/0.00622*	*0.4*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Fluoranthene	8270SIM	mg/Kg	*2.23/0.111*	*1,400*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Fluorene	8270SIM	mg/Kg	*0.144/0.0212*	*220*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*NA*	*4*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Naphthalene	8270SIM	mg/Kg	*0.391/0.0346*	*20*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	0.0038 [0.0035] J,B	-	-
Phenanthrene	8270SIM	mg/Kg	*0.515/0.0419*	*3,000*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Pyrene	8270SIM	mg/Kg	*0.875/0.053*	*1,000*	ND [0.0042]	ND [0.0035]	ND [0.0034]	ND [0.0035]	ND [0.0039]	ND [0.0033]	ND [0.0031]	ND [0.0035]	-	-
Total Solids	A2540G	Percent	*NA*	*NA*	58.3	70.6	72.3	72.1	63.6	75.6	78.6	71	-	-

Gray highlighted results had LODs that were greater than associated screening/cleanup levels.

[a] Method SW8011 was performed by TA, all other analyses were performed by SGS.

[b] Sediment screening levels are the National Oceanic and Atmospheric Administration PEL/TEL for Freshwater Sediment.

[c] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

No analytes exceeded either their applicable sediment screening or soil cleanup levels.

LOD - limit of detection
LOQ - limit of quantitation
mg/Kg - milligrams per Kilogram
NA - not applicable

PEL - Probable Effects Level
SGS - SGS North America Inc. of Anchorage Alaska.
TA - Test America Laboratories Inc. of Arvada, Colorado.
TEL - Threshold Effects Level

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 4-9 Surface Water Sample Results
PMP 19.5
Haines-Fairbanks Pipeline FUDS

PMP 19.5 Haines-Fairbanks Pipeline FUDS			Sample ID	14HF1901WS	14HF1902WS	14HF1903WS	14HF1904WS	14HF1905WS	14HF1906WS	14HF1907WS	14HF1908WS	14HF1909WS	14HF1910WS	14HF1911WS	14HF1912WS	14HF1913WS	14HF1914WS	14HF1915WS	14HF1916WS	14HF1917WQ
			Location ID	19-WS1	19-WS2	19-WS3	19-WS4	19-WS41	19-WS5	19-WS6	19-WS7	19-WS4	19-WS3	19-WS31	19-WS5	19-WS6	19-WS7	19-WS1	19-WS2	Trip Blank
			Sample Data Groups	1143338	1143338	1143338	1143338	1143338	1143338	1143338	1143338	1143745	1143745	1143745	1143745	1143745	1143745	1143745	1143745	1143745
			Laboratory	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS
			Sample Type	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Primary	Primary	Primary	Primary	Primary	Trip Blank
			Collection Date	7/23/2014	7/23/2014	7/23/2014	7/23/2014	7/23/2014	7/23/2014	7/23/2014	7/23/2014	8/8/2014	8/8/2014	8/8/2014	8/8/2014	8/8/2014	8/8/2014	8/8/2014	8/8/2014	8/8/2014
			Matrix	WS	WS	SO	WS	WS	WS	WS	WS	WS	WS	WS	WS	WS	WS	WS	WS	WQ
Analyte	Method[a]	Units	*Screening Level[b]*	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier	Result LOD Qualifier
Gasoline Range Organics	AK101	mg/L	*NA*	-	-	-	-	-	-	-	-	0.042 [0.05] J,B	ND [0.05]	ND [0.05]	ND [0.05]	0.0323 [0.05] J,B	0.0346 [0.05] J,B	0.0334 [0.05] J,B	ND [0.05]	ND [0.05]
Diesel Range Organics	AK102	mg/L	*NA*	-	-	-	-	-	-	-	-	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	ND [0.3]	1.29 [0.3]	ND [0.3]	-
Residual Range Organics	AK103	mg/L	*NA*	-	-	-	-	-	-	-	-	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	ND [0.25]	0.581 [0.25]	ND [0.25]	-
Lead	SW6020A	mg/L	*NA*	-	-	-	-	-	-	-	-	0.0003 [0.0005] J	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	-
TAH[c]	SW8260B	mg/L	*0.010*	-	-	-	-	-	-	-	-	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027
TAqH[c]	SW8260B/ 8270SIM	mg/L	*0.015*	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	0.0035	-	-	-	-	-	-	-	-	-
1,2-Dibromoethane[b]	SW8011	mg/L	*NA*	-	-	-	-	-	-	-	-	ND [0.0000099]	ND [0.0000099]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]	ND [0.00001]
1,2-Dichloroethane	SW8260B	mg/L	*NA*	-	-	-	-	-	-	-	-	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
Benzene	SW8260B	mg/L	*NA*	-	-	-	-	-	-	-	-	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
Ethylbenzene	SW8260B	mg/L	*NA*	-	-	-	-	-	-	-	-	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
Toluene	SW8260B	mg/L	*NA*	-	-	-	-	-	-	-	-	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
o-Xylene	SW8260B	mg/L	*NA*	-	-	-	-	-	-	-	-	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
Xylene, Isomers m & p	SW8260B	mg/L		-	-	-	-	-	-	-	-	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]	ND [0.001]
1-Methylnaphthalene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Acenaphthene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Acenaphthylene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Anthracene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Chrysene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Fluoranthene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Fluorene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Naphthalene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Phenanthrene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-
Pyrene	8270SIM	mg/L	*NA*	ND [0.0000261]	ND [0.0000257]	ND [0.0000267]	ND [0.0000265]	ND [0.0000266]	ND [0.000029]	ND [0.0000269]	ND [0.0000278]	-	-	-	-	-	-	-	-	-

Note: Samples 14HF1901 through 14HF1908 were collected in July 2014 and submitted for analysis of PAHs; samples 14HF1909WS through 171916WS were collected in August 2014 from the same locations as July 2014 samples, and submitted for analysis of GRO, DRO, RRO, BTEX, and lead.

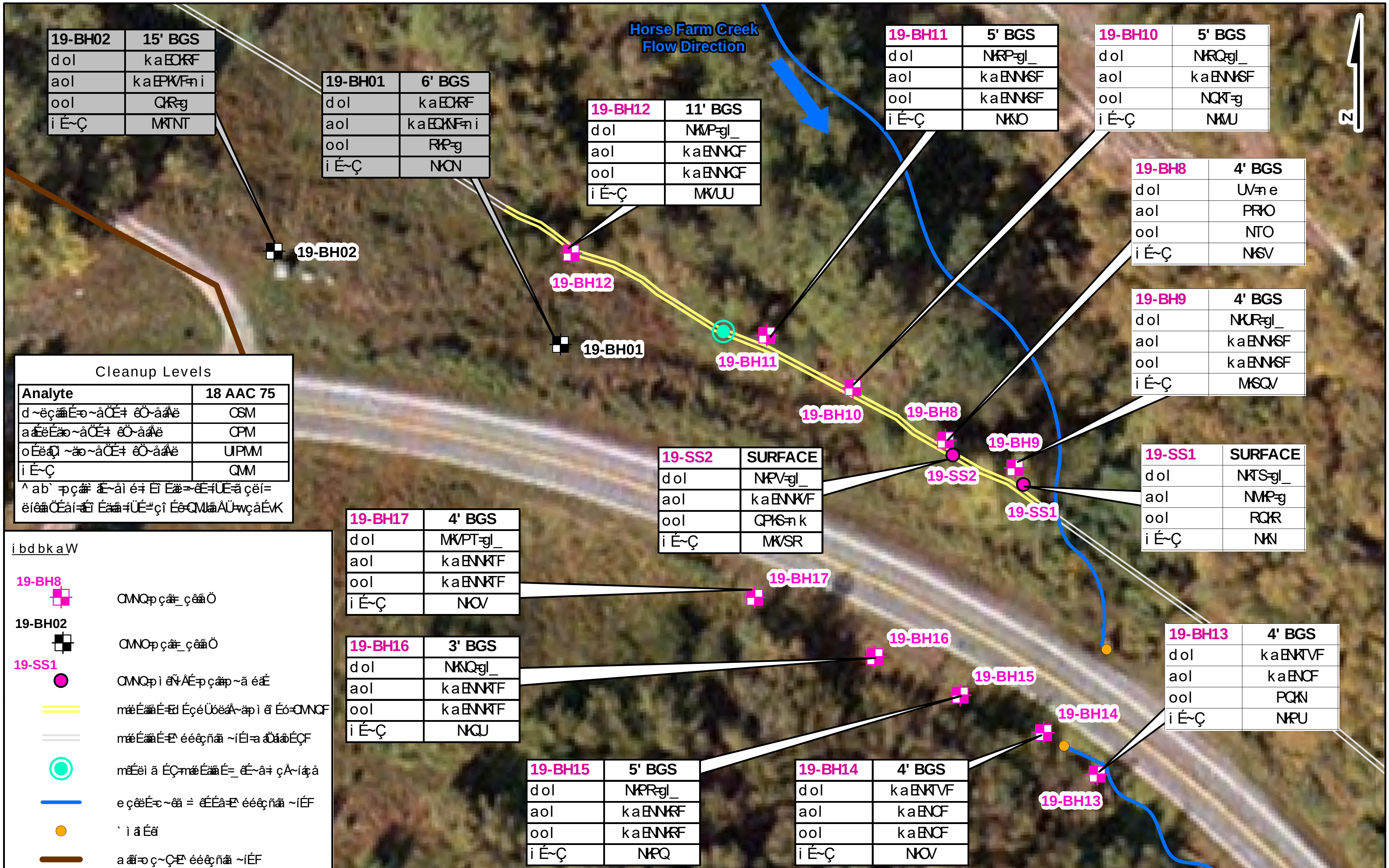
[a] Method SW8011 was performed by TA, all other analyses were performed by SGS.

[b] Surface water criteria are from ADEC Title 18 Alaska Administrative Code, Chapter 70.020.

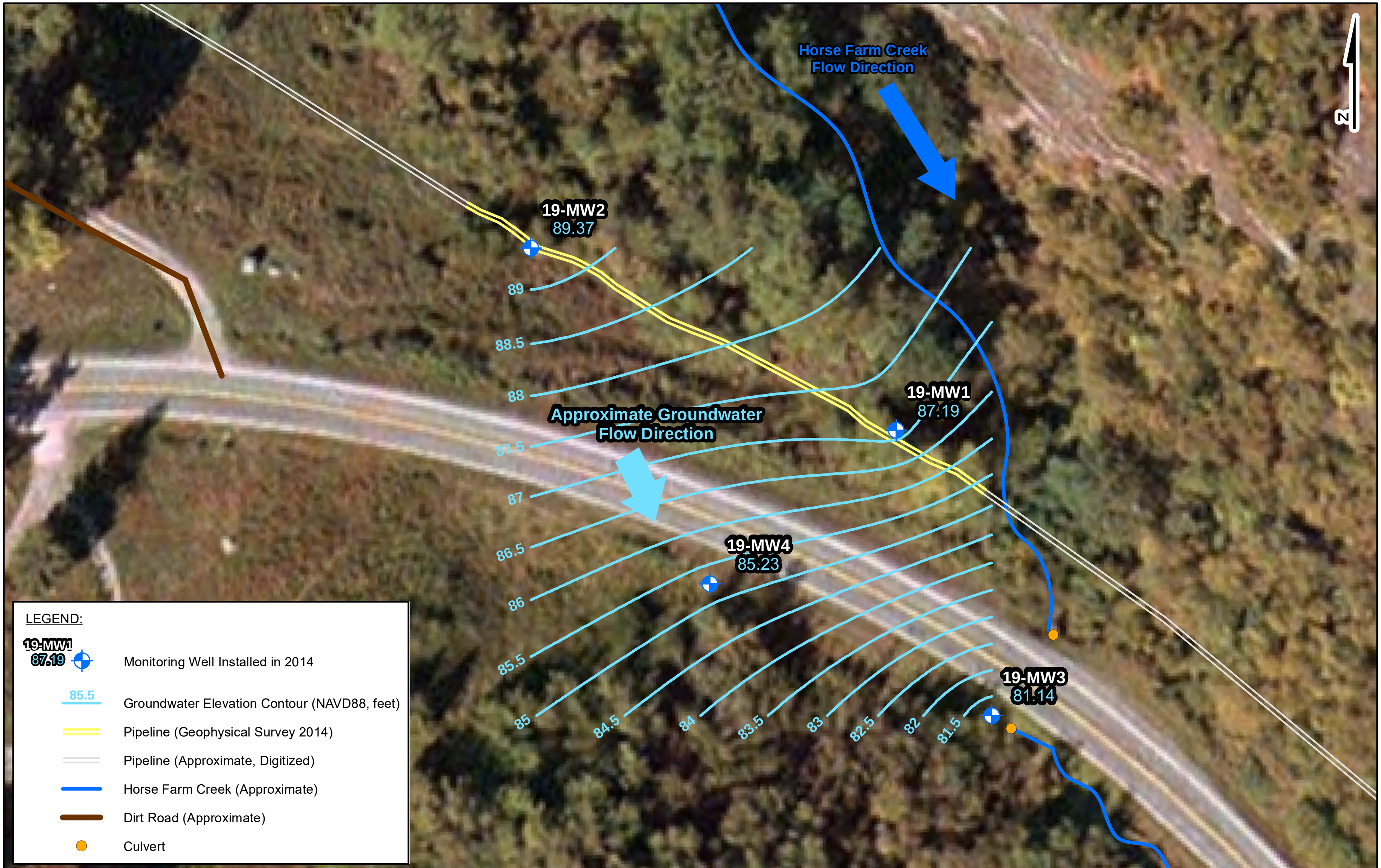
[c] Total aromatic hydrocarbons (TAH) is the sum of BTEX compounds, and total aqueous hydrocarbons (TAqH) is the sum of BTEX plus the sum of EPA's 16 priority PAH pollutants. Since the original samples submitted for 8260B analysis were cancelled, TAH/TAqH were calculated from data obtained from two separate dates.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
ND - analyte not detected

ADEC - Alaska Department of Environmental Conservation
EPA - U.S. Environmental Protection Agency
LOD - limit of detection
LOQ - limit of quantitation
mg/L - milligrams per liter
NA - Not applicable
SGS - SGS North America Inc. of Anchorage Alaska.
TA - Test America Laboratories Inc. of Arvada, Colorado.



Contaminant Concentrations in Soil Samples



NOTES:

1. Groundwater Elevation Contours were drawn in Surfer v.10 using groundwater elevations collected on July 27, 2014.

2. The pipeline is digitized based on the aerial imagery and previous mapping (ENSR 2006, DOWL 2006). The area of the pipeline located during the geophysical survey in 2014 is shown in yellow.

3. Coordinate System - Projection: UTM Zone 8N, meters (shown in feet); Horizontal Datum: WGS84. Vertical Datum: NAVD88, feet.

4. Imagery provided by Aero-Metric, 2004.

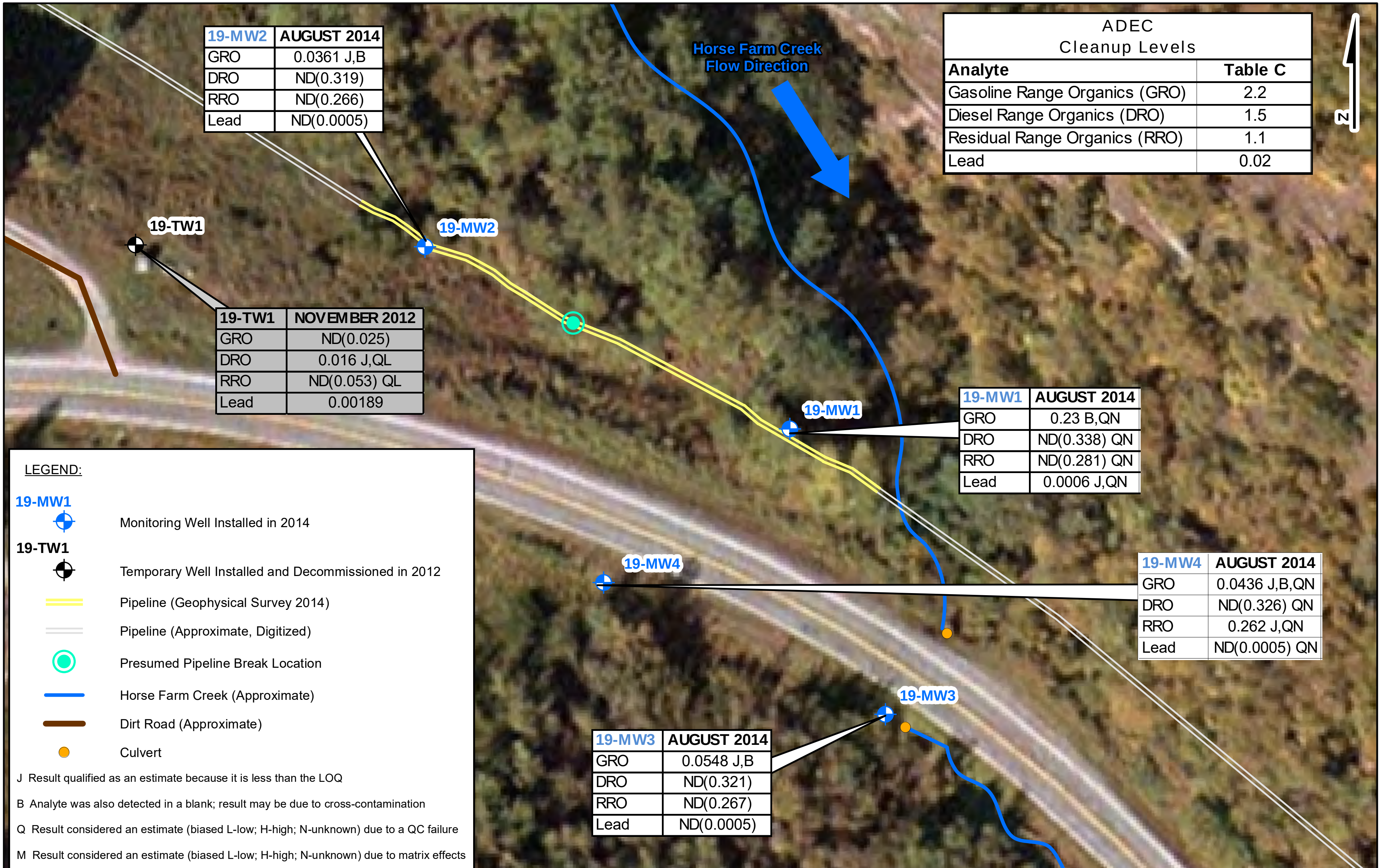
0 30 60 120 Feet

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

2014 Groundwater Elevation Contours
Pipeline Milepost 19.5
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS, Alaska
Project #: F10AK1016-03

Contract: W911KB-12-D-0001, TO29	Figure: 4-2	Date: 12/14



ADEC Cleanup Levels	
Analyte	**Table C**
Gasoline Range Organics (GRO)	2.2
Diesel Range Organics (DRO)	1.5
Residual Range Organics (RRO)	1.1
Lead	0.02

19-MW2	AUGUST 2014
GRO	0.0361 J,B
DRO	ND(0.319)
RRO	ND(0.266)
Lead	ND(0.0005)

19-TW1	NOVEMBER 2012
GRO	ND(0.025)
DRO	0.016 J,QL
RRO	ND(0.053) QL
Lead	0.00189

19-MW1	AUGUST 2014
GRO	0.23 B,QN
DRO	ND(0.338) QN
RRO	ND(0.281) QN
Lead	0.0006 J,QN

19-MW4	AUGUST 2014
GRO	0.0436 J,B,QN
DRO	ND(0.326) QN
RRO	0.262 J,QN
Lead	ND(0.0005) QN

19-MW3	AUGUST 2014
GRO	0.0548 J,B
DRO	ND(0.321)
RRO	ND(0.267)
Lead	ND(0.0005)

LEGEND:

19-MW1 Monitoring Well Installed in 2014

19-TW1 Temporary Well Installed and Decommissioned in 2012

Pipeline (Geophysical Survey 2014)

Pipeline (Approximate, Digitized)

Presumed Pipeline Break Location

Horse Farm Creek (Approximate)

Dirt Road (Approximate)

Culvert

J Result qualified as an estimate because it is less than the LOQ

B Analyte was also detected in a blank; result may be due to cross-contamination

Q Result considered an estimate (biased L-low; H-high; N-unknown) due to a QC failure

M Result considered an estimate (biased L-low; H-high; N-unknown) due to matrix effects

NOTES:

1. Select 2012 groundwater sample results shown in gray scale.

2. Groundwater concentrations are in milligrams per liter (mg/L). The highest result is shown when field duplicates were analyzed.

3. The pipeline is digitized based on the aerial imagery and previous mapping (ENSR 2006, DOWL 2006). The area of the pipeline located during the geophysical survey in 2014 is shown in yellow. The location of the pipeline break could not be definitively identified.

4. Coordinate System - Projection: UTM Zone 8N, meters (shown in feet); Horizontal Datum: WGS84. Vertical Datum: NAVD88, feet.

5. Imagery provided by Aero-Metric, 2004.

0 30 60 120 Feet

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
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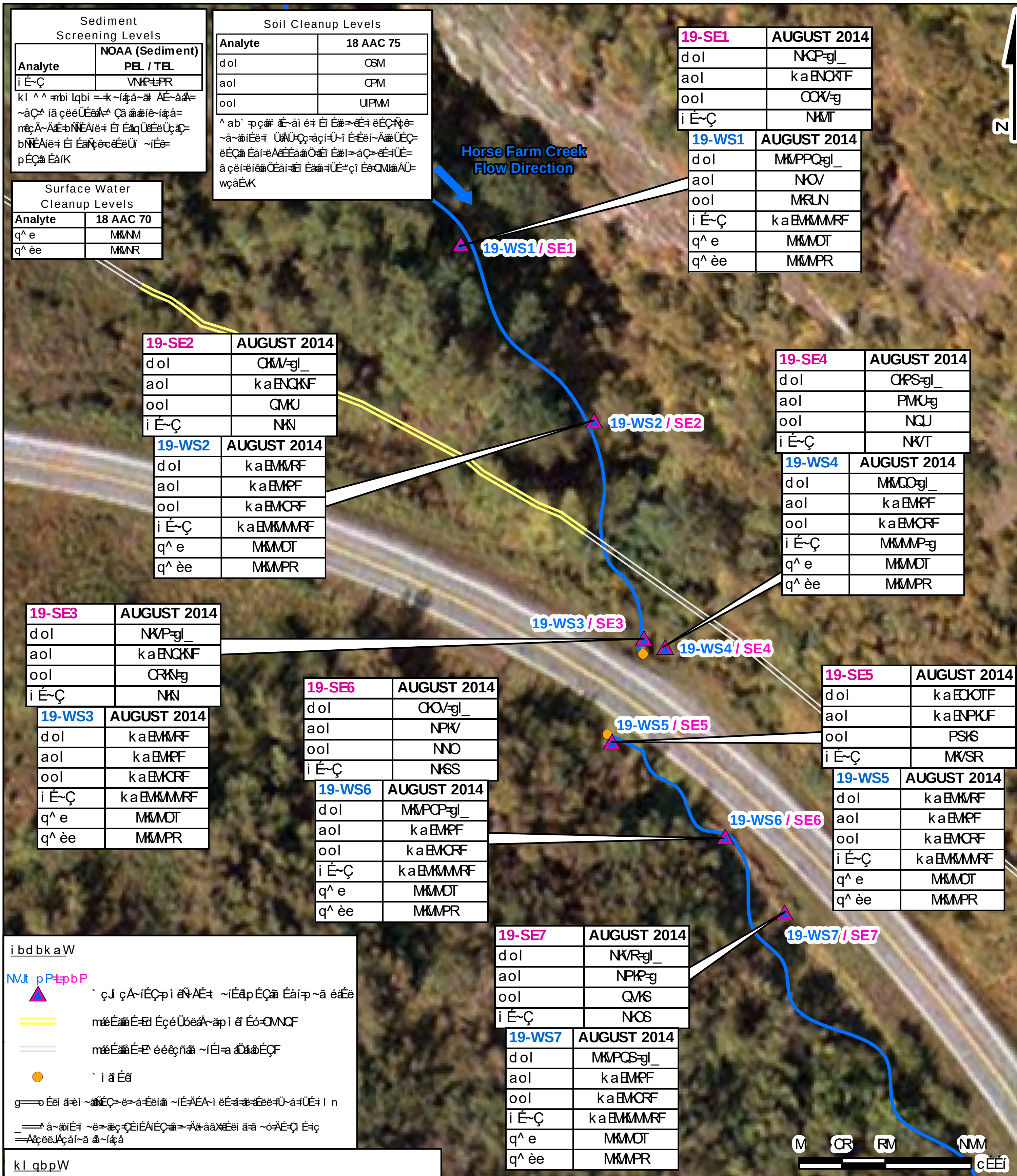
Anchorage, AK

Contaminant Concentrations in Groundwater Samples
Pipeline Milepost 19.5
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS, Alaska
Project #: F10AK1016-03

Contract: W911KB-12-D-0001, TO29 | Figure: 4-3 | Date: 12/14



Contaminant Concentrations in Surface Water and Sediment Samples

5.0 PMP 25.5 (GATE VALVE #4)

5.1 Site Description

The Gate Valve #4 site is located at PMP 25.5 on the north side of the Haines Highway at milepost 23.5, about 300 feet east of Wells Bridge (Figure 1-1). A 12-foot-high rusted steel pole marks the valve box. The box is located within a drainage ditch approximately 10 feet from the highway surface and approximately 4 feet lower.

No known releases are associated with this gate valve.

Highway construction activities are planned in this area, but at the time of this report construction plans have not been completed. The preferred alternative plan moves the highway north of its current location, overlying the location of Gate Valve #4.

A power line (12,500 kilowatt) runs underground along the north side of the Haines Highway; the power line is the responsibility of IPEC. A fiber optic line runs overhead and along the north side of Gate Valve #4 until it reaches a pole approximately 100 feet east of Gate Valve #4 where it goes underground, crosses the Haines Highway, and continues underground on the south side of the Haines Highway; the fiber optic line is the responsibility of AP&T.

5.2 Previous Investigations

5.2.1 2005 Limited Site Investigation

USACE conducted a limited site investigation in 2005. A ROST investigation could not be completed due to underground utilities in the area. Two soil samples were collected from inside the valve box, one from directly beneath the valve and one from a corner of the vault. The sample from under the valve had a strong fuel odor and a DRO concentration higher than the ADEC Table B2 cleanup level. DRO was detected in the sample from the corner of the vault but at a concentration below the cleanup level.

5.2.2 2006 Site Investigation

Two test holes using a hand auger were dug inside the valve vault during the 2006 site investigation (ENSR, 2007). Two samples were collected from each test hole at 1.5 to 2 feet and 4.5 to 5 feet beneath the bottom of the vault floor. All soil samples were analyzed for GRO, DRO, and RRO, and the shallow samples below the valve were also analyzed for lead. Both soil samples collected from the boring directly beneath the valve exceeded the cleanup level for GRO. DRO and RRO were also detected, but were below cleanup levels. Lead was detected below the cleanup level in the shallow sample below the valve. GRO, DRO, and RRO were also detected in both samples collected from the boring located in the corner of the valve box; however, results were lower than cleanup levels (ENSR, 2007).

5.2.3 2007 Soil Gas Study

The removal of the vault and gate valve and the excavation of potentially contaminated soils were planned for 2007. However, due to the proximity of the buried electric line (approximately 6 feet north of the valve vault) and the Haines Highway to the south, it was recommended that any excavation be postponed and coordinated with future highway construction. In place of excavation, a soil gas study was conducted involving the installation of 12 soil gas modules around Gate Valve #4. The soil gas results did not indicate the presence of petroleum-contaminated soil surrounding the valve vault.

5.2.4 2012 Remedial Investigation

An RI was conducted during 2012 and involved the collection and analysis of ten soil samples from seven soil borings. Four temporary wells were installed and sampled. Soil and groundwater contamination consistent with a leaded gasoline source was identified. Soil COCs include DRO, GRO, benzene, toluene, and 1,2-DCA. Groundwater COCs include GRO, DRO, benzene, EDB, 2-methylnaphthalene, and lead (FES, 2013).

5.2.5 2013 Sampling of Private Drinking Water Well

USACE collected groundwater samples from a private water well on the Jacquot property on May 2, 2013 (USACE, 2013b). The well is located approximately 700 feet south of the gate valve and is not currently being used. Samples were submitted for analyses of GRO, DRO, RRO, total lead, BTEX + 1,2-DCA, EDB, and PAHs. Only trace concentrations of GRO and lead were detected in the primary and duplicate samples. The sampling report is included as Appendix J.

5.3 Soil Sampling

5.3.1 Drilling and Soil Sampling

Drilling and soil sampling activities at the PMP 25.5 site occurred between July 17 and 18, 2014. A total of ten borings were advanced. Soil lithology generally consisted of silty sand (with and without gravel). Boring locations are shown on Figure 5-1, and boring logs are presented in Appendix C. Table 5-1 summarizes drilling and sampling activities that were completed in 2014.

Table 5-1 Drilling Summary (PMP 25.5)

Soil Boring	Well Number	Date Drilled	Total Depth (feet bgs)	Number of Soil Samples	Sample Interval (feet bgs)	PID Range (ppm)
25-BH08	25-MW1	7/17/14	30	1	23 - 24	0.0 - 0.1
25-BH09	-	7/17/14	30	3	5 - 6, 25 -26, 28 - 29	0.0 - 890
25-BH10	25-MW2	7/18/14	35	5	6 - 7, 9 - 10, 18 - 19, 23 - 24, 31 - 32	0.0 - 705
25-BH11	-	7/18/14	35	2	14 - 15, 27 - 28	0.0 - 1,670
25-BH12	-	7/18/14	35	2	12 - 13, 29 - 30	0.0 - 530
25-BH13	-	7/18/14	30	1	27 - 28	0.0
25-BH14	25-MW3	7/18/14	30	1	26 - 27	0.0
25-BH15	25-MW4	7/18/14	30	1	25 - 26	0.0
25-BH16	25-MW5	7/18/14	30	1	21 - 22	0.0
25-BH17	25-MW6	7/18/14	35	2	12 - 13, 32 - 33	0.0

5.3.2 Soil Sample Results

A total of 21 soil samples, including 19 primary samples and 2 field duplicates, were collected from the PMP 25.5 site. Soil samples were shipped in two SDGs. EDB samples were analyzed by TAL-D and assigned the report number 280-58139; BTEX, GRO, DRO, RRO, PAHs, and total lead were analyzed by SGS and assigned the report number 1143327. A sample summary table is included as Table 5-3 and an analytical results table for soil samples is included as Table 5-4.

Comparing sample results to the most stringent ADEC Method Two soil cleanup levels, GRO, DRO, 1-methylnaphthalene, 2-methylnaphthalene, and EDB were exceeded in one or more soil samples. Soil sample results are summarized below:

- DRO concentrations exceeded the cleanup level (230 mg/Kg) in three borings (25-BH09, 25-BH10, and 25-BH11). DRO concentrations exceeded the cleanup level in three of the five sample intervals collected from 25-BH10 adjacent the gate valve (between approximately 9-23 feet bgs); DRO did not exceed in the deepest or most shallow samples collected from this boring. DRO exceeded in both sample intervals collected from 25-BH11, and in the middle sample interval (26 feet bgs) from 25-BH09.
- GRO concentrations exceeded the cleanup level (260 mg/Kg) in the same three borings as DRO (25-BH09, 25-BH10, and 25-BH11). GRO only exceeded in one of the five sample intervals collected from 25-BH10 (18 feet bgs).
- EDB concentrations exceeded the cleanup level (0.00016 mg/Kg) in two borings; at 18 and 23 feet in 25-BH10, and 27 feet in 25-BH11.
- 1-methylnapthalene and 2-methylnapthalene exceeded the cleanup level (6.2 and 6.1

mg/Kg, respectively) in boring 25-BH11 from 27 feet bgs; neither analyte was detected in the shallower sample from this boring (14 feet bgs).

5.4 Groundwater Sampling

5.4.1 Monitoring Well Installation and Development

Monitoring wells were installed and developed as detailed in Section 2.3. Wells were completed as flushmounts. Well locations are shown on Figures 5-2 and 5-3. Completion details of the monitoring wells are presented on well logs in Appendix C. Final turbidity ranged from 19 to 56 NTU after removing between 6.5 and 10 gallons of water from the wells. Details of development of each well are provided on the well development forms included in Appendix D. Fuel odor was identified in the purge water from wells 25-MW2, 25-MW3 (slight), and 25-MW4 during development.

5.4.2 Groundwater Elevations and Flow Direction

Groundwater depth measurements were collected from each of the wells on July 30, 2014. Using the well survey data (Appendix F), groundwater elevations were calculated for each of the wells (Table 5-2). Groundwater contours shown on Figure 5-2 indicate the flow direction is towards the southwest towards the Chilkat River, similar to the groundwater flow direction observed during the 2012 RI. Groundwater elevations were approximately 3 feet higher in July 2014 than November 2012. The horizontal hydraulic gradient was relatively flat, approximately 0.002 ft/ft, which was slightly steeper than indicated by the 2012 data.

Table 5-2 Groundwater Elevations on July 30, 2014 (PMP 25.5)

Well	Screen Interval (feet BTOC)	GW Depth (feet BTOC)	Top of Casing Elevation (NAVD88, feet)	Screen Elevation (NAVD88, feet)	GW Elevation (NAVD88, feet)
25-MW1	17.87 – 27.87	19.95	145.40	127.53 – 117.53	125.45
25-MW2	19.38 – 29.38	24.59	150.25	130.87 – 120.87	125.66
25-MW3	19.20 – 29.20	24.62	150.18	130.98 – 120.98	125.56
25-MW4	19.20 – 29.20	21.75	147.23	128.03 – 118.03	125.48
25-MW5	17.14 – 27.14	19.25	144.56	127.42 – 117.42	125.31
25-MW6	24.35 – 34.35	27.10	152.77	128.42 – 118.42	125.67

5.4.3 Groundwater Contaminant Results

Groundwater samples were initially collected at the PMP 25.5 site on July 24 and 25, 2014, but were received at the laboratory above acceptable temperature (as described in Section 2.6). Groundwater samples were re-collected on July 30 and 31, 2014. A total of six primary samples, one field duplicate, and one trip blank were submitted to the project laboratory. Groundwater samples were shipped in two SDGs. EDB samples were analyzed by TAL-D and assigned the report number 280-58493; BTEX, GRO, DRO, RRO, PAHs, total lead, dissolved iron and manganese, sulfate, and total nitrate/nitrite were analyzed by SGS and assigned the report number 1143514.

Groundwater samples are summarized on Table 5-3. Groundwater field parameters are summarized in Table 5-5. Analytical groundwater results are included as Table 5-6. Groundwater results for select analytes are shown on Figure 5-4. Groundwater sample results are summarized below:

- GRO, DRO, EDB, and total lead concentrations exceeded groundwater cleanup levels in a single well, 25-MW2, adjacent the valve pit. The maximum GRO, DRO, EDB, and lead concentrations (in either the primary or field duplicate sample collected from this well) were 4.35, 13.4, 0.03 and 0.0822 mg/L, respectively.
- The RRO concentration exceeded the groundwater cleanup level of 1.1 mg/L in one well, 25-MW1, located approximately 100 feet west of the valve pit along the pipeline. The RRO concentration in this well was 3.96 mg/L. The RRO detection was suspect since RRO was not detected above the LOQ in any other groundwater or soil sample.

5.4.4 Groundwater Geochemical Results

Groundwater samples were analyzed for natural attenuation parameters as part of the groundwater investigation to evaluate the potential for biodegradation of petroleum contamination at the PMP 25.5 site. Natural attenuation parameters included sulfate, total nitrate/nitrite, dissolved iron and manganese, DO, and ORP. Results for these natural attenuation parameters are summarized on Table 5-5.

Geochemical data collected during the July 2014 groundwater investigation indicate that aerobic and anaerobic biodegradation of groundwater contaminants has occurred at the site. The following summarizes the evaluation of geochemical data:

- The groundwater flow direction and geochemical data indicate that monitoring well 25-MW6 is upgradient of the contaminated area and is assumed to represent background geochemistry conditions for this site.
    - The DO concentration was 1.38 mg/L.
    - Dissolved manganese and iron concentrations were near zero.
    - The sulfate concentration was 6.71 mg/L.
    - The total nitrate/nitrite results indicate that the maximum nitrate concentration in the background well is approximately 0.04 mg/L. The low total nitrate/nitrite concentrations indicate that nitrate reduction is not a significant biodegradation pathway.
- The DO concentration measured in the well adjacent the former Gate Valve #4 (25-MW2) was below 1 mg/L, representing anaerobic conditions.

- Elevated dissolved iron and manganese concentrations were also detected in well 25-MW2. These data support the reduction of iron and manganese during the anaerobic degradation of residual hydrocarbons. The changes in iron concentrations relative to background indicate iron reduction as the most significant biodegradation pathway at the site. Slightly elevated concentrations of dissolved iron and manganese were also noted in 25-MW1, which also had elevated fuel concentrations.
- Elevated total nitrate/nitrite concentrations were measured in 25-MW3 and 25-MW5 which may originate from a septic system associated with a nearby building.

5.5 Data Quality Summary

The chemical data were evaluated in order to assess data quality and usability. The findings of the review are documented in the CDQR and ADEC Checklists (Appendix B). Analytical data summarized in Tables 5-4 through 5-6 were qualified based on those findings. Overall, the completeness goals were met and the review process deemed the soil and groundwater data acceptable for project use. Notable issues associated with soil and groundwater data are summarized below:

- The GRO results in samples 14HF2508SO and 14HF2509SO may be impacted by poor field duplicate precision since the results are just above and below the ADEC cleanup level. The GRO results in these samples were qualified as non-biased estimates (QN).

5.6 Work Plan Deviations

As discussed in Section 2.6, PAH analyses for surface water samples were conducted using samples that were collected at a different times than samples submitted for the other analyses. Thus the TAqH results should be considered estimates since the values were calculated using two separate samples.

5.7 Nature and Extent of Contamination

5.7.1 Contaminants of Concern

Based upon the laboratory results, the contaminant source appears to be consistent with a leaded gasoline-type fuel. GRO, DRO, EDB, 1-methynapthalene, and 2-methylnapthalene were detected in one or more soil samples above the ADEC cleanup level. Benzene and 1,2-DCA, which were detected in one or more 2012 soil samples above the ADEC cleanup level, were not detected in any 2014 soil sample.

GRO, DRO, EDB, and total lead were all detected above ADEC cleanup levels in 25-MW2, the well located adjacent the gate valve. In addition, RRO was detected above the ADEC cleanup level in 25-MW1, but the laboratory indicated that the result was not consistent with fuel contamination.

Benzene and 2-methylnapthalene, which were detected in groundwater above ADEC cleanup levels in 2012, were below ADEC cleanup levels in all 2014 samples.

5.7.2 Extent of Soil Contamination

The extent of soil contamination was delineated and estimated to be approximately 4,300 sq. ft. As evidenced by soil borings drilled adjacent the valve pit, soil contamination appears to emanate from the bottom of the valve pit. Soil boring 25-BH10 did not identify soil contamination at a depth of 6 feet but the DRO concentration in the 9 foot sample exceeded the ADEC cleanup level. Fuel releases appeared to migrate vertically until the water table was reached and then spread laterally in the direction of the groundwater flow. The vertical contaminant distribution in soil is presented in Figure 5-4. Approximately 2,000 cy of soil exceeds ADEC Methods Two cleanup levels. The majority of the soil contamination is located either directly underlying the gate valve or within the smear zone, much of which is underlying the highway.

5.7.3 Extent of Groundwater Contamination

Utilizing the 2012 and 2014 sample results, the estimated extent of groundwater contamination exceeding the DRO cleanup level exceeds 7,000 sq. ft. (Figure 5-3) and roughly mirrors the extent of soil contamination north of the Haines Highway, but it extends farther in the downgradient direction (south and west). The RRO exceedance in 25-MW1 was not considered in the groundwater plume determination, as the result does not appear to be fuel related and RRO was not detected in any of the other groundwater samples.

While groundwater contamination (DRO, benzene, and EDB) was identified in a 2012 temporary well located south of the Haines Highway (25-TW4), there were no exceedances in any of the three wells located south of the highway in 2014; however, they were all located further from the gate valve.

5.8 Conceptual Site Model and Risk Evaluation

5.8.1 Human Health CSM

A Human Health CSM was prepared in accordance with ADEC's Policy Guidance on Developing Conceptual Site Models (ADEC, 2010b). Completed Human Health CSM forms are included in Appendix H. The following summarizes the Human Health CSM at the PMP 25.5 site.

Potential Contaminant Sources and Impacted Media
Potential contaminant sources at this site include potential releases from the gate valve and the HFP. The HFP has been out of service for 40 years and was drained of fuel and, therefore, does not represent a continuing source.

Data indicate that fuel releases resulted in contamination of subsurface soil and groundwater from petroleum contaminants including lead and lead scavengers. Groundwater contamination appears to have migrated away from the source area.

<u>Potential Sensitive Receptors and Exposure Scenarios</u>
Since the PMP 25.5 site is located within the Haines Highway ROW, current receptors include construction workers and local residents or tourists who may visit the site for recreational purposes.

Future land use scenarios could include either industrial or residential uses, although no current plans for either use are known at this time. Since the site is within the Haines Highway ROW, private industrial or residential use of the site is unlikely. The most conservative human health exposure scenario would be for residential use, which has been factored into the applicable cleanup levels identified for site COCs.

A private drinking water well is located approximately 700 feet south of Gate Valve #4. Reportedly this well is currently used as backup to a spring fed water source.

<u>Completed Exposure Pathways</u>
Due to the presence of subsurface soil contamination, soil ingestion, dermal absorption of contaminants, and inhalation of indoor/outdoor air are completed exposure pathways. Likewise, since contamination is present in groundwater, receptors may also be exposed to site contaminants through ingestion of, inhalation of volatiles from, or dermal absorption of groundwater.

The Chilkat River is located 500 feet downgradient from the site, but at this time does not appear to be in contact with contaminated groundwater. Wells installed between the source area and the river showed no evidence of contamination (with the exception of DRO/RRO in 25-MW1, which was indicated by the laboratory to not exhibit a fuel signature on the chromatogram). Due to the depth of groundwater at the site and distance from the contaminant plumes to the nearby surface water, dermal contact of surface water or river sediments are not completed exposure pathways.

5.8.2 Cumulative Risk Evaluation

The cumulative carcinogenic and noncarinogenic risks for the PMP 25.5 site were calculated using ADEC's Web-Based Method Three & Cumulative Risk Calculator. The calculation used the maximum concentrations of all analytes detected in 2014 soil and groundwater samples and the default total organic carbon (TOC) concentration (0.1%). Per ADEC guidance, petroleum ranges are not included in cumulative risk (ADEC, 2008).

Cumulative cancer risk for PMP 25.5 was calculated to be 7 x 10^{-4}, exceeding the benchmark of 2 x 10^{-5}. Additionally, the cumulative non-carcinogenic Hazard Index was 6 and above the threshold of 1. Groundwater contamination is responsible for the benchmark exceedances, as cumulative risks for soil contamination was quite low. The cumulative cancer risk was higher than determined in 2012, due the higher EDB groundwater concentration identified in 2014. The cumulative risk outputs from the ADEC calculator are included with the CSMs in Appendix H

5.8.3 Ecological Risk Evaluation

Ecological scoping was performed per the ADEC guidance document (ADEC, 2014) to determine if a more in-depth evaluation is required. No direct ecological impacts resulting from fuel releases, such as visibly stressed or dead biota, were identified at the site. The potential for ecological impact due to contact or ingestion of subsurface contaminated soils is considered to be low. A completed Ecoscoping Form for the PMP 25.5 site is included in Appendix I. Important findings of the ecoscoping process include:

- The PMP 25.5 site is approximately 2 miles upstream of the Chilkat River State Critical Habitat Area and adjacent the Alaska Chilkat Bald Eagle Preserve and is therefore considered critical habitat.
- One analyte (lead) that bioaccumulatives is present in groundwater but at a depth where it would not be in contact with sediments or surface water.
- Contaminated groundwater does not appear to be in contact with the Chilkat River; therefore, the aquatic exposure route is incomplete.
- Neither terrestrial nor aquatic exposure routes are complete due to depth and limited migration of contamination in both soil and groundwater.

Due to the lack of completed pathways to surface water and sediments and the depth and limited extent of contamination, further ecological assessment is not necessary at PMP 25.5.

5.9 Conclusion and Recommendations

Soil and groundwater contamination is present at the PMP 25.5 site in excess of ADEC cleanup levels. Soil contamination exists in the vicinity of the gate valve at depths between 9 and 27 feet bgs. Much of the soil contamination is presented within the smear zone and, likely, underlying the highway.

Groundwater contamination exceeding ADEC cleanup levels was limited to two wells. GRO, DRO, lead, and EDB were detected at concentrations exceeding cleanup levels in the well immediately adjacent the gate valve. A second well, located 100 feet west of the gate valve, had a RRO concentration exceeding the cleanup level; however, the result may not be fuel related. The groundwater plume is located over 400 feet from the Chilkat River and 600 feet from a private drinking water well located south of the gate valve. The groundwater plume does not appear to have significantly migrated and permanent monitoring wells are positioned to evaluate the potential for future contaminant migration.

The preferred alternative for a planned highway reconstruction project involves moving the highway to the north so that it would overlie the gate valve location and the bulk of the contaminated area. The majority of the soil contamination is within the saturated zone at depth greater than 23 feet and could not be feasibly excavated, particularly considering the proximity to the highway. However, some shallow subsurface soil contamination (probably less than 10 cy) could be removed along with the valve pit vault to reduce construction workers' exposure during highway improvements.

Groundwater geochemical data indicates that aerobic and anaerobic biodegradation are occurring at the site. Iron reduction appears to be the dominant biodegradation pathway. Additional groundwater sampling should be conducted to evaluate contaminant trends, the potential for contaminant migration, and the effectiveness of natural attenuation as a remedial option. In addition, the RRO exceedance that was identified in one well should be verified.

Groundwater contamination resulted in cumulative carcinogenic and noncarinogenic risks exceeding benchmark values. However, there is no current risk as the contaminated groundwater is not being used. Cumulative risks for direct contact and inhalation of soil contamination do not exceed acceptable levels and are further minimized due to the depth of soil contamination. A drinking water well is present on the property adjacent the valve pit. Although the well is not currently being used as a drinking water source, the potential exists for groundwater to be used in the area. However, as the well is located cross-gradient and approximately 700 feet from the gate valve, migration of contamination to the well is very unlikely.

An ecoscoping evaluation was completed for the site and no further ecological evaluation is necessary.

Table 5-3 Sample Summary
PMP 25.5
Haines-Fairbanks Pipeline FUDS

Sample ID	Location ID	Depth (ft bgs)	Sample Date	Sample Time	Sampler's Initials	Sample Type	Sample Matrix	BTEX (8260B) +1,2 DCA	GRO (AK101)	EDB (SW8011)	DRO/RRO (AK102/ AK103)	PAHs (8270D-SIM)	Total Lead (6020A)	Fe/Mn (6010B)	SO_4 (300.0)	Total NO_2/NO_3 as Nitrogen (353.2)	Associated Coolers	Sample Data Group
SOIL SAMPLE SUMMARY																		
14HF2501SO	25-BH0823	23	7/17/2014	1605	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2502SO	25-BH0905	5	7/17/2014	1815	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2503SO	25-BH0925	25	7/17/2014	1835	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2504SO	25-BH0928	28	7/17/2014	1900	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2505SO	25-BH09	28	7/17/2014	1910	CM/CB	Field Dup (-04SO)	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2506SO	25-BH1006	6	7/18/2014	935	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2507SO	25-BH1009	9	7/18/2014	940	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2508SO	25-BH1018	18	7/18/2014	955	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2509SO	25-BH10	18	7/18/2014	1005	CM/CB	Field Dup (-08SO)	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2510SO	25-BH1023	23	7/18/2014	1015	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2511SO	25-BH1031	31	7/18/2014	1025	CM/CB	Primary/MS/MSD	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2512SO	25-BH1114	14	7/18/2014	1145	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2513SO	25-BH1127	27	7/18/2014	1200	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2514SO	25-BH1212	12	7/18/2014	1250	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2515SO	25-BH1229	29	7/18/2014	1320	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2516SO	25-BH1327	27	7/18/2014	1445	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2517SO	25-BH1426	26	7/18/2014	1540	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2518SO	25-BH1525	25	7/18/2014	1650	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2519SO	25-BH1621	21	7/18/2014	1750	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2520SO	25-BH1712	12	7/18/2014	1855	CM/CB	Primary/MS/MSD	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
14HF2521SO	25-BH1732	32	7/18/2014	1930	CM/CB	Primary	Soil	X	X	X	X	X	X				FES-02, FES-01B	1143327, 280-58139
GROUNDWATER SAMPLE SUMMARY																		
14HF2501WG	25-MW1	NA	7/30/2014	1025	VR	Primary/MS/MSD	Groundwater	X	X	X	X	X	X	X	X	X	FES-26, 27, 28	1143514, 280-58493
14HF2502WG	25-MW2	NA	7/30/2014	1230	VR	Primary	Groundwater	X	X	X	X	X	X	X	X	X	FES-26, 27, 28	1143514, 280-58493
14HF2503WG	25-MW21	NA	7/30/2014	1240	VR	Field Dup (-02 WG)	Groundwater	X	X	X	X	X	X	X	X	X	FES-26, 27, 28	1143514, 280-58493
14HF2504WG	25-MW6	NA	7/30/2014	1645	VR	Primary	Groundwater	X	X	X	X	X	X	X	X	X	FES-26, 27, 29	1143514, 280-58493
14HF2506WG	25-MW5	NA	7/31/2014	1105	VR	Primary	Groundwater	X	X	X	X	X	X	X	X	X	FES-26, 27, 29	1143514, 280-58493
14HF2507WG	25-MW4	NA	7/31/2014	1230	VR	Primary	Groundwater	X	X	X	X	X	X	X	X	X	FES-26, 27, 29	1143514, 280-58493
14HF2508WG	25-MW3	NA	7/31/2014	1140	VR	Primary	Groundwater	X	X	X	X	X	X	X	X	X	FES-26, 27, 29	1143514, 280-58493
QUALITY CONTROL SAMPLES																		
Rinsates																		
14HF2505WG	Rinsate 2	NA	7/30/2014	1715	VR	Rinsate (Groundwater)	Water	X	X	X	X	X	X	X	X	X	FES-26, 27, 29	1143514, 280-58493
Trip Blanks																		
14HF2522SQ	Trip Blank	NA	7/17/2014	800	NA	Trip Blank	Soil	X	X								FES-02	1143327
14HF2509WQ	Trip Blank	NA	7/30/2014	800	NA	Trip Blank	Groundwater	X	X								FES-27	1143514
14HF2517WQ	Trip Blank	NA	7/30/2014	800	NA	Trip Blank	Groundwater			X							FES-26	280-58493

All samples except EDB were analyzed by SGS North America Inc, Alaska (standard turn-around time). NPDL #14-030.
EDB samples were analyzed by Test America, Denver

°C - degrees Celsius
CB - Chris Boese; CM - Craig Martin; VR - Vaness Ritchie
MS/MSD - matrix spike/matrix spike duplicate
NA - not applicable
HDPE - high density polyethylene
L - liter
mL - milliliter
VOA - volatile organic analysis
ft bgs - feet below ground surface

BTEX - Benzene, Toluene, Ethylbenzene, Total Xylenes
DRO - diesel range organics
RRO - residual range organics
GRO - gasoline range organics
1,2-DCA - 1,2-dichloroethane
EDB - 1,2-dibromoethane
Fe - iron
Mn - manganese
NO2/NO3 - nitrite/nitrate
PAHs - polynuclear aromatic hydrocarbons

Groundwater and Surface Water
BTEX+1,2-DCA - three HCl-preserved, 40 mL VOA vials
EDB - three Na2S2O3-preserved, 40 mL VOA vials
PAH - two non-preserved, 1L amber bottles
GRO - three HCl-preserved, 40 mL VOA vials
DRO/RRO - two HCl-preserved, 250 mL amber bottles
DRO/RRO SILICA GEL CLEANUP - two HCl-preserved, 1000 mL amber bottles
Lead - one HNO3-preserved, 250 mL HDPE bottle
Fe/Mn - one HNO3-preserved, 250 mL HDPE bottle, field-filtered
SO4 - one non-preserved, 250 mL HDPE bottle
NO2/NO3 - one H2SO4 preserved, 125 mL bottle

Soil and Sediment
Soil/Sediment Sample Collection (all samples were field-preserved at 4±2°C)
BTEX/GRO - one surrogated methanol-preserved, 4 oz amber jar
EDB - one non-preserved, 4 oz amber jar
PAH/DRO/RRO/Lead - one non-preserved, 8 oz jar

Table 5-4 Soil Sample Results
PMP 25.5
Haines-Fairbanks Pipeline FUDS

PMP 25.5 Haines-Fairbanks Pipeline FUDS			**Sample ID**	**14HF2501SO**	**14HF2502SO**	**14HF2503SO**	**14HF2504SO**	**14HF2505SO**	**14HF2506SO**	**14HF2507SO**	**14HF2508SO**
			Location ID	**25BH0823**	**25BH0905**	**25BH0925**	**25BH0928**	**25BH09**	**25BH1006**	**25BH1009**	**25BH1018**
			Sample Data Groups	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**
			Laboratory	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**
			Sample Type	**Primary**	**Primary**	**Primary**	**Primary**	**Field Duplicate**	**Primary**	**Primary**	**Primary**
			Collection Date	**7/17/2014**	**7/17/2014**	**7/17/2014**	**7/17/2014**	**7/17/2014**	**7/17/2014**	**7/18/2014**	**7/18/2014**
			Matrix	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Analyte	**Method[a]**	**Units**	***Cleanup Level[b]***	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**
Gasoline Range Organics	AK101	mg/Kg	*260*	0.762 [1.22] J,B	0.906 [1.27] J,B	**647 [14.3]**	23.6 [1.47]	29.3 [1.51]	1.03 [1.32] J,B	18.4 [1.31]	167 [2.75] QN
Diesel Range Organics	AK102	mg/Kg	*230*	ND [10.9]	ND [10.6]	**254 [11.1]**	17.9 [11.4] J	21.7 [11.4] J	ND [10.9]	**605 [10.9]**	**3160 [109]**
Residual Range Organics	AK103	mg/Kg	*8,300*	ND [10.9]	ND [10.6]	ND [11.1]	ND [11.4]	15.9 [11.4] J	8.41 [10.9] J	23.1 [10.9]	11.4 [10.9] J
Lead	SW6020A	mg/Kg	*400*	0.567 [0.102]	0.373 [0.0945]	0.741 [0.102]	0.689 [0.114]	1.1 [0.102]	0.645 [0.1]	14.1 [0.0955]	3.02 [0.108]
1,2-Dibromoethane	SW8011	mg/Kg	*0.00016*	ND [0.000054] QL	ND [0.000052] QL	ND [0.000059] QL	ND [0.000059] QL	ND [0.000058] QL	ND [0.000054]	ND [0.000057]	**0.0017 [0.000056]**
1,2-Dichloroethane	SW8260B	mg/Kg	*0.016*	ND [0.0122]	ND [0.0127]	ND [0.0143]	ND [0.0147]	ND [0.0151]	ND [0.0132]	ND [0.0131] QN	ND [0.0138]
Benzene	SW8260B	mg/Kg	*0.025*	ND [0.0061]	ND [0.0063]	ND [0.0072]	ND [0.0073]	ND [0.0075]	ND [0.0066]	ND [0.0066] QN	ND [0.0069]
Ethylbenzene	SW8260B	mg/Kg	*6.9*	ND [0.0122]	ND [0.0127]	0.285 [0.0143]	0.066 [0.0147]	0.0457 [0.0151]	ND [0.0132]	ND [0.0131] QN	ND [0.0138]
Toluene	SW8260B	mg/Kg	*6.5*	ND [0.0122]	ND [0.0127]	ND [0.0143]	ND [0.0147]	ND [0.0151]	ND [0.0132]	ND [0.0131] QN	ND [0.0138]
o-Xylene	SW8260B	mg/Kg	*63*	ND [0.0122]	ND [0.0127]	ND [0.0143]	0.0126 [0.0147] J	ND [0.0151]	ND [0.0132]	ND [0.0131] QN	ND [0.0138]
Xylene, Isomers m & p	SW8260B	mg/Kg		ND [0.0244]	ND [0.0255]	1.23 [0.0285]	0.306 [0.0294]	0.213 [0.0301]	ND [0.0264]	ND [0.0262] QN	ND [0.0276]
1-Methylnaphthalene	8270SIM	mg/Kg	*6.2*	ND [0.0027]	ND [0.0026]	0.172 [0.0281]	0.122 [0.0291]	0.117 [0.0291]	ND [0.0028]	ND [0.0027]	ND [0.0276]
2-Methylnaphthalene	8270SIM	mg/Kg	*6.1*	ND [0.0027]	ND [0.0026]	0.558 [0.0281]	0.32 [0.0291]	0.301 [0.0291]	ND [0.0028]	ND [0.0027]	ND [0.0276]
Acenaphthene	8270SIM	mg/Kg	*180*	ND [0.0027]	ND [0.0026]	ND [0.0028]	0.0051 [0.0029] J	0.005 [0.0029] J	ND [0.0028]	ND [0.0027]	ND [0.0276]
Acenaphthylene	8270SIM	mg/Kg	*180*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0276]
Anthracene	8270SIM	mg/Kg	*3,000*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0276]
Benzo(a)anthracene	8270SIM	mg/Kg	*3.6*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0028]
Benzo(a)pyrene	8270SIM	mg/Kg	*0.4*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0028]
Benzo(b)fluoranthene	8270SIM	mg/Kg	*4*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0028]
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*1,100*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0028]
Benzo(k)fluoranthene	8270SIM	mg/Kg	*40*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0028]
Chrysene	8270SIM	mg/Kg	*360*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0028]
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.4*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0028]
Fluoranthene	8270SIM	mg/Kg	*1,400*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0028]
Fluorene	8270SIM	mg/Kg	*220*	ND [0.0027]	ND [0.0026]	0.0305 [0.0028]	0.012 [0.0029]	0.0124 [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0276]
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*4*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	ND [0.0028]
Naphthalene	8270SIM	mg/Kg	*20*	ND [0.0027]	ND [0.0026]	0.0587 [0.0028]	0.113 [0.0291]	0.123 [0.0029]	ND [0.0028]	ND [0.0027]	0.303 [0.0276] QN
Phenanthrene	8270SIM	mg/Kg	*3,000*	ND [0.0027]	ND [0.0026]	0.0153 [0.0028]	0.0038 [0.0029] J	0.0042 [0.0029] J	ND [0.0028]	ND [0.0027]	ND [0.0276]
Pyrene	8270SIM	mg/Kg	*1,000*	ND [0.0027]	ND [0.0026]	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0028]	ND [0.0027]	0.0031 [0.0028] J
Total Solids	A2540G	Percent	*NA*	91.9	94	88.7	86.6	87.3	91.5	91.6	91.4

Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

Gray highlighted results had LODs that were greater than associated cleanup levels.

[a] Method SW8011 was performed by TA, all other analyses were performed by SGS.

[b] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

ADEC - Alaska Department of Environmental Conservation
LOD - limit of detection
LOQ - limit of quantitation
mg/Kg - milligrams per kilogram
SGS - SGS North America Inc. of Anchorage Alaska.
TA - Test America Laboratories Inc. of Arvada, Colorado.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ.
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 5-4 Soil Sample Results
PMP 25.5
Haines-Fairbanks Pipeline FUDS

PMP 25.5 Haines-Fairbanks Pipeline FUDS			**Sample ID**	**14HF2509SO**	**14HF2510SO**	**14HF2511SO**	**14HF2512SO**	**14HF2513SO**	**14HF2514SO**	**14HF2515SO**
			Location ID	**25BH10**	**25BH1023**	**25BH1031**	**25BH1114**	**25BH1127**	**25BH1212**	**25BH1229**
			Sample Data Groups	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**
			Laboratory	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**
			Sample Type	**Field Duplicate**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**
			Collection Date	**7/18/2014**	**7/18/2014**	**7/18/2014**	**7/18/2014**	**7/18/2014**	**7/18/2014**	**7/18/2014**
			Matrix	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**
Analyte	**Method[a]**	**Units**	***Cleanup Level[b]***	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**
Gasoline Range Organics	AK101	mg/Kg	*260*	**316 [12.3] QN**	124 [2.35] QH	5.18 [1.98] B	**875 [12.1]**	**540 [155]**	1.23 [1.24] J,B	8.78 [1.34] B
Diesel Range Organics	AK102	mg/Kg	*230*	**3290 [107]**	**5020 [220]**	ND [11.9]	**3340 [106]**	**2570 [117]**	7.91 [10.5] J,B	15.8 [10.8] J,B
Residual Range Organics	AK103	mg/Kg	*8,300*	8.97 [10.7] J	9.2 [11] J	ND [11.9]	ND [10.6]	104 [117] J	ND [10.5]	ND [10.8]
Lead	SW6020A	mg/Kg	*400*	2.12 [0.104]	3.8 [0.11]	0.476 [0.109]	5.73 [0.105]	2.93 [0.109]	0.497 [0.103]	0.545 [0.109]
1,2-Dibromoethane	SW8011	mg/Kg	*0.00016*	**0.0019 [0.00027]**	**0.015 [0.0014]**	ND [0.000058]	0.000018 [0.000055] J	**0.00062 [0.000059]**	ND [0.000054]	ND [0.000056]
1,2-Dichloroethane	SW8260B	mg/Kg	*0.016*	ND [0.0123]	ND [0.0117]	ND [0.0198]	ND [0.0121]	ND [0.0309]	ND [0.0124]	ND [0.0134]
Benzene	SW8260B	mg/Kg	*0.025*	ND [0.0062]	ND [0.0059]	ND [0.0098]	ND [0.006]	ND [0.0155]	ND [0.0062]	ND [0.0067]
Ethylbenzene	SW8260B	mg/Kg	*6.9*	ND [0.0123]	0.064 [0.0117]	ND [0.0198]	ND [0.0121]	3.46 [0.0309]	ND [0.0124]	ND [0.0134]
Toluene	SW8260B	mg/Kg	*6.5*	ND [0.0123]	0.0223 [0.0117] J	ND [0.0198]	ND [0.0121]	0.109 [0.0309]	ND [0.0124]	ND [0.0134]
o-Xylene	SW8260B	mg/Kg	*63*	ND [0.0123]	0.205 [0.0117]	ND [0.0198]	ND [0.0121]	6.66 [0.155]	ND [0.0124]	ND [0.0134]
Xylene, Isomers m & p	SW8260B	mg/Kg		ND [0.0246]	0.131 [0.0234]	ND [0.0395]	ND [0.0241]	15.8 [0.31]	ND [0.0248]	ND [0.0268]
1-Methylnaphthalene	8270SIM	mg/Kg	*6.2*	ND [0.0265]	4.75 [0.274]	0.0028 [0.0029] J	ND [0.0266]	**11 [0.58]**	ND [0.0026]	0.0053 [0.0027] J
2-Methylnaphthalene	8270SIM	mg/Kg	*6.1*	ND [0.0265]	**6.26 [0.274]**	0.0039 [0.0029] J	ND [0.0266]	**17.2 [0.58]**	ND [0.0026]	0.0095 [0.0027]
Acenaphthene	8270SIM	mg/Kg	*180*	ND [0.0265]	0.146 [0.0274]	ND [0.0029]	ND [0.0266]	0.162 [0.029]	ND [0.0026]	ND [0.0027]
Acenaphthylene	8270SIM	mg/Kg	*180*	ND [0.0265]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Anthracene	8270SIM	mg/Kg	*3,000*	ND [0.0265]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Benzo(a)anthracene	8270SIM	mg/Kg	*3.6*	ND [0.0027]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Benzo(a)pyrene	8270SIM	mg/Kg	*0.4*	ND [0.0027]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Benzo(b)fluoranthene	8270SIM	mg/Kg	*4*	ND [0.0027]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*1,100*	ND [0.0027]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Benzo(k)fluoranthene	8270SIM	mg/Kg	*40*	ND [0.0027]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Chrysene	8270SIM	mg/Kg	*360*	ND [0.0027]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.4*	ND [0.0027]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Fluoranthene	8270SIM	mg/Kg	*1,400*	ND [0.0027]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Fluorene	8270SIM	mg/Kg	*220*	ND [0.0265]	0.177 [0.0274]	ND [0.0029]	ND [0.0266]	0.322 [0.029]	ND [0.0026]	0.002 [0.0027] J
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*4*	ND [0.0027]	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Naphthalene	8270SIM	mg/Kg	*20*	ND [0.0265] QN	2.62 [0.274]	0.002 [0.0029] J	ND [0.0266]	6.32 [0.58]	ND [0.0026]	ND [0.0027]
Phenanthrene	8270SIM	mg/Kg	*3,000*	ND [0.0265]	0.0699 [0.0274]	ND [0.0029]	ND [0.0266]	0.122 [0.029]	ND [0.0026]	ND [0.0027]
Pyrene	8270SIM	mg/Kg	*1,000*	0.003 [0.0027] J	ND [0.0274]	ND [0.0029]	ND [0.0266]	ND [0.029]	ND [0.0026]	ND [0.0027]
Total Solids	A2540G	Percent	*NA*	92.5	89.9	84.4	93.5	85.7	94.7	91.3

Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

Gray highlighted results had LODs that were greater than associated cleanup levels.

[a] Method SW8011 was performed by TA, all other analyses were performed by SGS.

[b] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

ADEC - Alaska Department of Environmental Conservation
LOD - limit of detection
LOQ - limit of quantitation
mg/Kg - milligrams per kilogram
SGS - SGS North America Inc. of Anchorage Alaska.
TA - Test America Laboratories Inc. of Arvada, Colorado.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ.
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 5-4 Soil Sample Results
PMP 25.5
Haines-Fairbanks Pipeline FUDS

PMP 25.5 Haines-Fairbanks Pipeline FUDS			**Sample ID**	**14HF2516SO**	**14HF2517SO**	**14HF2518SO**	**14HF2519SO**	**14HF2520SO**	**14HF2521SO**	**14HF2522SQ**
			Location ID	**25BH1327**	**25BH1426**	**25BH1525**	**25BH1621**	**25BH1712**	**25BH1732**	**Trip Blank**
			Sample Data Groups	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327 280-58139**	**1143327**
			Laboratory	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS/TA[b]**	**SGS**
			Sample Type	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Primary**	**Trip Blank**
			Collection Date	**7/18/2014**	**7/18/2014**	**7/18/2014**	**7/18/2014**	**7/18/2014**	**7/18/2014**	**7/17/2014**
			Matrix	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Solid**
Analyte	**Method[a]**	**Units**	***Cleanup Level [b]***	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**	**Result LOD Qualifier**
Gasoline Range Organics	AK101	mg/Kg	*260*	1.12 [1.3] J,B	0.669 [0.965] J,B	0.935 [1.38] J,B	1.58 [1.53] J,B	1.43 [1.17] J,B	1.09 [1.4] J,B	1.3 [1.27] J
Diesel Range Organics	AK102	mg/Kg	*230*	8.43 [11.3] J,B	8.66 [11.7] J,B	7.67 [11.8] J,B	7.38 [11.7] J,B	9.17 [10.5] J,B	8.51 [11.3] J,B	-
Residual Range Organics	AK103	mg/Kg	*8,300*	11.4 [11.3] J,B	17 [11.7] J,B	ND [11.8]	12.7 [11.7] J,B	17.8 [10.5] J,B	18.2 [11.3] J,B	-
Lead	SW6020A	mg/Kg	*400*	0.477 [0.108]	0.466 [0.116]	0.464 [0.107]	0.488 [0.115]	0.367 [0.106]	0.349 [0.11]	-
1,2-Dibromoethane	SW8011	mg/Kg	*0.00016*	ND [0.000056]	ND [0.000057]	ND [0.000057]	ND [0.000060]	ND [0.000052]	ND [0.000057]	-
1,2-Dichloroethane	SW8260B	mg/Kg	*0.016*	ND [0.013]	ND [0.0097]	ND [0.0138]	ND [0.0153]	ND [0.0117]	ND [0.0139]	ND [0.0127]
Benzene	SW8260B	mg/Kg	*0.025*	ND [0.0065]	ND [0.0048]	ND [0.0069]	ND [0.0076]	ND [0.0059]	ND [0.007]	ND [0.0063]
Ethylbenzene	SW8260B	mg/Kg	*6.9*	ND [0.013]	ND [0.0097]	ND [0.0138]	ND [0.0153]	ND [0.0117]	ND [0.0139]	ND [0.0127]
Toluene	SW8260B	mg/Kg	*6.5*	ND [0.013]	ND [0.0097]	ND [0.0138]	ND [0.0153]	ND [0.0117]	ND [0.0139]	ND [0.0127]
o-Xylene	SW8260B	mg/Kg	*63*	ND [0.013]	ND [0.0097]	ND [0.0138]	ND [0.0153]	ND [0.0117]	ND [0.0139]	ND [0.0127]
Xylene, Isomers m & p	SW8260B	mg/Kg		ND [0.026]	ND [0.0193]	ND [0.0275]	ND [0.0307]	ND [0.0234]	ND [0.0279]	ND [0.0254]
1-Methylnaphthalene	8270SIM	mg/Kg	*6.2*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
2-Methylnaphthalene	8270SIM	mg/Kg	*6.1*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Acenaphthene	8270SIM	mg/Kg	*180*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Acenaphthylene	8270SIM	mg/Kg	*180*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Anthracene	8270SIM	mg/Kg	*3,000*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Benzo(a)anthracene	8270SIM	mg/Kg	*3.6*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Benzo(a)pyrene	8270SIM	mg/Kg	*0.4*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Benzo(b)fluoranthene	8270SIM	mg/Kg	*4*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Benzo(g,h,i)perylene	8270SIM	mg/Kg	*1,100*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Benzo(k)fluoranthene	8270SIM	mg/Kg	*40*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Chrysene	8270SIM	mg/Kg	*360*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Dibenzo(a,h)anthracene	8270SIM	mg/Kg	*0.4*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Fluoranthene	8270SIM	mg/Kg	*1,400*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Fluorene	8270SIM	mg/Kg	*220*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Indeno(1,2,3-cd)pyrene	8270SIM	mg/Kg	*4*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Naphthalene	8270SIM	mg/Kg	*20*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Phenanthrene	8270SIM	mg/Kg	*3,000*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Pyrene	8270SIM	mg/Kg	*1,000*	ND [0.0028]	ND [0.0029]	ND [0.0029]	ND [0.0029]	ND [0.0026]	ND [0.0253]	-
Total Solids	A2540G	Percent	*NA*	88.6	85.3	84.8	85.3	95	88.3	-

Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

Gray highlighted results had LODs that were greater than associated cleanup levels.

[a] Method SW8011 was performed by TA, all other analyses were performed by SGS.

[b] Soil cleanup levels are the most stringent Method Two (Over 40-inch Zone) level from ADEC Title 18 Alaska Administrative Code, 75.341, Tables B1 and B2.

ADEC - Alaska Department of Environmental Conservation
LOD - limit of detection
LOQ - limit of quantitation
mg/Kg - milligrams per kilogram
SGS - SGS North America Inc. of Anchorage Alaska.
TA - Test America Laboratories Inc. of Arvada, Colorado.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ.
ND - analyte not detected
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 5-5 Groundwater Field Parameters and COC Concentrations
PMP 25.5
Haines-Fairbanks Pipeline

Field Parameters										Geochemical Results				Contaminants of Concern						
Well ID	**Sample ID**	**Sample Date**	**Well Drawdown (feet)**	**Temp. (°C)**	**Conductivity (μS/cm)**	**DO (mg/L)**	**pH**	**ORP (millivolts)**	**Turbidity (NTU)**	**Sulfate (mg/L)**	**Total NO_2/NO_3 as N (mg/L)**	**Fe (mg/L)**	**Mn (mg/L)**	**DRO (mg/L)**	**GRO (mg/L)**	**RRO (mg/L)**	**Benzene (mg/L)**	**EDB (mg/L)**	**2-Methyl (mg/L)**	**Total Lead (mg/L)**
ADEC Cleanup Levels (Table C of Title 18 Alaska Administrative Code, Chapter 75.345)														**1.5**	**2.2**	**1.1**	**0.005**	**0.00005**	**0.15**	**0.015**
25-MW1	14HF2501WG	7/30/2014	0.07	8.87	0.961	0.53	6.46	75	5.3	6.74	0.085 J	3.04	1.44	1.28	0.074 J	**3.96**	ND(0.0002)	ND(0.00001)	ND(0.0000272)	0.0005 J
25-MW2	14HF2502WG	7/30/2014	0.06	7.59	1.122	0.79	6.29	50	6.5	11.2	ND(0.05)	46	6.49	**13.4**	**4.35** [1]	ND(0.257)	0.00034	**0.03**	0.093 [1]	**0.0822** [1]
25-MW3	14HF2508WG	7/31/2014	0.08	11.7	0.813	5.27	6.48	126.6	7.3	6.94	4.3	ND(0.25)	0.0392	0.392 J,B	0.05 J,B	0.267 J	ND(0.0002)	ND(0.000099)	ND(0.0000267)	ND(0.0005)
25-MW4	14HF2507WG	7/31/2014	0.27	8.5	1.721	1.45	6.12	88.1	5.4	9.56	0.664	1.46	0.795	0.519 J	0.0672 J	ND(0.265)	ND(0.0002)	ND(0.000099)	0.000252	ND(0.0005)
25-MW5	14HF2506WG	7/31/2014	0.10	8.39	1.669	3.12	6.35	97.5	22	9.16	2.43	ND(0.25)	0.333	0.471 J	0.0321 J	ND(0.264)	ND(0.0002)	ND(0.000099)	0.0000468 J	ND(0.0005)
25-MW6	14HF2504WG	7/30/2014	0.05	7.17	0.905	1.38	6.36	43	0.8	6.71	0.0415 J	1.78	0.348	0.332 J,B	ND(0.05)	ND(0.263)	ND(0.0002)	ND(0.000099)	0.0000448 J	ND(0.0005)

Note: Yellow highligned and **bolded** values meet or exceed ADEC Table C groundwater cleanup levels.

[1] Field Duplicate result shown when it exceeded primary result.

°C - degree Celsius
DO - dissolved oxygen
DRO - diesel range organics
EDB - 1,2-dibromoethane
GRO - gasoline range organics
Fe - iron
LOD - limit of detection
LOQ - limit of quantitation

μS/cm - microsiemens per centimeter
2-Methyl - 2-methylnaphthalene
mg/L - milligrams per liter
Mn - manganese
NTU - Nephelometer turbidity units
NO_2/NO_3 as N - nitrite/nitrate as nitrogen
ORP - oxidation reduction potential

Data Qualifiers:
J - result qualified as an estimate because it is less than the LOQ
ND - analyte not detected (LOD provided in parenthesis)
Q - result considered an estimate (biased L-low; H-high; N-unknown) due to a quality control failure

Table 5-6 Groundwater Sample Results
PMP 25.5
Haines-Fairbanks Pipeline FUDS

PMP 25.5 Haines-Fairbanks Pipeline FUDS			Sample ID	14HF2501WG	14HF2502WG	14HF2503WG	14HF2504WG	14HF2505WQ	14HF2506WG	14HF2507WG	14HF2508WG	14HF2509WQ
			Location ID	25-MW1	25-MW2	25-MW21	25-MW6	Rinsate 2	25-MW5	25-MW4	25-MW3	Trip Blank
			Sample Data Groups	1143514 280-58493	1143514 280-58493	1143514 280-58493	1143514 280-58493	1143514 280-58493	1143514 280-58493	1143514 280-58493	1143514 280-58493	1143514
			Laboratory	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS/TA[b]	SGS
			Sample Type	Primary	Primary	Field Duplicate	Primary	Rinsate	Primary	Primary	Primary	Trip Blank
			Collection Date	7/30/2014	7/30/2014	7/30/2014	7/30/2014	7/30/2014	7/30/2014	7/31/2014	7/31/2014	7/30/2014
			Matrix	Groundwater	Groundwater	Groundwater	Groundwater	Water	Groundwater	Groundwater	Groundwater	Water
Analyte	**Method[a]**	**Units**	***Cleanup Level[b]***	**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**
Gasoline Range Organics	AK101	mg/L	*2.2*	0.074 [0.05] J	**4.31 [0.5]**	**4.35 [0.5]**	ND [0.05]	0.0539 [0.05] J	0.0321 [0.05] J	0.0672 [0.05] J	0.05 [0.05] J,B	0.0313 [0.05] J
Diesel Range Organics	AK102	mg/L	*1.5*	1.28 [0.306]	**13.4 [0.309]**	**12.4 [0.324]**	0.332 [0.315] J,B	0.407 [0.303] J	0.471 [0.317] J	0.519 [0.318] J	0.392 [0.315] J,B	-
Residual Range Organics	AK103	mg/L	*1.1*	**3.96 [0.255]**	ND [0.257]	ND [0.27]	ND [0.263]	ND [0.253]	ND [0.264]	ND [0.265]	0.267 [0.263] J	-
Sulfate	E300.0	mg/L	*NA*	6.74 [0.25]	11.2 [0.05]	8.32 [0.25]	6.71 [0.25]	ND [0.05]	9.16 [0.250]	9.56 [0.25]	6.94 [0.25]	-
Nitrogen, Nitrate-Nitrite	A4500F	mg/L	*NA*	0.085 [0.05] J	ND [0.05]	ND [0.05]	0.0415 [0.05] J	ND [0.05]	2.43 [0.05]	0.664 [0.05]	4.3 [0.05]	-
Iron	SW6020A	mg/L	*NA*	3.04 [0.25]	46 [0.25]	42.1 [0.25]	1.78 [0.25]	ND [0.25]	ND [0.25]	1.46 [0.25]	ND [0.25]	-
Manganese	SW6020A	mg/L	*NA*	1.44 [0.001]	6.49 [0.01]	6.29 [0.01]	0.348 [0.001]	0.0029 [0.001]	0.333 [0.001]	0.795 [0.001]	0.0392 [0.001]	-
Lead	SW6020A	mg/L	*0.015*	0.0005 [0.0005] J	**0.0757 [0.0005]**	**0.0822 [0.0005]**	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	-
1,2-Dibromoethane[b]	SW8011	mg/L	*0.00005*	ND(0.00001)	**0.03 [0.0001]**	**0.028 [0.00099]**	ND [0.0000099]	ND [0.0000099]	ND [0.0000099]	ND [0.0000099]	ND [0.0000099]	ND [0.00001]
1,2-Dichloroethane	SW8260B	mg/L	*0.005*	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]	ND [0.00025]
Benzene	SW8260B	mg/L	*0.005*	ND [0.0002]	0.0034 [0.0002]	0.00299 [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]	ND [0.0002]
Ethylbenzene	SW8260B	mg/L	*0.70*	ND [0.0005]	0.227 [0.01]	0.22 [0.01]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
o-Xylene	SW8260B	mg/L	*10*	ND [0.0005]	0.423 [0.01]	0.427 [0.01]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]	ND [0.0005]
Toluene	SW8260B	mg/L	*1*	0.00074 [0.0005] J,MH	0.634 [0.01]	0.63 [0.01]	ND [0.0005]	0.0004 [0.0005] J	0.00043 [0.0005] J	ND [0.0005]	0.00035 [0.0005] J,B	ND [0.0005]
Xylene, Isomers m & p	SW8260B	mg/L	*NA*	ND [0.001]	0.837 [0.02]	0.852 [0.02]	ND [0.001]	ND [0.001]	ND [0.001]	0.00379 [0.001]	ND [0.001]	ND [0.001]
1-Methylnaphthalene	8270SIM	mg/L	*0.15*	ND [0.0000272]	0.0407 [0.00057]	0.0502 [0.0013]	0.0000245 [0.0000278] J	ND [0.0000278]	0.0000323 [0.0000274] J	0.0000501 [0.0000543] J	ND [0.0000267]	-
2-Methylnaphthalene	8270SIM	mg/L	*0.15*	ND [0.0000272]	0.0789 [0.0057]	0.093 [0.0013]	0.0000448 [0.0000278] J	ND [0.0000278]	0.0000468 [0.0000274] J	0.000252 [0.0000543]	ND [0.0000267]	-
Acenaphthene	8270SIM	mg/L	*2.2*	ND [0.0000272]	0.00053 [0.00057] J	ND [0.0013]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Acenaphthylene	8270SIM	mg/L	*2.2*	ND [0.0000272]	ND [0.00057]	ND [0.0013]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Anthracene	8270SIM	mg/L	*11*	ND [0.0000272]	ND [0.00057]	ND [0.0013]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Benzo(a)anthracene	8270SIM	mg/L	*0.0012*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Benzo(a)pyrene	8270SIM	mg/L	*0.0002*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Benzo(b)fluoranthene	8270SIM	mg/L	*0.0012*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Benzo(g,h,i)perylene	8270SIM	mg/L	*1.1*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	0.0000382 [0.0000278] J	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Benzo(k)fluoranthene	8270SIM	mg/L	*0.012*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	0.0000192 [0.0000278] J	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Chrysene	8270SIM	mg/L	*0.12*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Dibenzo(a,h)anthracene	8270SIM	mg/L	*0.0001*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	0.0000254 [0.0000278] J	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Fluoranthene	8270SIM	mg/L	*1.5*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Fluorene	8270SIM	mg/L	*1.5*	ND [0.0000272]	0.000923 [0.00057] J	0.000986 [0.0013] J	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Indeno(1,2,3-cd)pyrene	8270SIM	mg/L	*0.0012*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Naphthalene	8270SIM	mg/L	*0.73*	ND [0.0000272]	0.146 [0.0114]	0.173 [0.0133]	0.000134 [0.0000555]	0.000393 [0.0000555] J	0.000109 [0.000055] J	0.000506 [0.0000545]	ND [0.0000267]	-
Phenanthrene	8270SIM	mg/L	*11*	ND [0.0000272]	ND [0.00057]	ND [0.0013]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-
Pyrene	8270SIM	mg/L	*1.1*	ND [0.0000272]	ND [0.0000284]	ND [0.0000266]	ND [0.0000278]	ND [0.0000278]	ND [0.0000274]	ND [0.0000272]	ND [0.0000267]	-

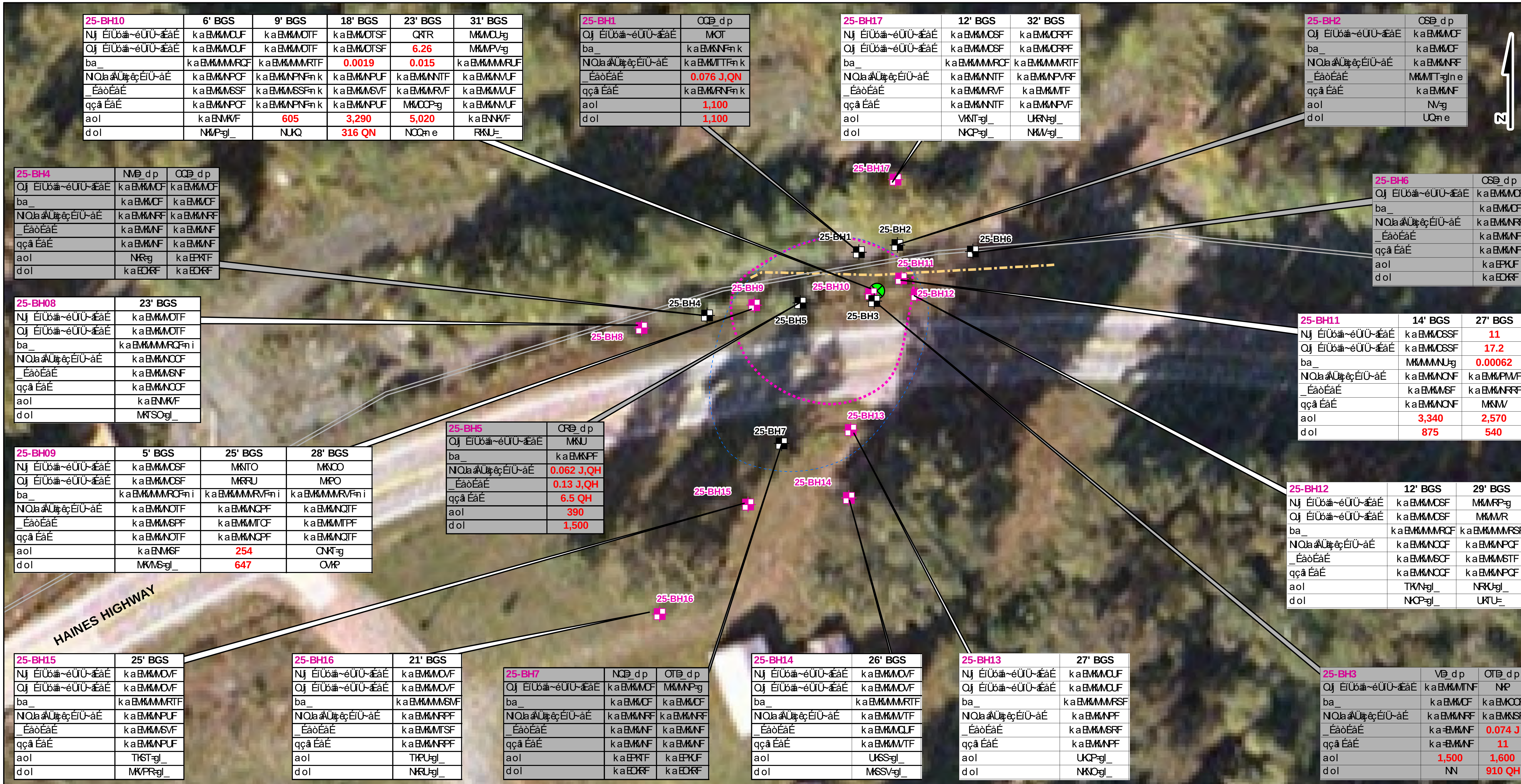
Yellow highlighted and **bolded** results exceed listed ADEC cleanup levels.

[a] Method SW8011 was performed by TA, all other analyses were performed by SGS.

[b] Groundwater cleanup levels are from ADEC Title 18 Alaska Administrative Code, Chapter 75.345, Table C.

ADEC - Alaska Department of Environmental Conservation
LOD - limit of detection
LOQ - limit of quantitation
mg/L - milligrams per liter
SGS - SGS North America Inc. of Anchorage Alaska.
TA - Test America Laboratories Inc. of Arvada, Colorado.

