UNITED STATES AIR FORCE
JOINT BASE ELMENDORF-RICHARDSON
ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

SITE CHARACTERIZATION REPORT
SS041 – ROOSEVELT ROAD PCB SITE

FINAL

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SITE CHARACTERIZATION REPORT
SS041 – ROOSEVELT ROAD PCB SITE

JOINT BASE ELMENDORF-RICHARDSON, ALASKA

Prepared for
Air Force Civil Engineer Center

Contract No. FA8903-09-D-8589 / Task Order 0016

MAY 2015

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EXECUTIVE SUMMARY

SS041 – Roosevelt Road PCB Site (listed under State of Alaska Contaminated Sites Database Hazard Identification Number 640, JBER-Ft. Rich OUA Roosevelt Road Transmitter Site SS041) is located at the former Fort Richardson Army Post on Joint Base Elmendorf-Richardson (JBER), referred to as JBER-R, in Anchorage, Alaska. This report presents the results of the July 2014 site characterization activities and evaluates potential risks to human health and the environment at SS041. Site characterization activities conducted in July 2014 were performed under the Final *Joint Base Elmendorf-Richardson, Basewide Uniform Federal Policy-Quality Assurance Project Plan* (Basewide UFP-QAPP) and the site-specific Final *Joint Base Elmendorf-Richardson, Basewide Uniform Federal Policy-Quality Assurance Project Plan, SS041 – Roosevelt Road PCB Site UFP-QAPP*, which were approved by the Alaska Department of Environmental Conservation (ADEC) in April 2013 and July 2014, respectively.

Work was conducted by CH2M HILL under subcontract to Weston Solutions, Inc. (WESTON) under the JBER and Clear Air Force Station Performance-Based Remediation (PBR) project. This work has been authorized by the Air Force Civil Engineer Center (AFCEC) under Contract Number FA8903-09-D-8589, Task Order (TO) No. 0016.

SITE OVERVIEW

The site is located between Roosevelt Road and the Alaska Railroad right-of-way. The site served as an emergency command and control communications center for JBER-R and the Anchorage area, and previously consisted of a former high-frequency transmitter facility and an underground bunker. A former sanitary system composed of buried septic lines, a cesspool, a septic tank, and leachfield were connected to the transmitter annex building and underground communications bunker. The structures at the site have been removed, with the exception of the cesspool and some remnants of the underground bunker. Temporary structures such as field trailers and Quonset huts are intermittently present onsite for military training purposes. Entry to the site is restricted by a locked gate which requires coordination with Range Control for access. A secondary fence is located in the northwestern corner of the facility and encompasses the former transmitter annex foundation, former underground bunker, and a portion of the buried septic lines. The cesspool, former septic tank, and associated septic lines are buried to the west of this secondary fence.

Polychlorinated biphenyl (PCB) contamination was discovered as a result of a surface leak of dielectric oils in the 1970s associated with transformers stored in the former transmitter annex building. The building was removed in 1978, and diesel fuel was used to wash the concrete foundation, resulting in a release of PCBs and petroleum hydrocarbons to soil.

Investigation and remedial activities addressing PCBs in soil occurred from 1987 to 1992. A follow-on remedial investigation (RI) was conducted in 1995 and focused on the site's cesspool, septic tank, and leachfield. Soil analytical results from the RI indicated that PCB contamination was present in material within the cesspool. Diesel-range organics (DRO) were also detected within the leachfield at concentrations above Title 18, Chapter 75 of the *Alaska Administrative Code* (18 AAC 75) respective Method Two Soil Cleanup Level. TCE was also detected in material within and surrounding the cesspool above the Method Two Soil Cleanup Level.

The Operable Unit A and B (OU A and B) Record of Decision (ROD) was finalized in 1997 and No Further Action (NFA) was selected as the remedy. The OUA and B ROD also specified that further actions for residual petroleum hydrocarbons in soil within the leachfield area would be conducted under the State-Fort Richardson Environmental Restoration Agreement. In 1998, PCB-contaminated sediment and sludge within the cesspool was mixed with cement and capped.

Regulatory oversight for SS041 is currently conducted by ADEC, and SS041 is listed under State of Alaska Contaminated Sites Database Hazard Identification Number 640 as Cleanup Complete with Institutional Controls. Land use controls (LUCs) for soil and groundwater, at SS041 are currently in place.

The focus of this site characterization is the leachfield where DRO was detected in soil above the screening level in 1995.

SUMMARY OF 2014 SITE CHARACTERIZATION ACTIVITIES

In July 2014, two soil borings were drilled and sampled within the leachfield to confirm the current nature of residual petroleum hydrocarbons in soil, to delineate the extent of DRO contamination, to assess potential risks from petroleum contamination remaining in the soil, and to make decisions about the need for and extent of corrective action to mitigate any unacceptable risk. Additional DRO, gasoline-range organics (GRO), residual-range organics (RRO), benzene, toluene, ethylbenzene, and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs), volatile petroleum hydrocarbons (VPH), and extractable petroleum hydrocarbons (EPH) data were collected to fill these data gaps. Because the site has a history of trichloroethene (TCE) and PCB contamination, the interval with historically high DRO contamination (15-20 feet bgs) was also analyzed for the full suite of volatile organic compounds (VOCs) and PCBs. Borings were terminated at 30 feet below ground surface (bgs), and no visible or olfactory evidence, or evidence of contamination by photoionization detector (PID) screening, was observed.

No groundwater samples were collected because groundwater was not encountered during the investigation.

NATURE AND EXTENT OF CONTAMINATION

The distribution of DRO in soil at SS041, was evaluated using data collected in 1995 and 2014. Consistent with the Basewide UFP-QAPP, analytical data were initially compared with project screening levels to confirm the presence and characterize the nature and extent of petroleum contamination in soil. Although most of the project screening levels are derived from human health-based exposure assumptions, the project screening levels are intended for screening purposes only. Detections above a screening level are not an indication of unacceptable risk. Rather, the risk evaluation identifies potential risks at a site and provides the basis for risk management decisions.

DRO was detected at concentrations below the screening level in both 2014 soil borings, located at and to the northeast of a historical DRO concentration of 470 milligrams per kilogram (mg/kg) which is above the screening level (based on the migration to groundwater cleanup level [18 AAC 75 Method Two Table B2]). This suggests that the concentration of DRO has attenuated to below the screening level.

In 1995, TCE was detected at a concentration (0.022 mg/kg) above the screening level (0.020 mg/kg) in soil boring AP-3604 from 15 to 16.5 feet bgs (Figure 4-1). During the 2014 site characterization, TCE was detected above the screening level at concentrations of 0.108 mg/kg and 0.0737 mg/kg at SS041-SB01 and SS041-SB02, respectively, at a depth of 15 to 20 feet bgs in both borings, similar to that of the 1995 investigation. The lateral extent of TCE contamination is delineated to the south and west by numerous historical borings and to the northeast by historical boring AP-3614. The vertical extent of TCE in soil extends to approximately 20 feet bgs as defined by soil boring AP-3604 which was advanced to 51.5 feet bgs (Table 4-1).

PCBs were analyzed in the 15-to-20-foot interval of each soil boring and were not detected in either boring.

Data indicate that DRO contamination has not reached groundwater. Groundwater was estimated at approximately 95 feet bgs (more than 75 feet below the depth of contamination at SS041) based on water level monitoring conducted in 1995 at nearby monitoring wells AP-3658, AP-3659, and Well B (located approximately 1,300 feet north/northwest of the leachfield).

RISK EVALUATION

Analytical data collected in 1995 and 2014 were used to assess potential site-specific risks to human health and the environment. The following sections summarize the results of the human health and ecological risk evaluations completed for SS041.

Human Health Risk Evaluation

Potential site-specific risks to human health and the environment were evaluated within the framework of ADEC's site cleanup rules (18 AAC 75.325 to 75.390).

A summary of the human health risk evaluation results for source areas for SS041 is as follows:

- No petroleum-related compounds remain in soil at SS041 at concentrations above the screening levels. Therefore, fuel hydrocarbons do not pose a risk to human health or the environment.

- TCE was detected above 18 AAC 75.342(c) Table B1 Soil Cleanup Levels (Table 5-2).

- Direct contact/ingestion and outdoor air inhalation pathways for TCE contamination are considered incomplete because TCE contamination in soil is deeper than 15 feet bgs. Therefore, contamination in soil does not pose a current or future risk to human health through the direct contact/ingestion and outdoor air inhalation exposure pathways.

- The indoor air inhalation pathway is considered incomplete for TCE at the present time because no buildings are located within 30 feet of soil contamination.

- Because TCE was detected above Table B1 Soil Cleanup Levels within 100 feet from the ground surface or potential future building foundation, the hypothetical future vapor intrusion exposure pathway is potentially complete. Risks from the future vapor intrusion exposure pathway have not been quantitatively evaluated.

- TCE was detected in soil above the Table B1 Soil Cleanup Level for migration to groundwater, consistent with results from the 1996 RI. The RI Report concluded that migration to groundwater is not a pathway of concern at the site since no site-related contaminants were detected in groundwater at concentrations exceeding screening criteria.

- Although PCBs remain on the site at concentrations above the screening level, the contaminated sediment has been mixed with cement and capped in the cesspool. Concentrations of PCBs were detected below screening levels in soil samples collected outside the cesspool at SS041; therefore, PCBs do not pose a current risk to human health or the environment.

- The groundwater ingestion exposure pathway is considered incomplete for current and future exposure pathways because no drinking water wells are onsite and no site-related contaminants have been detected in groundwater above screening levels (Ecology and Environment, 1996).

Ecological Risk Evaluation

The ADEC Ecoscoping form was completed for SS041. The site achieved the "off-ramp" in Part 2, Terrestrial and Aquatic Exposure Routes, indicating that exposure pathways and routes for ecological receptors are incomplete, which demonstrates that ecological risk is not of concern.

RECOMMENDATIONS

Based on the risk evaluation and compliance with environmental criteria, the following are recommended for SS041:

- Remove groundwater LUCs.

- Revise existing soil LUC boundaries and develop LUC language.

- Continue annual LUC inspections and reporting.

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Tables

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Appendixes

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LIST OF ACRONYMS AND ABBREVIATIONS

°F	degree(s) Fahrenheit
AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFCEC	Air Force Civil Engineer Center
amsl	above mean sea level
Army	United States Army
ASL	Applied Sciences Laboratory
bgs	below ground surface
BNA	base neutral and acid extractable organic compound
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and xylenes
BTEXN	BTEX and naphthalene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
CRREL	United States Army Cold Regions Research and Engineering Laboratory
CSM	conceptual site model
DQE	data quality evaluation
DRO	diesel-range organics
EB	equipment blank
EPA	United States Environmental Protection Agency
EPH	extractable petroleum hydrocarbons
ESF	Environmental Staging Facility
ERP	Environmental Restoration Program
FD	field duplicate
f_{oc}	fraction of organic carbon
ft/ft	feet per foot
GIS	geographic information system
GRO	gasoline-range organics
HRC	Hydrocarbon Risk Calculator
IC	institutional control
IDW	investigation-derived waste
JBER	Joint Base Elmendorf-Richardson
JBER-E	former Elmendorf Air Force Base
JBER-R	JBER-Richardson

LOD	level of detection
LUC	land use control
mg/kg	milligram(s) per kilogram
MS	matrix spike
MSD	matrix spike duplicate
NFA	No Further Action
NW EPH	Northwest extractable petroleum hydrocarbons
NW VPH	Northwest volatile petroleum hydrocarbons
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PBR	Performance-Based Remediation
PCB	polychlorinated biphenyl
PID	photoionization detector
POL	petroleum, oil, and lubricants
PPE	personal protective equipment
QC	quality control
RI	Remedial Investigation
ROD	Record of Decision
RPD	relative percent difference
RRO	residual-range organics
RSL	regional screening level
SARA	Superfund Amendments and Reauthorization Act of 1986
SOP	standard operating procedure
TB	trip blank
TCE	trichloroethene
TO	Task Order
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
USAF	United States Air Force
UST	underground storage tank
UU/UE	unlimited use and unrestricted exposure
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbons
WESTON	Weston Solutions, Inc.