Data Qualifiers:
B - analyte was also detected in a blank; result may be due to cross-contamination
J - result qualified as an estimate because it is less than the LOQ
M - result considered an estimate (biased L-low; H-high; N-unknown) dut to matrix issues
ND - analyte not detected



Cleanup Levels

Analyte | 18 AAC 75

Contaminant Concentrations in Soil Samples

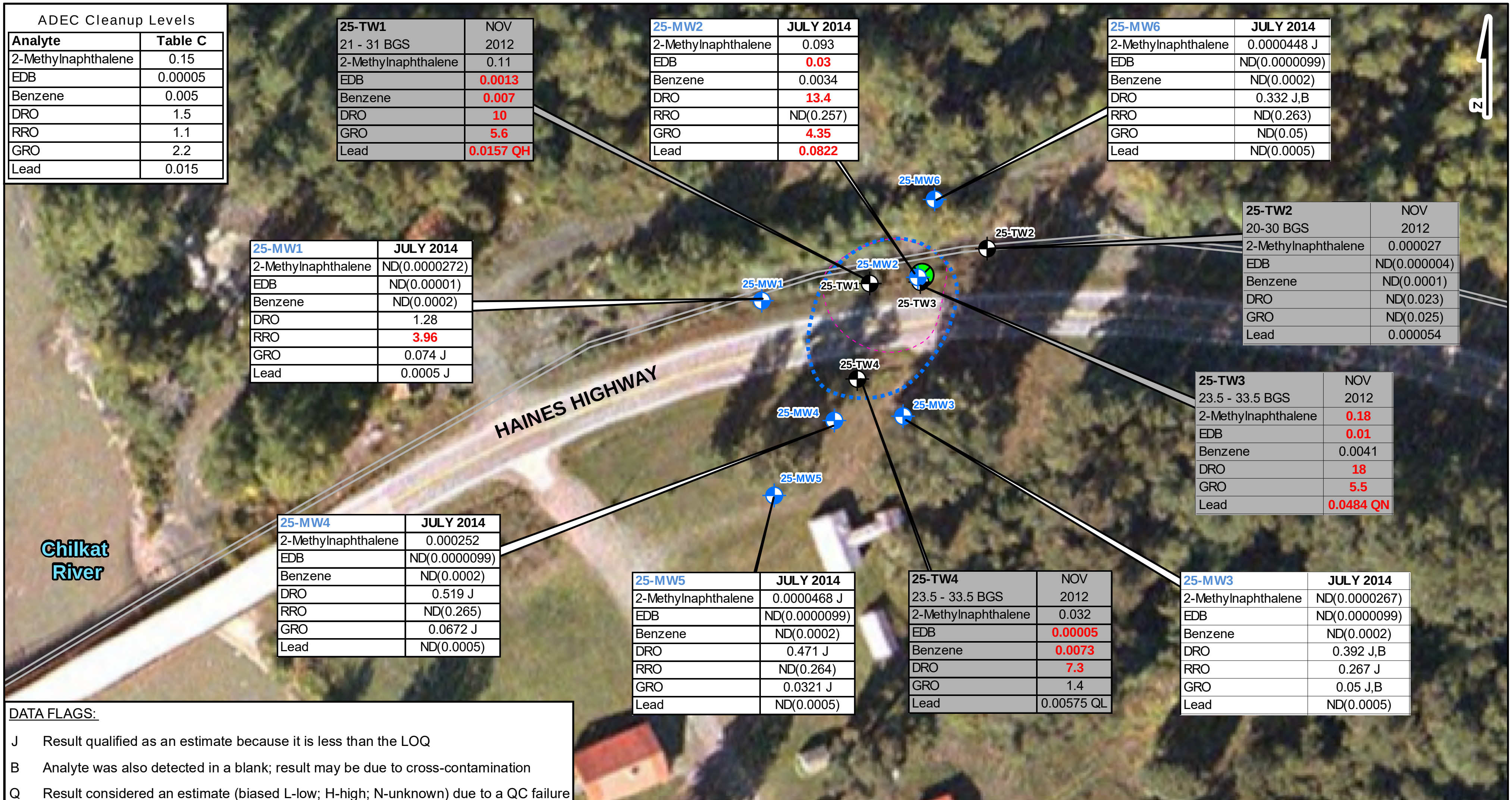
NOTES:

1. Groundwater Elevation Contours were drawn in Surfer v.10 using groundwater elevations collected on July 30, 2014.
2. The inset map uses two surface river elevations surveyed in 2014 in addition to the six monitoring wells.
3. The pipeline is digitized based on the aerial imagery and previous mapping (ENSR 2006, DOWL 2006).
4. Coordinate System - Projection: UTM Zone 8N, meters (shown in feet); Horizontal Datum: WGS84. Vertical Datum: NAVD88, feet.
5. Imagery provided by Aero-Metric, 2004.

Fairbanks Environmental Services 3538 International Street Fairbanks, AK 99701	Alaska District U.S. Army Corps of Engineers Anchorage, AK

2014 Groundwater Elevation Contours
Pipeline Milepost 25.5
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS Alaska
Project #: F10AK1016-03

Contract: W911KB-12-D-0001, TO29	Figure: 5-2	Date: 12/14



ADEC Cleanup Levels

Analyte	Table C
2-Methylnaphthalene	0.15
EDB	0.00005
Benzene	0.005
DRO	1.5
RRO	1.1
GRO	2.2
Lead	0.015

25-TW1	NOV
21 - 31 BGS	2012
2-Methylnaphthalene	0.11
EDB	0.0013
Benzene	0.007
DRO	10
GRO	5.6
Lead	0.0157 QH

25-MW2	JULY 2014
2-Methylnaphthalene	0.093
EDB	0.03
Benzene	0.0034
DRO	13.4
RRO	ND(0.257)
GRO	4.35
Lead	0.0822

25-MW6	JULY 2014
2-Methylnaphthalene	0.0000448 J
EDB	ND(0.0000099)
Benzene	ND(0.0002)
DRO	0.332 J,B
RRO	ND(0.263)
GRO	ND(0.05)
Lead	ND(0.0005)

25-TW2	NOV
20-30 BGS	2012
2-Methylnaphthalene	0.000027
EDB	ND(0.000004)
Benzene	ND(0.0001)
DRO	ND(0.023)
GRO	ND(0.025)
Lead	0.000054

25-MW1	JULY 2014
2-Methylnaphthalene	ND(0.0000272)
EDB	ND(0.00001)
Benzene	ND(0.0002)
DRO	1.28
RRO	3.96
GRO	0.074 J
Lead	0.0005 J

25-TW3	NOV
23.5 - 33.5 BGS	2012
2-Methylnaphthalene	0.18
EDB	0.01
Benzene	0.0041
DRO	18
GRO	5.5
Lead	0.0484 QN

25-MW4	JULY 2014
2-Methylnaphthalene	0.000252
EDB	ND(0.0000099)
Benzene	ND(0.0002)
DRO	0.519 J
RRO	ND(0.265)
GRO	0.0672 J
Lead	ND(0.0005)

25-MW5	JULY 2014
2-Methylnaphthalene	0.0000468 J
EDB	ND(0.0000099)
Benzene	ND(0.0002)
DRO	0.471 J
RRO	ND(0.264)
GRO	0.0321 J
Lead	ND(0.0005)

25-TW4	NOV
23.5 - 33.5 BGS	2012
2-Methylnaphthalene	0.032
EDB	0.00005
Benzene	0.0073
DRO	7.3
GRO	1.4
Lead	0.00575 QL

25-MW3	JULY 2014
2-Methylnaphthalene	ND(0.0000267)
EDB	ND(0.0000099)
Benzene	ND(0.0002)
DRO	0.392 J,B
RRO	0.267 J
GRO	0.05 J,B
Lead	ND(0.0005)

DATA FLAGS:

J Result qualified as an estimate because it is less than the LOQ

B Analyte was also detected in a blank; result may be due to cross-contamination

Q Result considered an estimate (biased L-low; H-high; N-unknown) due to a QC failure

NOTES:

1. 2012 groundwater results shown in gray scale.
2. Wells installed in 2012 were temporary wells. They were decommissioned after the site investigation.
3. Concentrations are in milligrams per Liter (mg/L).
4. The highest result is shown when field duplicates were analyzed.
5. The pipeline is digitized based on the aerial imagery and previous mapping (ENSR 2006, DOWL 2006).
6. Coordinate System - Projection: UTM Zone 8N, meters (shown in feet); Horizontal Datum: WGS84. Vertical Datum: NAVD88, feet.
7. Imagery provided by Aero-Metric, 2004.

LEGEND:

25-MW1 Monitoring Well Installed in 2014

25-TW1 Temporary Monitoring Well - Installed and Decommissioned in 2012

Gate Valve #4

Pipeline (Approximate)

Estimated Extent of Groundwater Contamination

Estimated Extent of Soil Contamination

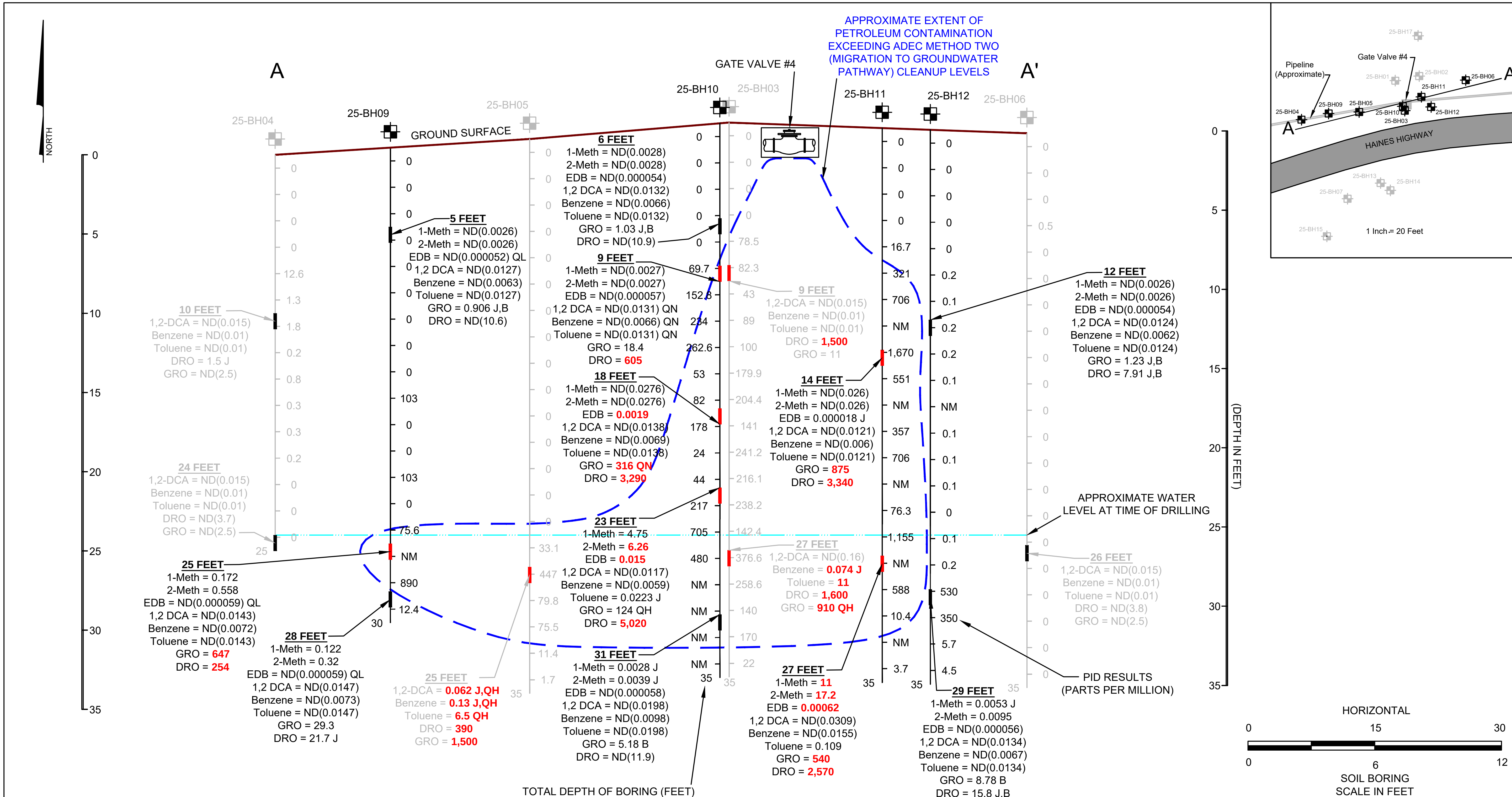
0 45 90 180 Feet

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

Contaminant Concentrations in Groundwater Samples
Pipeline Milepost 25.5
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS Alaska
Project #: F10AK1016-03

Contract: W911KB-12-D-0001, TO29 | Figure: 5-3 | Date: 12/14



LEGEND:

25-BH09	Soil Boring	Q	Result is estimated (L - Low; H - High ; N - Neutral) due to Quality Control failure	2-Meth	2-Methylnaphthalene
(red)	Lab Sample Interval with at least one analyte exceedance	B	Analyte was also detected in a blank; result may be due to cross-contamination	1,2 DCA	1,2 Dichloroethane
(black)	Lab Sample Interval with no analyte exceedances	PID	Photoionization Detector	EDB	1,2 Dibromoethane
J	Result is estimated because it was reported below LOQ	mg/Kg	Milligrams per Kilogram		
		1-Meth	1-Methylnaphthalene		

NOTES:

1. Concentrations are in mg/Kg
2. Concentrations exceeding ADEC Method Two (Migration to Groundwater) cleanup levels are shown in RED.
3. The highest result is shown when field duplicates were analyzed.
4. Grayscale results are from 2012.
5. Vertical Scale only applies to the boring depths. Ground surface elevations are based on the horizontal scale.

ADEC CLEANUP LEVELS (>40 inch zone):

Analyte	Method Two (Migration to Groundwater) mg/Kg
1-Methylnaphthalene	6.2
2-Methylnaphthalene	6.1
EDB	0.00016
1,2 Dichloroethane	0.016
Benzene	0.025
Toluene	6.5
GRO	260
DRO	230

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Cross Section A - A' Soil Boring Sample Results
Pipeline Milepost 25.5
Additional Environmental Investigation Report
Haines-Fairbanks Pipeline FUDS, Alaska
Project #: F10AK1016-03

CONTRACT: W911KB-12-D-0001, TO 29 | FIGURE: 5-4 | DATE: 12/14

25.5 A-A'

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APPENDIX A
Photo Log

Photograph 1 – Road signs were put at both ends of the Haines Highway (in working areas) prior to starting drilling activities. View to the northwest.

Photograph 2 – Flaggers alerted oncoming traffic when drilling activities were near road sholders. View to the northwest.

Photograph 3 – Drill rig set up on boring 17-BH15 on the north side of the Haines Highway. View to the southeast.

Photograph 4 – Drill rig set up on boring 17-BH21 on the south side of the Haines Highway. View to the southwest.

Photograph 5 – Soil lithology from boring 17-BH15 between 0 and 5 feet bgs. Silt with peat, dark brown, saturated below 1 foot. PID readings up to 1,050 ppm; sample collected from 4-5 feet bgs.

Photograph 6 – Soil lithology from boring 17-BH15 between 5-10 feet bgs. Silty gravel, gray, saturated. PID readings up to 1,015 ppm; sample collected from 9-10 feet bgs.

Photograph 7 – Soil lithology from boring 17-BH15 between 10-15 feet bgs. Sand with trace amount of silt, saturated. PID readings up to 140 ppm; sample collected from 14-15 feet bgs.

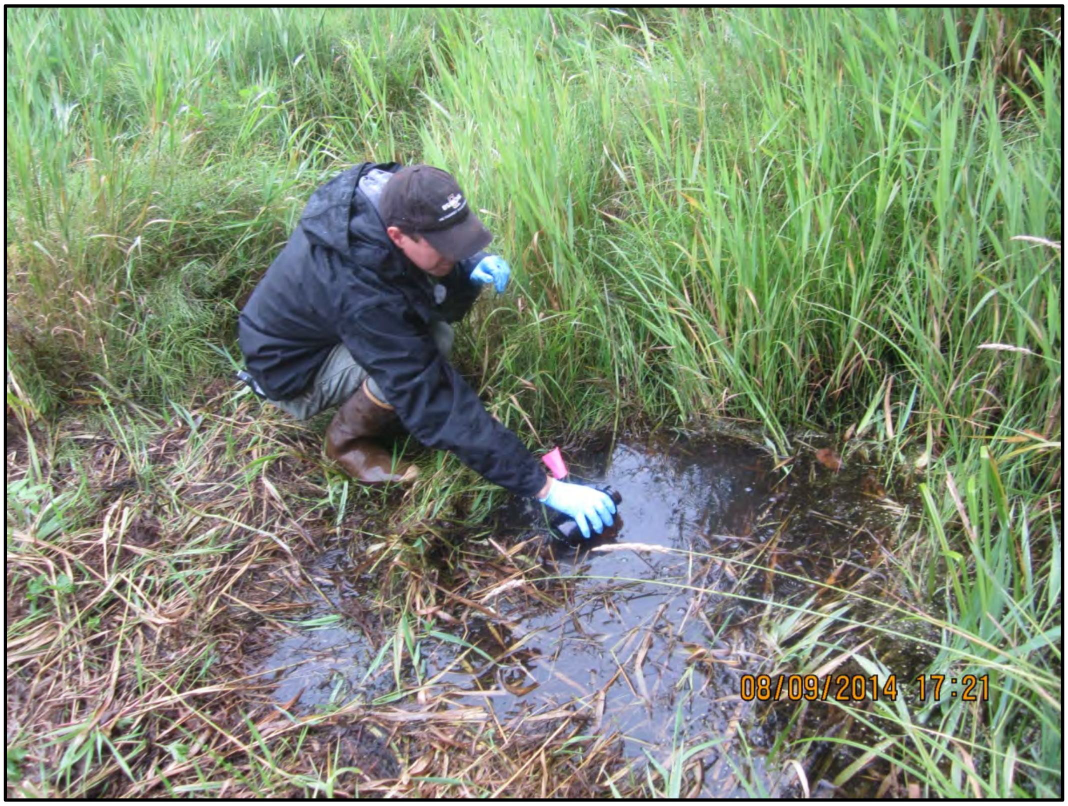
Photograph 8 – Monitoring well 17-MW6. View to north.

Photograph 9 – Collecting parameters prior to groundwater sampling at 17-MW5 during the first round of groundwater sample collection on July 26, 2014. View to the west.

Photograph 10 – Collecting parameters prior to groundwater sampling at well 17-MW2 during the sample re-collection on August 10, 2014. View to the northeast.

Photograph 11 – Measuring water/product in well point 17-TW4 near 17-MW2. Product was not encounted in any of the well points. View to the north.

Photograph 12 – Exposed (above ground) Haines-Fairbanks Pipeline. Surface water was 1-2 feet shallower in mid August 2014 compared to mid July 2014.

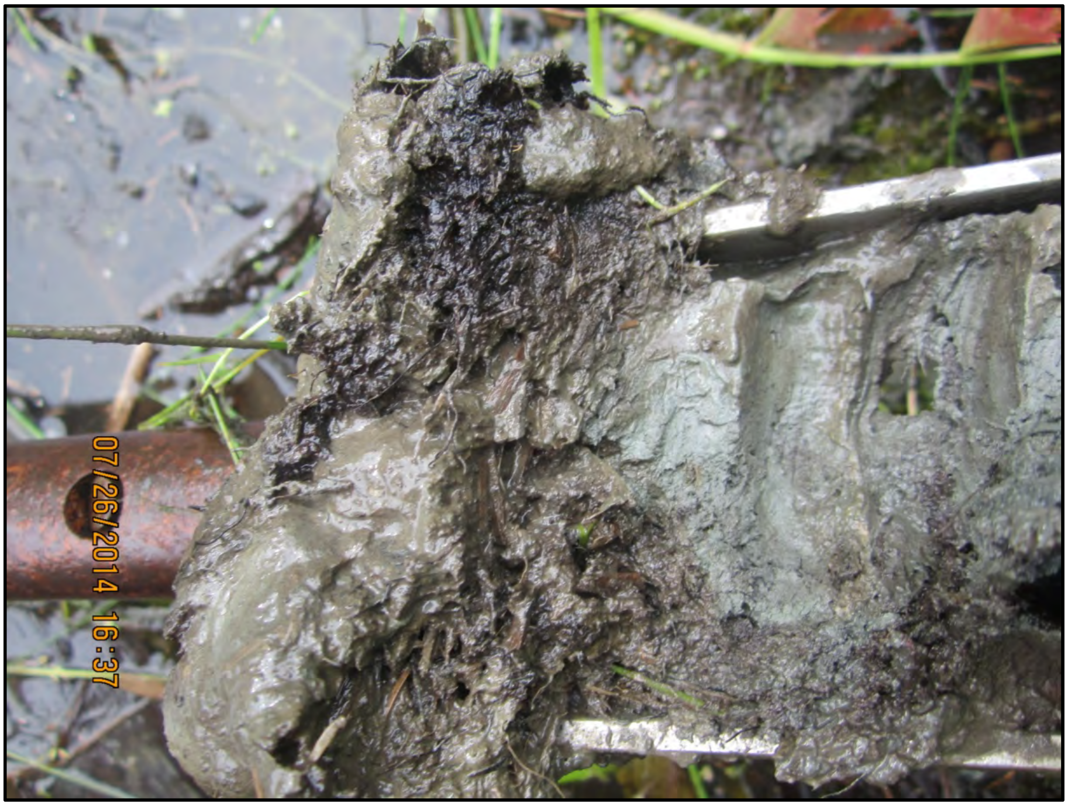


Photograph 13 – Collecting surface water sample 17-WS3 (co-located with sediment sample 17-SE6) sample using an new unpreserved sample jar. View to the west.

Photograph 14 – Organisms were encounted in surface water samples collected in the wetlands (non pipeline trench) samples. View of mosquito larva in sample collected from 17-SE13.

Photograph 15 – Hammering down sediment sampling equipment at 17-SE17. Some locations were picked if they had dead trees nearby. View to the southeast.

Photograph 16 – All wetland sediment samples contained swamp grass organics on top of the sediment.



Photograph 17 – Sediment samples were collected under the swamp grass and root mass layer.

Photograph 18 – Collecting sediment samples from the wetland area (17-SE17). View to the northeast.

Photograph 19 – Sediment collection equipment was decontaminated with alconox and rinse water after each sample was collected. View to the south.

Photograph 20 – Windy Creek Surveyors collecting GPS data (17-SE14) at a pipeline trench sample location. View to the southeast.

Photograph 21 – Geotek Alaska drilling 19-BH12/19-MW2. Note: New house under construction in background. View to the north-northeast.

Photograph 22 – Geoprobe set up to drill 19-BH14/19-MW3 near creek on the south side of the highway. View to the south.

Photograph 23 – Soil lithology from boring 19-BH12 between 0-5 feet bgs. Silt with organics, silty sand, brown and dry.

Photograph 24 – Close-up of soil lithology from boring 19-BH12 between 0-5 feet bgs.

Photograph 25 – Soil lithology from boring 19-BH12 between 5-10 feet bgs. Silty sand, gravel with silty sand, brown and gray, dry.

Photograph 26 – Close-up soil lithology from boring 19-BH12 between 5-10 feet bgs.

Photograph 27 – Decontamination of drill rod at PMP19.5, near 19-MW1/BH08. View to the northwest.

Photograph 28 – Flushmounted well completion - 19-MW2. View to the south.

Photograph 29 – Groundwater sampling at 19-MW2 during the intial July sampling event, new house construction in background. View to the north-northeast.

Photograph 30 – Groundwater sampling at 19-MW3 during the August re-sampling event, Horse Farm Creek in the background/left. View to the south-southeast.

Photograph 31 – Collecting surface water sample 19-WS5 (co-located with 19-SE5) in an unpreserved sample jar from just past the culvert south of the Haines Highway. View to the north.

Photograph 32 – Collecting a sediment sample (19-SE1) with a stainless steel spoon during the intial sampling event in July; these samples were all re-collected in August due to elevated cooler temperatures.

Photograph 33 – Organisms were encounted in surface sediment sample (19-SE7) collected at PMP19.5.

Photograph 34 – Pin flags marking geophysical survey of pipeline, view to the northeast.

Photograph 35 – Surveying surface water/sediment sample locations (location 19-WS5/19-SE5) in Horse Farm Creek. View to the southeast.

Photograph 36 – Trio of bears frequenting the PMP 19.5 site crossing the Haines Highway, GPS base station in background. View to the south.

Photograph 37 – Bears hanging around the site. View to the southeast.

Photograph 38 – Mother and two cubs at PMP 19.5, view to the south.

Photograph 39 – IPEC Utility locates conducted at PMP 25.5. IPEC and AP&T located utilites at all sites where work was performed in 2014.

Photograph 40 – Setting 25-MW2, steel pole marking valve box visible to on right-hand side of photograph. View to the northeast.

Photograph 41 – Geoprobe drilling boring at 25-BH14/25-MW3 location; view of house in the background. View to the southwest.

Photograph 42 – Soil lithology from 25-BH15 from 0-5 feet bgs. Silt with organics, sandy silt. Brown to black, dry.

Photograph 43 – Soil lithology from 25-BH15 from 10-15 feet bgs. Sandy silt with gravel, gray and black, dry.

Photograph 44 – Soil lithology from 25-BH15 from 15-20 feet bgs. Sandy silt with gravel, silty sand with gravel, and crushed white rock layer. Moist at 20 feet.

Photograph 45 – Soil lithology from 25-BH15 from 20-25 feet bgs. Silty sand with gravel, moist at 20 feet wet below 23 feet.

Photograph 46 – Soil lithology from 25-BH15 from 25-30 feet bgs. Silty sand with gravel, gray and black, saturated. Sample collected from 25-26 feet.

Photograph 47 – 1.5" Pre-Pack PVC with stainless steel mesh well screen was used in all wells.

Photograph 48 – Geoprobe installing well 25-MW1 in boring 25-BH08. View to the west-northwest.

Photograph 49 – Upgradient well 25-MW6 completed along access road. View to the west.

Photograph 50 – Closeup view of flushmount well 25-MW6.

Photograph 51 – Developing well 25-MW2 with a Waterra inertia pump. Wells were also surged with a steel surge block prior Waterra development.

Photograph 52 – Groundwater sampling at 25-MW1 during initial July sampling event. View to the west.

APPENDIX B

CDQR and ADEC Laboratory Data Review Checklists

Final

CHEMICAL DATA QUALITY REVIEW

PMP 17.7, PMP 19.5, and PMP 25.5 (Gate Valve #4) Sites

Haines-Fairbanks Pipeline FUDS

Additional Environmental Investigation

NPDL # 14-030

Prepared: October 2014

Revised: December 2014

Prepared for

U.S. Army Corps of Engineers - Alaska District

Prepared by

Fairbanks Environmental Services, Inc.

I certify that all data quality review criteria described in Section 1.1 were assessed, and that qualifications were made according to the criteria outlined in the site-specific QAPP.

Michael L Boese

Michael Boese
Project Chemist

LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
BTEX	benzene, toluene, ethylbenzene, and total xylenes
°C	degrees Celsius
CCV	continuing calibration verification
CDQR	Chemical Data Quality Review
COC	chain-of-custody
1,2-DCA	1,2-Dichloroethane
DL	detection limit
DoD	Department of Defense
DQO	data quality objectives
DRO	diesel range organics
EDB	1,2-Dibromoethane
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
FES	Fairbanks Environmental Services
FUDS	Formerly Used Defense Site
GRO	gasoline range organics
HCl	hydrochloric acid
HFP	Haines-Fairbanks Pipeline
HNO_3	nitric acid
LCS/LCSD	laboratory control sample/laboratory control sample duplicate
LocID	location identification number
LOD	limit of detection
LOQ	limit of quantitation
mg/Kg	milligrams per kilogram
mg/L	milligrams per liter
MS/MSD	matrix spike/matrix spike duplicate
ND	non-detect
NOAA	National Oceanic and Atmospheric Administration
NPDL	North Pacific Division Laboratory
PAH	polynuclear aromatic hydrocarbons
PEL	Probable Effects Level
PMP	Pipeline Milepost
ppm	parts per million
QC	quality control
QSM	Quality Systems Manual
RPD	relative percent difference
RRO	residual range organics
SDG	Sample Data Group
SGS	SGS-North America Inc.
SIM	Select Ion Monitoring
SM	Standard Methods
SV	small volume
TA	TestAmerica Laboratories Inc.
TEL	Threshold Effects Level
VOC	volatile organic compound

1.0 INTRODUCTION

This Chemical Data Quality Review (CDQR) presents the data quality review of groundwater and soil samples collected by Fairbanks Environmental Services (FES) during the July and August 2014 Environmental Investigation activities at three sites along the Haines-Fairbanks Pipeline (HFP), including Pipeline Milepost (PMP) 17.7, PMP 19.5, and PMP 25.5. FES performed a data quality review of project and quality control (QC) data in order to assess whether analytical data met data quality objectives and were acceptable for use. The project data were reviewed for deviations to the requirements presented in the Work Plan, Alaska Department of Environmental Conservation (ADEC) Technical Memo 06-002, and the Department of Defense (DoD) Quality Systems Manual (QSM), Version 4.2. The review included evaluation of the following: sample collection and handling, holding times, blanks (to assess cross-contamination), project sample and laboratory QC sample duplicates (to assess precision), laboratory control samples (LCSs) and sample surrogate recoveries (to assess accuracy), and matrix spike (MS) recoveries and relative percent differences (RPD) between MS and matrix spike duplicate (MSD) samples (to assess matrix effects). Calibration curves and continuing calibration verification recoveries were not reviewed except to address specific case narrative comments in laboratory reports.

Groundwater and surface water limits of detection (LODs) were compared to cleanup levels presented in 18 Alaska Administrative Code (AAC) 75, Table C, and soil LODs were compared to the most stringent cleanup levels (over 40-inch zone), listed in Tables B1 and B2 (ADEC, 2012). Sediment LODs were compared to National Oceanic and Atmospheric Administration (NOAA) Probable Effects Levels (PELs) and Threshold Effects Levels (TELs).

Groundwater, surface water, soil, and sediment sample data quality is discussed in Sections 2, 3, 4, and 5, respectively. Applicable data quality indicators are discussed for each method under separate subheadings. Data that did not meet acceptance criteria have been described and the associated samples and data quality implications or qualifications are summarized. References are included in Section 6.

1.1 Analytical Methods and Data Quality Objectives

The analytical methods and data quality objectives (DQOs) used for this review were presented in the Work Plan (FES, 2014). The DQOs represent the minimum acceptable QC limits and goals for analytical measurements and are used as comparison criteria during data quality review to determine both the quality and usability of the analytical data. The following tables summarize the DQO goals for groundwater/surface water and soil/sediment samples, respectively.

Summary of Data Quality Objectives for Groundwater and Surface Water Samples

Parameter	Preparation Method	Analytical Method	Limit of Detection (mg/L)	Precision (%RPD)	Accuracy (%)	Completeness (%)
GRO	5030B	AK101	0.050	20	60-120	90
DRO	3520C	AK102SV	0.300	20	75-125	90
RRO	3520C	AK103SV	0.250	20	60-120	90
BTEX and 1,2-DCA	5030B	8260B	0.0002-0.001	30	Analyte specific[a]	90
EDB[b]	SW8011		0.000004	30	70-130	90
PAHs	3520C	8270D SIM	0.000025	30	Analyte specific[c]	90
Total Lead	3010A	6020A	0.0005	20	80-120	90
Iron and Manganese (Field-Filtered) [d]	3010A	6020A	0.250/ 0.001	20	80-120	90
Sulfate[d]	300.0		0.050	20	90-110	90
Nitrate/Nitrite as N[d]	SM21 4500NO_3-F		0.050	20	90-110	90

[a] – Benzene (80-120%), Toluene (75-120%), Ethylbenzene (75-125), m,p-Xylenes (75-130%), o-Xylene (80-120%), 1,2-DCA (70-130%)
[b] – EDB analyzed for groundwater samples at PMP 19.5 & PMP 25.5 and surface water samples at PMP 19.5 only.
[c] – The analyte-specific LODs, precisions, and accuracies are presented in the 2014 Work Plan.
[d] – Dissolved iron and manganese, sulfate, and nitrate/nitrite as N analyzed for groundwater samples only.
BTEX – Benzene, Toluene, Ethylbenzene, and Xylenes; DRO – Diesel Range Organics; 1,2-DCA – 1,2-Dichloroethane; EDB – 1,2-Dibromoethane; GRO – Gasoline Range Organics; mg/L – milligrams per liter; RRO – Residual Range Organics; SIM – Select Ion Monitoring; SV – small volume

Summary of Data Quality Objectives for Soil and Sediment Samples

Parameter	Preparation Method	Analytical Method	Limit of Detection (mg/kg)	Precision (%RPD)	Accuracy (%)	Completeness (%)
GRO	5035A	AK101	1.25	20	60-120	90
DRO	3550C	AK102	10	20	75-125	90
RRO	3550C	AK103	10	20	60-120	90
BTEX and 1,2-DCA	5035A	8260B	0.00625-0.025	30	Analyte specific[a]	90
EDB[b]	8011		0.000015	30	70-125	90
PAHs	3550C	8270D SIM	0.0025	30	Analyte specific[c]	90
Total Lead	3050B	6020A	0.1	20	80-120	90

[a] – Benzene (75-125%), Toluene (70-125%), Ethylbenzene (75-125%), m,p-Xylenes (80-125%), o-Xylene (75-125%), 1,2-DCA (70-130).
[b] – EDB analyzed for soil and sediment samples at PMP 19.5 and PMP 25.5 only.
[c] – The analyte specific LODs, precisions, and accuracies are presented in the 2014 Work Plan.
mg/kg – milligrams per kilogram

The six DQO categories evaluated during this review were accuracy, precision, representativeness, comparability, sensitivity, and completeness.

- *Accuracy* measures the correctness, or the closeness, between the true value and the quantity detected. It is measured by calculating the percent recovery of known concentrations of spiked compounds that were introduced into the appropriate sample matrix. Surrogate, LCS, and MS sample recoveries were used to measure accuracy for this project. LCS and surrogate recovery criteria are defined in the QSM.
- *Precision* measures the reproducibility of repetitive measurements. It is measured by calculating the RPD between duplicate samples. Laboratory duplicate samples, field duplicate samples, MS and MSD pairs, and LCS and laboratory control sample duplicate (LCSD) pairs were used to measure precision for this project. LCS/LCSD precision criteria are defined in the QSM and field duplicate precision criteria are defined in the ADEC Laboratory Data Review Checklist (water: 30%; soil: 50%).
- *Representativeness* describes the degree to which data accurately and precisely represents site characteristics. This is addressed in more detail below.
- *Comparability* describes whether two data sets can be considered equivalent with respect to the project goal. This is addressed in more detail below.
- *Sensitivity* describes the lowest concentration that the analytical method can reliably quantitate, and is evaluated by verifying that the detected results and/or LODs meet the applicable cleanup levels.
- *Completeness* describes the amount of valid data obtained from the sampling event(s). It is calculated as the percentage of valid measurements compared to the total number of measurements. The completeness goal for this project was set at 90%.

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

The following qualifiers, listed below in increasing severity, are used in the data tables to indicate quality control deficiencies.

Data Qualifier Definitions

Qualifier	Definition
J	Analytical result is considered an estimated value because the concentration is below the laboratory limit of quantitation (LOQ) but above the detection limit (DL).
MN,MH, ML	Analytical result is considered an estimated value (biased H-high, L-low, or N-unknown) due to matrix effects.
B	Analytical result is considered a high estimated value due to contamination present in the blank samples.
QN,QH, QL	Analytical result is considered an estimated value (biased H-high, L-low, or N-unknown) due to a quality control failure.
R	Analytical result is rejected – result is not acceptable for project use.

1.2 Summary of Groundwater Samples

Groundwater samples were collected from PMP 17.7, PMP 19.5, and PMP 25.5 sites (note that all the wells were re-sampled because the initial round of samples arrived at the laboratory with elevated temperatures). A total of nine groundwater samples, consisting of eight primary samples and one field duplicate sample, were collected from the PMP 17.7 site. A total of five groundwater samples, consisting of four primary samples and one field duplicate sample, were collected from the PMP 19.5 site. A total of seven groundwater samples, consisting of six primary samples and one field duplicate sample, were collected from the PMP 25.5 site. One MS/MSD sample was collected at each PMP site. In addition, one equipment rinsate blank (sample 14HF2505WQ) was collected from re-usable equipment (a bladder pump) utilized to sample three of the six groundwater wells at PMP 25.5. A total of five trip blank samples were also analyzed, one for each sample cooler containing volatiles samples. Project samples were analyzed by the following analytical methods:

- Gasoline range organics (GRO) by Alaska (AK) Method 101
- Diesel range organics (DRO) by AK Method 102SV
- Residual range organics (RRO) by AK Method 103SV
- Benzene, Toluene, Ethylbenzene, and Xylene (BTEX), and 1,2-Dichloroethane (1,2-DCA) by Environmental Protection Agency (EPA) Method SW8260B
- 1,2-Dibromoethane (EDB) by SW8011 (PMP 19.5 and PMP 25.5 only)
- Total Lead by EPA Method 6020A
- Polynuclear aromatic hydrocarbons (PAHs) by EPA Method SW8270D-Select Ion Monitoring (SIM)
- Natural attenuation parameters (Nitrate-Nitrite as Nitrogen, Sulfate, and Dissolved Iron/Manganese) by the respective methods: Standard Methods (SM) 21 4500NO_3-F, E300.0, and SW6020A.

All project and QC samples (except EDB) were analyzed by SGS North America, Inc. (SGS) of Anchorage, Alaska. EDB project and QC samples were analyzed by TestAmerica Laboratories, Inc. (TA) of Denver, Colorado. The laboratories are approved by the State of Alaska through the Contaminated Sites Program and are certified through the DoD Environmental Laboratory Accreditation Program (ELAP) for the methods listed above (as applicable).

Groundwater samples were shipped in five sample data groups (SDGs) and assigned the SGS report numbers 1143514, 1143745, and 1143761, and TA report numbers 280-58493 and 280-58942. Sample tracking tables are included as Table 3-4, Table 4-4, and Table 5-3; analytical results tables are included as Tables 3-7, 4-7, and 5-6.

1.3 Summary of Surface Water Samples

Surface water samples were collected from PMP 17.7 and PMP 19.5 sites. A total of 23 surface water samples, consisting of 20 primary samples and three field duplicate samples, were collected from the PMP 17.7 site (note that the 10 surface water locations at PMP 17.7 were sampled twice due to elevated temperatures affecting all initial sample containers except the PAHs). A total of 16 surface water samples, consisting of 14 primary samples and two field duplicate samples were collected from the PMP 19.5 site (note that the seven surface water locations at PMP 19.5 were sampled twice due to elevated temperatures affecting all initial sample containers except the PAHs). Two MS/MSD samples were collected at each PMP site (minimum of one per 20 samples). A total of two trip blank samples were also analyzed, one for each sample cooler containing volatiles samples. Project samples were analyzed by the following analytical methods:

- GRO by AK Method 101
- DRO by AK Method 102SV
- RRO by AK Method 103SV
- BTEX and 1,2-DCA (1,2-DCA at PMP 19.5 and 25.5 only) by EPA Method SW8260B
- EDB by SW8011 (PMP 19.5 only)
- Total Lead by EPA Method 6020A
- PAHs by EPA Method SW8270D-SIM

All project and QC samples (except EDB) were analyzed by SGS of Anchorage, Alaska. EDB project and QC samples were analyzed by TA of Denver, Colorado. The laboratories are approved by the State of Alaska through the Contaminated Sites Program and are certified through the DoD ELAP for the methods listed above (as applicable).

Surface water samples were shipped in four SDGs and assigned the SGS report numbers 1143338, 1143745, and 1143761, and TA report number 280-58942. Sample tracking tables are included as Table 3-4 and Table 4-4; analytical results tables are included as Table 3-9 and 4-9.

1.4 Summary of Soil Samples

Soil samples were collected from PMP 17.7, PMP 19.5, and PMP 25.5. A total of 26 soil samples, consisting of 23 primary samples and 3 field duplicate samples, were collected from the PMP 17.7 site. A total of 14 soil samples, consisting of 12 primary samples and 2 field duplicate samples, were collected from the PMP 19.5 site. A total of 21 soil samples, consisting of 19 primary samples and 2 field duplicate samples, were collected from the PMP 25.5 site. In addition, two MS/MSD samples were collected at each PMP site (minimum of one per 20 samples). A total of four trip blank samples were analyzed, one for each sample shipment containing volatiles samples. Project samples were analyzed by the following analytical methods:

- GRO by AK Method 101
- DRO by AK Method 102
- RRO by AK Method 103
- BTEX and 1,2-DCA by EPA Method SW8260B
- PAHs by EPA Method SW8270D-SIM
- Total Lead by EPA Method 6020A
- EDB by SW8011 (PMP 19.5 and PMP 25.5 only)

All project and QC samples (except EDB) were analyzed by SGS of Anchorage, Alaska. EDB project and QC samples were analyzed by TA of Denver, Colorado. The laboratories are approved by the State of Alaska through the Contaminated Sites Program and are certified through the DoD ELAP for the methods listed above (as applicable).

Soil samples were shipped in five SDGs and assigned the SGS report numbers 1143326, 1143327, and 1143328, and TA report numbers 280-58134 and 280-58139. Sample tracking tables are included as Table 3-4, Table 4-4, and Table 5-3; analytical results tables are included as Table 3-5, Table 4-5, and Table 5-4.

1.5 Summary of Sediment Samples

Sediment samples were collected from PMP 17.7 and PMP 19.5. A total of 22 sediment samples, consisting of 20 primary samples and two field duplicate samples, were collected from the PMP 17.7 site. A total of eight sediment samples, consisting of seven primary samples and one field duplicate sample, were collected from the PMP 19.5 site. Two MS/MSD samples were collected at PMP 17.7 and one MS/MSD sample was collected at PMP 19.5 (minimum of one per 20 samples). In addition, one equipment rinsate blank (sample 14HF1725WQ) was collected from equipment used to sample sediment at PMP 17.7 (note that the equipment rinsate was analyzed under groundwater/surface water report 1143761). A total of two trip blank samples were analyzed, one for each sample shipment containing volatiles samples.

Project samples were analyzed by the following analytical methods:

- GRO by AK Method 101
- DRO by AK Method 102
- RRO by AK Method 103
- BTEX and 1,2-DCA by EPA Method SW8260B
- PAHs by EPA Method SW8270D-SIM
- Total Lead by EPA Method 6020A
- EDB by SW8011 (PMP 19.5 and PMP 25.5 only)

All project and QC samples (except EDB) were analyzed by SGS of Anchorage, Alaska. EDB project and QC samples were analyzed by TA of Denver, Colorado. The laboratories are approved by the State of Alaska through the Contaminated Sites Program and are certified through the DoD ELAP for the methods listed above (as applicable).

Sediment samples were shipped in three SDGs and assigned the SGS report numbers 1143746 and 1143760 and TA report number 280-58942. Sample tracking tables are included as Tables 3-4 and 4-4; analytical results tables are included as Table 3-8 and Table 4-8.

2.0 GROUNDWATER SAMPLE DATA QUALITY REVIEW

This section presents the findings of the data quality review and the resulting data qualifications for groundwater samples. Samples were analyzed for EDB by TA and for all other parameters by SGS and are included in five SDGs (1143514, 1143745, 1143761, 280-58493, and 280-58942).

2.1 Sample Collection

All wells met stabilization criteria detailed in the Work Plan except for four wells (17-MW3, 17-MW5, 19-MW1, and 19-MW4) that exhibited drawdown during well purging. Consequently, the results from the corresponding samples (14HF1701WG/14HF1702WG, 14HF1705WG, 14HF1903WG, and 14HF1904WG) that were qualified (QN) as estimates. Impact to data quality is minor since the drawdown measured in the four wells was either marginally over the 0.3 foot limit and/or was stable over the last several intervals.

2.2 Sample Handling

The evaluation of proper sample handling procedures include verification of the following: correct COC documentation, appropriate sample containers and preservatives, cooler temperatures maintained at 4 degrees Celsius (°C) (±2°C), and sample analysis within method-specified holding times. The following discrepancies were noted in the data packages:

Documentation Discrepancies

- FES revised the COC associated with report 280-58942 to request that sample 14HF1901WG be prepared as an MS/MSD. No data were impacted.
- The laboratory noted that the metals containers for sample 14HF2501WG and its MS aliquot (report 1143514) arrived with no bottle labels. The lids were labelled and the lab was able to identify the samples. There was no impact to data quality.
- The laboratory noted that one volatile organic analysis (VOA) vial for sample 14HF1709WG arrived with a label for sample 14HF1707WG (report 1143761). The sample was packed with other VOA vials for 14HF1709WG and the laboratory confirmed the correct identity of the vial with FES. No data quality was impacted.
- The laboratory noted that the dissolved metals containers for samples 14HF1701WG, 14HF1702WG, and 14HF1709WG (report 1143761) did not indicate that they were field filtered. The COC indicated that all dissolved metals containers were field filtered. The laboratory did not note any resolution to the issue of inconsistent documentation. The data validator confirmed with FES that the samples were field filtered. No data quality was impacted.

Preservation Discrepancies

- The laboratory added hydrochloric acid (HCl) preservative to a DRO/RRO container for the MS sample of 14HF2501WG and nitric acid (HNO_3) preservative to the total lead container for the MSD sample of 14HF2501WG (report 1143514). The delayed preservation of the MS/MSD aliquots had no quality impact on the parent sample.

2.3 Blanks

Method blanks, trip blanks, and equipment blanks were utilized to detect potential cross-contamination of project samples. Method blanks assess laboratory cross-contamination. Trip blanks assess field, shipment, and storage cross-contamination. Equipment blanks assess cross-contamination due to contact with reusable sampling equipment. Blank contamination that did not affect project data is not listed below but is included in the ADEC checklists.

Method Blanks

No analytes were detected above limits of quantitation (LOQs) in the method blanks. However, there were numerous method blank detections below the LOQ that may have impacted data. The following samples had analyte detections within ten times the method blank concentration and were qualified (B) to indicate potential laboratory contamination.

- GRO results in samples 14HF1704WG, 14HF1705WG, and 14HF1707WG (report 1143761); and 14HF1901WG, 14HF1902WG, 14HF1903WG, 14HF1904WG, and 14HF1905WG (report 1143745).
- Naphthalene result in sample 14HF1901WG (report 1143745).

There is only minor effect on data quality or usability because most affected results were at least one order of magnitude less than the associated cleanup levels. The effect on GRO in samples 14HF1704WG and 14HF1903WG may be significant as the results were less than one order of magnitude below the associated cleanup level.

Trip Blanks

Trip blanks were included with each cooler of volatile samples. No analytes were detected above the LOQs in the trip blanks. There were no trip blank detections below the LOQ that impacted data.

Equipment Blanks

Equipment Blank sample 14HF2505WQ was collected during groundwater sampling activities at the PMP 25.5 site. The equipment blank was collected from the bladder pump to evaluate the potential for sample cross-contamination during sample collection and is only applicable to wells that were sampled with the bladder pump (i.e., 25-MW2, 25-MW3, and 25-MW6). The equipment blank was analyzed for the same methods as the groundwater samples. The sample detected dissolved manganese at a concentration greater than the LOQ. However, all associated samples detected dissolved manganese at concentrations greater than ten-times that of the equipment blank and are considered unaffected by the equipment blank contamination. Additionally, there were numerous equipment blank detections below the LOQ that may have impacted data. The following samples had analyte detections within ten times the equipment blank concentration and were qualified (B) to indicate potential equipment contamination.

- The GRO result in sample 14HF2508WG (report 1143514).
- DRO results in samples 14HF2504WG and 14HF2508WG (report 1143514).
- The toluene results in sample 14HF2508WG (report 1143514).

There is only minor effect on data quality or usability because most affected results were at least one order of magnitude less than the associated cleanup levels. The effect on DRO in samples 14HF2504WG and14HF2508WG may be significant as the results were less than one order of magnitude below the associated cleanup level.

2.4 Surrogate Recovery

Surrogate compounds were added to each project sample (GRO, DRO, RRO, volatile organic compounds [VOCs], EDB, and PAH) by the laboratory prior to analysis as a measure of analytical extraction efficiency. Surrogate recoveries were then calculated as percentages and reported with the sample results. Surrogate recoveries that did not affect project data are not listed below but are included in the ADEC checklists. All surrogate recoveries in groundwater samples were within acceptable tolerance limits or did not affect project samples, except those noted below.

- Method 8270D surrogate 2-fluorobiphenyl recovered below the lower control limit in sample 14HF1903WG (report 1143745). All results in the sample were qualified (QL) as biased-low estimates due to the low surrogate recovery. Although the results are potentially low-biased and most results are non-detect (ND), impact to data quality is likely minor as the second surrogate was within control limits and the LODs or results are more than one order of magnitude less than the ADEC cleanup levels.
- Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in sample 14HF1703WG (report 1143761). The GRO result in the sample was flagged (QH) based upon the high recovery. Impact to the sample may be significant as the GRO result was just above the ADEC cleanup level.

2.5 Laboratory Control Samples

Spike compounds were added to blank samples to assess laboratory extraction and instrumentation performance. LCS and LCSD samples that did not affect project data are not listed below but are included in the ADEC checklists. All LCSs and LCSDs had acceptable recoveries, and all RPDs between LCS/LCSD sample results (when applicable) were within acceptable limits or did not affect project samples, except those noted below. Furthermore, LCS and/or LCS/LCSD samples were performed at the proper frequency (one per QC batch and for every analyte).

- The LCS and/or LCSD samples 1226735/1226736 in PAH batch XXX31702 (report 1143745) recovered below the lower control limits for acenaphthene, acenaphthylene, anthracene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and phenanthrene. These results in associated samples 14HF1901WG, 14HF1902WG, 14HF1903WG, 14HF1904WG, and 14HF1905WG were qualified (QL) as low estimates based upon the low recoveries. Impact to most results is minor as most detections or LODs were at least one order of magnitude below the ADEC cleanup levels. However, the 1-methylnaphthalene and 2-methylnaphthalene detections and LODs were within one order of magnitude of the cleanup level and may have been more significantly affected by the low LCS/LCSD recoveries.

- The case narratives in reports 1143514 and 1143761 contained errant LCS/LCSD comments about the 8260B analytes chloroethane and methyl ethyl ketone (MEK). Chloroethane and MEK were not target compounds reported for this project and the comments do not impact data quality.

2.6 Matrix Spike Samples and Duplicates

Spike compounds were added to project samples to assess potential matrix interference. MS and MSD samples that did not affect project data are not listed below but are included in the ADEC checklists. MS and MSD samples were collected at the proper frequency (a minimum of 1 for every 20 samples), and were performed for every analysis and QC batch, per QSM requirements, or did not affect project samples, with the exceptions noted below. Additionally, MS and/or MSD recovery and precision discrepancies that affect project samples are listed below.

- MS/MSD analysis was not performed for VOC batch VXX26223 (report 1143514). One MS/MSD sample was submitted with the project samples, which meets the required frequency. However, the laboratory batched the project samples in two batches. Impact to data is minor since acceptable LCS/LCSD analyses verified batch precision and accuracy and only two samples were included in this batch (14HF2502WG and 14HF2503WG).

- LCSD and MSD analysis was not performed for sulfate batches WXX10626 (report 1143514) and WXX10652 (reports 1143745 and 1143761), or nitrate/nitrite batches WFI2330 (report 1143514) and WFI2332 (reports 1143745 and 1143761). Acceptable batch precision was demonstrated by analysis of laboratory duplicate samples and data quality is not impacted.

- The VOC MS sample prepared from 14HF2501WG (report 1143514) recovered above the upper control limit for o-xylene. o-Xylene was not detected in the parent sample and the result is considered unaffected by the high MS recovery. The MSD sample prepared from the same parent recovered above the upper control limit for toluene. The toluene result in sample 14HF2501WG was qualified (MH) as a high estimate based upon the high recovery. Impact to the result is minor as the detection is more than three orders of magnitude below the ADEC cleanup level.

- The total nitrate/nitrite MS samples prepared from 14HF1706WG and 14HF1709WG (report 1143761) recovered below the lower control limit. The total nitrate/nitrite results in the parent samples were qualified (ML) as low estimates based upon the low recoveries. Impact to the results is likely minor as the data are used for evaluating natural attenuation (which requires order of magnitude changes in geochemistry); note that 18AAC75, Table C does not include a cleanup level for total nitrate/nitrite.

- The PAH MS and/or MSD samples prepared from 14HF1706WG (report 1143761) recovered below the lower control limits for 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, and fluorene. These results in the parent sample were flagged

(ML) as low estimates based upon the low recoveries. Although the results are potentially low-biased and most results are ND, impact to data quality is likely minor as the LODs or results are more than one order of magnitude less than the ADEC cleanup levels.

- The GRO MSD sample prepared from 14HF1706WG (report 1143761) recovered below the lower control limit. The GRO result in the parent sample was qualified (ML) as a low estimate based upon the low recovery. Impact to the sample result may be significant as the GRO result was just above the ADEC cleanup level.
- The case narrative in report 1143761 contained an errant MS comment about the EPA Method 300.0 analyte chloride. Chloride was not a target compound reported for this project and the comments do not impact data quality.

2.7 Field Duplicates

Field duplicate sample results for groundwater samples are summarized in the tables below. The duplicate frequency met the 10% requirement in the Work Plan for all reports. Overall, three field duplicates were collected for 18 primary groundwater samples (rate of 17%). LOD values were used in lieu of ND results for RPD calculation purposes. The analytes that did not meet the ADEC precision requirement (≤30%) for water-matrix samples are identified in grey highlight.

Summary of PMP 17.7 Groundwater Sample Field Duplicates (Report 1143761)

Analyte	Method	Units	14HF1701WG	Qualifier	14HF1702WG	Qualifier	RPD
GRO	AK101	mg/L	11.1		11.5		4
DRO	AK102	mg/L	1.23	QN	1.7	QN	32
RRO	AK103	mg/L	0.25	U	0.25	U	0
Sulfate	EPA 300.0	mg/L	0.544	QN	0.185	QN	98
Total Nitrate/Nitrite-N	SM21 4500NO_3-F	mg/L	0.255		0.232		9
Lead	SW6020A	mg/L	0.0012		0.000991	J	19
Iron	SW6020A	mg/L	67.6		67.8		0
Manganese	SW6020A	mg/L	2.04		2.07		1
Benzene	SW8260B	mg/L	0.62		0.65		5
Ethylbenzene	SW8260B	mg/L	0.338		0.361		7
o-Xylene	SW8260B	mg/L	0.335		0.344		3
Xylene, Isomers m & p	SW8260B	mg/L	2.04		2.19		7
Toluene	SW8260B	mg/L	0.0612		0.063		3
1-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.00954		0.0116		19
2-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.0145		0.0164		12
Acenaphthene	8270D SIMS (PAH)	mg/L	0.00011		0.000134		20
Fluorene	8270D SIMS (PAH)	mg/L	0.000137		0.000165		19
Naphthalene	8270D SIMS (PAH)	mg/L	0.0359		0.0467		26
Phenanthrene	8270D SIMS (PAH)	mg/L	0.0000282	J	0.0000264	J	7
All Other PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

Results highlighted in gray do not meet the 30% RPD criterion for water matrix samples.
J – Result is considered an estimate since it is reported below the LOQ.
QN – Result is considered an estimate with unknown bias due to field duplicate imprecision.
U – Not detected

Summary of PMP 19.5 Groundwater Sample Field Duplicates (Reports 1143745 and 280-58942)

Analyte	Method	Units	14HF1901WG	Qualifier	14HF1902WG	Qualifier	RPD
GRO	AK101	mg/L	0.0314	J	0.0361	J	14
DRO	AK102	mg/L	0.319	U	0.338	U	6
RRO	AK103	mg/L	0.266	U	0.281	U	5
Sulfate	EPA 300.0	mg/L	29.8		30		1
Total Nitrate/Nitrite-N	SM21 4500NO_3-F	mg/L	0.596		0.554		7
Lead	SW6020A	mg/L	0.0005	U	0.0005	U	0
Iron	SW6020A	mg/L	0.25	U,QN	0.35	J,QN	33
Manganese	SW6020A	mg/L	0.0265		0.0263		1
Ethylene Dibromide	SW8011	mg/L	0.00001	U	0.00001	U	0
1,2-Dichloroethane	SW8260B	mg/L	0.00025	U	0.00025	U	0
Benzene	SW8260B	mg/L	0.0002	U	0.0002	U	0
Ethylbenzene	SW8260B	mg/L	0.0005	U	0.0005	U	0
o-Xylene	SW8260B	mg/L	0.0005	U	0.0005	U	0
Xylene, Isomers m & p	SW8260B	mg/L	0.001	U	0.001	U	0
Toluene	SW8260B	mg/L	0.0005	U	0.0005	U	0
1-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.0000182	J,QN	0.000029	U,QN	46
Naphthalene	8270D SIMS (PAH)	mg/L	0.0000713	J	0.000058	U	21
All Other PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

Results highlighted in gray do not meet the 30% RPD criterion for water matrix samples.
J – Result is considered an estimate since it is reported below the LOQ.
QN – Result is considered an estimate with unknown bias due to field duplicate imprecision
U – Not detected

Summary of PMP 25.5 Groundwater Sample Field Duplicates (Reports 1143514 and 280-58493)

Analyte	Method	Units	14HF2502WG	Qualifier	14HF2503WG	Qualifier	RPD
GRO	AK101	mg/L	4.31		4.35		1
DRO	AK102	mg/L	13.4		12.4		8
RRO	AK103	mg/L	0.257	U	0.27	U	5
Sulfate	EPA 300.0	mg/L	11.2		8.32		30
Total Nitrate/Nitrite-N	SM21 4500NO_3-F	mg/L	0.050	U	0.050	U	0
Lead	SW6020A	mg/L	0.0757		0.0822		8
Iron	SW6020A	mg/L	46		42.1		9
Manganese	SW6020A	mg/L	6.49		6.29		3
Ethylene Dibromide	SW8011	mg/L	0.03		0.028		7
1,2-Dichloroethane	SW8260B	mg/L	0.00025	U	0.00025	U	0
Benzene	SW8260B	mg/L	0.0034		0.00299		13
Ethylbenzene	SW8260B	mg/L	0.227		0.22		3
o-Xylene	SW8260B	mg/L	0.423		0.427		1
Xylene, Isomers m & p	SW8260B	mg/L	0.837		0.852		2
Toluene	SW8260B	mg/L	0.634		0.63		1
1-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.0407		0.0502		21
2-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.0789		0.093		16
Acenaphthene	8270D SIMS (PAH)	mg/L	0.00053	J	0.00133	U	86

Analyte	Method	Units	14HF2502WG	Qualifier	14HF2503WG	Qualifier	RPD
Acenaphthylene	8270D SIMS (PAH)	mg/L	0.00057	U	0.00133	U	80
Anthracene	8270D SIMS (PAH)	mg/L	0.00057	U	0.00133	U	80
Fluorene	8270D SIMS (PAH)	mg/L	0.000923	J	0.000986	J	7
Naphthalene	8270D SIMS (PAH)	mg/L	0.146		0.173		17
Phenanthrene	8270D SIMS (PAH)	mg/L	0.00057	U	0.00133	U	80
All Other PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

Results highlighted in gray do not meet the 30% RPD criterion for water matrix samples.
J – Result is considered an estimate since it is reported below the LOQ.
U – Not detected

Analytes in the following groundwater field duplicate pairs did not meet the comparison criterion of ≤30% RPD and were qualified (QN) as estimated due to field duplicate imprecision, unless otherwise noted.

- 14HF1701WG/14HF1702WG (report 1143761): DRO (32%) and sulfate (98%).
- 14HF1901WG/14HF1902WG (report 1143745): Iron (33%) and 1-methylnaphthalene (46%).
- 14HF2503WG/14HF2502WG (report 1143514): acenaphthene (86%), acenaphthylene (80%), anthracene (80%), and phenanthrene (80%). These analytes were not detected in at least one of the paired samples and the LODs were used to calculate the RPD. The LODs for sample 14HF2503WG were elevated due to a 50x dilution (done to mitigate matrix interference with internal standards). These dissimilar RPDs led to the high RPD results and no flagging was applied.

In all cases except DRO in samples 14HF1701WG/14HF1702WG, impact to data was minor because non-comparable field duplicate results were well below cleanup levels, and most non-compliant comparisons involved “J” flagged and/or ND results. Impact to DRO results in samples 14HF1701WG and 14HF1702WG may be significant as they are just above and below the ADEC cleanup level.

2.8 Continuing Calibration Verification Samples

Evaluation of continuing calibration verification (CCV) samples is beyond the scope of review for this project; however, the laboratory included comments about CCV samples in some report case narratives. No CCV recovery exceptions were listed that affected groundwater project samples. CCV recovery exceptions that did not affect project data are not discussed here, but are included in the ADEC checklists. Additionally, the laboratory made errant CCV case narrative comments either for methods or target compounds not related to this project and these are also discussed in the ADEC checklists.

2.9 Analytical Sensitivity

Several project data analytes were identified as estimations by the laboratory due to reporting results between the detection limit (DL) and LOQ. Results reported above the DL but below the LOQ are qualified as estimates due to the unknown accuracy of the analytical method at those concentrations. These data qualifications are not reported again in this Chemical Data Quality Review, but they are noted with a "J" in associated results tables.

Analytical sensitivity was evaluated to verify that the LODs met the applicable cleanup levels. All associated ADEC groundwater cleanup levels listed in 18 AAC 75.345 were met, so data were reported with adequate sensitivity for project purposes.

2.10 Summary of Qualified Results

Overall, the review process deemed the groundwater project data acceptable for use. Several sample results were qualified; however, data quality impact is minor and no data were rejected. The following table provides a summary of groundwater sample results qualified pursuant to FES's review, including the associated sample numbers, analytes, and the reason for qualification. Note that per USACE review comments on the draft report, only the most severe flag was used when multiple Q or M flags were assigned to a result in tables and figures.

Summary of Qualified Groundwater Results

Data Package	Sample Numbers	Analytes	Qualification	Explanation
1143514 (PMP 25.5)	14HF2508WG	GRO	B	Blank Contamination (Equipment Blank)
	14HF2504WG and 14HF2508WG	DRO		
	14HF2508WG	Toluene		
	14HF2501WG	Toluene	MH	MSD Recovery Failure
1143745 (PMP 19.5)	14HF1903WG and 14HF1904WG	All Analytes	QN	Well Drawdown
	14HF1901WG, 14HF1902WG, 14HF1903WG, 14HF1904WG, and 14HF1905WG	GRO	B	Blank Contamination (Method Blank)
	14HF1901WG	Naphthalene		
	14HF1903WG	All PAHs	QL	Low-Biased Surrogate Recovery
	14HF1901WG, 14HF1902WG, 14HF1903WG, 14HF1904WG, and 14HF1905WG	Acenaphthene, Acenaphthylene, Anthracene, Fluorene, 1-Methylnaphthalene, 2-Methylnaphthalene, Naphthalene, and Phenanthrene	QL	LCS/LCSD Recovery Failure
	14HF1901WG and 14HF1902WG	Iron and 1-Methylnaphthalene	QN	Poor Field Duplicate Precision
1143761 (PMP 17.7)	14HF1701WG, 14HF1702WG, and 14HF1705WG	All Analytes	QN	Well Drawdown
	14HF1704WG, 14HF1705WG, and 14HF1707WG	GRO	B	Blank Contamination (Method Blank)
	14HF1703WG	GRO	QH	High-biased Surrogate Recovery
	14HF1706WG and 14HF1709WG	Total nitrate/nitrite	ML	MS Recovery Failure

Data Package	Sample Numbers	Analytes	Qualification	Explanation
1143761 (PMP 17.7)	14HF1706WG	1-Methylnaphthalene, 2-Methylnaphthalene, Acenaphthene, Acenaphthylene, Anthracene, Fluorene, and GRO	ML	MS/MSD Recovery Failure
	14HF1701WG and 14HF1702WG	DRO and Sulfate	QN	Poor Field Duplicate Precision

Note that per USACE review comments on the draft report, only the most severe flag was used when multiple Q or M flags were assigned to a result in tables and figures.

2.11 Completeness and Summary of Data Quality

All groundwater data were considered usable (reported with adequate sensitivity and no data were rejected), so a completeness score of 100% was calculated for this project. Therefore, the 90% completeness criterion in the Work Plan was met for the project groundwater data.

Overall, the review process deemed the groundwater project data acceptable for use. Several results were qualified; however, the impact to data quality for the majority of the samples was generally minor. The only data quality issues that may have significantly impacted project groundwater data is summarized below:

- Four wells (17-MW3, 17-MW5, 19-MW1, and 19-MW4) exhibited drawdown during well purging and the results from the corresponding samples (14HF1701WG, 14HF1705WG, 14HF1903WG, and 14HF1904WG) that were qualified (QN) as estimates. Impact to data quality is minor since the drawdown measured in the four wells was either marginally over the 0.3 foot limit and/or was stable over the last several intervals.
- The GRO results in samples 14HF1704WG and 14HF1903WG may be impacted by method blank contamination since the GRO results in these samples are high-biased and within one order of magnitude below the ADEC cleanup level. GRO results in these samples were qualified (B).
- The DRO results in samples 14HF2504WG and 14HF2508WG may be impacted by equipment blank contamination since the DRO results in these samples are high-biased and within one order of magnitude below the ADEC cleanup level. DRO results in these samples were qualified (B).
- The GRO result in sample 14HF1703WG may be impacted by high surrogate recovery since the result was high-biased and just above the ADEC cleanup level. The GRO result in this sample was qualified as a high estimate (QH).
- The 1-methylnaphthalene and 2-methylnaphthalene results in samples 14HF1901WG, 14HF1902WG, 14HF1903WG, 14HF1904WG, and 14HF1905WG may be impacted by low surrogate recoveries since the results were low-biased and within one order of magnitude below the ADEC cleanup levels. 1-methylnaphthalene and 2-methylnaphthalene results in these samples were qualified (QL).

- The GRO result in sample 14HF1706WG may be impacted by low matrix spike duplicate recovery since the result was low-biased and just above the ADEC cleanup level. The GRO result in this sample was qualified as a low estimate (ML).
- The DRO results in samples 14HF1701WG and 14HF1702WG may be impacted by poor field duplicate precision since the results are just above and below the ADEC cleanup level. The DRO results in these samples were qualified as non-biased estimates (QN).

3.0 SURFACE WATER SAMPLE DATA QUALITY REVIEW

This section presents the findings of the data quality review and the resulting data qualifications for surface water samples. Samples were analyzed for EDB by TA and for all other parameters by SGS and are included in four SDGs (1143338, 1143745, 1143761, and 280-58942).

3.1 Sample Collection

All surface water samples were collected according to Work Plan requirements.

3.2 Sample Handling

The evaluation of proper sample handling procedures include verification of the following: correct COC documentation, appropriate sample containers and preservatives, cooler temperatures maintained at 4 degrees °C (±2°C), and sample analysis within method-specified holding times. The following discrepancies were noted in the data packages:

Documentation Discrepancies

- The laboratory noted that sample 14HF1704WS (report 1143338) arrived with no bottle labels. The lids were labelled and the lab was able to identify the sample. There was no impact to data quality.

Temperature Discrepancies

- The temperature blank in cooler FES-32 (containing surface water samples for PMP 17.7 in report 1143761) was measured at 6.2°C upon receipt at the laboratory. The laboratory noted that the temperature blank was not near any ice in the cooler and was not representative of the cooler temperature. The cooler temperature was measured at 5.1°C. No flagging was applied based upon the slightly high temperature blank.

Preservation Discrepancies

- The laboratory noted that three VOA vials (containers C, E, and F) for sample 14HF1722WS (report 1143761) arrived with more than 6 millimeters of headspace. Containers C and E were not used for analysis. Container F was used for GRO analysis and the result was flagged (QL) as a low-biased estimate based upon the headspace. Impact to the result is minor as the GRO result is more than one degree of magnitude below the ADEC cleanup level.

3.3 Blanks

Method blanks and trip blanks were utilized to detect potential cross-contamination of project samples. Method blanks assess laboratory cross-contamination. Trip blanks assess field, shipment, and storage cross-contamination. Blank contamination that did not affect project data is not listed below but is included in the ADEC checklists.

Method Blanks

No analytes were detected above LOQs in the method blanks. However, there were numerous method blank detections below the LOQ that may have impacted data. The following samples had analyte detections within ten times the method blank concentration and were qualified (B) to indicate potential laboratory contamination.

- GRO results in samples 14HF1718WS, 14HF1719WS, 14HF1720WS, 14HF1721WS, 14HF1722WS, 14HF1724WS, 14HF1725WQ, and 14HF1726WQ (report 1143761); and 14HF1909WS, 14HF1913WS, 14HF1914WS, and 14HF1915WS (report 1143745).

There is only minor effect on data quality or usability because most affected results were at least one order of magnitude less than the associated cleanup levels. The effect on GRO in samples 14HF1719WS and 14HF1724WS may be significant as the results were less than one order of magnitude below the associated cleanup level.

Trip Blanks

Trip blanks were included with each cooler of volatile samples. No analytes were detected above the LOQs in the trip blanks. There were no trip blank detections below the LOQ that impacted data.

3.4 Surrogate Recovery

Surrogate compounds were added to each project sample (GRO, DRO, RRO, VOCs, EDB, and PAH) by the laboratory prior to analysis as a measure of analytical extraction efficiency. Surrogate recoveries were then calculated as percentages and reported with the sample results. Surrogate recoveries that did not affect project data are not listed below but are included in the ADEC checklists. All surrogate recoveries in surface water samples were within acceptable tolerance limits or did not affect project samples, except those noted below.

- Method 8270D surrogate terphenyl-d14 recovered above the upper control limit in sample 14HF1711WS (report 1143338). The detected acenaphthylene result in this sample was qualified as a high estimate (QH). All other PAHs were not detected and are considered unaffected by the high surrogate recovery. Impact to the sample was negligible since the surrogate recovery was high-biased and acenaphthalene was detected well below the ADEC cleanup level.

3.5 Laboratory Control Samples

Spike compounds were added to blank samples to assess laboratory extraction and instrumentation performance. All LCSs and LCSDs had acceptable recoveries, and all RPDs between LCS/LCSD sample results (when applicable) were within acceptable limits or did not affect project samples. Furthermore, LCS and/or LCS/LCSD samples were performed at the proper frequency (one per QC batch and for every analyte).

3.6 Matrix Spike Samples and Duplicates

Spike compounds were added to project samples to assess potential matrix interference. MS and MSD samples that did not affect project data are not listed below but are included in the ADEC checklists. MS and MSD samples were collected at the proper frequency (a minimum of 1 for every 20 samples), and were performed for every analysis and QC batch, per QSM requirements, or did not affect project samples. Additionally, MS and/or MSD recovery and precision were within acceptable limits or did not affect project samples.

3.7 Field Duplicates

Field duplicate sample results for surface water samples are summarized in the tables below. The duplicate frequency met the 10% requirement in the Work Plan for all reports. Overall, five field duplicates were collected for 34 primary surface water samples (rate of 15%). LOD values were used in lieu of ND results for RPD calculation purposes. The analytes that did not meet the ADEC precision requirement (≤30%) for water-matrix samples are identified in grey highlight.

Summary of PMP 17.7 Surface Water Sample Field Duplicates (Report 1143338)

Analyte	Method	Units	14HF1703WS	Qualifier	14HF1704WS	Qualifier	RPD
All PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

Summary of PMP 17.7 Surface Water Sample Field Duplicates (Report 1143761)

Analyte	Method	Units	14HF1719WS	Qualifier	14HF1724WS	Qualifier	RPD
GRO	AK101	mg/L	0.284		0.246		14
DRO	AK102	mg/L	0.29	J	0.271	J	7
RRO	AK103	mg/L	0.25	U	0.25	U	0
Lead	SW6020A	mg/L	0.0005	U	0.000454	J	10
Benzene	SW8260B	mg/L	0.00189		0.00197		4
Ethylbenzene	SW8260B	mg/L	0.00113		0.00087	J	26
o-Xylene	SW8260B	mg/L	0.00092	J	0.00094	J	2
Xylene, Isomers m & p	SW8260B	mg/L	0.00554		0.00571		3
Toluene	SW8260B	mg/L	0.00038	J	0.00032	J	17

J – Result is considered an estimate since it is reported below the LOQ.
U – Not detected

Summary of PMP 17.7 Surface Water Sample Field Duplicates (Report 1143761)

Analyte	Method	Units	14HF1721WS	Qualifier	14HF1723WS	Qualifier	RPD
DRO	AK102	mg/L	0.64	U	0.625	U	2
DRO Silica Gel	AK102	mg/L	0.64	U	0.625	U	2
RRO	AK103	mg/L	0.535	U	0.52	U	3
RRO Silica Gel	AK103	mg/L	0.535	U	0.52	U	3

U – Not detected

Summary of PMP 19.5 Surface Water Sample Field Duplicates (Report 1143338)

Analyte	Method	Units	14HF1904WS	Qualifier	14HF1905WS	Qualifier	RPD
All PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

U – Not detected

Summary of PMP 19.5 Surface Water Sample Field Duplicates (Reports 1143745 and 280-58942)

Analyte	Method	Units	14HF1910WS	Qualifier	14HF1911WS	Qualifier	RPD
GRO	AK101	mg/L	0.05	U	0.05	U	0
DRO	AK102	mg/L	0.3	U	0.3	U	0
RRO	AK103	mg/L	0.25	U	0.25	U	0
Lead	SW6020A	mg/L	0.0005	U	0.0005	U	0
Ethylene Dibromide	SW8011	mg/L	0.0000099	U	0.00001	U	1
1,2-Dichloroethane	SW8260B	mg/L	0.00025	U	0.00025	U	0
Benzene	SW8260B	mg/L	0.0002	U	0.0002	U	0
Ethylbenzene	SW8260B	mg/L	0.0005	U	0.0005	U	0
o-Xylene	SW8260B	mg/L	0.0005	U	0.0005	U	0
Xylene, Isomers m & p	SW8260B	mg/L	0.001	U	0.001	U	0
Toluene	SW8260B	mg/L	0.0005	U	0.0005	U	0

U – Not detected

All analytes in surface water field duplicate pairs met the comparison criterion of ≤30% RPD.

3.8 Continuing Calibration Verification Samples

Evaluation of CCV samples is beyond the scope of review for this project; however, the laboratory included comments about CCV samples in some report case narratives. No CCV recovery exceptions were listed that affected surface water project samples. CCV recovery exceptions that did not affect project data are not discussed here, but are included in the ADEC checklists. Additionally, the laboratory made errant CCV case narrative comments either for methods or target compounds not related to this project and these are also discussed in the ADEC checklists.

3.9 Analytical Sensitivity

Several project data analytes were identified as estimations by the laboratory due to reporting results between the DL and LOQ. Results reported above the DL but below the LOQ are qualified as estimates due to the unknown accuracy of the analytical method at those concentrations. These data qualifications are not reported again in this Chemical Data Quality Review, but they are noted with a “J” in associated results tables.

Analytical sensitivity was evaluated to verify that the LODs met the applicable cleanup levels. All associated ADEC water cleanup levels listed in 18 AAC 75.345 were met, so data were reported with adequate sensitivity for project purposes.

3.10 Summary of Qualified Results

Overall, the review process deemed the surface water project data acceptable for use. Several sample results were qualified; however, data quality impact is minor and no data were rejected. The following table provides a summary of surface water sample results qualified pursuant to FES's review, including the associated sample numbers, analytes, and the reason for qualification.

Summary of Qualified Surface Water Results

Data Package	Sample Numbers	Analytes	Qualification	Explanation
1143338 (PMP 17.7)	14HF1711WS	Acenaphthylene	QH	High-Biased Surrogate Recovery
1143745 (PMP 19.5)	14HF1909WS, 14HF1913WS, 14HF1914WS, and 14HF1915WS	GRO	B	Blank Contamination (Method Blank)
1143761 (PMP 17.7)	14HF1722WS	GRO	QL	Improper Preservation (Headspace)
	14HF1718WS, 14HF1719WS, 14HF1720WS, 14HF1721WS, 14HF1722WS, 14HF1724WS, 14HF1725WQ, and 14HF1726WQ	GRO	B	Blank Contamination (Method Blank)

3.11 Completeness and Summary of Data Quality

All surface water data were considered usable (reported with adequate sensitivity and no data were rejected), so a completeness score of 100% was calculated for this project. Therefore, the 90% completeness criterion in the Work Plan was met for the project. Therefore, the 90% completeness criterion in the Work Plan was met for the project surface water data.

Overall, the review process deemed the surface water project data acceptable for use. Several results were qualified; however, the impact to data quality for the majority of the samples was generally minor. The only data quality issues that may have significantly impacted project surface water data is summarized below:

- The GRO results in samples 14HF1719WS and 14HF1724WS may be impacted by method blank contamination since the GRO results in these samples are high-biased and within one order of magnitude below the ADEC cleanup level. GRO results in these samples were qualified (B).

4.0 SOIL SAMPLE DATA QUALITY REVIEW

This section presents the findings of the data quality review and the resulting data qualifications for soil samples. Samples were analyzed for EDB by TA and for all other parameters by SGS and are included in six SDGs (1143326, 1143327, 1143328, 280-58134, 280-58139, and 280-58942).

4.1 Sample Collection

All soil samples were collected according to Work Plan requirements.

4.2 Sample Handling

Sample handling procedures were reviewed to insure correct COC documentation, cooler and temperature blanks of 4±2 °C, proper sample preservation, and that sample analysis occurred within method-specified holding times. The following sample handling discrepancies were noted with soil samples:

Holding Time Discrepancies

- The preparation of EDB samples 14HF1901SO, 14HF1902SO, 14HF1903SO, 14HF1904SO, 14HF1905SO, 14HF1906SO, 14HF1907SO, 14HF1908SO, 14HF1909SO, 14HF1910SO, and 14HF1911SO, (report 280-58134) and 14HF2501SO, 14HF2502SO, 14HF2503SO, 14HF2504SO, and 14HF2505SO (report 280-58139) was performed one or two days outside the 14-day holding time. The EDB results in all samples were qualified as low estimates (QL). Although the results are potentially low-biased and most results are ND, impact to data quality is likely minor as the LODs or results are more than one order of magnitude less than the ADEC cleanup level.

4.3 Blanks

Method blanks and trip blanks were utilized to detect potential cross-contamination of project samples. Method blanks assess laboratory cross-contamination. Trip blanks assess field, shipment, and storage cross-contamination. Blank contamination that did not affect project data is not listed below but is included in the ADEC checklists.

Method Blanks

No analytes were detected above LOQs in the method blanks. However, there were numerous method blank detections below the LOQ that may have impacted data. The following samples had analyte detections within ten times the method blank concentration and were qualified (B) to indicate potential laboratory contamination.

- DRO results in samples 14HF1701SO, 14HF1702SO, 14HF1709SO, 14HF1717SO, 14HF1719SO, 14HF1720SO, 14HF1721SO, and 14HF1723SO (report 1143328); and 14HF2514SO, 14HF2515SO, 14HF2516SO, 14HF2517SO, 14HF2518SO, 14HF2519SO, 14HF2520SO, and 14HF2521SO (report 1143327).

- RRO results in samples 14HF1702SO, 14HF1709SO, 14HF1712SO, 14HF1716SO, 14HF1718SO, 14HF1719SO, 14HF1720SO, 14HF1721SO, 14HF1723SO (report 1143328); and 14HF2516SO, 14HF2517SO, 14HF2519SO, 14HF2520SO, and 14HF2521SO (report 1143327).

There is only minor effect on data quality or usability because all affected results were at least one order of magnitude less than the associated cleanup levels.

Trip Blanks

Trip blanks were shipped with each cooler of volatiles samples.

No analytes were detected above LOQs in the trip blanks. However, there were numerous trip blank detections below the LOQ that may have impacted data. The following results were reported within ten times the trip blank concentrations and were qualified (B) to indicate potential cross-contamination.

- The GRO results in samples 14HF1704SO, 14HF1705SO, 14HF1711SO, 14HF1713SO, 14HF1714SO, 14HF1717SO, 14HF1719SO, 14HF1720SO, 14HF1721SO, 14HF1723SO, 14HF1726SO, and 14HF1727SO (report 1143328); 14HF1901SS, 14HF1902SS, and 14HF1903SS (report 1143746); 14HF1902SO, 14HF1903SO, 14HF1904SO, 14HF1905SO, 14HF1909SO, 14HF1910SO, and 14HF1911SO (report 1143326); and 14HF2501SO, 14HF2502SO, 14HF2506SO, 14HF2511SO, 14HF2514SO, 14HF2515SO, 14HF2516SO, 14HF2517SO, 14HF2518SO, 14HF2519SO, 14HF2520SO, and 14HF2521SO (report 1143327).

Impact to data was minor as the affected results were all below cleanup levels.

4.4 Surrogate Recovery

Surrogate compounds were added to each project sample (GRO, DRO, RRO, VOCs, EDB, and PAH) by the laboratory prior to analysis as a measure of analytical extraction efficiency. Surrogate recoveries were then calculated as percentages and reported with the sample results. Surrogate recoveries that did not affect project data are not listed below but are included in the ADEC checklists. All surrogate recoveries in soil samples were within acceptable tolerance limits or did not affect project samples, except those noted below.

- Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in sample 14HF1901SO (report 1143326). The GRO result in this sample was qualified as a high estimate (QH). Impact to the sample was negligible since surrogate recovery was high-biased and the analyte was detected below the cleanup level.
- Method 8260B surrogate 1,2-dichloroethane-d4 recovered above the upper control limit and surrogate 4-bromofluorobenzene recovered just below the lower control limit in sample 14HF2507SO (report 1143327). No VOCs were detected in this sample and all VOC results were flagged as estimates (QN) without bias since one surrogate recovered above and one recovered below acceptance criteria. There was no impact to the sample from the high surrogate as the results were ND and the impact from the low surrogate was minor as the failure was very minor (0.2% low).

- Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in samples 14HF2508SO and 14HF2510SO (report 1143327). GRO results in these samples were flagged (QH) as biased-high estimates based upon the high surrogate recoveries. Impact to the results may be significant as the detections are within one order of magnitude of the ADEC cleanup level.
- Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in samples 14HF1701SO, 14HF1710SO, 14HF1715SO, 14HF1718SO, 14HF1724SO, and 14HF1725SO (report 1143328). The GRO results in these samples are flagged as estimates with a high bias (QH) based upon the high surrogate recoveries. The impact to sample 14HF1724SO is minor as the GRO result is almost one order of magnitude below the ADEC cleanup level. Impact to the remaining samples may be significant as the GRO results are nearer to or above the ADEC cleanup level.
- Method 8260B surrogate 4-bromofluorobenzene recovered above the upper control limit in sample 14HF1701SO (report 1143328). Detected VOC results in this sample were flagged as biased-high estimates (QH) based upon the high surrogate recovery. Undetected VOCs are considered unaffected by the high surrogate recovery. Impact to the sample is minor as the results are more than one order of magnitude below the cleanup levels.
- Method 8260B surrogate toluene-d8 recovered above the upper control limit in samples 14HF1705SO, 14HF1706SO, and 14HF1707SO (report 1143328). Detected VOC results in these samples were flagged as biased-high estimates (QH) based upon the high surrogate recoveries. Undetected VOCs are considered unaffected by the high surrogate recovery. Impact to the samples is minor as the results are at least one order of magnitude below the ADEC cleanup levels.
- Method 8270D surrogate 2-fluorobiphenyl recovered above the upper control limit in sample 14HF1708SO (report 1143328). Detected PAH compounds in the sample were flagged as biased-high estimates (QH) based upon the high surrogate recovery. Undetected PAHs are considered unaffected by the high surrogate recovery. Impact to the sample is mostly minor as all analytes, except naphthalene, were detected at least one order of magnitude less than the ADEC cleanup levels.

4.5 Laboratory Control Samples

Spike compounds were added to blank samples to assess laboratory extraction and instrumentation performance. LCS and LCSD samples that did not affect project data are not listed here but are included in the ADEC checklists. All LCSs and LCSDs had acceptable recoveries, and all RPDs between LCS/LCSD sample results (when applicable) were within acceptable limits or did not affect project samples. Furthermore, LCS and/or LCS/LCSD samples were performed at the proper frequency (one per QC batch and for every analyte).

4.6 Matrix Spike Samples and Duplicates

Spike compounds were added to project samples to assess potential matrix interference. MS and MSD samples that did not affect project data are not listed below but are included in the ADEC checklists. MS and MSD samples were collected at the proper frequency (a minimum of 1 for every 20 samples), and were performed for every analysis and QC batch, per QSM requirements, or did not affect project samples, with the exceptions noted below. Additionally, MS and/or MSD recovery and precision discrepancies that affect project samples are listed below.

- MS/MSD analysis was not performed for EDB batch 280-237081 (report 280-58139). Two MS/MSD samples were submitted with the project samples, which meets the required frequency. The laboratory analyzed the EDB samples in two batches, but placed the two MS/MSD samples in the same batch. Impact to data was minor since acceptable LCS/LCSD analyses verified batch precision and accuracy and only five samples were included in the batch (14HF2501SO, 14HF2502SO, 14HF2503SO, 14HF2504SO, and 14HF2505SO).
- MS/MSD analysis was not performed for DRO/RRO batches XXX31496 (report 1143326), XXX31503 (report 1143328), and XXX31504 (report 1143328). MS/MSD samples were submitted with the project samples at the required frequency. However, the laboratory analyzed the DRO/RRO samples in multiple batches. Impact to data was minor since acceptable LCS/LCSD analyses verified batch precision and accuracy and only six samples were included in the batches (14HF1901SO, 14HF1902SO, and 14HF1903SO (report 1143326) and 14HF1701SO, 14HF1702SO, and 14HF1703SO (report 1143328)).
- MS/MSD analysis was not performed for PAH batch XXX31542 (report 1143327). Two sets of MS/MSD samples were submitted with the project samples, which meets the required frequency. However, the laboratory analyzed the PAH samples in two batches and placed the two MS/MSD sample sets in the same batch. Impact to data is unknown but likely minor as the MS/MSD analyses performed on project samples in associated QC batches were acceptable. Batch accuracy was confirmed by an acceptable LCS sample, but no batch precision was confirmed.
- The VOC MS sample prepared from 14HF1710SO (report 1143328) recovered below the lower control limit for p&m-xylene. The p&m-xylene result in the parent sample was qualified (ML) as a low estimate based upon the low recovery. Impact to the sample was minor as the paired MSD recovery was within control limits and the MS failure was minor (1.8% low).
- The case narrative in report 1143746 contained an errant MS/MSD comment about the VOC analyte 1,2,4-trimethylbenzene. 1,2,4-Trimethylbenzene was not a target compound reported for this project and the comments do not impact data quality. The same case narrative also included an errant comment about PAH MSD sample 1227250, which was prepared from a non-project parent and was not reported in this SDG.

4.7 Field Duplicates

Field duplicate soil sample results are summarized in the tables below. The duplicate frequency met the 10% requirement in the Work Plan. Overall, seven field duplicates were collected for 54 primary soil samples (rate of 13%). LOD values were used in lieu of ND results for RPD calculation purposes. The analytes that did not meet the ADEC precision requirement (≤50%) for soil-matrix samples are identified in grey highlight.

Summary of PMP 17.7 Soil Sample Field Duplicate Results (Report 1143328)

Analyte	Method	Units	14HF1704SO	Qualifier	14HF1705SO	Qualifier	RPD
GRO	AK101	mg/Kg	2.28	J	2.87	J	23
DRO	AK102	mg/Kg	11.1	U	22.4	U	67
RRO	AK103	mg/Kg	11.1	U	22.4	U	67
Lead	SW6020A	mg/Kg	2.11		1.54		31
Benzene	SW8260B	mg/Kg	0.00695	U	0.00557	J	22
Ethylbenzene	SW8260B	mg/Kg	0.014	U	0.0147	U	5
o-Xylene	SW8260B	mg/Kg	0.014	U	0.0147	U	5
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0365	J	0.0361	J	1
Toluene	SW8260B	mg/Kg	0.0103	J	0.0147	J	35
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00797		0.00785	J	2
2-Methylnapthalene	8270D SIMS (PAH)	mg/Kg	0.0111		0.0114		3
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.00455	J	0.00561	J	21
All Other PAHs	8270D SIMS (PAH)	mg/Kg	0.00281	U	0.00565	U	67

Results highlighted in gray do not meet the 50% RPD criterion.
J – Result is estimated because it was reported below the LOQ.
U – Not detected.