TITLE AND APPROVAL PAGE

Document Name:	Site Characterization Report for SS041 – Roosevelt Road PCB Site
Site Name/Project Name:	Performance-Based Remediation (PBR) for Alaska Group PBR – Joint Base Elmendorf-Richardson, Alaska
Site Location/Number:	Latitude (NAD 83): 61.290507, Longitude (NAD 83): -149.683659/SS041
Contract Number:	FA8903-09-D-8589
Task Order Number:	0016
Lead Organization:	Air Force Civil Engineer Center (AFCEC)
State Regulatory Agency:	Alaska Department of Environmental Conservation (ADEC)
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Report Prepared By (Contractor's Qualified Person):	Corey Schwabenlander, CH2M HILL
Preparation Date:	May 2015

This SS041 Site Characterization Report was prepared by qualified persons, as required by 18 *Alaska Administrative Code* (AAC) 75.355(c)(1) and 18 AAC 75.380(a) and defined in 18 AAC 75.990(100).

Reporting Organization's Project Manager: Signature: _____

Leah Waller, CH2M HILL

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1.0 INTRODUCTION

This Site Characterization Report presents the results of the July 2014 site characterization activities, and evaluates potential risks to human health and the environment from petroleum hydrocarbon contamination at SS041 – Roosevelt Road PCB Site (formerly FTRS-73). SS041 is located at the former Fort Richardson Army Post on Joint Base Elmendorf-Richardson (JBER), referred to as JBER-R, in Anchorage, Alaska. Site characterization activities conducted in July 2014 were performed under the Final *Joint Base Elmendorf-Richardson, Basewide Uniform Federal Policy-Quality Assurance Project Plan* (Basewide UFP-QAPP) (United States Air Force [USAF], 2013) and the site-specific Final *Joint Base Elmendorf-Richardson, Basewide Uniform Federal Policy-Quality Assurance Project Plan Site Characterization Work Plan, SS041 – Roosevelt Road PCB Site* (Site Characterization Work Plan) (USAF, 2014), which were approved by the Alaska Department of Environmental Conservation (ADEC) in April 2013 and July 2014, respectively.

Work was conducted by CH2M HILL under subcontract to Weston Solutions, Inc. (WESTON) for the JBER and Clear Air Force Station Performance-Based Remediation (PBR) project. This work has been authorized by the Air Force Civil Engineer Center (AFCEC) under Contract Number FA8903-09-D-8589, Task Order (TO) No. 0016.

1.1 Purpose

The purpose of this report is to present the results of the 2014 field investigation, to further characterize the nature of petroleum hydrocarbon contamination at SS041, to evaluate potential risks to human health and the environment, and to determine whether further action is necessary to advance the site toward site closure. Activities were conducted within the framework of ADEC's site cleanup rules (Title 18, Chapter 75 of the *Alaska Administrative Code* [18 AAC 75], Sections 325 through 390) (ADEC, 2012a). Contamination concentrations in soil were compared to 18 AAC 75 Method Two cleanup criteria and were evaluated using ADEC's *Vapor Intrusion Guidance* (ADEC, 2012b) to assess potential risks to human health.

1.2 Organization of Report

This report is organized as follows:

- **Section 1.0: Introduction –** presents the purpose of this report and report organization.
- **Section 2.0: General Site Description and Background –** presents the installation-specific general geology, hydrogeology, and hydrology; a site overview, including a summary of previous investigations and cleanup actions; and the regulatory framework for investigating and evaluating risk at the site.
- **Section 3.0: Field Activities –** summarizes pre-investigation activities and field methods, and identifies deviations from the Site Characterization Work Plan (USAF, 2014).
- **Section 4.0: Site Characterization Results and Findings –** presents the site-specific geology, hydrology, and hydrogeology; presents analytical results from the 2014 field investigation and previous investigations that represent the distribution of contamination at the site; summarizes

the nature and extent of contamination; and provides an updated site-specific conceptual site model (CSM).

- **Section 5.0: Risk Evaluation –** describes the general process for evaluating potential risks to human health and the environment and identifies the site-specific pathways and contaminants of concern (COCs) posing potential unacceptable risks based on current and potential future land use scenarios.

- **Section 6.0: Conclusions and Recommendations –** presents the conclusions of the report, including the nature and extent of contamination and risk evaluation results; identifies data gaps and risks preventing site closure (if present); and may provide recommendations for further investigation, remediation, and/or institutional controls (ICs).

- **Section 7.0: References –** presents references used in preparation of this report.

Tables, figures, and appendixes follow Section 7.0.

2.0 GENERAL SITE DESCRIPTION AND BACKGROUND

2.1 JBER General Overview

2.1.1 Location and Description

JBER comprises the former Elmendorf Air Force Base (JBER-E) and JBER-R, located adjacent to the Municipality of Anchorage, Alaska. As a result of the 2005 Department of Defense Base Realignment and Closure (BRAC) Commission recommendations, the two installations merged to form JBER on October 1, 2010.

JBER is bound to the west by Cook Inlet, by Knik Arm to the north and northwest, by the Municipality of Anchorage to the southwest, and by primarily undeveloped lands to the east, most of which are part of Chugach State Park and the Chugach Mountains. JBER encompasses 73,000 acres with elevations ranging from sea level along the Knik Arm shoreline to 3,800 above mean sea level (amsl) in the Chugach Mountains located to the south and east.

2.1.2 Physical Characteristics

2.1.2.1 Climate

Local and regional geographic features greatly affect climate in the JBER area. JBER is located in a semiarid area of Southcentral Alaska. Cook Inlet moderates the climate seasonally, and four surrounding mountain ranges protect the area from Gulf of Alaska storms and extreme winter temperatures from the northern Alaska interior. Typical summer temperatures range from 46 to 65 degrees Fahrenheit (°F), and winter temperatures range from 4 to 45°F; extreme temperatures range from -38 to 86°F. Average annual precipitation in the Anchorage area is 15 inches, with a range from 13 to 20 inches. Most of the precipitation falls from July through September when the wind is from the southwest. Snowfall averages 66 inches, or about one-third (5.5 inches) of the total precipitation. The depth of snow on the ground does not normally exceed 24 inches.

2.1.2.2 Geology and Soils

The surficial and subsurface geology and stratigraphy of JBER-R are very complex because the area is covered by glacial, glacial-marine, and glaciofluvial deposits of Quaternary age (Hunter et al., 1999).

The geology underlying JBER-R consists of glacial deposits, alluvial deposits, and metamorphic rock. The northern and central portions of JBER-R are made up of glacial sediments deposited in the Cook Inlet basin during a number of glacial periods. Specifically, terminal moraine deposits (the Elmendorf Moraine) are located directly northwest of the main cantonment area. These soils are composed of fine-grained, poorly sorted glacial materials with interbedded heterogeneous layers of boulders, cobbles, gravel, sand, silt, and clays. Alluvial deposits on the cantonment area are bounded by the Elmendorf Moraine to the northwest and metamorphic bedrock terrain to the southeast. Glacial outwash, alluvial fan, and fluvial deposits comprise the alluvial sediments that range from gravel in the eastern portion of the plain to sand in the southwestern portion. The cantonment area is composed of deposits with well-bedded and well-sorted gravel (Hunter et al., 1999).

The Bootlegger Cove Formation was deposited in this region via glacial outwash deposits, and consists primarily of thinly bedded gray to light gray silt clay to clayey silt. The Bootlegger Cove Formation is a common aquitard and confining unit in the area. The ground moraine and the Bootlegger Cove Formation form an irregular surface upon which the younger alluvial sediments were deposited (Hunter et al., 1999).

The Mountain View Fan formation is a large alluvial fan that emanates from the Eagle River Valley and extends under the JBER-R cantonment area. The Elmendorf Moraine borders the fan to the north while low hills that protrude through younger glacial sediment border the fan to the south. These hills consist of ground moraine. The fan slopes to the west-southwest and extends beyond the base. The fan was likely deposited by ice-marginal, glacially fed streams, based on its composition (stratified outwash) during outburst flooding events from ice-dammed lakes in the Eagle River Valley. Beneath the Mountain View Fan lie older glacial and glacio-marine deposits (Hunter et al., 1999).

Mountains composed of metamorphic bedrock make up the southcentral and southern areas of JBER-R (Hunter et al., 1999).

2.1.2.3 Hydrology

Ship Creek serves as the main source of drinking water for JBER-R. A diversion dam, where water is taken from the creek, is located approximately 10.5 miles upstream from the mouth.

2.1.2.4 Hydrogeology and Groundwater Use

One shallow and one deep groundwater system have been identified in the area of JBER-R (Freethey, 1976); however, three separate aquifer systems exist in the cantonment area, including a shallow unconfined system, a locally confined system, and a deeper confined system. The deep aquifer serves as a secondary drinking water source for JBER-R, JBER-E, and the Municipality of Anchorage when there is low stream flow (Freethey, 1976). Three standby water supply wells supplement the surface water system with a maximum of two of the wells in use at a time during peak demand. The water source for the standby wells is a confined aquifer in the Knik outwash deposit. A drinking water well with a single service connection to the Otter Lake Recreational facility serves a transient population.

The shallow aquifer occurs under unconfined conditions in the Anchorage Plain deposits and in unconfined to semiconfined conditions in the till of the Elmendorf Moraine. Shallow perched groundwater of limited volume and extent exists in localized areas within the Elmendorf Moraine till deposits. Groundwater in the Anchorage Plain deposits occurs between 10 and 20 feet below ground surface (bgs). Flow in the Anchorage Plain is westerly along Ship Creek.

Groundwater in the next deeper aquifer system is most often found at approximately 80 feet within the central part of the cantonment area. The deeper aquifer changes from confined to semiconfined to unconfined, moving from south to north across the cantonment area. The upper confining unit moves out along the northern boundary of the cantonment area while the shallow unconfined and locally confined aquifers merge. Overall, the direction of flow in the deeper aquifer tends to be to the northwest. Evidence suggests, however, that flow within the deeper aquifer is also influenced by discontinuous fine-grained units that result in local groundwater flow directions that diverge

from the regional pattern. Groundwater flow directions vary widely in the central part of the cantonment area, where the hydraulic gradient is shallower and discontinuous fine-grained units are present at depth (Astley et al., 2000).

Groundwater in the deepest of the confined aquifers is at its shallowest depths (130 feet bgs) in the northern area of JBER-R. The flow in the deep confined system is generally toward Knik Arm in a westerly to northwesterly direction, with a hydraulic gradient between 0.0025 and 0.02 foot per foot (ft/ft). The deep confined system occurs under confined conditions beneath areas where the Bootlegger Cove Formation is present. When the Bootlegger Cove Formation is intermittently present or absent, the underlying aquifer can be described as a leaky confined system.

2.2 Site Overview

2.2.1 Location and Description

SS041 is located between Roosevelt Road and the Alaska Railroad right-of-way (Figure 2-1). Detailed location information is provided in Table 2-1. The site served as an emergency command and control communications center for JBER-R and the Anchorage area, and previously consisted of a former high-frequency transmitter facility and an underground bunker. A former sanitary system composed of buried septic lines, a cesspool, a septic tank, and leachfield were connected to the transmitter annex building and underground communications bunker. The sanitary system was used to dispose of septic waste from the underground bunker (Ecology and Environment, 1996).

Polychlorinated biphenyl (PCB) contamination was discovered as a result of a surface leak of dielectric oils in the 1970s associated with transformers stored in the former transmitter annex building (Ecology and Environment, 1996). The building was removed in 1978, and diesel fuel was used to wash the concrete foundation, resulting in a release of PCBs and petroleum hydrocarbons to soil (United States Army Cold Regions Research and Engineering Laboratory [CRREL], 1998). PCB-contaminated material within the cesspool was mixed with cement and capped in place in 1998.

The structures at the site have been removed, with the exception of the cesspool and some remnants of the underground bunker. Currently, the site is relatively flat and covered with 3 to 6 feet of clean fill (ADEC, 2002). Temporary structures such as field trailers and Quonset huts are intermittently present onsite for military training purposes. Entry to the site is restricted by a locked gate which requires coordination with Range Control for access. A secondary fence is located in the northeastern corner of the facility and encompasses the former transmitter annex foundation, former underground bunker, and a portion of the buried septic lines. The cesspool, former septic tank, and associated septic lines are buried to the west of this secondary fence.

2.2.2 Previous Investigations and Remedial Actions

Investigation and cleanup activities have been conducted at the SS041 since 1987:

- In 1987, PCB contamination was discovered in both the transformer annex foundation and the underground bunker as a result of dielectric oil leaks caused by vandalism of onsite transformers. The foundation of the transformer annex was then decontaminated using a diesel wash, which resulted in a release of PCBs and DRO to soil.

- Sample results from the 1987 Site Cleanup Plan indicated that PCB contamination above cleanup levels remained onsite both in soil and on the concrete structures (Ecology and Environment, 1991).

- In 1988, excavation efforts were initiated. Approximately 150 tons of PCB-contaminated soil were removed. However, the extent of PCBs at the site was greater than originally anticipated, and further investigations were required (Ecology and Environment, 1991).

- A follow-on remedial investigation (RI) was conducted in 1990 and identified PCBs in soil throughout the site and on the concrete foundation of the transmitter annex building. Soil and sludge found in the cesspool and septic tank were also contaminated with PCBs, volatile organic compounds (VOCs), base neutral and acid extractable organic compounds (BNAs), and metals (Ecology and Environment, 1991).

- Excavation activities performed in 1992 removed approximately 600 tons of contaminated soil from the underground bunker and transmitter annex foundation.

- A follow-on RI was conducted in 1995 and focused on the cesspool, septic tank, and leachfield. Analytical results indicated that PCB and DRO contamination at the site is primarily present in material within the cesspool and leachfield (Ecology and Environment, 1996).

- The Operable Unit A and B (OU A and B) Record of Decision (ROD) was finalized in 1997 and No Further Action (NFA) was selected as the remedy (Army, 1997). The OU A and B ROD also specified that further actions for residual petroleum hydrocarbons in soil within the leachfield area would be conducted under the State-Fort Richardson Environmental Restoration Agreement.

- In 1998, the underground septic lines were cut and filled with grout, and PCB-contaminated sediment and sludge within the cesspool were mixed with cement and capped. Containment of contamination was achieved by stabilizing and solidifying contaminated material in place (Dowl/Ogden, 1999).

- A limited PCB investigation was performed in 2001 to support the railroad track realignment project. No detectable concentrations of PCBs were observed during this effort.

- The railroad track alignment occurred in 2002, at which time SS041 was capped with 3 to 6 feet of clean backfill (ADEC, 2002).

See Section 4.3 for discussion of the historical data.

2.3 Regulatory Framework

Investigation and remediation activities at JBER are being conducted by USAF under the Environmental Restoration Program (ERP), funded by the Environmental Restoration Account.

In 1994, the former Fort Richardson Army Post (now known as JBER-R) was placed on the National Priorities List and signed a Federal Facility Agreement (FFA) with EPA and ADEC. As part of the formation of JBER, USAF assumed the responsibility to continue the cleanup of

sites on JBER-R under agreements previously established for the former Fort Richardson and signed by the EPA, ADEC, and U.S. Army. CERCLA outlines the responsibility for identifying and remediating contaminated sites in the United States and its possessions. The CERCLA legislation identifies EPA as the primary policy and enforcement agency regarding contaminated sites. Provisions within CERCLA Sections 101(14) and 104(a)(2) exclude petroleum-related contamination from CERCLA hazardous substance regulation.

The State-Fort Richardson Environmental Restoration Agreement included sites with petroleum, oil, and lubricants (collectively referred to as POL) contamination that were excluded from CERCLA and are under the jurisdiction of ADEC for cleanup. The ADEC Contaminated Sites Program and UST Programs regulate petroleum hydrocarbons and other environmental contaminants in accordance with 18 AAC 75, 18 AAC 78, and supporting guidance documents.

Regulatory oversight for SS041 is currently conducted by ADEC, and SS041 is listed under State of Alaska Contaminated Sites Database Hazard Identification Number 640 as Cleanup Complete with ICs.

2.3.1 Risk Calculation and Cleanup Level Requirements

ADEC's cleanup process provides groundwater cleanup levels based on drinking water standards (Table C of 18 AAC 75.345) and consists of four methods for determining soil cleanup levels and assessing potential risks to human health from petroleum hydrocarbon-contaminated sites, as follows:

- **Method One** uses site characteristics and a decision matrix (Tables A1 or A2 of 18 AAC 75.341) to arrive at cleanup levels for bulk petroleum hydrocarbon fractions (gasoline-range organics [GRO], DRO, and residual-range organics [RRO]) in soil.

- **Method Two** uses generic soil cleanup levels for individual compounds (Table B1 of 18 AAC 75.341), generic petroleum hydrocarbon soil cleanup levels (Table B2 of 18 AAC 75.341) and groundwater cleanup levels (Table C of 18 AAC 75.341), and a cumulative risk calculation. The cumulative risk calculation assesses whether the site meets the risk standard when more than one compound is present at a site and/or when multiple exposure pathways exist.

- **Methods Three and Four** calculate site-specific alternative cleanup levels. Alternative cleanup levels can be calculated using the equations presented in ADEC's *Contaminated Sites Program Cleanup Levels Guidance* (ADEC, 2008a), the ADEC online Method Three calculator, or the Hydrocarbon Risk Calculator (HRC). The ADEC online Method Three calculator is available at http://dec.alaska.gov/applications/spar/webcalc/index.htm. The HRC (version 1.1), a peer-reviewed Microsoft Excel spreadsheet model approved by ADEC as a Method Three tool, is available at Hydrocarbon Risk Calculator (Ver. 1.1) http://dec.alaska.gov/spar/csp/guidance/hrc/Hydrocarbon%20Risk%20Calculator.xls (1.9 MB). When the HRC is used under Method Four, it is to support alternative groundwater cleanup levels derived as part of a risk assessment, and responsible parties must follow ADEC's Risk Assessment Procedures Manual (ADEC, 2011a).

In accordance with 18 AAC 75, if a site has been adequately characterized and meets the risk standard under a residential land use scenario, then ADEC will issue a written determination that the site has achieved a Cleanup Complete status.

If site conditions do not meet the risk standard under a residential land use scenario, then the site may require cleanup or be considered suitable for a Cleanup Complete with ICs designation from ADEC. Based on the site-specific conditions, a site with a Cleanup Complete with ICs designation may be suitable for use under an alternate land use scenario such as commercial/industrial. Specific measures would be implemented to restrict access, and to limit exposure and use of contaminated soil and/or groundwater. These measures include, but are not limited to, documenting land use controls (LUCs) in the Restoration Program Atlas and the Base geographic information system (GIS), maintaining existing administrative controls through reviews of work clearance permits, and performing periodic inspections of the site.

2.3.2 Site Characterization Requirements

The *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites* (ADEC, 2009) also requires that sufficient data are collected to describe site-specific conditions (geology, hydrology, and hydrogeology), to adequately characterize the nature and extent of contaminated soil and groundwater at a site, and to present an updated CSM. As described in the *Cumulative Risk Guidance* (ADEC, 2008b), ADEC uses both an indicator compound and surrogate compound approach to assess contamination at hydrocarbon release sites. The basic hydrocarbon analytical suite includes benzene, toluene, ethylbenzene, and xylenes (BTEX) and 16 polycyclic aromatic hydrocarbon (PAH) compounds (indicator compounds), as well as GRO, DRO, and RRO (surrogate compounds). In addition, on a case-by-case basis, analysis for fuel additives, metals, and selected VOCs may be required.

Based on a review of the historical data and the site history, data gaps were identified and provide the basis for further site characterization. Additional investigation was needed to (1) define the vertical and lateral extent of DRO contamination within the leachfield, and (2) collect and analyze additional samples for parameters needed for evaluation of potential human health risks and input into the HRC (DRO/RRO, GRO, petroleum-related VOCs, PAHs, extractable petroleum hydrocarbons [EPH], and volatile petroleum hydrocarbons [VPH]). Because there is a history of VOCs and PCBs at this site, additional samples for PCBs and full-suite VOC analysis were collected at the interval of historically high DRO contamination (15 to 20 feet bgs) in both borings. These analyses were also assessed for waste characterization purposes.

3.0 FIELD ACTIVITIES

Site characterization activities were performed at SS041 on July 18, 2014, to fill the data gaps identified in Section 1.1. Pre-investigation activities and general field methods are described in the following sections. Sampling activities were supervised by a qualified person as defined in 18 AAC 75.990 (100) (resume provided in Appendix A-1).

Field documentation is provided in Appendix A-2; soil boring logs are provided in Appendix A-3; chain-of-custody forms are provided in Appendix A-4; a photo log is provided in Appendix A-5; and survey results are provided in Appendix A-6.

3.1 Pre-Investigation Activities

An initial site visit was performed by field personnel during June 2014 to identify and mark soil boring locations. Boring locations were marked out using swing tie measurements from existing features at the site. Potential hazards and access restraints were also assessed at this time. The site is gated and locked, and access requires coordination with Range Control.

A JBER Base Civil Engineer Work Clearance Request (dig permit) was acquired before drilling began, to identify potential current and abandoned utilities or pipelines.

3.2 Field Methods

3.2.1 Soil Sampling

Two soil borings (SS041-SB01 and SS041-SB02) were drilled to delineate DRO contamination within the leachfield. SS041-SB01 was drilled in a location of former DRO concentrations above the screening level to characterize the current nature and vertical extent of contamination. SS041-SB02 was drilled to delineate the horizontal extent to the northwest. Soil borings were drilled using a Geoprobe 8040DT drill rig. The Geoprobe 8040DT drill rig uses direct-push technology to advance a 5-foot-long, 1.60-inch-inside-diameter stainless steel core barrel (macrocore) lined with a disposable acetate liner ahead of the casing using hydraulic down-pressure and down-hole hammer. This method collects a continuous soil core from the surface to the end depth of the boring. Both borings were terminated at 30 feet bgs, and no evidence of contamination by photoionization detector (PID) screening or by visible or olfactory evidence was observed. Soil borings were abandoned using 3/8-inch bentonite chips from the bottom of the boring to the ground surface.

Soil samples were collected at 5-foot intervals from the continuous cores using the methods described in Standard Operating Procedure (SOP)-16 of the Basewide UFP-QAPP (USAF, 2013). Table 3-1 presents a summary of the soil samples collected during the 2014 investigation. Consistent with the Basewide UFP-QAPP (USAF, 2013) and SOP-18, continuous logging of soil type and stratigraphy, moisture or groundwater, visual observations of staining or liquid-phase petroleum, PID readings, and other observations were performed in the field by field personnel. The maximum PID reading for each 5-foot interval is recorded on the soil boring log (Appendix A-3).

Samples were assigned a unique identification number in the field. Soil samples were submitted to the laboratory in Corvallis, Oregon for GRO, DRO, RRO, PAHs, VOCs, BTEX and naphthalene (BTEXN), VPH, EPH, and fraction of organic carbon (f_{oc}) analyses. Two samples (one from the 15-to-20-foot interval of each boring) were also submitted for PCBs and full-suite VOCs. Geotechnical samples were collected and sent to Terra Firma Testing. Four types of field quality control (QC) samples (equipment blank [EB], trip blank [TB], and matrix spike/matrix spike duplicate [MS/MSD]) were collected to meet data quality standards. Two field duplicates (FDs) were collected and submitted for analysis. The number of QC samples collected satisfies the requirements established in the Site Characterization Work Plan (USAF, 2014).

3.2.2 Surveying

Soil boring locations were surveyed on October 22, 2014. The surveyed boring locations have approximately 1-inch horizontal and vertical accuracies. Survey results will be provided in Appendix A-6.

3.2.3 Waste Handling and Disposal

Wastes generated during site characterization activities include general refuse (expended personal protective equipment [PPE], paper towels, plastic bags, and plastic water containers) and investigation-derived waste (IDW) consisting of soil drill cuttings and wastewater from decontamination activities.