Summary of PMP 17.7 Soil Sample Field Duplicate Results (Report 1143328)

Analyte	Method	Units	14HF1713SO	Qualifier	14HF1714SO	Qualifier	RPD
GRO	AK101	mg/Kg	9.19		7.55		20
DRO	AK102	mg/Kg	12.1	U	12.1	U	0
RRO	AK103	mg/Kg	12.1	U	12.1	U	0
Lead	SW6020A	mg/Kg	2.56		2.43		5
Benzene	SW8260B	mg/Kg	0.00711	J	0.0086	J	19
Ethylbenzene	SW8260B	mg/Kg	0.021	J	0.0154	J	31
o-Xylene	SW8260B	mg/Kg	0.022	J	0.019	J	15
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0811		0.0516	J	44
Toluene	SW8260B	mg/Kg	0.0291	J	0.0186	J	44
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00274	J	0.00216	J	24
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00555	J	0.00357	J	43
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

J – Result is estimated because it was reported below the LOQ.
U – Not detected.

Summary of PMP 17.7 Soil Sample Field Duplicate Results (Report 1143328)

Analyte	Method	Units	14HF1724SO	Qualifier	14HF1725SO	Qualifier	RPD
GRO	AK101	mg/Kg	30.2	QN	60.2	QN	66
DRO	AK102	mg/Kg	66.2		44.4		39
RRO	AK103	mg/Kg	44.8		33.2		30
Lead	SW6020A	mg/Kg	5.63		6.1		8

Analyte	Method	Units	14HF1724SO	Qualifier	14HF1725SO	Qualifier	RPD
Benzene	SW8260B	mg/Kg	0.0107	U	0.0119	U	11
Ethylbenzene	SW8260B	mg/Kg	0.208	QN	0.353	QN	52
o-Xylene	SW8260B	mg/Kg	0.0188	J	0.0252	J	29
Xylene, Isomers m & p	SW8260B	mg/Kg	0.529		0.83		44
Toluene	SW8260B	mg/Kg	0.0214	U	0.02	J	7
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.239		0.24		0
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.385		0.379		2
Acenaphthene	8270D SIMS (PAH)	mg/Kg	0.00549	J	0.00604	J	10
Acenaphthylene	8270D SIMS (PAH)	mg/Kg	0.00346	U	0.00229	J	41
Fluorene	8270D SIMS (PAH)	mg/Kg	0.00704		0.0086		20
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.195		0.144		30
Phenanthrene	8270D SIMS (PAH)	mg/Kg	0.00316	J	0.00359	J	13
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

J – Result is estimated because it was reported below the LOQ.
QN – Result is considered and estimate due to poor field duplicate precision.
U – Not detected.

Summary of PMP 19.5 Soil Sample Field Duplicate Results (Reports 1143326 and 280-58134)

Analyte	Method	Units	14HF1907SO	Qualifier	14HF1908SO	Qualifier	RPD
GRO	AK101	mg/Kg	1.78	U	1.87	U	5
DRO	AK102	mg/Kg	12	U	12.2	U	2
RRO	AK103	mg/Kg	12	U	12.2	U	2
Lead	SW6020A	mg/Kg	1.26		1.29		2
Ethylene Dibromide	SW8011	mg/Kg	0.000059	U	0.000061	U	3
1,2-Dichloroethane	SW8260B	mg/Kg	0.0179	U	0.0187	U	4
Benzene	SW8260B	mg/Kg	0.0089	U	0.0093	U	4
Ethylbenzene	SW8260B	mg/Kg	0.0179	U	0.0187	U	4
o-Xylene	SW8260B	mg/Kg	0.0179	U	0.0187	U	4
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0357	U	0.0372	U	4
Toluene	SW8260B	mg/Kg	0.0179	U	0.0187	U	4
All PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

U – Not detected.

Summary of PMP 19.5 Soil Sample Field Duplicate Results (Reports 1143476 and 280-58942)

Analyte	Method	Units	14HF1902SS	Qualifier	14HF1903SS	Qualifier	RPD
Gasoline Range Organics	AK101	mg/Kg	1.39	J	1.08	J	25
Diesel Range Organics	AK102	mg/Kg	11.9	U	11.4	U	4
Residual Range Organics	AK103	mg/Kg	43.6	QN	15	J,QN	98
Lead	SW6020A	mg/Kg	0.965		0.644		40
Ethylene Dibromide	SW8011	mg/Kg	0.00006	U	0.000054	U	11
1,2-Dichloroethane	SW8260B	mg/Kg	0.0164	U	0.0147	U	11
Benzene	SW8260B	mg/Kg	0.0082	U	0.00735	U	11
Ethylbenzene	SW8260B	mg/Kg	0.0164	U	0.0147	U	11

Analyte	Method	Units	14HF1902SS	Qualifier	14HF1903SS	Qualifier	RPD
o-Xylene	SW8260B	mg/Kg	0.0164	U	0.0147	U	11
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0327	U	0.0294	U	11
Toluene	SW8260B	mg/Kg	0.0164	U	0.0147	U	11
All PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

Results highlighted in gray do not meet the 50% RPD criterion.
J – Result is estimated because it was reported below the LOQ.
QN – Result is considered and estimate due to poor field duplicate precision.
U – Not detected.

Summary of PMP 25.5 Soil Sample Field Duplicate Results (Reports 1143327 and 280-58139)

Analyte	Method	Units	14HF2504SO	Qualifier	14HF2505SO	Qualifier	RPD
GRO	AK101	mg/Kg	23.6		29.3		22
DRO	AK102	mg/Kg	17.9	J	21.7	J	19
RRO	AK103	mg/Kg	11.4	U	15.9	J	33
Lead	SW6020A	mg/Kg	0.689		1.1		46
Ethylene Dibromide	SW8011	mg/Kg	0.000059	U	0.000058	U	2
1,2-Dichloroethane	SW8260B	mg/Kg	0.0147	U	0.015	U	2
Benzene	SW8260B	mg/Kg	0.00735	U	0.0075	U	2
Ethylbenzene	SW8260B	mg/Kg	0.066		0.0457		36
o-Xylene	SW8260B	mg/Kg	0.0126	J	0.015	U	17
Xylene, Isomers m & p	SW8260B	mg/Kg	0.306		0.213		36
Toluene	SW8260B	mg/Kg	0.0147	U	0.015	U	2
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.122		0.117		4
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.32		0.301		6
Acenaphthene	8270D SIMS (PAH)	mg/Kg	0.00506	J	0.00504	J	0
Fluorene	8270D SIMS (PAH)	mg/Kg	0.012		0.0124		3
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.113		0.123		8
Phenanthrene	8270D SIMS (PAH)	mg/Kg	0.00383	J	0.00418	J	9
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

J – Result is estimated because it was reported below the LOQ.
U – Not detected.

Summary of PMP 25.5 Soil Sample Field Duplicate Results (Reports 1143327 and 280-58139)

Analyte	Method	Units	14HF2508SO	Qualifier	14HF2509SO	Qualifier	RPD
GRO	AK101	mg/Kg	167	QN	316	QN	62
DRO	AK102	mg/Kg	3160		3290		4
RRO	AK103	mg/Kg	11.4	J	8.97	J	24
Lead	SW6020A	mg/Kg	3.02		2.12		35
Ethylene Dibromide	SW8011	mg/Kg	0.0017		0.0019		11
1,2-Dichloroethane	SW8260B	mg/Kg	0.0138	U	0.0123	U	11
Benzene	SW8260B	mg/Kg	0.0069	U	0.00615	U	11
Ethylbenzene	SW8260B	mg/Kg	0.0138	U	0.0123	U	11
o-Xylene	SW8260B	mg/Kg	0.0138	U	0.0123	U	11
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0276	U	0.0245	U	12

Analyte	Method	Units	14HF2508SO	Qualifier	14HF2509SO	Qualifier	RPD
Toluene	SW8260B	mg/Kg	0.0138	U	0.0123	U	11
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.303	QN	0.0265	U,QN	168
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

Results highlighted in gray do not meet the 50% RPD criterion.
J – Result is estimated because it was reported below the LOQ.
QN – Result is considered and estimate due to poor field duplicate precision.
U – Not detected.

Analytes in the following soil field duplicate pairs did not meet the comparison criterion of ≤50% RPD and were qualified (QN) as estimated due to field duplicate imprecision, unless otherwise noted.

- 14HF1704SO/14HF1705SO (report 1143328): DRO (67%), RRO (67%), and all ND PAHs (67%). DRO, RRO, and all PAHs except 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene were not detected in either sample and the LODs were used to calculate the RPDs. The LODs for sample 14HF1705SO were elevated due to limited sample mass and this led to the high RPDs. These dissimilar RPDs led to the high RPD results and no flagging was applied.
- 14HF1724SO/14HF1725SO (report 1143328): GRO (66%) and ethylbenzene (52%).
- 14HF1902SS/14HF1903SS (report 1143746): RRO (98%).
- 14HF2508SO/14HF2509SO (report 1143327): GRO (62%) and naphthalene (168%).

In all cases except GRO in samples 14HF2508SO/14HF2509SO, impact to data was minor because non-comparable field duplicate results were well below cleanup levels, and most non-compliant comparisons involved “J” flagged and/or ND results. Impact to GRO results in samples 14HF2508SO and 14HF2509SO may be significant as they are just above and below the ADEC cleanup level.

4.8 Continuing Calibration Verification Samples

Evaluation of CCV samples is beyond the scope of review for this project; however, the laboratory included comments about CCV samples in some report case narratives. No CCV recovery exceptions were listed that affected soil project samples. CCV recovery exceptions that did not affect project data are not discussed here, but are included in the ADEC checklists. Additionally, the laboratory made errant CCV case narrative comments either for methods or target compounds not related to this project and these are also discussed in the ADEC checklists.

4.9 Analytical Sensitivity

Several project data reported analytes were identified as estimations by the laboratory due to reporting between the DL and the LOQ. Results reported above the DL but below the LOQ are qualified as estimates due to the unknown accuracy of the analytical method at those concentrations. These data qualifications are not reported again in this Chemical Data Quality Review, but they are noted with a “J” in associated results tables.

Analytical sensitivity was evaluated to verify that the detected results and/or LODs met the applicable cleanup levels. The reported LODs for soil samples were compared to cleanup levels presented in 18 AAC 75.341, Tables B1 and B2, over 40-inch zone (ADEC, 2012). All soil LODs met the cleanup levels for ND results with the exception of benzene in samples 14HF1703SO, 14HF1715SO, and 14HF1716SO, and 1,2-dichloroethane in samples 14HF1901SO, 14HF1904SO, 14HF1906SO, 14HF1907SO, 14HF1908SO, 14HF1901SS, 14HF1902SS, 14HF2511SO, and 14HF2513SO. Consequently, the absence of benzene and 1,2-dichloroethane at levels exceeding ADEC soil cleanup levels at those locations cannot be confirmed. Impacted data are highlighted in results tables. The three samples with elevated benzene LODs exceeded cleanup levels for GRO and DRO (14HF1703SO also exceeded for ethylbenzene and m+p-xylenes), and benzene results exceeded the cleanup level in other soil samples at the PMP 17.7 site, so impact to benzene data is minor. The impact to 1,2-dichloroethane data at PMP 19.5 is notable since the analyte was not detected at the site and half of the results may not be useable.

4.10 Summary of Qualified Results

Overall, the review process deemed the soil project data acceptable for use. Several results were qualified; however, data quality impact is minor and no data were rejected. The following table provides a summary of soil sample results qualified pursuant to FESs review, including the associated sample numbers, analytes, and the reason for qualification. Note that per USACE review comments on the draft report, only the most severe flag was used when multiple Q or M flags were assigned to a result in tables and figures.

Summary of Qualified Soil Results

Data Package	Sample Numbers	Analytes	Qualification	Explanation
280-58134 (PMP 19.5)	14HF1901SO, 14HF1902SO, 14HF1903SO, 14HF1904SO, 14HF1905SO, 14HF1906SO, 14HF1907SO, 14HF1908SO, 14HF1909SO, 14HF1910SO, and 14HF1911SO	EDB	QL	Missed Hold Time
28058139 (PMP 25.5)	14HF2501SO, 14HF2502SO, 14HF2503SO, 14HF2504SO, and 14HF2505SO	EDB	QL	Missed Hold Time
1143326 (PMP 19.5)	14HF1902SO, 14HF1903SO, 14HF1904SO, 14HF1905SO, 14HF1909SO, 14HF1910SO, and 14HF1911SO	GRO	B	Blank Contamination (Trip Blank)
	14HF1901SO	GRO	QH	High-Biased Surrogate Recovery

Data Package	Sample Numbers	Analytes	Qualification	Explanation
1143327 (PMP 25.5)	14HF2514SO, 14HF2515SO, 14HF2516SO, 14HF2517SO, 14HF2518SO, 14HF2519SO, 14HF2520SO, and 14HF2521SO	DRO	B	Blank Contamination (Method Blank)
	14HF2516SO, 14HF2517SO, 14HF2519SO, 14HF2520SO, and 14HF2521SO	RRO		
	14HF2501SO, 14HF2502SO, 14HF2506SO, 14HF2511SO, 14HF2514SO, 14HF2515SO, 14HF2516SO, 14HF2517SO, 14HF2518SO, 14HF2519SO, 14HF2520SO, and 14HF2521SO	GRO	B	Blank Contamination (Trip Blank)
	14HF2507SO	All VOCs	QN	High- and Low-Biased Surrogate Recoveries
	14HF2508SO and 14HF2510SO	GRO	QH	High-Biased Surrogate Recovery
	14HF2508SO and 14HF2509SO	GRO and Naphthalene	QN	Poor Field Duplicate Precision
1143328 (PMP 17.7)	14HF1701SO, 14HF1702SO, 14HF1709SO, 14HF1717SO, 14HF1719SO, 14HF1720SO, 14HF1721SO, and 14HF1723SO	DRO	B	Blank Contamination (Method Blank)
	14HF1702SO, 14HF1709SO, 14HF1712SO, 14HF1716SO, 14HF1718SO, 14HF1719SO, 14HF1720SO, 14HF1721SO, 14HF1723SO	RRO		
	14HF1704SO, 14HF1705SO, 14HF1711SO, 14HF1713SO, 14HF1714SO, 14HF1717SO, 14HF1719SO, 14HF1720SO, 14HF1721SO, 14HF1723SO, and 14HF1726SO	GRO	B	Blank Contamination (Trip Blank)
	14HF1701SO, 14HF1710SO, 14HF1715SO, 14HF1718SO, 14HF1724SO, and 14HF1725SO	GRO	QH	High-Biased Surrogate Recovery
	14HF1701SO, 14HF1705SO, 14HF1706SO, and 14HF1707SO	Detected VOCs	QH	High-Biased Surrogate Recovery
	14HF1708SO	Detected PAHs	QH	High-Biased Surrogate Recovery
	14HF1710SO	p&m-Xylene	ML	Low MS Recovery
	14HF1724SO and 14HF1725SO	GRO and Ethylbenzene	QN	Poor Field Duplicate Precision
1143746 (PMP 19.5)	14HF1901SS, 14HF1902SS, and 14HF1903SS	GRO	B	Blank Contamination (Trip Blank)
	14HF1902SS and 14HF1903SS	RRO	QN	Poor Field Duplicate Precision

Note that per USACE review comments on the draft report, only the most severe flag was used when multiple Q or M flags were assigned to a result in tables and figures.

4.11 Completeness and Summary of Data Quality

A majority of the soil data are considered usable (reported with adequate sensitivity and no data were rejected). However, the LOD for ND benzene results in 3 of the 84 soil samples and the LOD for non-detect 1,2-dichloroethane results in 9 of 84 soil samples exceeded the ADEC soil cleanup levels, and those data may not be usable. A completeness score of 99% was calculated for this project (based on 1676 of 1688 usable sediment results). Therefore, the 90% completeness criterion in the Work Plan was met for the project soil data.

Overall, the review process deemed the soil data acceptable for use. Several results were qualified; however, the impact to data quality impact was generally minor. The only data quality issues that may have significantly impacted project soil data are summarized below:

- Due to sample dilution, the reported LODs for the VOC analyte benzene did not meet the ADEC Method Two soil cleanup level in samples 14HF1703SO, 14HF1715SO, and 14HF1716SO. Consequently, the absence of benzene at levels exceeding the ADEC soil cleanup level at these locations cannot be confirmed. Impact to data is minor since the affected samples generally exceeded cleanup levels for other compounds, and benzene was detected in other PMP 17.7 site samples in excess of the cleanup level.
- The reported LODs for the VOC analyte 1,2-dichloroethane did not meet the ADEC Method Two soil cleanup level in samples 14HF1901SO, 14HF1904SO, 14HF1906SO, 14HF1907SO, 14HF1908SO, 14HF1901SS, 14HF1902SS, 14HF2511SO, and 14HF2513SO. Consequently, the absence of 1,2-dichloroethane at levels exceeding the ADEC soil cleanup level at these locations cannot be confirmed. The impact to 1,2-dichloroethane data at PMP 19.5 is notable since the analyte was not detected at the site and half of the results may not be useable.
- The GRO results in samples 14HF1701SO, 14HF1710SO, 14HF1715SO, 14HF1718SO, 14HF1724SO, 14HF1725SO, 14HF2508SO and 14HF2510SO may be impacted by high surrogate recoveries since the GRO results in these samples are high-biased and detected within one order of magnitude of the ADEC cleanup level. GRO results in these samples were qualified as high estimates (QH).
- The naphthalene result in sample 14HF1708SO may be impacted by high surrogate recovery since the naphthalene result in this sample is high-biased and detected within one order of magnitude of the ADEC cleanup level. The naphthalene result in this sample was qualified as a high estimate (QH).
- The GRO results in samples 14HF2508SO and 14HF2509SO may be impacted by poor field duplicate precision since the results are just above and below the ADEC cleanup level. The GRO results in these samples were qualified as non-biased estimates (QN).

5.0 SEDIMENT SAMPLE DATA QUALITY REVIEW

This section presents the findings of the data quality review and the resulting data qualifications for sediment samples. Samples were analyzed for EDB by TA and for all other parameters by SGS and are included in three SDGs (1143746, 1143760, and 280-58942).

5.1 Sample Collection

All sediment samples were collected according to Work Plan requirements.

5.2 Sample Handling

Sample handling procedures were reviewed to insure correct COC documentation, cooler and temperature blanks of 4±2 °C, proper sample preservation, and that sample analysis occurred within method-specified holding times. The following sample handling discrepancies were noted with sediment samples:

Documentation Discrepancies

- The laboratory noted sample ID and location ID discrepancies between the bottle labels and the COC for sample 14HF1901SE (report 1143746). FES was contacted and the laboratory logged the samples in correctly.

5.3 Blanks

Method blanks, trip blanks, and equipment blanks were utilized to detect potential cross-contamination of project samples. Method blanks assess laboratory cross-contamination. Trip blanks assess field, shipment, and storage cross-contamination. Equipment blanks assess cross-contamination due to contact with reusable sampling equipment. Blank contamination that did not affect project data is not listed below but is included in the ADEC checklists.

Method Blanks

No analytes were detected above LOQs in the method blanks. However, there were numerous method blank detections below the LOQ that may have impacted data. The following samples had analyte detections within ten times the method blank concentration and were qualified (B) to indicate potential laboratory contamination.

- GRO results in samples 14HF1712SE, 14HF1715SE, and 14HF1716SE (report 1143760).
- RRO results in samples 14HF1717SE and 14HF1718SE (report 1143760).
- 1-Methylnaphthalene result in sample 14HF1908SE (report 1143746).
- 2-Methylnaphthalene result in sample 14HF1908SE (report 1143746).
- Naphthalene result in sample 14HF1908SE (report 1143746).

There is only minor effect on data quality or usability because all affected results were at least one order of magnitude less than the associated cleanup levels.

Trip Blanks

Trip blanks were shipped with each cooler of volatiles samples. No analytes were detected above LOQs in the trip blanks. However, there were numerous trip blank detections below the LOQ that may have impacted data. The following results were reported within ten times the trip blank concentrations and were qualified (B) to indicate potential cross-contamination.

- The GRO results in samples 14HF1701SE, 14HF1702SE, 14HF1705SE, 14HF1706SE, and 14HF1711SE (report 1143760); and 14HF1901SE, 14HF1902SE, 14HF1903SE, 14HF1905SE, 14HF1906SE, 14HF1907SE, and 14HF1908SE (report 1143746).
- The ethylbenzene result in sample 14HF1703SE (report 1143760).

Impact to data was minor as the affected results were all below cleanup levels.

Equipment Blanks

Equipment Blank sample 14HF1725WQ was collected during sediment sampling activities at the PMP 17.7 site. The equipment blank was collected from reusable sampling equipment to evaluate the potential for sample cross-contamination during sample collection. The equipment blank was analyzed for the same methods as the sediment samples. Although several analytes were detected in the equipment blank sample, no sample results were reported within ten times the blank concentrations (on a part per million basis since the Equipment Blank was a water matrix sample). Consequently, there was no impact to project data.

5.4 Surrogate Recovery

Surrogate compounds were added to each project sample (GRO, DRO, RRO, VOCs, EDB, and PAH) by the laboratory prior to analysis as a measure of analytical extraction efficiency. Surrogate recoveries were then calculated as percentages and reported with the sample results. Surrogate recoveries that did not affect project data are not listed below but are included in the ADEC checklists. All surrogate recoveries in sediment samples were within acceptable tolerance limits or did not affect project samples, except those noted below.

- Method AK101 surrogate 4-bromofluorobenzene recovered below the lower control limit in sample 14HF1712SE (report 1143760). The GRO result in the parent sample was flagged (QL) based upon the low recovery. Impact to the sample was minor as the GRO result was more than one order of magnitude below the ADEC cleanup level.
- Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in samples 14HF1714SE, 14HF1717SE, 14HF1718SE, 14HF1720SE, and 14HF1722SE (report 1143760). The GRO results in these samples were flagged (QH) as estimates with a high bias based upon the high surrogate recoveries. Impact to the samples may be significant since the GRO results are within one order of magnitude below the ADEC cleanup level.

- Method 8260B surrogates toluene-d8 and 1,2-dichloroethane-d4 recovered above the upper control limits in sample 14HF1712SE (report 1143760). Toluene was detected in the sample and the result was flagged (QH) as a high estimate. All other VOC compounds were not detected and are considered unaffected by the high recoveries. Impact to the toluene result in this sample was minor since the detection was more than three orders of magnitude below the ADEC cleanup level.
- Method 8270D surrogate 2-fluorobiphenyl recovered below the lower control limit in sample 14HF1706SE (report 1143760). All PAH compounds in this sample were flagged (QL) as low estimates based upon the low recovery. Although the results are potentially low-biased and most results are ND, impact to data quality is likely minor as the second surrogate was within control limits and the LODs or results are more than one order of magnitude less than the ADEC cleanup levels.
- Method 8270D surrogate terphenyl-d14 recovered above the upper control limit in sample 14HF1707SE (report 1143760). Benzo(b)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene were detected in the sample and were flagged (QH) as high estimates. All other PAH compounds were not detected and are considered unaffected by the high recovery. Impact to these results was minor since the detections were at least two orders of magnitude below the ADEC cleanup levels.

5.5 Laboratory Control Samples

Spike compounds were added to blank samples to assess laboratory extraction and instrumentation performance. LCS and LCSD samples that did not affect project data are not listed here but are included in the ADEC checklists. All LCSs and LCSDs had acceptable recoveries, and all RPDs between LCS/LCSD sample results (when applicable) were within acceptable limits or did not affect project samples. Furthermore, LCS and/or LCS/LCSD samples were performed at the proper frequency (one per QC batch and for every analyte).

5.6 Matrix Spike Samples and Duplicates

Spike compounds were added to project samples to assess potential matrix interference. MS and MSD samples that did not affect project data are not listed below but are included in the ADEC checklists. MS and MSD samples were collected at the proper frequency (a minimum of 1 for every 20 samples), and were performed for every analysis and QC batch, per QSM requirements, or did not affect project samples, with the exceptions noted below. Additionally, MS and/or MSD recovery and precision discrepancies that affect project samples are listed below.

- MS/MSD analysis was not performed for DRO/RRO batches XXX31696 and XXX31699 (report 1143746). Two sets of MS/MSD samples were submitted with the project samples, which meets the required frequency. However, the laboratory batched the project samples in four batches. Impact to data is minor as acceptable LCS/LCSD analyses verified batch precision and accuracy and MS/MSD results in associated batches were acceptable. Samples

14HF1701SE, 14HF1702SE, 14HF1703SE, 14HF1704SE, 14HF1705SE, 14HF1717SE, and 14HF1718SE were contained in the two batches lacking MS/MSDs.

- The PAH MSD sample prepared from 14HF1901SE (report 1143746) recovered below the lower control limit for benzo(g,h,i)perylene. The benzo(g,h,i)perylene result in the parent sample was qualified (ML) as a low estimate based upon the low recovery. Although the result is potentially low-biased and the result in the parent sample was ND, impact to data quality is likely minor as the LOD was several orders of magnitude less than the ADEC cleanup level.
- The PAH MS/MSD samples prepared from 14HF1901SE (report 1143746) had RPDs above the control limit for benzo(g,h,i)perylene and benzo(k)fluoranthene. The benzo(g,h,i)perylene and benzo(k)fluoranthene results in the parent sample were qualified (MN) as estimates based upon the poor precision. Impact to the results was minor as the LODs were several orders of magnitude less than the ADEC cleanup level.
- The PAH MSD sample prepared from 14HF1706SE (report 1143760) recovered below the lower control limits for 1-methylnaphthalene and 2-methylnaphthalene. The 1-methylnaphthalene and 2-methylnaphthalene results in the parent sample were qualified (ML) as low estimates based upon the low recoveries. Impact to the results was minor as the paired MS recoveries were within control limits and the parent sample results for the two analytes were several orders of magnitude below the ADEC cleanup levels.
- The PAH MS and/or MSD samples prepared from 14HF1712SE (report 1143760) recovered below the lower control limits for 1-methylnaphthalene, 2-methylnaphthalene, benzo(a)pyrene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, fluorene, indeno(1,2,3-cd)pyrene, and naphthalene. 1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were detected in the parent sample at concentrations greater than 4-times that of the spike level and the recoveries are not considered meaningful. No flagging was applied to these analytes. The benzo(a)pyrene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, fluorene, and indeno(1,2,3-cd)pyrene results in the parent sample were flagged (ML) as low estimates based upon the low recoveries. Although the results are potentially low-biased and most results are ND, impact to data quality is likely minor as the paired MS or MSD recoveries were within control limits and the LODs or results are more than one order of magnitude less than the ADEC cleanup levels.
- The PAH MS/MSD samples prepared from 14HF1712SE (report 1143760) had RPDs above the control limits for 1-methylnaphthalene, 2-methylnaphthalene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, and naphthalene. 1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were detected in the parent sample at concentrations greater than 4-times that of the spike level and the precision results are not considered meaningful. The benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(g,h,i)perylene results in the parent sample were flagged (MN) as estimates based upon the poor precision. Impact to the results in the parent sample were minor as the LODs or results are more than one order of magnitude less than the ADEC cleanup levels.

5.7 Field Duplicates

Field duplicate sediment sample results are summarized in the tables below. The duplicate frequency met the 10% requirement in the Work Plan. Overall, three field duplicates were collected for 27 primary sediment samples (rate of 11%). LOD values were used in lieu of ND results for RPD calculation purposes. The analytes that did not meet the ADEC precision requirement (≤50%) for soil-matrix samples are identified in grey highlight.

Summary of PMP 17.7 Sediment Sample Field Duplicate Results (Report 1143760)

Analyte	Method	Units	14HF1706SE	Qualifier	14HF1707SE	Qualifier	RPD
GRO	AK101	mg/Kg	5.61	QN	10.5	QN	61
DRO	AK102	mg/Kg	53.8		34.9		43
RRO	AK103	mg/Kg	36.6		35.9		2
Lead	SW6020A	mg/Kg	7.97		7.9		1
Benzene	SW8260B	mg/Kg	0.01	J	0.0135	J	30
Ethylbenzene	SW8260B	mg/Kg	0.0264	U	0.0271	U	3
o-Xylene	SW8260B	mg/Kg	0.0264	U	0.0271	U	3
Xylene, Isomers m & p	SW8260B	mg/Kg	0.053	U	0.054	U	2
Toluene	SW8260B	mg/Kg	0.0264	U	0.0271	U	3
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00418	J,QN	0.00969	QN	79
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00229	J,QN	0.00625	J,QN	93
Benzo[b]Fluoranthene	8270D SIMS (PAH)	mg/Kg	0.00319	J	0.00402	J	23
Chrysene	8270D SIMS (PAH)	mg/Kg	0.00388	J	0.00491	J	23
Fluoranthene	8270D SIMS (PAH)	mg/Kg	0.0037	U	0.00367	J	1
Phenanthrene	8270D SIMS (PAH)	mg/Kg	0.0037	U,QN	0.00647	J,QN	54
Pyrene	8270D SIMS (PAH)	mg/Kg	0.00341	J	0.00404	J	17
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

Results highlighted in gray do not meet the 50% RPD criterion.
J – Result is estimated because it was reported below the LOQ.
QN – Result is considered and estimate due to poor field duplicate precision.
U – Not detected.

Summary of PMP 17.7 Sediment Sample Field Duplicate Results (Report 1143760)

Analyte	Method	Units	14HF1712SE	Qualifier	14HF1713SE	Qualifier	RPD
GRO	AK101	mg/Kg	6.26	J	7.7	U	21
DRO	AK102	mg/Kg	125		122		2
RRO	AK103	mg/Kg	171		238		33
Lead	SW6020A	mg/Kg	29.3	QN	15.6	QN	61
Benzene	SW8260B	mg/Kg	0.0437	U	0.0386	U	12
Ethylbenzene	SW8260B	mg/Kg	0.0875	U	0.077	U	13
o-Xylene	SW8260B	mg/Kg	0.0875	U	0.077	U	13
Xylene, Isomers m & p	SW8260B	mg/Kg	0.174	U	0.155	U	12
Toluene	SW8260B	mg/Kg	0.0716	J	0.0602	J	17
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.519	QN	0.289	QN	57
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.789	QN	0.435	QN	58
Fluorene	8270D SIMS (PAH)	mg/Kg	0.0368	J	0.0359	U	2
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.708	QN	0.38	QN	60

Analyte	Method	Units	14HF1712SE	Qualifier	14HF1713SE	Qualifier	RPD
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

J – Result is estimated because it was reported below the LOQ.
QN – Result is considered and estimate due to poor field duplicate precision.
U – Not detected.

Summary of PMP 19.5 Sediment Sample Field Duplicate Results (Reports 1143476 and 280-58942)

Analyte	Method	Units	14HF1902SE	Qualifier	14HF1903SE	Qualifier	RPD
GRO	AK101	mg/Kg	1.93	J	1.57	J	21
DRO	AK102	mg/Kg	14.1	U	13.8	U	2
RRO	AK103	mg/Kg	19.9	J	25.1	J	23
Lead	SW6020A	mg/Kg	1.1		1.07		3
Ethylene Dibromide	SW8011	mg/Kg	0.000072	U	0.000071	U	1
1,2-Dichloroethane	SW8260B	mg/Kg	0.0242	U	0.023	U	5
Benzene	SW8260B	mg/Kg	0.0121	U	0.0115	U	5
Ethylbenzene	SW8260B	mg/Kg	0.0242	U	0.023	U	5
o-Xylene	SW8260B	mg/Kg	0.0242	U	0.023	U	5
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0483	U	0.0459	U	5
Toluene	SW8260B	mg/Kg	0.0242	U	0.023	U	5
All PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

J – Result is estimated because it was reported below the LOQ.
U – Not detected.

Analytes in the following sediment field duplicate pairs did not meet the comparison criterion of ≤50% RPD and were qualified (QN) as estimated due to field duplicate imprecision.

- 14HF1706SE/14HF1707SE (report 1143760): GRO (61%), 1-methylnaphthalene (79%), 2-methylnaphthalene (93%), and phenanthrene (54%).
- 14HF1712SE/14HF1713SE (report 1143760): lead (61%), 1-methylnaphthalene (57%), 2-methylnaphthalene (58%), and naphthalene (60%).

In all cases, impact to data was minor because non-comparable field duplicate results were well below cleanup levels, and most non-compliant comparisons involved “J” flagged and/or ND results.

5.8 Continuing Calibration Verification Samples

Evaluation of CCV samples is beyond the scope of review for this project; however, the laboratory included comments about CCV samples in some report case narratives. No CCV recovery exceptions were listed that affected sediment project samples. CCV recovery exceptions that did not affect project data are not discussed here, but are included in the ADEC checklists. Additionally, the laboratory made errant CCV case narrative comments either for methods or target compounds not related to this project and these are also discussed in the ADEC checklists.

5.9 Analytical Sensitivity

Several project data reported analytes were identified as estimations by the laboratory due to reporting between the DL and the LOQ. Results reported above the DL but below the LOQ are qualified as estimates due to the unknown accuracy of the analytical method at those concentrations. These data qualifications are not reported again in this Chemical Data Quality Review, but they are noted with a "J" in associated results tables.

Analytical sensitivity was evaluated to verify that the detected results and/or LODs met the applicable screening and cleanup levels. The reported LODs for sediment samples were compared to NOAA PEL and TELs, and the most stringent ADEC Method Two cleanup levels (Over 40-Inch Zone). All sediment LODs met the cleanup levels for non-detect results except for several benzene and PAH samples that required dilution, and 1,2-dichloroethane results in several samples with high water content at PMP 19.5. The reported LODs for benzene did not meet the ADEC Method Two soil cleanup level in samples 14HF1712SE, 14HF1713SE, 14HF1714SE, 14HF1717SE, 14HF1718SE, 14HF1719SE, and 14HF1722SE, and the reported LODs for 1,2-dichlorothane did not meet the ADEC Method Two soil cleanup level in samples 14HF1901SE through 14HF1908SE. The reported LODs for several non-detect PAH analytes did not meet the NOAA TEL in sediment samples 14HF1712SE, 14HF1713SE, 14HF1715SE, 14HF1720SE, and 14HF1722SE. Consequently, the absence of benzene and 1,2-dichloroethane at levels exceeding the ADEC soil cleanup level and the absence of PAH analytes at levels exceeding the TEL at those locations cannot be confirmed. Impacted data are highlighted in results tables.

5.10 Summary of Qualified Results

Overall, the review process deemed the sediment project data acceptable for use. Several results were qualified; however, data quality impact is minor and no data were rejected. The following table provides a summary of sediment sample results qualified pursuant to FES's review, including the associated sample numbers, analytes, and the reason for qualification. Note that per USACE review comments on the draft report, only the most severe flag was used when multiple Q or M flags were assigned to a result in tables and figures.

Summary of Qualified Sediment Results

Data Package	Sample Numbers	Analytes	Qualification	Explanation
1143746 (PMP 19.5)	14HF1908SE	1-Methylnaphthalene, 2-Methylnaphthalene, and Naphthalene	B	Blank Contamination (Method Blank)
	14HF1901SE, 14HF1902SE, 14HF1903SE, 14HF1905SE, 14HF1906SE, 14HF1907SE, and 14HF1908SE	GRO	B	Blank Contamination (Trip Blank)
	14HF1901SE	Benzo(g,h,i)perylene	ML,MN	Low MSD Recovery, Poor MS/MSD Precision
		Benzo(k)fluoranthene	MN	Poor MS/MSD Precision

Data Package	Sample Numbers	Analytes	Qualification	Explanation
1143760 (PMP 17.7)	14HF1712SE, 14HF1715SE, and 14HF1716SE	GRO	B	Blank Contamination (Method Blank)
	14HF1717SE and 14HF1718SE	RRO		
	14HF1701SE, 14HF1702SE, 14HF1705SE, 14HF1706SE, and 14HF1711SE	GRO	B	Blank Contamination (Trip Blank)
	14HF1703SE	Ethylbenzene		
	14HF1712SE	GRO	QL	Low-Biased Surrogate Recovery
1143760 (PMP 17.7)	14HF1714SE, 14HF1717SE, 14HF1718SE, 14HF1720SE, and 14HF1722SE	GRO	QH	High-Biased Surrogate Recovery
	14HF1712SE	Toluene	QH	High-Biased Surrogate Recovery
	14HF1706SE	All PAHs	QL	Low-Biased Surrogate Recovery
	14HF1707SE	Benzo(b)fluoranthene, Chrysene, Fluoranthene, Phenanthrene, and Pyrene	QH	High-Biased Surrogate Recovery
	14HF1706SE	1-Methylnaphthalene and 2-Methylnaphthalene	ML	Low MSD Recovery
	14HF1712SE	Benzo(a)pyrene, Benzo(g,h,i)perylene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene	ML, MN	Low MS/MSD Recovery, Poor MS/MSD Precision
		Fluorene	ML	Low MS/MSD Recovery
		Benzo(k)fluoranthene and Benzo(b)fluoranthene	MN	Poor MS/MSD Precision
	14HF1706SE and 14HF1707SE	GRO, 1-Methylnaphthalene, 2-Methylnaphthalene, and Phenanthrene	QN	Poor Field Duplicate Precision
	14HF1712SE and 14HF1713SE	Lead, 1-Methylnaphthalene, 2-Methylnaphthalene, and Naphthalene	QN	Poor Field Duplicate Precision

Note that per USACE review comments on the draft report, only the most severe flag was used when multiple Q or M flags were assigned to a result in tables and figures.

5.11 Completeness and Summary of Data Quality

A majority of the sediment data are considered usable (reported with adequate sensitivity and no data were rejected). However, the LOD for ND benzene results in 7 of the 30 sediment samples and the LOD for ND 1,2-dichloroethane results in 8 of 30 sediment samples exceeded the ADEC soil cleanup levels, and those data may not be usable. In addition, the LOD for several ND PAH results in 5 of the 30 sediment samples exceeded the NOAA TEL due to sample dilution, and those data may not be usable. A completeness score of 95% was calculated for this project (based on 781 of 826 usable sediment results). Therefore, the 90% completeness criterion in the Work Plan was met for the project sediment data.

Overall, the review process deemed the sediment data acceptable for use. Several results were qualified; however, the impact to data quality impact was generally minor. The only data quality issues that may have significantly impacted project sediment data are summarized below:

- Due to sample dilution, the reported LODs for VOC analyte benzene did not meet the ADEC Method Two soil cleanup level in samples 14HF1712SE, 14HF1713SE, 14HF1714SE, 14HF1717SE, 14HF1718SE, 14HF1719SE, and 14HF1722SE. Consequently, the absence of benzene at levels exceeding the ADEC soil cleanup level at those locations cannot be confirmed. Impact to data is minor since the impacted samples generally exceeded cleanup levels for other compounds, and benzene was detected in other PMP 17.7 site samples in excess of the cleanup level.
- Due in part to high moisture content, the reported LODs for VOC analyte 1,2-dichlorothane did not meet the ADEC Method Two soil cleanup level in all sediment samples collected from the PMP 19.5 site (samples 14HF1901SE through 14HF1908SE). Consequently, the absence of 1,2-dichloroethane at levels exceeding the ADEC soil cleanup level in site sediments cannot be confirmed. Impact to project data is notable since it affected all sediment results at this site.
- Due to sample dilution, the reported LODs for several ND PAH analytes did not meet the NOAA TEL in sediment samples 14HF1712SE, 14HF1713SE, 14HF1715SE, 14HF1720SE, and 14HF1722SE. Consequently, the absence of these PAH analytes at levels exceeding the TEL at those locations cannot be confirmed. Impact to data is minor since all of the impacted samples exceeded cleanup levels for other PAH compounds.
- The GRO results in samples 14HF1714SE, 14HF1717SE, 14HF1718SE, 14HF1720SE, and 14HF1722SE may be impacted by high surrogate recoveries since the GRO results in these samples are high-biased and detected within one order of magnitude of the ADEC cleanup level.

6.0 REFERENCES

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Laboratory Data Review Checklist

Completed by: Rachel James

Title: Chemist, Argon, Inc. Date: 09/18/14

CS Report Name: Haines - Fairbanks Pipeline Report Date: 08/04/14

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS - Anchorage Laboratory Report Number: 1143326

ADEC File Number: 900.38.001 ADEC RecKey Number:

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

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Yes No ✓NA (Please explain.) Comments:

No discrepancies or sample condition issues were noted.

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

Comments:

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

4. Case Narrative

a. Present and understandable?

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

> The case narrative discussed surrogate and CCV recovery exceptions. Surrogate recovery discrepancies are discussed in 6c below. CCV recovery issues are discussed here.
>
> PAH CCV sample 1223864 contained in analytical batch XMS8193 recovered above the upper control limit for benzo(a)pyrene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These analytes were not detected in all associated samples and the results are considered unaffected by the high CCV recoveries.
>
> PAH CCV sample 1224074 contained in analytical batch XMS8195 recovered above the upper control limit for benzo(g,h,i)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These analytes were not detected in all associated samples and the results are considered unaffected by the high CCV recoveries.

c. Were all corrective actions documented?

✓Yes No NA (Please explain.) Comments:

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

Comments:

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

5. Samples Results
   a. Correct analyses performed/reported as requested on COC?
      ✓Yes No NA (Please explain.) Comments:

   b. All applicable holding times met?
      ✓Yes No NA (Please explain.) Comments:

   c. All soils reported on a dry weight basis?
      ✓Yes No NA (Please explain.) Comments:

   d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
      Yes ✓No NA (Please explain.) Comments:

All soil LODs met the cleanup levels for non-detect results with the exception of 1,2-dichloroethane in samples 14HF1901SO, 14HF1904SO, 14HF1906SO, 14HF1907SO, 14HF1908SO, 14HF1901SS, and 14HF1902SS. Consequently, the absence of 1,2-dichloroethane at levels exceeding ADEC soil cleanup levels at those locations cannot be confirmed. Impacted data are highlighted in results tables. The impact to 1,2-dichloroethane data at PMP 19.5 is notable since the analyte was not detected at the site and half of the results may not be useable.

   e. Data quality or usability affected?
      Comments:

See 5d.

6. QC Samples
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?
      ✓Yes No NA (Please explain.) Comments:

      ii. All method blank results less than PQL?
      ✓Yes No NA (Please explain.) Comments:

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

Method blank sample 1223253 contained in batch VXX26180 detected GRO below the LOQ at 0.84 mg/kg. No qualification action was taken based upon the method blank contamination because GRO was detected at a higher concentration in trip blank sample 14HF1912SQ (see 6d).

iii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

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

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

MS/MSD analysis was not performed for DRO/RRO batch XXX31496. One MS/MSD sample was submitted with the project samples, which meets the required frequency. However, the laboratory analyzed the DRO/RRO samples in two batches. Impact to data was minor since acceptable LCS/LCSD analyses verified batch precision and accuracy and only three samples were included in the batch (14HF1901SO, 14HF1902SO, and 14HF1903SO).

LCS/LCSDs and MS/MSDs were performed for the remaining GRO and DRO/RRO batches, and LCS and MS/MSDs were performed for all VOC and SVOC batches.

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

✓Yes No NA (Please explain.) Comments:

LCS and MS/MSDs were performed for the metals batch.

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

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

Not applicable.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the LCS/LCSD or MS/MSD samples.

c. Surrogates – Organics Only

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

✓Yes No NA (Please explain.) Comments:

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

Yes ✓ No NA (Please explain.) Comments:

Method 8260B surrogate 1,2-dichloroethane-d4 recovered above the upper control limit in samples 14HF1902SO, 14HF1906SO, 14HF1910SO, and 14HF1911SO and MB sample 1222890. No VOCs were detected in these samples and the results are considered unaffected by the high surrogate recoveries.

Method 8260B surrogate toluene-d8 recovered above the upper control limit in sample 14HF1901SO. No VOCs were detected in this sample and the results are considered unaffected by the high surrogate recovery.

Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in sample 14HF1901SO. The GRO result in this sample was qualified as a high estimate (QH). Impact to the sample was negligible since surrogate recovery was high-biased and the analyte was detected below the cleanup level.

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

✓Yes No NA (Please explain.) Comments:

See 6cii.

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

See 6cii.

Comments:

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

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

✓Yes No NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

✓Yes No NA (Please explain.) Comments:

Trip blank sample 14HF1912SQ was shipped with cooler FES-01.

iii. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, one analyte was detected below the LOQ.

Trip blank sample 14HF1912SQ detected GRO below the LOQ at 1.06 mg/kg. Associated samples 14HF1902SO, 14HF1903SO, 14HF1904SO, 14HF1905SO, 14HF1909SO, 14HF1910SO, and 14HF1911SO detected GRO at concentrations less than ten-times that of the trip blank. GRO results in these samples were qualified (B) based upon the trip blank contamination. Impact to the results is minor as they were more than two orders of magnitude less than the ADEC cleanup level.

iv. If above PQL, what samples are affected?

Comments:

See 6diii.

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

Comments:

See 6diii.

e. Field Duplicate

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

✓Yes No NA (Please explain.) Comments:

One soil field duplicate was collected for the 10 soil primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF1908SO was a field duplicate of 14HF1907SO.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

✓Yes No NA (Please explain.) Comments:

Results (detected and non-detected) are shown in the table below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier “U”.

Analyte	Method	Units	14HF1907SO	Qualifier	14HF1908SO	Qualifier	RPD
GRO	AK101	mg/Kg	1.78	U	1.87	U	5
DRO	AK102	mg/Kg	12	U	12.2	U	2
RRO	AK103	mg/Kg	12	U	12.2	U	2
Lead	SW6020A	mg/Kg	1.26		1.29		2
1,2-Dichloroethane	SW8260B	mg/Kg	0.0179	U	0.0187	U	4
Benzene	SW8260B	mg/Kg	0.0089	U	0.0093	U	4
Ethylbenzene	SW8260B	mg/Kg	0.0179	U	0.0187	U	4
o-Xylene	SW8260B	mg/Kg	0.0179	U	0.0187	U	4
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0357	U	0.0372	U	4
Toluene	SW8260B	mg/Kg	0.0179	U	0.0187	U	4
All PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

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

Comments:

No data quality or usability was affected by the field duplicate.

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

Yes No ✓NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

i. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Disposable sampling equipment was used and a decontamination blank was not necessary.

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

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

Laboratory Data Review Checklist

Completed by: Rachel James

Title: Chemist, Argon, Inc. Date: 09/19/14

CS Report Name: Haines – Fairbanks Pipeline Report Date: 08/06/14

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS - Anchorage Laboratory Report Number: 1143327

ADEC File Number: 900.38.001 ADEC RecKey Number:

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

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Yes No ✓NA (Please explain.) Comments:

No discrepancies or sample condition issues were noted.

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

Comments:

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

4. Case Narrative

a. Present and understandable?

✓Yes No NA (Please explain.) Comments:

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

Yes ✓No NA (Please explain.) Comments:

The case narrative discussed surrogate recovery exceptions, MS/MSD recovery and RPD exceptions, elevated LOQs, and CCV exceptions. Surrogate recovery exceptions and elevated LOQs (dilutions) are discussed in 6c below, MS/MSD exceptions are discussed in 6b below, and CCV exceptions are discussed here.

PAH CCV sample 1223864 contained in analytical batch XMS8193 recovered above the upper control limit for benzo(a)pyrene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These analytes were not detected in all associated samples and the results are considered unaffected by the high CCV recoveries.

PAH CCV sample 1224074 contained in analytical batch XMS8195 recovered above the upper control limit for benzo(g,h,i)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These analytes were not detected in all associated samples and the results are considered unaffected by the high CCV recoveries.

PAH CCV sample 1224126 contained in analytical batch XMS8197 recovered above the upper control limit for analytes not reported in the batch. Data quality is not impacted.

VOC CCV recoveries discussed in the case narrative are not applicable to this report because they are for target analytes not associated with this project.

The low 4-bromofluorobenzene surrogate recovery in sample 14HF2507SO was not discussed in the case narrative. See 6cii.

c. Were all corrective actions documented?

✓Yes No NA (Please explain.) Comments:

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

Comments:

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

5. Samples Results

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

✓Yes No NA (Please explain.) Comments:

b. All applicable holding times met?

✓Yes No NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

✓Yes No NA (Please explain.) Comments:

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

Yes ✓No NA (Please explain.) Comments:

The reported LODs for the VOC analyte 1,2-dichloroethane did not meet the ADEC Method Two soil cleanup level in samples 14HF2511SO and 14HF2513SO. Consequently, the absence of 1,2-dichloroethane at levels exceeding the ADEC soil cleanup level at these locations cannot be confirmed. The impact to 1,2-dichloroethane data at PMP 25.5 site is minor since only 2 of 21 soil samples were affected.

e. Data quality or usability affected?

Comments:

See 5d.

6. QC Samples

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?

✓Yes No NA (Please explain.) Comments:

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

Method blank sample 1223992 contained in batch VXX26194 detected GRO below the LOQ at 0.851 mg/kg. No qualification action was taken based upon the method blank contamination because GRO was detected at a higher concentration in trip blank sample 14HF2522SQ (see 6d).

Method blank sample 1222625 contained in batch XXX31504 detected DRO below the LOQ at 6.79 mg/kg and RRO below the LOQ at 9.48 mg/kg. Associated samples 14HF2514SO, 14HF2515SO, 14HF2516SO, 14HF2517SO, 14HF2518SO, 14HF2519SO, 14HF2520SO, and 14HF2521SO detected DRO at concentrations less than ten-times that of the method blank and were flagged (B) based upon the potential method blank contamination. Associated samples 14HF2516SO, 14HF2517SO, 14HF2519SO, 14HF2520SO, and 14HF2521SO detected RRO at concentrations less than ten-times that of the method blank and were flagged (B) based upon the potential method blank contamination. Impact to all samples is minor as the detections were at least one order of magnitude below the ADEC cleanup levels.

iii. If above PQL, what samples are affected?

Comments:

See 6aii.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6aii.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

MS/MSD analysis was not performed for PAH batch XXX31542. Two sets of MS/MSD samples were submitted with the project samples, which meets the required frequency. However, the laboratory analyzed the PAH samples in two batches and placed the two MS/MSD sample sets in the same batch. Impact to data is unknown but likely minor as the MS/MSD analyses performed on project samples in associated QC batches were acceptable. Batch accuracy was confirmed by an acceptable LCS sample, but no batch precision was confirmed.

LCS/LCSDs and MS/MSDs were performed for the remaining GRO and DRO/RRO batches, and LCS and MS/MSDs were performed for all VOC and SVOC batches.

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

✓Yes No NA (Please explain.) Comments:

LCSs and MS/MSDs were performed for the metals batches.

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

Yes ✓No NA (Please explain.) Comments:

The PAH MS sample prepared from 14HF2520SO recovered above the upper control limit for benzo(a)pyrene and chrysene. Both compounds were non-detect in the parent sample and the results are considered unaffected by the high MS recoveries. The VOC MS/MSD samples 1223458/1223459 prepared from a non-project parent sample recovered below the lower control limit for o-xylene and p&m-xylene. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the low recoveries.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

Sample 14HF2520SO is unaffected by the high recoveries in the MS sample prepared from it.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the LCS/LCSDs or MS/MSDs.

c. Surrogates – Organics Only

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

✓Yes No NA (Please explain.) Comments:

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

Yes ✓No NA (Please explain.) Comments:

Method 8260B surrogate 1,2-dichloroethane-d4 recovered above the upper control limit in samples 14HF2517SO and 14HF2521SO. No VOCs were detected in these samples and the results are considered unaffected by the high surrogate recoveries.

Method 8260B surrogates 1,2-dichloroethane-d4 and toluene-d8 recovered above the upper control limit in samples 14HF2518SO and 14HF2519SO. No VOCs were detected in these samples and the results are considered unaffected by the high surrogate recoveries.

Method 8260B surrogate 1,2-dichloroethane-d4 recovered above the upper control limit and surrogate 4-bromofluorobenzene recovered just below the lower control limit in sample 14HF2507SO. No VOCs were detected in this sample and all VOC results were flagged as estimates (QN) without bias since one surrogate recovered above and one recovered below acceptance criteria. There was no impact to the sample from the high surrogate as the results were non-detect and the impact from the low surrogate was minor as the failure was very minor (0.2% low).

Method 8270D surrogate 2-fluorobiphenyl recovered above the upper control limit in samples 14HF2508SO, 14HF2509SO, 14HF2510SO, 14HF2512SO, and 14HF2513SO due to 10x dilutions. No flagging was applied because the high recoveries are the consequence of dilutions.

Method 8270D surrogate terphenyl-d14 recovered above the upper control limit in sample 14HF2520SO. No PAHs were detected in the sample and the results are considered unaffected by the high surrogate recovery.

Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in samples 14HF2508SO and 14HF2510SO. GRO results in these samples were flagged (QH) as biased-high estimates based upon the high surrogate recoveries. Impact to the results may be significant as the detections are within one order of magnitude of the ADEC cleanup levels.

Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in samples 14HF2503SO, 14HF2509SO, 14HF2512SO, and 14HF2513SO due to 10x – 100x dilutions. No flagging was applied because the high recoveries are the consequence of dilution.

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

✓Yes No NA (Please explain.) Comments:

See 6cii.

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

Comments:

See 6cii.

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

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

✓Yes No NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

✓Yes No NA (Please explain.) Comments:

Trip blank sample 14HF2522SQ was shipped with cooler FES-02.

iii. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, one analyte was detected below the LOQ.

Trip blank sample 14HF2522SQ detected GRO below the LOQ at 1.3 mg/kg. Associated samples 14HF2501SO, 14HF2502SO, 14HF2506SO, 14HF2511SO, 14HF2514SO, 14HF2515SO, 14HF2516SO, 14HF2517SO, 14HF2518SO, 14HF2519SO, 14HF2520SO, and 14HF2521SO detected GRO at concentrations less than ten-times that of the trip blank and were flagged (B) based upon the potential method blank contamination. Impact to all samples is minor as the detections were at least one order of magnitude below the ADEC cleanup levels.

iv. If above PQL, what samples are affected?

Comments:

See 6diii.

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

Comments:

See 6diii.

e. Field Duplicate

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

✓Yes No NA (Please explain.) Comments:

Two soil field duplicates were collected for the 19 soil primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF2505SO was a field duplicate of 14HF2504SO and sample 14HF2509SO was a field duplicate of 14HF2508SO.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

Yes ✓No NA (Please explain.) Comments:

The RPD values for GRO (62%) and naphthalene (168%) did not meet the ≤50% RPD criterion for soil in sample pair 14HF2508SO/14HF2509SO. The GRO and naphthalene results were qualified (QN) in associated samples. See table below.

Results (detected and non-detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier "U".

Analyte	Method	Units	14HF2504SO	Qualifier	14HF2505SO	Qualifier	RPD
GRO	AK101	mg/Kg	23.6		29.3		22
DRO	AK102	mg/Kg	17.9	J	21.7	J	19
RRO	AK103	mg/Kg	11.4	U	15.9	J	33
Lead	SW6020A	mg/Kg	0.689		1.1		46
1,2-Dichloroethane	SW8260B	mg/Kg	0.0147	U	0.015	U	2
Benzene	SW8260B	mg/Kg	0.00735	U	0.0075	U	2
Ethylbenzene	SW8260B	mg/Kg	0.066		0.0457		36
o-Xylene	SW8260B	mg/Kg	0.0126	J	0.015	U	17
Xylene, Isomers m & p	SW8260B	mg/Kg	0.306		0.213		36
Toluene	SW8260B	mg/Kg	0.0147	U	0.015	U	2
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.122		0.117		4
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.32		0.301		6
Acenaphthene	8270D SIMS (PAH)	mg/Kg	0.00506	J	0.00504	J	0
Fluorene	8270D SIMS (PAH)	mg/Kg	0.012		0.0124		3
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.113		0.123		8
Phenanthrene	8270D SIMS (PAH)	mg/Kg	0.00383	J	0.00418	J	9
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

Analyte	Method	Units	14HF2508SO	Qualifier	14HF2509SO	Qualifier	RPD
GRO	AK101	mg/Kg	167	QN	316	QN	62
DRO	AK102	mg/Kg	3160		3290		4
RRO	AK103	mg/Kg	11.4	J	8.97	J	24
Lead	SW6020A	mg/Kg	3.02		2.12		35
1,2-Dichloroethane	SW8260B	mg/Kg	0.0138	U	0.0123	U	11
Benzene	SW8260B	mg/Kg	0.0069	U	0.00615	U	11
Ethylbenzene	SW8260B	mg/Kg	0.0138	U	0.0123	U	11
o-Xylene	SW8260B	mg/Kg	0.0138	U	0.0123	U	11
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0276	U	0.0245	U	12
Toluene	SW8260B	mg/Kg	0.0138	U	0.0123	U	11
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.303	QN	0.0265	U,QN	168
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

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

Comments:

See 6eiii.

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

Yes No ✓NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

i. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Disposable sampling equipment was used and a decontamination blank was not necessary.

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

a. Defined and appropriate?

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

✓Yes No NA (Please explain.) Comments:

Laboratory Data Review Checklist

Completed by:	Rachel James
Title:	Chemist, Argon, Inc.
Date:	09/23/14
CS Report Name:	Haines – Fairbanks Pipeline
Report Date:	09/08/14
Consultant Firm:	Fairbanks Environmental Services
Laboratory Name:	SGS - Anchorage
Laboratory Report Number:	1143328
ADEC File Number:	900.38.001
ADEC RecKey Number:	

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

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
✓Yes No NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
Yes No ✓NA (Please explain.) Comments:

No discrepancies or sample condition issues were noted.

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

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

4. <u>Case Narrative</u>

a. Present and understandable?
✓Yes No NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?
✓Yes No NA (Please explain.) Comments:

The case narrative discussed surrogate recovery exceptions, MS/MSD recovery exceptions, elevated LOQs, and CCV exceptions. Surrogate recovery exceptions and elevated LOQs (dilutions) are discussed in 6c below, MS/MSD exceptions are discussed in 6b below, and CCV exceptions are discussed here.

PAH CCV sample 1223864 contained in analytical batch XMS8193 recovered above the upper control limit for benzo(a)pyrene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Additionally, PAH CCV sample 1224074 contained in analytical batch XMS8195 and PAH CCV sample 1224126 contained in analytical batch XMS8197 recovered above the upper control limit for benzo(g,h,i)perylene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene. These analytes were not detected in all associated samples and the results are considered unaffected by the high CCV recoveries.

VOC CCV recoveries discussed in the case narrative are not applicable to this report because they are for target analytes not associated with this project.

c. Were all corrective actions documented?
✓Yes No NA (Please explain.) Comments:

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

Comments:

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

5. Samples Results

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

✓Yes No NA (Please explain.) Comments:

b. All applicable holding times met?

✓Yes No NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

✓Yes No NA (Please explain.) Comments:

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

Yes ✓No NA (Please explain.) Comments:

Due to sample dilution, the reported LODs for the VOC analyte benzene did not meet the ADEC Method Two soil cleanup level in samples 14HF1703SO, 14HF1715SO, and 14HF1716SO. Consequently, the absence of benzene at levels exceeding the ADEC soil cleanup level at these locations cannot be confirmed. Impact to data is minor since the affected samples generally exceeded cleanup levels for other compounds, and benzene was detected in other PMP 17.7 site samples in excess of the cleanup level.

e. Data quality or usability affected?

Comments:

See 5d.

6. QC Samples

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?
✓Yes No NA (Please explain.) Comments:

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

Method blank sample 1223248 contained in batch VXX26181 detected GRO below the LOQ at 0.912 mg/kg. No qualification action was taken based upon the method blank contamination because GRO was detected at a higher concentration in trip blank sample 14HF1727SQ (see 6d).

Method blank sample 1222625 contained in batch XXX31504 detected DRO below the LOQ at 6.79 mg/kg and RRO below the LOQ at 9.48 mg/kg. Associated samples 14HF1701SO and 14HF1702SO detected DRO and 14HF1702SO detected RRO at concentrations less than ten-times that of the method blank and were flagged (B) based upon the potential method blank contamination. Impact to all samples is minor as the detections were at least one order of magnitude below the ADEC cleanup levels.

Method blank sample 1223684 contained in batch XXX31555 detected DRO below the LOQ at 8.42 mg/kg and RRO below the LOQ at 7.4 mg/kg. Associated samples 14HF1709SO, 14HF1717SO, 14HF1719SO, 14HF1720SO, 14HF1721SO, and 14HF1723SO detected DRO and 14HF1709SO, 14HF1712SO, 14HF1716SO, 14HF1718SO, 14HF1719SO, 14HF1720SO, 14HF1721SO, and 14HF1723SO detected RRO at concentrations less than ten-times that of the method blank and were flagged (B) based upon the potential method blank contamination. Impact to all samples is minor as the detections were at least one order of magnitude below the ADEC cleanup levels.

Method blank sample 1223513 contained in batch XXX31545 detected naphthalene below the LOQ at 0.00161 mg/kg. Associated samples either detected naphthalene at concentrations greater than ten-times that of the method blank or were non-detect and are considered unaffected by the potential method blank contamination.

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

See 6aii.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
✓Yes No NA (Please explain.) Comments:

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

See 6aii.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

MS/MSD analysis was not performed for DRO/RRO batches XXX31503 and XXX31504. Two sets of MS/MSD samples were submitted with the project samples, which meets the required frequency. However, the laboratory batched the project samples in four batches. Impact to data is minor since acceptable LCS/LCSD analyses verified batch precision and accuracy and only three samples were included in these batches (14HF1701SO, 14HF1702SO, and 14HF1703SO).

LCS/LCSDs and MS/MSDs were performed for the remaining GRO and DRO/RRO batches, and LCSs and MS/MSDs were performed for all VOC and SVOC batches.

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

✓Yes No NA (Please explain.) Comments:

LCSs and MS/MSDs were performed for the metals batches.

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

Yes ✓No NA (Please explain.) Comments:

The GRO MS sample prepared from 14HF1710SO recovered below the lower control limit. The GRO concentration in the parent sample was greater than four-times the spike level and the recovery is not considered meaningful. No flags were applied.

The VOC MS sample prepared from 14HF1710SO recovered below the lower control limit for p&m-xylene. The p&m-xylene result in the parent sample was qualified (ML) as a low estimate based upon the low recovery. Impact to the sample was minor as the paired MSD recovery was within control limits and the MS failure was minor (1.8% low).

The VOC MS/MSD samples 1224039/1224040 prepared from a non-project parent sample recovered below the lower control limits for o-xylene and/or p&m-xylene. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the low recoveries.

The VOC MS sample 1223109 prepared from a non-project parent sample recovered below the lower control limit for p&m-xylene. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the low recovery.

The PAH MS sample prepared from 14HF1710SO recovered below the lower control limits for 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene. The concentrations in the parent sample were greater than four-times the spike level and the recoveries are not considered meaningful. No flags were applied.

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

Yes ✓No NA (Please explain.) Comments:

The VOC MS/MSD samples 1224039/1224040 prepared from a non-project parent sample had an RPD above the control limit for o-xylene. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the poor precision.

The PAH MS/MSD samples prepared from 14HF1710SO had RPDs above the control limits for all PAH target compounds. The laboratory prepared the MS sample using about 22 grams, but prepared the MSD sample using only about 11 grams. This difference in extraction masses caused dissimilar LOQs and, therefore, high RPDs. No qualification action was taken based solely upon the high RPDs, but the sample was instead assessed based upon spiked analyte recoveries (see 6biii).

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

Comments:

See 6biii and 6biv.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6biii and 6biv.

c. Surrogates – Organics Only

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

✓Yes No NA (Please explain.) Comments:

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

Yes ✓No NA (Please explain.) Comments:

Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in samples 14HF1702SO, 14HF1703SO, 14HF1706SO, 14HF1707SO, 14HF1708SO, 14HF1712SO, 14HF1716SO, and 14HF1722SO due to 10x – 100x dilutions. No flagging was applied because the high recoveries are the consequences of dilution.

Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in samples 14HF1701SO, 14HF1710SO, 14HF1715SO, 14HF1718SO, 14HF1724SO, and 14HF1725SO. The GRO results in these samples are flagged as estimates with a high bias (QH) based upon the high surrogate recoveries. The impact to sample 14HF1724SO is minor as the GRO result is almost one order of magnitude below the ADEC cleanup level. Impact to the remaining samples may be significant as the GRO results are nearer to or above the ADEC cleanup level.

Method 8260B surrogate 4-bromofluorobenzene recovered above the upper control limit in sample 14HF1701SO. Detected VOC results in this sample were flagged as biased-high estimates (QH) based upon the high surrogate recovery. Impact to the sample is minor as the results are more than one order of magnitude below the cleanup levels.

Method 8260B surrogate toluene-d8 recovered above the upper control limit in samples 14HF1705SO, 14HF1706SO, 14HF1707SO, 14HF1711SO, and 14HF1712SO. No VOC compounds were detected in samples 14HF1711SO and 14HF1712SO and the results are considered unaffected by the high surrogate recoveries. Detected VOC results in samples 14HF1705SO, 14HF1706SO, and 14HF1707SO were flagged as biased-high estimates (QH) based upon the high surrogate recoveries. Impact to the samples is minor as the results are at least one order of magnitude below the ADEC cleanup levels.

Method 8260B surrogate toluene-d8 recovered above the upper control limit in sample 14HF1708SO due to a 20x dilution. No flagging was applied because the high recovery was the consequence of dilution.

Method 8260B surrogates toluene-d8 and 1,2-dichloroethane-d4 recovered above the upper control limits in sample 14HF1726SO. No VOCs were detected in the sample and the results are considered unaffected by the high surrogate recoveries.

Method 8270D surrogate 2-fluorobiphenyl recovered above the upper control limit in samples 14HF1703SO, and 14HF1707SO. Additionally, surrogates 2-fluorobiphenyl and terphenyl-d14 recovered above the upper control limits in sample 14HF1722SO. These samples were analyzed at 20x – 50x dilutions. No flagging was applied because the high recoveries were the consequence of dilution.

Method 8270D surrogate 2-fluorobiphenyl recovered above the upper control limit in sample 14HF1708SO. Detected PAH compounds in the sample were flagged as biased-high estimates (QH) based upon the high surrogate recovery. Impact to the sample is mostly minor as all analytes except naphthalene were detected at least one order of magnitude less than the ADEC cleanup levels.

Method 8270D surrogate 2-fluorobiphenyl recovered above the upper control limit in sample 14HF1712SO. No PAHs were detected in the sample and the results are considered unaffected by the high surrogate recovery.

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

✓Yes   No   NA (Please explain.)   Comments:

See 6cii.

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

Comments:

See 6cii.

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

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

✓Yes No NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

✓Yes No NA (Please explain.) Comments:

Trip blank sample 14HF1727SQ was shipped with cooler FES-03.

iii. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, one analyte did have a detection below the LOQ. Trip blank sample 14HF1727SQ detected GRO below the LOQ at 1.12 mg/kg. Associated samples 14HF1704SO, 14HF1705SO, 14HF1711SO, 14HF1713SO, 14HF1714SO, 14HF1717SO, 14HF1719SO, 14HF1720SO, 14HF1721SO, 14HF1723SO, 14HF1726SO, and 14HF1727SO detected GRO at concentrations less than ten-times that of the trip blank and were flagged (B) based upon the potential travel contamination. Impact to all samples is minor as the detections were at least one order of magnitude below the ADEC cleanup level.

iv. If above PQL, what samples are affected?

Comments:

See 6diii.

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

Comments:

See 6diii.

e. Field Duplicate

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

✓Yes No NA (Please explain.) Comments:

Three soil field duplicates were collected for the 23 soil primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF1705SO was a field duplicate of 14HF1704SO, sample 14HF1714SO was a field duplicate of 14HF1713SO, and sample 14HF1725SO was a field duplicate of 14HF1724SO.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

Yes ✓No NA (Please explain.) Comments:

RPD values for DRO (67%), RRO (67%), and all non-detect PAHs (67%) did not meet the ≤50% RPD criterion for soil in sample pair 14HF1704SO/14HF1705SO. DRO, RRO, and all PAHs except 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene were not detected in either sample and the LODs were used to calculate the RPDs. The LODs for sample 14HF1705SO were elevated due to limited sample mass and this led to the high RPDs. No flagging was applied.

RPD values for GRO (66%) and ethylbenzene (52%) did not meet the ≤50% RPD criterion for soil in sample pair 14HF1724SO/14HF1725SO. The GRO and ethylbenzene results were qualified (QN) in associated samples. See table below.

Results (detected and non-detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier “U”.

Analyte	Method	Units	14HF1704SO	Qualifier	14HF1705SO	Qualifier	RPD
GRO	AK101	mg/Kg	2.28	J	2.87	J	23
DRO	AK102	mg/Kg	11.1	U	22.4	U	67
RRO	AK103	mg/Kg	11.1	U	22.4	U	67
Lead	SW6020A	mg/Kg	2.11		1.54		31
Benzene	SW8260B	mg/Kg	0.00695	U	0.00557	J	22
Ethylbenzene	SW8260B	mg/Kg	0.014	U	0.0147	U	5
o-Xylene	SW8260B	mg/Kg	0.014	U	0.0147	U	5
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0365	J	0.0361	J	1
Toluene	SW8260B	mg/Kg	0.0103	J	0.0147	J	35
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00797		0.00785	J	2
2-Methylnapthalene	8270D SIMS (PAH)	mg/Kg	0.0111		0.0114		3
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.00455	J	0.00561	J	21
All Other PAHs	8270D SIMS (PAH)	mg/Kg	0.00281	U	0.00565	U	67

Analyte	Method	Units	14HF1713SO	Qualifier	14HF1714SO	Qualifier	RPD
GRO	AK101	mg/Kg	9.19		7.55		20
DRO	AK102	mg/Kg	12.1	U	12.1	U	0
RRO	AK103	mg/Kg	12.1	U	12.1	U	0
Lead	SW6020A	mg/Kg	2.56		2.43		5
Benzene	SW8260B	mg/Kg	0.00711	J	0.0086	J	19
Ethylbenzene	SW8260B	mg/Kg	0.021	J	0.0154	J	31
o-Xylene	SW8260B	mg/Kg	0.022	J	0.019	J	15
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0811		0.0516	J	44
Toluene	SW8260B	mg/Kg	0.0291	J	0.0186	J	44
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00274	J	0.00216	J	24
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00555	J	0.00357	J	43
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

Analyte	Method	Units	14HF1724SO	Qualifier	14HF1725SO	Qualifier	RPD
GRO	AK101	mg/Kg	30.2	QN	60.2	QN	66
DRO	AK102	mg/Kg	66.2		44.4		39
RRO	AK103	mg/Kg	44.8		33.2		30
Lead	SW6020A	mg/Kg	5.63		6.1		8
Benzene	SW8260B	mg/Kg	0.0107	U	0.0119	U	11
Ethylbenzene	SW8260B	mg/Kg	0.208	QN	0.353	QN	52
o-Xylene	SW8260B	mg/Kg	0.0188	J	0.0252	J	29
Xylene, Isomers m & p	SW8260B	mg/Kg	0.529		0.83		44
Toluene	SW8260B	mg/Kg	0.0214	U	0.02	J	7
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.239		0.24		0
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.385		0.379		2
Acenaphthene	8270D SIMS (PAH)	mg/Kg	0.00549	J	0.00604	J	10
Acenaphthylene	8270D SIMS (PAH)	mg/Kg	0.00346	U	0.00229	J	41
Fluorene	8270D SIMS (PAH)	mg/Kg	0.00704		0.0086		20
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.195		0.144		30
Phenanthrene	8270D SIMS (PAH)	mg/Kg	0.00316	J	0.00359	J	13
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

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

Comments:

See 6eiii.

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

Yes No ✓NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

i. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Disposable sampling equipment was used and a decontamination blank was not necessary.

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

a. Defined and appropriate?

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

Laboratory Data Review Checklist

Completed by: Rachel James

Title: Chemist, Argon, Inc. Date: 09/29/14

CS Report Name: Haines - Fairbanks Pipeline Report Date: 08/04/14

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS - Anchorage Laboratory Report Number: 1143338

ADEC File Number: 900.38.001 ADEC RecKey Number:

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

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
✓Yes No NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
✓Yes No NA (Please explain.) Comments:

The laboratory noted that sample 14HF1704WS arrived with no bottle labels. The lids were labelled and the lab was able to identify the sample. There was no impact to data quality.

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

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

4. <u>Case Narrative</u>

a. Present and understandable?
✓Yes No NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?
✓Yes No NA (Please explain.) Comments:

The case narrative discussed a surrogate recovery exception, which is discussed in 6c below.

c. Were all corrective actions documented?
✓Yes No NA (Please explain.) Comments:

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

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

5. <u>Samples Results</u>

a. Correct analyses performed/reported as requested on COC?
✓Yes No NA (Please explain.) Comments:

b. All applicable holding times met?

✓Yes No NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

Yes No ✓NA (Please explain.) Comments:

No soil samples were included in this report.

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

✓Yes No NA (Please explain.) Comments:

e. Data quality or usability affected?

Comments:

No data quality or usability was affected.

6. <u>QC Samples</u>

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?

✓Yes No NA (Please explain.) Comments:

iii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

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

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

LCS/LCSDs and MS/MSDs were performed for all SVOC batches.

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

Yes ✓No NA (Please explain.) Comments:

No metals/inorganics samples were included in this report.

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

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

Not applicable.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the LCS/LCSD or MS/MSD samples.

c. Surrogates – Organics Only

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

✓Yes No NA (Please explain.) Comments:

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

Yes ✓ No NA (Please explain.) Comments:

Method 8270D surrogate terphenyl-d14 recovered above the upper control limit in sample 14HF1711WS. The detected acenaphthylene result in this sample was qualified as a high estimate (QH). Impact to the sample was negligible since the surrogate recovery was high-biased and the analyte was detected well below the ADEC cleanup level. All other PAHs were not detected and are considered unaffected by the high surrogate recovery.

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

✓Yes No NA (Please explain.) Comments:

See 6cii.

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

Comments:

See 6cii.

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

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

Yes No ✓NA (Please explain.) Comments:

No volatile analyses were included in this report.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

Yes No ✓NA (Please explain.) Comments:

Not applicable.

iii. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

Not applicable.

e. Field Duplicate

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

✓Yes No NA (Please explain.) Comments:

Two surface water field duplicates were collected for the 17 surface water primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF1704WS was a field duplicate of 14HF1703WS and sample 14HF1905WS was a field duplicate of 14HF1904WS.

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

✓Yes No NA (Please explain.) Comments:

Results (detected and non-detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier "U".

Analyte	Method	Units	14HF1703WS	Qualifier	14HF1704WS	Qualifier	RPD
All PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

Analyte	Method	Units	14HF1904WS	Qualifier	14HF1905WS	Qualifier	RPD
All PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

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

Comments:

No data quality or usability was affected by the field duplicates.

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

✓Yes No NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

i. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

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

a. Defined and appropriate?

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

Laboratory Data Review Checklist

Completed by:	Rachel James		
Title:	Chemist, Argon, Inc.	Date:	09/29/14
CS Report Name:	Haines – Fairbanks Pipeline	Report Date:	08/13/14
Consultant Firm:	Fairbanks Environmental Services		
Laboratory Name:	SGS - Anchorage	Laboratory Report Number:	1143514
ADEC File Number:	900.38.001	ADEC RecKey Number:	

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

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

      No samples were transferred.

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

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

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

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

Yes ✓No NA (Please explain.) Comments:

The laboratory added HCl preservative to a DRO/RRO container for the MS sample of 14HF2501WG and HNO_3 preservative to the total lead container for the MSD sample of 14HF2501WG. The delayed preservation of the MS/MSD aliquots had no quality impact on the parent sample.

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

✓Yes No NA (Please explain.) Comments:

The laboratory noted that the metals containers for sample 14HF2501WG and its MS aliquot arrived with no bottle labels. The lids were labelled and the lab was able to identify the samples. There was no impact to data quality.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

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

4. <u>Case Narrative</u>

a. Present and understandable?

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

The case narrative discussed elevated LOQs, MS/MSD recovery exceptions, LCS/LCSD recovery and RPD exceptions, and CCV recovery exceptions. Elevated LOQs do not impact data quality, MS/MSD exceptions are discussed in 6b below, and LCS/LCSD and CCV exceptions do not apply to this report because they are for target compounds not associated with this project.

c. Were all corrective actions documented?

✓Yes No NA (Please explain.) Comments:

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

Comments:

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

5. Samples Results

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

✓Yes No NA (Please explain.) Comments:

b. All applicable holding times met?

✓Yes No NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

Yes No ✓NA (Please explain.) Comments:

No soil samples were included in this report.

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

✓Yes No NA (Please explain.) Comments:

e. Data quality or usability affected?

Comments:

No data quality or usability was affected.

6. QC Samples

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?

✓Yes No NA (Please explain.) Comments:

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

Method blank sample 1225000 contained in batch VXX26219 detected GRO below the LOQ at 0.0359 mg/L. No qualification action was taken based upon the method blank contamination because GRO was detected at a higher concentration in equipment blank sample 14HF2505WQ (see 6f).

Method blank sample 1224252 contained in batch XXX31584 detected DRO below the LOQ at 0.295 mg/L. No qualification action was taken based upon the method blank contamination because DRO was detected at a higher concentration in equipment blank sample 14HF2505WQ (see 6f).

iii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

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

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

MS/MSD analysis was not performed for VOC batch VXX26223. One MS/MSD sample was submitted with the project samples, which meets the required frequency. However, the laboratory batched the project samples in two batches. Impact to data is minor since acceptable LCS/LCSD analyses verified batch precision and accuracy and only two samples were included in this batch (14HF2502WG and 14HF2503WG).

LCSD and MSD analysis was not performed for sulfate batch WXX10626 or nitrate/nitrite batch WFI2330. Acceptable batch precision was demonstrated by analysis of laboratory duplicate samples and data quality is not impacted.

LCS/LCSDs and MS/MSDs were performed for the remaining GRO and DRO/RRO batches, and LCSs and MS/MSDs were performed for all VOC and SVOC batches.

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

✓Yes No NA (Please explain.) Comments:

LCS and MS/MSDs were performed for the metals batch.

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

Yes ✓No NA (Please explain.) Comments:

The VOC MS sample prepared from 14HF2501WG recovered above the upper control limit for o-xylene. o-Xylene was not detected in the parent sample and the result is considered unaffected by the high MS recovery. The MSD sample prepared from the same parent recovered above the upper control limit for toluene. The toluene result in sample 14HF2501WG was qualified (MH) as a high estimate based upon the high recovery. Impact to the result is minor as the detection is more than three orders of magnitude below the ADEC cleanup level.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6biii.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6biii.

c. Surrogates – Organics Only

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

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

No data quality or usability is affected by the surrogates.

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

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

✓Yes No NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

✓Yes No NA (Please explain.) Comments:

Trip blank sample 14HF2509WQ was shipped with cooler FES-27.

iii. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, one analyte did have a detection below the LOQ. Trip blank sample 14HF2509WQ detected GRO below the LOQ at 0.0313 mg/L. No qualification action was taken based upon the trip blank contamination because GRO was detected at a higher concentration in the equipment blank sample 14HF2505WQ (see 6f).

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the trip blank.

e. Field Duplicate

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

✓Yes No NA (Please explain.) Comments:

One groundwater field duplicate was collected for the 6 groundwater primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF2503WG was a field duplicate of 14HF2502WG.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

Yes ✓No NA (Please explain.) Comments:

RPD values for acenaphthene (86%), acenaphthylene (80%), anthracene (80%), and phenanthrene (80%) did not meet the ≤30% RPD criterion for water in sample pair 14HF2503WG/14HF2502WG. These analytes were not detected in at least one of the paired samples and the LODs were used to calculate the RPD. The LODs for sample 14HF2503WG were elevated due to a 50x dilution (done to mitigate matrix interference with internal standards). These dissimilar RPDs led to the high RPD results and no flagging was applied.

Results (detected and non-detected) are shown in the table below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier "U".

Analyte	Method	Units	14HF2502WG	Qualifier	14HF2503WG	Qualifier	RPD
GRO	AK101	mg/L	4.31		4.35		1
DRO	AK102	mg/L	13.4		12.4		8
RRO	AK103	mg/L	0.257	U	0.27	U	5
Sulfate	EPA 300.0	mg/L	11.2		8.32		30
Total Nitrate/Nitrite-N	SM21 4500NO3-F	mg/L	0.050	U	0.050	U	0
Lead	SW6020A	mg/L	0.0757		0.0822		8
Iron	SW6020A	mg/L	46		42.1		9
Manganese	SW6020A	mg/L	6.49		6.29		3
1,2-Dichloroethane	SW8260B	mg/L	0.00025	U	0.00025	U	0

Analyte	Method	Units	14HF2502WG	Qualifier	14HF2503WG	Qualifier	RPD
Benzene	SW8260B	mg/L	0.0034		0.00299		13
Ethylbenzene	SW8260B	mg/L	0.227		0.22		3
o-Xylene	SW8260B	mg/L	0.423		0.427		1
Xylene, Isomers m & p	SW8260B	mg/L	0.837		0.852		2
Toluene	SW8260B	mg/L	0.634		0.63		1
1-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.0407		0.0502		21
2-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.0789		0.093		16
Acenaphthene	8270D SIMS (PAH)	mg/L	0.00053	J	0.00133	U	86
Acenaphthylene	8270D SIMS (PAH)	mg/L	0.00057	U	0.00133	U	80
Anthracene	8270D SIMS (PAH)	mg/L	0.00057	U	0.00133	U	80
Fluorene	8270D SIMS (PAH)	mg/L	0.000923	J	0.000986	J	7
Naphthalene	8270D SIMS (PAH)	mg/L	0.146		0.173		17
Phenanthrene	8270D SIMS (PAH)	mg/L	0.00057	U	0.00133	U	80
All Other PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

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

Comments:

See 6eiii.

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

✓Yes No NA (Please explain.) Comments:

Sample 14HF2505WQ was an equipment blank and was collected from the bladder pump used to collect samples from three wells (25-MW2, 25-MW3, and 25-MW6). The other wells at the site were collected using disposable equipment and peristaltic pump, so EB does not apply to these.

i. All results less than PQL?

Yes ✓No NA (Please explain.) Comments:

Equipment blank sample 14HF2505WQ detected dissolved manganese at a concentration greater than the LOD. All associated samples detected dissolved manganese at concentrations greater than ten-times that of the equipment blank and are considered unaffected by the equipment blank contamination.

Additionally, the equipment blank sample detected four analytes below the LOQ.

Equipment blank sample 14HF2505WQ detected GRO below the LOQ at 0.0539 mg/L. Associated sample 14HF2508WG detected GRO at concentrations less than ten-times that of the equipment blank and was flagged (B) based upon the potential equipment contamination. Impact to all samples is minor as the detection was at least one order of magnitude below the ADEC cleanup level.

Equipment blank sample 14HF2505WQ detected DRO below the LOQ at 0.407 mg/L. Associated samples 14HF2504WG and 14HF2508WG detected DRO at concentrations less than ten-times that of the equipment blank and were flagged (B) based upon the potential equipment contamination. Impact to samples may be significant as the detections were within one order of magnitude of the ADEC cleanup level.

Equipment blank sample 14HF2505WQ detected toluene below the LOQ at 0.004 mg/L. Associated sample 14HF2508WG detected toluene at concentrations less than ten-times that of the equipment blank and were flagged (B) based upon the potential equipment contamination. Impact to all samples is minor as the detections were at least two orders of magnitude below the ADEC cleanup level.

Equipment blank sample 14HF2505WQ detected naphthalene below the LOQ at 0.0000393 mg/L. No associated samples had naphthalene results within 10 times the EB result and no data were impacted.

ii. If above PQL, what samples are affected?

Comments:

See 6fi.

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

Comments:

See 6fi.

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

a. Defined and appropriate?

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

Laboratory Data Review Checklist

Completed by: Rachel James

Title: Chemist, Argon, Inc. Date: 09/29/14

CS Report Name: Haines – Fairbanks Pipeline Report Date: 08/13/14

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS - Anchorage Laboratory Report Number: 1143745

ADEC File Number: 900.38.001 ADEC RecKey Number:

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

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
✓Yes No NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
Yes No ✓NA (Please explain.) Comments:

No discrepancies or sample condition issues were noted.

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

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

4. <u>Case Narrative</u>

a. Present and understandable?
✓Yes No NA (Please explain.) Comments:

The case narrative includes errant comments about CCV failures for method 8021B, which was not performed for this report.

b. Discrepancies, errors or QC failures identified by the lab?
✓Yes No NA (Please explain.) Comments:

The case narrative discussed LCS/LCSD recovery and RPD exceptions, surrogate recovery exceptions, and CCV recovery exceptions. LCS/LCSD recovery exceptions are discussed in 6b below, LCS/LCSD RPD exceptions do not apply to this report because they are for target compounds not associated with this project, surrogate recovery exceptions are discussed in 6c below, and CCV exceptions do not apply to this report and are explained in 4a above.

c. Were all corrective actions documented?
✓Yes No NA (Please explain.) Comments:

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

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

5. <u>Samples Results</u>

a. Correct analyses performed/reported as requested on COC?
✓Yes No NA (Please explain.) Comments:

b. All applicable holding times met?

✓Yes No NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

Yes No ✓NA (Please explain.) Comments:

No soil samples were included in this report.

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

✓Yes No NA (Please explain.) Comments:

e. Data quality or usability affected?

Comments:

No data quality or usability was affected.

6. <u>QC Samples</u>

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?

✓Yes No NA (Please explain.) Comments:

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

Method blank sample 1227019 contained in batch VXX26269 detected GRO below the LOQ at 0.05 mg/L. Associated sample 14HF1901WG detected GRO at a concentration less than ten-times that of the method blank and was flagged (B) based upon the potential method blank contamination. Impact to the sample is minor as the detection was at least one order of magnitude below the ADEC cleanup level.

Method blank sample 1227070 contained in batch VXX26270 detected GRO below the LOQ at 0.0427 mg/L. Associated samples 14HF1902WG, 14HF1903WG, 14HF0904WG, 14HF1905WG, 14HF1909WS, 14HF1913WS, 14HF1914WS, and 14HF1915WS detected GRO at concentrations less than ten-times that of the method blank and were flagged (B) based upon the potential method blank contamination. Impact to most samples is minor as the detections were at least one order of magnitude below the ADEC cleanup level. Impact to sample 14HF1903WG may be significant as the GRO detection was within one order of magnitude of the ADEC cleanup level.

Method blank sample 1226734 contained in batch XXX31702 detected naphthalene below the LOQ at 0.0000327 mg/L. Associated sample 14HF1901WG detected naphthalene at a concentration less than ten-times that of the method blank and was flagged (B) based upon the potential method blank contamination. Impact to the sample is minor as the detection was more than one order of magnitude below the ADEC cleanup level.

iii. If above PQL, what samples are affected?

Comments:

See 6aii.

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

✓Yes No NA (Please explain.) Comments:

See 6aii.

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

Comments:

See 6aii.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

LCS/LCSDs and MS/MSDs were performed for the GRO, DRO/RRO, VOC, and SVOC batches.

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

✓Yes No NA (Please explain.) Comments:

LCSD and MSD analysis was not performed for sulfate batch WXX10652 or nitrate/nitrite batch WFI2332. Acceptable batch precision was demonstrated by analysis of laboratory duplicate samples and data quality is not impacted.

LCSs and MS/MSDs were performed for the metals batches.

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

Yes ✓No NA (Please explain.) Comments:

The PAH LCS and/or LCSD samples 1226735/1226736 recovered below the lower control limits for acenaphthene, acenaphthylene, anthracene, fluorene, 1-methylnaphthalene, 2-methylnaphthalene, naphthalene, and phenanthrene. These results in associated samples 14HF1901WG, 14HF1902WG, 14HF1903WG, 14HF1904WG, and 14HF1905WG were qualified (QL) as low estimates based upon the low recoveries. Impact to most results is minor as most detections or LODs were at least one order of magnitude below the ADEC cleanup levels. However, the 1-methylnaphthalene and 2-methylnaphthalene detections and LODs were within one order of magnitude of the cleanup level and may have been more significantly affected by the low LCS/LCSD recoveries.