Consistent with the Basewide UFP-QAPP (USAF, 2013), wastes were taken to the Environmental Staging Facility (ESF), which is located on Warehouse Street near the intersection with Loop Road. Specific wastes were handled as follows:

- General refuse and expended PPE were disposed of daily in JBER refuse waste containers at the ESF.

- Soil cuttings were placed into one labeled 55-gallon drum during soil boring advancement and transported to the ESF. The drums were labeled with date, project name, well/boring number, contents, depths of material, corresponding analytical numbers, analysis to be performed, and the contractor point of contact. The drums were given unique identification numbers (ESF3084 and ESF 3086).

- Soil was characterized for appropriate treatment and disposal using soil cuttings sampling results. The analytical results were provided to the JBER ESF operator; soil cuttings are awaiting disposal based on those results. Disposal records are on file and available upon request. Decontamination water was collected in 15-gallon containers, transported to the ESF, transferred into open-top 55-gallon drums, and labeled. Decontamination water was then batch treated with other IDW water.

3.3 Deviations from the Work Plan

Field activities were conducted in accordance with the Basewide UFP-QAPP (USAF, 2013) and the Site Characterization Work Plan (USAF, 2014), without deviation.

4.0 SITE CHARACTERIZATION RESULTS AND FINDINGS

This section presents site-specific geology, hydrogeology, and hydrology; soil analytical results; the nature and extent of contamination in soil; and an updated CSM for the site.

4.1 Data Presentation and Interpretation

4.1.1 Project Screening Levels

Consistent with the Basewide UFP-QAPP (USAF, 2013), analytical data were initially compared with project screening levels to confirm the presence and characterize the nature and extent of contamination in soil. Although most of the project screening levels are derived from human health-based exposure assumptions, the project screening levels are intended for screening purposes only. Detections above a screening level are not an indication of unacceptable risk. Rather, the risk evaluation (Section 5.0) identifies potential risks at a site and provides the basis for risk management decisions.

Soil screening levels consider cumulative exposure of human receptors to contaminants in soil through direct contact and outdoor inhalation, as well as protection of groundwater. Screening levels are based on 18 AAC 75 Method Two soil cleanup level tables. Specifically, soil screening levels (for sites with less than 40 inches of precipitation) are the most stringent of (1) one-tenth of the Table B1 inhalation/direct contact cleanup levels, (2) the direct value of Table B1 migration to groundwater cleanup levels, or (3) the direct value of Table B2 soil cleanup levels (for sites with less than 40 inches of precipitation). If an ADEC cleanup criterion does not exist for a given compound in soil, then the screening level for that compound is the latest version of the EPA regional screening level (RSL) (EPA, 2014).

4.1.2 Chemical Analysis and Data Tables

Individual detected results are designated in bold font, and results detected above project screening levels are designated by shading in data tables. Historical data are presented in Table 4-1. Historical data may not be considered representative of current site conditions because concentrations will be reduced by attenuation over time. For example, historical DRO and RRO results that are 15 years old or older may no longer be representative for those analytes. BTEX and other VOCs tend to attenuate more quickly, and data that are more than 5 to 10 years old may not be representative of current site conditions and may be overly conservative. GRO concentrations also tend to attenuate relatively quickly compared to DRO and RRO fractions.

For the data collected in 2014, Table 4-2 lists the measured concentration if the analyte was detected, and reports the level of detection (LOD) if the analyte was not detected. In addition, data flags are presented to help characterize and/or qualify data. The LOD is the smallest amount or concentration of a substance that must be present in a sample to be detected at a high level of confidence (99 percent). At the LOD, the false negative rate is 1 percent (a false negative means that the analytes is reported as not being present when it really is present). The detection limit is the smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99 percent level of confidence. The most common data flags are "U," indicating that the analyte was not detected, and "J," indicating that the analyte value is an estimated value. The J flag is used when compounds are detected at concentrations below the level

of quantitation and/or when a QC parameter is out of range. The B flag is used to indicate that the compound was also detected in a QC blank sample. If an analyte is not detected, then the result is listed as "LOD value" followed by the data flag "U" (i.e., 0.01 U).

FD samples were collected at a rate of approximately one duplicate per 10 original samples. Sample receipt forms, laboratory data review checklists, and a comprehensive data quality evaluation (DQE) report of the 2014 site characterization samples are included in Appendix B. The goal of the DQE (Appendix B-1) is to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision making process.

4.1.3 Site Map(s)

Historical soil borings are shown as square symbols, and 2014 data are shown as circular symbols (Figure 4-1). Soil boring locations with contaminant concentrations between one and 10 times the screening level are shown in yellow. Locations with concentrations below screening levels are shown in green. The color coding is intended to allow visualization of the extent of contamination.

4.2 Physical Characteristics

4.2.1 Geology and Soils

Boring logs from SS041 show that the soils consist primarily of well-graded gravel with poorly graded sand. The soil lithology across the site is relatively homogeneous. Both borings (SS041-SB01 and SS041-SB02) drilled in July 2014 did not show an obvious contrast between backfill material and the surrounding native soil. Boring logs from the 2014 investigation are presented in Appendix A-3.

One soil sample collected from 0 to 30 feet bgs during the 2014 investigation was submitted to the laboratory for geotechnical testing. Bulk density, specific gravity, moisture content, and grain size distribution results for the sample are summarized in Table 4-3. Grain size distribution testing results indicate that the Unified Soil Classification is GW-GM (well graded gravel with silt and sand). The complete geotechnical analytical results are included as Appendix B-2.

4.2.2 Hydrogeology and Groundwater Use

Depth to groundwater was not measured during the July 2014 investigation because monitoring wells AP-3658 and AP-3659 could not be located. Historically, groundwater has been measured at approximately 95 feet bgs at monitoring wells AP-3658, AP-3659, and Well B (located approximately 1,300 feet north/northwest of the leachfield), and locally flows toward the southwest (Ecology and Environment, 1996). There are no drinking water wells located within 0.5 mile of SS041, and the closest standby water-supply well (35610) is 1.8 miles to the southwest of SS041.

4.2.3 Hydrology

SS041 is not near any surface water bodies. The nearest surface water body is Otter Lake, which is approximately 1.5 miles west of the site.

4.3 Summary of Previous Investigations

Previous investigations were conducted at SS041 from 1987 to 1995, during which approximately 750 tons of PCB-contaminated soil were removed from the site.

A site investigation occurred in 1987, prompting an initial removal effort of PCB-contaminated soil in 1988, at which time approximately 150 tons of material were removed from the site. However, further PCB contamination was encountered during these efforts; and in 1990, a follow-on site investigation was performed. Soil and wipe samples were collected from the underground bunker, transmitter annex foundation, and the cesspool area, and were analyzed for VOCs, BNAs, PCBs, asbestos, dioxin, total petroleum hydrocarbons, metals, and revegetation parameters. Results from this investigation indicated that PCBs remained in soil at all locations sampled (Ecology and Environment, 1991). In addition to PCBs, soil and sludge contaminated with VOCs, BNAs, and metals were identified in the cesspool area.

Remediation activities performed in 1992 removed approximately 600 tons of contaminated soil from the site. Excavation activities included field screening and laboratory confirmation samples to provide delineation of PCBs at the transmitter annex foundation and underground bunker facilities (ADEC, 1992).

In 1995, a limited RI was conducted at the site that targeted the cesspool, septic tank, and leachfield. Although the leachfield had not been included in the previous investigations, confirmation samples from the 1991 field effort identified it as a potential source of VOCs, PCBs, BNAs, and metals. Data collected during the RI indicated that PCB and DRO contamination at the site is primarily present in material within the cesspool and leachfield, respectively (Ecology and Environment, 1996). The maximum concentration of PCBs (2.3 mg/kg at approximately 5 feet bgs) was detected in material within the cesspool, which was subsequently mixed with cement and capped (see Figure 2-1) (United States Army Engineer District Alaska [USAEDA], 2000; USAF, 2013). DRO was detected in soil borings within the leachfield from 5 to 51.5 feet bgs, with only one sample above the cleanup level in boring AP-3598 (470 mg/kg) at 15 feet bgs. The DRO contamination in the leachfield is likely a result of contaminated media being introduced into the septic system; however, the volume of media released has not previously been documented (United States Army [Army], 1997). Trichloroethene (TCE) was also detected in soil borings within the leachfield, with a maximum concentration of 0.022 mg/kg at 15 to 16.5 feet bgs in boring AP-3604. PCBs were detected in soil from the leachfield at concentrations from 0.04 to 0.2 mg/kg (AP-3610 and AP-3617, respectively), which is below the 18 AAC 75 Method Two soil cleanup level of 1.0 mg/kg. No contaminants were detected in groundwater above the screening criteria specified in the 1996 RI (Ecology and Environment, 1996).

The OU A and B ROD was finalized in 1997, and NFA was selected as the remedy. The OUA and B ROD also specified that further actions for residual petroleum hydrocarbons in soil within the leachfield area would be conducted under the State-Fort Richardson Environmental Restoration Agreement. In 1998, PCB-contaminated sediment and sludge within the cesspool was mixed with cement and capped (Dowl/Ogden, 1999).SS041 is listed under State of Alaska Contaminated Sites Database Hazard Identification Number 640 as Cleanup Complete with ICs. LUCs for soil and groundwater at SS041 are currently in place.

Table 4-1 and Figure 4-1 present the historical soil data for contaminant concentrations detected in soil above screening levels.

4.4 Site Characterization Results

Table 4-2 presents a summary of 2014 soil data for SS041, and Figure 4-1 presents historical and 2014 results for contaminant concentrations detected in soil above screening levels. Complete, validated analytical data, including a DQE report, are presented in Appendix B.

4.4.1 Source of Release(s)

PCB contamination was a result of a surface leak of dielectric oils in the 1970s associated with transformers stored in the former transmitter annex building (Ecology and Environment, 1996). The building was removed in 1978, and diesel fuel was used to wash the concrete foundation, resulting in a release of PCBs and petroleum hydrocarbons to soil (CRREL, 1998).

4.4.2 Nature and Extent of Soil Contamination

4.4.2.1 DRO in Soil

DRO was identified as the primary contaminant in soil based on historical data (Figure 4-1) within the leachfield. In 1995, DRO was detected at a concentration (470 mg/kg) above the screening level (250 mg/kg) in boring AP-3598. Soil samples collected at 2014 site characterization borings SS041-SB01 and SS041-SB02 (installed at the approximate location of AP-3598 and to the northeast of that location, respectively) showed detected concentrations of DRO below the screening level in both borings. This suggests that DRO has likely attenuated to concentrations below the screening level.

4.4.2.2 TCE in Soil

In 1995, TCE was detected at a concentration (0.022 mg/kg) above the screening level (0.020 mg/kg) in soil boring AP-3604 from 15 to 16.5 feet bgs (Figure 4-1). During the 2014 site characterization, TCE was detected above the screening level at concentrations of 0.108 mg/kg and 0.0737 mg/kg at SS041-SB01 and SS041-SB02, respectively, at a depth of 15 to 20 feet bgs in both borings, similar to that of the 1995 investigation. The lateral extent of TCE contamination is delineated to the south and west by numerous historical borings and to the northeast by historical boring AP-3614. The vertical extent of TCE in soil extends to approximately 20 feet bgs as defined by soil boring AP-3604 which was advanced to 51.5 feet bgs (Table 4-1).

4.4.2.3 PCBs in Soil

PCBs were analyzed in the 15-to-20-foot interval of SS041-SB01 and SS041-SB02 and were not detected in either boring.

4.4.2.4 Other Compounds in Soil

In 2014, no other petroleum hydrocarbons (i.e., GRO, RRO, BTEX, and PAHs) or VOCs were detected above screening levels. Several VOCs were reported as nondetects (at the LOD) above the project screening levels, as shown in Table 4-4. LODs below the project screening levels for

these analytes were identified in the Basewide UFP-QAPP as unachievable in methanol preservation; therefore, the results are not unexpected. None of the VOCs included in Table 4-4 were identified as COCs in previous investigations under CERCLA.