The nitrate/nitrite MS sample 1226863 prepared from a non-project parent sample recovered below the lower control limit. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the low recovery.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6biii.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6biii.

c. Surrogates – Organics Only

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

✓Yes No NA (Please explain.) Comments:

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

Yes ✓No NA (Please explain.) Comments:

Method 8270D surrogate 2-fluorobiphenyl recovered below the lower control limit in LCS/LCSD samples 1226735/1226736. No qualification action was taken based upon the surrogate recoveries in the QC sample and they were instead assessed based upon the recoveries of spiked compounds. See Section 6ciii.

Method 8270D surrogate 2-fluorobiphenyl recovered below the lower control limit in sample 14HF1903WG. All results in the sample were qualified (QL) as biased-low estimates due to the low surrogate recovery. Although the results are potentially low-biased and most results are non-detect, impact to data quality is likely minor as the second surrogate was within control limits and the LODs or results are more than one order of magnitude less than the ADEC cleanup levels.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6cii.

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

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

✓Yes No NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

✓Yes No NA (Please explain.) Comments:

Trip blank sample 14HF1906WQ was shipped with cooler FES-36 and trip blank sample 14HF1917WQ was shipped with cooler FES-30.

iii. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, one analyte did have a detection below the LOQ.

Trip blank sample 14HF1906WQ detected GRO below the LOQ at 0.0357 mg/L. No qualification action was taken based upon the trip blank contamination because GRO was detected at a higher concentration in the method blank samples 1227019 and 1227070 and these two method blank samples cover all project samples (see 6a).

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the trip blank.

e. Field Duplicate

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

✓Yes No NA (Please explain.) Comments:

One groundwater field duplicate was collected for the 4 groundwater primary samples and one surface water field duplicate was collected for the 7 surface water primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF1902WG was a field duplicate of 14HF0901WG and sample 14HF1911WS was a field duplicate of 14HF1910WS.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

Yes ✓No NA (Please explain.) Comments:

RPD values for lead (33%) and 1-methylnaphthalene (46%) did not meet the ≤30% RPD criterion for water in sample pair 14HF1901WG/14HF1902WG. Lead and 1-methylnaphthalene were qualified (QN) in the associated samples. See table below.

Results (detected and non-detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier “U”.

Analyte	Method	Units	14HF1901WG	Qualifier	14HF1902WG	Qualifier	RPD
GRO	AK101	mg/L	0.0314	J	0.0361	J	14
DRO	AK102	mg/L	0.319	U	0.338	U	6
RRO	AK103	mg/L	0.266	U	0.281	U	5
Sulfate	EPA 300.0	mg/L	29.8		30		1
Total Nitrate/Nitrite-N	SM21 4500NO3-F	ug/L	596		554		7
Lead	SW6020A	mg/L	0.0005	U	0.0005	U	0
Iron	SW6020A	mg/L	0.25	U,QN	0.35	J,QN	33
Manganese	SW6020A	mg/L	0.0265		0.0263		1
1,2-Dichloroethane	SW8260B	mg/L	0.00025	U	0.00025	U	0
Benzene	SW8260B	mg/L	0.0002	U	0.0002	U	0
Ethylbenzene	SW8260B	mg/L	0.0005	U	0.0005	U	0
o-Xylene	SW8260B	mg/L	0.0005	U	0.0005	U	0
Xylene, Isomers m & p	SW8260B	mg/L	0.001	U	0.001	U	0
Toluene	SW8260B	mg/L	0.0005	U	0.0005	U	0
1-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.0000182	J,QN	0.000029	U,QN	46
Naphthalene	8270D SIMS (PAH)	mg/L	0.0000713	J	0.000058	U	21
All Other PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

Analyte	Method	Units	14HF1910WS	Qualifier	14HF1911WS	Qualifier	RPD
GRO	AK101	mg/L	0.05	U	0.05	U	0
DRO	AK102	mg/L	0.3	U	0.3	U	0
RRO	AK103	mg/L	0.25	U	0.25	U	0
Lead	SW6020A	mg/L	0.0005	U	0.0005	U	0
1,2-Dichloroethane	SW8260B	mg/L	0.00025	U	0.00025	U	0
Benzene	SW8260B	mg/L	0.0002	U	0.0002	U	0
Ethylbenzene	SW8260B	mg/L	0.0005	U	0.0005	U	0
o-Xylene	SW8260B	mg/L	0.0005	U	0.0005	U	0
Xylene, Isomers m & p	SW8260B	mg/L	0.001	U	0.001	U	0
Toluene	SW8260B	mg/L	0.0005	U	0.0005	U	0

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

Comments:

See 6eiii.

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

Yes No ✓NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

i. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Disposable sampling equipment was used an a decontamination blank was not necessary.

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

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

In addition, all results in two associated samples (14HF1903WG and 14HF1904WG) were qualified as non-biased estimates (QN) due to water draw down noted during sample purging and collection. Impact to data quality is minor since the drawdown measured in the wells was either marginally over the 0.3 foot limit and/or was stable over the last several intervals.

Laboratory Data Review Checklist

Completed by: Rachel James

Title: Chemist, Argon, Inc. Date: 09/24/14

CS Report Name: Haines – Fairbanks Pipeline Report Date: 08/22/14

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS - Anchorage Laboratory Report Number: 1143746

ADEC File Number: 900.38.001 ADEC RecKey Number:

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

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
✓Yes No NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
✓Yes No NA (Please explain.) Comments:

The laboratory noted sample ID and location ID discrepancies between the bottle labels and the COC for sample 14HF1901SE. Fairbanks Environmental Services was contacted and the laboratory logged the samples in correctly.

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

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

4. Case Narrative

a. Present and understandable?
✓Yes No NA (Please explain.) Comments:

The case narrative included errant comments about PAH MSD sample 1227250 which was not reported in this SDG.

b. Discrepancies, errors or QC failures identified by the lab?
✓Yes No NA (Please explain.) Comments:

The case narrative discussed MS/MSD recovery and RPD exceptions and MB detections. MS/MSD recovery and RPD exceptions are discussed in 6b below and MB detections are discussed in 6a below.

c. Were all corrective actions documented?
✓Yes No NA (Please explain.) Comments:

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

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

5. Samples Results

a. Correct analyses performed/reported as requested on COC?
✓Yes No NA (Please explain.) Comments:

b. All applicable holding times met?

✓Yes No NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

✓Yes No NA (Please explain.) Comments:

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

Yes ✓No NA (Please explain.) Comments:

Due in part to high moisture content, the reported LODs for VOC analyte 1,2-dichlorothane did not meet the ADEC Method Two soil cleanup level in all sediment samples collected from the PMP 19.5 site (samples 14HF1901SE through 14HF1908SE). Consequently, the absence of 1,2-dichloroethane at levels exceeding the ADEC soil cleanup level in site sediments cannot be confirmed. Impact to project data is notable since it affected all sediment results from this site.

e. Data quality or usability affected?

Comments:

See 5d.

6. <u>QC Samples</u>

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?

✓Yes No NA (Please explain.) Comments:

No method blank results were above the LOQ; however, two method blanks did have detections below the LOQ. Method blank sample 1228529 contained in batch VXX26310 detected GRO below the LOQ at 0.844 mg/kg. No qualification action was taken based upon the method blank contamination because GRO was detected at a higher concentration in trip blank sample 14HF1909SQ. Method blank sample 1227026 contained in batch XXX31711 detected 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene below the LOQ at 0.00284 mg/kg, 0.00366 mg/kg, and 0.00322 mg/kg, respectively. Associated sample 14HF1908SE detected all three compounds at concentrations less than ten-times that of the method blank and was flagged (B) based upon the potential method blank contamination. Impact to the sample is minor as the detections were at least three orders of magnitude below the ADEC cleanup levels.

iii. If above PQL, what samples are affected?

Comments:

See 6aii.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6aii.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

LCS/LCSDs and MS/MSDs were performed for the GRO and DRO/RRO batches. LCSs and MS/MSDs were performed for the VOC and SVOC batches.

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

✓Yes No NA (Please explain.) Comments:

LCS/LCSDs and MS/MSDs were performed for the metals batch.

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

Yes ✓No NA (Please explain.) Comments:

The PAH MSD sample prepared from 14HF1901SE recovered below the lower control limit for benzo(g,h,i)perylene. The benzo(g,h,i)perylene result in the parent sample was qualified (ML) as a low estimate based upon the low recovery. Although the result is potentially low-biased and the result in the parent sample was non-detect, impact to data quality is likely minor as the LOD was several orders of magnitude less than the ADEC cleanup level.

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

Yes ✓No NA (Please explain.) Comments:

The PAH MS/MSD samples prepared from 14HF1901SE had RPDs above the control limit for benzo(g,h,i)perylene and benzo(k)fluoranthene. The benzo(g,h,i)perylene and benzo(k)fluoranthene results in the parent sample were qualified (MN) as estimates based upon the poor precision. Impact to the results was minor as the LODs were several orders of magnitude less than the ADEC cleanup level.

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

Comments:

See 6ciii and 6civ.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6ciii and 6civ.

c. Surrogates – Organics Only

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

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Yes No ✓NA (Please explain.) Comments:

No samples had failed surrogate recoveries.

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

Comments:

No data quality or usability was affected by the surrogates.

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

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

✓Yes No NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

✓Yes No NA (Please explain.) Comments:

Trip blank samples 14HF1909SQ and 14HF1910SQ were both shipped with cooler FES-31.

iii. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, two analytes did have detections below the LOQ.

Trip blank sample 14HF1910SQ detected GRO below the LOQ at 0.872 mg/kg. No qualification action was taken based upon this trip blank detection because GRO was detected at a higher concentration in trip blank sample 14HF1909SQ and both trip blanks were shipped in the same cooler.

Trip blank sample 14HF1909SQ detected GRO below the LOQ at 0.957 mg/kg. Associated samples 14HF1901SE, 14HF1902SE, 14HF1903SE, 14HF1905SE, 14HF1906SE, 14HF1907SE, 14HF1908SE, 14HF1901SS, 14HF1902SS, and 14HF1903SS detected GRO at concentrations less than ten-times that of the trip blank and were flagged (B) based upon the potential travel contamination. Impact to all samples is minor as the detections were at least one order of magnitude below the ADEC cleanup levels.

Trip blank sample 14HF1910SQ detected p&m-xylene below the LOQ at 0.0244 mg/kg. This analyte was non-detect in all associated samples and they are considered unaffected by the potential travel contamination.

iv. If above PQL, what samples are affected?

Comments:

See 6diii.

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

Comments:

See 6diii.

e. Field Duplicate

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

One sediment field duplicate was collected for the 7 sediment primary samples and one surface soil field duplicate was collected for the 2 surface soil primary samples associated with this work order.

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

Sample 14HF1903SE was a field duplicate of 14HF1902SE and sample 14HF1903SS was a field duplicate of 14HF1902SS.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

Yes ✓No NA (Please explain.) Comments:

The RPD value for RRO (98%) did not meet the ≤50% RPD criterion for soil in sample pair 14HF1902SS/14HF1903SS. The RRO results in were qualified (QN) in associated samples.

Results (detected and non-detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier "U".

Analyte	Method	Units	14HF1902SE	Qualifier	14HF1903SE	Qualifier	RPD
GRO	AK101	mg/Kg	1.93	J	1.57	J	21
DRO	AK102	mg/Kg	14.1	U	13.8	U	2
RRO	AK103	mg/Kg	19.9	J	25.1	J	23
Lead	SW6020A	mg/Kg	1.1		1.07		3
Ethylene Dibromide	SW8011	mg/Kg	0.000072	U	0.000071	U	1
1,2-Dichloroethane	SW8260B	mg/Kg	0.0242	U	0.023	U	5
Benzene	SW8260B	mg/Kg	0.0121	U	0.0115	U	5
Ethylbenzene	SW8260B	mg/Kg	0.0242	U	0.023	U	5
o-Xylene	SW8260B	mg/Kg	0.0242	U	0.023	U	5
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0483	U	0.0459	U	5
Toluene	SW8260B	mg/Kg	0.0242	U	0.023	U	5
All PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

Analyte	Method	Units	14HF1902SS	Qualifier	14HF1903SS	Qualifier	RPD
Gasoline Range Organics	AK101	mg/Kg	1.39	J	1.08	J	25
Diesel Range Organics	AK102	mg/Kg	11.9	U	11.4	U	4
Residual Range Organics	AK103	mg/Kg	43.6	QN	15	J,QN	98
Lead	SW6020A	mg/Kg	0.965		0.644		40
Ethylene Dibromide	SW8011	mg/Kg	0.00006	U	0.000054	U	11
1,2-Dichloroethane	SW8260B	mg/Kg	0.0164	U	0.0147	U	11
Benzene	SW8260B	mg/Kg	0.0082	U	0.00735	U	11
Ethylbenzene	SW8260B	mg/Kg	0.0164	U	0.0147	U	11
o-Xylene	SW8260B	mg/Kg	0.0164	U	0.0147	U	11
Xylene, Isomers m & p	SW8260B	mg/Kg	0.0327	U	0.0294	U	11
Toluene	SW8260B	mg/Kg	0.0164	U	0.0147	U	11
All PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

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

Comments:

See 6eiii.

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

Yes No ✓NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

i. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Disposable sampling equipment was used and a decontamination blank was not necessary.

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

a. Defined and appropriate?

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

Laboratory Data Review Checklist

Completed by: Rachel James

Title: Chemist, Argon, Inc. Date: 09/25/14

CS Report Name: Haines – Fairbanks Pipeline Report Date: 08/22/14

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS - Anchorage Laboratory Report Number: 1143760

ADEC File Number: 900.38.001 ADEC RecKey Number:

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

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Yes No ✓NA (Please explain.) Comments:

No discrepancies were noted.

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

Comments:

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

4. Case Narrative

a. Present and understandable?

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

The case narrative discussed surrogate recovery exceptions, MS/MSD recovery and RPD exceptions, elevated LOQs, and MB detections. Surrogate recovery exceptions and elevated LOQs (dilutions) are discussed in 6c below, MS/MSD recovery and RPD exceptions are discussed in 6b below, and MB detections are discussed in 6a below.

c. Were all corrective actions documented?

✓Yes No NA (Please explain.) Comments:

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

Comments:

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

5. Samples Results

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

✓Yes No NA (Please explain.) Comments:

b. All applicable holding times met?

✓Yes No NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

✓Yes No NA (Please explain.) Comments:

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

Yes ✓No NA (Please explain.) Comments:

Due to sample dilution, the reported LODs for benzene did not meet the ADEC Method Two soil cleanup level in samples 14HF1712SE, 14HF1713SE, 14HF1714SE, 14HF1717SE, 14HF1718SE, 14HF1719SE, and 14HF1722SE. Consequently, the absence of benzene at levels exceeding the ADEC soil cleanup level and the absence of PAH analytes at levels exceeding the TEL at those locations cannot be confirmed. Impact to data is minor since the impacted samples generally exceeded cleanup levels for other compounds, and benzene was detected in other PMP 17.7 site samples in excess of the cleanup level

Due to sample dilution, the reported LODs for several non-detect PAH analytes did not meet the NOAA TEL in sediment samples 14HF1712SE, 14HF1713SE, 14HF1715SE, 14HF1720SE, and 14HF1722SE. Consequently, the absence of these PAH analytes at levels exceeding the TEL at those locations cannot be confirmed. Impact to data is minor since all of the impacted samples exceeded cleanup levels for other PAH compounds.

e. Data quality or usability affected?

Comments:

See 5d.

6. <u>QC Samples</u>

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?

✓Yes No NA (Please explain.) Comments:

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

Method blank sample 1228210 contained in batch VXX26303 detected GRO below the LOQ at 1.08 mg/kg. Associated samples 14HF1712SE, 14HF1715SE, and 14HF1716SE detected GRO at concentrations less than ten-times that of the method blank and were flagged (B) based upon the potential method blank contamination. Impact to samples is minor as the detections were at least one order of magnitude below the ADEC cleanup level.

Method blank sample 1226691 contained in batch XXX31699 detected RRO below the LOQ at 6.22 mg/kg. Associated samples 14HF1717SE and 14HF1718SE detected RRO at concentrations less than ten-times that of the method blank and were flagged (B) based upon the potential method blank contamination. Impact to samples is minor as the detections were at least three orders of magnitude below the ADEC cleanup level.

Method blank sample 1227026 contained in batch XXX31711 detected 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene below the LOQ at 0.00284 mg/kg, 0.00366 mg/kg, and 0.00322 mg/kg, respectively. All associated samples either did not detect these compounds or the detections were greater than ten-times that of the method blank and the results are considered unaffected by the potential method blank contamination.

iii. If above PQL, what samples are affected?

Comments:

See 6aii.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6aii.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

MS/MSD analysis was not performed for DRO/RRO batches XXX31696 and XXX31699. Two sets of MS/MSD samples were submitted with the project samples, which meets the required frequency. However, the laboratory batched the project samples in four batches. Impact to data is minor as acceptable LCS/LCSD analyses verified batch precision and accuracy and MS/MSD results in associated batches were acceptable. Samples 14HF1701SE, 14HF1702SE, 14HF1703SE, 14HF1704SE, 14HF1705SE, 14HF1717SE, and 14HF1718SE were contained in the two batches lacking MS/MSDs.

LCS/LCSDs and MS/MSDs were performed for the remaining GRO and DRO/RRO batches and LCSs and MS/MSDs were performed for the remaining VOC and SVOC batches.

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

✓Yes No NA (Please explain.) Comments:

LCSs and MS/MSDs were performed for the metals batches.

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

Yes ✓No NA (Please explain.) Comments:

The DRO/RRO MS/MSD samples 1226959/1226960 prepared from a non-project parent sample recovered below the lower control limit for DRO. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the low recoveries.

The PAH MSD sample prepared from 14HF1706SE recovered below the lower control limits for 1-methylnaphthalene and 2-methylnaphthalene. The 1-methylnaphthalene and 2-methylnaphthalene results in the parent sample were qualified (ML) as low estimates based upon the low recoveries. Impact to the results was minor as the paired MS recoveries were within control limits and the parent sample results for the two analytes were several orders of magnitude below the ADEC cleanup levels.

The PAH MS and/or MSD samples prepared from 14HF1712SE recovered below the lower control limits for 1-methylnaphthalene, 2-methylnaphthalene, benzo(a)pyrene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, fluorene, indeno(1,2,3-cd)pyrene, and naphthalene. 1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were detected in the parent sample at concentrations greater than 4-times that of the spike level and the recoveries are not considered meaningful. No flagging was applied to these analytes. The benzo(a)pyrene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, fluorene, and indeno(1,2,3-cd)pyrene results in the parent sample were flagged (ML) as low estimates based upon the low recoveries. Although the results are potentially low-biased and most results are non-detect, impact to data quality is likely minor as the paired MS or MSD recoveries were within control limits and the LODs or results are more than one order of magnitude less than the ADEC cleanup levels.

The PAH MSD sample 1227250 prepared from a non-project parent sample recovered below the lower control limit for benzo(g,h,i)perylene. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the low recovery.

The PAH MS/MSD samples 1227247/1227248 prepared from a non-project parent sample recovered outside the control limits for 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and/or naphthalene. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the out of control recoveries.

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

Yes ✓No NA (Please explain.) Comments:

The PAH MS/MSD samples prepared from 14HF1706SE had RPDs above the control limits for 1-methylnaphthalene and 2-methylnaphthalene. These analytes were already flagged for not meeting the accuracy criteria and no additional flagging was applied based upon the poor precision.

The PAH MS/MSD samples prepared from 14HF1712SE had RPDs above the control limits for 1-methylnaphthalene, 2-methylnaphthalene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, and naphthalene. 1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were detected in the parent sample at concentrations greater than 4-times that of the spike level and the precision results are not considered meaningful. The benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(g,h,i)perylene results in the parent sample were flagged (MN) as estimates based upon the poor precision. Impact to the results in the parent sample were minor as the LODs or results are more than one order of magnitude less than the ADEC cleanup levels.

The PAH MS/MSD samples 1227249/1227250 prepared from a non-project parent sample had high RPDs for benzo(k)fluoranthene and benzo(g,h,i)perylene. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the poor precision.

The PAH MS/MSD samples 1227247/1227248 prepared from a non-project parent sample had high RPDs for acenaphthene, anthracene, fluorene, and/or phenanthrene. The parent sample is not associated with this project and, therefore, no project samples were flagged based upon the poor precision.

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

See 6ciii and 6civ.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
✓Yes No NA (Please explain.) Comments:

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

See 6ciii and 6civ.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
✓Yes No NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
Yes ✓No NA (Please explain.) Comments:

Method AK101 surrogate 4-bromofluorobenzene recovered below the lower control limit in sample 14HF1712SE. The GRO result in the parent sample was flagged (QL) based upon the low recovery. Impact to the sample was minor as the GRO result was more than one order of magnitude below the ADEC cleanup level.

Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in samples 14HF1714SE, 14HF1717SE, 14HF1718SE, 14HF1719SE, 14HF1720SE, and 14HF1722SE. Sample 14HF1719SE was analyzed at a 10x dilution and no flagging was applied because the high recovery was the consequence of dilution. The GRO results in samples 14HF1714SE, 14HF1717SE, 14HF1718SE, 14HF1720SE, and 14HF1722SE were flagged (QH) as estimates with a high bias based upon the high surrogate recoveries. Impact to samples may be significant since the GRO results are within one order of magnitude below the ADEC cleanup level.

Method 8260B surrogate toluene-d8 recovered above the upper control limit in sample 14HF1704SE. No VOCs were detected in the sample and the results are considered unaffected by the high recovery.

Method 8260B surrogates toluene-d8 and 1,2-dichloroethane-d4 recovered above the upper control limits in sample 14HF1712SE. Toluene was detected in the sample and the result was flagged (QH) as a high estimate. Impact to the toluene result in this sample was minor since the detection was more than three orders of magnitude below the ADEC cleanup level. All other VOC compounds were not detected and are considered unaffected by the high recoveries.

Method 8270D surrogate 2-fluorobiphenyl recovered below the lower control limit in sample 14HF1706SE. All PAH compounds in this sample were flagged (QL) as low estimates based upon the low recovery. Although the results are potentially low-biased and most results are non-detect, impact to data quality is likely minor as the second surrogate was within control limits and the LODs or results are more than one order of magnitude less than the ADEC cleanup level.

Method 8270D surrogate terphenyl-d14 recovered above the upper control limit in sample 14HF1707SE. Benzo(b)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene were detected in the sample and were flagged (QH) as high estimates. Impact to these results was minor since the detections were at least two orders of magnitude below the ADEC cleanup levels. All other PAH compounds were not detected and are considered unaffected by the high recovery.

Method 8270D surrogate 2-fluorobiphenyl recovered above the upper control limit in sample 14HF1720SE due to 20x dilution. No flagging was applied because the high recovery is the consequence of dilution.

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

✓Yes No NA (Please explain.) Comments:

See 6cii.

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

Comments:

See 6cii.

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

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

✓Yes No NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
✓Yes No NA (Please explain.) Comments:

Trip blank sample 14HF1723SQ was shipped with cooler FES-35.

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

No trip blank results were above the LOQ; however, two analytes did have detections below the LOQ.

Trip blank sample 14HF1723SQ detected GRO below the LOQ at 0.925 mg/kg. Associated samples 14HF1701SE, 14HF1702SE, 14HF1705SE, 14HF1706SE, and 14HF1711SE detected GRO at concentrations less than ten-times that of the trip blank and were flagged (B) based upon the potential travel contamination. Other associated samples were affected by the higher GRO concentration in method blank sample 1228210 (see 6a). Impact to the samples is minor as the detections were at least one order of magnitude below the ADEC cleanup level.

Trip blank sample 14HF1723SQ detected ethylbenzene below the LOQ at 0.00847 mg/kg. Associated sample 14HF1703SE detected ethylbenzene at a concentration less than ten-times that of the trip blank and was flagged (B) based upon the potential travel contamination. Impact to the sample is minor as the detection was two orders of magnitude below the ADEC cleanup level.

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

See 6diii.

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

See 6diii.

e. Field Duplicate

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

Two sediment field duplicates were collected for the 20 sediment primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF1707SE was a field duplicate of 14HF1706SE and sample 14HF1713SE was a field duplicate of 14HF1712SE.

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

Yes ✓No NA (Please explain.) Comments:

RPD values for GRO (61%), 1-methylnaphthalene (79%), 2-methylnaphthalene (93%), and phenanthrene (54%) did not meet the ≤50% RPD criterion for soil in sample pair 14HF1706SE/14HF1707SE. These analytes were qualified (QN) in associated samples. See table below.

RPD values for lead (61%), 1-methylnaphthalene (57%), 2-methylnaphthalene (58%), and naphthalene (60%) did not meet the ≤50% RPD criterion for soil in sample pair 14HF1712SE/14HF1713SE. These analytes were qualified (QN) in associated samples. See table below.

Results (detected and non-detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier “U”.

Analyte	Method	Units	14HF1706SE	Qualifier	14HF1707SE	Qualifier	RPD
GRO	AK101	mg/Kg	5.61	QN	10.5	QN	61
DRO	AK102	mg/Kg	53.8		34.9		43
RRO	AK103	mg/Kg	36.6		35.9		2
Lead	SW6020A	mg/Kg	7.97		7.9		1
Benzene	SW8260B	mg/Kg	0.01	J	0.0135	J	30
Ethylbenzene	SW8260B	mg/Kg	0.0264	U	0.0271	U	3
o-Xylene	SW8260B	mg/Kg	0.0264	U	0.0271	U	3
Xylene, Isomers m & p	SW8260B	mg/Kg	0.053	U	0.054	U	2
Toluene	SW8260B	mg/Kg	0.0264	U	0.0271	U	3
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00418	J,QN	0.00969	QN	79
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.00229	J,QN	0.00625	J,QN	93
Benzo[b]Fluoranthene	8270D SIMS (PAH)	mg/Kg	0.00319	J	0.00402	J	23
Chrysene	8270D SIMS (PAH)	mg/Kg	0.00388	J	0.00491	J	23
Fluoranthene	8270D SIMS (PAH)	mg/Kg	0.0037	U	0.00367	J	1
Phenanthrene	8270D SIMS (PAH)	mg/Kg	0.0037	U,QN	0.00647	J,QN	54
Pyrene	8270D SIMS (PAH)	mg/Kg	0.00341	J	0.00404	J	17
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

Analyte	Method	Units	14HF1712SE	Qualifier	14HF1713SE	Qualifier	RPD
GRO	AK101	mg/Kg	6.26	J	7.7	U	21
DRO	AK102	mg/Kg	125		122		2
RRO	AK103	mg/Kg	171		238		33
Lead	SW6020A	mg/Kg	29.3	QN	15.6	QN	61
Benzene	SW8260B	mg/Kg	0.0437	U	0.0386	U	12
Ethylbenzene	SW8260B	mg/Kg	0.0875	U	0.077	U	13
o-Xylene	SW8260B	mg/Kg	0.0875	U	0.077	U	13
Xylene, Isomers m & p	SW8260B	mg/Kg	0.174	U	0.155	U	12
Toluene	SW8260B	mg/Kg	0.0716	J	0.0602	J	17
1-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.519	QN	0.289	QN	57
2-Methylnaphthalene	8270D SIMS (PAH)	mg/Kg	0.789	QN	0.435	QN	58
Fluorene	8270D SIMS (PAH)	mg/Kg	0.0368	J	0.0359	U	2
Naphthalene	8270D SIMS (PAH)	mg/Kg	0.708	QN	0.38	QN	60
All Other PAHs	8270D SIMS (PAH)	mg/Kg	Varies	All U	Varies	All U	≤50

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

Comments:

See 6eiii.

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

✓Yes No NA (Please explain.) Comments:

Sample 14HF1725WQ from work order 1143761 was an equipment blank that applies to these samples.

i. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

No equipment blank results were above the LOQ; however three analytes did have detections below the LOQ.

Equipment blank sample 14HF1725WQ detected GRO below the LOQ at 0.516 mg/L. No qualification action was taken based upon the equipment blank contamination because GRO was detected at a higher concentration (when compared on a part per million basis) in method blank sample 1228210 and trip blank sample 14HF1723SQ (see 6a and 6d).

Equipment blank sample 14HF1725WQ detected toluene below the LOQ at 0.00078 mg/L. All associated samples were either non-detect or detected toluene at concentrations greater than ten-times that of the equipment blank (when compared on a part per million basis). No flagging was necessary.

Equipment blank sample 14HF1725WQ detected 2-methylnaphthalene and naphthalene below the LOQ at 0.0000179 mg/L and 0.0000664 mg/L, respectively. All associated samples were either non-detect or detected 2-methylnaphthalene or naphthalene at concentrations greater than ten-times that of the equipment blank (when compared on a part per million basis). No flagging was necessary.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the equipment blank.

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

   ✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

Laboratory Data Review Checklist

Completed by: Rachel James

Title: Chemist, Argon, Inc. Date: 09/30/14

CS Report Name: Haines – Fairbanks Pipeline Report Date: 08/29/14

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: SGS - Anchorage Laboratory Report Number: 1143761

ADEC File Number: 900.38.001 ADEC RecKey Number:

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

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

      No samples were transferred.

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

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

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

      The temperature blank in cooler FES-32 was measured at 6.2°C upon receipt at the laboratory. The laboratory noted that the temperature blank was not near any ice in the cooler and was not representative of the cooler temperature. The cooler temperature was measured at 5.1°C. No flagging was applied based upon the slightly high temperature blank.

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

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

The laboratory noted that three VOA vials (containers C, E, and F) for sample 14HF1722WS arrived with more than 6mm of headspace. Containers C and E were not used for analysis. Container F was used for GRO analysis and the result was flagged (QL) as a low-biased estimate based upon the headspace. Impact to the result is minor as the GRO result is more than one degree of magnitude below the ADEC cleanup level.

The laboratory noted that one VOA vial for sample 14HF1709WG arrived with a label for sample 14HF1707WG. The sample was packed with other VOA vials for 14HF1709WG and the laboratory confirmed the correct identity of the vial with Fairbanks Environmental Services. No data quality was impacted.

The laboratory noted that the dissolved metals containers for samples 14HF1701WG, 14HF1702WG, and 14HF1709WG did not indicate that they were field filtered. The COC indicated that all dissolved metals containers were field filtered. The laboratory did not note any resolution to the issue of inconsistent documentation. The data validator confirmed with Fairbanks Environmental Services that the samples were field filtered. No data quality was impacted.

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

✓Yes No NA (Please explain.) Comments:

See 3a and 3c.

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

Comments:

See 3c.

4. <u>Case Narrative</u>

a. Present and understandable?

✓Yes No NA (Please explain.) Comments:

The case narrative includes errant comments about CCV failures for method 8021B, which was not performed for this report. Also included are errant LCS/LCSD, MS, and CCV comments regarding target compounds not associated with this project.

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

✓Yes   No   NA (Please explain.)   Comments:

The case narrative discusses surrogate recovery exceptions, LCS/LCSD recovery and RPD exceptions, MS/MSD recovery exceptions, and CCV exceptions. Surrogate recovery exceptions are discussed in 6c below, LCS/LCSD recovery exceptions are discussed in 6b below, LCS/LCSD RPD exceptions do not apply to this report because they are for target compounds not associated with this project, MS/MSD recovery exceptions are discussed in 6b below, and CCV exceptions do not apply to this report and are explained in 4a above.

c. Were all corrective actions documented?

Yes   ✓No   NA (Please explain.)   Comments:

The laboratory did not document a resolution to inconsistent field filtering documentation for samples 14HF1701WG, 14HF1702WG, and 14HF0709WG (see 3c).

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

Comments:

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

5. Samples Results

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

✓Yes   No   NA (Please explain.)   Comments:

b. All applicable holding times met?

✓Yes   No   NA (Please explain.)   Comments:

c. All soils reported on a dry weight basis?

Yes   No   ✓NA (Please explain.)   Comments:

No soil samples were included in this report.

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

✓Yes   No   NA (Please explain.)   Comments:

e. Data quality or usability affected?

Comments:

No data quality or usability was affected.

6. QC Samples

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?

✓Yes No NA (Please explain.) Comments:

No method blanks were above the LOQ; however, two method blanks did have detections below the LOQ.

Method blank sample 1226824 contained in batch VXX26265 detected GRO below the LOQ at 0.038 mg/L. Associated samples 14HF1707WG, 14HF1718WS, 14HF1719WS, 14HF1720WS, and 14HF1726WQ detected GRO at concentrations less than ten-times that of the method blank and were flagged (B) based upon the potential method blank contamination. Impact to most samples is minor as the detections were at least one order of magnitude below the ADEC cleanup level. Impact to sample 14HF1719WS may be significant as the GRO detection was within one order of magnitude of the ADEC cleanup level.

Method blank sample 1227019 contained in batch VXX26269 detected GRO below the LOQ at 0.05 mg/L. Associated samples 14HF1704WG, 14HF1705WG, 14HF1721WS, 14HF1722WS, 14HF1724WS, and 14HF1725WQ detected GRO at concentrations less than ten-times that of the method blank and were flagged (B) based upon the potential method blank contamination. Impact to most samples is minor as the detections were at least one order of magnitude below the ADEC cleanup level. Impact to samples 14HF1704WG and 14HF1724WS may be significant as the GRO detections were within one order of magnitude of the ADEC cleanup level.

iii. If above PQL, what samples are affected?

Comments:

See 6aii.

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

See 6aii.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

LCS/LCSDs and MS/MSDs were performed for the GRO, DRO/RRO, VOC, and SVOC batches.

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

✓Yes   No   NA (Please explain.)   Comments:

LCSD and MSD analysis was not performed for sulfate batches WXX10652 and WXX10654 and nitrate/nitrite batch WFI2332. Acceptable batch precision was demonstrated by analysis of laboratory duplicate samples and data quality is not impacted.

LCSs and MS/MSDs were performed for the metals batches.

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

Yes   ✓No   NA (Please explain.)   Comments:

The total nitrate/nitrite MS samples prepared from 14HF1706WG and 14HF1709WG recovered below the lower control limit. The total nitrate/nitrite results in the parent samples were qualified (ML) as low estimates based upon the low recoveries. Impact to the results is unknown as 18AAC75, Table C does not include a cleanup level for total nitrate/nitrite.

The PAH MS and/or MSD samples prepared from 14HF1706WG recovered below the lower control limits for 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and naphthalene. Naphthalene was detected in the parent sample at a concentration greater than 4-times that of the spike level and the recoveries are not considered meaningful. No flagging was applied to naphthalene results in the parent sample. The 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, and fluorene results in the parent sample were flagged (ML) as low estimates based upon the low recoveries. Although the results are potentially low-biased and most results are non-detect, impact to data quality is likely minor as the LODs or results are more than one order of magnitude less than the ADEC cleanup levels.

The GRO MSD sample prepared from 14HF1706WG recovered below the lower control limit. The GRO result in the parent sample was qualified (ML) as a low estimate based upon the low recovery. Impact to the sample result may be significant as the GRO result was just above the ADEC cleanup level.

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

✓Yes   No   NA (Please explain.)   Comments:

See 4b for discussion of the errant case narrative LCS/LCSD RPD comment.

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

Comments:

See 6ciii.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
✓Yes No NA (Please explain.) Comments:

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

See 6ciii.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
✓Yes No NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
Yes ✓No NA (Please explain.) Comments:

Method AK101 surrogate 4-bromofluorobenzene recovered above the upper control limit in sample 14HF1703WG. The GRO result in the sample was flagged (QH) based upon the high recovery. Impact to the sample may be significant as the GRO result was just above the ADEC cleanup level.

Method AK102 surrogate 5a-androstane recovered above the upper control limit in LCS/LCSD samples 1227362/1227363. No action was taken based upon the surrogate recoveries because the spiked DRO recoveries were within control limits.

Method 8270D surrogate 4-fluorobiphenyl recovered below the lower control limit in MB sample 1226737. The second surrogate in the MB and all project sample surrogates were within control limits. No action to project samples was taken based upon the MB surrogate recovery.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
✓Yes No NA (Please explain.) Comments:

See 6cii.

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

See 6cii.

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

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

✓Yes No NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

✓Yes No NA (Please explain.) Comments:

Trip blank sample 14HF1710WQ was shipped with cooler FES-39 and trip blank sample 14HF1726WQ was shipped with cooler FES-32.

iii. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

No trip blank results were above the LOQ; however, one analyte did have a detection below the LOQ. Trip blank sample 14HF1726WQ detected GRO below the LOQ at 0.0323 mg/L. No qualification action was taken based upon the trip blank contamination because GRO was detected at higher concentrations in the method blank samples 1226824 and 1227019 (see 6a).

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

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

e. Field Duplicate

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

✓Yes No NA (Please explain.) Comments:

Two surface water field duplicates were collected for the 11 surface water primary samples and one groundwater field duplicate was collected for the 8 groundwater primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF1723WS was a field duplicate of 14HF1721WS, sample 14HF1724WS was a field duplicate of 14HF1719WS, and sample 14HF1702WG was a field duplicate of 14HF1701WG.

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

Yes ✓No NA (Please explain.) Comments:

The RPD values for DRO (32%) and sulfate (98%) did not meet the ≤30% RPD criterion for water in sample pair 14HF1701WG/14HF1702WG. These analytes were qualified (QN) in associated samples. See table below.

Results (detected and non-detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier "U".

Analyte	Method	Units	14HF1721WS	Qualifier	14HF1723WS	Qualifier	RPD
DRO	AK102	mg/L	0.64	U	0.625	U	2
DRO Silica Gel	AK102	mg/L	0.64	U	0.625	U	2
RRO	AK103	mg/L	0.535	U	0.52	U	3
RRO Silica Gel	AK103	mg/L	0.535	U	0.52	U	3

Analyte	Method	Units	14HF1719WS	Qualifier	14HF1724WS	Qualifier	RPD
GRO	AK101	mg/L	0.284		0.246		14
DRO	AK102	mg/L	0.29	J	0.271	J	7
RRO	AK103	mg/L	0.25	U	0.25	U	0
Lead	SW6020A	mg/L	0.0005	U	0.000454	J	10
Benzene	SW8260B	mg/L	0.00189		0.00197		4
Ethylbenzene	SW8260B	mg/L	0.00113		0.00087	J	26
o-Xylene	SW8260B	mg/L	0.00092	J	0.00094	J	2
Xylene, Isomers m & p	SW8260B	mg/L	0.00554		0.00571		3
Toluene	SW8260B	mg/L	0.00038	J	0.00032	J	17

Analyte	Method	Units	14HF1701WG	Qualifier	14HF1702WG	Qualifier	RPD
GRO	AK101	mg/L	11.1		11.5		4
DRO	AK102	mg/L	1.23	QN	1.7	QN	32
RRO	AK103	mg/L	0.25	U	0.25	U	0
Sulfate	EPA 300.0	mg/L	0.544	QN	0.185	QN	98
Total Nitrate/Nitrite-N	SM21 4500NO3-F	ug/L	255		232		9
Lead	SW6020A	mg/L	0.0012		0.000991	J	19
Iron	SW6020A	mg/L	67.6		67.8		0
Manganese	SW6020A	mg/L	2.04		2.07		1
Benzene	SW8260B	mg/L	0.62		0.65		5
Ethylbenzene	SW8260B	mg/L	0.338		0.361		7
o-Xylene	SW8260B	mg/L	0.335		0.344		3
Xylene, Isomers m & p	SW8260B	mg/L	2.04		2.19		7
Toluene	SW8260B	mg/L	0.0612		0.063		3
1-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.00954		0.0116		19
2-Methylnaphthalene	8270D SIMS (PAH)	mg/L	0.0145		0.0164		12
Acenaphthene	8270D SIMS (PAH)	mg/L	0.00011		0.000134		20
Fluorene	8270D SIMS (PAH)	mg/L	0.000137		0.000165		19
Naphthalene	8270D SIMS (PAH)	mg/L	0.0359		0.0467		26
Phenanthrene	8270D SIMS (PAH)	mg/L	0.0000282	J	0.0000264	J	7
All Other PAHs	8270D SIMS (PAH)	mg/L	Varies	All U	Varies	All U	≤30

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

Comments:

See 6eiii.

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

Yes No ✓NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary. The equipment blank sample 14HF1725WQ contained in this report applies to sediment samples collected under SDG 1143760.

i. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Disposable sampling equipment was used and a decontamination blank was not necessary.

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

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report. In addition, all results in three associated samples (14HF1701WG, 14HF1702WG, 14HF1705WG) were qualified as non-biased estimates (QN) due to water draw down noted during sample purging and collection. Impact to data quality is minor since the drawdown measured in the wells was either marginally over the 0.3 foot limit and/or was stable over the last several intervals.

Laboratory Data Review Checklist

Completed by:	Rachel James
Title:	Chemist, Argon, Inc.
Date:	09/26/14
CS Report Name:	Haines – Fairbanks Pipeline
Report Date:	08/12/14
Consultant Firm:	Fairbanks Environmental Services
Laboratory Name:	TestAmerica - Denver
Laboratory Report Number:	280-58134
ADEC File Number:	900.38.001
ADEC RecKey Number:	

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

      However, SW8011 is not listed as a CS analysis.

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
✓Yes No NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
Yes No ✓NA (Please explain.) Comments:

No discrepancies were noted.

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

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

4. Case Narrative

a. Present and understandable?
✓Yes No NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?
✓Yes No NA (Please explain.) Comments:

The case narrative discussed holding time exceedances, which is discussed in 5b below.

c. Were all corrective actions documented?
✓Yes No NA (Please explain.) Comments:

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

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

5. Samples Results

a. Correct analyses performed/reported as requested on COC?
✓Yes No NA (Please explain.) Comments:

b. All applicable holding times met?
Yes ✓No NA (Please explain.) Comments:

TestAmerica uses a 14 day holding time for SW8011, but it is not specified in the reference method. Samples 14HF1901SO, 14HF1902SO, 14HF1903SO, 14HF1904SO, 14HF1905SO, 14HF1906SO, 14HF1907SO, 14HF1908SO, 14HF1909SO, 14HF1910SO, and 14HF1911SO were prepared one or two days past the 14 day holding time. The EDB results in all samples were qualified as low estimates (QL). Although the results are potentially low-biased and most results are non-detect, impact to data quality is likely minor as the LODs or results are more than one order of magnitude less than the ADEC cleanup level.

c. All soils reported on a dry weight basis?
✓Yes No NA (Please explain.) Comments:

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
✓Yes No NA (Please explain.) Comments:

e. Data quality or usability affected?
Comments:

See 5b.

6. <u>QC Samples</u>
a. Method Blank
i. One method blank reported per matrix, analysis and 20 samples?
✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?
✓Yes No NA (Please explain.) Comments:

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

Not applicable.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

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

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)
✓Yes No NA (Please explain.) Comments:

LCS/LCSDs and MS/MSDs were performed for the EDB batch.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
Yes No ✓NA (Please explain.) Comments:

No metals or inorganics were included in this report.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)
✓Yes No NA (Please explain.) Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)
✓Yes No NA (Please explain.) Comments:

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

Not applicable.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

No data quality or usability was affected by the LCS/LCSDs or MS/MSDs.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
✓Yes No NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
✓Yes No NA (Please explain.) Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
Yes No ✓NA (Please explain.) Comments:

No samples had failed surrogate recoveries.

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

No data quality or usability was affected by the surrogates.

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

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
Yes ✓No NA (Please explain.) Comments:

No soil trip blank was submitted, which is consistent with the project QAPP Worksheet #20B.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Not applicable.

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the lack of a trip blank. EDB was non-detect in all samples in this report; therefore, travel contamination was not suspected.

e. Field Duplicate

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

✓Yes No NA (Please explain.) Comments:

One soil field duplicate was collected for the 10 soil primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF1908SO was a field duplicate of 14HF1907SO.

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

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

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

✓Yes No NA (Please explain.) Comments:

Results (detected and non-detected) are shown in the table below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier "U".

Analyte	Method	Units	14HF1907SO	Qualifier	14HF1908SO	Qualifier	RPD
Ethylene Dibromide	SW8011	mg/Kg	0.000059	U	0.000061	U	2

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

Comments:

No data quality or usability was affected by the field duplicate.

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

Yes No ✓NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

i. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Disposable sampling equipment was used and a decontamination blank was not necessary.

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

a. Defined and appropriate?

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

Laboratory Data Review Checklist

Completed by:	Rachel James		
Title:	Chemist, Argon, Inc.	Date:	09/26/14
CS Report Name:	Haines – Fairbanks Pipeline	Report Date:	08/13/14
Consultant Firm:	Fairbanks Environmental Services		
Laboratory Name:	TestAmerica - Denver	Laboratory Report Number:	280-58139
ADEC File Number:	900.38.001	ADEC RecKey Number:	

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

      However, SW8011 is not listed as a CS analysis.

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
✓Yes   No   NA (Please explain.)   Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
Yes   No   ✓NA (Please explain.)   Comments:

No discrepancies were noted.

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

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

4. Case Narrative

a. Present and understandable?
✓Yes   No   NA (Please explain.)   Comments:

b. Discrepancies, errors or QC failures identified by the lab?
✓Yes   No   NA (Please explain.)   Comments:

The case narrative discussed holding time exceedances and dilutions. The holding time exceedances are discussed in 5b below. There were no effects on data quality or usability based upon the dilutions.

c. Were all corrective actions documented?
✓Yes   No   NA (Please explain.)   Comments:

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

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

5. Samples Results

a. Correct analyses performed/reported as requested on COC?
✓Yes   No   NA (Please explain.)   Comments:

b. All applicable holding times met?

Yes ✓No NA (Please explain.) Comments:

TestAmerica uses a 14 day holding time for SW8011, but it is not specified in the reference method. Samples 14HF2501SO, 14HF2502SO, 14HF2503SO, 14HF2504SO, and 14HF2505SO were prepared one day past the 14 day holding time. The EDB results in these samples were qualified as low estimates (QL). Although the results are potentially low-biased and all results are non-detect, impact to data quality is likely minor as the LODs are more than one order of magnitude less than the ADEC cleanup level.

c. All soils reported on a dry weight basis?

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

e. Data quality or usability affected?

Comments:

See 5b.

6. <u>QC Samples</u>

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?

✓Yes No NA (Please explain.) Comments:

iii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

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

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

MS/MSD analysis was not performed for EDB batch 280-237081. Two MS/MSD samples were submitted with the project samples, which meets the required frequency. The laboratory analyzed the EDB samples in two batches, but placed the two MS/MSD samples in the same batch. Impact to data was minor since acceptable LCS/LCSD analyses verified batch precision and accuracy and only five samples were included in the batch (14HF2501SO, 14HF2502SO, 14HF2503SO, 14HF2504SO, and 14HF2505SO). LCS/LCSDs and MS/MSDs were performed for the remaining EDB batch.

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

Yes No ✓NA (Please explain.) Comments:

No metals or inorganics were included in this report.

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

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

Not applicable.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

No data quality or usability was affected by the LCS/LCSDs or MS/MSDs.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
✓Yes No NA (Please explain.) Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
✓Yes No NA (Please explain.) Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
Yes No ✓NA (Please explain.) Comments:

No samples had failed surrogate recoveries.

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

No data quality or usability was affected by the surrogates.

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

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
Yes ✓No NA (Please explain.) Comments:

No soil trip blank was submitted, which is consistent with the project QAPP Worksheet #20B.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Not applicable.

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

Due to the lack of a trip blank, it is impossible to know if the EDB detections in samples 14HF2508SO, 14HF2509SO, 14HF2510SO, 14HF2512SO, and 14HF2513SO were due to travel contamination. However, the other 27 samples in the cooler did not detect EDB and travel contamination was not suspected.

e. Field Duplicate

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

✓Yes No NA (Please explain.) Comments:

Two soil field duplicates were collected for the 19 soil primary samples associated with this work order.

ii. Submitted blind to lab?

✓Yes No NA (Please explain.) Comments:

Sample 14HF2505SO was a field duplicate of 14HF2504SO and sample 14HF2509SO was a field duplicate of 14HF2508SO.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

✓Yes No NA (Please explain.) Comments:

Results (detected and non-detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier “U”.

Analyte	Method	Units	14HF2504SO	Qualifier	14HF2505SO	Qualifier	RPD
Ethylene Dibromide	SW8011	mg/Kg	0.000059	U	0.000058	U	2

Analyte	Method	Units	14HF2508SO	Qualifier	14HF2509SO	Qualifier	RPD
Ethylene Dibromide	SW8011	mg/Kg	0.0017		0.0019		11

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

Comments:

No data quality or usability was affected by the field duplicates.

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

Yes No ✓NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

i. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Disposable sampling equipment was used and a decontamination blank was not necessary.

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

a. Defined and appropriate?

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

Laboratory Data Review Checklist

Completed by:	Rachel James
Title:	Chemist, Argon, Inc.
Date:	09/26/14
CS Report Name:	Haines – Fairbanks Pipeline
Report Date:	08/28/14
Consultant Firm:	Fairbanks Environmental Services
Laboratory Name:	TestAmerica - Denver
Laboratory Report Number:	280-58493
ADEC File Number:	900.38.001
ADEC RecKey Number:	

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

      However, SW8011 is not listed as a CS analysis.

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
✓Yes No NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
Yes No ✓NA (Please explain.) Comments:

No discrepancies were noted.

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

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

4. Case Narrative

a. Present and understandable?
✓Yes No NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?
✓Yes No NA (Please explain.) Comments:

The case narrative discussed surrogate recovery exceptions and dilutions. Both issues are discussed in 6c below.

c. Were all corrective actions documented?
✓Yes No NA (Please explain.) Comments:

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

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

5. Samples Results

a. Correct analyses performed/reported as requested on COC?
✓Yes No NA (Please explain.) Comments:

b. All applicable holding times met?

✓Yes   No   NA (Please explain.)   Comments:

c. All soils reported on a dry weight basis?

Yes   No   ✓NA (Please explain.)   Comments:

No soil samples were included in this report.

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

✓Yes   No   NA (Please explain.)   Comments:

e. Data quality or usability affected?

Comments:

No data quality or usability was affected.

6. <u>QC Samples</u>

a. Method Blank

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

✓Yes   No   NA (Please explain.)   Comments:

ii. All method blank results less than PQL?

✓Yes   No   NA (Please explain.)   Comments:

iii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Yes   No   ✓NA (Please explain.)   Comments:

Not applicable.

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

Comments:

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

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)
✓Yes No NA (Please explain.) Comments:

LCS/LCSDs and MS/MSDs were performed for the single EDB batch.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
Yes No ✓NA (Please explain.) Comments:

No metals or inorganics were included in this report.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)
✓Yes No NA (Please explain.) Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)
✓Yes No NA (Please explain.) Comments:

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

Not applicable.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

No data quality or usability was affected by the LCS/LCSDs or MS/MSDs.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
✓Yes No NA (Please explain.) Comments:

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

Yes ✓No NA (Please explain.) Comments:

Method 8011 surrogate 1,2-dibromopropane recovered below the lower control limit in samples 14HF2502WG and 14HF2503WG. The samples were analyzed at 100x dilutions and no flagging was applied because the low recoveries were the consequence of dilution.

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

Yes No ✓NA (Please explain.) Comments:

Flagging was not necessary (see 6cii).

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

Comments:

No data quality or usability was affected by the surrogates.

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

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

✓Yes No NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

✓Yes No NA (Please explain.) Comments:

Trip blank sample 14HF2509WQ was shipped with cooler FES-26.

iii. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the trip blank.

e. Field Duplicate

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

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

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

Sample 14HF2503WG was a field duplicate of 14HF2502WG.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

✓Yes No NA (Please explain.) Comments:

Results (detected and non-detected) are shown in the table below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier "U".

Analyte	Method	Units	14HF2502WG	Qualifier	14HF2503WG	Qualifier	RPD
Ethylene Dibromide	SW8011	mg/L	0.03		0.028		7

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

Comments:

No data quality or usability was affected by the field duplicate.

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

✓Yes No NA (Please explain.) Comments:

Sample 14HF2505WQ was an equipment blank. The equipment blank was collected from the bladder pump to evaluate the potential for sample cross-contamination during sample collection and is only applicable to wells that were sampled with the bladder pump (i.e., 25-MW2, 25-MW-3, and 25-MW6). Disposable equipment was used to collect samples from the other wells, so an equipment blank was not necessary.

i. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the equipment blank.

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

      ✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

Laboratory Data Review Checklist

Completed by:	Rachel James		
Title:	Chemist, Argon, Inc.	Date:	09/26/14
CS Report Name:	Haines – Fairbanks Pipeline	Report Date:	08/28/14
Consultant Firm:	Fairbanks Environmental Services		
Laboratory Name:	TestAmerica - Denver	Laboratory Report Number:	280-58942
ADEC File Number:	900.38.001	ADEC RecKey Number:	

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

      However, SW8011 is not listed as a CS analysis.

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

      No samples were transferred.

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

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

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

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?
      ✓Yes No NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
✓Yes No NA (Please explain.) Comments:

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
Yes No ✓NA (Please explain.) Comments:

No discrepancies were noted.

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

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

4. Case Narrative

a. Present and understandable?
✓Yes No NA (Please explain.) Comments:

b. Discrepancies, errors or QC failures identified by the lab?
✓Yes No NA (Please explain.) Comments:

The case narrative discussed revised COC comments, which is discussed in 5a below.

c. Were all corrective actions documented?
✓Yes No NA (Please explain.) Comments:

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

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

5. Samples Results

a. Correct analyses performed/reported as requested on COC?
✓Yes No NA (Please explain.) Comments:

Fairbanks Environmental Services revised the COC to request that sample 14HF1901WG be prepared as an MS/MSD. No data was impacted.

b. All applicable holding times met?

✓Yes No NA (Please explain.) Comments:

c. All soils reported on a dry weight basis?

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

e. Data quality or usability affected?

Comments:

No data quality or usability was affected.

6. <u>QC Samples</u>

a. Method Blank

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

✓Yes No NA (Please explain.) Comments:

ii. All method blank results less than PQL?

✓Yes No NA (Please explain.) Comments:

iii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

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

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

✓Yes No NA (Please explain.) Comments:

LCS/LCSDs and MS/MSDs were prepared for all EDB batches.

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

Yes No ✓NA (Please explain.) Comments:

No metals or inorganics were included in this report.

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

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Comments:

Not applicable.

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

Yes No ✓NA (Please explain.) Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the LCS/LCSDs or MS/MSDs.

c. Surrogates – Organics Only

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

✓Yes No NA (Please explain.) Comments:

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

✓Yes No NA (Please explain.) Comments:

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

Yes No ✓NA (Please explain.) Comments:

No samples had failed surrogate recoveries.

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

Comments:

No data quality or usability was affected by the surrogates.

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

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

Yes ✓No NA (Please explain.) Comments:

No soil trip blank was submitted, which is consistent with the project QAPP Worksheet #20B. However, the water trip blank 14HF1917WQ was shipped in the same cooler as both water and soil samples.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

✓Yes No NA (Please explain.) Comments:

Trip blank sample 14HF1917WQ was shipped with cooler 081201.

iii. All results less than PQL?

✓Yes No NA (Please explain.) Comments:

iv. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected by the lack of a trip blank. EDB was non-detect in all water and soil samples in this report; therefore, travel contamination is not suspected.

e. Field Duplicate

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

One sediment field duplicate was collected for the 7 sediment primary samples, one surface soil field duplicate was collected for the 2 surface soil primary samples, one groundwater field duplicate was collected for the 4 groundwater primary samples, and one surface water field duplicate was collected for the 7 surface water primary samples associated with this work order.

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

Sample 14HF1903SE was a field duplicate of 14HF1902SE, sample 14HF1903SS was a field duplicate of 14HF1902SS, sample 14HF1902WG was a field duplicate of 14HF1901WG, and sample 14HF1911WS was a field duplicate of 14HF1910WS.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

✓Yes No NA (Please explain.) Comments:

Results (detected and non-detected) are shown in the tables below. In the case where a result was non-detect, the LOD was used for RPD calculation purposes. The non-detect results are identified with the qualifier "U".

Analyte	Method	Units	14HF1902SE	Qualifier	14HF1903SE	Qualifier	RPD
Ethylene Dibromide	SW8011	mg/Kg	0.000072	U	0.000071	U	1

Analyte	Method	Units	14HF1902SS	Qualifier	14HF1903SS	Qualifier	RPD
Ethylene Dibromide	SW8011	mg/Kg	0.00006	U	0.000054	U	11

Analyte	Method	Units	14HF1901WG	Qualifier	14HF1902WG	Qualifier	RPD
Ethylene Dibromide	SW8011	mg/L	0.00001	U	0.00001	U	0

Analyte	Method	Units	14HF1910WS	Qualifier	14HF1911WS	Qualifier	RPD
Ethylene Dibromide	SW8011	mg/L	0.0000099	U	0.00001	U	1

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

Comments:

No data quality or usability was affected by the field duplicates.

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

Yes No ✓NA (Please explain.) Comments:

Samples were collected using disposable equipment. Therefore, a decontamination blank was not necessary.

i. All results less than PQL?

Yes No ✓NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

No data quality or usability was affected. Disposable sampling equipment was used and a decontamination blank was not necessary.

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

a. Defined and appropriate?

✓Yes No NA (Please explain.) Comments:

All applicable data qualifiers are discussed within this checklist, with the exception of the J-flag. The J-flag indicates that the result is less than the LOQ and is, therefore, considered to be an estimated value. J-flags are presented, as required, in laboratory deliverables and all data tables associated with the Report.

In addition, all results in two associated samples (14HF1903WG and 14HF1904WG) were qualified as non-biased estimates (QN) due to water draw down noted during sample purging and collection. Impact to data quality is minor since the drawdown measured in the wells was either marginally over the 0.3 foot limit and/or was stable over the last several intervals.

APPENDIX C
Soil Boring and Well Logs

LOG OF BORING 17-BH12 (17-MW1)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/19/2014 1300
X Coordinate: -135.77051° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34752° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 64.895 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with peat, dark brown, moist			
			▽	GW	Silty GRAVEL (fill), angular to 1/2", gray, wet			
					Saturated below 1'		5.6	
				ML	SILT, brown and gray			
						50	36.4	
	X			GW	Silty GRAVEL, gray, strong hydrocarbon odor			14HF1701SO
							1,269	
5	X				Silty sandy GRAVEL, gray, moderate hydrocarbon odor		143	14HF1702SO
						60	5.7	
					Pebbles and GRAVEL, gray		0.0	
10					Bottom of the boring at 10'			
15								

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LOG OF BORING 17-BH13 (17-MW2)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/19/2014 1400
X Coordinate: -135.77125° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34811° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 64.955 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			▽	PT	PEAT and organics, brown, moist			
				ML	SILT, dark brown, wet, 2" wood fragment at 2' and 2.5'			
					Saturated below 1'		16.7	
					Moderate hydrocarbon odor	70	542	
				GW	Silty GRAVEL, rounded less than1/4", brown and gray, strong hydrocarbon odor			
	X						1,268	14HF1703SO
5					Silty GRAVEL, gray			
					GRAVEL, rounded, gray		1,165	
					Silty GRAVEL, brown and gray			
						95	1,340	
							318	
10	X				Bottom of the boring at 10'			14HF1704SO / 14HF1705SO
15								

LOG OF BORING 17-BH14

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/19/2014 1440
X Coordinate: -135.77111° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34819° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 62.757 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			▽	PT ML	PEAT and roots, dark brown, moist SILT with peat, brown, wet Saturated below 1'	75	2.0	
					SILT, brown, moderate hydrocarbon odor		423	
					Strong hydrocarbon odor		1,203	
5	X							14HF1706SO
						95	777	
				GW	Silty GRAVEL, brown and gray		356	
							318	
10	X				Bottom of the boring at 10'			14HF1707SO
15								

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LOG OF BORING 17-BH15

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/19/2014 1510
X Coordinate: -135.77151° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34828° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 61.791 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			▽	ML	SILT with peat, dark brown, wet , moderate hydrocarbon odor			
					SILT, brown, saturated below 1'		372	
						65	346	
					Strong hydrocarbon odor		1,050	14HF1708SO
5				GW	Silty GRAVEL, gray			
					Gravel with SILT, brown and gray		1,015	
						80	121	
					Silty GRAVEL, rounded to 1/2", gray, slight hydrocarbon odor			
							12.3	14HF1709SO
10					Silty sandy GRAVEL		21.5	
				SW	SAND with trace amounts of silt, find-medium, gray	80	56.2	
							140	14HF1710SO
15					SAND, gray			
				Pebbles	PEBBLES with sand, gray		9.0	
				GW	GRAVEL, rounded to 1", gray	95	5.9	
					Sandy GRAVEL, gray			14HF1711SO
20					Bottom of the boring at 20'		0.0	

LOG OF BORING 17-BH16 (17-MW3)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/19/2014 1705
X Coordinate: -135.77164° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34841° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 65.964 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML GW	SILT with organics, dark brown, moist Silty GRAVEL (fill), gray, moist		0.0	
			▽		Wet at 3.5'	60	0.0	
				ML	SILT, brown and gray, saturated below 4', moderate hydrocarbon odor		830	
5	X			GW	Silty GRAVEL, brown and gray			14HF1715SO
				ML	SILT with occasional gravel, gray		521	
	X				Strong hydrocarbon odor	85	1,356	14HF1716SO
							117	
10					SILT, brown and gray		101	
						90	72.1	
							17.3	
15	X				Bottom of the boring at 15'			14HF1717SO

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LOG OF BORING 17-BH17

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/20/2014 1720
X Coordinate: -135.77138° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34782° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 63.233 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with organics, brown, saturated below 0.5'			
							13.4	
					SILT, gray			
						60	36.2	
					Moderate hydrocarbon odor			
							350	14HF1724SO / 14HF1725SO
5				SW	SAND, fine-medium, gray			
							235	
						60	240	
				GW	Sandy GRAVEL, rounded and angular to 1", gray			
							228	
10					Bottom of the boring at 10'			
15								

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LOG OF BORING 17-BH18 (17-MW5)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/20/2014 1615
X Coordinate: -135.77184° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34813° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 65.684 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			▽	ML	SILT with peat, dark brown, moist			
				SW	Silty SAND, brown, wet		0.0	
					Saturated below 1'			
				SM	Sandy SILT, gray, strong hydrocarbon odor	70	988	
							121	
5	X						1,609	14HF1722SO
						95	1,250	
				GW	Silty sandy GRAVEL, rounded to 1", brown and gray, slight hydrocarbon odor		72	
				SW	SAND, medium-coarse, gray			
10							6.7	
				GW	GRAVEL with sand, brown and gray	90	2.8	
					Sandy GRAVEL, gray		6.0	
15	X				Bottom of the boring at 15'			14HF1723SO

LOG OF BORING 17-BH19 (17-MW6)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/20/2014 1050
X Coordinate: -135.77216° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34833° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 66.297 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with organics, brown, moist			
					SILT, brown, moist		5.0	
			▽		Wet at 1'			
					Saturated below 1.5'			
				SW	Silty SAND, brown	65	36.2	
					Silty SAND, gray, moderate hydrocarbon odor		480	
5	X						915	14HF1718SO
						80	15.0	
				GW	Sandy GRAVEL, gray		18.2	
				SW	SAND, medium, gray			
10	X						5.2	14HF1719SO
				GW	Sandy GRAVEL with pebbles, rounded to 3/4", gray	95	0.0	
							0.0	
15					Bottom of the boring at 15'			

FAIRBANKS ENVIRONMENTAL SERVICES
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FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

LOG OF BORING 17-BH20 (17-MW7)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/20/2014 1145
X Coordinate: -135.77243° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34836° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 67.507 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				PT	PEAT and organics, dark brown, moist			
				SW	SAND, brown and gray, moist			
				SM	Sandy SILT, brown, moist		0.0	
					Wet at 1.5'			
					Saturated below 2.5'	70	0.0	
				SW	Silty SAND, gray		0.0	
5							0.0	
	X			SM	Sandy SILT, gray, wood Fragments from 7' to 7.5'	75	0.0	14HF1720SO
					Wood Fragments from 9' to 9.5'		0.0	
10					Bottom of the boring at 10'			
15								

LOG OF BORING 17-BH21 (17-MW8)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/20/2014 1510
X Coordinate: -135.77221° GCS WGS Longitude in 1984 Decimal Degrees
Y Coordinate: 59.34813° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 66.170 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Water Level	USCS	Sample Description	% Recovery	Sample Number
0			PT	PEAT with organics, moist	70	
			SM	Sandy SILT, brown, moist		
		▽		Wet at 1.5'		
			SW	Silty SAND, brown and gray, saturated below 2'		
5					65	
	X		ML	SILT, brown		14HF1721SO
			SM	Sandy SILT, gray		
10					90	
			ML	SILT, brown, wood Fragments from 13' to 13.5'		
			GW	Silty GRAVEL, gray		
15				Bottom of the boring at 15'		

PID (ppm) interval	PID (ppm)
1	0.0
2	0.0
3	0.0
4	0.0
5	9.1
6	0.0
7	0.0
8	0.0
9	0.0

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ANCHORAGE, ALASKA

LOG OF BORING 17-BH22

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/19/2014 1620
X Coordinate: -135.77044° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34748° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 63.510 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			▽	ML	SILT with organics, dark brown, saturated below 0.5'			
				GW	Silty GRAVEL, brown		2.5	
					Slight hydrocarbon odor	30	54.5	
					Moderate hydrocarbon odor		237	
				SW	Gravelly SAND, gray, strong hydrocarbon odor			
5	X			GW	Sandy GRAVEL, brown and gray		1,246	14HF1712SO
				SW	Gravelly SAND, gray	60	1,005	
							655	
10					SAND, medium, dark gray		86.5	
						90	50.0	
	X						8.2	14HF1713SO / 14HF1714SO
15					Bottom of the boring at 15'			

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LOG OF BORING 17-BH23 (17-MW4)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date / Time Started: 7/20/2014 1740
X Coordinate: -135.77164° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34777° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 64.522 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			∇	ML SM	SILT with organics, dark brown, saturated below 0.5' Sandy SILT, brown	60	0.0	
				SW	Silty SAND, gray		0.0	
							0.0	
5					SAND, gray	70	0.0	
				GW	Sandy GRAVEL, gray		0.0	14HF1726SO
							0.0	
10					Bottom of the boring at 10'			
15								

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WELL COMPLETION OF
17-MW1

FAIRBANKS ENVIRONMENTAL SERVICES
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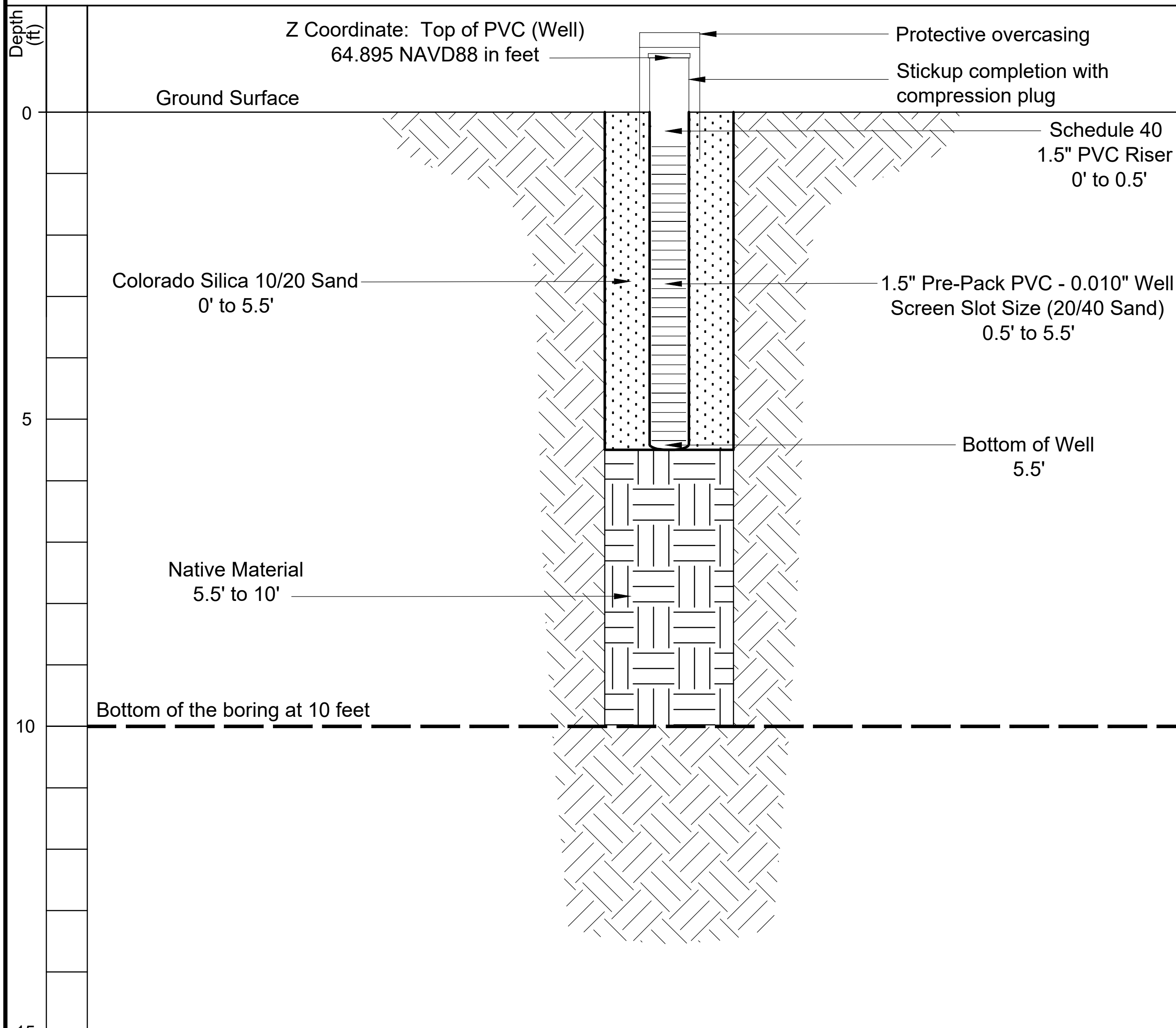
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7	FES Representative: Craig Martin
Date Completed: 7/19/2014	Drilling Contractor: Geotek Alaska
X Coordinate: -135.77051 GCS WGS 1984 Longitude in Decimal Degrees	Drilling Method: Geoprobe 6020DT Macro-Core
Y Coordinate: 59.34752 GCS WGS 1984 Latitude in Decimal Degrees	Sampling Method: Macro-Core



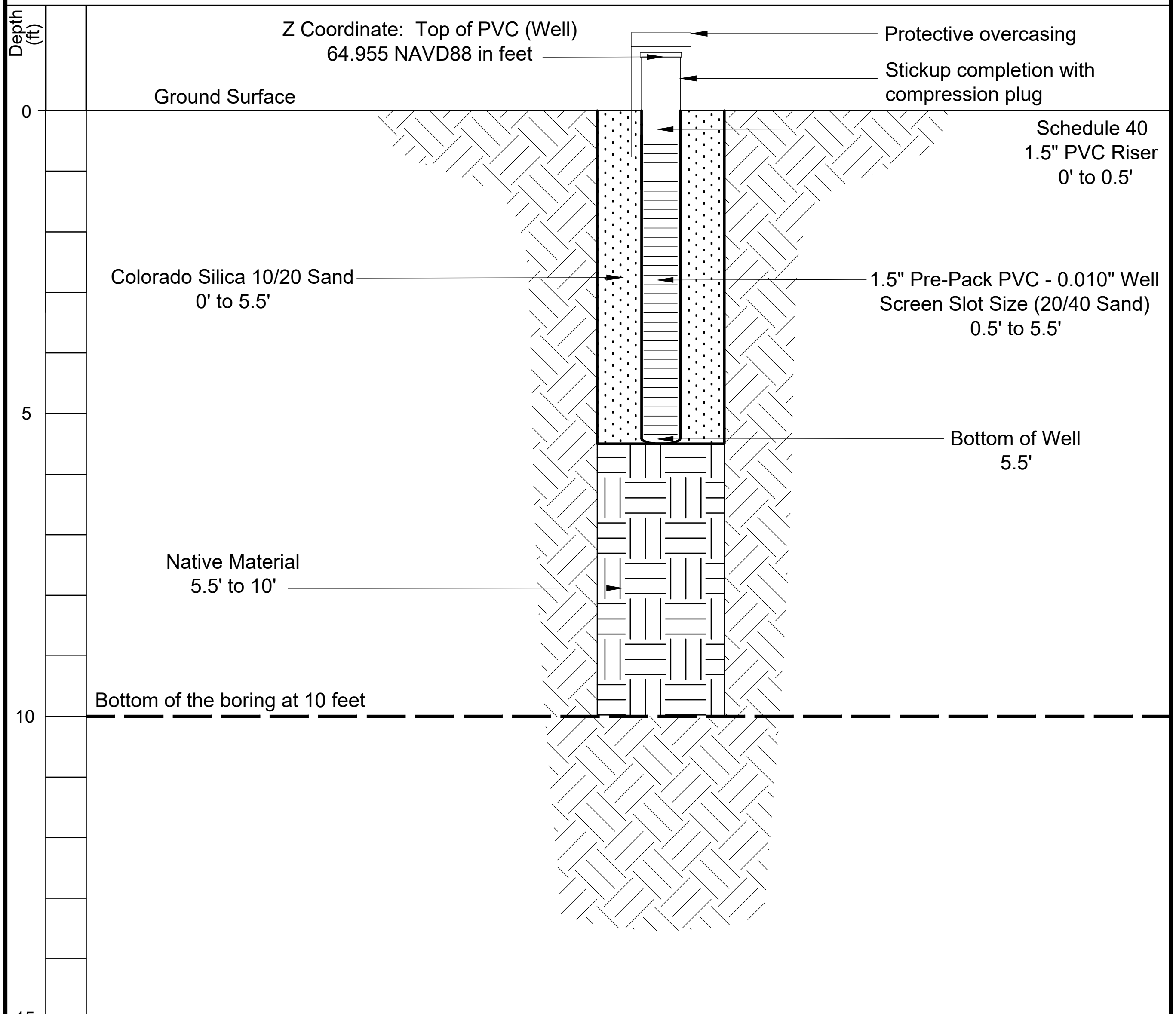
WELL COMPLETION OF
17-MW2

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date Completed: 7/19/2014
X Coordinate: -135.77125 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34811 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core



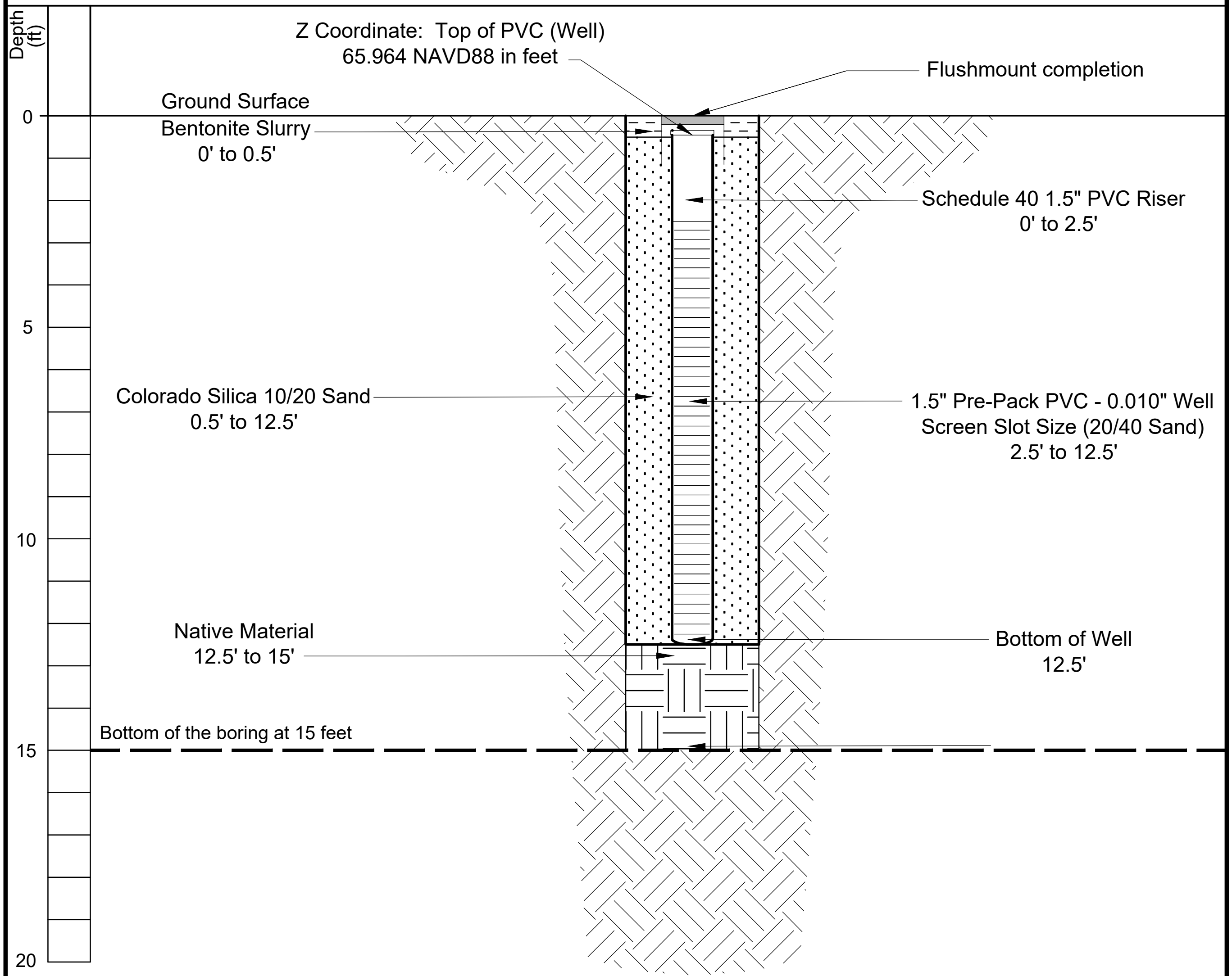
WELL COMPLETION OF
17-MW3

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date Completed: 7/19/2014
X Coordinate: -135.77164 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34841 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core



WELL COMPLETION OF
17-MW4

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
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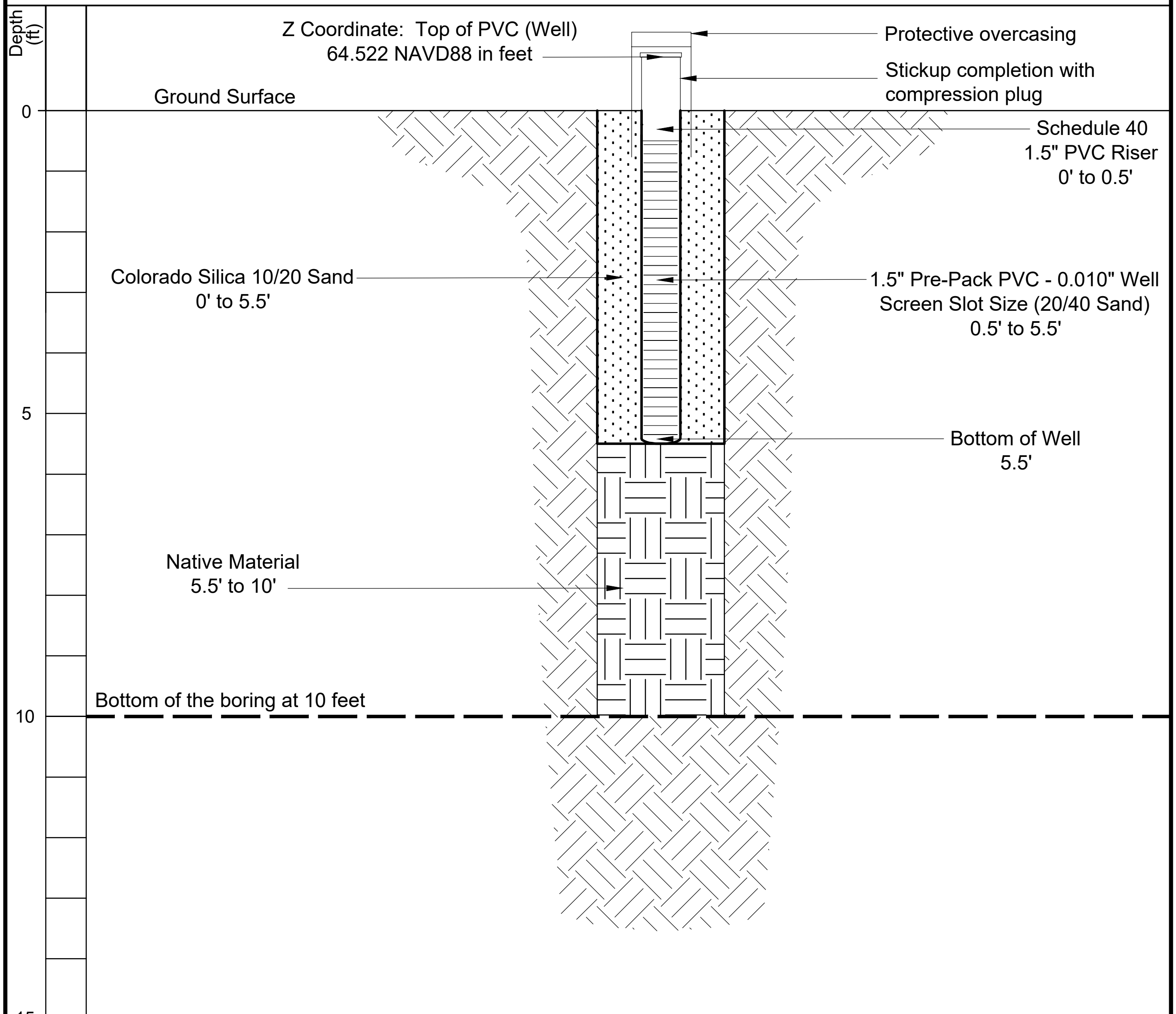
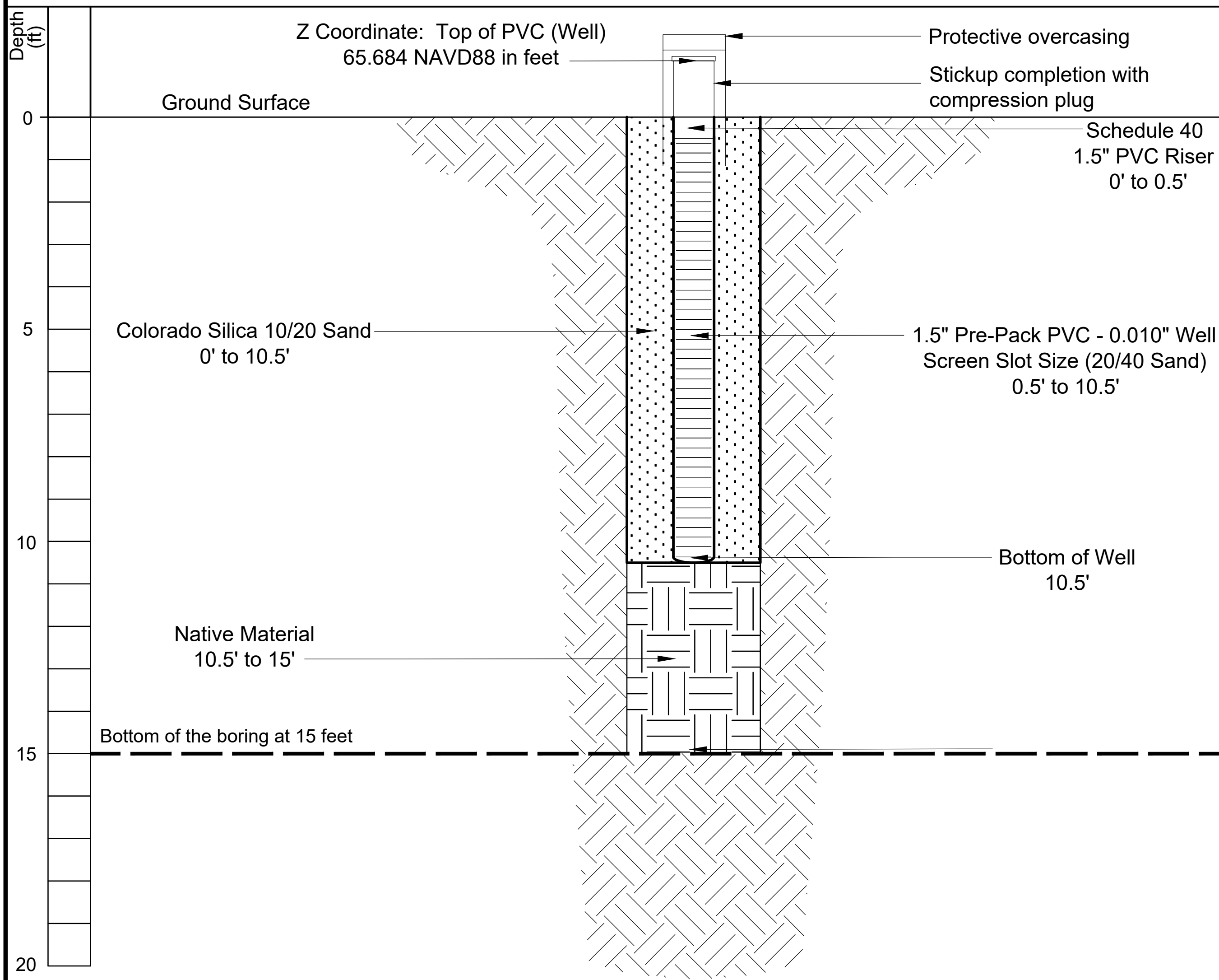
Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date Completed: 7/20/2014
X Coordinate: -135.77164 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34777 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core



WELL COMPLETION OF **17-MW5**	FAIRBANKS ENVIRONMENTAL SERVICES 3538 INTERNATIONAL STREET FAIRBANKS, ALASKA	ALASKA DISTRICT CORPS OF ENGINEERS ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7	FES Representative: Craig Martin
Date Completed: 7/20/2014	Drilling Contractor: Geotek Alaska
X Coordinate: -135.77184 GCS WGS 1984 Longitude in Decimal Degrees	Drilling Method: Geoprobe 6020DT Macro-Core
Y Coordinate: 59.34813 GCS WGS 1984 Latitude in Decimal Degrees	Sampling Method: Macro-Core



WELL COMPLETION OF
17-MW6

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
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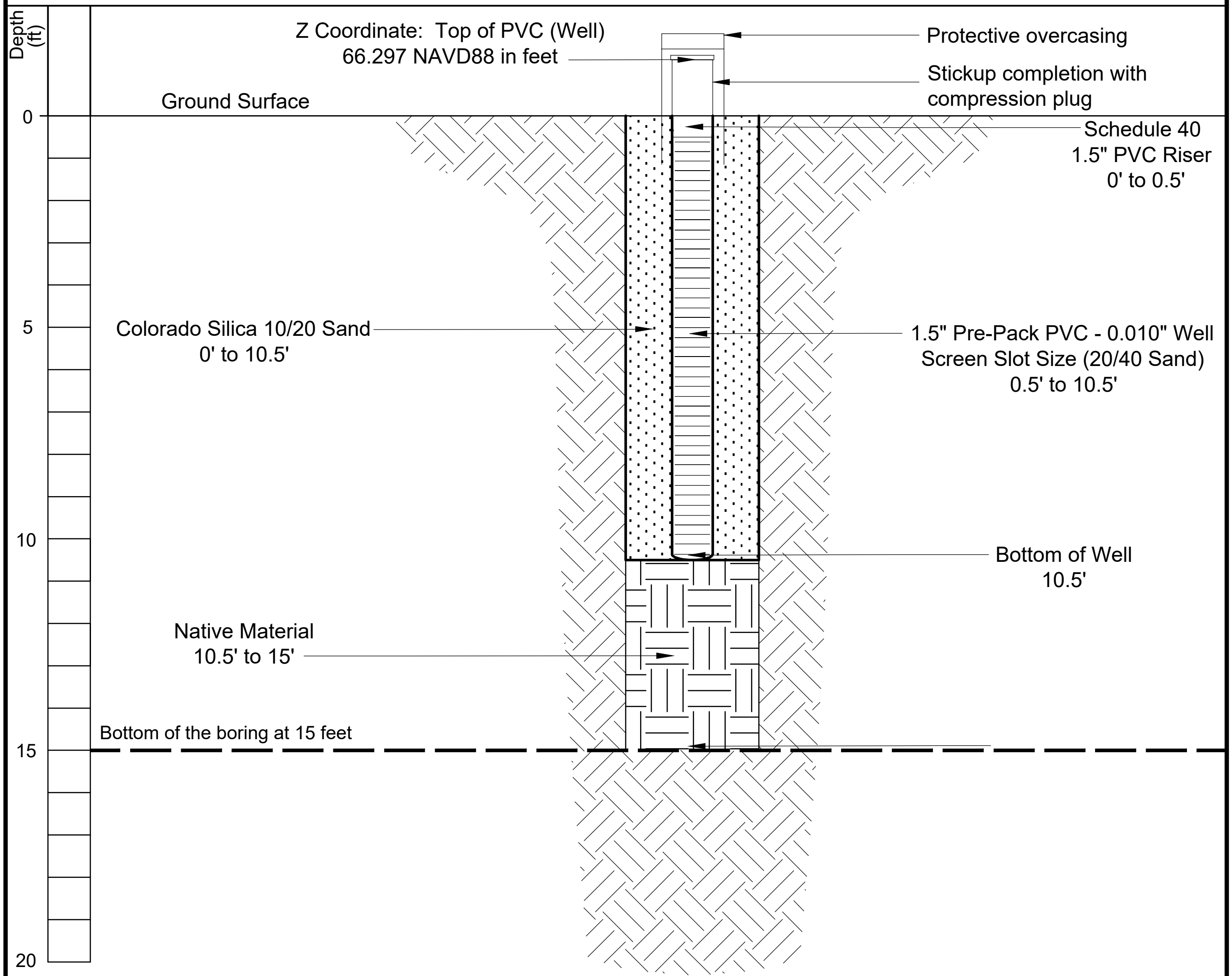
Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date Completed: 7/20/2014
X Coordinate: -135.77216 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34833 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core



WELL COMPLETION OF
17-MW7

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
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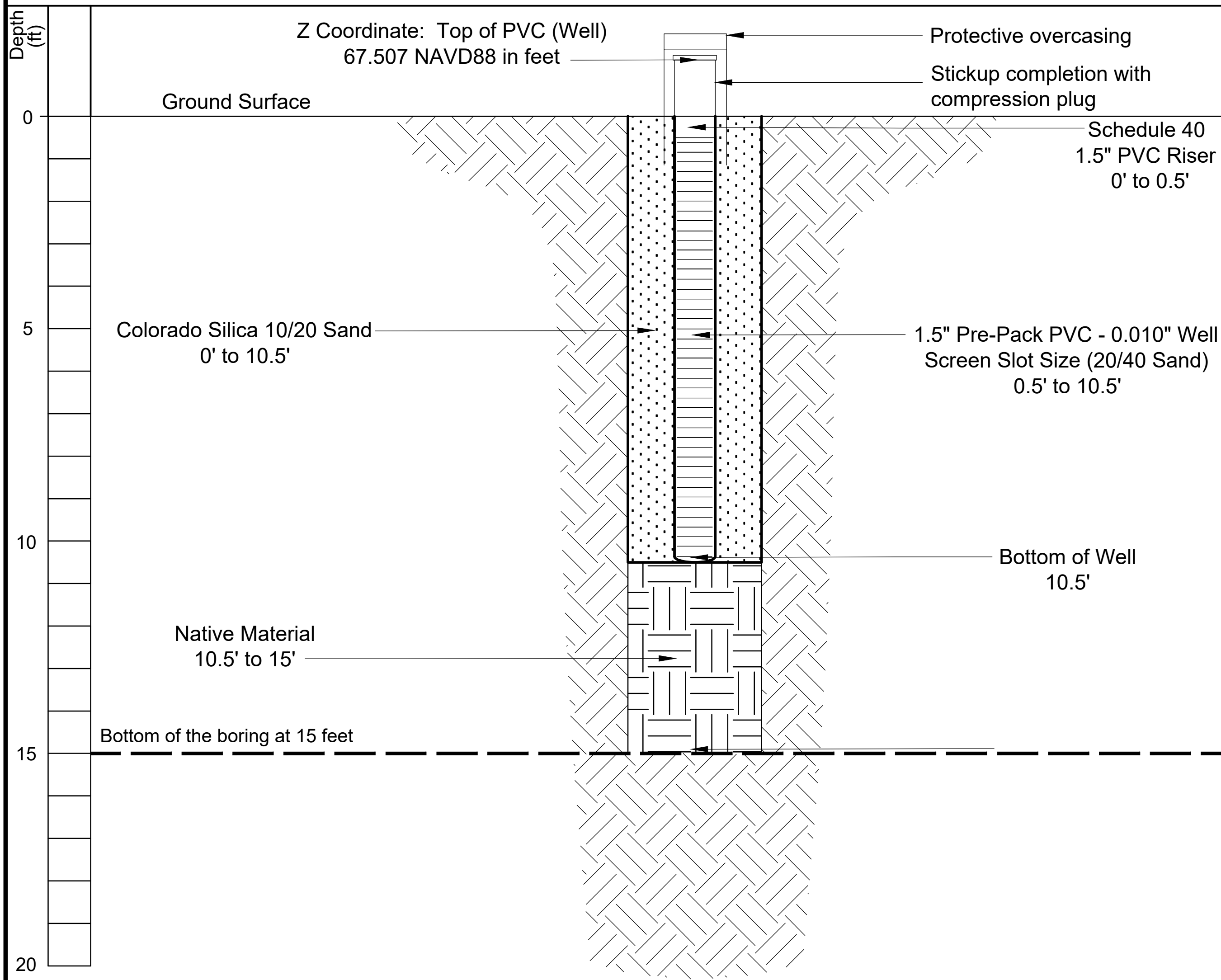
Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7
Date Completed: 7/20/2014
X Coordinate: -135.77243 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.34836 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core



WELL COMPLETION OF
17-MW8

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
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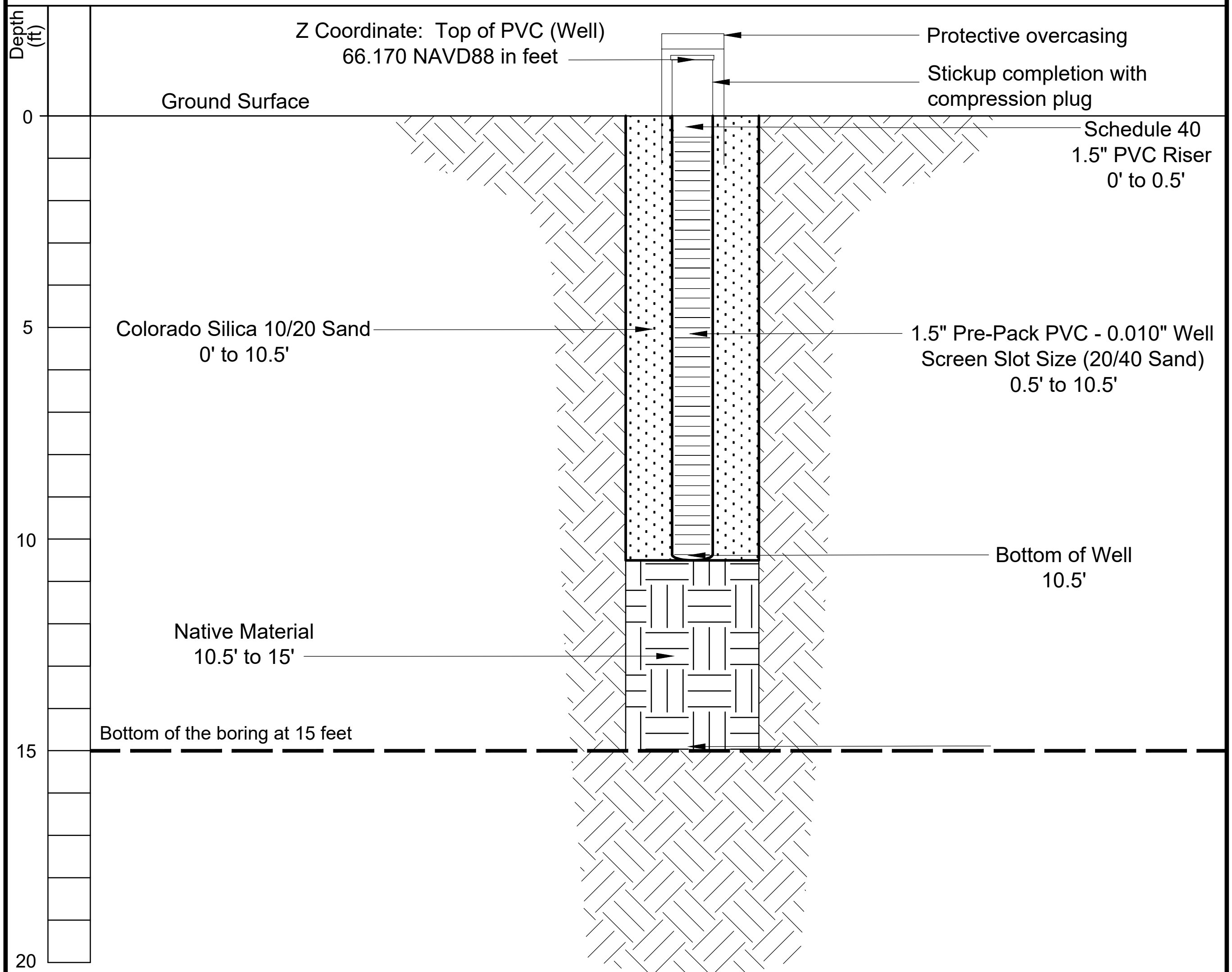
Location: Haines-Fairbanks Pipeline (FUDS), PMP 17.7	FES Representative: Craig Martin
Date Completed: 7/20/2014	Drilling Contractor: Geotek Alaska
X Coordinate: -135.77221 GCS WGS 1984 Longitude in Decimal Degrees	Drilling Method: Geoprobe 6020DT Macro-Core
Y Coordinate: 59.34813 GCS WGS 1984 Latitude in Decimal Degrees	Sampling Method: Macro-Core



LOG OF BORING 19-BH08 (19-MW1)

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date / Time Started: 7/16/2014 1430
X Coordinate: -135.80061° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36632° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 89.685 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				SP	SAND, brown and gray, moist, saturated below 0.5'			
					Silty SAND with gravel, black		0.1	
						40	0.1	
							3.0	14HF1901SO
5							3.9	
				PT	Silty PEAT, black			
				GP	Sandy GRAVEL, gray	95	0.1	
							0.1	
10					Bottom of the boring at 10'			
15								

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LOG OF BORING 19-BH09

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date / Time Started: 7/16/2014 1500
X Coordinate: -135.80043° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36629° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 85.835 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				SP	Silty SAND, dark gray, moist			
			▽	GP	Sandy GRAVEL with silt, gray, wet		0.0	
					Saturated below 2'	35	0.0	
							0.0	14HF1902SO
5				SP	Silty SAND with gravel, brown			
					Silty SAND, gray		0.0	
						95	0.0	
					Silty SAND with peat, brown		0.0	
10					Bottom of the boring at 10'			
15								

LOG OF BORING 19-BH10

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date / Time Started: 7/16/2014 1545
X Coordinate: -135.80085° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36639° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 90.071 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				-	VEGETATION, brown, moist			
				SP	SAND with vegetation, gray, moist		0.0	
			▽		Silty SAND, brown, wet			
					Saturated below 2'	25	0.0	
							0.0	
5	X				Silty SAND with gravel, brown and gray		0.0	14HF1903SO
					Silty SAND with peat, brown	70	0.0	
					Silty SAND with gravel, gray			
							0.0	
10					Bottom of the boring at 10'			
15								

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LOG OF BORING 19-BH11

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5	FES Representative: Craig Martin
Date / Time Started: 7/16/2014 1620	Drilling Contractor: Geotek Alaska
X Coordinate: -135.80108° GCS WGS 1984 Longitude in Decimal Degrees	Drilling Method: Geoprobe 6020DT Macro-Core
Y Coordinate: 59.36646° GCS WGS 1984 Latitude in Decimal Degrees	Sampling Method: Macro-Core
Z Coordinate: 92.771 NAVD88 in Feet	

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT, brown, moist	45	0.0	
				GP	Silty sandy GRAVEL, brown and gray, moist		0.0	
			▽		Wet at 4'		0.0	
5	X				Saturated below 5'	35	0.0	14HF1904SO
							0.0	
							0.0	
10					Bottom of the boring at 10'			
15								

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LOG OF BORING 19-BH12 (19-MW2)

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date / Time Started: 7/16/2014 1650
X Coordinate: -135.80159° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36657° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 98.707 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML SP	SILT with organics, brown, dry Silty SAND, gray, dry		0.0	
				ML GP	SILT, brown, dry GRAVEL with silty sand, brown and gray, dry	65	0.0	
							0.0	
5							0.0	
						35	0.0	
			▽		Wet at 9'		0.0	
10	☒				Saturated below 10'		0.0	14HF1905SO
						50	0.0	
							0.0	
15							0.0	
						50	0.0	
20					Bottom of the boring at 20'		0.0	

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LOG OF BORING 19-BH13

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date / Time Started: 7/17/2014 1120
X Coordinate: -135.80021° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36589° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 80.344 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			▽	ML	SILT with vegetation, brown, moist, saturated below 0.5' SILT with peat, brown and gray	50	0.0	14HF1906SO
				SP ML SP	SAND with gravel, coarse, gray Peaty SILT, brown Silty SAND, gray		0.0	
							0.0	
5						95	0.1	
				ML	SILT with peat, brown SILT, brown and gray		0.0	
				SP	Silty SAND, medium-coarse, brown, 2" wood fragment at 9.5'		0.0	
10					Bottom of the boring at 10'			
15								

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LOG OF BORING 19-BH14 (19-MW3)

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date / Time Started: 7/17/2014 1150
X Coordinate: -135.80035° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36594° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 81.458 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			▽	ML	SILT with vegetation, brown, moist, saturated below 0.5'	45	0.0	
				SP	Silty SAND with gravel, gray			
				PT	Silty PEAT, brown		0.0	
				SP	SAND, gray			
	X						0.0	14HF1907SO / 14HF1908SO
5					SAND with gravel, medium-coarse, gravel is rounded to 1/2", gray	95	0.0	
					SAND, gray			
					SAND with pebbles, gray		0.0	
							0.0	
10					Bottom of the boring at 10'			
15								

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LOG OF BORING 19-BH15

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date / Time Started: 7/17/2014 1230
X Coordinate: -135.80057° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36599° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 82.032 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			▽	ML	SILT with vegetation, brown, moist, saturated below 0.5'			
				SP	Silty SAND, brown		0.0	
						60	0.0	
				PT	Silty PEAT, brown			
				SP	SAND, fine, gray			
							0.0	
5	X				SAND, fine-medium, gray			14HF1909SO
							0.0	
				PT	Silty PEAT, brown			
				SP	Silty SAND, gray	95	0.0	
				PT	Silty PEAT, brown, wood fragments at 10'			
							0.0	
10					Bottom of the boring at 10'			
15								

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LOG OF BORING 19-BH16

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date / Time Started: 7/17/2014 1300
X Coordinate: -135.80079° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36604° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 82.002 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			∇	ML	SILT with vegetation, brown, moist, saturated below 0.5'			
				SP	Silty SAND, brown		0.0	
						75	0.0	
	X				SAND with silt and wood fragments, brown			14HF1910SO
					Silty SAND, gray		0.0	
5					Silty SAND with peat, brown			
					SAND, fine-medium, gray		0.0	
						95	0.0	
				ML	SILT with peat, brown			
				SP	Silty SAND, gray		0.0	
10					Bottom of the boring at 10'			
15								

LOG OF BORING 19-BH17 (19-MW4)

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date / Time Started: 7/17/2014 1300
X Coordinate: -135.80110° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36611° GCS WGS 1984 Latitude in Decimal Degrees
Z Coordinate: 85.540 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with vegetation, brown, moist, saturated below 0.5'			
				SP	Silty SAND, brown		0.0	
				ML	SILT with peat, brown	70	0.0	
				SP	SAND, medium, brown and gray			
	X						0.0	14HF1911SO
5					Silty SAND, medium-coarse, gray		0.0	
				SM	Sandy SILT, brown			
				SP	Silty SAND, medium-coarse, brown and gray	95	0.0	
							0.0	
10					Bottom of the boring at 10'			
15								

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

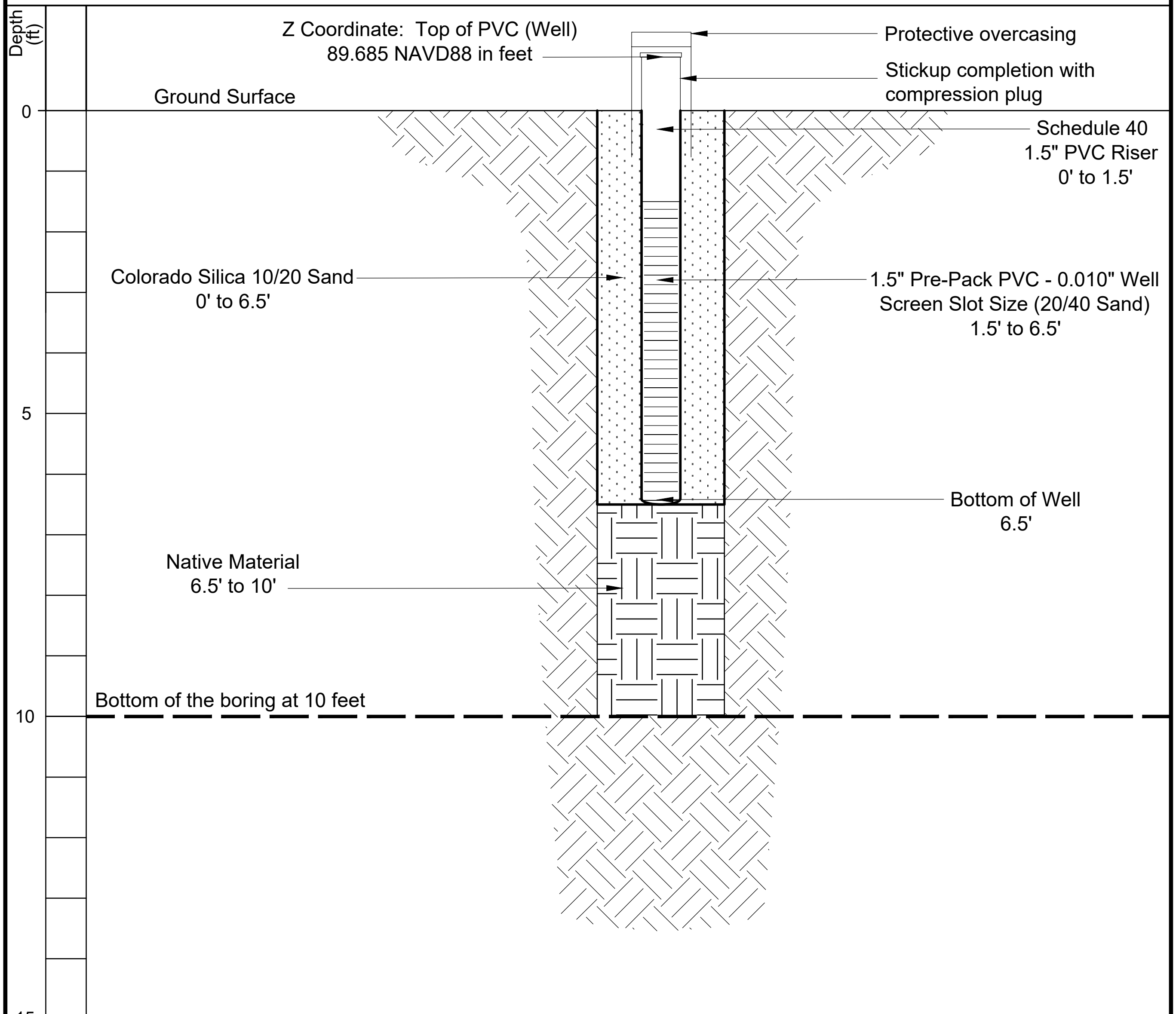
WELL COMPLETION OF
19-MW1

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date Completed: 7/16/2014
X Coordinate: -135.80061 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36632 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core



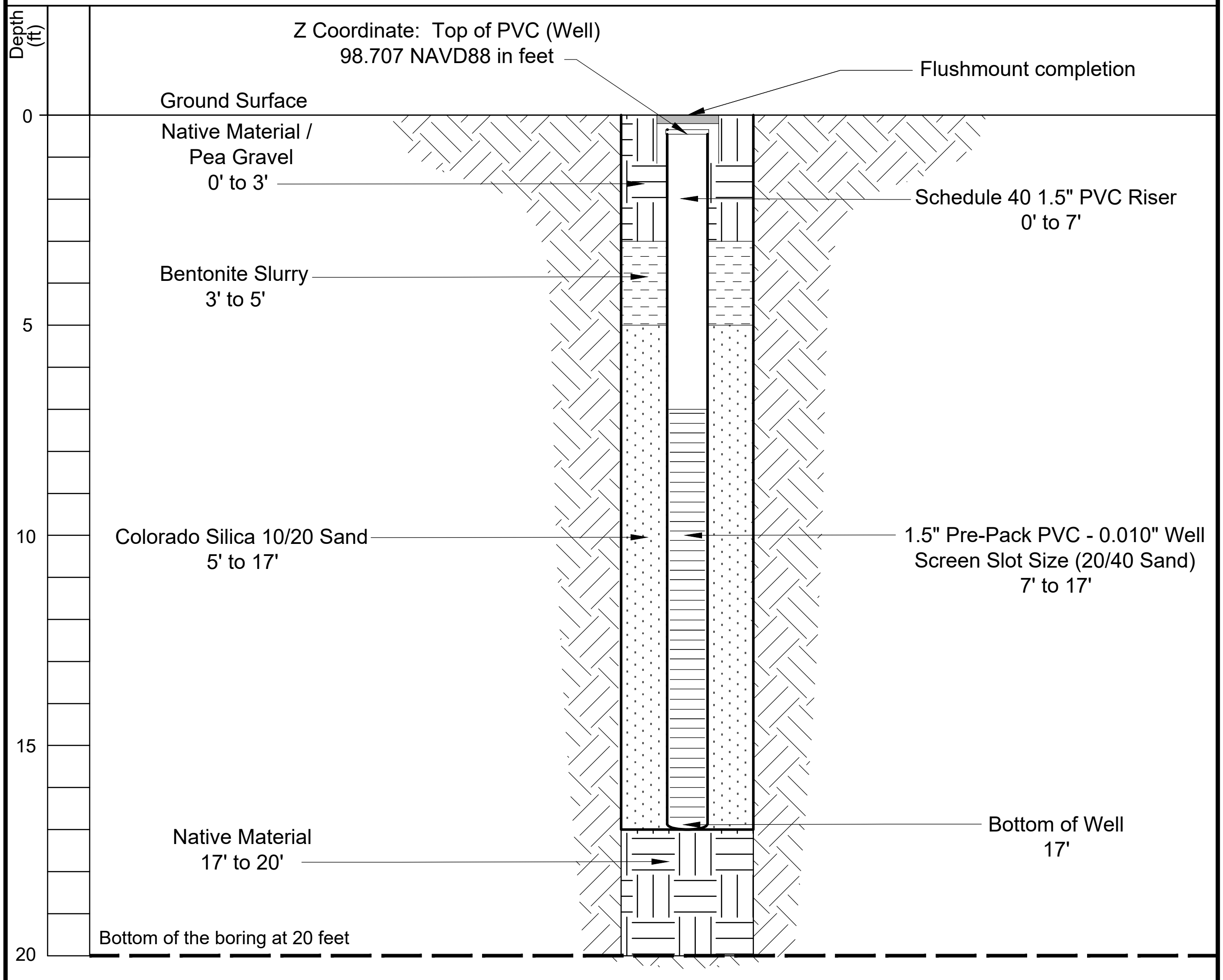
WELL COMPLETION OF
19-MW2

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5
Date Completed: 7/16/2014
X Coordinate: -135.80159 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.36657 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

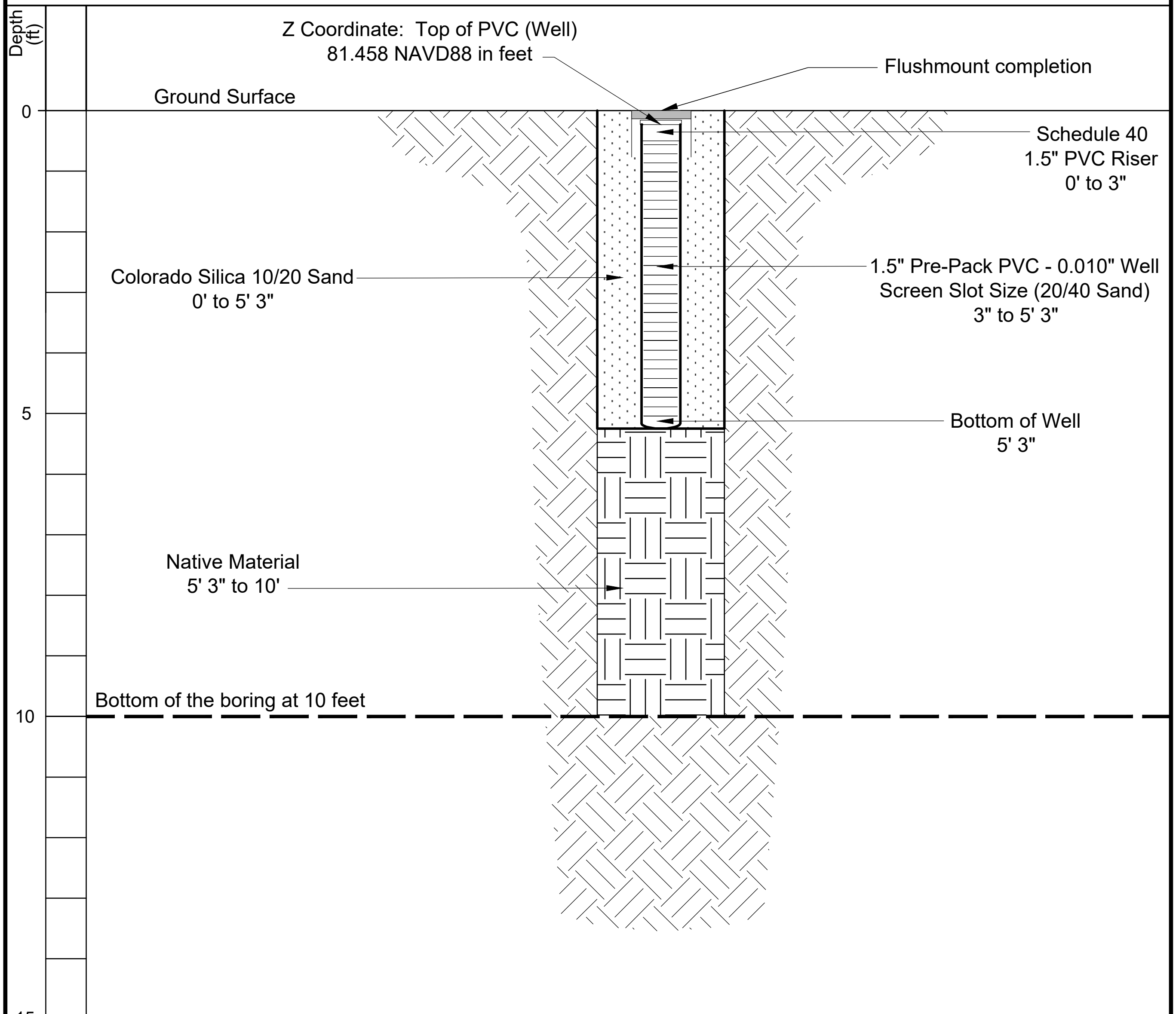


WELL COMPLETION OF
19-MW3

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5	FES Representative: Craig Martin
Date Completed: 7/17/2014	Drilling Contractor: Geotek Alaska
X Coordinate: -135.80035 GCS WGS 1984 Longitude in Decimal Degrees	Drilling Method: Geoprobe 6020DT Macro-Core
Y Coordinate: 59.36594 GCS WGS 1984 Latitude in Decimal Degrees	Sampling Method: Macro-Core

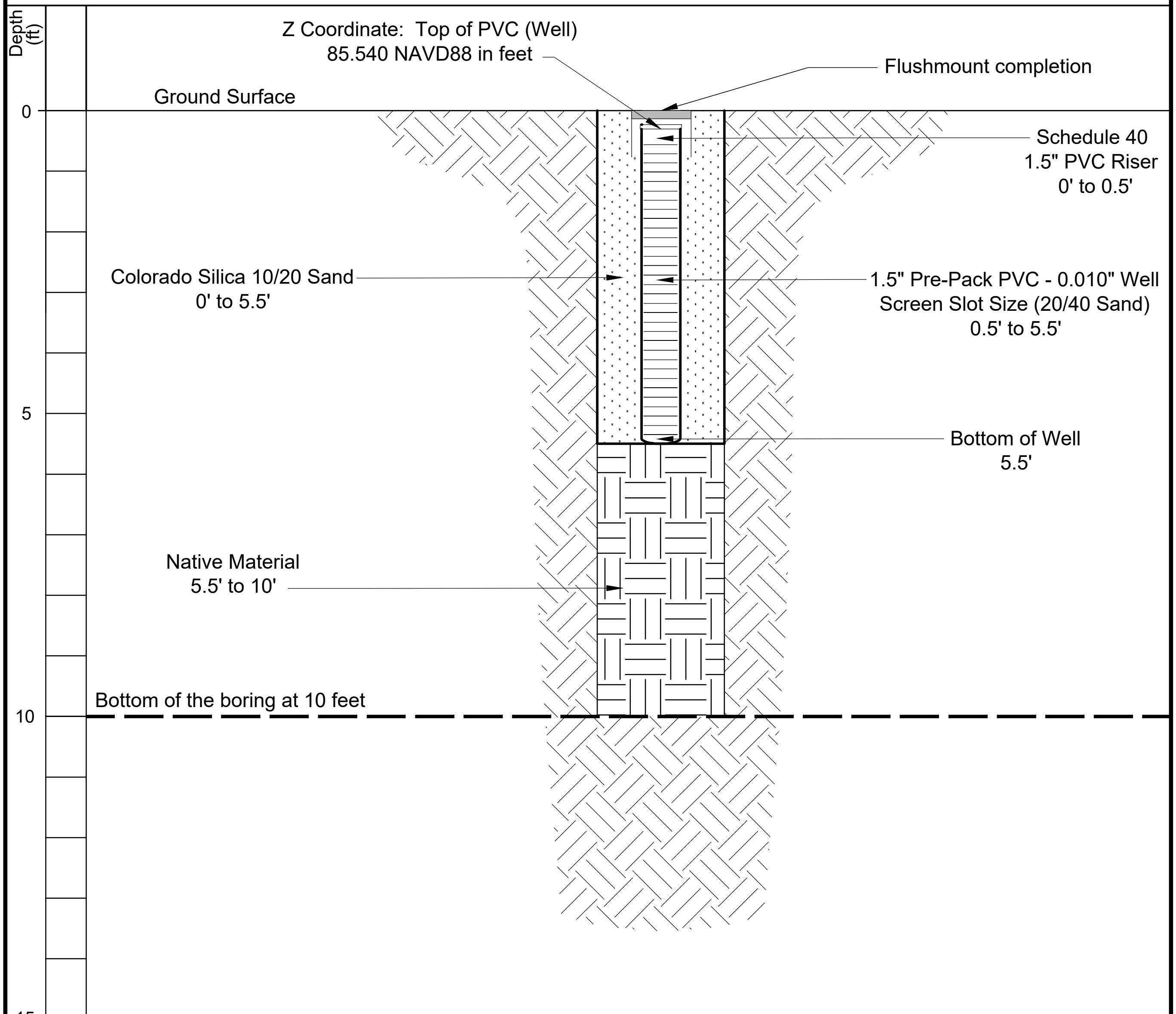


WELL COMPLETION OF
19-MW4

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines Fairbanks Pipeline (FUDS), PMP 19.5	FES Representative: Craig Martin
Date Completed: 7/17/2014	Drilling Contractor: Geotek Alaska
X Coordinate: -135.80110 GCS WGS 1984 Longitude in Decimal Degrees	Drilling Method: Geoprobe 6020DT Macro-Core
Y Coordinate: 59.36611 GCS WGS 1984 Latitude in Decimal Degrees	Sampling Method: Macro-Core



LOG OF BORING 25-BH08 (25-MW1)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/17/2014 1530
X Coordinate: -135.92976° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41600° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 145.400 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0								
				ML	SILT with vegetation, brown, dry			
				SM	Sandy SILT, brown, dry		0.0	
				SP	Silty SAND, fine-medium, black, dry			
						60	0.0	
				GP	Silty sandy GRAVEL, brown, dry			
							0.0	
				SM	Sandy SILT, brown, dry			
5								
				GP	Sandy GRAVEL, angular-broken to 1", gray, dry		0.0	
						70	0.0	
					Silty sandy GRAVEL			
							0.0	
				SP	Silty SAND with gravel, brown and gray, dry			
10								
							0.0	
					2.5" wood fragments at 11'			
						70	0.0	
							0.0	
					Iron staining at 15'			
15								
				SM	Sandy SILT, gray, moist		0.0	
				SP	Silty SAND, gray, moist			
						65	0.0	
					Silty SAND with gravel, angular to 3/4", brown and gray, moist		0.0	
20					Silty SAND, brown and gray, wet			
							0.0	
					Saturated below 22'			
						95	0.0	
								14HF2501SO
					Silty SAND with gravel, brown and gray		0.0	
25								
					Silty SAND with small amounts of gravel, brown and gray			
							0.0	
						95	0.1	
							0.0	
					Bottom of the boring at 30'			
30								
35								

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

LOG OF BORING 25-BH09

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/17/2014 1800
X Coordinate: -135.92951° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41603° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 147.202 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with vegetation, brown, dry			
				SP	Silty SAND transitioning to SAND, fine-medium, black, dry		0.0	
						75	0.0	
							0.0	
5					Silty SAND with small amounts of gravel, gravel is angular to 1/4", gray, dry, roots at 5'		0.0	14HF2502SO
						75	0.0	
							0.0	
10					Silty SAND with increasing amounts of gravel, gray, dry		0.0	
				ML	SILT, brown, dry, iron staining	80	0.0	
				SP	Silty SAND, brown, dry			
				ML	SILT, brown, dry		0.0	
15				SP	Silty SAND with small amounts of gravel, brown, dry, rock in bottom of liner			
							103	
						75	0.0	
							0.0	
20							103	
					Wet at 21'			
					Silty SAND with small amounts of gravel, gray, saturated below 22'	60	0.0	
					Silty SAND, gray			
					SAND, gray, slight hydrocarbon odor		75.6	
25					Silty SAND with small amounts of gravel, brown and gray		NM	14HF2503SO
					Strong hydrocarbon odor	95	890	
							12.4	14HF2504SO / 14HF2505SO
30					Bottom of the boring at 30'			
35								

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

LOG OF BORING 25-BH10 (25-MW2)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/18/2014 0920
X Coordinate: -135.92924° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41604° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 150.254 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0			ML SP	SILT with vegetation, brown, dry Silty SAND, fine-medium, black, dry		0.0	
					70	0.0	
				Silty SAND with small amounts of gravel, angular to 1/4", brown, dry			
						0.0	
5				Silty SAND with small amounts of gravel, black, dry		0.0	
	X						14HF2506SO
					70	0.0	
	X					69.7	14HF2507SO
10				Silty SAND, black, dry, moderate hydrocarbon odor		152.8	
					60	234	
				3" layer of white rock at 14'		262.6	
15						53	
					60	82	
	X					178	14HF2508SO / 14HF2509SO
20						24	
					70	44	
	X			Some gravel at 23'		217	14HF2510SO
25		▽		Wet at 25'		705	
				Saturated below 27'	30	480	
						NM	
30				Some pebbles at 30'		NM	
	X						14HF2511SO
					30	NM	
						NM	
35				Bottom of the boring at 35'			

FAIRBANKS ENVIRONMENTAL SERVICES
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FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

LOG OF BORING 25-BH11

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/18/2014 1125
X Coordinate: -135.92917° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41606° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 150.368 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with vegetation, brown, dry			
				SP	Silty SAND with small amounts of gravel, black, dry		0.0	
						60	0.0	
							0.0	
5					Silty SAND with small amounts of gravel, gravel is angular to 3/4", black, dry		0.0	
						65	16.7	
					Moderate hydrocarbon odor			
					Broken rock at 9.5'		321	
10							706	
						50	NM	
	X				Strong hydrocarbon odor		1,670	14HF2512SO
15					Silty SAND, black, moist		551	
						60	NM	
				GP	Silty sandy GRAVEL, gray, moist			
				SP	Silty SAND with gravel, brown and gray, moist		357	
20							706	
						60	NM	
							76.3	
25			▽		Wet at 25'		1,155	
					Saturated below 27'			
	X			SM	Sandy SILT, brown	90	NM	14HF2513SO
							588	
30				SP	Silty SAND, brown and gray		10.4	
						70	NM	
35					Bottom of the boring at 35'		3.7	

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

LOG OF BORING 25-BH12

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/18/2014 1225
X Coordinate: -135.92914° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41604° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 152.584 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with vegetation, brown, dry			
				SP	Silty SAND, fine-medium, black, dry		0.0	
						65	0.0	
							0.0	
5					SAND, medium-coarse, black, dry			
							0.0	
						70	0.0	
					Silty SAND, black, dry		0.2	
10					Silty SAND with gravel, gray, dry			
							0.1	
	X			GP	Silty sandy GRAVEL, angular-broken to 1", gray, dry	70	0.2	14HF2514SO
							0.2	
				SP	Silty SAND with gravel, gray, dry			
15				ML	SILT with peat, brown, dry			
							0.1	
				SP	Silty SAND, gray, moist			
						70	NM	
							0.1	
20								
							0.1	
						70	0.1	
					Silty SAND with gravel, gravel is angular to 1", brown and gray, moist			
							0.0	
25								
							0.1	
			▽		Wet at 26.5'			
						70	0.2	
					Saturated below 28', moderate hydrocarbon odor			
	X						530	14HF2515SO
30								
							350	
						70	5.7	
							4.5	
35					Bottom of the boring at 35'			

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

LOG OF BORING 25-BH13

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/18/2014 1410
X Coordinate: -135.92928° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41588° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 152.028 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with organics, brown, dry			
							0.0	
				GP	Silty GRAVEL (fill), gray, dry			
						60	0.0	
				SP	Silty SAND with gravel, brown and gray, dry			
							0.0	
5					Silty SAND with small amounts of gravel from 5' - 6'. 4" SILT lenses at 6' and 9'.			
							0.0	
						70	0.0	
							0.0	
10					Silty SAND with gravel, brown and gray, dry			
							0.0	
						80	0.0	
					4" layer of white rock at 13'			
							0.0	
15					Crushed rock from 15.5' to 16'			
				SP/SM	Alternating layers of silty SAND with some gravel / sandy SILT with some gravel, brown and gray, dry			
							0.0	
						90	0.0	
							0.0	
20				SP	Silty SAND, gray, moist			
							0.0	
					SAND with gravel, gray, moist			
						90	0.0	
					Silty SAND, brown, moist			
							0.0	
25			▽		Silty SAND with gravel, brown, wet			
							0.0	
					Saturated below 26'			
	☒					90	0.0	14HF2516SO
							0.0	
30					Bottom of the boring at 30'			
35								

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

LOG OF BORING

LOG OF BORING 25-BH14 (25-MW3)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/18/2014 1455
X Coordinate: -135.92929° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41580° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 150.178 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with organics, brown, dry			
				SP	Silty SAND, fine, black, dry, 2" of wood fragments at 6"		0.0	
						80	0.0	
							0.0	
5							0.0	
						65	0.0	
					Small amounts of gravel from 9' to 10'		0.0	
10							0.0	
				GP	Sandy GRAVEL, angular to 1", dark gray, dry	80	0.0	
				SP	Silty SAND, coarse, black, dry		0.0	
15				SM	Sandy SILT, black, dry		0.0	
						55	0.0	
					1" layer of white crushed rock at 19.5'			
				SP	Silty SAND, dark gray and black, dry		0.0	
20							0.0	
						80	0.0	
					Silty SAND with gravel, gray and black, moist			
							0.0	
25			▽		Wet below 24.5'			
					Saturated below 25'			
	X				Silty SAND with gravel, gray and black		0.0	14HF2517SO
						80	0.0	
					Bottom of the boring at 30'		0.0	
30								
35								

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

LOG OF BORING 25-BH15 (25-MW4)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/18/2014 1655
X Coordinate: -135.92952° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41579° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 147.231 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with organics, brown, dry			
				SP	Silty SAND, fine, black, dry		0.0	
						75	0.0	
							0.0	
5							0.0	
						80	0.0	
					Small amounts of gravel from 8.5' to 10'		0.0	
10							0.0	
				SM	Sandy SILT with gravel, sand is medium-coarse, gray and black, dry	75	0.0	
							0.0	
15					1.5" layer of white crushed rock at 15.5'		0.0	
				SP	Silty SAND with gravel, gray and black, dry, moist at 20'	80	0.0	
							0.0	
20							0.0	
			▽		Wet at 22'	80	0.0	
					Saturated below 23'			
							0.0	
25	X				Silty SAND with gravel, gray and black		0.0	14HF2518SO
						90	0.0	
30					Bottom of the boring at 30'		0.0	
35								

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

AK

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

LOG OF BORING 25-BH16 (25-MW5)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/18/2014 1740
X Coordinate: -135.92971° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41567° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 144.564 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				ML	SILT with organics, brown, dry, 1" of wood fragments at 3.5'			
				SP	Silty SAND, dark gray, dry		0.0	
						85	0.0	
							0.0	
5							0.0	
					Small amounts of gravel from 7' to 10'	80	0.0	
				GP	Silty sandy GRAVEL, brown and gray, dry		0.0	
10							0.0	
						70	0.0	
				SP	Silty SAND, brown and gray, dry		0.0	
15							0.0	
						80	0.0	
			▽		Silty SAND with gravel, gray, wet		0.0	
20					Silty SAND, gray, saturated below 20'		0.0	
	X							14HF2519SO
						90	0.0	
							0.0	
25					Silty SAND with gravel, gray and black		0.0	
						75	0.0	
30					Bottom of the boring at 30'		0.0	
35								

FAIRBANKS ENVIRONMENTAL SERVICES
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ALASKA DISTRICT
CORPS OF ENGINEERS
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LOG OF BORING 25-BH17 (25-MW6)

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date / Time Started: 7/18/2014 1840
X Coordinate: -135.92919° GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41618° GCS WGS 1984 Latiude in Decimal Degrees
Z Coordinate: 152.773 NAVD88 in Feet

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

Depth (Feet)	Lab Sample	Graphic	Water Level	USCS	Sample Description	% Recovery	PID (ppm)	Sample Number
0				OL	ORGANICS and CRUSHED ROCK, brown, dry		0.0	
				SP	Silty SAND, fine-medium, black, dry	65	0.0	
							0.0	
5					Silty SAND with gravel, black, dry		0.0	
						70	0.0	
							0.0	
10							0.0	
	X					70	0.0	14HF2520SO
							0.0	
15							0.0	
					Silty SAND, brown, dry	65	0.0	
							0.0	
20					Silty SAND with small amounts of gravel, brown and gray, dry		0.0	
						60	0.0	
				GP	Silty sandy GRAVEL, angular to 1/4", gray, moist		0.0	
25							0.0	
			▽		Wet at 27'	30	0.0	
					Saturated below 28.5'		0.0	
30							0.0	
	X			SP/SM	Alternating layers of SAND and SILT, brown and gray	60	0.0	14HF2521SO
					Bottom of the boring at 35'		0.0	
35								

FAIRBANKS ENVIRONMENTAL SERVICES
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ALASKA DISTRICT
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WELL COMPLETION OF
25-MW1

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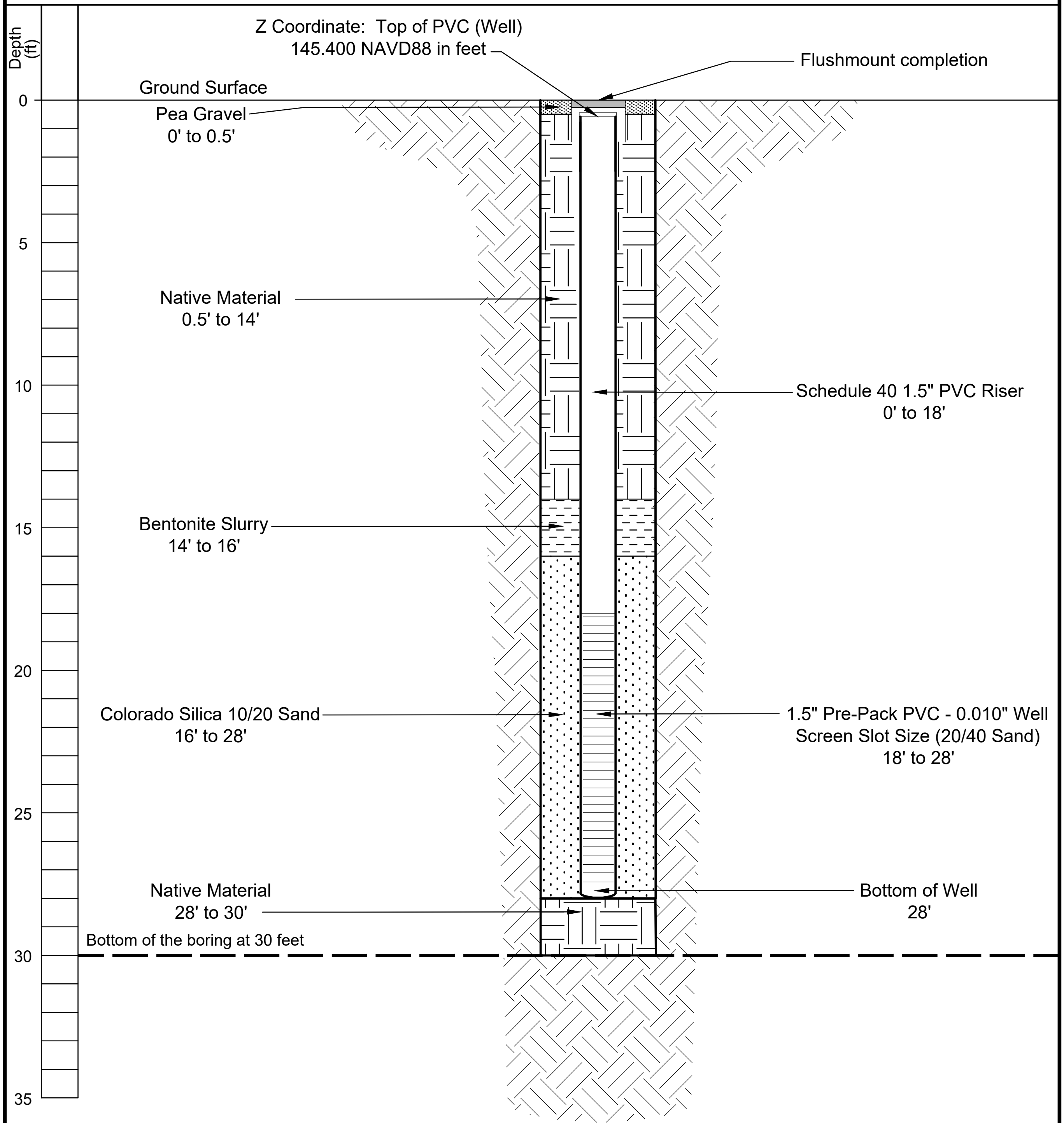
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5	FES Representative: Craig Martin
Date Completed: 7/17/2014	Drilling Contractor: Geotek Alaska
X Coordinate: -135.92976 GCS WGS 1984 Longitude in Decimal Degrees	Drilling Method: Geoprobe 6020DT Macro-Core
Y Coordinate: 59.41600 GCS WGS 1984 Latitude in Decimal Degrees	Sampling Method: Macro-Core



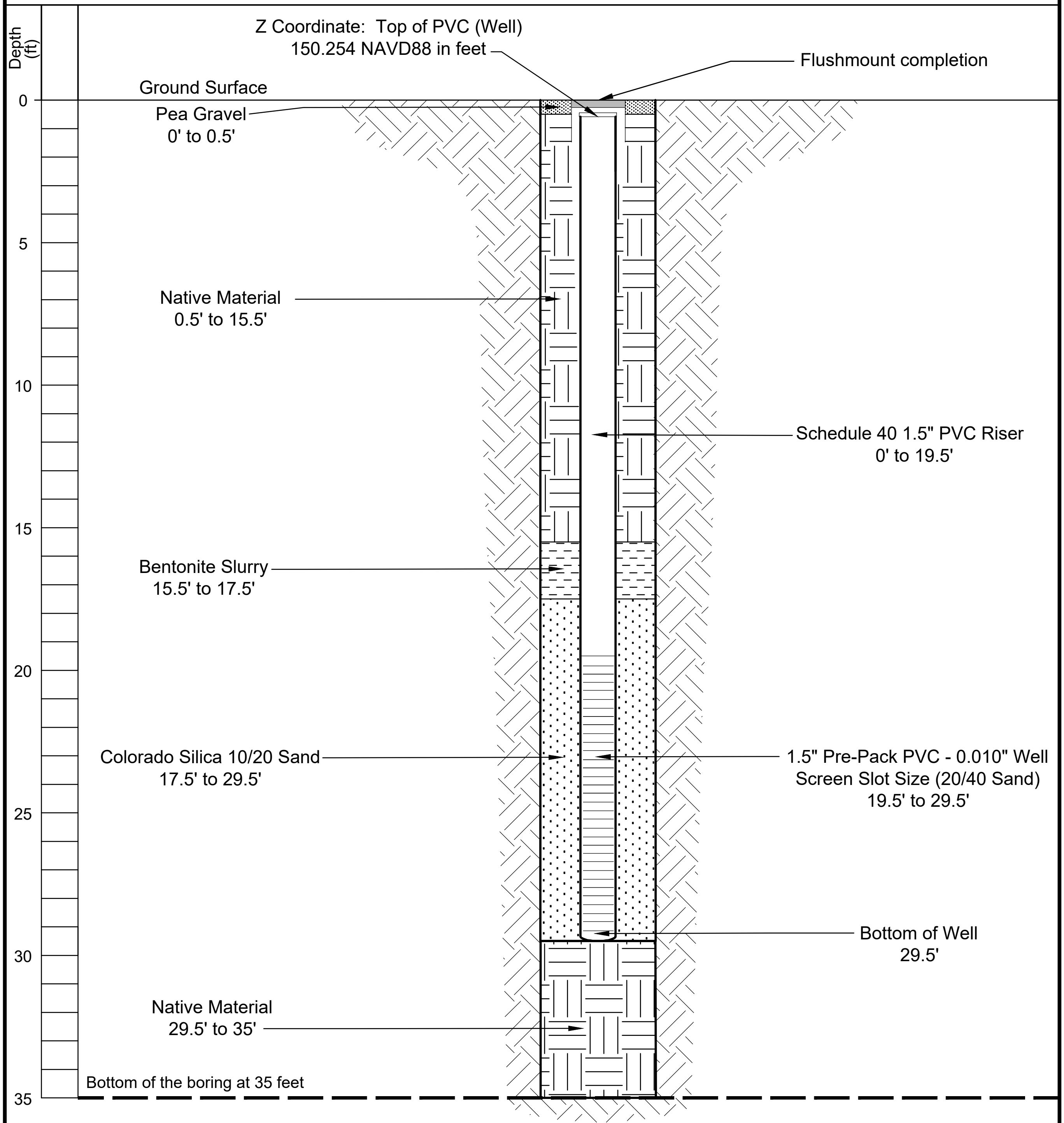
WELL COMPLETION OF
25-MW2

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date Completed: 7/18/2014
X Coordinate: -135.92924 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41604 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core



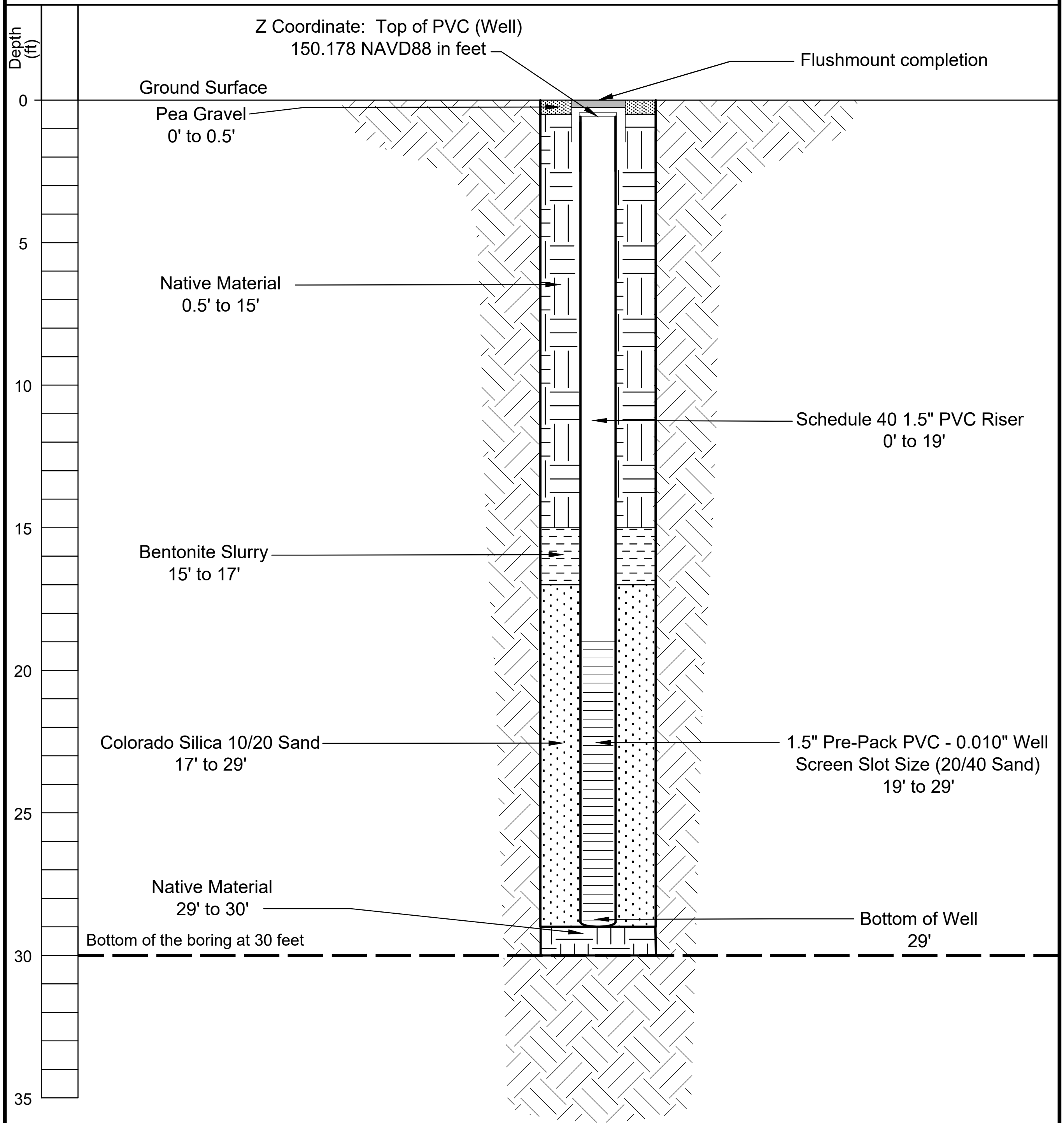
WELL COMPLETION OF
25-MW3

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date Completed: 7/18/2014
X Coordinate: -135.92929 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41580 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core

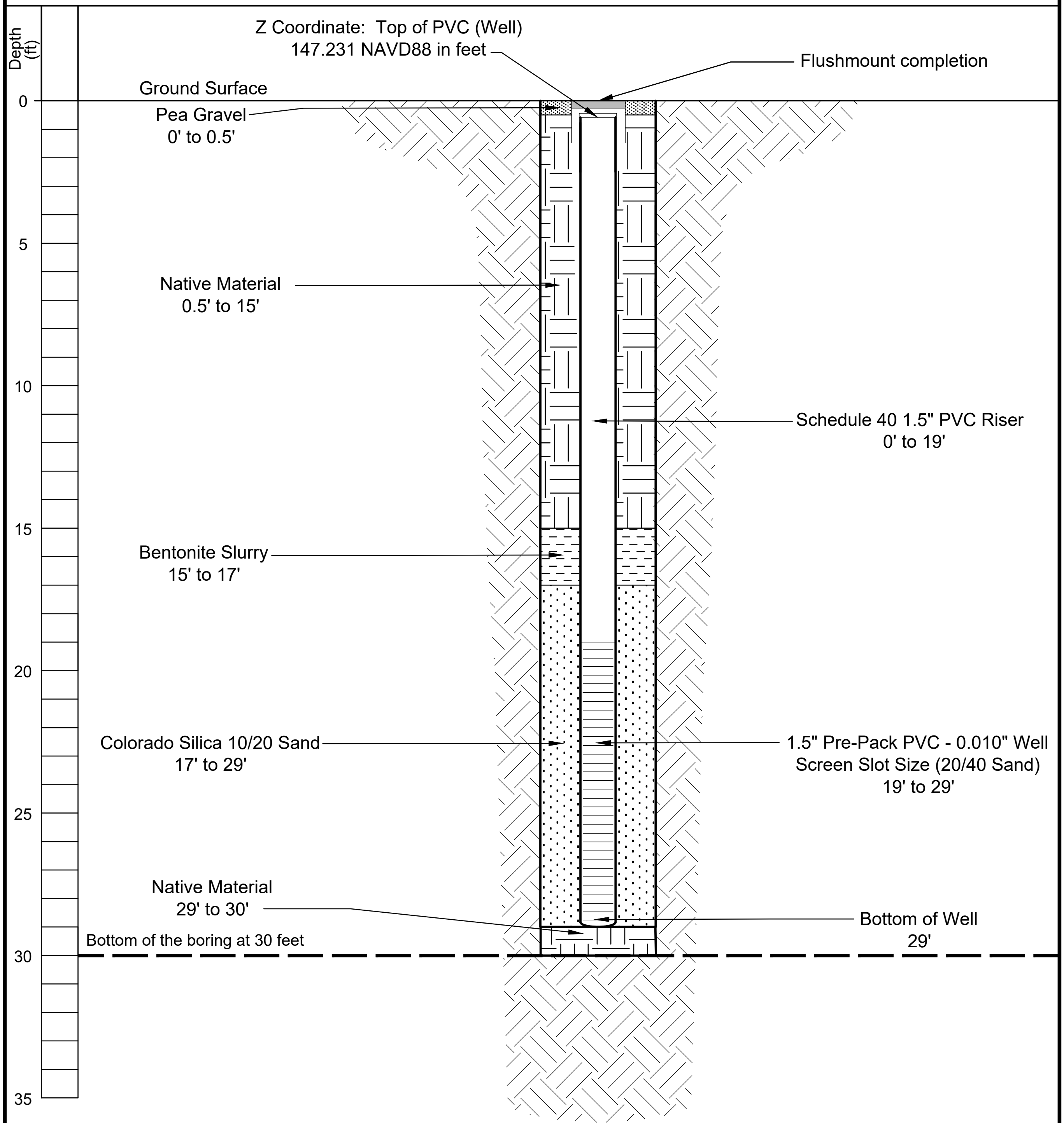


WELL COMPLETION OF
25-MW4

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5	FES Representative: Craig Martin
Date Completed: 7/18/2014	Drilling Contractor: Geotek Alaska
X Coordinate: -135.92952 GCS WGS 1984 Longitude in Decimal Degrees	Drilling Method: Geoprobe 6020DT Macro-Core
Y Coordinate: 59.41579 GCS WGS 1984 Latitude in Decimal Degrees	Sampling Method: Macro-Core



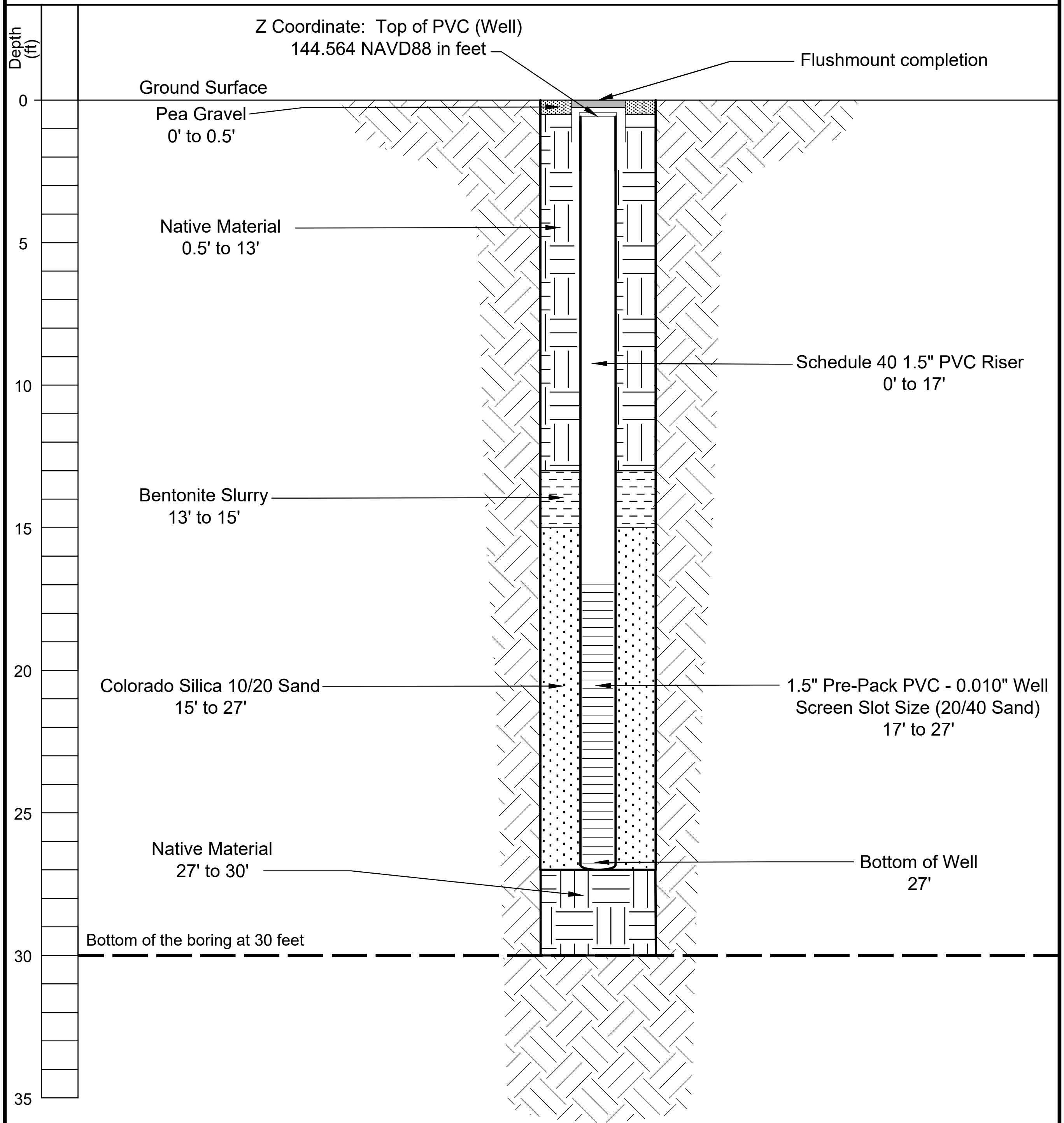
WELL COMPLETION OF
25-MW5

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date Completed: 7/18/2014
X Coordinate: -135.92971 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41567 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core



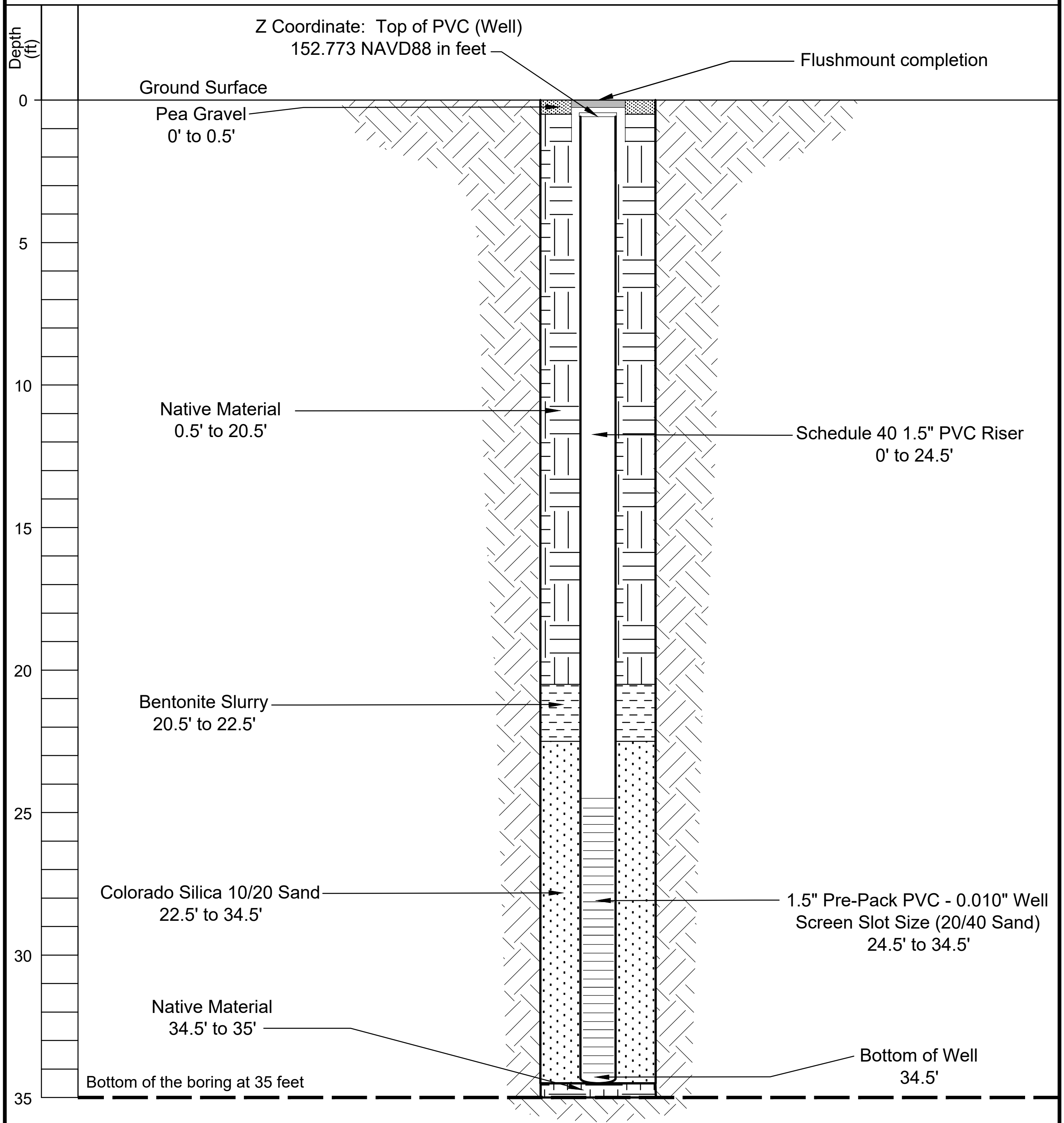
WELL COMPLETION OF
25-MW6

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Location: Haines-Fairbanks Pipeline (FUDS), PMP 25.5
Date Completed: 7/18/2014
X Coordinate: -135.92919 GCS WGS 1984 Longitude in Decimal Degrees
Y Coordinate: 59.41618 GCS WGS 1984 Latitude in Decimal Degrees

FES Representative: Craig Martin
Drilling Contractor: Geotek Alaska
Drilling Method: Geoprobe 6020DT Macro-Core
Sampling Method: Macro-Core



APPENDIX D
Field Forms

Groundwater Sample Form — Haines, Alaska

Project #: 6029-03

Site Location: PMP 17.7, Haines Fairbanks Pipeline

Date: 8/10/14

Probe/Well #: 17-MW3

Time: 1455

Sample ID: 14HF17 WG 01 (SR)

Sampler: CB

Weather: OVERCAST / RAIN

Outside Temperature: ~53°F

QA/QC ~~Sample~~ ID/Time/LOCID: 14HF17 WG 02 (SR) / 1510 / 17-MW31

MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump/ Bail/ Submersible

Sample Method: Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 11 Water Level: 9

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 12.37

Depth to Water from TOC (feet): - 3.19

Column of Water in Probe/Well (feet): = 9.18

Volume to be Purged

Column of Water in Probe/Well (feet): X 9.18

Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)

Min. Volume of Water in Probe/Well Casing (gal): = 0.84 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.15	5	9.29	1.683	1.18	6.22	-47.4	19.11	4.06
0.3	10	9.28	1.683	0.72	6.33	-67.3	17.08	4.21
0.45	15	9.61	1.687	0.61	6.39	-75.7	17.76	4.33
0.6	20	9.53	1.686	0.51	6.43	-78.8	14.22	4.36
0.75	25	9.33	1.682	0.43	6.44	-82.4	10.76	4.38
0.9	30	9.37	1.679	0.39	6.46	-84.9	11.56	4.39
1.05	35	9.12	1.680	0.32	6.46	-81.9	9.15	4.39
1.20	40	9.15	1.681	0.31	6.46	-82.6	7.91	4.39
1.35	45	9.13	1.681	0.32	6.46	-82.9	7.71	4.39
1.5	FINAL							

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

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

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

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

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

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

Depth tubing / pump set: approx. 5.1 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese

pH checked for DRO samples: Y / N Approximate HCl volume added (mL): 0

Purge Water

Gallons generated: 1.5 Surface Discharge thru GAC? Yes / No If No, why not?

Sampler's Initials: CB

Groundwater Sample Form — **Haines, Alaska**

Project #:	6029-03	**Site Location:**	PMP 17.7, Haines Fairbanks Pipeline
Date:	8/19/14	**Probe/Well #:**	17-MW5
Time:	1615	**Sample ID:**	14HF1703WG
Sampler:	JK		
Weather:	Rain	**Outside Temperature:**	60°F
QA/QC Sample ID/Time/LOCID:		**MS/MSD Performed?**	Yes/No JK

Purge Method: Peristaltic Pump/ Bail/ Submersible **Sample Method:** Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 4 Water Level: SOL 10

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

Column of Water in Probe/Well		**Volume to be Purged**	
Total Depth in Probe/Well (feet):	12.30	Column of Water in Probe/Well (feet):	X 9.48
Depth to Water from TOC (feet):	- 2.82	Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)	
Column of Water in Probe/Well (feet):	= 9.48	Min. Volume of Water in Probe/Well Casing (gal):	= .87 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.25	5	8.41	1.082	0.47	6.97	-94.0	2.16	2.86
0.50	10	8.20	1.032	0.31	6.98	-100.2	1.49	2.86
0.75	15	8.09	1.024	0.29	6.98	-102.8	1.69	2.86
1.00	20	8.12	1.022	0.27	6.98	-105.4	1.77	2.86
1.25	25	8.14	1.019	0.26	6.99	-107.2	1.64	2.86

JK

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

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

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

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

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

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

Depth tubing / pump set: approx. 4.8 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese

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

Purge Water

Gallons generated: 1.5 Surface Discharge thru GAC? Yes/ No If No, why not?

Sampler's Initials: JK

Groundwater Sample Form — Haines, Alaska

Project #: 6029-03
Date: 8/9/14
Time: 1800
Sampler: SK
Weather: Rain

Site Location: PMP 17.7, Haines Fairbanks Pipeline
Probe/Well #: 17-MW4
Sample ID: 14HF1704WG
Outside Temperature: 65°F

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

Purge Method: Peristaltic Pump/ Bail/ Submersible
Sample Method: Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 4 Water Level: SOL 10

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 6.92
Depth to Water from TOC (feet): - 1.65
Column of Water in Probe/Well (feet): = 5.27

Volume to be Purged

Column of Water in Probe/Well (feet): x 5.27
Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)
Min. Volume of Water in Probe/Well Casing (gal): = .48 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.25	5	10.74	1.041	1.72	7.05	-87.4	14.83	1.67
0.50	10	10.52	1.048	0.61	7.07	-95.5	10.84	1.68
0.75	15	10.33	1.055	0.51	7.06	-97.7	6.60	1.68
1.00	20	10.26	1.061	0.43	7.07	-97.6	3.63	1.69
1.25	25	10.20 ✓	1.067	0.43 ✓	7.03 ✓	-97.6 ✓	2.98	1.69
—								

SK

Did groundwater parameters stabilize? Yes / No If no, why not?
Did drawdown stabilize? Yes / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? Yes/No If no, why not?
Water Color: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock Y/ N Labeled with LOC ID: Y/ N Comments:
Sheen: Yes/ No Odor: Yes / No Notes/Comments:
Depth tubing / pump set: approx. 3.5 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese
pH checked for DRO samples: Y/N Approximate HCl volume added (mL): —

Purge Water

Gallons generated: 1.5 Surface Discharge thru GAC? Yes/ No If No, why not?
Sampler's Initials: SK

Groundwater Sample Form — Haines, Alaska

Project #:	6029-03	**Site Location:**	PMP 17.7, Haines Fairbanks Pipeline
Date:	8/9/14	**Probe/Well #:**	17-MW7
Time:	1125	**Sample ID:**	14HF1705WG
Sampler:	JK		
Weather:	Overcast	**Outside Temperature:**	60°F

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

Purge Method: Peristaltic Pump/ Bail/ Submersible **Sample Method:** Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 **Turbidity Meter #:** 11 **Water Level:** SOL 10

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

Column of Water in Probe/Well		**Volume to be Purged**	
Total Depth in Probe/Well (feet):	13.70	Column of Water in Probe/Well (feet):	X 8.94
Depth to Water from TOC (feet):	- 4.76	Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)	
Column of Water in Probe/Well (feet):	= 8.94	Min. Volume of Water in Probe/Well Casing (gal):	= .82 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.25	5	7.81	1.227	1.26	5.94	4.5	14.67	5.31
0.50	10	8.06	1.216	0.89	6.03	-13.0	30.57	5.22
0.75	15	8.12	1.219	0.77	6.10	-21.5	18.03	5.23
1.00	20	8.15	1.216	0.77	6.15	-27.5	16.57	5.23
1.25	25	8.17	1.212	0.78	6.19	-29.8	11.94	5.23
1.5	30	8.17	1.205	0.78	6.21	-30.6	10.44	5.24
		JK						

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

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

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

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

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

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

Depth tubing / pump set: approx. 6.5 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, ~~Total Lead~~, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese

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

Purge Water

Gallons generated: 1.75 Surface Discharge thru GAC? Yes/ No If No, why not?

Sampler's Initials: JK

Groundwater Sample Form | **Haines, Alaska**

Project #:	6029-03	**Site Location:**	PMP 17.7, Haines Fairbanks Pipeline
Date:	8/9/14	**Probe/Well #:**	17-MW6
Time:	1250	**Sample ID:**	14HF1706WG
Sampler:	JK		
Weather:	Lite Rain	**Outside Temperature:**	55°F

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

Purge Method: Peristaltic Pump/ Bail/ Submersible **Sample Method:** Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 **Turbidity Meter #:** 11 **Water Level:** SOL 10

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 12.35

Depth to Water from TOC (feet): - 3.47

Column of Water in Probe/Well (feet): = 8.88

Volume to be Purged

Column of Water in Probe/Well (feet): X 8.88

Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)

Min. Volume of Water in Probe/Well Casing (gal): = .82 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.25	5	7.12	1.231	0.48	7.12	-64.4	28.98	3.51
0.50	10	7.11	1.226	0.36	7.14	-82.3	62.20	3.52
0.75	15	7.36	1.221	0.27	7.16	-93.8	81.44	3.52
1.00	20	7.22	1.221	0.26	7.18	-103.1	61.27	3.52
1.25	25	7.25	1.211	0.25	7.19	-108.2	47.08	3.52
1.50	30	7.22	1.209	0.24	7.20	-109.7	33.82	3.52
			JK					

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

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

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

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

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

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

Depth tubing / pump set: approx. 5.5 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese

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

Purge Water

Gallons generated: 2.0 Surface Discharge thru GAC? Yes / No If No, why not?

Sampler's Initials: JK

Groundwater Sample Form | **Haines, Alaska**

Project #:	6029-03	**Site Location:**	PMP 17.7, Haines Fairbanks Pipeline
Date:	8/9/14	**Probe/Well #:**	17-MW 8
Time:	1510	**Sample ID:**	14HF1707WG
Sampler:	SK		
Weather:	Lite Rain	**Outside Temperature:**	60°F

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

Purge Method: Peristaltic Pump/ Bail/ Submersible **Sample Method:** Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 **Turbidity Meter #:** 11 **Water Level:** SDL 10

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 13.22

Depth to Water from TOC (feet): - 3.39

Column of Water in Probe/Well (feet): = 9.83

Volume to be Purged

Column of Water in Probe/Well (feet): X 9.83

Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)

Min. Volume of Water in Probe/Well Casing (gal): = 0.9 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.25	5	9.99	1.168	0.82	6.54	-12.8	21.59	3.49
0.50	10	10.33	1.094	0.85	6.59	-31.3	7.22	3.51
0.75	15	10.42	1.061	0.53	6.61	-46.8	4.41	3.52
1.00	20	10.45	1.049	0.45	6.62	-53.2	3.95	3.52
1.25	25	10.43	1.035	0.41	6.63	-55.9	3.68	3.52
1.5	30	10.43	1.005	0.40	6.63	-55.8	3.31	3.52

SK

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

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

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

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

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

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

Depth tubing / pump set: approx. 5.4 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese

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

Purge Water

Gallons generated: 1.75 Surface Discharge thru GAC? Yes/ No If No, why not?

Sampler's Initials: SK

Groundwater Sample Form — Haines, Alaska

Project #: 6029-03

Site Location: PMP 17.7, Haines Fairbanks Pipeline

Date: 8/19/14

Probe/Well #: 17-MW01

Time: 1950

Sample ID: 14HF1708WG

Sampler: SK

Weather: Rain

Outside Temperature: 60°C

QA/QC Sample ID/Time/LOCID:

MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump/ Bail/ Submersible

Sample Method: Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 11 Water Level: SOC 10

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 6.95

Depth to Water from TOC (feet): - 2.30

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

Volume to be Purged

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

Circle: Gallons per foot of .5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)

Min. Volume of Water in Probe/Well Casing (gal): = (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.25	5	10.26	1.209	0.92	7.45	-91.9	6.89	2.38
0.50	10	10.37	1.203	0.36	7.33	-117.4	4.09	2.33
0.75	15	10.41	1.200	0.23	7.47	-130.0	3.12	2.34
1.00	20	10.45	1.197	0.22	7.48	-138.7	2.57	2.34
1.25	25	10.41	1.196	0.23	7.49	-142.5	2.95	2.34
			SK					

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

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

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

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

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

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

Depth tubing / pump set: approx. 4.3 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese

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

Purge Water

Gallons generated: 1.5 Surface Discharge thru GAC? Yes / No If No, why not?

Sampler's Initials: SK

Groundwater Sample Form — Haines, Alaska

Project #: 6029-03
Site Location: PMP 17.7, Haines Fairbanks Pipeline
Date: 8/10/14
Probe/Well #: 17-MW2
Time: 1435
Sample ID: 14HF1709WG
Sampler: AS
Weather: Overcast, Rain
Outside Temperature: 55°F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes/No

Purge Method: Peristaltic Pump/ Bail/ Submersible
Sample Method: Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: 12 Water Level: 10 Solinist

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 6.40
Depth to Water from TOC (feet): - 1.98
Column of Water in Probe/Well (feet): = 4.42

Volume to be Purged

Column of Water in Probe/Well (feet): X 4.42
Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)
Min. Volume of Water in Probe/Well Casing (gal): = 0.41 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Start purging at 1402

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	10	10.69	1.089	0.28	7.24	-59.4	98.90	2.10
0.6	15	10.60	1.039	0.23	7.25	-75.1	94.14	2.11
0.8	20	10.57	1.088	0.23	7.25	-84.6	62.53	2.11
1.0	25	10.55	1.088	0.27	7.24	-90.2	51.67	2.11
1.2	30	10.69	1.087	0.27	7.24	-91.8	42.96	2.11
	Finish sampling @		~~1520~~ 1510					
							A.S.	

Did groundwater parameters stabilize? Yes / No If no, why not?
Did drawdown stabilize? Yes / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? Yes/No If no, why not?
Water Color: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock Y/ N Labeled with LOC ID: Y/ N Comments:
Sheen: Yes/ No Odor: Yes/ No Notes/Comments:
Depth tubing / pump set: approx. 4 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese
pH checked for DRO samples: Y/ N Approximate HCl volume added (mL): 0

Purge Water

Gallons generated: 1.5 Surface Discharge thru GAC? Yes/No If No, why not?
Sampler's Initials: AS.

Groundwater Sample Form — Haines, Alaska

Project #: 6029-03

Site Location: PMP 17.7, Haines Fairbanks Pipeline

Date: 8/10/14

Probe/Well #: RINSATE

Time: 1355

Sample ID: 14HF1725WQ

Sampler: CB

Weather: RAIN

Outside Temperature: 53°F

QA/QC Sample ID/Time/LOCID:

MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump/ Bail/ Submersible

Sample Method: Peristaltic Pump/ Bail/ Submersible

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

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet):

Depth to Water from TOC (feet): -

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

Volume to be Purged

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

Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)

Min. Volume of Water in Probe/Well Casing (gal): = (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)

RINSATE FROM TOOLING USED TO COLLECT SEDIMENT SAMPLES AT 17.7 DI WATER.

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

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

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

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

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

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

Depth tubing / pump set: approx.____ feet below top of casing

Laboratory Analyses (Circle): GRO, ~~DRO~~, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese

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

Purge Water

Gallons generated:____ Surface Discharge thru GAC? Yes / No If No, why not?____

Sampler's Initials:____

17 WS

HAINES FAIRBANKS PIPELINE
SAMPLE TRACKING LOG

No.	Sample No.	Location ID	Date	Time	Water Depth	Odor Y/N	Sheen Y/N	Notes
1	14HF1713WS	17-WS2	8/9/14	1200	6"-1'	N	N	RIVER
2	14	1		1220	6"-1'	N	N	RIVER
3	15	4		1320	1'	Y	Y	~~[illegible]~~ PIPELINE TRENCH
4	16	5		1400	1'	Y	N	
5	17	6		1430	1'	Y	N	
6	18	7		1500	2.5'	Y	Y	
7	19	8		1535	2.5'	Y	N	
8	20	3		1715	1.5	N	N	WETLAND
9	21 MSMSD	9		1905	1.5	N	N	
10	22	10		1820	1'	N	N	
DUP 11	23	11		1825	—	—	—	—
DUP 12	24	81		1605	—	—	—	—
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

Page ___ of ____

17 SE

HAINES FAIRBANKS PIPELINE
SAMPLE TRACKING LOG

w/ LITTLE SAND

RIVER/

No.	Sample No.	Location ID	Date	Time	Soil Type / Color	Odor Y/N	PID (ppm)	Standing Water Depth
1	14HF1701SE	17-SE5	8/9/14	1150	SILT(MUD) GRAY	N	0	6"
2	02	17-SE4		1210		N	0	6"
3	03	17-SE3		1215		N	0	6"
4	04	17-SE2		1225		N	0	6"
5	05	17-SE1		1235		N	0	6"
6	06	MSMSD 17-SE7		1325		SLIGHT	43.9	1'
7	07	DUP 71		1330		SLIGHT	—	1' DUP
8	08	8		1410		Y ~~SLIGHT~~	276.2	1'
9	09	9		1440		SLIGHT	40.2	1'
10	10	10		1510		Y ~~SLIGHT~~	146.1	2.5'
11	11	11		1545		SLIGHT	12.1	2.5'
12	12	MSMSD 6		1725		Y ~~SLIGHT~~	295.9	1.5'
13	13	DUP 61		1730		—	—	— DUP
14	14	15	8/10/14	1005		Y	174.2	1'
15	15	16		1030		Y	72.3	1'
16	16	17		1045		Y	214	1.5'
17	17	18		1055		Y	95.1	1.5'
18	18	19		1305		Y	1,400	1.5'
19	19	12	8/9/14	1915		Y	269.7	1.5'
20	20	20	8/10/14	1315		Y	353.5	6"
21	21	13	8/9/14	1830		Y	529.1	1'
22	22	14	8/10/14	0945		Y	2,678	6"

Groundwater Sample Form | **Haines, Alaska**

Project #: 6029-04
Site Location: PMP 19.5, Haines Fairbanks Pipeline
Date: 8/8/14
Probe/Well #: 19-MW2
Time: 1600
Sample ID: 14HF1901WG
Sampler: JK
Weather: P. Sunny
Outside Temperature: 60°F
QA/QC Sample ID/Time/LOCID: 14HF1902WG / 1615 / 19-MW21 **MS/MSD Performed?** Yes/No

Purge Method: Peristaltic Pump/ Bail/ Submersible
Sample Method: Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 **Turbidity Meter #:** 11 **Water Level:** Sol.

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 16.73
Depth to Water from TOC (feet): - 9.16
Column of Water in Probe/Well (feet): = 7.57

Volume to be Purged

Column of Water in Probe/Well (feet): x 7.57
Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)
Min. Volume of Water in Probe/Well Casing (gal): = .69 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	6.67	0.193	3.10	5.82	113.0	20.08	9.20
0.8	10	6.47	0.174	3.27	5.93	109.3	5.18	9.21
1.2	15	6.45	0.164	3.52	5.97	107.5	4.95	9.22
1.6	20	6.58	0.162	3.53	6.00	105.1	3.05	9.23
2.0	25	6.51	0.162	3.59	6.12	103.8	2.70	9.23
2.4	30	6.50	0.161	3.59	6.08	103.0	2.50	9.23
				JK				

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

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

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

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

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

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

Depth tubing / pump set: approx. 11 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, 1,2 DCA, EDB

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

Purge Water

Gallons generated: 4.5 Surface Discharge thru GAC? Yes / No If No, why not?

Sampler's Initials: JK

Groundwater Sample Form **Haines, Alaska**

Project #:	6029-04	Site Location:	PMP 19.5, Haines Fairbanks Pipeline
Date:	8/8/14	Probe/Well #:	19-MW1
Time:	1900	Sample ID:	14HF1903WG
Sampler:	JK		
Weather:	Overcast	Outside Temperature:	60°F

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

Purge Method: Peristaltic Pump/ Bail/ Submersible Sample Method: Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 11 Water Level: Sol.