4.4.2.5 Groundwater

Groundwater was not analyzed during the 2014 field effort because data collected during the 1996 RI indicate that contamination has not reached groundwater and groundwater migration is not a pathway of concern at the site (Ecology and Environment, 1996). Groundwater was estimated at approximately 95 feet bgs (more than 75 feet below the depth of contamination at SS041) based on water level monitoring conducted in 1995 at nearby monitoring wells AP-3658, AP-3659, and Well B (located approximately 1,300 feet north/northwest of the leachfield).

4.4.3 Data Quality Evaluation

Sample receipt forms, laboratory data review checklists, and a comprehensive DQE report of the 2014 site characterization samples are included in Appendix B. The goal of the DQE is to demonstrate that a sufficient number of representative samples were collected, and the resulting analytical data can be used to support the decision making process. The data collected are assessed for quality and accuracy, and when the data do not meet established criteria, the data are labeled as "qualified." Qualified data are assigned flags during the data validation process; the final validation flags are included in the data summary tables in this report (Section 4.0). The following summary highlights the DQE findings:

1. Completeness for all method/matrix/analyte combinations was 100 percent.
2. All AK101 data were qualified because of low-level detections in the TBs. The degree to which blank contamination was observed suggests a contamination issue during sample collection or shipping.
3. Approximately 43 percent of the VPH data were qualified because of low-level detections in the TBs and laboratory blanks. The degree to which blank contamination was observed is within reasonable method expectations considering the small size of the dataset.
4. Approximately 4 percent of SW8270D-SIM data were qualified because of low-level detections in the laboratory blanks. The degree to which blank contamination was observed is within reasonable method expectations.
5. FD relative percent difference (RPD) exceedances were observed for Methods VPH and Lloyd Kahn; six results were qualified as estimated.
6. MS/MSD recovery exceedances were observed for Method SW8260C; three results were qualified as estimated.
7. Although data were qualified as estimated because of QC exceedances as noted, overall precision and accuracy of the data as measured by field and laboratory QC indicators suggest that data are usable for project objectives.

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5.0 RISK EVALUATION

This section describes the process used to evaluate potential site-specific risks to human health and the environment within the framework of ADEC's site cleanup rules (18 AAC 75.325 to 75.390).

The procedures used to evaluate risks are consistent with the following regulations and guidance:

- 18 AAC 75.345(g) (ADEC, 2012a)
- *Cumulative Risk Guidance* (ADEC, 2008b)
- *Ecoscoping Guidance, A Tool for Developing an Ecological Conceptual Site Model* (ADEC, 2012c)
- *Vapor Intrusion Guidance for Contaminated Sites* (ADEC, 2012d)

Risk evaluation provides the basis for making risk management decisions regarding contaminated soils and the suitability of a site for unlimited use and unrestricted exposure (UU/UE), for receiving a "Cleanup Complete" designation from ADEC, and for preparation of alternative cleanup levels for soil, if necessary.

5.1 Potential Receptors and Exposure Pathways

Potential exposure pathways—the means by which people, animals, and plants might come into contact with contamination in environmental media—at SS041 were evaluated in accordance with ADEC's *Policy Guidance on Developing Conceptual Site Models* (ADEC, 2010). The results of this evaluation are presented in Table 5-1.

Potential exposure pathways are based on current and potential future land and groundwater uses. The current land use for SS041 is industrial. There is no current use of groundwater as a drinking water source. No buildings are currently located within 100 feet of contaminated soil. SS041 is a gravel-covered area with grass, and has no significant habitat.

5.2 Human Health Risk Evaluation

5.2.1 Data Evaluation

Data evaluation is the process for evaluating available data to assess the type, quantity, and quality of suitable data for risk evaluation under Method Three. Soil data collected in 1995 and 2014 were considered suitable to characterize the nature of the contamination (Tables 4-1 and 4-2).

Fuel hydrocarbons no longer remain in soil at concentrations above the screening levels. Although TPH-diesel was detected at a concentration (470 mg/kg) above the screening level in 1995 at location AP-3598 from 15 to 16.5 feet bgs, this location was resampled in 2014 (SS041-SB01) and DRO was not detected at a concentration above the screening level. No other petroleum-related compounds have been detected in soil at SS041 at concentrations above screening levels. Therefore, fuel hydrocarbons do not pose a risk to human health or the environment.

PCBs within the cesspool and TCE in soil are the only constituents detected at concentrations above the screening levels. Groundwater samples were not collected at the site in 2014, and no contaminants were detected in groundwater above the screening criteria specified in the 1995 RI (Ecology and Environment, 1996).

5.2.2 Exposure Assessment

Exposure assessment is the process of determining magnitude, frequency, duration, and route of exposure to a chemical or physical agent. In accordance with ADEC's *Policy Guidance on Developing Conceptual Site Models* (ADEC, 2010), pathways through which people might come into contact with contaminants at the site were evaluated and are presented in Table 5-1.

ADEC requires consideration of both current and future exposure scenarios. Current site use consisting of temporary structures such as field trailers and Quonset huts are intermittently present onsite for military training purposes. Therefore, risks to human health for an hypothetical future commercial/industrial and residential (unrestricted use) exposure scenarios were evaluated and assume that the following pathways are potentially complete in the future:

- Inhalation of volatiles migrating from soil into indoor air (vapor intrusion)
- Ingestion of groundwater

5.2.2.1 DRO in Soil

No petroleum-related compounds remain in soil at SS041 at concentrations above the screening levels.

5.2.2.2 TCE in Soil

Existing data show that TCE contamination in the soil at SS041 is at depths greater than 15 feet bgs; therefore, the incidental ingestion and dermal contact pathway as well as outdoor air inhalation are considered incomplete for TCE contamination. Because no buildings are located within 100 feet of contaminated soil, the vapor intrusion pathway is considered currently incomplete.

Consistent with the *Vapor Intrusion Guidance for Contaminated Sites* (ADEC, 2012d), inhalation of volatiles migrating from soil into indoor air within future overlying buildings (vapor intrusion pathway) was analyzed by comparing screening level exceedances with ADEC Table B1 levels (Table 5-2). TCE was detected above its most conservative Table B1 cleanup level from one historical sample (AP-3604 from 15 to 16.5 feet bgs) and two 2014 samples (SS041-SB01 from 15 to 20 feet bgs, and SS041-SB02 from 15 to 20 feet bgs). VOCs detected in other locations are below 18 AAC 75 Table B1 cleanup levels.

5.2.2.3 PCBs in Soil

PCB-contaminated sludge and sediment remain onsite in the cesspool from approximately 0 to 5 feet bgs; however, the contaminated material is entombed in a concrete slurry mix and capped with 6 inches of concrete and rebar. Although concentrations of PCBs remain on the site at concentrations (1.5 mg/kg, 1.8 mg/kg, and 2.3 mg/kg) above the screening level within the cesspool, the selected remedy in the OU A and B ROD (Army, 1997) was NFA. Concentrations

of PCBs were not detected above screening levels in soil samples collected outside the cesspool at SS041. Therefore, PCBs do not pose a current risk to human health or the environment.

5.2.2.4 Groundwater

Groundwater is not currently used as a drinking water source and no site-related contaminants have been detected in groundwater above screening levels; therefore the ingestion of groundwater pathway is considered incomplete.

5.2.3 Site-Specific Risk Evaluation Summary

A summary of the human health risk evaluation results for source areas for SS041 is as follows:

- No petroleum-related compounds remain in soil at SS041 at concentrations above the screening levels. Therefore, fuel hydrocarbons do not pose a risk to human health or the environment.

- TCE was detected above 18 AAC 75.342(c) Table B1 Soil Cleanup Levels (Table 5-2) as follows:

    - Direct contact/ingestion and outdoor air inhalation pathways for TCE contamination are considered incomplete because TCE contamination in soil is deeper than 15 feet bgs. Therefore, contamination in soil does not pose a current or future risk to human health through the direct contact/ingestion and outdoor air inhalation exposure pathways.

    - The indoor air inhalation pathway is considered incomplete for TCE at the present time because no buildings are located within 100 feet of soil contamination.

    - Because TCE was detected above Table B1 Soil Cleanup Levels within 100 feet from the ground surface or potential future building foundation, the hypothetical future vapor intrusion exposure pathway is potentially complete. Risks from the future vapor intrusion exposure pathway have not been quantitatively evaluated.

    - TCE was detected in soil above the Table B1 Soil Cleanup Level for migration to groundwater, consistent with results from the 1996 RI. The RI Report concluded that migration to groundwater is not a pathway of concern at the site since no site-related contaminants were detected in groundwater at concentrations exceeding screening criteria.

- Although concentrations of PCBs remain on the site at concentrations above the screening level, the contaminated sediment has been mixed with cement and capped in the cesspool. Concentrations of PCBs were not detected above the screening level in soil samples collected outside the cesspool at SS041. Therefore, PCBs do not pose a current risk to human health or the environment.

- The groundwater ingestion exposure pathway is considered incomplete for current and future exposure pathways because no drinking water wells are onsite and no site-related contaminants have been detected in groundwater above screening levels (Ecology and Environment, 1996).

5.3 Ecological Risk Evaluation

In accordance with 18 AAC 75.325 (ADEC, 2012a) and ADEC's ecological risk guidance, the ecological risk at SS041 was evaluated based on the following available information:

- No visible staining of surface soils was observed at the site.
- No stunted vegetation was observed at the site.
- No significant surface water runoff or sediment transport from the site to surface water bodies exists. The nearest surface water body is Otter Lake, which is located approximately 1.5 miles west of the site.
- Contaminants in groundwater are not likely to cause a violation of the water quality standards in 18 AAC 70 for surface water or sediment. Groundwater at the site is not closely connected hydrologically to nearby surface water and does not discharge to surface water near the site.
- Petroleum hydrocarbon contamination in soil is less than 0.5 acre (considered insignificant).

ADEC's Ecoscoping form was completed to evaluate ecological risk at SS041, and is presented in Appendix C. Terrestrial and aquatic exposure routes were concluded not to be complete at SS041. No further evaluation of ecological risk is determined to be required.

6.0 CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions of this report based on the nature and extent of contamination and risk evaluation results, identifies data gaps and risks preventing site closure (if present), and provides recommendations for further actions with regard to soil and groundwater at the site, which may include further investigation or cleanup of the site.

6.1 Conclusions

The following conclusions were made regarding SS041:

- During previous investigations, DRO was detected in soil at concentrations above the project screening level within the leachfield. However, the concentration of DRO measured during the 2014 site characterization was below the project screening level in all borings. This indicates that DRO has attenuated to a concentration below the screening level. No petroleum-related compounds remain in soil at SS041 at concentrations above the screening levels. Therefore, fuel hydrocarbons do not pose a risk to human health or the environment.

- TCE was detected above 18 AAC 75.342(c) Table B1 Soil Cleanup Levels as follows:

    - Direct contact/ingestion and outdoor air inhalation pathways for TCE contamination are considered incomplete because TCE contamination in soil is deeper than 15 feet bgs. Therefore, contamination in soil does not pose a current or future risk to human health through the direct contact/ingestion and outdoor air inhalation exposure pathways.

    - The indoor air inhalation pathway is considered incomplete for TCE at the present time because no buildings are located within 100 feet of soil contamination.

    - Because TCE was detected above Table B1 Soil Cleanup Levels within 100 feet from the ground surface or potential future building foundation, the hypothetical future vapor intrusion exposure pathway is potentially complete. Risks from the future vapor intrusion exposure pathway have not been quantitatively evaluated.

    - TCE was detected in soil above the Table B1 Soil Cleanup Level for migration to groundwater, consistent with results from the 1996 RI. The RI Report concluded that migration to groundwater is not a pathway of concern at the site since no site-related contaminants were detected in groundwater at concentrations exceeding screening criteria.

- Although concentrations of PCBs remain on the site at concentrations above the screening level, the contaminated sediment has been mixed with cement and capped in the cesspool. Concentrations of PCBs were not detected above the screening levels in soil samples collected outside the cesspool at SS041. Therefore, PCBs do not pose a current risk to human health or the environment.