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

Column of Water in Probe/Well		Volume to be Purged	
Total Depth in Probe/Well (feet):	8.67	Column of Water in Probe/Well (feet):	X 6.22
Depth to Water from TOC (feet):	- 2.45	Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)	
Column of Water in Probe/Well (feet):	= 6.22	Min. Volume of Water in Probe/Well Casing (gal):	= .57 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.25	5	11.48	0.215	1.15	6.36	-24.1	7.95	3.76
0.50	10	11.14	0.217	0.92	6.33	-28.3	6.05	3.88
0.75	15	10.97	0.220	0.67	6.32	-32.7	5.73	3.90
1.00	20	10.92	0.220	0.58	6.32	-35.9	4.98	3.91
1.25	25	10.87	0.220	0.50	6.34	-38.7	4.57	3.93
1.50	30	10.86 ✓	0.221 ✓	0.46 x	6.35 ✓	-41.0 ✓	4.29 ✓	3.94

JK

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

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

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

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

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

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

Depth tubing / pump set: approx. 4.5 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, 1,2 DCA, EDB

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

Purge Water

Gallons generated: 1.6 Surface Discharge thru GAC? Yes / No If No, why not?

Sampler's Initials: JK

Groundwater Sample Form | **Haines, Alaska**

Project #: 6029-04
Site Location: PMP 19.5, Haines Fairbanks Pipeline
Date: 8/8/14
Probe/Well #: 19-MW4
Time: 1400
Sample ID: 14HF1904WG
Sampler: JK
Weather: overcast
Outside Temperature: 60°F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes/No

Purge Method: Peristaltic Pump/ Bail/ Submersible
Sample Method: Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 6 **Turbidity Meter #:** 11 **Water Level:**

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 5.91
Depth to Water from TOC (feet): - 0.45
Column of Water in Probe/Well (feet): = 5.46

Volume to be Purged

Column of Water in Probe/Well (feet): X 5.46
Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)
Min. Volume of Water in Probe/Well Casing (gal): = 0.5 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.4	5	11.33	0.273	0.98	5.87	19.7	9.61	0.82
0.8	10	11.33	0.272	0.64	5.89	3.4	7.44	0.84
1.2	15	11.20	0.271	0.49	6.05	-8.7	4.60	0.87
1.6	20	11.11	0.272	0.41	6.12	-18.3	3.88	0.90
2.0	25	11.16	0.272	0.37	6.18	-26.6	4.84	0.93
2.4	30	11.13	0.273	0.33	6.21	-33.2	2.83	0.95

JK

Did groundwater parameters stabilize? Yes / No **If no, why not?**
Did drawdown stabilize? Yes / No **If no, why not?**
Was flowrate between 0.03 and 0.15 GPM? Yes/No **If no, why not?**
Water Color: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock: Y / N Labeled with LOC ID Y / N **Comments:**
Sheen: Yes / No **Odor:** Yes / No **Notes/Comments:**
Depth tubing / pump set: approx. 2.5 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, 1,2 DCA, EDB
pH checked for DRO samples: Y / N **Approximate HCl volume added (mL):**

Purge Water

Gallons generated: 2.5 Surface Discharge thru GAC? Yes / No If No, why not?
Sampler's Initials: JK

Groundwater Sample Form — Haines, Alaska

Project #: 6029-04
Site Location: PMP 19.5, Haines Fairbanks Pipeline
Date: 8/8/14
Probe/Well #: 19-MW3
Time: 1345
Sample ID: 14HF1905WG
Sampler: AS
Weather: Cloudy
Outside Temperature: 60 °F
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes/No

Purge Method: Peristaltic Pump/Bail/ Submersible
Sample Method: Peristaltic Pump/Bail/ Submersible

Equipment Used for Sampling: YSI # 9 Turbidity Meter #: T12 Water Level: 9

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 5.04
Depth to Water from TOC (feet): - 0.43 (est)
Column of Water in Probe/Well (feet): = 4.61

Volume to be Purged

Column of Water in Probe/Well (feet): x 4.61
Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)
Min. Volume of Water in Probe/Well Casing (gal): = 0.42 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.15	5	11.65	0.248	0.22	6.79	0.4	7.96	0.61
0.3	10	11.83	0.255	0.20	6.82	-13.5	8.23	0.61
0.45	15	11.78	0.257	0.19	6.82	-22.8	3.31	0.61
0.60	20	11.76	0.258	0.17	6.82	-27.6	3.17	0.61
0.75	25	11.82	0.258	0.07	6.83	-31.4	1.57	0.61
0.90	30	11.79	0.259	0.16	6.83	-33.8	1.76	0.61
								A.S.

Did groundwater parameters stabilize? Yes / No If no, why not?
Did drawdown stabilize? Yes / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? Yes/No If no, why not?
Water Color: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock: Y / N Labeled with LOC ID Y/ N Comments: Orange organics on top
Sheen: Yes / No Odor: Yes / No Notes/Comments:
Depth tubing / pump set: approx. 2.4 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, 1,2 DCA, EDB
pH checked for DRO samples: Y / N Approximate HCl volume added (mL): 0

Purge Water

Gallons generated: 1.1 Surface Discharge thru GAC? Yes / No If No, why not?
Sampler's Initials: AS

19.5 WS

HAINES FAIRBANKS PIPELINE
SAMPLE TRACKING LOG

2014

No.	Sample No.	Location ID	Date	Time	Water Depth	Odor Y/N	Sheen Y/N	Notes
1	14HF1909WS	19-WS4.	8/8	~~1345~~ 1400	0.5-1	N	N	MSMSD CREEK
2	10	19-WS3		1420				
3	11	19-WS31		1430				DUP
4	12	-WS5		1645				
5	13	-WS6		1705				
6	14	-WS7		1720				
7	15	-WS1		1805				
8	16	-WS2		1820				
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								

19.5 SE

HAINES FAIRBANKS PIPELINE
SAMPLE TRACKING LOG

2014

No.	Sample No.	Location ID	Date	Time	Soil Type / Color	Odor Y/N	PID (ppm)	Notes
1	14HF19 01SE	19-SE4	8/8/14	1410	SAND/GRAY	N	0.0	MSMSD CREEK
2	02	19-SE3		1425	SAND/GRAY		0.0	
3	03	19-SE31		1435			0.0	DUP
4	04	19-SE5		1655			0.0	
5	05	19-SE6		1715			0.0	
6	06	19-SE7		1730			0.0	
7	07	19-SE1		1815			0.0	
8	08	19-SE2		1830			0.0	
9	~~09~~ 01SS	19-SS1		1835	SILT/BROWN		0.0	—
10	~~10~~ 02SS	19-SS2		1840			0.0	
11	03SS	19-SS3		1845			MSMSD/DUP	
12								
13					SILT W/			
14					SAND			
15								
16								
17								
18								
19								
20								
21								
22								

Groundwater Sample Form — Haines, Alaska

Project #: 6029-~~04~~ 05 | Site Location: PMP ~~19.5,~~ 25.5 Haines Fairbanks Pipeline

Date: 7/30/14 | Probe/Well #: 25-MW1

Time: 1025 | Sample ID: 14HF2501WG

Sampler: VR

Weather: overcast | Outside Temperature: 50s

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

Purge Method: Peristaltic Pump/ Bail/ Submersible | Sample Method: Peristaltic Pump/ Bail/ Submersible

Equipment Used for Sampling: YSI # 8 | Turbidity Meter #: 12 | Water Level: 9

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 27.87

Depth to Water from TOC (feet): - 19.95

Column of Water in Probe/Well (feet): = 7.92

Volume to be Purged

Column of Water in Probe/Well (feet): ~~19.92~~ x 7.92

Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)

Min. Volume of Water in Probe/Well Casing (gal): = 0.7 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1	10	8.79	0.977	0.74	6.42	95.9	6.46	20.02
1.5	15	8.96	0.974	0.67	6.45	89.3	4.67	20.02
2.0	20	8.87	0.969	0.56	6.46	82.0	5.16	20.02
2.5	25	8.82	0.964	0.54	6.45	77.5	5.31	20.02
3.0	30	8.87	0.961	0.53	6.46	75.0	5.26	20.02

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

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

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

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

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

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

Depth tubing / pump set: approx. 22 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, 1,2 DCA, EDB

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

Purge Water

Gallons generated: ~3 Surface Discharge thru GAC? Yes / No If No, why not?

Sampler's Initials: VR

0930

Groundwater Sample Form — Haines, Alaska

Project #: 6029-~~04~~ 05

Site Location: PMP ~~19.5~~ 25.5 Haines Fairbanks Pipeline

Date: 7/30/14

Probe/Well #: 25-MW2

Time: 1230

Sample ID: 14HF2502WG

Sampler: VR

Weather: overcast

Outside Temperature: 50's

QA/QC Sample ID/Time/LOCID: 14HF2503WG / 1240 / 25-MW21

MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump/ Bail/ Submersible/ Bladder

Sample Method: Peristaltic Pump/ Bail/ Submersible/ Bladder

Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: 9

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 29.38

Depth to Water from TOC (feet): - ~~29.38~~ 24.59

Column of Water in Probe/Well (feet): = 4.79

Volume to be Purged

Column of Water in Probe/Well (feet): X 4.79

Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)

Min. Volume of Water in Probe/Well Casing (gal): = 0.4 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
3	100	~~7.73~~						
3.15	105	7.73	1.118	1.05	6.22	77.9	8.11	24.65
3.30	110	7.52	1.123	1.02	6.20	68.7	6.97	24.65
3.45	115	7.52	1.122	0.93	6.21	61.7	7.13	24.65
3.60	120	7.65	1.117	0.81	6.27	54.0	6.85	24.65
3.75	125	7.59	1.122	0.79	6.29	50.0	6.51	24.65

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

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

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

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

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

Sheen: Yes / No discontinuous Odor: Yes / No Strong POL Notes/Comments:

Depth tubing / pump set: approx. 27.5 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, 1,2 DCA, EDB

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

Purge Water

Gallons generated: ~ 3.8 Surface Discharge thru GAC? Yes / No If No, why not?

Sampler's Initials: VR

Groundwater Sample Form

Haines, Alaska

Project #:	6029-05	**Site Location:**	PMP 25.5, Haines Fairbanks Pipeline
Date:	7/30/14	**Probe/Well #:**	25 MW6
Time:	1645	**Sample ID:**	14HF2504WG
Sampler:	VR		
Weather:	overcast	**Outside Temperature:**	50's

QA/QC Sample ID/Time/LOCID: 14HF2505WQ / 1715 / RINSATE2 **MS/MSD Performed? Yes/ No**

Purge Method: Peristaltic Pump/ Bail/ Submersible/ Bladder Pump **Sample Method:** Peristaltic Pump/ Bail/ Submersible/ Bladder Pump

Equipment Used for Sampling: YSI # 8 **Turbidity Meter #:** 12 **Water Level:** 9

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

Column of Water in Probe/Well		**Volume to be Purged**	
Total Depth in Probe/Well (feet):	34.35	Column of Water in Probe/Well (feet):	x 7.34
Depth to Water from TOC (feet):	- ~~27.01~~ 27.10	Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)	
Column of Water in Probe/Well (feet):	= 7.34	Min. Volume of Water in Probe/Well Casing (gal):	= 0.7 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.9	30	7.26	0.904	1.59	6.34	64.9	1.37	27.15
1.05	35	7.18	0.905	1.46	6.36	56.6	1.05	27.15
1.20	40	7.17	0.905	1.40	6.36	49.7	0.82	27.15
1.35	45	7.18	0.905	1.37	6.36	45.0	0.76	27.15
1.50	50	7.17	0.905	1.38	6.36	43.0	0.77	27.15

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

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

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

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

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

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

Depth tubing / pump set: approx. 29 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, 1,2 DCA, EDB

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

Purge Water

Gallons generated: ~1.5 Surface Discharge thru GAC? Yes / No If No, why not?

Sampler's Initials: VR

m

Groundwater Sample Form — Haines, Alaska

Project #: 6029-05
Date: 7/31/14
Time: 1105
Sampler: VR
Weather: Clear, Sunny
QA/QC Sample ID/Time/LOCID: —

Site Location: PMP 25.5, Haines Fairbanks Pipeline
Probe/Well #: ~~25-MW5~~ 25-MW5
Sample ID: 14HF2506 WG
Outside Temperature: 50's
MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump/ Bail/ Submersible/ Bladder Pump
Sample Method: Peristaltic Pump/ Bail/ Submersible/ Bladder Pump

Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: SOL#10

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 27.14
Depth to Water from TOC (feet): - 19.25
Column of Water in Probe/Well (feet): = 7.89

Volume to be Purged

Column of Water in Probe/Well (feet): X 7.89
Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)
Min. Volume of Water in Probe/Well Casing (gal): = 0.7 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
1.2	15	8.71	1.623	3.57	6.37	101.5	56.04	19.35
1.5	20	8.89	1.635	3.23	6.35	100.7	39.34	19.35
1.85	25	8.30	1.641	3.22	6.35	99.6	32.12	19.35
2.2	30	8.35	1.658	3.20	6.36	97.6	26.16	19.35
2.5	35	8.41	1.662	3.14	6.34	97.7	23.72	19.35
2.9	40	8.39	1.669	3.12	6.35	97.5	22.31	19.35

Did groundwater parameters stabilize? Yes / No If no, why not?
Did drawdown stabilize? Yes / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? Yes/No If no, why not?
Water Color: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock: Y / N Labeled with LOC ID: Y / N Comments:
Sheen: Yes / No Odor: Yes / No Notes/Comments:
Depth tubing / pump set: approx. 21 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, 1,2 DCA, EDB
pH checked for DRO samples: Y / N Approximate HCl volume added (mL): Ø

Purge Water

Gallons generated: ~3.0 Surface Discharge thru GAC? Yes / No If No, why not?
Sampler's Initials: VR

Groundwater Sample Form — Haines, Alaska

Project #: 6029-05
Site Location: PMP 25.5, Haines Fairbanks Pipeline
Date: 7/31/14
Probe/Well #: ~~25-MW5~~ 25-MW4
Time: 1230
Sample ID: 14HF2507WG
Sampler: VR
Weather: clear, sunny
Outside Temperature: 50s
QA/QC Sample ID/Time/LOCID: —
MS/MSD Performed? Yes/ No

Purge Method: Peristaltic Pump/ Bail/ Submersible/ Bladder Pump
Sample Method: Peristaltic Pump/ Bail/ Submersible/ Bladder Pump

Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: Sol #10

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 29.20
Depth to Water from TOC (feet): - 21.75
Column of Water in Probe/Well (feet): = 7.45

Volume to be Purged

Column of Water in Probe/Well (feet): x 7.45
Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)
Min. Volume of Water in Probe/Well Casing (gal): = 0.7 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
0.7	15	8.45	1.726	1.49	6.21	96.9	17.18	22.02
1.0	20	8.87	1.728	1.41	6.19	93.5	14.09	22.02
1.35	25	8.32	1.721	1.45	6.16	91.1	5.23	22.02
1.65	30	8.50	1.718	1.48	6.14	89.9	6.64	22.02
2.3	35	8.49	1.721	1.45	6.12	88.1	5.41	22.02

Did groundwater parameters stabilize? Yes / No If no, why not?
Did drawdown stabilize? Yes / No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? Yes/No If no, why not?
Water Color: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock: Y / N Labeled with LOC ID: Y / N Comments:
Sheen: Yes / No Odor: Yes / No Notes/Comments:
Depth tubing / pump set: approx. 24 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, Total Lead, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, 1,2 DCA, EDB
pH checked for DRO samples: Y / N Approximate HCl volume added (mL): ∅

Purge Water
Gallons generated: ~~24~~ VR Surface Discharge thru GAC? Yes / No If No, why not?
Sampler's Initials: VR

Groundwater Sample Form — Haines, Alaska

Project #: 6029-05

Date: 7/31/14

Time: 1140

Sampler: VR

Weather: clear, sunny

Site Location: PMP 25.5, Haines Fairbanks Pipeline

Probe/Well #: 25-MW3

Sample ID: 14HF2508WG

Outside Temperature: 50's

QA/QC Sample ID/Time/LOCID:

MS/MSD Performed? Yes/No

Purge Method: Peristaltic Pump/ Bail/ Submersible/ Bladder Pump

Sample Method: Peristaltic Pump/ Bail/ Submersible/ Bladder Pump

Equipment Used for Sampling: YSI # 8 Turbidity Meter #: 12 Water Level: 9

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

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 29.20

Depth to Water from TOC (feet): - 24.62

Column of Water in Probe/Well (feet): = 4.58

Volume to be Purged

Column of Water in Probe/Well (feet): x 4.58

Circle: Gallons per foot of 1.5" (X 0.0918) or 2" (X 0.163) or 4" (X 0.65)

Min. Volume of Water in Probe/Well Casing (gal): = 0.4 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Stabilization Parameters:		±3% (or ±0.2°C max)	±3%	±10% (<1mg/L, ±0.1 mg/L)	±0.1 units	±10 mV	±10% (<10NTU, ±1NTU)	<0.33 feet
Water Removed (gal)	Time Purged (min)	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH	Potential (mV)	Turbidity (NTU)	Water Level (ft)
	10	10.05	0.802	6.33	6.32	138.3	17.17	24.70
1.0	35	10.63	0.810	5.31	6.43	130.7	14.69	24.70
1.15	40	10.71	0.812	5.30	6.38	131.5	10.12	24.70
1.30	45	10.73	0.812	5.27	6.44	129.9	8.59	24.70
1.45	50	11.70	0.813	5.27	6.48	126.6	7.31	24.70

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

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

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

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

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

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

Depth tubing / pump set: approx. 26.5 feet below top of casing

Laboratory Analyses (Circle): GRO, DRO, RRO, BTEX, PAH, ~~Total Lead~~, Total Nitrates/Nitrites as N, Sulfate, Dissolved Iron and Manganese, ~~1,2 DCA, EDB~~

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

Purge Water

Gallons generated: ~1.5 Surface Discharge thru GAC? Yes / No If No, why not?

Sampler's Initials: VR

WELL DEVELOPMENT DATA | Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 19.5
Date: 7/24/15 & 7/25/14
Well #: 19-MW1
Start Time: 1835-2000
Initials: UB
Weather / Temperature: PT SUNNY 62°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: ____

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: HAND WATERRA

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 8.42
Volume of Water in Casing (gal): = 0.52 (1 Casing Volume)
Depth to Water (feet): - 2.65
10 Casing Volumes: X 10 = 5.2
Column of Water in Well (feet): = 5.77

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

	Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
7/24	0.5	793.3		
	1	695.0		
	1.5	711.5		
	2	709.0		
	2.5	653.2		
7/25	3	409.1		
	3.5	276.7		
	4	309.0		
	4.5	214.5		
	5.5	188.1		

~ 10 MINUTES TO FULLY RECHARGE.

OBSERVATIONS

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

Post Water Color: Clear Yellow Orange Brown/Black (Sand/Silt) → (GOES DRY)

Sheen? NO 7/24/14 Fuel Odor? NO

Potable Water Added and Removed (Gallons): WELL DRAWS DOWN AFTER 1 CASING VOLUME IS REMOVED. LET RECHARGE -

Notes/Comments: REMOVED 5 CASING VOLUMES.
7/25/14 - REMOVED 5 MORE CASING VOLUMES

PURGE WATER

Gallons Generated: ~~2.5~~ UB 5.5 Delivered to IDW? ~~Yes / No~~ Surface Discharge thru GAC? Yes / No

Initials: UB

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 17.7

Date: 7/25/14

Well #: 17-MW1

Start Time: 1440- 1510

Initials: CB

Weather / Temperature: SUNNY 62°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer **Other:** HAND WATERRA

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump **Other:** ____

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 6.95

Depth to Water (feet): - 2.50

Column of Water in Well (feet): = 4.45

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.4 (1 Casing Volume)

10 Casing Volumes: X 10 = 4.0

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
1	69.12		
2	46.53		
3	47.29		

OBSERVATIONS

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

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

Sheen? NO **Fuel Odor?** NO

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 3 Delivered to IDW? __Yes / ~~No~~__ Surface Discharge thru GAC? __Yes / No__

Initials: CB

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 17-7

Date: 7/25/14

Well #: 17-MW2

~~Start~~ Time: 1415

Initials: GB

Weather / Temperature: PT SUNNY 62°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: ____________

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: ____________

DEVELOPMENT VOLUME

Column of Water in Probe/Well

PRODUCT AT 2.02 FEET

Total Depth (feet): 6.71

Volume of Water in Casing (gal): = ____________ (1 Casing Volume)

Depth to Water (feet): - 2.05

10 Casing Volumes: X 10 = ____________

Column of Water in Well (feet): = ____________

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

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)

DID NOT DEVELOP

OBSERVATIONS

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

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

Sheen? ____________ **Fuel Odor?** ____________

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: ____________ Delivered to IDW? ___Yes / No___ Surface Discharge thru GAC? ___Yes / No___

Initials: ____________

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 1717

Date: 7/25/14

Well #: 17-MW3

Start Time: 1325 - 1400

Initials: UB

Weather / Temperature: PT SUNNY 62°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: HAND WATERRA

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: ______

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 12.37

Depth to Water (feet): - 3.13

Column of Water in Well (feet): = 9.24

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.84 (1 Casing Volume)

10 Casing Volumes: X 10 = 8.4

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
2	79.26		
5	46.09		

OBSERVATIONS

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

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

Sheen? YES

Fuel Odor? YES

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 1B Delivered to IDW? ___Yes / ~~No~~___ Surface Discharge thru GAC? ___Yes / No___

Initials: 5

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 17.7

Date: 7/25/14 1510-1550

Well #: 17-MW4

Start Time: 1510-1550

Initials: UB

Weather / Temperature: PT SUNNY 63°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer **Other:** HAND WATERRA

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump **Other:** ____

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 6.92

Depth to Water (feet): - 2.15

Column of Water in Well (feet): = 4.77

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.43 (1 Casing Volume)

10 Casing Volumes: X 10 = 4.3

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
3	59.21		
6	32.08		

OBSERVATIONS

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

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

Sheen? NO **Fuel Odor?** NO

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 6 Delivered to IDW? ~~Yes / No~~ Surface Discharge thru GAC? Yes / No

Initials: UB

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 17.7

Date: 7/25/14

Well #: 17-MW5

Start Time: 1550 - 1620

Initials: CB

Weather / Temperature: PT SUNNY 62°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer **Other:** HAND WATERRA

Surge Block Used (Circle): Steel Rod Waterra Bailer **Submersible Pump** **Other:**

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 12.30

Depth to Water (feet): - 2.71

Column of Water in Well (feet): = 9.59

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.88 (1 Casing Volume)

10 Casing Volumes: X 10 = 8.8

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
2	62.74		
4	26.81		

OBSERVATIONS

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

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

Sheen? ~~NO~~ YES **Fuel Odor?** CB ~~NO~~ YES

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 4 Delivered to IDW? ~~Yes~~ / No___ Surface Discharge thru GAC? Yes / No___

Initials: CB

WELL DEVELOPMENT DATA — **Haines Fairbanks Pipeline, Haines Alaska**

Specific Site Location: PUMP 17.7
Date: 7/25/14
Well #: 17-MW6
Start Time: 1650 - 1720
Initials: CB
Weather / Temperature: PT SUNNY 61°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer **Other:** HAND WATERRA
Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump **Other:** ______

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 12.35
Depth to Water (feet): - 3.33
Column of Water in Well (feet): = 9.02
X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.82 (1 Casing Volume)
10 Casing Volumes: X 10 = 8.2

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
2	326.4		
4	176.9		
6	78.78		
8	32.92		

OBSERVATIONS

Pre Water Color: Clear Yellow Orange Brown/Black (Sand/Silt)
Post Water Color: Clear Yellow Orange Brown/Black (Sand/Silt)
Sheen? NO
Fuel Odor? SLIGHT
Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 8
Delivered to IDW? Yes / ~~No~~
Surface Discharge thru GAC? Yes / No
Initials: CB

WELL DEVELOPMENT DATA — Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 17.7 — Date: 7/25/14

Well #: 17-MW7 — Start Time: 1720 - 1745

Initials: UB — Weather / Temperature: PT SUNNY 62°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: HAND WATERRA

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: ______

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 13.70 — Volume of Water in Casing (gal): = 0.83 (1 Casing Volume)

Depth to Water (feet): - 4.00 — 10 Casing Volumes: X 10 = 8.3

Column of Water in Well (feet): = 9.10

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

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
1	156.8		
3	113.5		
5	68.23		
5.5	47.81		

OBSERVATIONS

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

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

Sheen? NO — Fuel Odor? NO

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 5.5 — Delivered to IDW? __~~Yes / No~~__ — Surface Discharge thru GAC? __Yes No__

Initials: UB

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 17.7

Date: 7/25/14

Well #: 17-MW8

Start Time: 1620 - 1650

Initials: UB

Weather / Temperature: SUNNY 64°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer **Other:** HAND WATERRA

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump **Other:** ______

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 13.22

Depth to Water (feet): - 3.28

Column of Water in Well (feet): = 9.94

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5'

Volume of Water in Casing (gal): = 0.91 (1 Casing Volume)

10 Casing Volumes: X 10 = 9.1

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
2	95.26		
4	58.42		
5	29.73		

OBSERVATIONS

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

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

Sheen? SLIGHT **Fuel Odor?** SLIGHT

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 5 Delivered to IDW? ~~Yes / No~~ Surface Discharge thru GAC? Yes / No

Initials: UB

WELL DEVELOPMENT DATA — Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 19.5

Date: 7/24/14

Well #: 19-MW2

Start Time: 1820 - 2000

Initials: GB

Weather / Temperature: PT SUNNY 62 °F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: ____

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: ____

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 16.73

Volume of Water in Casing (gal): = 0.67 (1 Casing Volume)

Depth to Water (feet): - 9.36

10 Casing Volumes: X 10 = 6.7

Column of Water in Well (feet): = 7.37

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
2	329.1		
4	151.3		
6	76.21		
8	41.91		

OBSERVATIONS

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

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

Sheen? NO

Fuel Odor? NO

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 8

Delivered to IDW? ~~Yes / No~~

Surface Discharge thru GAC? Yes / No

Initials: GB

WELL DEVELOPMENT DATA CB	Haines Fairbanks Pipeline, Haines Alaska
Specific Site Location: ~~25.5~~ PMP 19.5	Date: 7/25/14
Well #: 19-MW3	Start Time: 0850 - 1300
Initials: CB	Weather / Temperature: PT SUNNY 61°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: ______

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: ______

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 5.08

Depth to Water (feet): - 0.4'

Column of Water in Well (feet): = 4.86

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.42 (1 Casing Volume)

10 Casing Volumes: X 10 = 4.2

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
0.4	214		
0.8	198		
1.2	217		
1.6	114		
2.0	69.7		
2.4	72.1		
2.8	70.0		
3.2	41.92		
3.6	56.21		
4.0	50.11		

OBSERVATIONS

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

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

Sheet? NO **Fuel Odor?** NO

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 4.0 Delivered to IDW? Yes / No Surface Discharge thru GAC? Yes / No

Initials: CB

WELL DEVELOPMENT DATA — Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 19.5
Date: 7/25/14
Well #: 25-MW4
Start Time: 0850 - 1300
Initials: CB
Weather / Temperature: PT SUNNY 60°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: HAND WATERRA

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: HAND WATERRA

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 5.94
Volume of Water in Casing (gal): = 0.49 (1 Casing Volume)

Depth to Water (feet): - 0.51
10 Casing Volumes: X 10 = 4.9

Column of Water in Well (feet): = 5.43

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
0.5	826.1		
1.0	549.6		
1.5	493.1		
2	417.9		
2.5	263.0		
3	149.8		
3.5	109.5		
4	117.3		
4.5	156.7		
5	147.2		

OBSERVATIONS

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

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

Sheen? NO
Fuel Odor? NO

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 5
Delivered to IDW? ~~Yes / No~~
Surface Discharge thru GAC? Yes / No

Initials: CB

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: 25.5

Date: 7/24/14

Well #: 25-MW1

Start Time: 800 - 940

Initials: UB

Weather / Temperature: OVERCAST 60°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer **Other:**

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump **Other:**

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 27.87

Depth to Water (feet): - 20.02

Column of Water in Well (feet): = 7.85

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.72 (1 Casing Volume)

10 Casing Volumes: X 10 = 7.2

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
2	401.0		
4	76.92		
6	40.08		
8	35.96		

OBSERVATIONS

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

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

Sheen? NO **Fuel Odor?** NO

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 8 Delivered to IDW? ___Yes / No___ Surface Discharge thru GAC? ___Yes / No___

Initials: UB

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: 25.5

Well #: 25-MW2

Initials: CB

Date: 7/24/14

Start Time: 0950 - 1145

Weather / Temperature: OVERCAST 65°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: ______

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: ______

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 29.38

Depth to Water (feet): - 24.61

Column of Water in Well (feet): = 4.77

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.43 (1 Casing Volume)

10 Casing Volumes: X 10 = 4.3

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
2	OVER		
4	329.1		
6	101.5		
8	79.17		
10	22.11		

OBSERVATIONS

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

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

Sheen? NO

Fuel Odor? YES

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 10 Delivered to IDW? __Yes / No__ Surface Discharge thru GAC? __Yes / No__

Initials: CB

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: 25.5

Well #: 25-MW3

Initials: IB

Date: 7/24/14

Start Time: 1605-1750

Weather / Temperature: OVERCAST 62°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: ______

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: ______

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 30.50

Depth to Water (feet): - 24.67

Column of Water in Well (feet): = 5.83

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.53 (1 Casing Volume)

10 Casing Volumes: X 10 = 5.3

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
2	429.0		
5	156.1		
6.5	45.21		

OBSERVATIONS

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

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

Sheen? NO **Fuel Odor?** SLIGHT

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 6.5 Delivered to IDW? ~~Yes / No~~ Surface Discharge thru GAC? Yes / No

Initials: IB

WELL DEVELOPMENT DATA	Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: 25.5

Date: 7/24/14

Well #: 25-MW4

Start Time: 1605 - 1700

Initials: UB

Weather / Temperature: OVERCAST 62°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: ______

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: HAND WATERRA

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 29.20

Volume of Water in Casing (gal): = .68 (1 Casing Volume)

Depth to Water (feet): - 21.74

10 Casing Volumes: X 10 = 6.8

Column of Water in Well (feet): = 7.46

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
4	69.21		
8	41.08		

OBSERVATIONS

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

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

Sheen? ~~YES~~ NO

Fuel Odor? YES

Potable Water Added and Removed (Gallons):

Notes/Comments: SET WATERRA UP ON 25-MW-3 AND HAND WATERRAED AT 25-MW4

PURGE WATER

Gallons Generated: 8 Delivered to IDW? ~~Yes / No~~ Surface Discharge thru GAC? Yes / No

Initials: UB

WELL DEVELOPMENT DATA

Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: 25.5

Date: 7/24/14

Well #: 25-MW5

Start Time: 1410 - 1545

Initials: CB

Weather / Temperature: ______

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: ______

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: ______

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 27.14

Volume of Water in Casing (gal): = 0.72 (1 Casing Volume)

Depth to Water (feet): - 19.20

10 Casing Volumes: X 10 = 7.2

Column of Water in Well (feet): = 7.94

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
3	over		
5	239.8		
7	157.5		
10	56.21		

OBSERVATIONS

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

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

Sheen? NO

Fuel Odor? NO

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 10

Delivered to IDW? ~~Yes / No~~

Surface Discharge thru GAC? Yes / No

Initials: CB

WELL DEVELOPMENT DATA — Haines Fairbanks Pipeline, Haines Alaska

Specific Site Location: PMP 25.5

Date: 7/24/14

Well #: 25-MW6

Start Time: 1200 - 1400

Initials: UB

Weather / Temperature: PT SUNNY ~65°F

DEVELOPMENT DATA

Pump Type (Circle): Waterra Submersible Bailer Other: ____

Surge Block Used (Circle): Steel Rod Waterra Bailer Submersible Pump Other: ____

DEVELOPMENT VOLUME

Column of Water in Probe/Well

Total Depth (feet): 35.35

Depth to Water (feet): - 27.15

Column of Water in Well (feet): = 8.20

X Gallons per foot of 1.25" (X 0.064) or 2" (X 0.163) or 4" (X 0.65) 1.5"

Volume of Water in Casing (gal): = 0.75 (1 Casing Volume)

10 Casing Volumes: X 10 = 7.5

Well development will be considered complete when turbidity decreases (goal is less than 50 nephelometric turbidity units (NTU)) or after the removal of 10 casing volumes, whichever comes first.

WATER QUALITY PARAMETERS

Water Removed (Gallons)	Turbidity (NTU)	Water Removed (Gallons)	Turbidity (NTU)
1.5	121.7		
4	36.21		
7.5	19.49		

OBSERVATIONS

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

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

Sheen? NO

Fuel Odor? NO

Potable Water Added and Removed (Gallons):

Notes/Comments:

PURGE WATER

Gallons Generated: 7.5 Delivered to IDW? Yes / No

Surface Discharge thru GAC? Yes / No

Initials: UB

APPENDIX E
Field Notes

INCH

PREP ITEMS INCLUDE:

→Review Work Plan and develop plan for the day
→Review and load gear from appropriate checklist
→Print necessary forms
→Calibrate YSI, Turbidity Meters, etc.
→Dump and refill decon/rinse water buckets
→Drive to site
→Conduct health and safety meeting

RECYCLED

CLEAN UP/END OF DAY ITEMS INCLUDE:

→Complete daily forms and update Project Manager(s)
→Dump trash
→Handle IDW appropriately (label and store/GAC treatment)
→Clean YSI probes
→Check pH on DRO samples and add HCl as necessary
→Put samples in refrigerator
→Clean field vehicle
→Charge peristaltic pump/submersible pump batteries

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HFP AREA SITES:

PMP 17.7, 19.5, 25.5

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Project F10AK1016-03 and -14

Haines, AK
W911KB-12-D-0001, TO 29

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8/8/14 Clear, 50°F 1/3

0515 Arrived at FAI for flight to ANC - JNU.

0930 Arrived in JNU and checked in at Wings of Alaska for flight to HNS.

1030 Flight leaves JNU for HNS
- Caravan 208B

1110 Arrived in HNS and found van

1120 Met Josh at the airport. Organized gear for sampling today.

1140 Left the airport with Josh to go to the PMP 19.5 site. Chris went to the ice plant to work out freezing down more gel ice.

1200 Arrived at PMP 19.5 site. Conducted site walk to locate wells. Unload and organize gear for sampling

8/8/14 Cloudy, 55°F 2/3

1240 Chris Arrived on site after dropping off ice. Needs to be picked up by 1130 on Sunday.

~~8~~ Completed set up at 19-MW3

1.5" Ø well. Water level was very shallow and the WL indicator did not go down far enough on the tape to read the numbers. I put the tip into the water and then marked the top of casing with my finger. I then transfered that measurement to the tape. As a result, the depth to water measurements are considered to be estimates.

1319 Start purging

1345 Collect samples

1429 Finished collecting samples. See GW Sample form.

Rite in the Rain

8/8/14 Cloudy, 55°F 3/3

Cleaned up and started collecting surface water and sediment samples with Chris. See sample forms

1910 Left site at the completion of sampling

1930 Arrived at the Chalet. Unloaded and organized gear.

2000. End of Day

A.S.

8/9/14 Cloudy 1/5

0800 Started prepping for sampling today.

0845 Left the Chalet w/ Chris to go to the PMP 17.7 Site.

0900 Arrived on site and did brief site walk orientation. Chris noted that the surface water has decreased from the last time he was here.

0910 Worked on filling out labels for the days sampling

Set up GPS to get current almanac and prepare for locating sampling points.

0938 Josh arrived on site

1145 Completed prep and started collecting samples at the Slough

1300 Completed sampling at Slough. See log sheet.

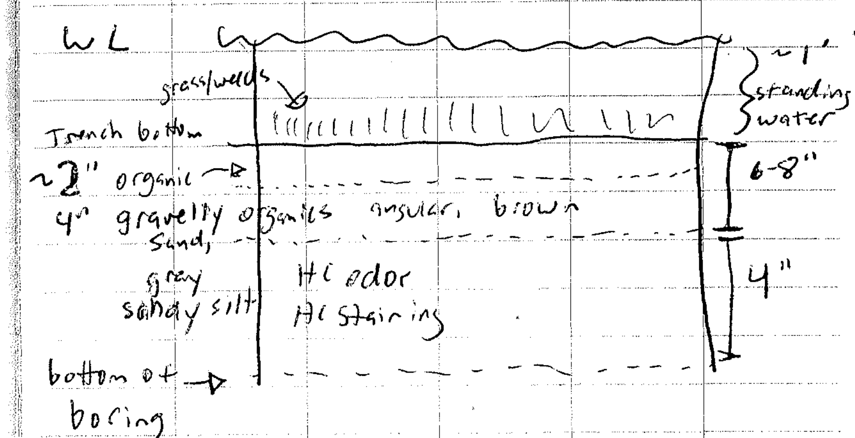
Rite in the Rain

8/9/14 Overcast, Rain, 50°F 2/5

Major evidence of the bear at a large tree near SE2. However, we did not see the bear.

Started sampling in the pipeline trench. Surface water, sediment.

Lithology of sediment sample locations was similar at each site



Samples collected w/ hand auger & SS spoons

8/9/14 Overcast, Rain 50°F 3/5

1630 Completed sampling in the pipeline trench

1640 Calibrated miniRAE Lite Photoionization detector Span = 100.0 ppm

Warmed up sediment samples in the van prior to evaluation with the PID. See sample tracking log for PID results.

1657 Completed PID analysis

Set up for collecting samples in the wetland.

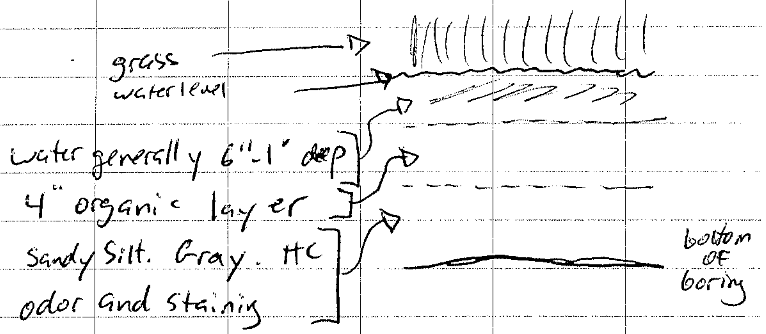
SE-6, WS-3 - see sample forms

1737 Measured WL in 17-MW2 2.1' btoc

PID ~~sam~~ sediment samples - see sample form

8/9/14 Overcast, Rain 4/5

General lithology observed



- Noted more grass than in the pipeline trench.

- There was no gravel or cobbles in the wetland samples from today, compared to the pipeline trench samples.

- Observed many organisms in the surface water - likely mosquito larvae.

- sandy Silt, ~~w~~ was saturated, gray, and had strong HC odor.

8/9/14 Overcast, Rain 5/5

1945	Completed sampling and started cleaning up for the day.
2015	Left site for the Chalet.
2030	Arrived at Chalet. Unloaded gear and organized samples. Finished forms and field book.
2100	Dinner
2200	Work on computer and COCs, etc.
2300	End of day

AS

Rite in the Rain

8/10/14 Overcast, Rain, 50°F 1/3

0800 Prep for the day, Identify sample kit, calibrate YSI and turbidimeters (see cal form).

0910 Left Chalet

0929 Arrived on site. Started prep for ~~[illegible]~~ sediment sampling.

~~[illegible]~~ See sample form.

1105 Left site w/ Chris to pick up ice from fish plant.

1135 Arrived at Haines packing plant and loaded the 6 cases of ice into the freezer in the van. Some partially frozen not put in freezer.

Checked in with Wings of AK - they have not been flying today. Decided to take ferry today.

8/10/14 Overcast, Rain 50°F 2/3

1205 Arrived at Ferry Terminal and bought ticket to JNU.

1225 Talked to Craig and gave him an update on our status

1250 Arrived back at PMP 17.7 to complete sampling

1300 Started sediment sampling again. See field form

1350 Set up at 17-MW2 for sampling. See GW sample form

1510 Completed sampling. Tear down and clean up. Decon WL meter. Pack van.

PID sediment samples w/ mini RAE Lite. See sample form for readings

8/10/14 Overcast, Rain 3/3

1550 Left site for Haines.

1610 Checked in with Wings of Alaska, and they still did not have any flights coming or going today. They confirmed I could get a refund for the flight, and we headed to the ferry.

1625 Arrived at the ferry terminal.

2200 Ferry Arrived in JNU

2230 Arrived at lodging - end of day

A.S.

8/11/14 Overcast, Rain 55°F 1/1

0600 Arrived at airport for flight to ANC, then on to FAI.

1130 Flight lands in FAI

1200 Returned to FES.

A.S.

Rite in the Rain®
ALL-WEATHER
JOURNAL
№ 393N

Christopher Boese
Fairbanks Envrionmental Services
907-378-4630
2014 Haines PMP 17.7, 19.5, & 25.5
Contract No. W911KB-12-D-0001
Task Order 29

CBOESE

PREP ITEMS INCLUDE:

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

CLEAN UP/END OF DAY ITEMS INCLUDE:

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

CONTENTS

PAGE	REFERENCE	DATE
	CM = CRAIG MARTIN	
	IPEC = INSIDE PASSAGE ELECTRIC COOPERATIVE	
	AP&T = POWER & TELEPHONE	
	RB = RUSTY BUTLER	
	MM = MIKE MCHANEY	
	JR = JEFF REZIN	
	ISO. = 100 ppm ISOBUTYLENE	
	GT = GEOTEK ALASKA	
	~~JP~~ CB	
	VR - VANESSA RITCHIE	

7/13/14 - 0500 - SHOP, PACK REMAINING ITEMS. 0600 - LEAVE SHOP FOR HAINES, AK. 0605 - FUEL VAN AT SOURDOUGH FUEL. 0812 - DELTA. 1017 - TOK. FUEL VAN IN BORDER CITY. 1627 - HAINES JUNCTION. A LOT OF ROAD CONSTRUCTION FROM BORDER TO HAINES JUNCTION. 1827 - ARRIVE AT 17.7 CHECK SWAMP LEVELS. AREAS WHERE WE ~~ARE~~ DRILLING LOOK TO BE ~0.5-1'. RIVER WATER LEVELS ARE VERY HIGH. 1718 - DROVE TO TOWN (HAINES) CALLED RUSTY FROM GEOTEC. RUSTY WEATHERED IN JUNEAU. WILL MEET ON 7/14/14 AT DMP 19.5. CALLED CRAIG MARTIN TO LET HIM KNOW MY STATUS. 1953 - FUEL VAN @ BIGFOOT SERVICE. DRIVE BACK TO CABIN. UNLOAD

VAN INTO BLUE POP UP TENT
2030 - END OF DAY [signature]
7/14/14 - 0630 - PREP FOR
DAY. PUT REMAINING ITEMS
FROM VAN IN BLUE TENT.
PREP FOR DIG LOCATES
0805 - LEAVE CABIN FOR PMP
17.7. 0827 - ARRIVE 17.7
USE GPS TO LOCATE 17-MW1
AND 17-BHS. WATER AT
17-MW1 IS (SWAMP) 1.75'
DON FROM APT ARRIVES
ONSITE AT 0837 ~~0847~~. DID
SITE WORK WITH HIM.
HE (APT) HAS UTILITES
THAT RUN IN THE PIPELINE
TO A JUNCTION BOX NEAR
17-MW3 (MARKED UP MAP)
THEN LINE GOES OUT
OF BOX BACK IN PIPELINE
UP HAINES HIGHWAY (NORTH)
CONFIRMED (DON) NO LINES
ON OTHER (SOUTH) SIDE OF
ROAD. DON LEFT SITE TO
DO LOCATES AT ~0853.
→ PMP 19.5

0905 - JASON FROM IPEC
ARRIVES. HIS LINES (UTILITY)
ALSO RUN IN PIPELINE
TO BOX THEN BACK IN
PIPELINE (MARKED UP MAP)
HE CONFIRMED NOTHING ON
OTHER (SOUTH) SIDE OF
ROAD. NOTE: BOTH COMPANIES
SAY THEY CANNOT USE
LOCATOR TO LOCATE LINES
IN THE PIPELINE. ~0915 -
MOVE TO PMP 19.5. DON
ALREADY ONSITE LOCATING
LINE THAT GOES FROM
GROUP OF UTILITY BOXES
TO CREEK (HORSE FARM)
JASON (IPEC) ALSO ONSITE.
MARKED UP MAP FOR BOTH
COMPANIES. BOTH UTILITES
BREAK AWAY FROM PIPELINE
NEAR PROPOSED POINT 19-BH11.
THEN RUN TOGETHER TO
UTILITY BOXES. BOTH IPEC/APT
CONFIRM THAT UTILITY LINE
DOES NOT RUN ON OTHER

SIDE OF ROAD NEAR BORINGS 17-BH13-17 HOWEVER IT DOES CROSS ROAD AT JUNCTION BOX FURTHER SOUTHEAST OF 17-BH17. IPEC ALSO SPRAYPAINTED UTILITY FROM BOXES TO HORSE FARM CREEK. ~~0940~~ CB - TALKED TO DON (AP&T) ABOUT PUMP 25.5 UTILITES MARKED UP MAP. HE ONLY HAS OVERHEAD LINES IN THE AREA. 0940 - MOBE TO PUMP 25.5. JASON (IPEC) LOCATED UNDERGROUND UTILITY LINE FROM 25' NORTHEAST OF GATE VALVE TO 50' SOUTHWEST OF 25-BH9/25-MW2. I ALSO MARKED LINE WITH RED PIN FLAGS. TOOK PHOTOS OF JASON WITH LOCATOR. JASON CONFIRMED NO UTILITIES ON SOUTH SIDE OF ROAD (HAINES HIGHWAY). JASON LEFT SITE AT 1015.

I DOCUMENTED ALL UTILITY LOCATES IN FIELDBOOK TO 1035. LEFT SITE TO WINGS TO PICK UP CRAIG MARTIN. 1056 - ARRIVE AT WINGS (AIRPORT) MORNING FLIGHT COULD NOT LAND DUE TO FOG CM TOOK FERRY. 1108 - DRIVE TO HAINES FOR CELL RECEPTION. CALLED CM → TALK LOGISTICS. ALSO PICK UP HIP WADERS AT OLERUDS SPORTING GOODS. 1223 - HEAD BACK TO LOCATE SAMPLE POINTS AT SITES. CM FERRY IN AT ~~1645~~. LOCATE ALL SAMPLE POINTS AT 17.7. NOTE: THICK BRUSH ON SOUTH SIDE OF ROAD DRILLING LOCATIONS. 1-2' OF WATER IN SOME SPOTS ON NORTH SIDE OF ROAD / EXCESSIVE OVERGROWTH. 1437 - MOBE TO 19.5. LOCATE ALL SAMPLE LOCATIONS (WITH GPS).

PICKED UP CM AT 1200. DINNER. BACK TO CABIN 1930
MOST OF SITE IS CLEARED EXCEPT
LARGE TREES STILL REMAIN ON
SOUTHEAST CORNER OF SITE. 1600 -
LOCATE ALL SAMPLE LOCATIONS AT 17.7
7/15/14 - 0800. PREP FOR
SAFETY / WORK BREAKFAST
WITH GEOTEC. 0830 - HAVE
BREAKFAST - DISCUSS PLAN
FOR DRILLING. START AT
25.5. 0937 - SITE VISIT
AT 25.5 W/ CM / RB /
M TO 0955. DRIVE TO
19.5 FOR SITE VISIT ARRIVE
AT 1003 TO 1026. MOBE TO
TOWN. STOP BY SPORTING GOODS
STORE FOR CM TO PICK UP
RAINGEAR. 1119 - STOP BY
POST OFFICE 1227 - STOP BY
PMP 19.5 TO CHECK ON
GEOTEC. NOT THERE. MOBE TO
PMP 17.7 1232 - 17.7 WAIT
FOR ANN MARIE. INVESTIGATE
SITE WITH CM. SITE VISIT
WITH ANN MARIE (DEC) UNTIL
1400. MOBE TO PMP 19.5

SITE VISIT WITH ANN
MARIE UNTIL 1510. MOBE
TO 25.5 → SITE VISIT
UNTIL 1606. STOP AT
HANK JACOVE' RESIDENCE
AND GET APPROVAL TO
INSTALL WELLS IN HIS
YARD. (EXTREMELY NICE
GUY). DRIVE TO CABIN.
PREP GEAR FOR WEDNESDAY
DRILLING ACTIVITIES. NOTE:
RUSTY WAS ABLE TO LOCATE
PIPELINE AT PMP 19.5. HE
WILL PROVIDE REPORT OF HIS
OBSERVATIONS AND A MAP
SHOWING X, Y HORIZONTAL
COORDINATES OF PIPELINE.
PIPELINE IS NORTH OF APPROX.
LOCATION SHOWN ON MAPS.
BORINGS WILL BE FIELD
ADJUSTED BASED ON PIPELINE
LOCATION. END OF DAY AT
1930 07/16/14 - 0800 - PREP FOR
DRILLING AT PMP 19.5. GEOTEC
UNABLE TO START EARLY

BECAUSE DRILLING GEAR IS
STILL NOT OFF /OUT OF
SHIPMENT. 1020 - DRIVE
INTO HAINES 1055 - RADIO
SHACK - PICK UP PRINTER
CABLE CHECK ON DRILLERS.
ESTIMATED TIME IS ~~NOON~~
1230. 1145 - LEAVE HAINES
FOR PMP 19.5 MEET WITH
HOMEOWNER ACROSS STREET → LET HIM
KNOW WE WILL BE DRILLING/DATES.
1420 - CALIBRATE FES PID 3 = 100ppm ISO.
1425 - SET UP ON 19-BH08
~~TO~~ DRILL → SEE BORING
LOG. 1450 - SET WELL 19-
MOVE 19-BH9 CLOSER TO MW1
~~CREEK~~ TO LOOK FOR
CONTAMINATION - NO PID
VALUES. OR FUEL OBSERVATIONS
MOVED 19-BH10 UP AWAY
FROM CREEK & NW OF 19-BH08
TO SEE IF ANY CONTAMINATION
IS IN THE AREA - ALL BH'S
~~TO~~ THIS POINT ARE W/1
10 FEET OF PIPELINE

IDENTIFIED BY EM ON
7/15/17 Ch Boise
1554 - 19-BH10 0-5'
→ SEE B.L. 1614 - START
19-BH11. 1635 - MEASURED
66 METERS FROM OLD
ROAD TO PIPELINE FOR
19 ~~BH~~ 12. → SET WELL.
19-MW2. CLEAN UP TO
1800 - LEAVE SITE. PLAN
IS TO DO BORINGS ON
OTHER SIDE OF ROAD
ON 7/17/14. 1825 - CABIN →
CLEAN UP. PREP FOR
7/17/14 → END OF DAY
AT 1900. NOTE: CONDUCTED
TAILGATE SAFETY MEETING
PRIOR TO DRILLING ACTIVITIES →
SEE FORM. 7/17/14 - 0700 -
PREP FOR DRILLING AT
PMP 19.5, 0730 - MOBE TO SITE.
0750 - ARRIVE AT PMP 19.5
PREP TO DRILL SOUTH SIDE
OF HAINES HIGHWAY. GEOTEC
NOT ON SITE. DECIDE TO GPS

BORINGS/WELLS

SITE FEATURES → HOUSE, DRIVEWAY
NEW WELL, HORSE FARM STREAM
SMALL STREAM, DRAINAGE
DITCH 0930 – GEOTEC STILL
NOT ONSITE → DRIVE TO
TOWN FOR CELL SERVICE
1002 – FUEL VAN AT
BIGFOOT SERVICES. MOUNTAIN
MARKET TO GET WIFI TO
1045. 1105 – PMP 19.5 →
SET UP DRILLING ON. CALIBRATE
FES PID #3 1150 – DONE AT
19-BH13 → MOBE TO 19-BH14
NOTE: WEATHER ~55°F OVERCAST
NO RAIN. SET WELL @ 19-MW3
IN 19-BH14 TO 1227 → MOBE
TO 19-BH15. ~MOBE TO 19-
BH16. DONE BY ~1300 MOBE
TO 19BH17 DONE BY 1335 →
SET WELL 19-MW4. CLEAN
UP. MOBE TO PMP 25.5.
SITE WALK WITH J.R. UNLOAD
GEOPROBE START AT 25-BH8.
1618 – DONE WITH 25-BH8 →
INSTALLED 25-MW1 → SEE LOG.

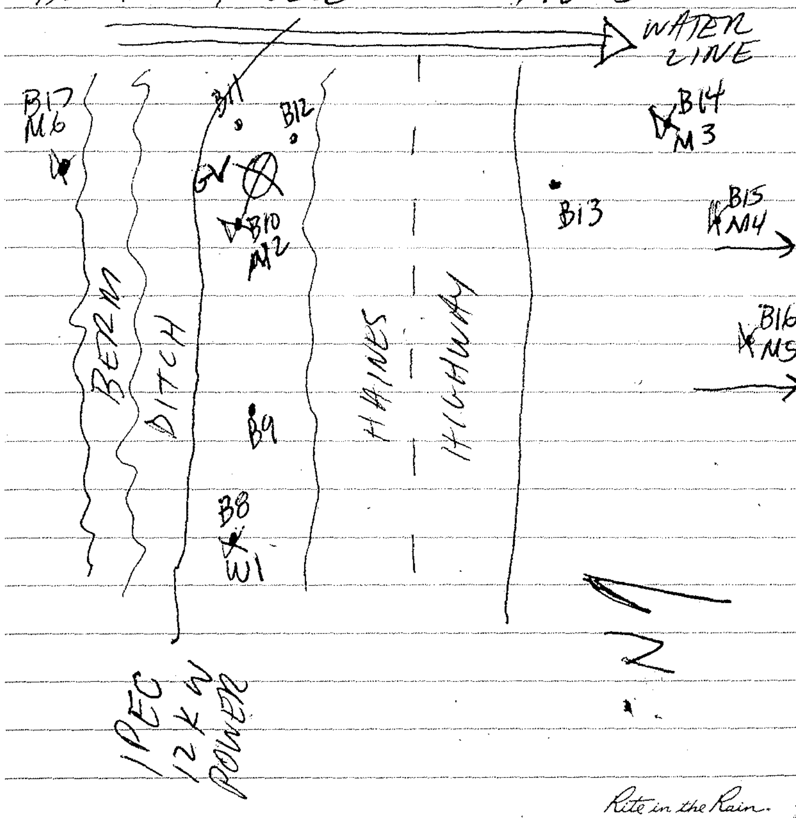
NOTE: GT HAVING ISSUES
SETTING WELL → HAD TO GO
TO ROADHOUSE 33 MILE TO
GET TOOLING FOR SOFT
GEOLOGY. FINISHED SETTING
WELL AT 1815. MOBE TO
25-BH9. NOTE: CHANGED
NUMBER SCHEMES FROM BORINGS
& WELLS ON ALL MAPS –
BORINGS & WELLS ARE
NUMBERED IN THE ORDER
THEY WERE INSTALLED.
1915 – DONE WITH 25-BH9 →
CLEAN UP SITE. 1927
LEAVE SITE. 1942 – ARRIVE
AT CABIN. END OF DAY
[signature]
7/18/14 – 0730 – PREP FOR
DRILLING AT PMP 25.5
0800 – HAVE SAFETY BREAK-
FAST WITH GT → DISCUSS
HIGHWAY SAFETY. 0850 –
ON SITE PMP 25.5 → PREP
TO START AT 25BH10.
CALIBRATE FES PID#3 TO

12

100 PPM ISO. 0920 - START DRILLING 25-BH10. 1035 - START SETTING WELL IN 25BH10 = 25MW2. ~1120 - START TO DRILL 25-BH11 - SEE BORING LOG(S).
1221 - MOBE TO 25-BH12.
1334 - DONE AT 25-BH12 MOBE TO 25-BH13. 1410 - START 25-BH13. 1448 - MOBE TO 25-BH14. SET WELL 25-MW3 TO 1620
NOTE: WEATHER WAS COOL OVERCAST IN THE MORNING AND HOT (65°F)/SUNNY AFTER 1510. 1625 - START 25-BH15 TO 1655, SET WELL 25-MW4 TO 1715. MOBE TO 25-BH16. 17~~20~~03 START 25-BH16. DONE AT 1800 SET WELL 25-MW5 TO 1835 → MOBE TO 25-BH17. DRILL BORING TO ~1945 → SET WELL 25-BH6. CLEAN UP. 2035 LEAVE SITE -

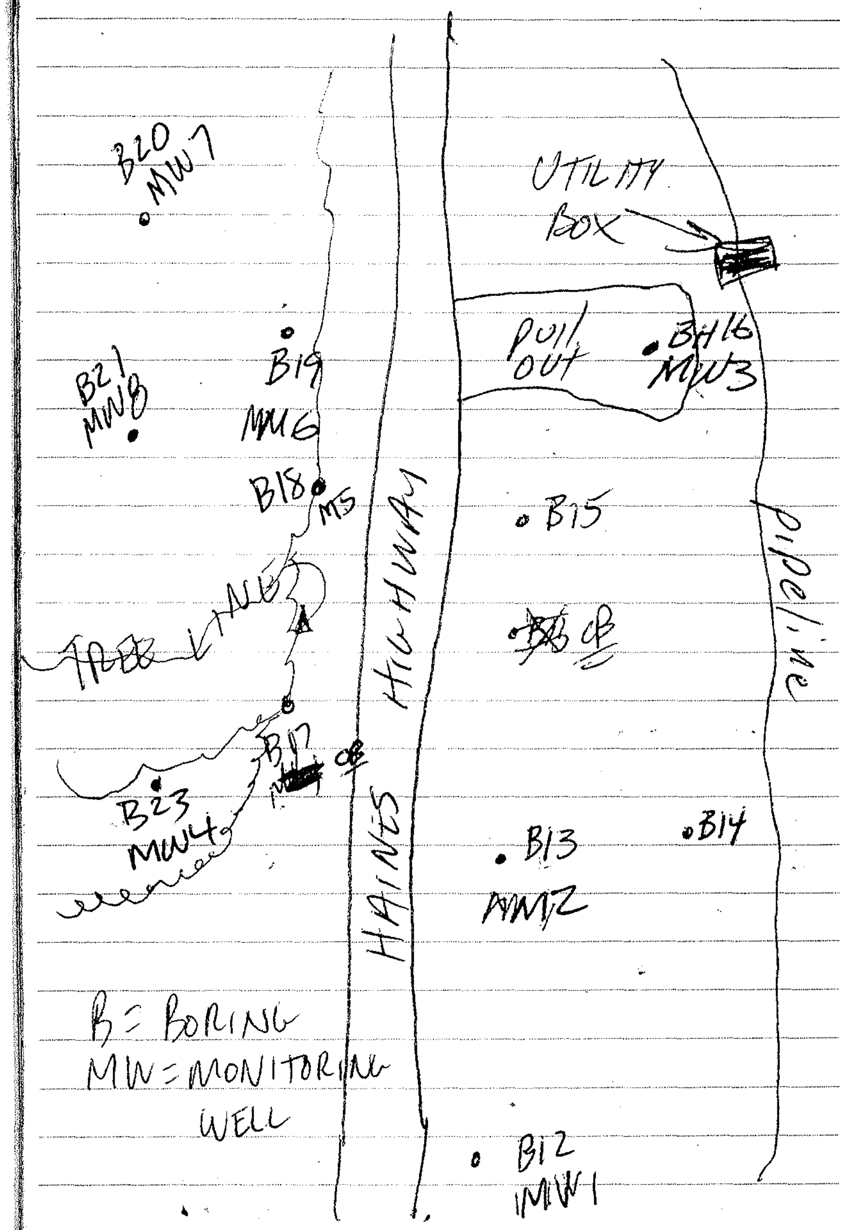
13

2100 - CABIN. END OF DAY [signature]
7/19/14 0730 - PREP FOR DRILLING AT 17.7. 0830 - ARRIVE AT PUMP 25.5 → WAIT FOR GT → FINISH INSTALLING 25-MW6 (ONLY HAD 5' OF SCREEN ON NIGHT PRIOR. GPS'ED ALL BORING/WELL LOCATIONS



1200 - ARRIVE AT PMP 17.7
SET UP ON 17-BH12
DECIDE TO START ON NORTH
SIDE OF ROAD BECAUSE OF
GOOD WEATHER. SET UP
TRAFFIC SIGNS FOR BOTH
LANES. USED FLAGGERS
TO WALK GEOPROBE ON
SHOULDER OF ROAD TO
1256 - START 17-BH12. CAL-
IBRATE FES PID #3 TO
100 ppm ISO. 1335 - 1410 -
DRILL 17-BH13. NOTE: INST-
ALLED WELL 17-MW1 IN
17-BH12 AND 17-MW2 IN
17-BH13. 1450 - MOBE TO
17-BH14. 1510 - MOBE TO
17-BH15. TO ~1615. MOBE
BACK ~22' PAST BH12 TO
BETTER DEFINE SOUTHERN EDGE
& VERTICAL EXTENT. SCOPED
OUT OTHER SIDE OF ROAD
W/ GT FOR 7/20/14. 1708
START 17BH16. 1745 - SET
WELL 17-MW3 TO 1850.

LEAVE SITE AT ~1905.
ARRIVE AT CABIN BY
1935. CLEAN UP. END
OF DAY 2000. 7/20/14 -
PREP FOR DAY #2 DRILLING
AT PMP 17.7. 0900 - ARRIVE
AT PMP 17.7. WEATHER =
~55°F & RAIN.
SITE MAP NEXT PAGE.
CALIBRATE FES PID #3 TO
100 ppm ISO. INSTALLED 2
WELL POINTS WHERE PROD-
UCT WAS ENCOUNTERED IN
2012 - NO FUEL FOUND.
1100 - READY TO DRILL
17-BH19. WILL SEE IF THERE
IS CONTAMINATION IN 17-
BH20 TO DECIDE WHERE TO
PUT WELL AT. 1145 - MOBE
TO 17-BH20. NOTE: SOME
LOCATIONS (BORING) OFFSET
DUE TO ACCESS THROUGH
WOODS. LARGE COTTONWOOD
DOWN TREES IN FOREST.
SET WELL 17-MW7 TO



1257. SET WELL 17-MW6 IN 17-BH19 ON WAY BACK THROUGH TREES. [1231]

RETURNED TO WELL POINTS TO MEASURE. WP1 = NO PRODUCT WP2 = NO PRODUCT, WP1 IN 1.5 SWAMP WATER WP2 NOT IN STANDING WATER. 17-WP3 - NO PRODUCT - WATER ENCOUNTERED. WATER AT 3.85 / GROUND AT 2.5 — WATER IS 1.35 BELOW GROUND. NO ODOR ON WLI 17-WP4 - NO PRODUCT.

THESE PROBES NEAR 2012-TW5 NOT 2012-TW4

MEASURED 17-MW2 (PRE WELL CUT) = 0.05' OF PRODUCT.

1515 - SET UP ON 17-BH21/MW-7

1615 - MOBE TO 17-BH18/17-MW5.

1716 - MOBE TO 17-BH17. NOTE: SOIL IN 17-BH17 WAS CONTAMINATED. MOVED ~100 FT + AND

DRILLED 17-BH23/17-MW4
HAD DIFFICULTIES GETTING
DRILL RIG OUT OF DITCH
AREA. ~1900 → LEAVE SITE
ARRIVE AT CABIN. CLEAN
UP UNTIL 2030. END OF
DAY. [signature]
7/21/14 - 0700 - PREP FOR
COLLECTING SEDIMENT AND
SURFACE WATER SAMPLES
AT 17.7. 1110 - ARRIVE
PMP 17.7 → SET UP. COLL-
ECT ALL 5 SEDIMENT
AND BOTH SURFACE WATER
SAMPLES ALONG THE SLEW.
→ NO SIGNS OF CONTAMINATION.
ALSO COLLECTED WS & SE
SAMPLE NEXT TO 17-BH13/
17-MW2. → ~~SAMPLE~~ WS SAMPLE
HAD NO SIGNS OF FUEL
BUT SE SAMPLE HAD
STRONG FUEL ODOR. 1430
CLEAN UP AND HEAD BACK
TO CABIN FOR CM TO PACK
FOR FLIGHT BACK TO FAIRBANKS

1500 - AT CABIN. CLEAN UP.
1545 - VR ARRIVE. DRIVE
INTO TOWN TO MEET CM
CCM PICKING UP IDW
TRANSPORT FORM & MEET
WITH ANN MARIE (DEC) IN
IN HAINES. HAVE ~~DINNER~~ →
DROP CM OFF AT AIRPORT
DINNER W/ VR. FUEL
VAN AT BIGFOOT FUEL.
HEAD BACK TO CABIN. UNLOAD
FREEZER FROM VR VAN &
ROTATE GEL ICE PACKS.
NOTE: DRILLERS GT COMP-
LETED WELLS AT ALL 3
SITES. FILLED OUT IDW
STICKERS & GATHERED TRASH
FOR GT. GT IS GOING
TO TAKE IDW TO ANCHORAGE
VIA FERRY. 2100 - END OF
DAY. [signature] 7/22/14 - 0800
TIMESHEETS. PREP FOR
WS/SE SAMPLEING AT
PMP 17.7 & WS/SE/SS
SAMPLEING AT PMP 19.5.

TO 1003 - LEAVE CABIN STOP BY 19.5 TO FIND HAND AUGER. 1030 - ARRIVE AT PMP 17.7. CALIBRATE FES PID #3 → SET UP TO WS/SE SAMPLE → SEE SAMPLE TRACKING LOGS FOR LOCATIONS AND TIMES + SEPERATE NOTE PAGES. 1755 - LEAVE SITE. ~1825 - ARRIVE AT CABIN. DINNER TO 1930. WRAP/PACK ALL SOIL SAMPLES TO 0130. END OF DAY. FCB [signature]

07/23/14

0700 - PREP COOLERS FOR SHIPMENT - ADD FRESH ICE + CUSTODY SEALS & TAPE. 0830 - LEAVE FOR WINGS AVIATION. SHIP 3 COOLERS TO ANCHORAGE + 1 TO DENVER. HEAD INTO TOWN TO GET MORE PACKING SUPPLIES

1105 - ARRIVE BACK AT CABIN. ROTATE ICE. PREP FOR WS/SE SAMPLING AT 19.5. PICK UP VR (SHE HAD BEEN PACKING COOLERS FOR WS SHIPMENT ON 7/24/14. 1145 - LEAVE CABIN (CHALET) FOR PMP 19.5. NOTE: ALL SE & SS SAMPLES AT PMP 19.5 WERE COLLECTED WITH DISPOSABLE SPOONS → NO RINSATE. ~~19-SS1~~ CB ~~&~~ 19-SS2 WERE LOCATED BASED ON WHERE SMALL CREEK (NOT HORSE FARM) ONCE FLOWED. NOTE: ALL SEDIMENT SAMPLES COLLECTED AT PMP 17.7 ON 7/23/14 WERE SILTS. 19-SE1 & SE2 WERE SAND 19-SS1 WAS SAND AND 19-SS2 WAS ~~SAND~~ SILT. (BROWN). 19-SS2 IN PROXIMITY TO 19-BH8

NO SIGNS OF FUEL
CONTAMINATION IN EITHER
SS SAMPLE. FINISH
COLLECTING THE REST OF
THE SE/WS SAMPLES. 1810 -
RETURN TO CABIN. PREP FOR
GWS AT 25.5 ON 7/24/15. PACK
PAH COOLERS FOR SHIPPING. 2130 -
7/24/15 END OF DAY
0700 - PREP FOR WELL
DEVELOPMENT AND GROUND
WATER SAMPLING AT PMP
25.5. 0737 - LEAVE CABIN
0752 - ARRIVE. AT
PMP 25.5 → SET UP ON
25-MW1, DEVELOPED ALL
WG'S AT 25.5 → SEE
FORMS. ~1010 - MIKE M
FROM GT SHOWED UP →
TOLD HIM TO MAKE WELLS
ON SOUTH SIDE OF THE ROAD FLUSH. 1140 KD AT 19.5
ON-SITE. WEATHER IS
PT SUNNY MOST OF DAY TO OVERCAST
~65-70°F. SAFETY BRIEF

KD. SET HER UP TO SAMPLE
25-MW1. NOTE: CALIBRATED
TURBIDITY #7 (OAKTON) PRIOR
TO DEVELOPMENT. USED
SURGE BLOCK AND WATERRA
INERTIA PUMP TO DEVELOP
WELLS FLOWRATE ~~= 0.1~~ TO
~~0.15~~ ~~GPM~~. ALSO HAND CB
WATERRA'ED WELLS TO
REMOVE AS MUCH SILT
AS POSSIBLE. 0.1-0.15 GPM
DEVELOP TO 1730. SHOW
UR ALL BH/MW LOCATIONS
FOR HER TO ASSIST WINDY
CREEK SURVEYS. LOCK &
CLOSE & TAKE PICTURES OF
ALL WELLS OPEN. ~~COLLECT~~
~~RINSATE FROM BLADDER~~ CB
~~PUMP USED IN 25-MW2~~
1811 - LEAVE PMP 25.5 TO
DEVELOP WELL AT PMP 19.5
1820 - ARRIVE PMP 19.5
SET TO DEVELOP 19-MW2
WITH WATERRA. AND HAND
WATERRA 19-MW1. ALSO

RESAMPLED 19-SS1 FARTHER
INTO TREES PER CM.
LEAVE SITE AT 2013.
~~HEAD TO TOWN TO FILL~~ CB
~~GENERATOR FOR 7/25/14.~~
DECIDE TO FILL TOMMORROW
7/25/14 WHEN TANK IS
EMPTY. ~~0820~~ 2025 - ARRIVE
AT PMP 25.5 → KEEP
VR/KD CLEAN UP. 1851
ARRIVE CABIN. CLEAN TO
UP. PREP FOR 7/25/14 1930
7/25/14 - 0730 - PREP
FOR SAMPLING AT ALL
SITES. 0830 - LEAVE CABIN.
0845 - ARRIVE PMP 19.5
PURGE 19-MW1 DRY - LET
RECHARGE. KD SET UP
SAMPLING 19-MW2. SET
UP WATERRA ON 19-MW3
HAND WATERRA AT 19-MW4
→ WELLS TAKE BETWEEN
10-11 MINUTES TO FULLY
RECHARGE → ROTATED IN
CYCLE FROM WELL TO

WELL PULLING OUT SILTY/
SANDY WATER AND HAND
AUGERED NEAR 19-MW1
IN BETWEEN. REMOVED
10 CASING VOLUMES FROM
EACH WELL. TO 1302 -
MOBE TO DEVELOP WELLS
AT 17.7. 1320 - ARRIVE
17.7. DEVELOP ALL WELLS
TO 1745. SET UP TO
COLLECT REMAING SE SAMPLES.
DIDNT COLLECT SAMPLES
WENT BACK TO CABIN
TO PACK SAMPLES. PACKED
19.5/25.5 GW SAMPLES
TO 2200. CLEAN UP
END OF DAY CB

7/26/14
0730 - ROTATE ICE ON
16 COOLERS HEADED FOR
SGS ANCHORAGE. PACK
REMAINING ITEMS GOING
TO ANCHORAGE. PREP FOR
GROUNDWATER/SEDIMENT
SAMPLING AT 17.7.

COLLECT REMAINING SE
SAMPLES AT 17.7 →
SEE SE SAMPLE LOG.
FILL ALL BOREHOLES AT
ALL SITES. MEASURE
PRODUCT IN ALL WELL POINTS →
NO PRODUCT → 0.03 IN 17-
MW2. PACK COOLERS 2/30 –
7/27/14 END OF DAY [signature]
0730 – PACK REMAINING
ITEMS GOING TO ANCH.
ROTATE ICE. CLEAN UP.
0847 – LEAVE CHALET
FOR ANCHORAGE. 0902 –
FUEL 2008 VAN AT 33
MILE ROAD HOUSE. 1633 –
IN TOK – FUEL VAN. CALL
CM. 2230 – ARRIVE IN
ANCHORAGE. STAY NIGHT.
[signature]

7/28/14 – 0800 – 2200
DRIVE FROM HAINES
TO ANCHORAGE.
[signature]

CONTENTS

PAGE	REFERENCE	DATE

HAINES RE-SAMPLE

8/8/14

0500 - LEAVE HOUSE FOR AIRPORT
0610 - FLIGHT FROM FAIRBANKS
TO HAINES. 1100 - ARRIVE IN
HAINES - PREP VANS FOR
SAMPLING AT 19.5.
CONDUCT SAFETY MEETING
WITH JOSH KLYNSTRA (JK)
AND AARON SWANK (AS).
NOTE: RAN INTO ANN
MARIE AT HAINES AIRPORT.
WEATHER = PARTLY CLOUDY ~56°F
DRIVE TO HAINES FISH-
PACKING AND HAVE
THEM FREEZE 6 CASES
OF ICE. JK DROVE
DOWN DAY EARLIER WITH
~4 CASES OF FROZEN
GEL ICE. JK/AS SET
UP TO GWS AT 19.5
1245 - I ARRIVE AT
19.5 → SET UP TO
COLLECT SURFACE/SEDIMENT
SAMPLES AT ALL LOCATIONS
(AND SURFACE SAMPLES)

TO 1913. LEAVE SITE.
NOTE AS/JK COLLECTED ALL
WG SAMPLES. RETURN TO
CHALET → CLEAN UP / PREP
FOR 8/9/14. DINNER 2100 -
END OF DAY. [signature]
8/9/14 - 0800 - PREP FOR
ALL SAMPLING AT PMP
17.7. ROTATE ICE IN COOLERS
0840 - LEAVE CHALET. ~900
ARRIVE AT PMP 17.7. AS.
AND I WORKED AS A TEAM
TO COLLECT SLEW, PIPE
LINE TRENCH, AND WETLAND
CO LOCATED WS/SE SAMPLES.
JK COLLECTED ALL WG
SAMPLES EXCEPT 17-~~MW~~2
AND 3. NOTE 17-~~MW~~2
DOES NOT HAVE PRODUCT
WATER LEVEL = 2.10'.
WEATHER = RAIN ~53°F
2015 - LEAVE SITE. RETURN
TO CHALET. CLEAN UP.
DINNER. SET JK UP
FOR COC/PACKING ON

8/10/14 2300 - END OF
DAY. [signature]
8/10/14 - 0830 - PREP FOR
COLLECTING REMAINING WG/
SE SAMPLES AT PMP 17.7
0905 - LEAVE FOR SITE.
JK STAYING AT CHALET
TO PACK SAMPLES. NOTE:
WEATHER = HEAVY RAIN
~52°F. 0927 - ARRIVE
AT PMP 17.7 → SET
UP TO SE SAMPLE
1105 - LEAVE 17.7 TO
PICK UP ICE AT FISH
PACKING PLANT. PICKED
UP 6 CASES OF ICE.
DROVE TO FERRY TERMINAL
TO GET A.S. A TICKET
BECAUSE WINGS IS
WEATHERED IN. 1220 -
HEAD BACK TO PMP 17.7
TO FINISH SAMPLING.
1246 - ARRIVE AT PMP
17.7. FINISH COLLECTING
LAST 2 SE/WG SAMPLES.

CLEAN UP. 1550 - LEAVE SITE. FOR FERRY TERMINAL ~~DINNER~~ CB DROP H.S. OFF AT FERRY. HAD DINNER IN HAINES. 1745 - RETURN TO CHALET. FINISH PACKING COOLERS WITH REMAINING SAMPLES. PACK JK VAN WITH GEAR. REVIEW COC'S 2015. END OF DAY.

Chris Boese

8/11/14 - 0730 - PACK REMAINING ITEMS FROM CHALET. 827 - LEAVE CHALET. 2326 - ARRIVE IN ANCHORAGE - STAY NIGHT.

2330 - END OF DAY

8/12/14

0800 - ROTATE ICE IN ALL COOLERS. 1315 - AFFIX CUSTODY SEALS TO COOLERS → TAKE TO SGS ANCHORAGE. 1430 DROP OFF SAMPLES.

DROP VAN OFF AT FES ANCHORAGE → TAKE TAXI TO AIRPORT. 1721 - ARRIVE IN FAIRBANKS. 1800 - END OF DAY Chris Boese

CRAIG MARTIN HAINES HFO

2014 CONTENTS

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MONDAY 7/14/14

0430 LEAVE HOUSE

0500 ARRIVE AT SHOP - TAKE TAXI ~~AT~~ TO AIRPORT.

0600 LEAVE FOR JUNEAU - STOP AT ANC

1000 ARRIVE AT JUNEAU

1015 CHECK IN WITH WINGS. FLIGHT DELAYED/CANCELED DUE TO FOG IN HAINES. IFFY FOR REST OF THE DAY. DECIDE TO TAKE FERRY INSTEAD

1230 LEAVE JUNEAU ON COLUMBIA

~~5~~1730 ARRIVE HAINES. MEET CHRIS & RUSTY/MIKE - GEOTECH. HAVE DINNER.

1830 DRIVE TO HOUSE. STOP AND LOOK AT SITES ALONG WAY.

1900 ARRIVE AT HOUSE

END OF DAY

[signature]

 7/15/14

0800 HAVE BREAKFAST WITH GEOTEK (RUSTY/MIKE). DISCUSS WORK APPROACH/SAFETY ISSUES.
0930 SITE VISIT W/GEOTEK AT 25.5
1000 SITE VISIT W/GEOTEK AT 19.5. SHOW RUSTY AREA OF PIPELINE THAT REQUIRES LOCATION (FILIPEK'S DRIVEWAY TO CREEK) & SHOW HIM LOCATES (UTILITIES) & EXPLAIN THAT CLOSE TO THE CREEK THE UTILITIES ENTER PIPELINE & COULD NOT BE LOCATED.
1030 IN HAINES TO PICKUP SUPPLIES. GET EMAILS/PHONE CALLS.
1230 HEAD BACK TO 19.5 TO CHECK GEOTEK PROGRESS (PIPELINE LOCATES) - NOT THERE
1300 MEET ANNE MARIE AT 17.7. SHOW SAMPLE LOCATIONS & DISCUSS STRATEGY.
1400 TAKE ANNE MARIE TO 19.5. GEOTEK IS DOING LOCATES. HAVE MOST OF LOCATES DONE WITH EM TO THE DRAINAGE CHANNEL.
1500 GO TO 25.5 WITH ANNE MARIE. ANNE MARIE LEAVES WE GO TO HANK JACKOTE'S. MR. JACKOTE'S SON IN LAW IS MOWING LAWN - BILL VALENTINE. WE INTRODUCE OURSELVES & WHAT WE INTEND TO DO REGARDING DRILLING ON THEIR PROPERTY.

MR. VALENTINE INDICATED HE HAD WORKED FOR FISH & GAME AND RESPONDED TO THE 1970 BREAK AT 19.5. HE SAW FUEL SPRAYING DIRECTLY IN CREEK. HE TOURED THE AREA IN HELICOPTER LOOKING FOR OIL IN STREAM & CHILKAT R. MR. VALENTINE IS MENTIONED IN THE 1970 SPILL REPORT. MEET W/ HANK JACKOTE & SHOW HIM DRILLING LOCATIONS - HE IS OK WITH LOCATIONS & POINTS OUT WHERE HE THINKS UNDERGROUND POWER IS.
1600 HEAD TO HOUSE & ORGANIZE GEAR
1730 HEAD TOWARDS TOWN, SEE JASON OF IPEC NEAR 25.5. WE STOP & SHOW HIM DRILLING LOCATIONS AT ~~25~~ 25.5 ON JACKOTE'S PROPERTY. HE INDICATES NO UNDERGROUND POWER IN AREA. HEAD TO TOWN FOR DINNER
1930 BACK AT HOUSE

END OF DAY

7/16/14

0800 BREAKFAST - PREP FOR DAY. GEOTEK IS WAITING FOR AML TO OFFLOAD MATERIALS.

1020 HEAD TO HAINES. PICKUP SUPPLIES. GEOTEK ESTIMATES ONSITE TIME 1200-1300.

1145 BACK TO 19.S. MEET W/ GEORGE CAMPBELL EXPLAIN WHAT WE WILL BE DOING. HE INDICATES THAT ITS OK TO PARK ALONG FILIPEK'S DRIVE AS LONG AS ~~VE~~ VEHICLES CAN GET PAST. HE ALSO SAID THAT WE CAN PARK ON HIS PROPERTY ALONG A TRAIL NEXT TO ROAD. HE SAID THAT HE ~~[illegible]~~ ENCOUNTERED DIESEL SMELL WHILE DIGGING BETWEEN ELECTRICAL BOXES ON HIS PROPERTY AND HWY.

1230 BACK TO HOUSE

1400 BACK TO 19.S. GEOTEK HAD JUST GOTTEN THERE SAFETY BRIEFING. HAUL GEAR TO DRILLING LOCATION.

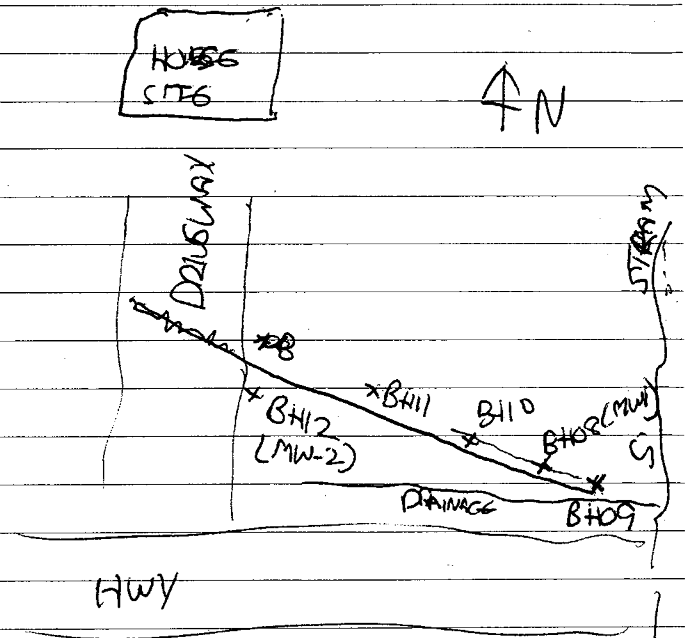
1430 DRILL BH08. ELEVATED PID HITS BETWEEN 2 & 5'. SET WELL. WATER NEAR SURFACE SO SET 5' SCREEN FROM ABOUT 1/2 FT TO 5 1/2'. WILL MAKE ~~[illegible]~~ STICK UP.

1450 MOVE TO BH09 - CLOSER TO CREEK. NO CONTAMINATION DETECTED.

1550 DRILL BH10. NO CONTAMINATION DETECTED.

1620 DRILL BH11. NO CONTAMINATION DETECTED. SET WELL (MW-2) FOR UPGRADIENT LOCATION.

~~NOT~~ DIG TEST PITS WITH HAND SHOVELS IN DRAINAGE CHANNEL NEAR CK TO TRY TO LOCATION. NONE DETECTED



1800 LEAVE SITE. END OF DAY

9/17/14 WEATHER – OVERCAST/50's 60's NO RAIN

0700 BREAKFAST/PREP

0800 GO TO 19.5 - STRATECRAG DRILLING ON SOUTH SIDE OF HWY, GEOTEK LATE. GO TO TOWN. CHECK EMAILS & GET SUPPLIES, GET FUEL.

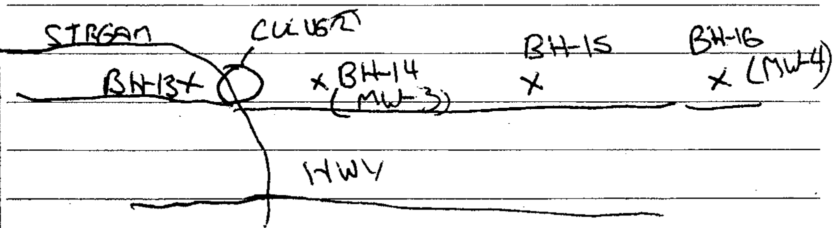
1100 MEET GEOTEK AT 19.5. SET UP ON BH-13 LOCATED ON EAST SIDE OF CULVERT. CLEAN

1150 MOVE TO BH-14 WEST SIDE OF CULVERT. CLEAN. SET WELL (MW-3)

1230 MOVE TO BH-15. CLEAN

1300 MOVE TO BH-16. CLEAN. SET WELL (MW-4)

1330 MOB TO 25.5



P/MP 25.5

1530 SETUP ON BH08. NO CONTAMINATION DETECTED. SET WELL MW-1. (19'-29') SOME DIFFICULTY SET WELL - LOST DRIVE POINT.

1820 SET UP ON BH9. CLEAN UNTIL SMEAR ZONE ~24', SHREDDED LINER ON 25-30 (COULDN'T LOG CORE BUT WAS ABLE TO COLLECT SAMPLE).

1930 LEAVE SITE - HEAD TO HOUSE

END OF DAY

7/18/14

0800 MEET GEOTEK FOR BREAKFAST - DISCUSS WORK FOR DAY/SAFETY

0850 ON SITE AT 25.5. SET UP AT BH 10

0920 START DRILL BH-10. ENCOUNTER SOIL CONTAMINATION AT ~8'. SAMPLE ABOVE & BELOW (5' & 9'), SET WELL (MW-2). FUEL CONTAMINATION TO 30'.

1020 SET UP AT BH-11. ENCOUNTERED FUEL CONTAMINATION AT ~~8~~ 7'. INCREASING PID'S TO 14' (SAMPLED).

1220 MOVE TO BH-12. CLEAN TILL 29' WATER AT 29'.

1410 MOVE TO BH-13 ~~TO~~ (ACROSS HIGHWAY - JOCKETTE'S) NO FUEL
WATER AT ~26' CONTAMINATION IN SOILS DETECTED

1450 SET UP AT BH-14. NO SOIL CONTAMINATION DETECTED. WATER AT SET WELL (MW-3).

1530 HEAD TO TOWN. CALL BETH W/UPDATES. WILL COLLECT SED/SW SAMPLES AT 19.5 WITH FOLLOWING CHANGES (1) ELIMINATE FURTHEST UPGRADIENT SAMPLE (2) COLLECT TWO ~~SEDIMENT~~/SURFACE SOIL SAMPLES FROM DRAINAGE (3) HAND AUGER AROUND BH08.

1620 ARRIVE BACK ON SITE, START DRILLING AT BH15. NO SOIL CONTAMINATION. WATER AT 23', SET WELL (MW-4) 20-30.

1715 SET UP AT BH16. NO SOIL CONT. WATER AT 20'. SET WELL AT 18-28. (MW-5)

1830 MOVE ACROSS HWY. SET UP AT BH17. NO SOIL CONTAMINATION DETECTED. WATER AT 30' (MAY BE SLIGHTLY HIGHER). SCREEN ~25-35'.

2035 WILL FINISH SETTING WELL (MW-6) IN MORNING. LEAVE SITE

DONE FOR DAY

 7/19/14 SUNNY - LOW 60'S IN AM

0900 ARRIVE ON SITE. DRILLERS FINISH MW-6 AT 25.5. HAD PROBLEMS WITH WELL HEAVING.

1200 MOVE TO 17.7. GEOTEK OFFLOADS TRAILER AT PULLOFF TO THE NORTH ON THE EAST SIDE OF THE HWY. START DRILLING AT 17-BH12 AT SOUTH END OF SITE. EXPECT BORING TO BE CLEAN. HIT CONTAMINATION BETWEEN 3 FT. & 7 FT. INSTALLED MW-1

1330 MOVE FURTHER NORTH TO BH13 ENCOUNTER CONTAMINATED SOIL AT APPROX 2'. DRILL TO 10' FT. SATURATED AT 1'. SOILS HAD HIGH PID'S BETWEEN 1 & 10'. INSTALL MW-2. DIFFICULT TO SCREEN WELL ABOVE WATER TABLE & HAVE SURFACE SEAL TO PREVENT SURFACE WATER INFILTRATION.

1440 MOVE TO BH14. - LOCATED TO THE EAST NEAR PIPELINE TRENCH - NEAR POSSIBLE LOCATION OF PIPELINE BREAK SATURATED BELOW 1' & HIGH PID'S TO BOTTOM OF BORING AT 10'.

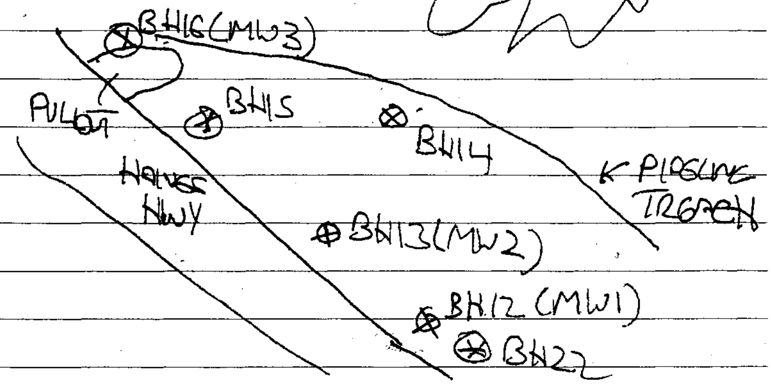
1520 MOVE TO BH15. NEAR LOCATION OF WHERE PRODUCT WAS FOUND

IN 2012. VERY STRONG HYDROCARBON ODOR AT 3-4 FT.

1615 MOVE TO SOUTH. INSTALL A BORING BETWEEN BH12 & THE 2012 BORING (BH7) TO TRY TO DEFINE SOUTHERN BOUNDARY OF PLUME. BH-22 - SIMILAR RESULTS AS BH12 VERY HIGH PIDS AT 5-7 FT.

1700 MOVE BACK TO PULLOUT AREA. DRILL BORING BH16 ON NORTH END OF PULLOUT. FUEL CONTAMINATED SOIL DETECTED AT ABOUT ~~TO~~ 4 FT. INSTALL MW3.

1900 CLEANUP & LEAVE SITE AT
END OF DAY



7/20/14 50'S & LIGHT RAIN

0800 ~~REGP~~ PREP FOR DAY & BREAKFAST

0900 ARRIVE AT SITE. CHRIS & I INSTALL WELLPOINTS SURROUNDING MW-2 (0.05' OF PRODUCT IN WELL). NO FUEL FOUND IN ANY DIRECTION ~10' ~~FEET~~ FROM MW2.

1100 DRILL ON WEST SIDE OF HWY SET UP AT BH19 - ATTEMPT TO LOCATE NW EXTENT OF SOIL CONTAMINATION. FUEL CONTAMINATION IDENTIFIED AT APPROX 4 FT. CLEAN AT ABOUT 8'. SINCE BORING WAS NOT CLEAN MOVE

1145 NEW TO BH20. THIS BORING WAS LOCATED IN FORESTED AREA WHICH REQUIRED MANUEVERING AROUND DOWN TREES. BORING WAS CLEAN & INSTALLED MW-7.

1245 ~~DRILL BORING~~ SET WELL MW6 IN BORING BH-19.

1500 DRILL BH21. - LOCATED IN WOOD SOUTH OF BH20. SOIL BORING WAS CLEAN. INSTALL MW-8.

1620 MOVE TO BH18 (NEAR HIGHWAY) SOIL CONTAMINATION IDENTIFIED AT ABOUT 3' AND EXTENDED TO 9'. INSTALL MW5

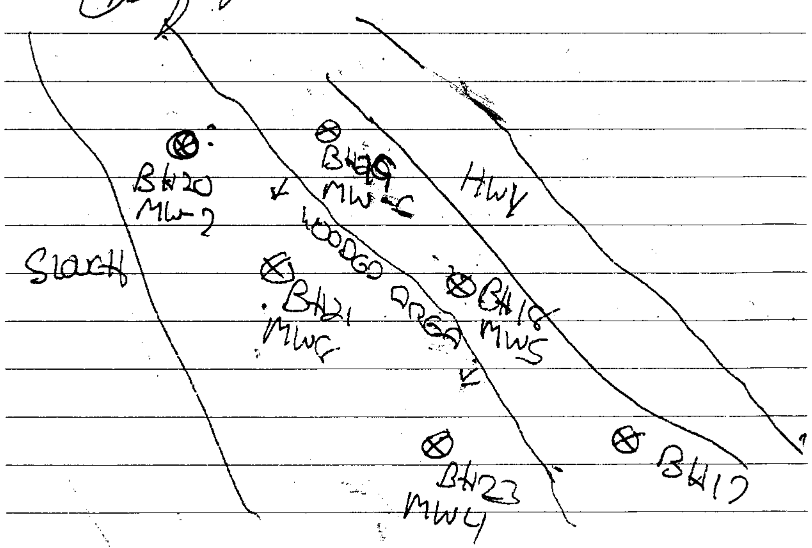
1715 MOVE SOUTH TO BH22. ELEVATED PID'S (ALTHOUGH MUCH LOWER THAN BH18/19). DECIDE TO NOT INSTALL WELL.

1745 MOVED ~100' WEST TO ~~BH~~ BH23 BORING CLEAN - INSTALL MW-4.

1800 MOVE DRILL ~~RIGH~~ RIG BACK TO EAST SIDE OF HWY WITH MUCH DIFFICULTY DUE TO STEEP BANK & MUD.

1900 LEAVE SITE

END OF DAY



14 7/21/14 MONDAY

0800 ~~MEET GEOTEK~~ FOR BREAKFAST. DISCUSS WHAT IS REMAINING FOR THEM TO FINISH. WELL COMPLETIONS / SITE CLEANUP

0900 BACK TO HOUSE – PACK TO LEAVE.

1030 – HEAD TO PMP 12.7 FOR SEDIMENT/SW SAMPLING. COLLECT 5 SEDIMENT / 2 SW SAMPLES ALONG CHILKAT SLOUGH. NO EVIDENCE OF CONTAMINATION.

1300 COLLECT SW/SEDIMENT SAMPLE IN WETLAND AREA ON SIDE OF THE HWY, APPROX 10' FROM WBH13. STRONG FUEL ODOR IN SEDIMENT SAMPLE.

1430 HEAD BACK TO HOUSE & PACK

1530 MEET ANNE MARIE IN HAINES. UPDATE HER ON FIELD WORK & HAVE HER SIGN IDW TRANSPORT FORMS

1550 GO TO AIRPORT FOR FLIGHT TO JUNEAU & HOME

2100 ARRIVE HOME

8/6/14 P.Cloudy 60°F

0700- prep sampling gear
for GW & Soil sampling
in Haines @ PMP 17.7 & 19.5.

→ Pre Label Jars for
the 19.5 site

end project day @
1300.

JK

8/7/14 Sunny 65°F

0700 - Load last minute gear into van.
fill a cooler with ice

0800 - leaving fairbanks
→ Stop @ fuel station in North pole. also need to find a NAPA and buy new windshield wipers.

- leaving North Pole

1950 - Crossing back into AK from Canada. Looking for a place to stop for the night

2015 - found a place to park out of the way of traffic.

End Day @ 2030

JSK

1/1

8/8/14 Cloudy 60°F

0700 - Drive to Haines Airport and prep gear.

0830 - unload airport van and begin calibration of YSI's and Turbidimeters.

0945 - call from CB to take airport van to chalet and unload non-essential gear.

1010 - Drive to Challet

1110 - arrive back @ airport to meet CB & AS.

transfer field gear to other van and ice to airport van. CB will take Ice to be frozen. AS and JSK to begin sampling @ 19 site.

1/2

8/8/14 Cloudy 60°F

1145 - arrive @ 19 site and do a site walk
↳ prep gear to sample

1255 Begin pumping water @ 19-MW4

1330 - completed with MW4
↳ move to van and drive van to MW2

1445 - set up @ MW2 after deconing WLs
↳ collect MS/MSD & Dup

1740 - Begin setup @ MW1

1910 - completed sampling and van is loaded. Leaving site.

1925 - arrive at Chalet and unload van into the building
↳ check pH on DRO and metals containers.
End day 2000

2/2

8/9/14 Overcast 55°F

0800 - calibrate YSI's & Turbidimeters

0845 - leaving chalet
↳ one of my tires is low so I am going to find a place to get air for it.

0945 - Tire pressure is now ok
↳ did a site walk w/ CB to locate wells.
move gear to set up @ 17-MW7

1028 - begin purging MW7

1059 - parameters collected begin collecting sample.

1149 - Begin purging @ MW6

1233 - Begin collecting MS/MSD @ MW6

1400 - completed @ MW6
move to MW8

1/3

8/9/19 Lite Rain 60°F

1446 - completed purging well
begin sample collection.

1530 - Begin Purging MW5

1640 - set up @ MW4

1820 - move to MW1

1849 - Begin purging MW1

2005 - Demob to van

2010 - Collect WL on
17-MW3 @ 3.29 'btoc
17-MW2 @ 2.11 'btoc

2015 Return to Chalet.

2050 - completed checking pH
values for all samples
collected today no acid needed
to be added
↳ Adding Ice to
coolers for tonight.

2/3

8/9/19 Rain 50°F

2100 - Break for Dinner

2145 - Meeting about the
plan for tomorrow.

↳ begin the COC for
packing samples

2315 - End Day

JK

3/3

8/10/14 Rain 55°F

0800 haul coolers inside to begin packing

↳ complete COC before Packing samples.

1440 - completed packing the samples that I have. Clean up and organize for later.

1505 - drive to 17.7 site to assist CB + AS with cleanup @ site.
↳ Drive to Haines to drop AS @ Ferry Terminal

1630 - break for dinner

1715 - Return to Chalet and pack up remaining samples from today.

end day 2000 JK

1/1

8/11/14 Overcast 55°F

0800 - load last of gear into van and prep to leave

0830 - begin drive back to Fairbanks.

1600 - passing through Tok
↳ stopped for fuel.

1745 - passing through Delta

1925 - arrive @ the fairbanks office, unload samples into the fridge

End Day @ 2000

1/1

 8/12/14

1000 - begin COC and pack samples.

1300 - complete COC and deliver samples to Goldstreak

1400 email Lab notification of sample shipment.

End Day 1400

SK

1/1

KRISTIN DRENZEK
BOOK #12KDØ4

NOVEMBER 4, 2012 → NOV. 12, 2012
AND
JULY 24, 25
2014

Rite in the Rain.
ALL-WEATHER
JOURNAL
№ 391

HAINES-FAIRBANKS PIPELINE
PMP 1.9, 17.7, 19.5, 25.5
HAINES, AK

PROJECT # F10AK1016 01,
2014: -03, -14
FES

2014: W911KB-12-D-0001
TO 29

CONTRACT # W911KB-08-D-0003
TASK ORDER 21

7/24/14 —— HFP-HAINES —— PARTLY CLOUDY 60°

NOTE: LEVEL OF PPE WORN FOR THIS PROJECT IS LEVEL D UNLESS OTHERWISE NOTED IN THIS FIELDBOOK.

0700 - ARRIVE @ ANCHORAGE AIRPORT FOR FLIGHT TO JUNEAU.

0800 - DEPART ANC FOR JUNEAU

1000 - ARRIVE JUNEAU

1015 - DEPART JUNEAU ON WINGS OF ALASKA

1055 - ARRIVE IN HAINES

1115 - MEET U. RITCHIE @ HAINES AIRPORT

1140 - MEET UP W/ C. BOESE @ PMP 25.5. C. BOESE GIVES ME SAFETY INTRO TO SITE

1200 - CALIBRATE YSI #6 + 8

YSI	pH 4 Before	pH 4 After	pH 7 Before	pH 7 After	Conductivity Before	Conductivity After
#6	3.68	4.00	7.08	7.00	0.874	1.000
#8	3.91	4.00	7.02	7.00	0.832	1.000

	ORP Before	ORP After	DO Before	DO After	
#6	214.9	240.0	12.67	9.09	@ 757.1 mmHg
#8	217.8	240.0	10.06	9.03	@ 756.2 mmHg

pH4 - 00654-02, exp. 7/2015

pH7 - 00654-04, exp 5/2015

Conductivity 1,000us - 060907 / 13E100134, exp 11/2014

ORP - 6273, exp. 6/2018

CALIBRATE TURBIDIMETER "MICROTPW T12" + "CARBON 2"

7/24/14 —— HFP-HAINES —— 25.5 PARTLY CLOUDY 60

1245 SET UP ON WELL 25-MW1 TO COLLECT SAMPLE 14HF2503WG @ 1405, MS/MSD.

ANALYSES: 40ml

- GRO - 3 VOA VIALS, AK101, pres HCl
- DRO/RRO - 2 - 250mL poly, AK102SV / AK103SV, HCl
- BTEX +1,2-DCA - 3 - 40mL VOA, 8260B, pres. HCl
- PAH - 2 - 1L amber, 8270D-sim, no pres
- Nitrate/Nitrite as N - 1 - 60mL poly, SM4500NO3F, SO4
- Iron/Mang - 1 - 125ml plastic poly, 6020A, HNO3, field filtered
- Total lead - 1 - 125ml poly, 6020A, HNO3
- Sulfate - 1 - 60ml poly, 300.0, no pres.
- EDB - 3 - 40mL VOA, 8011, $Na_2S_2O_3$

1410 START COLLECTING SAMPLES, VOLATILES FIRST

1450 FINISHED COLLECTING PRIMARY + MS/MSD FROM 25-MW1, TURBIDITY CLEARED TO 47.4 @ END OF COLLECTION. CLEAN UP AREA, DECON WATER LEVEL, MOVE EQUIPMENT TO 25-MW5.

1515 - 1535 BREAK

1540 SET UP ON WELL 25-MW5

1650 COLLECT SAMPLE 14HF2504WG, FOR ANALYSES LISTED ABOVE.

1705 FINISHED SAMPLING, DECON WATER LEVEL + MOVE EQUIPMENT TO 25-MW4.

25.5 OVERCAST

7/24/14 —— HFP-HAINES —— 60°

1720 SET UP ON WELL 25-MW4. WELL JUST FINISHED BEING DEVELOPED, WATER LEVEL DRAWN DOWN FROM 21.74 TO 21.82. WAIT 10 MIN FOR WATER LEVEL TO GO BACK UP.

1745 - START PURGING WELL

1835-1855 COLLECT SAMPLE 14HF2506WG, TIME = 1830. SAME ANALYSES.

1900 CLEAN UP/DECON WATER LEVEL

1910 ATTEMPT TO SAMPLE 25-MW3 W/ A PERISTALTIC PUMP (DEPTH TO H_2O = 24.6').

1925-1940 BREAK

LOAD GEAR INTO VAN

2000 COLLECT RINSATE SAMPLE, "RINSATE 2", SAMPLE # 14HF2507WG @ 8pm.

2025 FINISHED COLLECTING RINSATE SAMPLE. IRON + MANG NOT FIELD FILTERED (RINSATE COLLECTED BY POURING WATER INTO/THROUGH METAL PUMP HOUSING).

CLEAN UP SITE

2045 DEPART PMP 25.5.

2100 BACK AT HOUSE, ORGANIZE SAMPLE COOLERS + GEAR

2115 DONE FOR DAY

19.5

7/25/14 —— HFP-HAINES —— 60°

710 START CALIBRATING YSI

YSI #	pH4 Before	pH4 After	pH7 Before	pH7 After	Conductivity Before	Conductivity After
#6	4.05	4.00	7.03	7.00	1.026	1.000
#8	4.15	4.00	6.95	7.00	1.014	1.000

YSI #	ORP Before	ORP After	DO Before	DO After	
#6	246.5	240.0	11.91	9.08	@750.4 mmHg
#8	237.2	240.0	9.82	9.04	@751.8 mmHg

SAME LOT #s + EXPIRATION DATES AS 7/24 CALIBRATION. CALIBRATE TURBIDIMETERS.

755 FINISHED CALIBRATING. BREAK

830 LEAVE HOUSE W/ C. BOESE

850 ARRIVE AT PMP 19.5. C. BOESE LEADS SAFETY MEETING

900 SET UP ON WELL 19-MW2

915 START PURGING WELL. WATER V. CLEAR.

955 START COLLECTING MS/MSD SAMPLE 14HF1901WG (1020), THEN COLLECT DUPLICATE SAMPLE 14HF1902WG, "19-MW21" @ 1045.

1115 FINISHED SAMPLING WELL. DECON WATER LEVEL + PACK UP, THEN BREAK FOR LUNCH.

1130 - 1145 BREAK, THEN MOVE EQUIPMENT TO 19-MW1.

1210 - V. RITCHIE MEETS US AT 19.5

19.5
7/25/14 —— HFP-HAINES —— 60°

1215 - SET UP ON 19-MW1 TO COLLECT SAMPLE 14HF1903WG. WELL DREW DOWN REPEATEDLY DURING DEVELOPMENT BUT WAS QUICK TO RECHARGE. PUMP AT VERY SLOW RATE BUT STILL SEE DRAWDOWN DRAWDOWN SLOWS A BIT.

1305-1345 COLLECT SAMPLE. TURBIDITY WAS TAKEN BEFORE COLLECTING SAMPLE OUT OF TUBING ONCE FLOW-THROUGH CELL WAS DISCONNECTED - TURBIDITY READINGS 38.9 SO COLLECT SAMPLE. THE EXTRA SLOW PURGE RATE WAS PREVENTING SEDIMENT/TURBID H_2O FROM CLEARING FLOW-THROUGH. TURBIDITY FOLLOWING SAMPLE COLLECTION = 24.7, WATER LEVEL RECHARGING TO 4.00'.

1350 GAR PURGE WATER, PACK UP EQUIPMENT DECON WATER LEVEL METER.

1400 SET UP ON WELL 19-MW3 WATER IS WITHIN INCHES OF SURFACE/TOC.

1450- WOMAN IN CAR WARNS US THAT A GRIZZLY + 2 CUBS IN ROAD WALKING OUR WAY. V. RITCHIE + I LEAVE PUMPS RUNNING + GET IN VAN WAIT A FEW MINUTES, NO SIGN OF BEAR. DRIVE TOWARDS BEAR DIRECTION, SEE IF U. CLEAR. EVENTUALLY

[signature]

19.5
7/25/14 —— HFP-HAINES —— 60°

ABLE TO TURN VAN AROUND, WHEN BACK @ SITE GRIZZLY NOWHERE TO BE SEEN. RESUME SAMPLING AS TEAM, LET 19-MW3 CONTINUE TO PURGE WHILE STANDING GUARD AS V. RITCHIE FINISHES SAMPLING 19-MW4. (TUBING HAD COME OUT OF 19-MW3, REPLACED IT + CONTINUED PURGE WATER BEFORE GOING TO MW4.)

1550 FINISHED COLLECTING SAMPLE AT 19-MW4. PACK UP EQUIPMENT, THEN BOTH HEAD TO 19-MW3.

1600 RESUME SAMPLING AT 19-MW3. COLLECT 2 SETS OF PARAMETERS - ALL STABLE + LOW TURBIDITY (HAS BEEN PURGING ≈ 110 MIN, EXCEPT HOWEVER LONG TUBING WAS OUT FOR).

1615-1625 GRIZZLY BACK, BY ADJACENT PROPERTY. SEEMED TO BE STAYING PUT, FINISH SAMPLING WHILE V. RITCHIE KEEPS WATCH ON BEARS FROM ROAD (HIGHER ELEV, VIEW AROUND BRUSH).

1635 - FINISHED SAMPLING WELL. PACK UP EQUIPMENT FROM PMP 19.5. MEET UP W/ C. BOESE, THEN V. RITCHIE DRIVES ME TO THE AIRPORT @ 1700.

[signature]

7/25/14 —— HFP-HAINES —— 60°

1720 ARRIVE @ HAINES AIRPORT FOR 1750 WINGS OF ALASKA FLIGHT.

1750 DEPART HAINES FOR JUNEAU

18^{30} ARRIVE IN JUNEAU

20^{15} DEPART JUNEAU FOR ANCHORAGE

2145 ARRIVE IN ANCHORAGE, FINISHED W/ FIELD EFFORT FOR 2014 ON HAINES-FAIRBANKS PIPELINE-HAINES SITES.

Rite in the Rain®
ALL-WEATHER WRITING PAPER

Name Vanessa Ritchie
Fairbanks Environmental Services
Address 3538 International St
Fbks, AK 99709
Phone 907.699.6899

Project Haines Fairbanks Pipeline

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

RiteintheRain.com

HFP - Haines Sites FRI 7/18/14

0900 Pack personal gear for trip
1130 Drive to airport
1200 Arrive, check in
1330 Depart for Anchorage
1430 Arrive, Pick up supplies at TTT. Pick up sample kit at SGS. Check sample kit for completeness
1700 EOD.

SUN 7/20/14
~~7/19/14~~

1200 Buy food for fieldwork. Fuel van & check fluids.
1340 Depart Anchorage for TOK
1930 Arrive TOK, check into hotel.
2000 EOD

Nice drive! Partial clouds

0600 Check out of hotel. Get ice for food cooler. Fuel van
0630 Depart Tok for Haines
0830 Canada boarder crossing. No issues.
1230 Lunch in Haines Jct
1500 U.S. boarder crossing. No issues
1530 Arrive @ rental chalet. Find Chris there managing soil samples. Craig is in town meeting w/ ADEC.
1600 Chris & I drive to town. Meet w/ Craig to discuss project. Drop Craig off at airport. Eat dinner in town. Return to chalet.
1900 Arrive at Chalet. Unpack van. Organize gear & food.
2030 EOD.

Nice drive weatherwise ~60°F, partly cloudy, light rain in parts. Poor road conditions between Beaver Creek and Kluane Lake. Construction throughout that part as well.

0730 Breakfast, pack lunch, assemble sample kit & gear. ~~Calibrate~~
1000 Depart Chalet for PMP 17.7
1015 Arrive. Set up to sample surface H_2O & Sediment. Analyses: BTEX (8260B), GRO (AK101), DRO/RRO (AK102/103), PAH (8270D-SIM), Total Pb (6020A)

17-WS4 (distinct POL odor), 17-SE7 (slight odor, but only 0.6ppm on PID.
* See sample tracking form for locations & times.
1200-1220 Lunch
1740 Collect rinsate on auger
1755 Depart 17.7 for chalet
1830 Dinner
1900 Pack samples for shipment tomorrow morning. Complete COCs.
0100 EOD.

WEATHER:

Rite in the Rain

0730 Exchange gel ice in coolers. Place custody seals & shipping labels to coolers.
0815 Chris drives to town to get coolers on ~~ff~~ Wings flight. Meanwhile I write chains for SW & SE samples for shipment tomorrow.
1145 Depart for PMP 19.5
1220 Arrive. Meet Chris there. Begin SW/SE sampling along steam. Rinsate not collected as SE samples were collected directly w/ a new disposable stainless steel spoon @ ea. location. No ~~notab~~ noteable odor in any sample (H_2O or sed). Collect 2 surface soil samples near 19-MW1 in/near small drainage.
* see sample tracking form for location & times
Analyses: BTEX + 1,2-DCA (8260B), GRO (AK101), EDB (8011), DRO/RRO (AK102/103), PAH (8270D-SIM)
Total Pb (6020A)

1805 Depart site for chalet
1820 Arrive. Unload samples. Cook dinner. Organize gear for tomorrow. Pack SW PAH samples (7-day HT) for morning shipment (17.7 & 19.5 ~~25.5~~)
2030 EOD

0630 wake. Eat breakfast
0700 Change ice in sample coolers. Prep coolers for shipping. Load gear.
0825 Drive to airport to ship coolers via Wings airlines. Then AK Air
· soil from 17.7, 19.5 & 25.5
· SW H_2O from 17.7 & 19.5 (PAHs only)
0855 Arrive @ airport. Shipping procedure:
- Call AK Air cargo office in Juneau to make booking. Give # of coolers & approx. weight, & all shipping details (to/from & contact info). Get waybill #. Pricing is estimated at this point but they cannot take credit card # over phone at this point since they do not have exact weight & measurements.
- Give AK Air waybill to ~~Gold~~ Wings. Fill out AK Air Goldstreak form so that paperwork accompanies coolers.
- Pay for Wings cargo portion
- Once AK Air recieves coolers they will contact the contact person on Goldstreak form. No cell service at site so handy to have someone else as contact person.

0915 Leave airport in search of frozen gel ice. Locate some at Haines Packing Co 5 1/2 mi Mud Bay Rd. They had no frozen packs but requested 40 of them for sample shipping. They put some in flash freezer & I will return to retrieve them. Quoted \$2/pack. If have future sampling events would suggest calling in advance to have some frozen.

Contact info: Song Nash
cell 907 314 0459
office 907 766 2883
masternash@hotmail.com

(they pack seafood in frozen salt H_2O so not often using gel ice)

1055 Pick up Kristen @ airport. Drive to PMP 25.5

1130 Arrive to find Chris has developed 2 wells. Discuss plan for the day. ⇒ GW sample. Analyses: BTEX + 1,2-DCA (8260), GRO (AK101) EDB (8011), DRO/RRO (AK102/103), PAH (8270D-SIM), Total Pb, Fe/Mn (6010B), SO4 (300.0), Total NO_2/NO_3 (353.2)

Calibrate instruments.

1300 Set up on MW2. Bladder pump. Strong POL odor & nearly continuous sheen. Initially very turbid (268 NTU) but cleared to <50 NTU. Purge 80 min, very low flow. Parameters stabilized. See sample form. Collect field duplicate. Decon bladder pump & level.

1630 Set up to sample MW6. Bladder pump. No sheen, no odor, less turbidity. Purge 60 min. Parameters stabilized. Decon.

2000 Collect rinsate from bladder pump. See sample form & pics.

2040 Depart for chalet. Arrive. Put more ice on samples. Organize for next day.

2130 EOD.

0700 Wake. Eat.
0800 Prep for day. Kristen calib instruments
0830 Depart chalet for PMP25.5 to finish GW sampling while Kristen & Chris go to PMP 19.5.
0845 Set up on last well - 25-MW3. Bladder pump. Purge 30 min & DO readings still very high (11-12 mg/L). Pull pump & check tubing connections. Purge for 15 more minutes & DO still not dropping. Pull pump & change out bladder. Continue purging & DO drops. Parameters stabilize. Initial turbidity >600 NTU. Final 8.53 NTU. See sample form. Decon. Clean up site.
1150 Depart for PMP 19.5 to meet up w/ Chris & Kristen.
1200 Arrive. Walk site w/ Chris so he can show me locations of all borings that ~~will~~ require surveying.
1330 Set up to sample 19-MW4. Well is known ~~to~~ have poor recharge because it was purged dry quickly during development. So initially set flow rate @ 0.05 GPM. Well draw down so decrease to 0.02 GPM. Stabilizes. All parameters stabilize. Getting ready to sample

& motorist came by to warn of nearby brown bear w/ 2 cubs heading our way! Kristen was sampling MW3 nearby so we left wells purging, abandoned gear & went to van. Saw bears walk through site but lost sight of them. Decided to continue sampling as a team. Kristen stood watch while I sampled MW4
1550 Finished MW4 & moved to MW3 for Kristen to sample. Spotted bears again but far away.
1640 Finished MW3. Owner of adjacent property (Lynn Campbell ?) came up w/ her dog during a walk. Bears in her driveway so was waiting to get home. Ended up flagging down motorist to drive her up her driveway.
1700 Drive Kristen to airport. Make phone calls while having phone service & return emails to labs concerning sample shipments. Pick up food at store. Drive back to Chalet. Organize gear & put more ice on samples.
2030 EOD.

★ Analyses for PMP 19.5 are on page 6 - PLUS Fe/Mn (6010B), SO_4 (300.0), Total NO_2/NO_3 (353.2)

0700 Wake. Prep for day. eat. Depart 17.7 to GWS. Chris prep calib. instruments.
0900 Arrive @ 17.7.
Analyses: See page 5 for analyses PLUS Fe/Mn (6010C), SO4 (300.0), total NO2/NO3 (353.2)

0930 Set up to sample 17-MW3. Initial drawdown but stabilized at 0.02 GPM. Low turbidity. Has sheen & POL odor. Collect Field duplicate. Parameters stabilized. Decon. See GWS form for details.
1200 Set up to sample 17-MW4. Drawdown stabilized @ 0.03 GPM. No sheen, possible slight POL odor. Parameters stabilized. See GWS form. Decon.
1335 Set up to sample 17-MW5. Good flow rate. Pumped @ 0.1 GPM. Stabilized quickly. No sheen, fairly strong POL odor. See GWS form. Decon.
1500 Pack up gear. Head to town to buy frozen gel ice at Haines packing. Buy 40 packs.
1730 Head back to chalet.

1800 Arrive. Start prepping sample for transport to Anchorage. Chris is driving remaining samples intentended for SGS to ANC for drop off. I will ship EDB sediment & water samples to Test America Denver from Haines.
1930 Eric Cousino w/ Windy Creek Surveys arrives (with his dad, Roger). They are staying at Chalet. Chris & I continue to pack samples & load into van. Clean up mess. Finish field notes.
2245 EOD.

0630 Wake. Eat

0700 Eric leaves for PMP 25.5. Help Chris load remaining gear into van. Put fresh ice in coolers.

0850 Chris leaves for ANC. I leave to meet up w/ ERIC @ 25.5.

0900 Arrive @ 25.5. Talk w/ ERIC about borehole locations & well locations. Drive him to PMP 19.5 & walk him through site. Drop him back off at 25.5 Head back to chalet.

0950 Begin writing electronic versions of COCs to send to chris.

1200 Russell from GeoTek sends text to indicate he is in town to properly complete flushmount well @ 19.5 & 3 stick up @ 17.7. Meet Russell @ 19.5. Grizzly sow with 2 cubs at site. Wait for them to leave but they appear to be sticking around. Leave for 17.7 to start work there instead. Show Russell the work that needs done. Leave for chalet to complete COCs while Russell works.

1430 Arrive @ chalet. Write COCs.

1730 Russell shows up @ chalet indicating that he is done @ 17.7. Follow Russell to 19.5. Arrive to find that bears are still their but Eric is also there surveying, while his dad is keeping watch on the bears. Begin properly completing flushmounts while I watch bear activity. Complete task. Depart for ~~25.5~~ 17.7.

1830 Arrive 17.7. Russell lowered & stabilized steel overcasing for MW1, 2, & 4. Greatly improved stability-wise, although MW2 is in wetland & is consequently a little "unstable". Russell departs for town to leave.

1930 Arrive back at 19.5. Take photos of all wells & remeasure water levels. Note that ~1.5" of PVC casing for MW-4 was cut off in order to lower flushmount properly, so total depth is different than what is recorded on GW sample form. * This occured while Eric was still on site so elevation data from Eric is correct.

19-MW1	2.50'
MW2	9.34'
MW3	0.32'
MW4	0.23'

2030 EOD.

HFP - cont   Mon 7/28/14

0700 Wake. Eat.

0830 Make COC changes. Communicate w/ labs. Put ice on EDB samples. Meanwhile Eric has left to get started surveying PMP 17.7

1000 Leave chalet to meet Eric.

1020 Arrive. Take pictures of wells & look for flags/stakes that need surveying. Retake GW levels.

* 17-MW1	2.09' (tl depth 6.55')
-MW2	1.89
-MW3	3.05
-MW4	1.38
-MW5	2.46
-MW6	3.01
-MW7	4.20
-MW8	2.84

* ~3-4" was cut off PVC casing when steel overcasing was lowered

1315 DOT & DF&G representatives stop by & introduce themselves. DOT PM was giving DF&G a tour of sites. Discussed their interest in knowing which way groundwater is flowing.

7/28/14

1400 Help Eric survey sediment & surface water locations. Measure H2O depth at each location when applicable. Samples collected in pipeline trench, in wetland, & along slough.

LOC ID	H2O Depth (inches)
17-SE1 ~~17-WS1~~	Ø
SE2 / 17-WS1	12"
SE3 ~~17-WS2~~	4" of Thick mud
SE4 / 17-WS2	6"
SE5	Ø
SE6 / 17-WS3	4"
SE7 / 17-WS4	8"
SE8 / 17-WS5	9"
SE9 / 17-WS6	8"
SE10 / 17-WS7	10"
SE11 / 17-WS8	13"
SE12 / 17-WS9	9"
SE13 / 17-WS10	12"
SE14	4"
SE15	17"
SE16	11"
SE17	15"
SE18	10"
SE19	13"
SE20	3" STRONG POL ODOR

worm location
0.35' water

7/28/14

1600 Surveying complete. Depart 17.7 for town for dinner

2030 Receive word about coolers being out of temperature (high) – the ones that Chris dropped off at SGS in ANC. Discuss w/ Craig & Chris how to move forward. Thinking that I may have enough containers to re-sample PMP 25.5 wells. Drive to Chalet to do ~~sample~~ container count.

2100 Arrive. Determine that 25.5 can be resampled if more PAH are shipped to me. Chris will Goldstreak containers

2230 EOD.

* have enough PAH bottles to start sampling on Wed morning then can drive to pick up shipment

TUES 7/29/14

0800 wake. Find Eric & Roger gone. Address emails & chemistry related issues concerning HFP & other projects.

1230 Tear down tent outside & gather/pack unneeded gear to prep for demobilization. Gather garbage to drop @ landfill. Drive to town to drop off garbage but arrived too late (closed @ 4pm). Buy more ice packs for fish processors. Return to Chalet. Prepare 25.5 sample kit & gear. Load in van.

2130 EOD.

Wed 7/30/14

0700 Wake. Eat. Submit timesheet. Calibrate instruments, load gear.
0900 Depart chalet for 25.5. ~~See pg~~ To ~~resample~~. See page 8 for sample analyses.
Set up bladder pump on MW2 to purge while purge & sample MW1 w/ peri pump (took MW2 a while to stabilize last time so try to be efficient w/ time). Purge & sample MW1. Stabilizes after 30 min. Low turbidity & odor. No sheen or odor. See gw sample form. Collect MS/MSD. Decon.
Begin collecting parameters on MW1. Collect 5 rounds of readings. Stable parameters & low turbidity. Discontinous sheen & strong POL odor. Collect field duplicate.
1410 Depart site for landfill (closes @ 4pm). & Drop garbage. Pick up freight (sampling supplies) @ airport. Return to 25.5.
1600 Arrive @ 25.5. Purge & sample MW6 w/ bladder pump. Stable parameters & low turbidity. No odor or sheen. See gw sample form.
1730 Decon bladder pump. Collect rinsate.
1750 Depart site for chalet.

7/30/14

1800 Arrive, shower, eat.
1930 Put fresh ice on samples. Pre-Pack EDB samples for shipment to TA & write COCs for what was sampled today. (3 wells still to sample @ 25.5) Send emails to lab to let them know when to expect samples.

weather: 70's, sunny, nice day.

Thurs 7/31/14

0800 Wake. Eat. Calibrate instruments.
Put fresh ice on samples. Return
email to lab to discuss samples &
shipment plans.

0930 Depart Chalet for PMP25.5.
Set up to sample MW5. → peri pump used Parameters
stabilize well. No sheen or odor
observed. See gw sample form.
While collecting parameters on MW5,
begin purging nearby MW3 with a
bladder pump.

1120

1130 Completed sampling MW5 & move over to
finish MW3. Parameters stabile. Low
turbidity. No sheen & no odor observed.
See GW sample form.

1200 Set up to sample MW4. Parameters stabilized
quickly. Low turbidity. No odor or sheen
observed. See GW sample form.

1300 Take photos of all wells & site. Depart
for Chalet.

1320 Arrive. Pack samples for shipment.
Write COCs. Pack up all gear
outside & inside. Prep instruments

for storage. Clean chalet rental.
Charge peri pumps.

2230 EOD.

Fri 8/01/14

0600 Wake. Finish packing. Put fresh ice on samples. Sign COCs. Seal & Tape coolers for shipment. Eat. Wash dishes.
0800 Depart Chalet for airport to ship samples.
0830 Arrive airport. Ship EDB to TA & remaining samples to ~~SGS.~~ Chris in ANC to drop off at SGS. Notify labs & Chris of sample shipments.
0930 End of field activities.
1700 Recieve message from Chris that samples were received, dropped off at SGS, & all temperatures were acceptable.

Sat 8/02/14

0930 Check on EDB samples shipped to TA. Plane arrived 1 hr ago. Samples not yet picked up.
1030 Check again. Samples received by laboratory.
1300 Samples reported to be in good condition. EOD.

→ Taking ferry from Haines to Skagway to hike Chilkoot, so return to Fairbanks not recorded here.

APPENDIX F
Survey Data

Windy Creek Surveys, LLC. 2650 Monteverde Rd., Fairbanks, AK. 99709

"Survey support for environmental monitoring" Phone: (907) 455-6776, Fax: (907) 455-6776

Email: ejc@windycreeksurveys.com

October 13, 2014

Re: FUDS – Haines-Fairbanks Pipeline PMP17.7

Mr. Craig Martin
Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Dear Mr. Martin,

This letter is to serve as our Survey Report for the 2014 FUDS – Haines-Fairbanks Pipeline PMP17.7 Site Monitor Well Survey.

The Basis of Coordinates for this work is the 2014 OPUS solution for primary control point 900. Sufficient static GPS data was collected for us to obtain and share an OPUS solution on OPUS DB. The horizontal coordinates for this point varied by 0.007′ in northing and 0.009′ in easting from the position used in 2012.

Horizontal coordinates for all improvements at this site were determined after post-processing the static GPS data that was collected on July 27th and 28th, 2014, and holding the 2014 OPUS solution coordinates for the three primary control points at our three sites. These post-processed coordinates were adjusted in a least squares adjustment to produce the final site control coordinates for the secondary control points established this survey at the PMP17.7, PMP19.5, and PMP25.5 sites. A final control coordinate listing was imported into Carlson Service and OPUS based coordinate localizations were created for each site. The final localization utilized for this site is "PMP17.7.OPUS.VERT.LOC".

The horizontal locations portion of the field survey was conducted on July 28th, 2014 utilizing 3 JAVAD Triumph-1 GNSS receivers. Two RTK base stations (set to broadcast on different frequencies) were situated at separate locations (Points "900" and "8000"). Each monitoring well and bore hole was positioned from both base stations, with 8000 series points (based on Point "900") and 9000 series points (based on Point "8000") recorded. A field inverse check between the two points established for the monitoring wells from separate base stations found a maximum positional variance of 0.17′ (which is well within the Manual of Electronic Deliverables - Survey Accuracy Requirement of 0.5 meters that is specified for monitoring wells). We chose to use 8000 series point numbers for the reported monitoring well locations as they were obtained from the RTK base station located at the 2" Aluminum Cap Monument "HFP-17.7"(Point 900).

The Basis of Elevations for this site originates from the 2014 OPUS solution for Point 900, with its NAVD88 (computed using Geoid12A) elevation of 63.681′. The vertical control survey was conducted on July 28th, 2014. Elevations were established on the top of PVC of each well. A Leica DNA03 level and a fiberglass Leica rod were utilized to complete the level loops that established these elevations. Leica Geo Office 7.0 software was utilized to process the level loops. A localization was created in the data collector utilizing the OPUS derived coordinates and leveled elevation data, so that our RTK GPS shots would be situated exactly into our coordinate system. The final RTK GPS coordinates were then exported after having applied the appropriate localization.

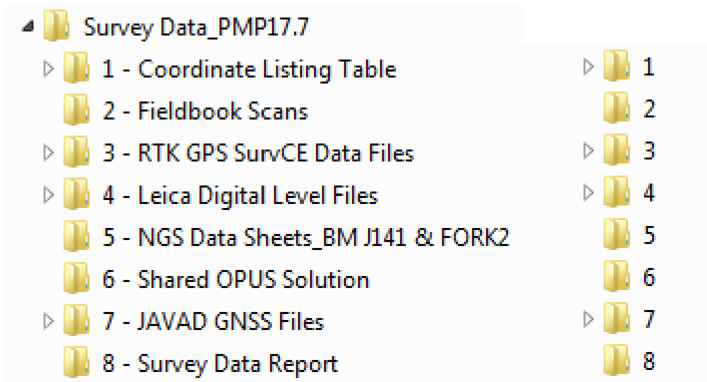
The NAVD88 elevation of Point 900 established in 2012 from the NGS Benchmark "J141" was 61.958′. For comparison: the 2014 OPUS solution for Point 900 showed an NAVD88(Computed using GEOID12A) orthometric elevation of 63.6′.

COE 2011 Manual for Electronic Deliverables – FUDS Project - compliant Survey Data deliverables include a Data Sheet listing the Monitoring Well positions in CGS WGS84 latitude/longitude in decimal degrees with the ground elevations listed in NAVD88 Feet, as per the requirements set forth in the COE Manual for

Windy Creek Surveys, LLC. 2650 Monteverde Rd., Fairbanks, AK. 99709

"Survey support for environmental monitoring" Phone: (907) 455-6776, Fax: (907) 455-6776
Email: ejc@windycreeksurveys.com

Electronic Deliverables. A comma delimited file including all of the wells, .pdf copies of the fieldbook, and the RTK GPS Service data files have been included as per the Manual. Also included is a listing the of Monitoring Well positions in UTM, Zone 8 (meters) with the elevations listed in feet. An image of the Survey Data file structure and its pared down naming structure can be seen below.



The CGS WGS84 latitude/longitude in decimal degrees with the ground elevations listed in NAVD88 Feet, Survey Data Table coordinate listing is as follows:

=== Control ===

Column A	Column B	Column C	Column D	Column E	Column F
900	59.347379783	-135.770626097	63.681	OPUS."HFP17.7"	DATE:07-28-2014 TIME:15:53:39
8000	59.347480652	-135.770444755	63.164	RTK.BASE.17BH22	DATE:07-28-2014 TIME:14:08:37
8004	59.348365493	-135.772443231	66.276	RTK.BCMON"J141""	DATE:07-28-2014 TIME:12:36:16
8031	59.347813552	-135.771008679	67.081	RTK.TBM.MAG	DATE:07-28-2014 TIME:15:01:38

=== Monitor Wells ===

Column A	Column B	Column C	Column D	Column E	Column F
8000	59.347480739	-135.770444613	63.510	17BH22	DATE:07-28-2014 TIME:11:44:39
8001	59.347524747	-135.770507705	64.895	17BH12/MW1	DATE:07-28-2014 TIME:11:53:13
8002	59.348110883	-135.771246656	64.955	17BH13/MW2	DATE:07-28-2014 TIME:12:01:08
8003	59.348410386	-135.771637090	65.964	17BH16/MW3	DATE:07-28-2014 TIME:12:04:08
8005	59.348364732	-135.772429432	67.507	17BH20/MW7	DATE:07-28-2014 TIME:12:53:13
8006	59.348364930	-135.772429476	67.507	17BH20/MW7	DATE:07-28-2014 TIME:12:56:03
8007	59.348332883	-135.772157508	66.297	17BH19/MW6	DATE:07-28-2014 TIME:13:09:13
8009	59.348128851	-135.772211217	66.170	17BH21/MW8	DATE:07-28-2014 TIME:13:22:14
8010	59.348128131	-135.771838227	65.684	17BH18/MW5	DATE:07-28-2014 TIME:13:30:54

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8011	59.347772585	-135.771635600	64.522	17BH23/MW4	DATE:07-28-2014 TIME:13:43:13
8012	59.347818344	-135.771376148	63.233	17BH17	DATE:07-28-2014 TIME:13:55:30
8013	59.348277460	-135.771509511	61.791	17BH15	DATE:07-28-2014 TIME:14:01:14
8014	59.348193629	-135.771107193	62.757	17BH14	DATE:07-28-2014 TIME:14:08:39

=== Features ===

Column A	Column B	Column C	Column D	Column E	Column F
8015	59.348431940	-135.771616708	62.150	17WS4/SE7	DATE:07-28-2014 TIME:14:20:29
8016	59.348244056	-135.771421243	62.277	17SE14	DATE:07-28-2014 TIME:14:24:59
8017	59.348128327	-135.771302442	62.233	17WP4	DATE:07-28-2014 TIME:14:26:36
8018	59.348127706	-135.771267029	62.110	WORM/WS3/SE6	DATE:07-28-2014 TIME:14:27:42
8019	59.348108451	-135.771247624	63.022	17WP1	DATE:07-28-2014 TIME:14:28:39
8020	59.348076687	-135.771235691	62.579	17WP3	DATE:07-28-2014 TIME:14:29:19
8021	59.348138413	-135.771188371	62.527	17WP2	DATE:07-28-2014 TIME:14:30:14
8022	59.348236466	-135.771090497	45.821	17WS5/SE8	DATE:07-28-2014 TIME:14:36:41
8023	59.348139220	-135.771057699	61.406	17WS10/SE13	DATE:07-28-2014 TIME:14:38:37
8024	59.348071396	-135.770819511	62.135	17SE20	DATE:07-28-2014 TIME:14:42:26
8025	59.348022194	-135.770922114	61.721	17WS9/SE12	DATE:07-28-2014 TIME:14:43:27
8026	59.347981692	-135.771084692	61.276	17SE15	DATE:07-28-2014 TIME:14:45:48
8027	59.347910471	-135.770932085	61.828	17SE16	DATE:07-28-2014 TIME:14:47:27
8028	59.347951039	-135.770789714	61.486	17SE19	DATE:07-28-2014 TIME:14:49:13
8029	59.347860621	-135.770568035	61.613	17SE18	DATE:07-28-2014 TIME:14:51:45
8030	59.347697888	-135.770476692	61.372	17SE17	DATE:07-28-2014 TIME:14:55:21
8032	59.348023822	-135.770512585	61.717	17WS6/SE9	DATE:07-28-2014 TIME:15:04:35
8033	59.347779608	-135.770144362	61.705	17WS7/SE10	DATE:07-28-2014 TIME:15:08:15
8034	59.347551168	-135.769780443	61.615	17WS8/SE11	DATE:07-28-2014 TIME:15:10:46
8035	59.348286173	-135.772801657	64.745	17WS2/SE4	DATE:07-28-2014 TIME:15:33:44
8036	59.348162052	-135.772817533	62.713	17SE5	DATE:07-28-2014 TIME:15:39:39
8037	59.348512682	-135.772807934	62.568	17SE3	DATE:07-28-2014 TIME:15:43:53
8038	59.348664495	-135.772867159	62.051	17WS1/SE2	DATE:07-28-2014 TIME:15:48:25
8039	59.348837894	-135.772952079	62.793	17SE1	DATE:07-28-2014 TIME:15:50:38

Sincerely,

10/14/2014

X Eric J. Cousino

Eric J. Cousino, PLS

Signed by: Eric J Cousino - Signature

Windy Creek Surveys, LLC. 2650 Monteverde Rd., Fairbanks, AK. 99709

"Survey support for environmental monitoring" Phone: (907) 455-6776, Fax: (907) 455-6776
Email: ejc@windycreeksurveys.com

October 13, 2014

Re: FUDS – Haines-Fairbanks Pipeline PMP19.5

Mr. Craig Martin
Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Dear Mr. Martin,

This letter is to serve as our Survey Report for the 2014 FUDS – Haines-Fairbanks Pipeline PMP19.5 Site Monitor Well Survey.

The Basis of Coordinates for this work is the 2014 OPUS solution for primary control point 902. Sufficient static GPS data was collected for us to obtain and share an OPUS solution on OPUS DB. The horizontal coordinates for this point varied by 0.008′ in northing and 0.045′ in easting from the position used in 2012.

Horizontal coordinates for all improvements at this site were determined after post-processing the static GPS data that was collected on July 27th and 28th, 2014, and holding the 2014 OPUS solution coordinates for the three primary control points at our three sites. These post-processed coordinates were adjusted in a least squares adjustment to produce the final site control coordinates for the secondary control points established this survey at the PMP17.7, PMP19.5, and PMP25.5 sites. A final control coordinate listing was imported into Carlson Service and OPUS based coordinate localizations were created for each site. The final localization utilized for this site is "PMP19.5.OPUS.VERT.LOC".

The horizontal locations portion of the field survey was conducted on July 27th, 2014 utilizing 3 JAVAD Triumph-1 GNSS receivers. Two RTK base stations (set to broadcast on different frequencies) were situated at separate locations (Points "902" and "6019"). Each monitoring well and bore hole was positioned from both base stations, with 6000 series points (based on Point "902") and 7000 series points (based on Point "6019") recorded. A field inverse check between the two points established for the monitoring wells from separate base stations found a maximum positional variance of 0.10′ (which is well within the Manual of Electronic Deliverables - Survey Accuracy Requirement of 0.5 meters that is specified for monitoring wells). We chose to use 6000 series point numbers for the reported monitoring well locations as they were obtained from the RTK base station located at the 2" Aluminum Cap Monument "HFP-19.5"(Point 902).

The Basis of Elevations for this site originates from the 2014 OPUS solution for Point 902, with its **new** NAVD88 (computed using Geoid12A) elevation of 91.860′. The vertical control survey was conducted on July 27th, 2014. Elevations were established on the top of PVC of each well. A Leica DNA03 level and a fiberglass Leica rod were utilized to complete the level loops that established these elevations. Leica Geo Office 7.0 software was utilized to process the level loops. A localization was created in the data collector utilizing the OPUS derived coordinates and leveled elevation data, so that our RTK GPS shots would be situated exactly into our coordinate system. The final RTK GPS coordinates were then exported after having applied the appropriate localization.

This work was performed around a sow grizzly with two small well behaved cubs (excepting the RTK GPS base station that one knocked over). She circled through the site repeatedly throughout the day to forage. She was not trying to be threatening or menacing, but she was an intimidating showstopper nonetheless.

COE 2011 Manual for Electronic Deliverables – FUDS Project - compliant Survey Data deliverables include a Data Sheet listing the Monitoring Well positions in CGS WGS84 latitude/longitude in decimal degrees with the ground elevations listed in NAVD88 Feet, as per the requirements set forth in the COE Manual for

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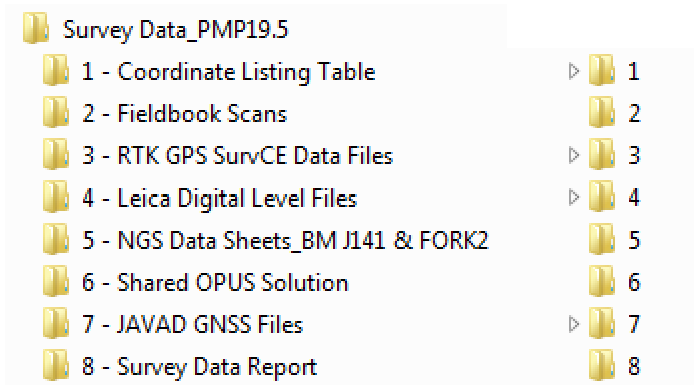
Electronic Deliverables. A comma delimited file including all of the wells, .pdf copies of the fieldbook, and the RTK GPS Service data files have been included as per the Manual. Also included is a listing the of Monitoring Well positions in UTM, Zone 8 (meters) with the elevations listed in feet. An image of the Survey Data file structure and its pared down naming structure can be seen below.



The CGS WGS84 latitude/longitude in decimal degrees with the ground elevations listed in NAVD88 Feet, Survey Data Table coordinate listing is as follows:

=== Control ===

Column A	Column B	Column C	Column D	Column E	Column F
902	59.366147427	-135.802076820	91.860	OPUS."HFP19.5"	DATE:07-27-2014 TIME:20:02:14
6019	59.366610735	-135.801581490	100.952	SET8"SPIKE	DATE:07-27-2014 TIME:18:48:57

=== Monitor Wells ===

Column A	Column B	Column C	Column D	Column E	Column F
6020	59.366566242	-135.801588307	98.707	19BH12/MW2	DATE:07-27-2014 TIME:17:58:51
6021	59.366324929	-135.800612278	89.685	19BH8/MW1	DATE:07-27-2014 TIME:18:09:16
6022	59.366113697	-135.801102118	85.540	19BH17/MW4.a	DATE:07-27-2014 TIME:18:12:51
6023	59.365939439	-135.800348989	81.458	19BH14/MW3	DATE:07-27-2014 TIME:18:19:52
6024	59.366113697	-135.801102118	85.458	19BH17/MW4.b	DATE:07-27-2014 TIME:18:12:51
6025	59.366036758	-135.800788448	82.002	19BH16	DATE:07-27-2014 TIME:18:28:27
6026	59.365987571	-135.800566124	82.032	19BH15	DATE:07-27-2014 TIME:18:33:15
6027	59.365885281	-135.800208835	80.344	19BH13	DATE:07-27-2014 TIME:18:34:29
6034	59.366289336	-135.800431093	85.835	19BH9	DATE:07-27-2014 TIME:19:05:42
6050	59.366460707	-135.801078534	92.771	19BH11	DATE:07-27-2014 TIME:19:30:34
6053	59.366392324	-135.800854506	90.071	19BH10	DATE:07-27-2014 TIME:19:35:22

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=== **Features** ===

Column A	Column B	Column C	Column D	Column E	Column F
6028	59.365642733	-135.799738594	77.532	19WS7/SE7	DATE:07-27-2014 TIME:18:47:18
6029	59.365761713	-135.799925679	77.987	19WS6/SE6	DATE:07-27-2014 TIME:18:48:12
6030	59.365910487	-135.800281700	79.285	19WS5/SE5	DATE:07-27-2014 TIME:18:49:15
6031	59.366061951	-135.800120067	80.934	19WS4/SE4	DATE:07-27-2014 TIME:18:53:21
6032	59.366075099	-135.800185429	80.948	19WS3/SE3	DATE:07-27-2014 TIME:18:54:21
6035	59.366283921	-135.800415827	86.174	19HAND.AUGER2	DATE:07-27-2014 TIME:19:07:25
6036	59.366266988	-135.800409440	72.213	19SS1	DATE:07-27-2014 TIME:19:09:13
6037	59.366624469	-135.801760869	100.881	PT	DATE:07-27-2014 TIME:19:27:19
6038	59.366614428	-135.801724569	100.478	PT	DATE:07-27-2014 TIME:19:28:00
6039	59.366603566	-135.801671691	100.370	PT	DATE:07-27-2014 TIME:19:28:11
6040	59.366591376	-135.801636589	100.062	PT	DATE:07-27-2014 TIME:19:28:26
6041	59.366565139	-135.801569176	98.838	PT	DATE:07-27-2014 TIME:19:28:46
6042	59.366551534	-135.801477092	97.820	PT	DATE:07-27-2014 TIME:19:29:00
6043	59.366545735	-135.801453893	97.432	PT	DATE:07-27-2014 TIME:19:29:06
6044	59.366532121	-135.801404141	96.637	PT	DATE:07-27-2014 TIME:19:29:13
6045	59.366515219	-135.801362222	95.589	PT	DATE:07-27-2014 TIME:19:29:20
6046	59.366502430	-135.801321321	95.686	PT	DATE:07-27-2014 TIME:19:29:28
6047	59.366470525	-135.801219694	94.258	PT	DATE:07-27-2014 TIME:19:29:39
6048	59.366458461	-135.801159802	92.627	PT	DATE:07-27-2014 TIME:19:29:48
6049	59.366441385	-135.801072021	92.249	PT	DATE:07-27-2014 TIME:19:30:03
6051	59.366697449	-135.800769705	98.363	19WS1/SE1	DATE:07-27-2014 TIME:19:32:06
6052	59.366419667	-135.800349606	89.293	19WS2/SE2	DATE:07-27-2014 TIME:19:34:06
6054	59.366353592	-135.800738823	88.077	PT	DATE:07-27-2014 TIME:19:36:27
6055	59.366333829	-135.800693084	87.984	PT	DATE:07-27-2014 TIME:19:36:42
6056	59.366284469	-135.800520560	82.880	PT	DATE:07-27-2014 TIME:19:37:33
6057	59.366269755	-135.800448458	85.486	PT	DATE:07-27-2014 TIME:19:39:04
6058	59.366242809	-135.800373635	86.223	PT	DATE:07-27-2014 TIME:19:42:37
6059	59.366304467	-135.800592821	86.603	19SS2	DATE:07-27-2014 TIME:19:45:07
6060	59.366335286	-135.800629811	87.596	19HAND.AUGER1	DATE:07-27-2014 TIME:19:45:40

Sincerely,

10/14/2014

X Eric J. Cousino

Eric J. Cousino, PLS

Signed by: Eric J Cousino - Signature

Windy Creek Surveys, LLC. 2650 Monteverde Rd., Fairbanks, AK. 99709

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Email: ejc@windycreeksurveys.com

October 13, 2014

Re: FUDS – Haines-Fairbanks Pipeline PMP25.5

Mr. Craig Martin
Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Dear Mr. Martin,

This letter is to serve as our Survey Report for the 2014 FUDS – Haines-Fairbanks Pipeline PMP25.5 Site Monitor Well Survey.

The Basis of Coordinates for this work is the 2014 OPUS solution for primary control point 904. Sufficient static GPS data was collected for us to obtain and share an OPUS solution on OPUS DB. The horizontal coordinates for this point varied by 0.023′ in northing and 0.002′ in easting from the position used in 2012.

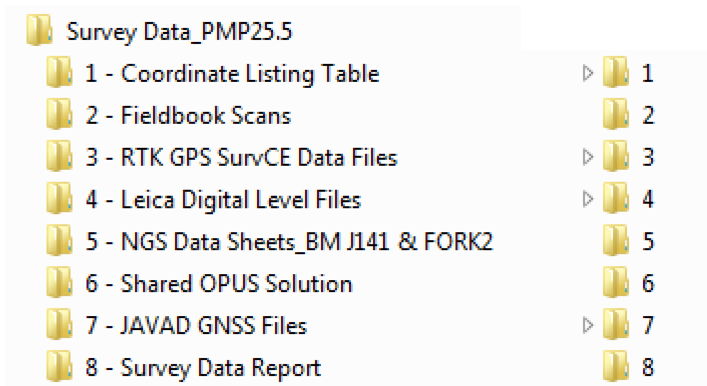
Horizontal coordinates for all improvements at this site were determined after post-processing the static GPS data that was collected on July 27th and 28th, 2014, and holding the 2014 OPUS solution coordinates for the three primary control points at our three sites. These post-processed coordinates were adjusted in a least squares adjustment to produce the final site control coordinates for the secondary control points established this survey at the PMP17.7, PMP19.5, and PMP25.5 sites. A final control coordinate listing was imported into Carlson Service and OPUS based coordinate localizations were created for each site. The final localization utilized for this site is "PMP25.5.OPUS.VERT.LOC".

The horizontal locations portion of the field survey was conducted on July 27th, 2014 utilizing 3 JAVAD Triumph-1 GNSS receivers. Two RTK base stations (set to broadcast on different frequencies) were situated at separate locations (Points "904" and "6000"). Each monitoring well and bore hole was positioned from both base stations, with 6000 series points (based on Point "904") and 7000 series points (based on Point "6000") recorded. A field inverse check between the two points established for the monitoring wells from separate base stations found a maximum positional variance of 0.24′ (which is well within the Manual of Electronic Deliverables - Survey Accuracy Requirement of 0.5 meters that is specified for monitoring wells). We chose to use 6000 series point numbers for the reported monitoring well locations as they were obtained from the RTK base station located at the 2" Aluminum Cap Monument "HFP-25.5"(Point 904).

The Basis of Elevations for this site originates from the 2014 OPUS solution for Point 904, with its new NAVD88 (computed using Geoid12A) elevation of 155.662′. The vertical control survey was conducted on July 27th, 2014. Elevations were established on the top of PVC of each well. A Leica DNA03 level and a fiberglass Leica rod were utilized to complete the level loops that established these elevations. Leica Geo Office 7.0 software was utilized to process the level loops. A localization was created in the data collector utilizing the OPUS derived coordinates and leveled elevation data, so that our RTK GPS shots would be situated exactly into our coordinate system. The final RTK GPS coordinates were then exported after having applied the appropriate localization.

The NAVD88 elevation of Point 904 established in 2012 from the NGS Benchmark "FORK2" was 154.237′. The 2012 OPUS solution for Point 904 showed an NAVD88(Computed using GEOID12A) orthometric elevation of 155.646′. For comparison: the 2014 OPUS solution for Point 904 showed an NAVD88(Computed using GEOID12A) orthometric elevation of 155.662′. Conclusion taken from looking at this and "J141" at the PMP17.7 site, is that: it is not safe for the NGS to apply its geoid parameters to its historic data on these passive monuments and generate NAVD88 elevations in this mountainous area. It could be isostatic rebound, and the exact identification of this inconsistency is probably more complicated than that. In the long run, it does not really matter what it is, because what we have now is superior to what we had in 2012. We have a more accurate reflection of the precise current position of the improvements, and they are now in a Horizontal (and Vertical) Time Dependent (HTDP/VTDP) System that is consistent with the passive monumentation on the ground.

COE 2011 Manual for Electronic Deliverables – FUDS Project - compliant Survey Data deliverables include a Data Sheet listing the Monitoring Well positions in CGS WGS84 latitude/longitude in decimal degrees with the ground elevations listed in NAVD88 Feet, as per the requirements set forth in the COE Manual for Electronic Deliverables. A comma delimited file including all of the wells, .pdf copies of the fieldbook, and the RTK GPS Service data files have been included as per the Manual. Also included is a listing the of Monitoring Well positions in UTM, Zone 8 (meters) with the elevations listed in feet. An image of the Survey Data file structure and its pared down naming structure can be seen below.



The CGS WGS84 latitude/longitude in decimal degrees with the ground elevations listed in NAVD88 Feet, Survey Data Table coordinate listing is as follows:

=== Control ===

Column A	Column B	Column C	Column D	Column E	Column F
904	59.416137879	-135.928844749	155.662	OPUS."HFP25.5"	DATE:07-27-2014 TIME:12:55:54
6000	59.415794936	-135.929516030	148.729	25BH15/MW4	DATE:07-27-2014 TIME:12:52:44
6012	59.415483698	-135.931304583	137.456	RTK.BCMON.FORK2	DATE:07-27-2014 TIME:13:03:31

=== Monitor Wells ===

Column A	Column B	Column C	Column D	Column E	Column F
6000	59.415794936	-135.929516030	147.231	25BH15/MW4	DATE:07-27-2014 TIME:11:54:21
6001	59.415665505	-135.929714014	144.564	25BH16/MW5	DATE:07-27-2014 TIME:12:05:38
6002	59.415803987	-135.929285401	150.178	25BH14/MW3	DATE:07-27-2014 TIME:12:20:35

6003	59.415999069	-135.929764911	145.400	25BH8/MW1	DATE:07-27-2014 TIME:12:23:02
6004	59.416042509	-135.929241592	150.254	25BH10/MW2	DATE:07-27-2014 TIME:12:33:58
6005	59.416175924	-135.929189034	152.773	25BH17/MW6	DATE:07-27-2014 TIME:12:36:43
6006	59.415883462	-135.929283307	152.028	25BH13	DATE:07-27-2014 TIME:12:51:56
6007	59.416041932	-135.929136621	152.584	25BH12	DATE:07-27-2014 TIME:12:54:26
6008	59.416060819	-135.929173287	150.368	25BH11	DATE:07-27-2014 TIME:12:54:54
6009	59.416027357	-135.929508320	147.202	25BH9	DATE:07-27-2014 TIME:12:55:22

=== Features ===

Column A	Column B	Column C	Column D	Column E	Column F
6010	59.415545446	-135.931747692	123.800	WATER.LEVEL	DATE:07-27-2014 TIME:12:58:29
6011	59.415399627	-135.931464335	124.029	WATER.LEVEL	DATE:07-27-2014 TIME:13:00:30

Sincerely,

10/14/2014

X Eric J. Cousino

Eric J. Cousino, PLS

Signed by: Eric J Cousino - Signature

APPENDIX G

Geophysical Survey Report

GeoTek Alaska, Inc.

September 11, 2014
13-1036

Mr. Craig Martin
Fairbanks Environmental Services
748 Gaffney Rd
Fairbanks, AK 99701
Phone: (907) 452-1006

RE: Letter Report – Geophysical Survey – Haines, Alaska

The following is a Letter Report submitted to Fairbanks Environmental Services (FES) by GeoTek Alaska, Inc. (GTA). This report concerns the performance of a Geophysical Survey for a project site near Haines, AK. The Geophysical Survey was requested by Mr. Craig Martin (FES) by email on August 22, 2013.

Introduction

In support of an environmental site characterization, FES contracted GTA to perform a geophysical survey at a project site location near Haines, AK (Figure 1). The project site was located approximately seventeen miles (17-mi) northwest of Haines along the Haines Highway (Alaska State Highway 7). GTA performed a geophysical survey to identify any data anomalies that may be attributed to a buried metal pipeline within a designated Area of Concern (AOC) at the project site.

<u>Location</u>

The project site is located approximately seventeen miles (17-mi) northwest of Haines, AK along the Haines Highway (Figure 2). The geophysical survey was performed at an AOC that is approximately one hundred feet (100-ft) north of the highway.

Survey Area

The geophysical survey consisted of acquiring electromagnetic (EM) profile line data over the entire AOC, and Ground Penetrating Radar (GPR) data over a smaller area within the AOC (Figure 3).

The overall area of the EM survey at the project site is approximately five thousand two hundred square feet (5,200-ft^2). The survey area for the EM data was established in a northwest-southeast orientation. The dimension of the surveyed area is approximately twenty feet wide by two hundred sixty feet long (20-ft X 260-ft). Within the grid area, the EM profile lines were acquired northeast-southwest or perpendicular to the long axis of the AOC. Due to vegetation, the separation between acquired EM profile lines is irregular and ranges from fifteen feet (15-ft) to fifty feet (50-ft) within the survey area.

A GPR grid was established in the northwestern portion of the EM data grid. The GPR grid dimension is sixteen feet by twenty two feet (16-ft X 22-ft). The GPR profile lines were acquired in a single orientation of northeast-southwest with two feet (2-ft) line spacing.

The boundaries of the AOC and dimensions of data acquisition grids (extent and data density) were reviewed, discussed, and agreed upon with the client prior to performing the survey.

Data Acquired

Data acquisition was performed on July 15th, 2014. A total of thirteen (13) profile lines of EM data and twelve (12) GPR profile lines were acquired during the geophysical survey. GTA also acquired GPS data for the positioning of the geophysical data. GTA established a GPS base station at the project location and performed a post processing data correction using NOAA's Online Positioning User Service (OPUS).

Data Quality

The quality of both data sets (EM and GPR) is good (on a scale of good, fair, poor).

Instrumentation and Technical Approach

The geophysical survey consisted of acquiring EM data over the entire project AOC and GPR data over a smaller grid area within the AOC. Following, is a brief description of the equipment used for the data acquisition of the geophysical data and the technical approach.

Electromagnetic (EM)

The EM equipment used for the data acquisition at the project site consisted of the Geonics EM61-MK2 metal detector. The following is a brief description of the equipment and basic concepts of operation:

Geonics EM61-MK2 - The Geonics EM61-MK2 is a high sensitivity, high-resolution, time-domain electromagnetic metal detector that detects both ferrous and non-ferrous metallic objects. The EM61 instrument is used for acquisition of electromagnetic data to identify anomalies associated with buried metal objects, including ferrous and non-ferrous metals.

EM61 Operation

The EM61 instrument consists of two coils mounted one above another on the coil assembly that serve as both transmitter and receiver. A steady voltage is applied to the lower or transmitter coil (peak power of 100 watts) that is sharply terminated at each cycle or pulse. A rapid reduction of the transmitter current, and thus of the associated primary magnetic field, induces an electromotive force in nearby conductors (i.e., metallic objects). This electromotive force causes electrical eddy currents to flow in conductors with decay characteristics that are a function of the conductivity, size, and shape of the conductor. The decaying currents generate a secondary magnetic field that is detected and measured by the two coils now acting as receivers. The measurements are made at a relatively long time (0.45 milliseconds) after termination of the primary pulse. This delay in measurement provides for a response that is practically independent of the electrical conductivity of the ground due to the longer decay characteristic of electrical eddy currents in metallic objects than that of the ground. The measured response from the secondary magnetic field is proportional to the metal type, mass, shape, and depth of the conductor.

When using EM data it should also be understood that for a target to be detectable, several conditions must be met. Generally, three (3) conditions apply and they are; 1) the transmitted signal must induce currents inside the target. In the case of a resistive target, induced currents must flow around the target, 2) there must be a difference in electrical properties between the target and the surrounding material to generate an anomalous electromagnetic response, and 3) the anomalous electromagnetic response must be large compared to any noise signals or background response.

Ground Penetrating Radar (GPR)

The GPR equipment used for the data acquisition at the project site consisted of the Sensors and Software pulseEKKO Pro system. The following is a brief description of the equipment and basic concepts of operation:

Sensors and Software pulseEKKO Pro system - The Sensors and Software pulseEKKO Pro system consists of a GPR antenna system (with attached transmitter and receiver) that is transported manually or by a lightweight cart. The GPR system also includes a Digital Video Logger (DVL), an odometer wheel, and battery. The DVL is where GPR data is recorded and displayed in wiggle trace format. The real-time display of traces allows the operator to see the acquired data on the DVL as the operator moves. This provides for quality control of data during acquisition, and the ability to observe diagnostic responses of buried objects (i.e., pipelines, boulders, void spaces, etc.).

GPR Operation

Ground Penetrating Radar directs a pulse of radio waves (i.e., frequencies from 12.5 MHz to 1000 MHz) downward into the earth. Part of the transmitted energy of the waves is reflected back to the receiver from interfaces or objects with differing electrical properties. GPR reflection data is recorded as a function of the two-way time required for a signal pulse to transmit, reflect, and return to the receiver antenna. Differing soil properties produce a scattering of the GPR signal and some of the scattered signal is reflected back to the GPR receiving antenna. Typically, a reflection event is produced at an interface where the electrical properties (e.g., dielectric constant and electrical conductivity) vary with soil lithology, associated grain size and porosity, water saturation, and pore chemistry.

A GPR profile line consists of data traces recorded at a station spacing determined appropriate for the project objectives. The records of multiple, separate pulses at a single location (i.e., station) are summed to enhance the signal-to-noise ratio and produce a single trace for that station. The summed trace is transmitted in digital form to a data-logging instrument or computer. The display of each summed trace at every station along the established survey grid line produces a GPR profile line for that grid line location. For this project, the GPR data was acquired at an appropriate station spacing interval (0.03-ft) to achieve the geophysical survey objective.

Additionally, localized buried targets (both metallic and non-metallic) can also produce a reflection event that enables the location of the object, and determination of its depth in the subsurface. A hyperbolic shaped response or diffraction is diagnostic of localized buried targets. The top of the hyperbola in GPR profile data indicates the location of a buried object. The shape of the tails of the hyperbola provides for the calculation of the velocity of the radio waves in the subsurface. Thus, the depth of a buried object can be determined from the time of the reflection event for the object (top of hyperbola) and the calculated velocity of the radio waves in the subsurface.

Technical Approach

After identification of the AOC at the project site, the EM61instrument was used as a reconnaissance tool to determine the response and general location of a pipeline. During reconnaissance, flags were used to indicate the general location of the pipeline for the purpose of establishing a gird of parallel profile lines. Once the grid and profile locations were established, EM data were acquired and the location of the response from the pipeline was flagged as the data were acquired. After flagging the location of the pipeline with the EM profile data, GPS data was acquired for the locations of the pipeline.

In addition to the EM data, a GPR grid was established in the northwest portion of the AOC. The GPR grid was established to corroborate the EM data and to provide confidence in the EM data interpretation of the pipeline response.

Once acquisition was completed the data set was transported to GTA's office for download from the geophysical equipment. The raw data was reviewed for quality assurance, and final processing of the EM and GPR data was accomplished.

Control Surveying

The dimensions of the geophysical survey grid were chosen to include the entire extent of the AOC within the data acquisition grid. The positioning of the geophysical data was accomplished by using a Leica 1200 GPS unit and Real Time Kinematic (RTK) positioning. GTA established a GPS base station near the project site to provide accurate positioning of the geophysical data. All positioning data acquired in the field used the WGS84 datum and geographic coordinate system (latitude and longitude).

Results

The results from the geophysical survey at the project site near Haines, AK are shown in Figures 4 - 6. The figures included in this report are listed below:

<u>Report Figures</u>

Figures 1- 3	Project Location Figures
Figure 4	Selected EM and GPR Data Profile Lines
Figure 5	Additional Selected EM Data Profile Lines
Figure 6	Locations of EM Data Profile Lines and Pipeline Anomalies

Figure 4 presents both the EM and GPR data for the same location of two (2) profile lines. The response from the pipeline is indicated in both of the different data sets. It should be noted that the typical, anomalous response from a pipeline in the GPR data is a “diffraction” or hyperbolic shaped reflection. The hyperbolic shaped diffraction is indicated in the profile lines from the GPR data set acquired for this project. The response from the pipeline occurs at the same location in both the EM and GPR data sets.

Figure 5 presents other selected profile lines form the EM data set. The response from the pipeline is readily discernible in the profile line data, and this data was used to interpret the location of the pipeline. The peak of the response from the pipeline is interpreted to be associated with the location of the pipeline and is indicated in each of the profile lines shown in Figure 5.

Figure 6 provides the location of the data anomalies interpreted as a response from the pipeline for most of the profile lines acquired at the site. Additionally, the location of the selected EM and GPR profile lines are indicated for the profile line data shown in Figures 4 and 5. It should be noted that GPS data for three (3) of the pipeline locations identified in the EM profile data could not be acquired due to interference from overhead vegetation.

Conclusions

In conclusion, GTA accomplished the objectives for this geophysical survey at the project site near Haines, Alaska. The following are some general comments from the interpretation of the geophysical data:

- The dimension of the area of concern (AOC) for this project is approximately twenty feet wide by two hundred sixty feet long (20-ft X 260-ft). Thirteen (13) EM profile lines and a smaller grid of GPR data (16-ft X 22-ft) were acquired.
- Based on an interpretation of the data in the field, the anomalous response from the pipeline in the data sets was flagged in the field to identify the pipeline location for the purpose of further site characterization (i.e. drilling/soil sampling).
- The data sets were transported to GTA’s office for further processing and report purposes. The location of anomalies identified in the field is

corroborated by the two (2) data sets and final interpretation of the processed data.

Limitations of Technical Services

GeoTek Alaska, Inc. (GTA) performed our services in a manner consistent with the skill level of currently practicing professionals under similar conditions. GTA's investigations are conducted within the design limitations of the equipment used for the purposes described in this report. Interpretations developed and presented in this report are based on the data collected by GTA in the field and were performed to the best of the interpreter's abilities. Limitations exist as actual site conditions may vary; thus no warranty is expressed or implied. This report is intended for the exclusive use of Fairbanks Environment Services and their authorized parties for purposes described herein.

Closure

GeoTek Alaska, Inc. appreciates this opportunity to support Fairbanks Environmental Services with a geophysical survey in Fairbanks, Alaska. GTA remains available to assist FES with future projects. Should you have any questions or require any additional information, please do not hesitate to contact the undersigned at (907) 569-5900.

Sincerely,

Chris Nettels

Chris Nettels
President/Consulting Geophysicist

GeoTek Alaska, Inc.
Geophysical and Environmental Site Assessment

Fairbanks Environmental Services
Haines, Alaska
Project Location

Created By: CBN	Date: 09/11/2014	Figure: 1
Project No: 13-1036	File Path: R:\00-000 GEOPHYSICAL PROJECTS\13-000 GEOPHYSICAL PROJECTS\13-1036 Haines_FES\Geophysics\Report\figures\prelim\13-1036_Haines_FES.pptx	

N

GeoTek Alaska, Inc.
Geophysical and Environmental Site Assessment

Fairbanks Environmental Services
Haines, Alaska
Project Site Location

Created By: CBN	Date: 09/11/2014
Project No: 13-1036	File Path: R:\00-000 GEOPHYSICAL PROJECTS\13-000 GEOPHYSICAL PROJECTS\13-1036 Haines_FES\Geophysics\Report\figures\prelim\13-1036_Haines_FES.pptx

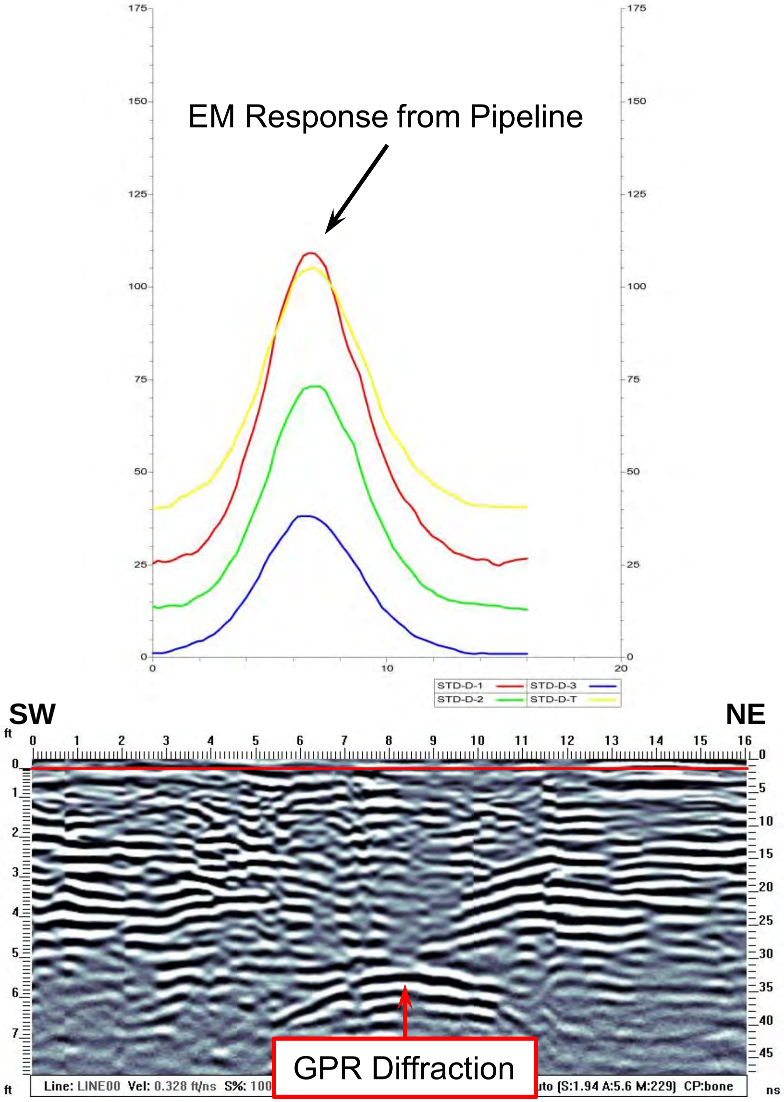
Figure: 2

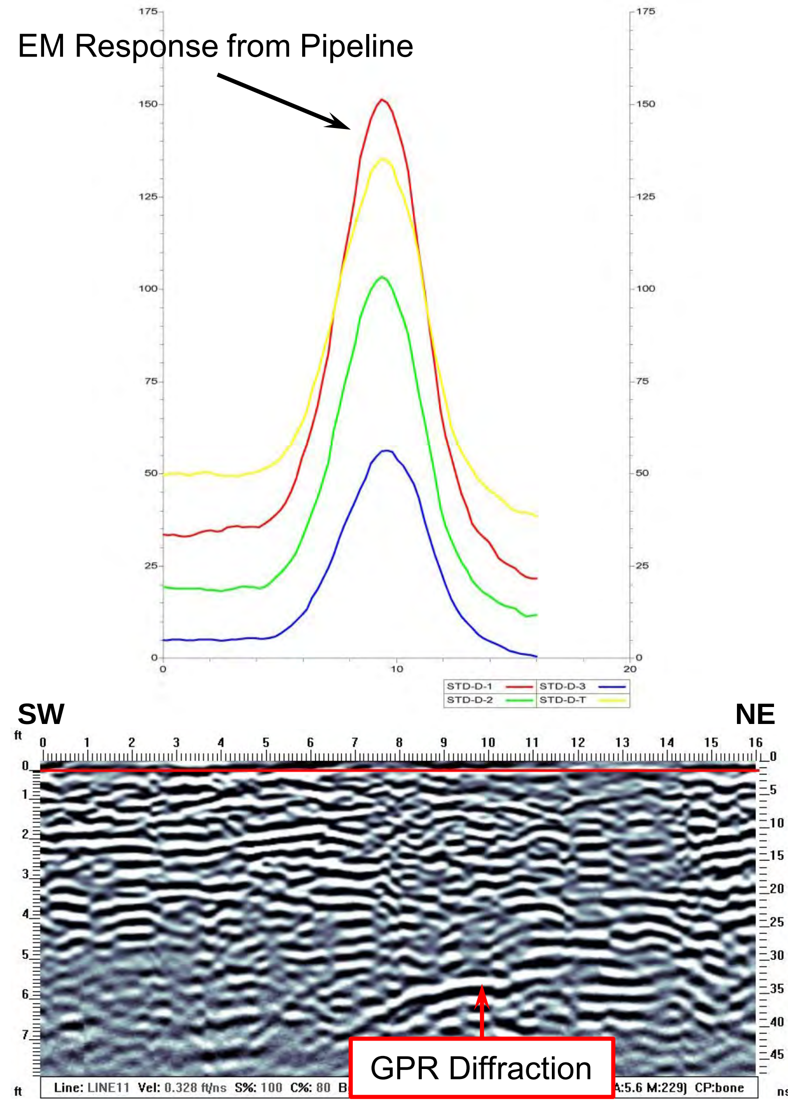
N

GeoTek Alaska, Inc.
Geophysical and Environmental Site Assessment

Fairbanks Environmental Services
Haines, Alaska
Geophysical Survey Locations

Created By: CBN	Date: 09/11/2014	Figure: 3
Project No: 13-1036	File Path: R:\00-000 GEOPHYSICAL PROJECTS\13-000 GEOPHYSICAL PROJECTS\13-1036 Haines_FES\Geophysics\Report\figures\prelim\13-1036_Haines_FES.pptx	





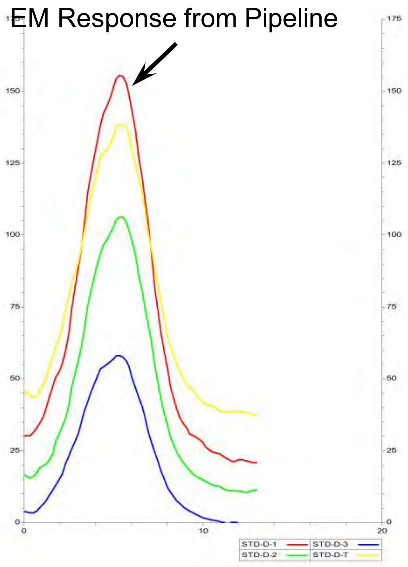
GeoTek Alaska, Inc.
Geophysical and Environmental Site Assessment

Fairbanks Environmental Services
Haines, Alaska
EM & GPR Data Profile Lines

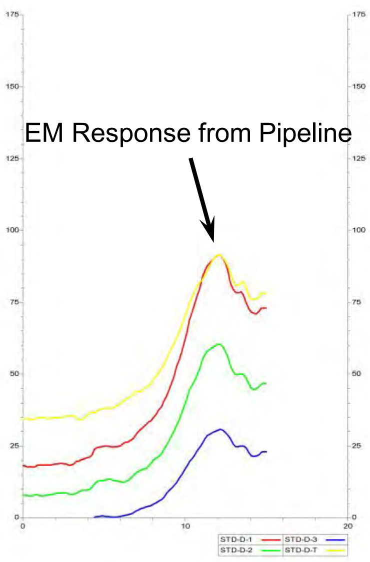
Created By:	Date:
CBN	09/11/2014
Project No: 13-1036	File Path: R:\00-000 GEOPHYSICAL PROJECTS\13-000 GEOPHYSICAL PROJECTS\13-1036 Haines_FES\Geophysics\Report\figures\prelim\13-1036_Haines_FES.pptx

Figure: 4

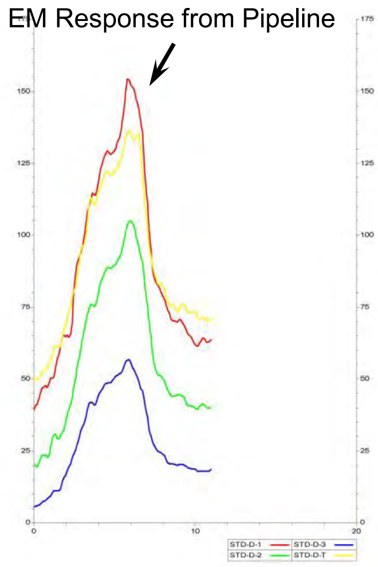
Profile Line 45



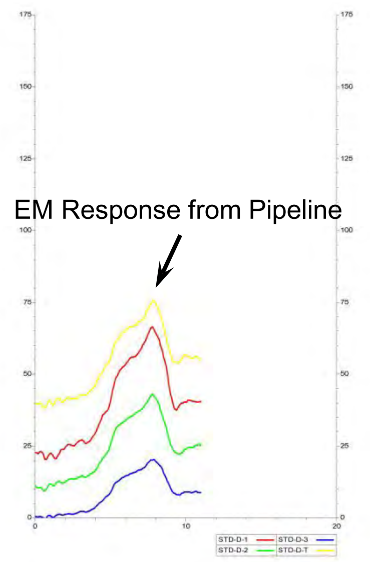
Profile Line 30



Profile Line 15



Profile Line 0



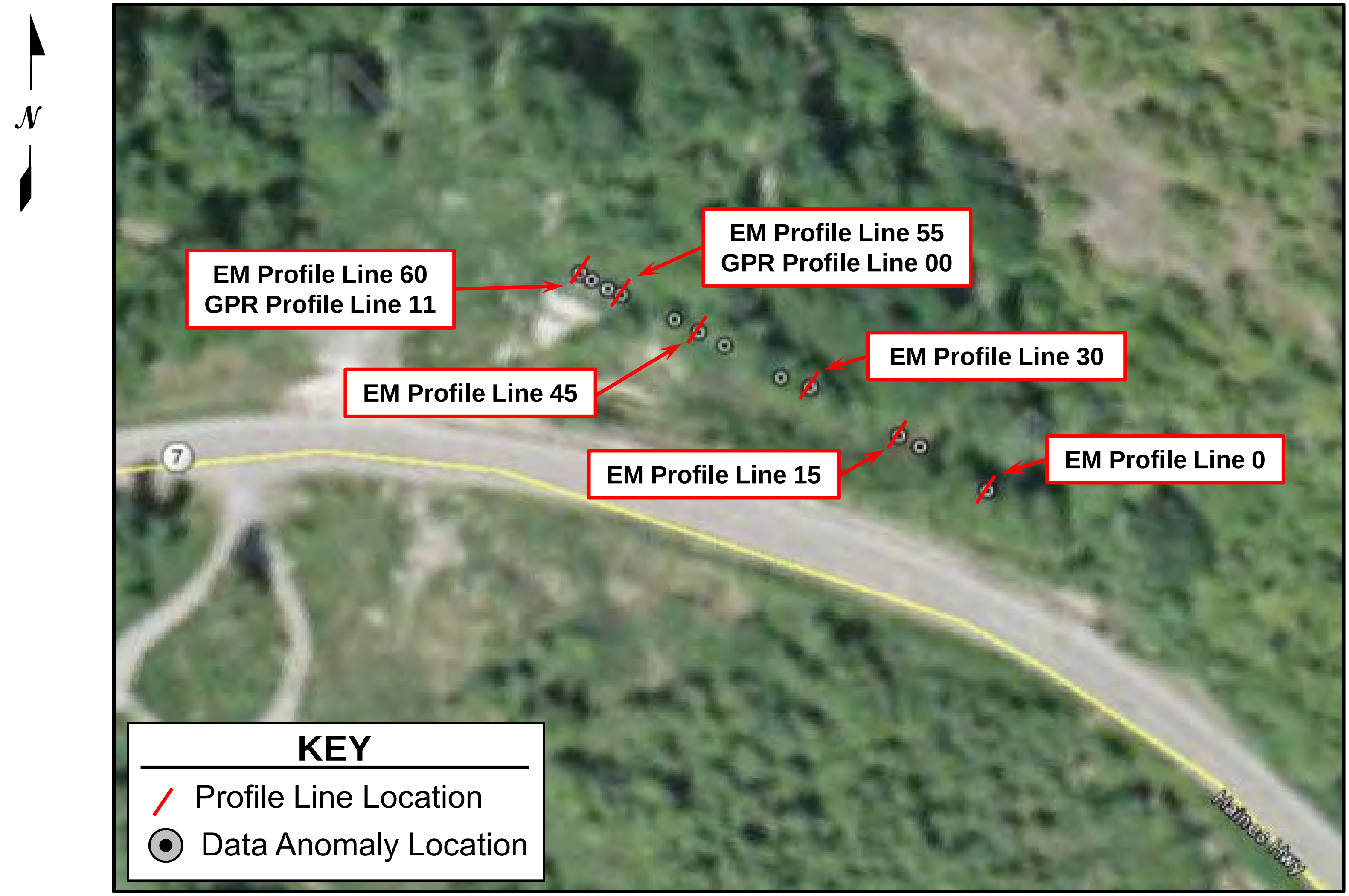
GeoTek Alaska, Inc.
Geophysical and Environmental Site Assessment

Fairbanks Environmental Services

Haines, Alaska

EM Data Profile Lines

Created By: CBN	Date: 09/11/2014	Figure: 5
Project No: 13-1036	File Path: R:\00-000 GEOPHYSICAL PROJECTS\13-000 GEOPHYSICAL PROJECTS\13-1036 Haines_FES\Geophysics\Report\figures\prelim\13-1036_Haines_FES.pptx	



GeoTek Alaska, Inc.
Geophysical and Environmental Site Assessment

Fairbanks Environmental Services
Haines, Alaska
Location of Pipeline Anomalies

Created By: CBN	Date: 09/11/2014
Project No: 13-1036	File Path: R:\00-000 GEOPHYSICAL PROJECTS\13-000 GEOPHYSICAL PROJECTS\13-1036 Haines_FES\Geophysics\Report\figures\prelim\13-1036_Haines_FES.pptx

Figure: 6

APPENDIX H
Human Health CSM and Cumulative Risk Evaluation Documentation

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: PMP 17.7 Haines Fairbanks Pipeline

Completed By: Craig Martin - FES

Date Completed: 11/3/2014

***Instructions**: Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.*

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.*

(3) *Check all exposure media identified in (2).*

(4) *Check all pathways that could be complete. The pathways identified in this column **must** agree with Sections 2 and 3 of the Human Health CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.*

Media / Transport Mechanisms

Media	Transport Mechanisms	
☑ Surface Soil (0-2 ft bgs)	Direct release to surface soil	check soil
	☑ Migration to subsurface	check soil
	☑ Migration to groundwater	check groundwater
	☑ Volatilization	check air
	☑ Runoff or erosion	check surface water
	☐ Uptake by plants or animals	check biota
	☐ Other (list):______	
☑ Subsurface Soil (2-15 ft bgs)	Direct release to subsurface soil	check soil
	☑ Migration to groundwater	check groundwater
	☑ Volatilization	check air
	☐ Uptake by plants or animals	check biota
	☐ Other (list):______	
☑ Ground-water	Direct release to groundwater	check groundwater
	☑ Volatilization	check air
	☑ Flow to surface water body	check surface water
	☑ Flow to sediment	check sediment
	☐ Uptake by plants or animals	check biota
	☐ Other (list):______	
☑ Surface Water	Direct release to surface water	check surface water
	☑ Volatilization	check air
	☑ Sedimentation	check sediment
	☐ Uptake by plants or animals	check biota
	☐ Other (list):______	
☑ Sediment	Direct release to sediment	check sediment
	☑ Resuspension, runoff, or erosion	check surface water
	☐ Uptake by plants or animals	check biota
	☐ Other (list):______	

Exposure Media / Exposure Pathway/Route / Current & Future Receptors

Exposure Media	Exposure Pathway/Route	Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ soil	☑ Incidental Soil Ingestion	F		C/F	C/F	C/F	C/F	
	☑ Dermal Absorption of Contaminants from Soil	F		C/F	C/F	C/F	C/F	
	☐ Inhalation of Fugitive Dust							
☑ groundwater	☑ Ingestion of Groundwater	F	F	F	F		F	
	☑ Dermal Absorption of Contaminants in Groundwater	F	F	F	F		F	
	☑ Inhalation of Volatile Compounds in Tap Water	F	F	F	F		F	
☑ air	☑ Inhalation of Outdoor Air	F	F	C/F	C/F	C/F	C/F	
	☐ Inhalation of Indoor Air							
	☐ Inhalation of Fugitive Dust							
☑ surface water	☑ Ingestion of Surface Water	F	F	C/F	C/F	C/F	C/F	
	☑ Dermal Absorption of Contaminants in Surface Water	F	F	C/F	C/F	C/F	C/F	
	☐ Inhalation of Volatile Compounds in Tap Water							
☑ sediment	☑ Direct Contact with Sediment	F	F	C/F	C/F	C/F	C/F	
☑ biota	☐ Ingestion of Wild or Farmed Foods							

Revised, 10/01/2010

Print Form

Human Health Conceptual Site Model
Scoping Form

Site Name: PMP 17.7 (Haines-Fairbanks Pipeline)

File Number: 900.38.001

Completed by: Craig Martin - Fairbanks Environmental Services

Introduction
The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources *(check potential sources at the site)*

- ☐ USTs
- ☐ ASTs
- ☐ Dispensers/fuel loading racks
- ☐ Drums
- ☐ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☒ Other: Pipeline

Release Mechanisms *(check potential release mechanisms at the site)*

- ☒ Spills
- ☒ Leaks
- ☐ Direct discharge
- ☐ Burning
- ☐ Other:

Impacted Media *(check potentially-impacted media at the site)*

- ☒ Surface soil (0-2 feet bgs*)
- ☒ Subsurface soil (>2 feet bgs)
- ☒ Air
- ☒ Sediment
- ☒ Groundwater
- ☒ Surface water
- ☒ Biota
- ☐ Other:

Receptors *(check receptors that could be affected by contamination at the site)*

- ☒ Residents (adult or child)
- ☐ Commercial or industrial worker
- ☒ Construction worker
- ☒ Subsistence harvester (i.e. gathers wild foods)
- ☒ Subsistence consumer (i.e. eats wild foods)
- ☒ Site visitor
- ☒ Trespasser
- ☒ Recreational user
- ☐ Farmer
- ☐ Other:

* bgs - below ground surface

2. **Exposure Pathways:** *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) ☒

If the box is checked, label this pathway complete: Complete

Comments:

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future? ☒

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the groundwater is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350. ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future? ☒

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities). ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

The wetland/pipeline trench (where surface water contamination is present) are not suitable drinking water sources, and neither is the Chilkat River slough (no surface water contamination). Surface water at the site is not a Human Health concern, but it is an ecological concern.