- The groundwater ingestion exposure pathway is considered incomplete for current and future exposure pathways because no drinking water wells are onsite and no site-related contaminants have been detected in groundwater above screening levels (Ecology and Environment, 1996).

- Ecological exposure pathways are considered incomplete, which demonstrates that ecological risk is not of concern (see the Ecoscoping form in Appendix C).

6.2 Recommendations

Based on the risk evaluation, the following are recommended for SS041:

- Remove groundwater LUCs.
- Revise soil LUC boundaries and develop LUC language.
- Continue annual LUC inspections and reporting.

7.0 REFERENCES

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Tables

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Table 2-1: SS041 Location Information

Latitude (NAD 83)	Longitude (NAD 83)	Date of Collection	Method of Collection	Reference Point for Which the Coordinates Were Established	Scale of Map Used to Acquire Coordinates	Estimated Accuracy and Associated Unit of Measure
61.290507	-149.683659	02/28/13	Esri ArcGIS conversion tool "Feature to Point" to select centroid of polygon site boundary on file.	Center of Site Boundary	Not applicable	Not applicable

Notes:

GIS = geographic information system
NAD = North American Datum

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Table 3-1: Soil Sample Summary

Location	Sample ID	Matrix	Sample Type	Depth (ft)	Collection Date	AK101	AK102/103	NW EPH	NW VPH	SW8082	BTEXN	SW8260C	SW8270D-SIM	ASTM D7263	ASTM D854	ASTM D422	Lloyd Kahn
SS041-SB01	14Q3SS041-SB0101-SO-0	Soil	N	5-10	18-Jul-14	X	X				X		X				
SS041-SB01	14Q3SS041-SB0102-SO-0	Soil	N	10-15	18-Jul-14	X	X	X	X		X		X				
SS041-SB01	14Q3SS041-SB0103-SO-0	Soil	N	15-20	18-Jul-14	X	X	X	X	X		X	X				
SS041-SB01	14Q3SS041-SB0103-SO-1	Soil	FD	15-20	18-Jul-14	X	X	X	X	X		X	X				
SS041-SB01	14Q3SS041-SB0103-SO-0MS	Soil	MS	15-20	18-Jul-14	X				X		X					
SS041-SB01	14Q3SS041-SB0103-SO-0SD	Soil	MSD	15-20	18-Jul-14	X				X		X					
SS041-SB01	14Q3SS041-SB0104-SO-0	Soil	N	20-25	18-Jul-14	X	X				X		X				
SS041-SB01	14Q3SS041-SB0105-SO-0	Soil	N	25-30	18-Jul-14	X	X				X		X				
SS041-SB02	14Q3SS041-SB0201-SO-0	Soil	N	5-10	18-Jul-14	X	X				X		X	X	X	X	
SS041-SB02	14Q3SS041-SB0202-SO-0	Soil	N	10-15	18-Jul-14	X	X				X		X				
SS041-SB02	14Q3SS041-SB0203-SO-0	Soil	N	15-20	18-Jul-14	X	X			X		X	X				
SS041-SB02	14Q3SS041-SB0204-SO-0	Soil	N	20-25	18-Jul-14	X	X				X		X				
SS041-SB02	14Q3SS041-SB0205-SO-0	Soil	N	25-30	18-Jul-14	X	X				X		X				X
SS041-SB02	14Q3SS041-SB0205-SO-1	Soil	FD	25-30	18-Jul-14												X

Notes:
N = primary sample
FD = field duplicate
MS/MSD = matrix spike/matrix spike duplicate
ft = feet

AK101 = gasoline-range organics
AK102/103 = diesel-/residual-range organics
BTEXN = benzene, toluene, ethylbenzene, toluene, and napthalene
NW EPH = extractable petroleum hydrocarbon speciation
NW VPH = volatile petroleum hydrocarbon speciation
SW8082 = polychlorinated biphenyls
SW8260C = volatile organic compounds
SW8270D-SIM = polynuclear aromatic hydrocarbons
Lloyd Kahn = total organic carbon
ASTM D422 = grain size
ASTM D7263 = bulk density
ASTM D854 = specific gravity

Table 4-1: SS041 Historical Soil Data

Sample Location	Year	Soil Sample Depth (ft bgs)	DRO (mg/kg)	PCBs (mg/kg)	TCE (mg/kg)
18 AAC 75 Migration to Groundwater Cleanup Level			*250*	*N/A*	*0.02*
18 AAC 75 Direct Contact Cleanup Level			*10,250*	*1*	*17*
ADEC Maximum Allowable			*12,500*	*N/A*	*N/A*
Cesspool	1995	0 to 5	ND (450)	**1.5**	--
Cesspool	1995	0 to 5	ND (450)	**1.8**	--
Cesspool	1995	0 to 5	ND (450)	**2.3**	--
AP-3598	1995	5 to 6.5	150	ND (0.08)	ND (0.00013)
AP-3598	1995	10 to 11.5	5	ND (0.08)	0.00900
AP-3598	1995	15 to 16.5	**470**	ND (0.08)	0.00098
AP-3598	1995	20 to 21.5	5	ND (0.08)	0.00510
AP-3598	1995	30 to 31.5	ND (3)	ND (0.08)	0.00291
AP-3598	1995	40 to 41.5	ND (3)	ND (0.08)	0.00500
AP-3598	1995	50 to 51.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3599	1995	5 to 6.5	14	ND (0.08)	ND (0.00013)
AP-3599	1995	10 to 11.5	41	ND (0.08)	ND (0.00013)
AP-3599	1995	15 to 16.5	19	ND (0.08)	ND (0.00013)
AP-3599	1995	20 to 21.5	5	ND (0.08)	ND (0.00013)
AP-3600	1995	5 to 6.5	7	ND (0.08)	ND (0.00013)
AP-3600	1995	10 to 11.5	7	ND (0.08)	0.00134
AP-3600	1995	15 to 16.5	ND (3)	ND (0.08)	0.00399
AP-3600	1995	20 to 21.5	ND (3)	ND (0.08)	0.00107
AP-3600	1995	30 to 31.5	ND (3)	ND (0.08)	0.00490
AP-3600	1995	40 to 41.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3600	1995	50 to 51.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3601	1995	5 to 6.5	11	ND (0.08)	ND (0.00013)
AP-3601	1995	10 to 11.5	26	ND (0.08)	ND (0.00013)
AP-3601	1995	15 to 16.5	10	ND (0.08)	0.00051
AP-3601	1995	20 to 21.5	ND (3)	ND (0.08)	0.00221
AP-3602	1995	5 to 6.5	117	ND (0.08)	ND (0.00013)
AP-3602	1995	10 to 11.5	71	ND (0.08)	0.00700
AP-3602	1995	15 to 16.5	15	ND (0.08)	0.00700
AP-3602	1995	20 to 21.5	ND (3)	ND (0.08)	0.00081
AP-3602	1995	30 to 31.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3602	1995	40 to 41.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3602	1995	50 to 51.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3603	1995	5 to 6.5	32	ND (0.08)	0.00061
AP-3603	1995	10 to 11.5	5	ND (0.08)	0.00112
AP-3603	1995	15 to 16.5	244	ND (0.08)	0.00800
AP-3603	1995	20 to 21.5	ND (3)	ND (0.08)	0.00309
AP-3603	1995	30 to 31.5	ND (3)	ND (0.08)	0.00419
AP-3603	1995	40 to 41.5	ND (3)	ND (0.08)	0.00267
AP-3603	1995	50 to 51.5	ND (3)	ND (0.08)	0.00069
AP-3604	1995	5 to 6.5	16	ND (0.08)	0.00111
AP-3604	1995	10 to 11.5	5	ND (0.08)	0.00900
AP-3604	1995	15 to 16.5	7	ND (0.08)	**0.022**
AP-3604	1995	20 to 21.5	ND (3)	ND (0.08)	0.010
AP-3604	1995	30 to 31.5	ND (3)	ND (0.08)	0.00014
AP-3604	1995	40 to 41.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3604	1995	50 to 51.5	5	ND (0.08)	ND (0.00013)

Table 4-1: SS041 Historical Soil Data

Sample Location	Year	Soil Sample Depth (ft bgs)	DRO (mg/kg)	PCBs (mg/kg)	TCE (mg/kg)
AP-3605	1995	5 to 6.5	29	ND (0.08)	ND (0.00013)
AP-3605	1995	10 to 11.5	30	ND (0.08)	0.00036
AP-3605	1995	15 to 16.5	7	ND (0.08)	0.00224
AP-3605	1995	20 to 21.5	9	ND (0.08)	ND (0.00013)
AP-3605	1995	30 to 31.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3605	1995	40 to 41.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3605	1995	50 to 51.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3606	1995	5 to 6.5	5	ND (0.08)	ND (0.00013)
AP-3606	1995	10 to 11.5	5	ND (0.08)	ND (0.00013)
AP-3606	1995	15 to 16.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3606	1995	20 to 21.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3607	1995	5 to 6.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3607	1995	10 to 11.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3607	1995	15 to 16.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3607	1995	20 to 21.5	ND (3)	ND (0.08)	0.00062
AP-3607	1995	30 to 31.5	ND (3)	ND (0.08)	0.00064
AP-3607	1995	40 to 41.5	ND (3)	ND (0.08)	0.00019
AP-3607	1995	50 to 51.5	ND (3)	ND (0.08)	0.00033
AP-3608	1995	5 to 6.5	22	ND (0.08)	ND (0.00013)
AP-3608	1995	10 to 11.5	4	ND (0.08)	ND (0.00013)
AP-3608	1995	15 to 16.5	7	ND (0.08)	ND (0.00013)
AP-3608	1995	20 to 21.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3608	1995	30 to 31.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3608	1995	40 to 41.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3608	1995	50 to 51.5	4	ND (0.08)	ND (0.00013)
AP-3609	1995	5 to 6.5	5	ND (0.08)	ND (0.00013)
AP-3609	1995	10 to 11.5	3	ND (0.08)	ND (0.00013)
AP-3609	1995	15 to 16.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3609	1995	20 to 21.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3609	1995	30 to 31.5	5	ND (0.08)	ND (0.00013)
AP-3609	1995	40 to 41.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3609	1995	50 to 51.5	4	ND (0.08)	ND (0.00013)
AP-3610	1995	5 to 6.5	15	0.04	ND (0.00013)
AP-3610	1995	10 to 11.5	6	ND (0.08)	ND (0.00013)
AP-3610	1995	15 to 16.5	9	ND (0.08)	ND (0.00013)
AP-3610	1995	20 to 21.5	77	ND (0.08)	0.00038 UJ
AP-3611	1995	5 to 6.5	19	ND (0.08)	ND (0.00013)
AP-3611	1995	10 to 11.5	3	ND (0.08)	0.00410
AP-3611	1995	15 to 16.5	ND (3)	ND (0.08)	0.01700
AP-3611	1995	20 to 21.5	ND (3)	ND (0.08)	0.00413
AP-3612	1995	5 to 6.5	7	ND (0.08)	ND (0.00013)
AP-3612	1995	10 to 11.5	16	ND (0.08)	ND (0.00013)
AP-3612	1995	15 to 16.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3612	1995	20 to 21.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3612	1995	30 to 31.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3612	1995	40 to 41.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3612	1995	50 to 51.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3613	1995	5 to 6.5	26	0.05	ND (0.00013)
AP-3613	1995	10 to 11.5	10	ND (0.08)	ND (0.00013)

Table 4-1: SS041 Historical Soil Data

Sample Location	Year	Soil Sample Depth (ft bgs)	DRO (mg/kg)	PCBs (mg/kg)	TCE (mg/kg)
AP-3613	1995	15 to 16.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3613	1995	20 to 21.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3613	1995	30 to 31.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3613	1995	40 to 41.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3613	1995	50 to 51.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3614	1995	5 to 6.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3614	1995	10 to 11.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3614	1995	15 to 16.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3614	1995	20 to 21.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3614	1995	30 to 31.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3614	1995	40 to 40.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3615	1995	5 to 6.5	6	ND (0.08)	ND (0.00013)
AP-3615	1995	10 to 11.5	20	ND (0.08)	ND (0.00013)
AP-3615	1995	15 to 16.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3615	1995	20 to 21.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3615	1995	30 to 31.5	ND (3)	ND (0.08)	0.00013 UJ
AP-3615	1995	40 to 41.5	ND (3)	ND (0.08)	0.00013 UJ
AP-3615	1995	50 to 51.5	ND (3)	ND (0.08)	0.00013 UJ
AP-3616	1995	5 to 6.5	51	ND (0.08)	ND (0.00013)
AP-3616	1995	10 to 11.5	11	ND (0.08)	ND (0.00013)
AP-3616	1995	15 to 16.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3616	1995	20 to 21.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3616	1995	30 to 31.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3616	1995	40 to 41.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3616	1995	50 to 51.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3617	1995	5 to 6.5	28	0.2	ND (0.00013)
AP-3617	1995	10 to 11.5	ND (3)	ND (0.08)	ND (0.00013)
AP-3617	1995	15 to 16.5	7	ND (0.08)	ND (0.00013)
AP-3617	1995	20 to 21.5	25	ND (0.08)	ND (0.00013)
AP-3658	1995	60 to 61.5	23	ND (0.08)	ND (0.00031)
AP-3658	1995	80 to 81.5	6.6	ND (0.08)	ND (0.00031)
AP-3658	1995	90 to 91.5	4.7	ND (0.08)	ND (0.00031)
AP-3659	1995	60 to 61.5	NA	ND (0.08)	ND (0.0389)
AP-3659	1996	70 to 71.5	31	ND (0.08)	ND (0.0003)
AP-3659	1995	80 to 81.5	21	ND (0.08)	ND (0.0003)
AP-3659	1995	90 to 91.5	4.7	ND (0.08)	ND (0.00031)

This table only presents historical data for analytes that were detected at concentrations above SLs.

Flags are not included in this table; however all laboratory-assigned flagging is available in the data packages fro

Data Source: Ecology and Environment, 1996

Notes:

-- = analyte not analyzed

mg/kg = milligram(s) per kilogram

N/A = cleanup criteria does not apply to particular analyte

Bold = detection

Bold/Shading = concentration detected above ADEC's Method Two Migration-to-Groundwater Cleanup Level

Bold/Shading = concentration detected above ADEC's Method Two Direct Contact Cleanup Level

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Table 4-2: Summary of Soil Analytical Results

Analyte	Screening Level	Screening Level Source	Location:	SS041-SB01						SS041-SB02					
			Sample ID:	*14Q3SS041-SB0101-SO-0*	*14Q3SS041-SB0102-SO-0*	*14Q3SS041-SB0103-SO-0*	*14Q3SS041-SB0103-SO-1*	*14Q3SS041-SB0104-SO-0*	*14Q3SS041-SB0105-SO-0*	*14Q3SS041-SB0201-SO-0*	*14Q3SS041-SB0202-SO-0*	*14Q3SS041-SB0203-SO-0*	*14Q3SS041-SB0204-SO-0*	*14Q3SS041-SB0205-SO-0*	*14Q3SS041-SB0205-SO-1*
			Sample Depth (feet):	*5 to 10*	*10 to 15*	*15 to 20*	*15 to 20*	*20 to 25*	*25 to 30*	*5 to 10*	*10 to 15*	*15 to 20*	*20 to 25*	*25 to 30*	*25 to 30*
			Sample Date:	*7/18/2014*	*7/18/2014*	*7/18/2014*	*7/18/2014*	*7/18/2014*	*7/18/2014*	*7/18/2014*	*7/18/2014*	*7/18/2014*	*7/18/2014*	*7/18/2014*	*7/18/2014*
				N	*N*	*N*	*FD*	*N*	*N*	*N*	*N*	*N*	*N*	*N*	*FD*
Hydrocarbons (mg/kg)															
C10-C12 Aliphatic	NA	NA		--	0.093 U	0.11 U	0.11 U	--	--	--	--	--	--	--	--
C10-C12 Aromatic	NA	NA		--	**0.13 B**	**0.47 B**	**2.7 J**	--	--	--	--	--	--	--	--
C12-C16 Aliphatic	NA	NA		--	1 U	1.2 U	1.1 U	--	--	--	--	--	--	--	--
C12-C16 Aromatic	NA	NA		--	1 U	1.2 U	1.1 U	--	--	--	--	--	--	--	--
C16-C21 Aliphatic	NA	NA		--	1 U	1.2 U	1.1 U	--	--	--	--	--	--	--	--
C16-C21 Aromatic	NA	NA		--	1 U	1.2 U	1.1 U	--	--	--	--	--	--	--	--
C21-C34 Aliphatic	NA	NA		--	**3.1 J**	**1.3 J**	**1.3 J**	--	--	--	--	--	--	--	--
C21-C34 Aromatic	NA	NA		--	**1.7 J**	1.2 U	1.1 U	--	--	--	--	--	--	--	--
C5-C6 Aliphatic	NA	NA		--	**0.39 B**	**0.54 B**	0.16 UJ	--	--	--	--	--	--	--	--
C6-C8 Aliphatic	NA	NA		--	0.093 U	0.11 U	0.16 U	--	--	--	--	--	--	--	--
C8-C10 Aliphatic	NA	NA		--	0.093 U	0.11 U	0.16 U	--	--	--	--	--	--	--	--
C8-C10 Aromatic	NA	NA		--	**0.13 B**	**0.6 B**	**3.3 J**	--	--	--	--	--	--	--	--
Total volatile petroleum hydrocarbons	NA	NA		--	**0.84 B**	**2.1 B**	**5.8 B**	--	--	--	--	--	--	--	--
DRO	250	B		8.39 U	**4.81 J**	**5.36 J**	**5.02 J**	8.17 U	8.98 U	8.58 U	**4.22 J**	8.97 U	8.08 U	8.47 U	--
GRO	300	B		**0.265 B**	**0.774 B**	**0.487 B**	**0.562 B**	**0.325 B**	**0.453 B**	**0.38 B**	**0.498 B**	**0.536 B**	**0.354 B**	**0.408 B**	--
RRO	10,000	A		**8.4 J**	**9.08 J**	**11.1 J**	**11.1 J**	8.12 U	8.93 U	**5.8 J**	**13.5**	8.92 U	8.03 U	8.43 U	--
PCBs (mg/kg)															
Aroclor 1016	0.1	C		--	--	0.0244 U	0.0245 U	--	--	--	--	0.0223 U	--	--	--
Aroclor 1221	0.1	C		--	--	0.0244 U	0.0245 U	--	--	--	--	0.0223 U	--	--	--
Aroclor 1232	0.1	C		--	--	0.00152 U	0.00153 U	--	--	--	--	0.00139 U	--	--	--
Aroclor 1242	0.1	C		--	--	0.00366 U	0.00368 U	--	--	--	--	0.00334 U	--	--	--
Aroclor 1248	0.1	C		--	--	0.00366 U	0.00368 U	--	--	--	--	0.00334 U	--	--	--
Aroclor 1254	0.1	C		--	--	0.00366 U	0.00368 U	--	--	--	--	0.00334 U	--	--	--
Aroclor 1260	0.1	C		--	--	0.0122 U	0.0123 U	--	--	--	--	0.0111 U	--	--	--
PAHs (mg/kg)															
1-Methylnaphthalene	6.2	E		**0.000238 J**	**0.000399 J**	**0.00136**	**0.000955 J**	**0.000262 J**	0.000432 U	**0.000337 J**	**0.000244 J**	**0.000218 J**	0.000398 U	0.000414 U	--
2-Methylnaphthalene	6.1	E		**0.000441 J**	**0.000667 J**	**0.00334**	**0.00266**	**0.000642 J**	**0.000379 J**	**0.000589 J**	**0.000432 J**	**0.00038 J**	**0.000214 J**	**0.000239 J**	--
Acenaphthene	180	E		0.000418 U	**0.000543 J**	0.000469 U	0.000494 U	0.000396 U	0.000432 U	0.000419 U	0.000432 U	0.00046 U	0.000398 U	0.000414 U	--
Acenaphthylene	180	E		0.000418 U	0.000418 U	0.000469 U	0.000494 U	0.000396 U	0.000432 U	0.000419 U	0.000432 U	0.00046 U	0.000398 U	0.000414 U	--
Anthracene	2,060	C		0.000992 U	**0.00155**	0.00111 U	0.00117 U	0.000939 U	0.00103 U	0.000994 U	0.00103 U	0.00109 U	0.000946 U	0.000984 U	--
Benzo(a)anthracene	0.49	C		0.000418 U	**0.00449**	**0.000198 J**	0.000494 U	0.000396 U	0.000432 U	**0.000483 J**	0.000432 U	0.00046 U	0.000398 U	0.000414 U	--
Benzo(a)pyrene	0.049	C		0.000522 U	**0.00351**	0.000587 U	0.000618 U	0.000494 U	0.00054 U	**0.000523 J**	0.00054 U	0.000575 U	0.000498 U	0.000518 U	--
Benzo(b)fluoranthene	0.49	C		0.000992 U	**0.00257**	0.00111 U	0.00117 U	0.000939 U	0.00103 U	**0.000534 J**	0.00103 U	0.00109 U	0.000946 U	0.000984 U	--
Benzo(g,h,i)perylene	140	C		0.000992 U	**0.00191**	0.00111 U	0.00117 U	0.000939 U	0.00103 U	**0.000499 J**	0.00103 U	0.00109 U	0.000946 U	0.000984 U	--
Benzo(k)fluoranthene	4.9	C		0.000992 U	**0.000849 J**	0.00111 U	0.00117 U	0.000939 U	0.00103 U	0.000994 U	0.00103 U	0.00109 U	0.000946 U	0.000984 U	--
Chrysene	49	C		0.000992 U	**0.00486**	**0.000782 J**	**0.000595 J**	0.000939 U	0.00103 U	**0.000421 J**	0.00103 U	0.00109 U	0.000946 U	0.000984 U	--
Dibenz(a,h)anthracene	0.049	C		0.000992 U	0.000992 U	0.00111 U	0.00117 U	0.000939 U	0.00103 U	0.000994 U	0.00103 U	0.00109 U	0.000946 U	0.000984 U	--
Fluoranthene	190	C		**0.000425 B**	**0.00686**	**0.000742 B**	**0.00058 B**	**0.000394 B**	**0.000244 B**	**0.000789 B**	**0.000521 B**	0.00046 U	0.000398 U	0.000414 U	--
Fluorene	220	E		0.000418 U	**0.000449 J**	**0.000346 J**	0.000494 U	0.000396 U	0.000432 U	0.000419 U	0.000432 U	0.00046 U	0.000398 U	0.000414 U	--
Indeno(1,2,3-cd)pyrene	0.49	C		0.000992 U	**0.00119**	0.00111 U	0.00117 U	0.000939 U	0.00103 U	0.000994 U	0.00103 U	0.00109 U	0.000946 U	0.000984 U	--
Phenanthrene	2,060	C		**0.00042 J**	**0.00773**	**0.00545**	**0.00471**	0.000396 U	**0.000268 J**	**0.000448 J**	**0.000515 J**	0.00046 U	0.000398 U	**0.000248 J**	--
Pyrene	140	C		**0.000368 J**	**0.012**	**0.000605 J**	**0.000367 J**	**0.000244 J**	0.000324 U	**0.000678 J**	**0.000588 J**	0.000345 U	**0.000164 J**	0.000311 U	--