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? ☒

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) ☒

If all of the boxes are checked, label this pathway complete: Incomplete

Comments:

Groundwater is connected to surface water in the wetland. No bioaccumulative contaminants were detected in excess of cleanup levels in 2014.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Are the contaminants in soil volatile (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures) ☐

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Incomplete

Comments:

It is unlikely that structures would be built in a wetland.

3. **Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- o Climate permits recreational use of waters for swimming.
- o Climate permits exposure to groundwater during activities, such as construction.
- o Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☒

Comments:

The wetland does not likely represent a Human Health concern except if construction workers were exposed to contaminants during road construction. Contamination was identified in surface water along the pipeline trench which presents an ecological concern.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- o The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- o The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Volatiles are present at the site, but it is unlikely that structures would be built on the site and that water would be used for household purposes. The site is a wetland located within a preserve.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- o Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- o Dust particles are less than 10 micrometers (Particulate Matter - PM_{10}). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.
- o Chromium is present in soil that can be dispersed as dust particles of any size.

Generally, DEC direct contact soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because it is assumed most dust particles are incidentally ingested instead of inhaled to the lower lungs. The inhalation pathway only needs to be evaluated when very small dust particles are present (e.g., along a dirt roadway or where dusts are a nuisance). This is not true in the case of chromium. Site specific cleanup levels will need to be calculated in the event that inhalation of dust containing chromium is a complete pathway at a site.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

The site is well vegetated and/or under water; this condition eliminates the fugitive dust pathway.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- o Climate permits recreational activities around sediment.
- o The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed: ☒

Comments:

No recreational activities were identified that would result in exposure to wetland sediments. The Chilkat River slough is approximately 50 feet south of soil contamination, and slough sediments did not show evidence of contamination. However, contaminated sediment exists in the pipeline trench and in the wetland.

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

Biota is checked as exposure media due to a reported tree kill from the fuel release, documented during the 1971 site visit. No bioaccumulatives are currently present at the site, so there are no completed pathways for ingestion of wild or farmed foods through this media.

Method Three & Cumulative Risk Calculator

PMP 17.7 HFP

The following are cumulative cancer risks and hazard quotients by chemical.

Note that petroleum ranges (GRO, DRO, and RRO) are not included in cumulative risks. Also, if PCBs or dioxins are present at the site, the cumulative risks associated with these chemicals may also need to be considered; please contact the ADEC project manager for your site for information on how to address these chemicals.

Chemicals in red are carcinogenic.

Direct Contact Risks

Chemical	Soil Concentration (mg/kg)	Cancer Risk	Hazard Quotient
Acenaphthene	0.221	0	0.000096
Acenaphthylene	0.0023	0	0.000001
Benzene	4.16	0.00000035	0.013
Ethylbenzene	27.8	0	0.0033
Fluoranthene	0.0057	0	0.0000038
Fluorene	0.354	0	0.00019
1-Methylnaphthalene	7.85	0	0.034
2-Methylnaphthalene	13.4	0	0.058
Naphthalene	11	0	0.01
Phenanthrene	0.0406	0	0.0000024
Pyrene	0.0059	0	0.0000054
Toluene	71.2	0	0.011
Xylenes (total)	143.2	0	0.0086
Lead	10.1	0	0

Inhalation Risks

Chemical	Soil Concentration (mg/kg)	Cancer Risk	Hazard Quotient
Acenaphthene	0.221	0	0
Acenaphthylene	0.0023	0	0
Benzene	4.16	0.0000049	0.049
Ethylbenzene	27.8	0.0000034	0.0073
Fluoranthene	0.0057	0	0
Fluorene	0.354	0	0
1-Methylnaphthalene	7.85	0	0.014
2-Methylnaphthalene	13.4	0	0.024
Naphthalene	11	0.0000052	0.12
Phenanthrene	0.0406	0	0
Pyrene	0.0059	0	0
Toluene	71.2	0	0.0047
Xylenes (total)	143.2	0	0.36
Lead	10.1	0	0

Groundwater Risks

Chemical	Groundwater Concentration (mg/L)	Cancer Risk	Hazard Quotient
Acenaphthene	0.000184	0	0.000084
Acenaphthylene	0	0	0
Benzene	0.65	0.00043	4.3
Ethylbenzene	0.438	0	0.12
Fluoranthene	0	0	0
Fluorene	0.000252	0	0.00017
1-Methylnaphthalene	0.0161	0	0.11
2-Methylnaphthalene	0.0251	0	0.17
Naphthalene	0.0537	0	0.074
Phenanthrene	0.0000435	0	0.000004
Pyrene	0	0	0
Toluene	0.063	0	0.022
Xylenes (total)	2.5343	0	0.35
Lead	0.0012	0	0

Cumulative Risk

Cumulative Cancer Risk	0.0004
Cumulative Hazard Index	6

Attention!

Total risks exceed the benchmark values of a hazard index of 1 and/or a cancer risk of 0.00001. To accurately assess the possible effects of noncarcinogenic compounds, the HI can be segregated by target organ or system endpoint and mechanism of toxicity. Cleanup levels may be lowered to meet these cumulative risk benchmarks.

For the following chemicals, the cleanup level in Table C exceeds the cumulative risk standard of 1 x 10 -5:

- arsenic
- benzo(a)pyrene, beryllium, bromodichloromethane, chlordane, chlorodibromomethane
- 1,4-dichlorobenzene, 3,3-dichlorobenzidine, 1,1-dichloroethylene, 1,3-dichloropropene
- heptachlor
- heptachlor epoxide, hexachlorobenzene
- toxaphene
- vinyl chloride
- n-nitrosodi-n-propylamine

The following compounds exceed the HQ of 1.0 when set at the Table C levels:

- arsenic
- 2-chlorophenol
- hexachloro-1,3-butadiene
- hexachloroethane

In these cases, the cumulative risk at the site should be calculated by both including these chemicals and not including these chemicals. Decisions to set cleanup levels at either the Table C values or values that correspond to less than or equal to the cumulative risk standards will be made a DEC delegated authority.

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: PMP 19.5 Haines Fairbanks Pipeline

Completed By: Craig Martin - FES

Date Completed: 11/3/2014

***Instructions*: Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.**

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.*

(3) *Check all exposure media identified in (2).*

(4) *Check all pathways that could be complete. The pathways identified in this column must agree with Sections 2 and 3 of the Human Health CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.*

Media / Transport Mechanisms

☐ Surface Soil (0-2 ft bgs)
- Direct release to surface soil — check soil
- ☐ Migration to subsurface — check soil
- ☐ Migration to groundwater — check groundwater
- ☐ Volatilization — check air
- ☐ Runoff or erosion — check surface water
- ☐ Uptake by plants or animals — check biota
- ☐ Other (list):

☑ Subsurface Soil (2-15 ft bgs)
- Direct release to subsurface soil — check soil
- ☑ Migration to groundwater — check groundwater
- ☐ Volatilization — check air
- ☐ Uptake by plants or animals — check biota
- ☐ Other (list):

☑ Ground-water
- Direct release to groundwater — check groundwater
- ☐ Volatilization — check air
- ☐ Flow to surface water body — check surface water
- ☐ Flow to sediment — check sediment
- ☐ Uptake by plants or animals — check biota
- ☐ Other (list):

☐ Surface Water
- Direct release to surface water — check surface water
- ☐ Volatilization — check air
- ☐ Sedimentation — check sediment
- ☐ Uptake by plants or animals — check biota
- ☐ Other (list):

☐ Sediment
- Direct release to sediment — check sediment
- ☐ Resuspension, runoff, or erosion — check surface water
- ☐ Uptake by plants or animals — check biota
- ☐ Other (list):

Exposure Media / Exposure Pathway/Route / Current & Future Receptors

Exposure Media	Exposure Pathway/Route	Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
☑ soil	☑ Incidental Soil Ingestion	I		I	I	I	I	
	☑ Dermal Absorption of Contaminants from Soil	I		I	I	I	I	
	☐ Inhalation of Fugitive Dust							
☑ groundwater	☑ Ingestion of Groundwater	F		F	F	F	F	
	☑ Dermal Absorption of Contaminants in Groundwater	F		F	F	F	F	
	☐ Inhalation of Volatile Compounds in Tap Water							
☐ air	☐ Inhalation of Outdoor Air							
	☐ Inhalation of Indoor Air							
	☐ Inhalation of Fugitive Dust							
☐ surface water	☐ Ingestion of Surface Water							
	☐ Dermal Absorption of Contaminants in Surface Water							
	☐ Inhalation of Volatile Compounds in Tap Water							
☐ sediment	☐ Direct Contact with Sediment							
☐ biota	☐ Ingestion of Wild or Farmed Foods							

Print Form

Human Health Conceptual Site Model Scoping Form

Site Name: PMP 19.5 (Haines-Fairbanks Pipeline)

File Number: 900.38.001

Completed by: Craig Martin - Fairbanks Environmental Services

Introduction
The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. <u>From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.</u>

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources *(check potential sources at the site)*

- ☐ USTs
- ☐ ASTs
- ☐ Dispensers/fuel loading racks
- ☐ Drums
- ☐ Vehicles
- ☐ Landfills
- ☐ Transformers
- ☒ Other: Pipeline

Release Mechanisms *(check potential release mechanisms at the site)*

- ☒ Spills
- ☒ Leaks
- ☐ Direct discharge
- ☐ Burning
- ☐ Other:

Impacted Media *(check potentially-impacted media at the site)*

- ☐ Surface soil (0-2 feet bgs*)
- ☒ Subsurface soil (>2 feet bgs)
- ☐ Air
- ☐ Sediment
- ☒ Groundwater
- ☐ Surface water
- ☐ Biota
- ☐ Other:

Receptors *(check receptors that could be affected by contamination at the site)*

- ☒ Residents (adult or child)
- ☐ Commercial or industrial worker
- ☒ Construction worker
- ☒ Subsistence harvester (i.e. gathers wild foods)
- ☒ Subsistence consumer (i.e. eats wild foods)
- ☒ Site visitor
- ☐ Trespasser
- ☐ Recreational user
- ☐ Farmer
- ☐ Other:

* bgs - below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) ☐

If the box is checked, label this pathway complete: Incomplete

Comments:

Contaminants are not present at this depth; limited soil contamination exists between 26-36 feet bgs.

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☐

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

Contaminants are not present at this depth; limited soil contamination exists between 26-36 feet bgs.

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future? ☒

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the ground-water is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350. ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

No contaminants were detected in soil or groundwater in excess of cleanup levels in the area of the site investigated in 2014. Limited contamination exists surrounding 2012 boring 19-BH04, and receptors could be exposed if a drinking water well were constructed near this well in the future.

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future? ☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities). ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

No contaminants were detected in surface water in excess of cleanup levels.

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? ☒

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? ☐

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) ☐

If all of the boxes are checked, label this pathway complete: Incomplete

Comments:

No bioaccumulative compounds were detected within 1/10th of the cleanup levels.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☐

Are the contaminants in soil volatile (see Appendix D in the guidance document)? ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

Contaminants are not present at this depth; limited soil contamination exists between 26-36 feet bgs.

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures) ☒

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)? ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

Limited DRO soil contamination exists between 26-36 feet bgs. No buildings are currently within this distance of contamination, and contamination is limited to the area immediately underneath the pipeline valve.

3. **Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

No contaminants were detected exceeding cleanup levels in surface water samples.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

No contaminants were detected exceeding cleanup levels in surface water or groundwater samples.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- o Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- o Dust particles are less than 10 micrometers (Particulate Matter - PM_{10}). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.
- o Chromium is present in soil that can be dispersed as dust particles of any size.

Generally, DEC direct contact soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because it is assumed most dust particles are incidentally ingested instead of inhaled to the lower lungs. The inhalation pathway only needs to be evaluated when very small dust particles are present (e.g., along a dirt roadway or where dusts are a nuisance). This is not true in the case of chromium. Site specific cleanup levels will need to be calculated in the event that inhalation of dust containing chromium is a complete pathway at a site.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

No contaminants were detected exceeding cleanup levels in soil samples.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- o Climate permits recreational activities around sediment.
- o The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

No contaminants were detected exceeding cleanup levels in sediment samples.

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

HUMAN HEALTH CONCEPTUAL SITE MODEL GRAPHIC FORM

Site: PMP 25.5 Haines Fairbanks Pipeline

Completed By: Craig Martin - FES

Date Completed: 11/3/2014

***Instructions**: Follow the numbered directions below. Do not consider contaminant concentrations or engineering/land use controls when describing pathways.*

(1) *Check the media that could be directly affected by the release.*

(2) *For each medium identified in (1), follow the top arrow and check possible transport mechanisms. Check additional media under (1) if the media acts as a secondary source.*

(3) *Check all exposure media identified in (2).*

(4) *Check all pathways that could be complete. The pathways identified in this column **must** agree with Sections 2 and 3 of the Human Health CSM Scoping Form.*

(5) *Identify the receptors potentially affected by each exposure pathway: Enter "C" for current receptors, "F" for future receptors, "C/F" for both current and future receptors, or "I" for insignificant exposure.*

Media / Transport Mechanisms

Media	Transport Mechanisms	
[ ] Surface Soil (0-2 ft bgs)	Direct release to surface soil	check soil
	[ ] Migration to subsurface	check soil
	[ ] Migration to groundwater	check groundwater
	[ ] Volatilization	check air
	[ ] Runoff or erosion	check surface water
	[ ] Uptake by plants or animals	check biota
	[ ] Other (list):	
[x] Subsurface Soil (2-15 ft bgs)	Direct release to subsurface soil	check soil
	[x] Migration to groundwater	check groundwater
	[x] Volatilization	check air
	[ ] Uptake by plants or animals	check biota
	[ ] Other (list):	
[x] Ground-water	Direct release to groundwater	check groundwater
	[x] Volatilization	check air
	[ ] Flow to surface water body	check surface water
	[ ] Flow to sediment	check sediment
	[ ] Uptake by plants or animals	check biota
	[ ] Other (list):	
[ ] Surface Water	Direct release to surface water	check surface water
	[ ] Volatilization	check air
	[ ] Sedimentation	check sediment
	[ ] Uptake by plants or animals	check biota
	[ ] Other (list):	
[ ] Sediment	Direct release to sediment	check sediment
	[ ] Resuspension, runoff, or erosion	check surface water
	[ ] Uptake by plants or animals	check biota
	[ ] Other (list):	

Exposure Media / Exposure Pathway/Route / Current & Future Receptors

Exposure Media	Exposure Pathway/Route	Residents (adults or children)	Commercial or industrial workers	Site visitors, trespassers, or recreational users	Construction workers	Farmers or subsistence harvesters	Subsistence consumers	Other
[x] soil	[x] Incidental Soil Ingestion	C/F		C/F	F	C/F	C/F	
	[x] Dermal Absorption of Contaminants from Soil	C/F		C/F	F	C/F	C/F	
	[ ] Inhalation of Fugitive Dust							
[x] groundwater	[x] Ingestion of Groundwater	C/F		C/F	F	C/F	C/F	
	[x] Dermal Absorption of Contaminants in Groundwater	C/F		C/F	F	C/F	C/F	
	[x] Inhalation of Volatile Compounds in Tap Water	I		I	I		I	
[x] air	[x] Inhalation of Outdoor Air	C/F		C/F	F	C/F	C/F	
	[x] Inhalation of Indoor Air	C/F		C/F				
	[ ] Inhalation of Fugitive Dust							
[ ] surface water	[ ] Ingestion of Surface Water							
	[ ] Dermal Absorption of Contaminants in Surface Water							
	[ ] Inhalation of Volatile Compounds in Tap Water							
[ ] sediment	[ ] Direct Contact with Sediment							
[ ] biota	[ ] Ingestion of Wild or Farmed Foods							

Revised, 10/01/2010

Print Form

Human Health Conceptual Site Model
Scoping Form

Site Name: PMP 25.5 (Haines-Fairbanks Pipeline)

File Number: 900.38.001

Completed by: Craig Martin - Fairbanks Environmental Services

Introduction
The form should be used to reach agreement with the Alaska Department of Environmental Conservation (DEC) about which exposure pathways should be further investigated during site characterization. From this information, summary text about the CSM and a graphic depicting exposure pathways should be submitted with the site characterization work plan and updated as needed in later reports.

General Instructions: Follow the italicized instructions in each section below.

1. General Information:

Sources *(check potential sources at the site)*

- [ ] USTs
- [ ] ASTs
- [ ] Dispensers/fuel loading racks
- [ ] Drums
- [ ] Vehicles
- [ ] Landfills
- [ ] Transformers
- [x] Other: Pipeline

Release Mechanisms *(check potential release mechanisms at the site)*

- [ ] Spills
- [x] Leaks
- [ ] Direct discharge
- [ ] Burning
- [ ] Other:

Impacted Media *(check potentially-impacted media at the site)*

- [ ] Surface soil (0-2 feet bgs*)
- [x] Subsurface soil (>2 feet bgs)
- [ ] Air
- [ ] Sediment
- [x] Groundwater
- [ ] Surface water
- [ ] Biota
- [ ] Other:

Receptors *(check receptors that could be affected by contamination at the site)*

- [x] Residents (adult or child)
- [ ] Commercial or industrial worker
- [x] Construction worker
- [x] Subsistence harvester (i.e. gathers wild foods)
- [x] Subsistence consumer (i.e. eats wild foods)
- [x] Site visitor
- [x] Trespasser
- [x] Recreational user
- [x] Farmer
- [ ] Other:

* bgs - below ground surface

2. Exposure Pathways: *(The answers to the following questions will identify complete exposure pathways at the site. Check each box where the answer to the question is "yes".)*

a) Direct Contact -

1. Incidental Soil Ingestion

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site-specific basis.) ☒

If the box is checked, label this pathway complete: Complete

Comments:

Contaminants are present in soil below 9 feet bgs.

2. Dermal Absorption of Contaminants from Soil

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Can the soil contaminants permeate the skin (see Appendix B in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

Contaminants are present in soil below 9 feet bgs.

b) Ingestion -

1. Ingestion of Groundwater

Have contaminants been detected or are they expected to be detected in the groundwater, or are contaminants expected to migrate to groundwater in the future? ☒

Could the potentially affected groundwater be used as a current or future drinking water source? Please note, only leave the box unchecked if DEC has determined the ground-water is not a currently or reasonably expected future source of drinking water according to 18 AAC 75.350. ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

2. Ingestion of Surface Water

Have contaminants been detected or are they expected to be detected in surface water, or are contaminants expected to migrate to surface water in the future? ☐

Could potentially affected surface water bodies be used, currently or in the future, as a drinking water source? Consider both public water systems and private use (i.e., during residential, recreational or subsistence activities). ☐

If both boxes are checked, label this pathway complete: Incomplete

Comments:

The Chilkat River is located directly west of the site, but it is very silty and not a suitable drinking water source. Contaminants do not appear to be migrating to surface water.

3. Ingestion of Wild and Farmed Foods

Is the site in an area that is used or reasonably could be used for hunting, fishing, or harvesting of wild or farmed foods? ☒

Do the site contaminants have the potential to bioaccumulate (see Appendix C in the guidance document)? ☒

Are site contaminants located where they would have the potential to be taken up into biota? (i.e. soil within the root zone for plants or burrowing depth for animals, in groundwater that could be connected to surface water, etc.) ☒

If all of the boxes are checked, label this pathway complete: Complete

Comments:

Lead was identified at the site in excess of ADEC groundwater cleanup levels. Groundwater may be used to water farmed foods.

c) Inhalation-

1. Inhalation of Outdoor Air

Are contaminants present or potentially present in surface soil between 0 and 15 feet below the ground surface? (Contamination at deeper depths may require evaluation on a site specific basis.) ☒

Are the contaminants in soil volatile (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

Data indicate that Benzene and EDB are present above soil and/or groundwater cleanup levels at depths of approximately 18-27 feet bgs, and they may be present at higher depth intervals.

2. Inhalation of Indoor Air

Are occupied buildings on the site or reasonably expected to be occupied or placed on the site in an area that could be affected by contaminant vapors? (within 30 horizontal or vertical feet of petroleum contaminated soil or groundwater; within 100 feet of non-petroleum contaminted soil or groundwater; or subject to "preferential pathways," which promote easy airflow like utility conduits or rock fractures) ☒

Are volatile compounds present in soil or groundwater (see Appendix D in the guidance document)? ☒

If both boxes are checked, label this pathway complete: Complete

Comments:

Currently there do not appear to be any structures within 30 feet of the groundwater plume but potential exists as the site is located in a residential area.

3. **Additional Exposure Pathways:** *(Although there are no definitive questions provided in this section, these exposure pathways should also be considered at each site. Use the guidelines provided below to determine if further evaluation of each pathway is warranted.)*

Dermal Exposure to Contaminants in Groundwater and Surface Water

Dermal exposure to contaminants in groundwater and surface water may be a complete pathway if:

- Climate permits recreational use of waters for swimming.
- Climate permits exposure to groundwater during activities, such as construction.
- Groundwater or surface water is used for household purposes, such as bathing or cleaning.

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☒

Comments:

There is a drinking water well installed on the property located southwest of the groundwater plume. The well was evaluated by USACE and does not currently contain any contaminants exceeding cleanup levels. The well is not currently in use.

Inhalation of Volatile Compounds in Tap Water

Inhalation of volatile compounds in tap water may be a complete pathway if:

- The contaminated water is used for indoor household purposes such as showering, laundering, and dish washing.
- The contaminants of concern are volatile (common volatile contaminants are listed in Appendix D in the guidance document.)

Generally, DEC groundwater cleanup levels in 18 AAC 75, Table C, are assumed to be protective of this pathway.

Check the box if further evaluation of this pathway is needed: ☒

Comments:

The extent of Benzene and EDB in groundwater is limited in extent, and does not appear to have migrated south of the highway. Benzene was not detected above cleanup levels in any 2014 samples. However, because the site is located adjacent residential property with a well (not currently in use), the inhalation pathway is considered complete but exposure is deemed to be insignificant.

Inhalation of Fugitive Dust

Inhalation of fugitive dust may be a complete pathway if:

- o Nonvolatile compounds are found in the top 2 centimeters of soil. The top 2 centimeters of soil are likely to be dispersed in the wind as dust particles.
- o Dust particles are less than 10 micrometers (Particulate Matter - PM_{10}). Particles of this size are called respirable particles and can reach the pulmonary parts of the lungs when inhaled.
- o Chromium is present in soil that can be dispersed as dust particles of any size.

Generally, DEC direct contact soil cleanup levels in Table B1 of 18 AAC 75 are protective of this pathway because it is assumed most dust particles are incidentally ingested instead of inhaled to the lower lungs. The inhalation pathway only needs to be evaluated when very small dust particles are present (e.g., along a dirt roadway or where dusts are a nuisance). This is not true in the case of chromium. Site specific cleanup levels will need to be calculated in the event that inhalation of dust containing chromium is a complete pathway at a site.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Soil contamination starts at a depth of approximately 9 feet bgs, so this pathway is incomplete.

Direct Contact with Sediment

This pathway involves people's hands being exposed to sediment, such as during some recreational, subsistence, or industrial activity. People then incidentally ingest sediment from normal hand-to-mouth activities. In addition, dermal absorption of contaminants may be of concern if the the contaminants are able to permeate the skin (see Appendix B in the guidance document). This type of exposure should be investigated if:

- o Climate permits recreational activities around sediment.
- o The community has identified subsistence or recreational activities that would result in exposure to the sediment, such as clam digging.

Generally, DEC direct contact soil cleanup levels in 18 AAC 75, Table B1, are assumed to be protective of direct contact with sediment.

Check the box if further evaluation of this pathway is needed: ☐

Comments:

Groundwater contamination is limited in extent and does not appear to be migrating to the Chilkat River.
There are also no recreational activities that would result in exposure to contaminated sediments.

4. Other Comments *(Provide other comments as necessary to support the information provided in this form.)*

Method Three & Cumulative Risk Calculator

PMP 25.5 HFP

The following are cumulative cancer risks and hazard quotients by chemical.

Note that petroleum ranges (GRO, DRO, and RRO) are not included in cumulative risks. Also, if PCBs or dioxins are present at the site, the cumulative risks associated with these chemicals may also need to be considered; please contact the ADEC project manager for your site for information on how to address these chemicals.

Chemicals in red are carcinogenic.

Direct Contact Risks

Chemical	Soil Concentration (mg/kg)	Cancer Risk	Hazard Quotient
Acenaphthylene	0.146	0	0.000063
Benzene	0	0	0
Benzo(k)fluoranthene	0	0	0
Benzo(g,h,i)perylene	0	0	0
Dibenzo(a,h)anthracene	0	0	0
Ethylbenzene	3.46	0	0.00042
Ethylene dibromide (1,2-Dibromomethane)	0.015	0.000000044	0.00002
Fluorene	0.322	0	0.00017
1-Methylnaphthalene	11	0	0.048
2-Methylnaphthalene	17.2	0	0.075
Naphthalene	6.32	0	0.0057
Phenanthrene	0.122	0	0.0000073
Pyrene	0.0031	0	0.0000028
Toluene	0.109	0	0.000017
Xylenes (total)	22.46	0	0.0014
Lead	14.1	0	0

Inhalation Risks

Chemical	Soil Concentration (mg/kg)	Cancer Risk	Hazard Quotient
Acenaphthylene	0.146	0	0
Benzene	0	0	0
Benzo(k)fluoranthene	0	0	0
Benzo(g,h,i)perylene	0	0	0
Dibenzo(a,h)anthracene	0	0	0
Ethylbenzene	3.46	0.00000043	0.00091
Ethylene dibromide (1,2-Dibromomethane)	0.015	0.00000034	0.00015
Fluorene	0.322	0	0
1-Methylnaphthalene	11	0	0.02
2-Methylnaphthalene	17.2	0	0.031

Naphthalene	6.32	0.000003	0.069
Phenanthrene	0.122	0	0
Pyrene	0.0031	0	0
Toluene	0.109	0	0.0000072
Xylenes (total)	22.46	0	0.056
Lead	14.1	0	0

Groundwater Risks

Chemical	Groundwater Concentration (mg/L)	Cancer Risk	Hazard Quotient
Acenaphthylene	0.00053	0	0.00024
Benzene	0.0034	0.0000023	0.023
Benzo(k)fluoranthene	0.0000192	0.000000016	0
Benzo(g,h,i)perylene	0.0000382	0	0.000035
Dibenzo(a,h)anthracene	0.0000254	0.0000021	0
Ethylbenzene	0.227	0	0.061
Ethylene dibromide (1,2-Dibromomethane)	0.03	0.0007	0.091
Fluorene	0.000986	0	0.00066
1-Methylnaphthalene	0.0502	0	0.33
2-Methylnaphthalene	0.093	0	0.62
Naphthalene	0.173	0	0.24
Phenanthrene	0	0	0
Pyrene	0	0	0
Toluene	0.634	0	0.22
Xylenes (total)	1.279	0	0.18
Lead	0.0822	0	0

Cumulative Risk

Cumulative Cancer Risk	0.0007
Cumulative Hazard Index	2

Attention!

Total risks exceed the benchmark values of a hazard index of 1 and/or a cancer risk of 0.00001. To accurately assess the possible effects of noncarcinogenic compounds, the HI can be segregated by target organ or system endpoint and mechanism of toxicity. Cleanup levels may be lowered to meet these cumulative risk benchmarks.

For the following chemicals, the cleanup level in Table C exceeds the cumulative risk standard of 1 x 10 -5:

- arsenic
- benzo(a)pyrene, beryllium, bromodichloromethane, chlordane, chlorodibromomethane
- 1,4-dichlorobenzene, 3,3-dichlorobenzidine, 1,1-dichloroethylene, 1,3-dichloropropene
- heptachlor
- heptachlor epoxide, hexachlorobenzene
- toxaphene
- vinyl chloride
- n-nitrosodi-n-propylamine

The following compounds exceed the HQ of 1.0 when set at the Table C levels:

- arsenic

- 2-chlorophenol
- hexachloro-1,3-butadiene
- hexachloroethane

In these cases, the cumulative risk at the site should be calculated by both including these chemicals and not including these chemicals. Decisions to set cleanup levels at either the Table C values or values that correspond to less than or equal to the cumulative risk standards will be made a DEC delegated authority.

APPENDIX I
Ecoscoping Forms

Appendix C: Blank Ecoscoping Form

Site Name: PMP 17.7, Haines-Fairbanks Pipeline FUDS
Completed by: Craig Martin, Fairbanks Environmental Services
Date: 11/7/2014

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? C*heck the appropriate box.*

☐ Yes – D*escribe observations below and evaluate all of the remaining sections* *<u>without taking any off-ramps</u>.*
☒ No – *Go to next section.*

Comments:

Immediately following the fuel spill, trees within the impacted area were reportedly killed. However, wetland vegetation appears to have recovered.

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

<u>Terrestrial Exposure Routes</u>

☒ Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
☒ Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.
☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).
☒ Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
☐ Particulates deposited on plants directly or from rain splash.
☒ Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

- [ ] Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
- [ ] Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the *Policy Guidance on Developing Conceptual Site Models*).
- [ ] Other site-specific exposure pathways.

<u>Aquatic Exposure Routes</u>

- [ ] Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
- [X] Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
- [ ] Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
- [ ] Deposition into sediments from upwelling of contaminated groundwater.
- [X] Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
- [X] Aquatic plants rooted in contaminated sediments.
- [X] Bioaccumulatives (see the *Policy Guidance on Developing Conceptual Site Models*) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
- [ ] Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

- [ ] OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

- [X] Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).
- [ ] Critical habitat or anadromous stream in an area that could be affected by the contamination.
- [ ] Habitat that is important to the region that could be affected by the contamination.

☒ Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

A portion of the site is located within the Alaska Chilkat Bald Eagle Preserve. Moose and bear are known to utilize the area.

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

☐ Endangered or threatened species are present.

☒ The aquatic environment is or could be affected.

☒ Non-petroleum contaminants may be present, or the total area of petroleum-contaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

The estimated extent of petroleum contaminated soil is approximately 1.5 acres.

5. Toxicity Determination

Check all that apply.

☐ Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).

☒ Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models*) and submit it with the form to your DEC project manager.*

If neither box is checked, check the box below and submit this form to your DEC project manager.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Several PAH's in sediment samples exceed NOAA PEL and/or TEL screening criteria.

Appendix C: Blank Ecoscoping Form

Site Name: PMP 19.5, Haines-Fairbanks Pipeline FUDS
Completed by: Craig Martin, Fairbanks Environmental Services
Date: 11/7/2014

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? C*heck the appropriate box.*

☐ Yes – D*escribe observations below and evaluate all of the remaining sections* *without taking any off-ramps*.
☒ No – *Go to next section.*

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

Terrestrial Exposure Routes

☐ Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.
☐ Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.
☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).
☐ Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.
☐ Particulates deposited on plants directly or from rain splash.
☐ Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

- ☐ Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
- ☐ Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the *Policy Guidance on Developing Conceptual Site Models*).
- ☐ Other site-specific exposure pathways.

<u>Aquatic Exposure Routes</u>

- ☐ Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
- ☐ Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
- ☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
- ☐ Deposition into sediments from upwelling of contaminated groundwater.
- ☐ Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
- ☐ Aquatic plants rooted in contaminated sediments.
- ☐ Bioaccumulatives (see the *Policy Guidance on Developing Conceptual Site Models*) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
- ☐ Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☒ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

No contamination was identified above cleanup levels at this site in 2014. Deep soil samples (26 and 36' bgs) underlying a pipeline valve exceeded the cleanup level during the 2012 RI. A 2012 groundwater sample collected from this vicinity also exceeded the DRO cleanup level; however no contamination was found in surrounding wells and contamination is limited to immediately adjacent the valve. These samples were located over 350 feet from Horse Farm Creek, and groundwater flow from the pipeline valve (up on a hill) is to the west-northwest, away from the creek.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

- ☐ Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).
- ☐ Critical habitat or anadromous stream in an area that could be affected by the contamination.
- ☐ Habitat that is important to the region that could be affected by the contamination.

☐ Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

☐ Endangered or threatened species are present.
☐ The aquatic environment is or could be affected.
☐ Non-petroleum contaminants may be present, or the total area of petroleum-contaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

☐ Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).
☐ Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models*) and submit it with the form to your DEC project manager.*

If neither box is checked, check the box below and submit this form to your DEC project manager.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Appendix C: Blank Ecoscoping Form

Site Name: PMP 25.5, Haines-Fairbanks Pipeline FUDS
Completed by: Craig Martin, Fairbanks Environmental Services
Date: 11/7/2014

Instructions: Follow the italicized instructions in each section below. "Off-ramps," where the evaluation ends before completing all of the sections, can be taken when indicated by the instructions. Comment boxes should be used to help support your answers.

1. Direct Visual Impacts and Acute Toxicity

Are direct impacts that may result from the site contaminants evident, or is acute toxicity from high contaminant concentrations suspected? C*heck the appropriate box.*

☐ Yes – D*escribe observations below and evaluate all of the remaining sections <u>without taking any off-ramps</u>.*
☒ No – *Go to next section.*

Comments:

2. Terrestrial and Aquatic Exposure Routes

Check each terrestrial and aquatic route that could occur at the site.

<u>Terrestrial Exposure Routes</u>

☐ Exposure to water-borne contaminants as a result of wading or swimming in contaminated waters or ingesting contaminated water.

☐ Contaminant uptake in terrestrial plants whose roots are in contact with contaminated surface water.

☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at upland "seep" locations (not associated with a wetland or waterbody).

☐ Contaminant uptake by terrestrial plants whose roots are in contact with soil moisture or groundwater present within the root zone (generally no more than 4 feet below ground surface.

☐ Particulates deposited on plants directly or from rain splash.

☐ Incidental ingestion and/or exposure while animals grub for food, burrow (up to 2 feet for small animals or 6 feet for large animals), or groom.

- ☐ Inhalation of fugitive dust or vapors disturbed by foraging or burrowing activities.
- ☐ Bioaccumulatives (other than PAHs, which bioaccumulate more readily in aquatic environments) taken up by soil invertebrates, which are in turn eaten by higher food chain organisms (see the *Policy Guidance on Developing Conceptual Site Models*).
- ☐ Other site-specific exposure pathways.

<u>Aquatic Exposure Routes</u>

- ☐ Contaminated surface runoff migration to water bodies through swales, drainage ditches, or overland flow.
- ☐ Aquatic receptors exposed through osmotic exchange, respiration, or ventilation of surface waters.
- ☐ Contaminant migration via saturated or unsaturated groundwater zones and discharge at "seep" locations along banks or directly to surface water.
- ☐ Deposition into sediments from upwelling of contaminated groundwater.
- ☐ Aquatic receptors may be exposed directly to contaminated sediments through foraging or burrowing, or indirectly exposed due to osmotic exchange, respiration, or ventilation of sediment pore water.
- ☐ Aquatic plants rooted in contaminated sediments.
- ☐ Bioaccumulatives (see the *Policy Guidance on Developing Conceptual Site Models*) taken up by sediment invertebrates, which are in turn eaten by higher food chain organisms.
- ☐ Other site-specific exposure pathways.

If any of the above boxes are checked, go on to the next section. If none are checked, end the evaluation and check the box below.

☒ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

Contamination at this site is present between 9 and 27 feet bgs in soil, precluding exposure to these receptors. A sample collected from the area of soil contamination (beneath the gate valve) did not detect any contaminants at 6' bgs. Terrestrial plants in the vicinity of the gate valve would not have unusually deep roots thus this is not a completed exposure route (stated depth above was roots to 4' bgs). Animals grubbing for food would be unlikely to reach the 9' depth of contamination present in soil. Depth to groundwater is 19-27 feet bgs. A bioaccumulative (lead) is present in groundwater but at a depth where it would not be in contact with sediments or surface water.

3. Habitat

Check all that may apply. See Ecoscoping Guidance for additional help.

- ☐ Habitat that could be affected by the contamination supports valued species (i.e., species that are regulated, used for subsistence, have ceremonial importance, have commercial value, or provide recreational opportunity).
- ☐ Critical habitat or anadromous stream in an area that could be affected by the contamination.
- ☐ Habitat that is important to the region that could be affected by the contamination.

☐ Contamination is in a park, preserve, or wildlife refuge.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

4. Contaminant Quantity

Check all that may apply. See Ecoscoping Guidance for additional help.

☐ Endangered or threatened species are present.
☐ The aquatic environment is or could be affected.
☐ Non-petroleum contaminants may be present, or the total area of petroleum-contaminated surface soil exceeds one-half acre.

If any of the above boxes are checked, go on to the next scoping factor. If none are checked, end the evaluation and check the box below.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

5. Toxicity Determination

Check all that apply.

☐ Bioaccumulative chemicals are present (see *Policy Guidance on Developing Conceptual Site Models*).
☐ Contaminants exceed benchmark levels (see the Ecological Benchmark Tool in RAIS, available at: http://rais.ornl.gov/tools/eco_search.php).

If either box is checked, complete a detailed Ecological Conceptual Site Model (see DEC's Policy Guidance on Developing Conceptual Site Models*) and submit it with the form to your DEC project manager.*

If neither box is checked, check the box below and submit this form to your DEC project manager.

☐ OFF-RAMP: NO FURTHER ECOLOGICAL EVALUATION NECESSARY

Comments:

APPENDIX J
2013 USACE PMP 25.5 Trip Report

DEPARTMENT OF THE ARMY
US ARMY ENGINEER DISTRICT (ALASKA)
PO BOX 6898
JBER, ALASKA 99506-6898

REPLY TO
ATTENTION OF

CEPOA-EN-G-CIH 10 July 2013

MEMORANDUM THRU CEPOA-EN-GES

FOR CEPOA-PM-ESP (Astley)

SUBJECT: Trip Report with Chemical Findings, Pipeline Mile Post (PMP) 25.5 Well Sampling, Haines – Fairbanks Pipeline (13-035).

1. Executive Summary:

   The United States Army Corps of Engineers, Alaska District, Engineering Division, Engineering and Geotechnical Services Branch, Chemistry and Industrial Hygiene Section (CEPOA-EN-G-CIH) was tasked by the Environmental and Special Projects Branch (CEPOA-PM-ESP) to collect a groundwater sample from a residential water well, owned by Henry Jacquot, near the former Haines to Fairbanks PMP 25.5 (also known as Gate Valve #4). This sample was collected in order to evaluate the possibility of fuel from former Gate Valve #4 impacting the water supply. See Figures 1 and 3 for the project location.

   In addition, representative samples were taken from the location of the PMP 25.5 gate valve and screened with both a photoionization detector (PID) and an ultraviolet optical screening tool (UVOST) to determine the suitability of a potential future UVOST investigation at this project site.

   Finally, all structures at the Hank Jacquot property were located using a hand held global positioning system (GPS), photographed, and the type of foundation and occupancy of each building was determined.

2. References:

   a. Alaska Department of Environmental Conservation (ADEC); <u>18 AAC 75 Oil and Other Hazardous Substances Pollution Control</u>; April 8, 2012.

   b. Department of Defense Environmental Data Quality Workgroup (DoD EDQW); <u>DoD Quality Systems Manual (QSM), Version 4.2</u>; October 2010.

   c. Test America Tacoma, <u>Laboratory Data Report SDG #580-38326, HFP 25.5</u>; June 2013.

d. U.S. Army Corps of Engineers, Alaska District (USACE-AK); Work Plan (SAP/SSHP), Pipeline Mile Post 25.5 Well Sampling, Haines – Fairbanks Pipeline (13-035); January 2013.

3. Background:

The Haines to Fairbanks pipeline (HFP), its five pumping stations, and two associated bulk storage terminals were constructed in 1953 and 1954 by the U.S. military. The HFP was built to transport fuels from the port at Haines, Alaska, to the military bases in interior Alaska. Much of the 8-inch diameter pipeline was laid on the ground surface, although most of the 42 miles of HFP between the Haines Fuel Terminal and the Canadian border were buried.

The HFP was plagued with leaks from corrosion, ice damage, and vandalism (e.g., bullet holes) throughout its operational history. Underground portions of the pipeline experienced damage from broken welds and at least one accidental breach from borehole drilling. Ice plugs formed in the pipeline during system startup and resulted in spills at a number of sites; however, most of these ice plugs were located in Canadian sections of the pipeline. In 2002, the HFP right-of-way (ROW; 25 feet to either side of the pipeline) was determined by the USACE to be eligible for investigation under the Formerly Used Defense Site (FUDS) Program.

The PMP 25.5 site is the location of pipeline gate valve number four. Two test holes using a hand auger were dug inside the valve vault during a 2006 site investigation. Two samples were collected from each test hole at 18 to 24 inches and 4.5 to 5 feet beneath the bottom of the vault floor. All soil samples were analyzed for gasoline-range organics (GRO) and diesel-range organics/residual-range organics (DRO/RRO), and the 18-inch samples below the valve were also analyzed for lead. Both soil samples collected from the boring directly beneath the valve exceeded 18 AAC 75 table B2 regulatory limits for GRO. DRO and RRO were also detected, but at levels lower than the ADEC Table B2 cleanup levels. Lead was detected below the ADEC Table B1 cleanup level in the shallow sample below the valve. GRO, DRO, and RRO were also detected in both samples collected from the boring located in the corner of the valve box; however, results were lower than cleanup levels.

Removal of the vault and valve and excavation of potential contaminated soils were planned for 2007. However, due to the proximity of the buried electric line (approximately 6 feet north of the valve vault) and the Haines Highway to the south, it was recommended that any excavation be postponed and coordinated with future roadwork. Instead, a soil gas study was conducted involving the installation of 12 soil gas modules around Gate Valve #4. The soil gas results did not indicate the presence of petroleum-contaminated soil surrounding the valve vault.

4. Field Activities and Observations:

Field activities were divided into three main tasks. The first was the collection of a water sample and associated duplicate from the Hank Jacquot well located in the large house on the south end of the property (see figure 3). All samples were collected in accordance with the approved project work plan (ref. 2d). One sample (and one duplicate) was taken directly from the well output after first purging at least one casing volume from the well.

Samples were collected by USACE chemist Jake Sweet. There was no noticeable sheen or odor detected by the field crew. Samples were submitted to the Test America Tacoma laboratory for analysis of polynuclear aromatic hydrocarbons (PAHs) by method SW8270C-SIM; GRO by AK101; DRO/RRO by method AK102/103; benzene, toluene, ethylbenzene, xylene (BTEX) and 1,2-dichloroethane (DCA) by SW8260; 1,2-dibromoethane (EDB) by EPA 504.1; and lead by method SW6020.

The second task involved collecting soil samples from the gate valve located adjacent to the Jacquot property. The bottom of the valve pit was approximately 36" below the surrounding ground surface. A hand auger was used to collect soil increments from the 18" and 36" intervals beneath the floor of the valve pit (approximately 4.5 and 6 feet below ground surface). Soils from these depths were screened using a PID and the one with the highest response was further screened with a UVOST to determine the suitability of this technology to detect the fuel type at this project site. The 36" deep soils were screened with the UVOST and fuel signatures were detected by the tool. See figure 2 for the UVOST log. Based on these results, it appears that the UVOST would be a useful tool for delineating fuel contamination in this area.

The third task involved collecting building locations at the Hank Jacquot property using a hand held GPS and determining their foundation/flooring constructions and occupancies. See figure 3 and photos for building locations and types.

5. Results of Analysis:

A complete set of analytical results is presented in Attachment 2. No analytes were detected in the Hank Jacquot well water sample above ADEC screening limits.

6. Data Quality Review and Assessment:

The analytical data packages are on file at CEPOA-EN-G-CIH. A data review and quality assessment was performed by USACE chemist Jake Sweet. The data review included an evaluation of sample collection, handling (to include preservation and temperature requirements), and sample documentation to assess comparability; an evaluation of sample reporting limits against project screening limits to assess data usability; an evaluation of method, trip, and equipment blanks to assess field and laboratory contamination; an evaluation of laboratory control samples to assess accuracy and precision; an evaluation of matrix spike and surrogate recoveries to assess accuracy, precision, and matrix effects; and an evaluation of field duplicates to assess field and laboratory precision. Reviews and evaluations of instrument calibrations were not performed; however, laboratory case narratives were reviewed for these types of deviations. If such deviations impacted data quality/usability, appropriate data flags were applied and discussed below. Laboratory quality indicators were compared to those in the QSM, and appropriate data qualifiers were applied. Attachment 2 contains comprehensive data tables with data qualifiers and

Attachment 3 contains the ADEC laboratory data review checklists for each Sample Delivery Group (SDG). The review is summarized below:

a. All sample handling criteria were met.

   - All samples were extracted and analyzed as per the chain of custody. All quality control frequency criteria were met.

b. All sample Limits of Detection (LODs, defined by the QSM) were below project action limits.

c. All method blank, trip blank, and equipment blank requirements were met with the exception of the following:

   - GRO was detected in both the method and trip blanks at a similar concentration. GRO was also detected in all project samples at a similar concentration. GRO results are considered to be blank impacted and are qualified “B”. Results are considered to be biased high. There are no data impacts as the results are biased high and are far below screening criteria.

d. All laboratory control sample/laboratory control sample duplicates (LCS/LCSD) were within the specified control limits.

e. All matrix spike/matrix spike duplicate (MS/MSD) results met the laboratory acceptance limits with the following exceptions:

   - Recoveries for 1,2-dibromoethane were biased low in the both the MS and MSD in sample -02GW. Results for this compound in the primary sample are potentially biased low and are flagged “QL”. Data usability is not impacted as all results were non detect with a LOD far below screening criteria.

f. All surrogates met criteria.

g. All field duplicate relative percent differences (RPDs) met ADEC criteria (30% waters, 50% soils).

7. Conclusions and Recommendations:

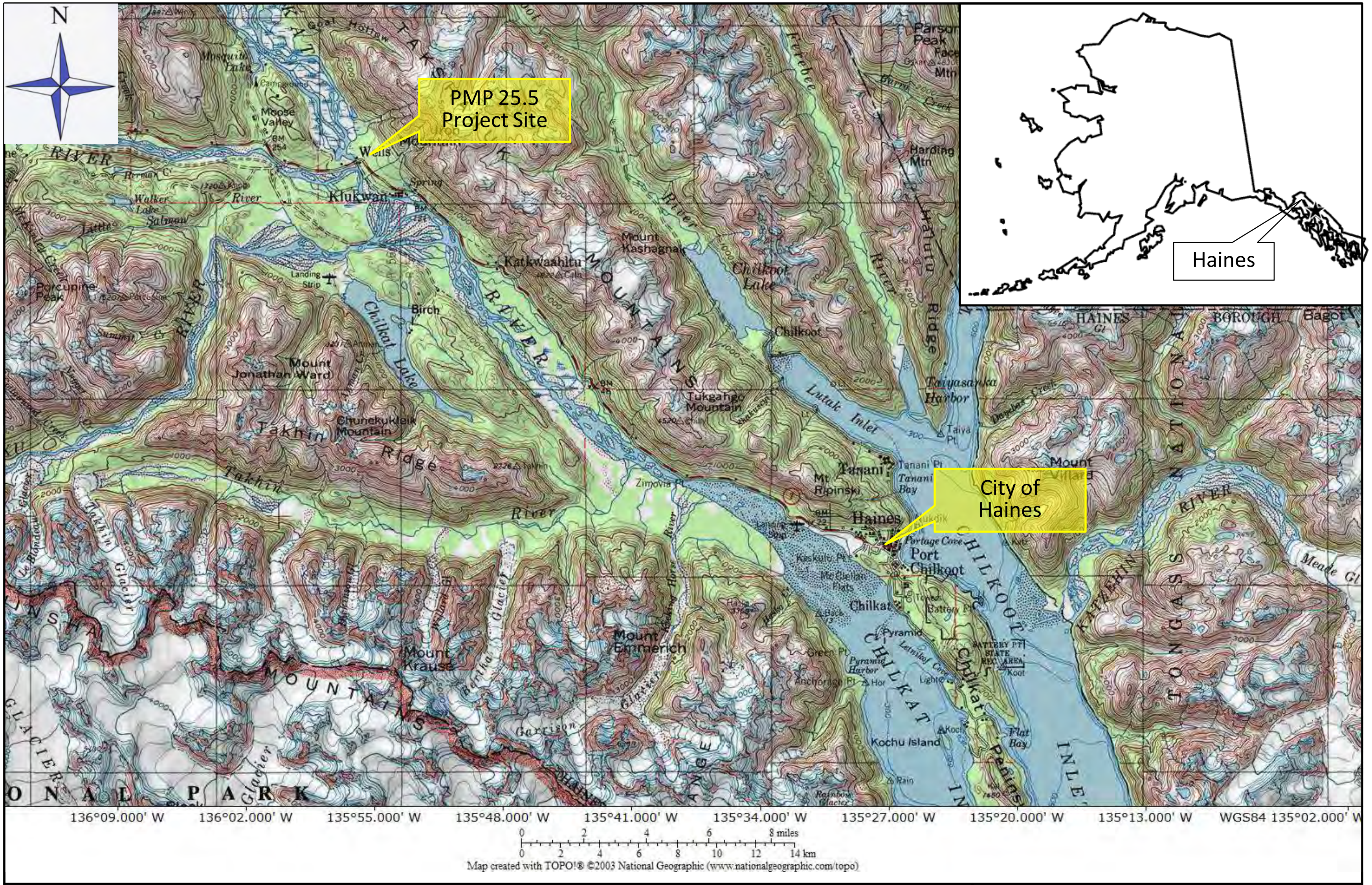
   Based on analytical results, the well located at the Hank Jacquot property has not been impacted by petroleum releases associated with activities at the Haines-Fairbanks Pipeline. In addition, it appears UVOST technology would be appropriate to use to delineate fuel contamination associated with the gate valve at the PMP 25.5 site.

8. Questions and comments should be addressed to Jake Sweet (907-753-2694).

Jake Sweet
Chemistry and Industrial Hygeine Section,
Geotechnical and Engineering Services Branch,
Engineering Division

Attachment 1: Figures and Photographs
Attachment 2: Data Tables
Attachment 3: ADEC Data Quality Worksheets
Attachment 4: Field Notes

Attachment 1
Figures and Photos



Haines – Fairbanks Pipeline PMP 25.5 Project Location	Figure 1: Site Location and Vicinity

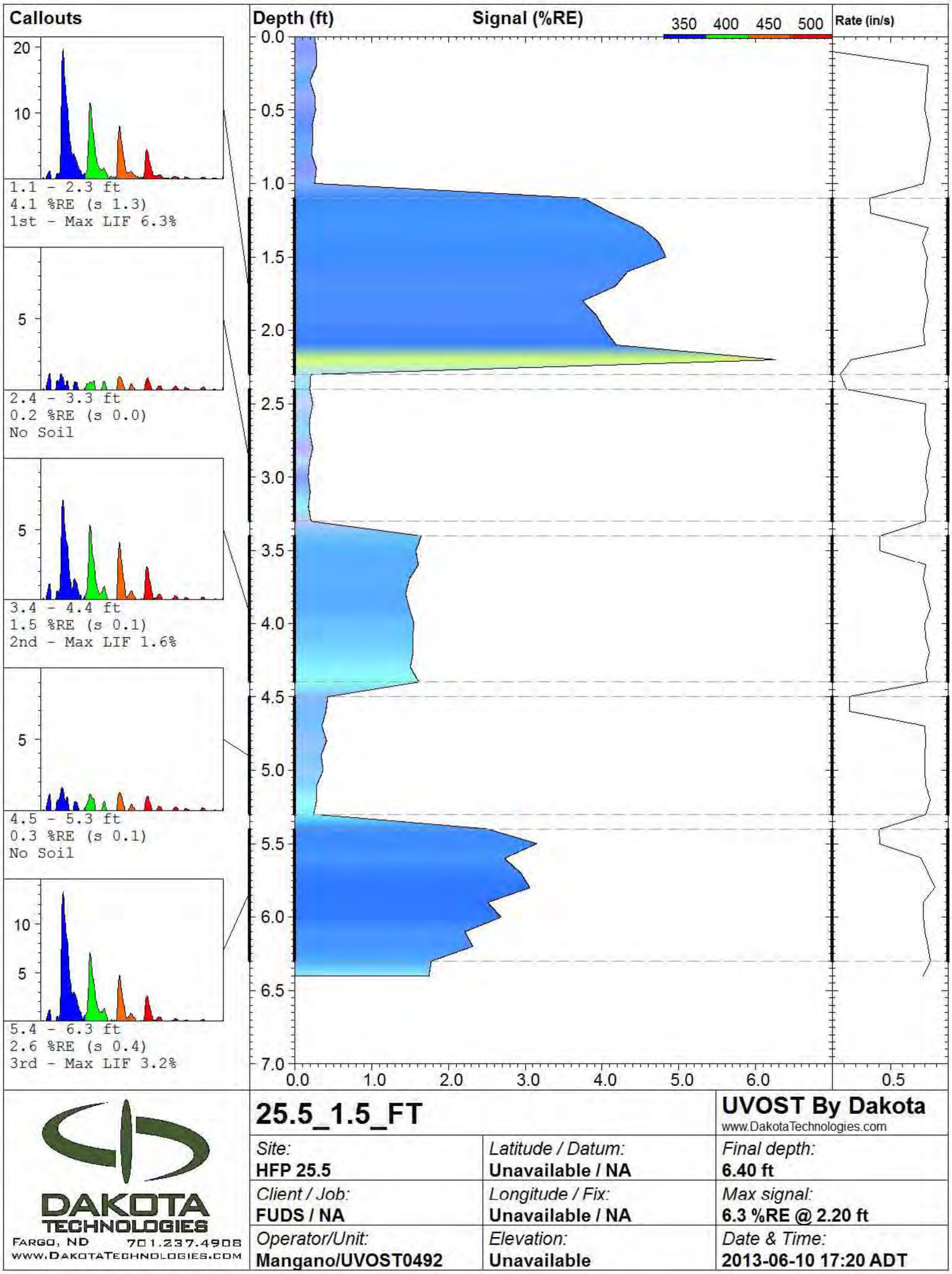
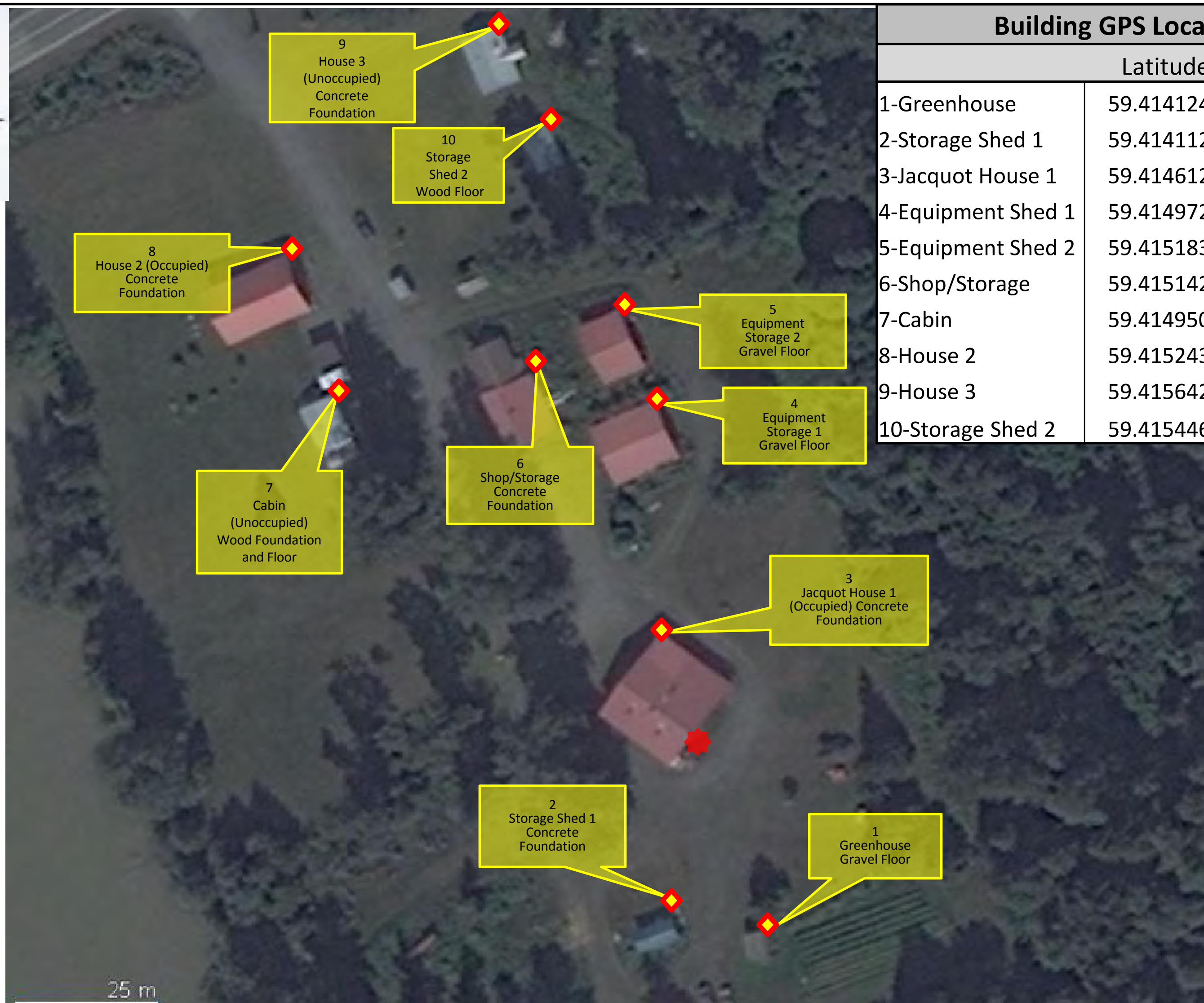


Figure 2: UVOST Log

N



Building GPS Locations

	Latitude	Longitude
1-Greenhouse	59.4141248	-135.928635
2-Storage Shed 1	59.4141124	-135.928967
3-Jacquot House 1	59.4146128	-135.929021
4-Equipment Shed 1	59.4149728	-135.928972
5-Equipment Shed 2	59.4151835	-135.929092
6-Shop/Storage	59.4151429	-135.929479
7-Cabin	59.4149503	-135.930001
8-House 2	59.4152436	-135.930175
9-House 3	59.4156427	-135.929540
10-Storage Shed 2	59.4154462	-135.929379

AK

GPS location for each building

Sampled Well Location

US Army Corps of Engineers
Alaska District

Figure 3: Well and Building Locations


Greenhouse building looking S. Unoccupied building with gravel floor (Photographer: Sweet)


Storage Shed 1 looking W. Unoccupied building with concrete floor (Photographer: Sweet)

Jacquot House 1 looking S. Occupied building with concrete foundation (Photographer: Sweet)

Equipment Shed 1 looking E. Unoccupied building with gravel floor (Photographer: Sweet)

Equipment Shed 2 looking E. Unoccupied building with gravel floor (Photographer: Sweet)

Shop/Storage Building looking E. Unoccupied building with concrete foundation (Photographer: Sweet)

Cabin Building looking W. Unoccupied building with wood floor and foundation. (Photographer: Sweet)

House 2 looking W. Occupied building with concrete foundation. (Photographer: Sweet)

House 3 looking NE. Unoccupied building with concrete foundation. (Photographer: Sweet)

Storage Shed 2. Unoccupied building with wood floors. (Photographer: Sweet)

Attachment 2
Analytical Data

Jacquot Well Data Table

			Sample ID Location ID, Depth Sample Del Group Collection Date	13MP25-01-GW Jacquot well 580-38326-1 5/2/2013	13MP25-02GW Jacquot well 580-38326-1 5/2/2013	13MP25-1001TB 1001TB 580-38326-1 5/2/2013
Method	**ANALYTE**	**UNITS**	**ADEC**		**Duplicate of -01GW**	**Trip Blank**
8270SIM	1-Methylnaphthalene	MG/L	0.15	ND [0.000019]	ND [0.000019]	
8270SIM	2-Methylnaphthalene	MG/L	0.15	ND [0.000025]	ND [0.000025]	
8270SIM	Acenaphthene	MG/L	2.2	ND [0.000019]	ND [0.000019]	
8270SIM	Acenaphthylene	MG/L	2.2	ND [0.000019]	ND [0.000019]	
8270SIM	Anthracene	MG/L	11	ND [0.000019]	ND [0.000019]	
8270SIM	Benzo(a)anthracene	MG/L	0.0012	ND [0.000019]	ND [0.000019]	
8270SIM	Benzo(a)pyrene	MG/L	0.0002	ND [0.000019]	ND [0.000019]	
8270SIM	Benzo(b)fluoranthene	MG/L	0.0012	ND [0.000019]	ND [0.000019]	
8270SIM	Benzo(g,h,i)perylene	MG/L	1.1	ND [0.000019]	ND [0.000019]	
8270SIM	Benzo(k)fluoranthene	MG/L	0.012	ND [0.000019]	ND [0.000019]	
8270SIM	Chrysene	MG/L	0.12	ND [0.000019]	ND [0.000019]	
8270SIM	Dibenzo(a,h)anthracene	MG/L	0.00012	ND [0.000019]	ND [0.000019]	
8270SIM	Fluoranthene	MG/L	1.5	ND [0.000019]	ND [0.000019]	
8270SIM	Fluorene	MG/L	1.5	ND [0.000019]	ND [0.000019]	
8270SIM	Indeno(1,2,3-cd)pyrene	MG/L	0.0012	ND [0.000019]	ND [0.000019]	
8270SIM	Naphthalene	MG/L	0.73	ND [0.000019]	ND [0.000019]	
8270SIM	Phenanthrene	MG/L	11	ND [0.000019]	ND [0.000019]	
8270SIM	Pyrene	MG/L	1.1	ND [0.000019]	ND [0.000019]	
AK101	Gasoline Range Organics (C6-C10)	MG/L	2.2	0.018 [0.05] B	0.015 [0.05] B	0.016 [0.05] B
AK102	Diesel Range Organics (C10-C25)	MG/L	1.5	ND [0.49]	ND [0.47]	
AK103	Residual Range Organics (C25-C36)	MG/L	1.1	ND [0.49]	ND [0.47]	
E504.1	1,2-Dibromoethane	MG/L	0.00005	ND [0.00001] QL	ND [0.00001] QL	ND [0.00001]
SW6020	Lead	MG/L	0.015	0.00036 [0.002]	0.00039 [0.002]	
SW8260B	1,2-Dichloroethane	MG/L	0.005	ND [0.001]	ND [0.001]	ND [0.001]
SW8260B	Benzene	MG/L	0.005	ND [0.001]	ND [0.001]	ND [0.001]
SW8260B	Ethylbenzene	MG/L	0.7	ND [0.001]	ND [0.001]	ND [0.001]
SW8260B	o-Xylene	MG/L	10	ND [0.001]	ND [0.001]	ND [0.001]
SW8260B	Toluene	MG/L	1	ND [0.001]	ND [0.001]	ND [0.001]
SW8260B	Xylene, Isomers m & p	MG/L	10	ND [0.002]	ND [0.002]	ND [0.002]

ADEC - most stringent of 18 AAC 75 Method 2 Table C Cleanup Level

[ ] - Laboratory LOQ

Solid shade indicates screening value exceedance

Data Flags are defined at the end of the table

Data Flag Explanations

ND - Analyte is not detected; [ ] - Laboratory Limit of Quantification (LOQ)

Qualifier	Definition
J	Analyte result is considered an estimated value because the level is below the laboratory LOQ but above the DL
B	Analyte result is considered a high estimated value due to contamination present in the method blank.
QH, QL, QN	Analyte result is considered an estimated value biased (high, low, uncertain) due to a quality control failure
R	Analyte result is rejected - result is not usable.

Flags may be combined when more than one quality deficiency exists

Attachment 3
ADEC Data Quality Worksheets

Laboratory Data Review Checklist

Completed by: Jake Sweet

Title: Chemist — Date: 20 June 2013

CS Report Name: HFP MP 25.5 Investigation — Report Date: 21 June 2013

Consultant Firm: US Army Corps of Engineers

Laboratory Name: Test America Tacoma — Laboratory Report Number: 580-38326

ADEC File Number: — ADEC RecKey Number:

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

      Yes, all samples were submitted to and analyzed by Test America Tacoma. This lab has both ADEC and ELAP certification for all analytes.

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

      Not Applicable.

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

      Yes. All sample handling procedures were documented

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

      Yes.

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

      Yes, all samples were shipped in two coolers. The temperature blank in cooler "alpha" was measured at 2.6 degrees C. The temperature blank in cooler "bravo" was measured at 4.8 degrees C.

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

□Yes □ No □NA (Please explain.) Comments:

Yes, all volatiles samples were field preserved with Methanol.

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
□Yes □ No □NA (Please explain.) Comments:

There were no discrepancies noted.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
□Yes □ No □NA (Please explain.) Comments:

There were no discrepancies to report.

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

There are no data quality impacts.

4. <u>Case Narrative</u>
a. Present and understandable?
□Yes □ No □NA (Please explain.) Comments:

Yes.

b. Discrepancies, errors or QC failures identified by the lab?
□Yes □ No □NA (Please explain.) Comments:

Yes.

c. Were all corrective actions documented?
□Yes □ No □NA (Please explain.) Comments:

Yes

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

The case narrative indicates that all data is usable as flagged.

5. <u>Samples Results</u>
a. Correct analyses performed/reported as requested on COC?
□Yes □ No □NA (Please explain.) Comments:

Yes.

b. All applicable holding times met?
 Yes No NA (Please explain.) Comments:

Yes.

c. All soils reported on a dry weight basis?
 Yes No NA (Please explain.) Comments:

Not applicable, all samples are water samples.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
 Yes No NA (Please explain.) Comments:

Yes, all PQLs meet project criteria.

e. Data quality or usability affected?
Comments:

Not applicable.

6. <u>QC Samples</u>
 a. Method Blank
  i. One method blank reported per matrix, analysis and 20 samples?
 Yes No NA (Please explain.) Comments:

Yes.

  ii. All method blank results less than PQL?
 Yes No NA (Please explain.) Comments:

No, GRO was detected in the method blank of lab batch 135145 at a concentration of 0.0184 mg/kg.

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

All GRO results are affected.

  iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
 Yes No NA (Please explain.) Comments:

All GRO detects are similar to the method blank contamination. All detects are considered to be lab contamination and are flagged “B”.

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

All data is usable as flagged. GRO results are far below screening criteria.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, LCS/LCSDs were performed at the required frequency.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes.

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes.

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

Not applicable.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
☐Yes ☐ No ☐NA (Please explain.) Comments:

No data flags required.

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

There were no data quality issues.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes.

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

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

Yes.

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

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

Not applicable.

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

Comments:

There are no data quality impacts.

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

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

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

Yes.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

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

Yes. All VOC samples were submitted in a single cooler (cooler "alpha") with one trip blank.

iii. All results less than PQL?

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

No. GRO was detected both in the method and trip blanks at a similar concentration.

iv. If above PQL, what samples are affected?

Comments:

All samples are affected.

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

Comments:

All GRO results are impacted by both method and trip blank contamination. All GRO results are considered biased high and are flagged "B". Data usability is not impacted as all results are far below screening criteria and are biased high.

e. Field Duplicate

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

Yes, sample -02 is a duplicate of sample -01.

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

Yes.

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

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

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration
□Yes □ No □NA (Please explain.) Comments:

Yes, all RPDs are below 30%.

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

Comments:

None.

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

□Yes □ No □NA (Please explain.) Comments:

No. Only disposable equipment was used. Only one sample and a duplicate were collected for this effort.

i. All results less than PQL?

□Yes □ No □NA (Please explain.) Comments:

Not applicable.

ii. If above PQL, what samples are affected?

Comments:

Not applicable.

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

Comments:

Not applicable.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

See data tables for all flags and descriptions.

Attachment 4
Field Notes

"Outdoor writing products...
...for outdoor writing people."

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"Rite in the Rain" - A unique All-Weather Writing paper created to shed water and enhance the written image. It is widely used throughout the world for recording critical field data in all kinds of weather.

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HFP MP 25.5

Hank Jacquot
Well

13-035

1 of 1

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JBER, AK 99506

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Project HFP PMP 25.5
Hank Jacquot well
13-035

5/2/13 45°F partly cloudy.

0755 - leave hotel, gather supplies, drive to site.

Onsite: Jake Sweet, Mike Undem.

0920 arrive @ MP 25.5 project site

take photographs of valve vault.

0927 begin hand augering to 5'

0936: take sample @ 2.5' BGS
Fuel odor PID = 79 cold

0945 take sample @ 3' BGS
Fuel odor PID: 310 cold,

refusal (frozen?) @ 3.5' BGS

0958 terminate boring. collect 2.5 + 3' samples for UVOST testing.

5/2/13 50°F overcast

1005 - arrive @ Hank Jacquots home.
1011 - begin pumping water.
Flow rate high ~ 5 gal/30 sec.

Homeowner ran well for about 30 minutes earlier in the day (est 40 gallons)

1015 - begin filling 5 gallon buckets to purge well. Need to remove ~ 75 gallons.

1020 - well ran dry. Decrease flow rate ~ 5 gal/min.

1025 well runs dry again.
decrease flow rate further

1030 flow rate good. Well is intermittently pumping.

1031 filled 18 buckets (90 gallons)

5/2/13 50°F overcast/windy.

1033 – start filling sample containers

1054 Sample $\boxed{\#1}$ complete

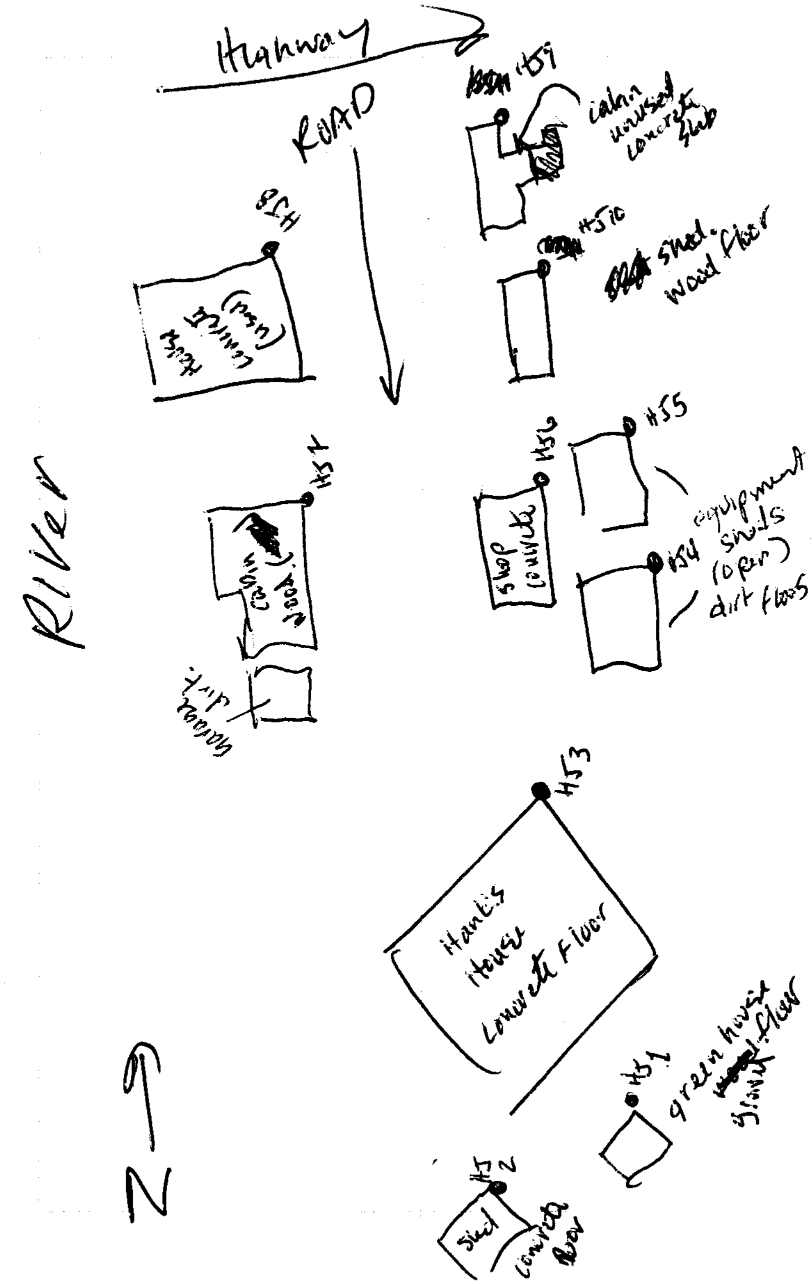
2 x 1L DRO/RRO
2 x 1 L PAH
1 x 250 mL lead
3 x 40 mL GRO
3 x 40 mL BTEX + DCA
3 x 40 mL EDB

1100 on COC ~~Sam~~ Sample $\boxed{\#2}$ Dupe of #1

6 x 1L DRO/RRO
6 x 1L PAH
2 x 250 mL Lead
9 x 40 mL GRO
9 x 40 mL BTEX + DCA
9 x 40 mL EDB

* MS/MSD

1100 – done @ Hank Jacquot well



5/2/13

1141 - Done @ Jacquot property.
photos + GPS of all buildings

1200 - head to lunch.

1330 - arrive @ PMP 19.5 site for
photos.

Pictures 2184 - 2195 @ site.

1349 arrive @ PMP 17.7 site for photos

Photos 2196 - 2215

1414 - head to hotel to pack samples.

0645 Trip blank
13MP25-1001 TB

1910 coolers packed COC signed.

— END OF PROJECT —

APPENDIX K
Review Comments

REVIEW COMMENTS	**PROJECT: Haines-Fairbanks Pipeline FUDS – PMP 17.7, 19.5, and 25.5 (F10AK1016-03/14)** **DOCUMENT: Draft Additional Environmental Investigation Report**

ADEC	**DATE:** 12/23/2014 **REVIEWER: Ann Marie Palmieri** **PHONE:**	**Action taken on comment by:**

Item No.	**Drawing Sht. No., Spec. Para.**	**COMMENTS**	**'A' – Accepted 'N' - Noted**	**FES RESPONSE**	
1	Page ES-3, paragraph 6, last line	Additional groundwater sampling at PMP 25.5 (GV 4) should be conducted in order to determine a contaminant trend, as well.	Accepted	The last sentence of the paragraph will include "in order to determine a contaminant trend" as an additional reason for groundwater sampling at PMP 25.5.	
2	Page ES-3, paragraph 7, last line and Page 5-10, paragraph 3	Although the contaminated groundwater is currently not being used as a drinking water source, there is a drinking water well downgradient. That well is not currently be used and they get their drinking water from somewhere else, is this correct? So, we would still consider this a reasonably potential future source of drinking water, as that well could be utilized at any time. Although the text as written is technically correct, I think that it would be more accurate if you mentioned that the groundwater in the immediate area has been used for drinking water in the past and could be used in the future.	Noted/Accepted	Based upon the groundwater elevation contours, the drinking water well is located in a cross-gradient direction from the contaminated area. However, since groundwater within the contaminated area could potentially be used in the future, the following text will be added to the Executive Summary and Section 5.9: "A drinking water well (not currently in use) is present on the property adjacent the valve pit, so the potential exists for groundwater to be used in the area. However, as the well is located cross-gradient and approximately 700 feet from the gate valve, migration of contamination to the well is very unlikely."	
		-End of Comments-			

THE STATE
of ALASKA
GOVERNOR BILL WALKER

Department of Environmental Conservation

DIVISION OF SPILL PREVENTION AND RESPONSE
Contaminated Sites Program

Post Office Box 1542
Haines, Alaska 99827
Main: 907-766-3184
Fax: 907-766-3185
www.dec.alaska.gov

File No: 900.38.001

February 6, 2015

Ms. Beth Astley
US Army, Engineer District Alaska
Post Office Box 6898
JBER, AK 99506-0898

Re: Approval of the *Final Additional Environmental Investigation Report*
Cleanup Complete of Pipeline Milepost (PMP) 19.5
Haines-Fairbanks Pipeline Sites 17.7, 19.5, and 25.5

Dear Ms. Astley:

The Alaska Department of Environmental Conservation (DEC) has received and reviewed the *Final Additional Environmental Investigation Report* for the Haines-Fairbanks Pipeline Sites, Pipeline Mileposts (PMP) 17.7, 19.5 and 25.5, prepared by Fairbanks Environmental Services and dated December 2014. This document satisfactorily addresses DEC comments made on the draft version. DEC hereby approves this report in accordance with 18 Alaska Administrative Code (AAC) 75.335(d).

The *Additional Environmental Investigation Report* documents site characterization activities that were conducted at three (3) separate sections of the Haines-Fairbanks Pipeline in July and August 2014. These investigations were conducted to obtain additional data based upon the results of the Remedial Investigation activities in 2012.

At PMP 17.7, soil borings were advanced and soil samples collected in order to more clearly define the extent of contamination. Based upon those results, it is estimated that 20,000 cubic yards of petroleum-contaminated soil could be present. Groundwater monitoring wells were also installed and sampled. Based upon those results, a horizontal extent of 89,000 square feet of contaminated groundwater was estimated. Surface water and sediment samples collected at the Chilkat River showed that the contamination has not migrated to the river. The groundwater flow direction calculated in 2014 was to the east, away from the river, which is different from the direction calculated in 2012, thus leading to conclusion that the river discharges to groundwater during periods of high flow and gains from the groundwater during low flow. Contaminated soil and groundwater is present on both sides of the Haines Highway which could complicate the cleanup effort.

At PMP 25.5 (Gate Valve 4), additional soil borings were advanced and soil samples collected to more clearly define the extent of contamination. Based upon those results, it is estimated that 2,000 cubic yards of petroleum-contaminated soil could be present. Several contaminants of potential concern which were found to be present above their respective cleanup levels in 2012, were found below the cleanup levels in 2014. Groundwater monitoring wells were also installed and sampled. Based upon those results, a horizontal extent of 7,000 square feet of contaminated groundwater was estimated. Groundwater was determined to be flowing toward the southwest. Although groundwater in the area has been used as a drinking water source by an adjacent downgradient homeowner, it is currently not being used for this purpose. Sample results collected between the valve, leading edges of contamination, and the Chilkat River demonstrated that the contamination has most likely not reached the river.

PMP 19.5: Cleanup Complete Determination

In 1970, an estimated 75,000 gallons of fuel was released from a break in the pipeline at PMP 19.5 resulting in significant impacts to Horse Farm Creek. It is believed that the majority of the fuel flowed into Horse Farm Creek and down to the Chilkat River. Some fuel-contaminated soil was excavated and removed by the Army as they responded to the spill. A pipeline valve is also located in this same area and leaks from the valve could have occurred.

As part of the USACE's large effort to locate contamination along the Haines-Fairbanks Pipeline, site investigation activities were conducted at both the pipeline valve and the suspected area of the release. A site investigation using the Rapid-Optical Screening Tool (ROST) was conducted in 2005 downgradient from the valve in an area that was thought to be near the point of the release. No contamination was found. In 2006, four (4) shallow test pits were advanced and sampled. Although petroleum was found in the soil near the valve, the concentrations were below the respective cleanup levels. In 2012, soil and groundwater samples were collected from soil borings and temporary monitoring wells. Gasoline-range organics and diesel-range organics were found to slightly exceed their respective cleanup levels in one (1) sample at depth near the pipeline valve.

Following the 2012 field season, a 1970 spill report from the National Marine Fisheries Service was identified which defined the area impacted by the spill. In 2014, the area of the pipeline break was located in the field and ten (10) soil borings were advanced in, and downgradient of, the identified release area. The potential for petroleum contamination was found in only one of the borings. A single soil sample was collected from this boring; however, the analytical results revealed concentrations of all contaminants of potential concern below their respective soil cleanup levels. Four (4) groundwater monitoring wells were installed and sampled; none of the analytical results showed fuel contamination. The surface water of Horse Farm Creek was sampled both above and below the suspected spill area, and none of the analytical results showed fuel contamination. The upgradient surface water sample had a detection for residual-range organics; however, upon review of the laboratory chromatogram, it was determined that this pattern did not meet the standard fuel signature and thus is most likely the result of biogenic interference.

DEC hereby determines that no contamination of any significance resulting from the Haines-Fairbanks Pipeline was found to be present at the Haines-Fairbanks Pipeline PMP 19.5 site. The small volume of contaminated soil found at depth at the pipeline valve is not contributing to contamination of the groundwater nor is it posing a risk to human health or the environment. DEC does not require any additional investigation and/or cleanup in regards to petroleum contamination associated with the Haines-Fairbanks Pipeline at this site.

Please note that if, in the future, additional contamination is found to be present that could pose an unacceptable risk to human health, safety, welfare or the environment, it must be reported to the DEC and additional investigation and/or cleanup may be required.

If you have any questions or concerns regarding these Haines-Fairbanks Pipeline projects, please feel free to contact me at annemarie.palmieri@alaska.gov or 907-766-3184. We look forward to continuing to work on this project with you.

Sincerely,

Anne Marie Palmieri
Environmental Program Specialist

cc: Bud Filipek
Kate Kanouse, ADF&G (via electronic mail only)