Table 4-2: Summary of Soil Analytical Results

Analyte	Location:		SS041-SB01						SS041-SB02					
	Sample ID:		14Q3SS041-SB0101-SO-0	14Q3SS041-SB0102-SO-0	14Q3SS041-SB0103-SO-0	14Q3SS041-SB0103-SO-1	14Q3SS041-SB0104-SO-0	14Q3SS041-SB0105-SO-0	14Q3SS041-SB0201-SO-0	14Q3SS041-SB0202-SO-0	14Q3SS041-SB0203-SO-0	14Q3SS041-SB0204-SO-0	14Q3SS041-SB0205-SO-0	14Q3SS041-SB0205-SO-1
	Sample Depth (feet):		5 to 10	10 to 15	15 to 20	15 to 20	20 to 25	25 to 30	5 to 10	10 to 15	15 to 20	20 to 25	25 to 30	25 to 30
	Sample Date:		7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014
	Screening Level	Screening Level Source	N	N	N	FD	N	N	N	N	N	N	N	FD
VOCs (mg/kg)														
1,1,1,2-Tetrachloroethane	0.00019	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,1,1-Trichloroethane	0.82	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,1,2,2-Tetrachloroethane	0.017	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,1,2-Trichloroethane	0.018	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,1,2-Trichlorotrifluoroethane	75	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,1-Dichloroethane	25	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,1-Dichloroethene	0.03	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,1-Dichloropropene	--	NA	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,2,3-Trichlorobenzene	0.015	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,2,3-Trichloropropane	0.00053	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,2,4-Trichlorobenzene	0.85	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,2,4-Trimethylbenzene	4.9	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,2-Dibromo-3-chloropropane	0.00000014	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,2-Dichlorobenzene	4.5	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,2-Dichloroethane	0.016	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,2-Dichloropropane	0.018	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,3,5-Trimethylbenzene	4.2	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,3-Butadiene	0.0000086	F	--	--	0.0219 UJ	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,3-Dichlorobenzene	6.9	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,3-Dichloropropane	0.099	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
1,4-Dichlorobenzene	0.64	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
2,2-Dichloropropane	--	NA	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
2-Butanone (nethyl ethyl ketone)	59	E	--	--	0.248 U	0.252 U	--	--	--	--	0.252 U	--	--	--
2-Chlorotoluene	0.17	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
2-Hexanone	0.0079	F	--	--	0.073 U	0.0742 U	--	--	--	--	0.0743 U	--	--	--
4-Chlorotoluene	0.81	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
4-Methyl-2-pentanone (methyl isobutyl ketone)	8.1	E	--	--	0.073 U	0.0742 U	--	--	--	--	0.0743 U	--	--	--
Acetone	88	E	--	--	0.073 U	0.0742 U	--	--	--	--	0.0743 U	--	--	--
Benzene	0.025	E	0.0131 U	0.0243 U	0.0219 U	0.0223 U	0.0118 U	0.0216 U	0.0174 U	0.0218 U	0.0223 U	0.015 U	0.0176 U	--
Bromobenzene	0.036	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Bromochloromethane	0.021	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Bromodichloromethane	0.044	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Bromoform	0.34	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Bromomethane	0.16	E	--	--	0.0365 U	0.0371 U	--	--	--	--	0.0371 U	--	--	--
Carbon disulfide	12	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Carbon tetrachloride	0.023	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Chlorobenzene	0.63	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Chloroethane	2.3	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Chloroform	0.32	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Chloromethane	0.21	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
cis-1,2-Dichloroethene	0.24	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
cis-1,3-Dichloropropene	0.033	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Cyclohexane	13	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Dibromochloromethane	0.032	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Dibromomethane	1.1	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Dichlorodifluoromethane	38	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--

Table 4-2: Summary of Soil Analytical Results

Analyte	Screening Level	Screening Level Source	SS041-SB01						SS041-SB02					
Sample ID:			14Q3SS041-SB0101-SO-0	14Q3SS041-SB0102-SO-0	14Q3SS041-SB0103-SO-0	14Q3SS041-SB0103-SO-1	14Q3SS041-SB0104-SO-0	14Q3SS041-SB0105-SO-0	14Q3SS041-SB0201-SO-0	14Q3SS041-SB0202-SO-0	14Q3SS041-SB0203-SO-0	14Q3SS041-SB0204-SO-0	14Q3SS041-SB0205-SO-0	14Q3SS041-SB0205-SO-1
Sample Depth (feet):			5 to 10	10 to 15	15 to 20	15 to 20	20 to 25	25 to 30	5 to 10	10 to 15	15 to 20	20 to 25	25 to 30	25 to 30
Sample Date:			7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014
			N	N	N	FD	N	N	N	N	N	N	N	FD
Ethylbenzene	6.9	E	0.0131 U	0.0243 U	0.0219 U	0.0223 U	0.0118 U	0.0216 U	0.0174 U	0.0218 U	0.0223 U	0.015 U	0.0176 U	--
Ethylene dibromide	0.00016	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Hexachlorobutadiene	0.12	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Isopropylbenzene	6.2	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
m, p-Xylene	6.3	D	0.0261 U	0.0486 U	0.0438 U	0.0445 U	0.0236 U	0.0431 U	0.0347 U	0.0437 U	0.0446 U	0.0299 U	0.0351 U	--
Methyl tert-butyl ether	1.3	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Methylene chloride	0.016	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
n-Butylbenzene	4.2	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
n-Hexane	1.8	F	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
n-Propylbenzene	4.2	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Naphthalene	2.8	D	**0.00241**	**0.00224**	**0.00619**	**0.00651**	**0.00629**	**0.00252**	**0.00229**	**0.00245**	**0.00244**	**0.00188**	**0.00107 B**	--
o-Xylene	6.3	D	0.0131 U	0.0243 U	0.0219 U	0.0223 U	0.0118 U	0.0216 U	0.0174 U	0.0218 U	0.0223 U	0.015 U	0.0176 U	--
p-Isopropyltoluene	--	NA	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
sec-Butylbenzene	4.1	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Styrene	0.96	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
tert-Butylbenzene	7	D	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Tetrachloroethene	0.024	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Toluene	6.5	E	0.0131 U	0.0243 U	0.0219 U	0.0223 U	0.0118 U	0.0216 U	0.0174 U	0.0218 U	0.0223 U	0.015 U	0.0176 U	--
Total Xylenes	6.3	D	0.0327 U	0.0608 U	0.0548 U	0.0556 U	0.0295 U	0.0539 U	0.0434 U	0.0546 U	0.0557 U	0.0374 U	0.0439 U	--
trans-1,2-Dichloroethene	0.37	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
trans-1,3-Dichloropropene	0.033	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Trichloroethene	0.02	E	--	--	**0.0803**	**0.108**	--	--	--	--	**0.0737**	--	--	--
Trichlorofluoromethane	86	E	--	--	0.0219 U	0.0223 U	--	--	--	--	0.0223 U	--	--	--
Vinyl acetate	110	E	--	--	0.0365 U	0.0371 U	--	--	--	--	0.0371 U	--	--	--
Vinyl chloride	0.0085	E	--	--	0.0219 UJ	0.0223 U	--	--	--	--	0.0223 U	--	--	--
General Chemistry (mg/kg)														
Total organic carbon	NA	NA	--	--	--	--	--	--	--	--	--	--	**89.3 J**	**278 J**

Notes:

-- = not analyzed
B = The analyte was detected in the associated method and/or calibration blank.
DRO = diesel-range organics
FD = field duplicate
GRO = gasoline-range organics
J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.
mg/kg = milligram(s) per kilogram
N = primary sample
NA = no screening level exists
PCB = polychlorinated biphenyl
RRO = residual-range organics
VOC = volatile organic compound
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was below the reported sample quantitation limit; however, the reported value is approximate.

Bold indicates that the analyte was detected.
Shading indicates the result exceeded screening criteria.

Screening Level Sources:

A = 2012 ADEC Table B2 Method Two Soil Cleanup Level (under 40 inches) – Ingestion
B = 2012 ADEC Table B2 Method Two Soil Cleanup Level (under 40 inches) – Migration to Groundwater
C = 1/10th 2012 ADEC Table B1 Method Two Soil Cleanup Level (under 40 inches) – Direct Contact
D = 1/10th 2012 ADEC Table B1 Method Two Soil Cleanup Level (under 40 inches) – Outdoor Inhalation
E = 2012 ADEC Table B1 Method Two Soil Cleanup Level (under 40 inches) – Migration to Groundwater
F = 2013 EPA Soil Regional Screening Limits – Protection of Groundwater Risk-Based

Table 4-3: Geotechnical Summary

Location	Sample ID (Date)	Depth (feet bgs)	USCS Classification	Grain Size Distribution (Percentage)			Bulk Density (pcf)		Specific Gravity	Natural Moisture Content (Percent)
				Gravel	Sand	Silt/Clay	Wet	Dry		
SS041-SB02	14Q3SS041-SB0201-SO-0	5 to 10	GW-GM	54.6	37.3	8.1	NT	130.2	2.673	3.5

Notes:
bgs = below ground surface
ft = feet
GW-GM = well-graded gravel with silt and sand
NT = not tested
pcf = pound(s) per cubic foot
USCS = Unified Soil Classification System

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Table 4-4: Level of Detections above Screening Levels

Location	Sample ID	Method	Analyte	Result (mg/kg)	Result Flag	Screening Level (mg/kg)	Screening Level Source	Reason
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	1,1,1,2-Tetrachloroethane	0.0219	U	0.00019	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	1,1,2,2-Tetrachloroethane	0.0219	U	0.017	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	1,1,2-Trichloroethane	0.0219	U	0.018	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	1,2,3-Trichlorobenzene	0.0219	U	0.015	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	1,2,3-Trichloropropane	0.0219	U	0.00053	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	1,2-Dibromo-3-Chloropropane	0.0219	U	0.00000014	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	1,2-Dichloroethane	0.0219	U	0.016	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	1,2-Dichloropropane	0.0219	U	0.018	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	2-Hexanone	0.073	U	0.0079	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	Bromochloromethane	0.0219	U	0.021	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	Ethylene Dibromide (EDB)	0.0219	U	0.00016	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-0	SW8260C	Methylene Chloride	0.0219	U	0.016	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB01	14Q3SS041-SB0103-SO-1	SW8260C	1,3-Butadiene	0.0223	U	0.0000086	2012 EPA Protection of Groundwater Risk-Based RSL	Analyte not in the Basewide QAPP (USAF, 2013); SL not achievable by SW8260C in methanol
SS041-SB01	14Q3SS041-SB0103-SO-1	SW8260C	Vinyl Chloride	0.0223	U	0.0085	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	1,1,1,2-Tetrachloroethane	0.0223	U	0.00019	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	1,1,2,2-Tetrachloroethane	0.0223	U	0.017	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	1,1,2-Trichloroethane	0.0223	U	0.018	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	1,2,3-Trichlorobenzene	0.0223	U	0.015	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	1,2,3-Trichloropropane	0.0223	U	0.00053	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	1,2-Dibromo-3-Chloropropane	0.0223	U	0.00000014	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	1,2-Dichloroethane	0.0223	U	0.016	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	1,2-Dichloropropane	0.0223	U	0.018	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	1,3-Butadiene	0.0223	U	0.0000086	2012 EPA Protection of Groundwater Risk-Based RSL	Analyte not in the Basewide QAPP (USAF, 2013); SL not achievable by SW8260C in methanol
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	2-Hexanone	0.0743	U	0.0079	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	Bromochloromethane	0.0223	U	0.021	2012 EPA Protection of Groundwater Risk-Based RSL	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	Ethylene Dibromide (EDB)	0.0223	U	0.00016	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	Methylene Chloride	0.0223	U	0.016	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)
SS041-SB02	14Q3SS041-SB0203-SO-0	SW8260C	Vinyl Chloride	0.0223	U	0.0085	2012 ADEC Table B1 Method 2-Migration to Groundwater	SL not achievable by SW8260C in methanol as noted in Basewide QAPP (USAF, 2013)

Notes:
ADEC = Alaska Deparatment of Environmental Conservation
EPA = United States Environmental Protection Agency
mg/kg = milligram(s) per kilogram
QAPP = Quality Assurance Project Plan
RSL = regional screening limit
SL = screening level
U = The analyte was analyzed for, but was not detected, above the reported sample method detection limit. Result is reported as nondetect at the limit of detection.

Table 5-1: Exposure Pathway Evaluation

Pathway	Result*	Explanation
Soil contact	Pathway incomplete	There is no contamination in the soil at concentrations above project screening levels at depths from 0 to 15 feet bgs. Because the soil contact pathway is applicable for soil from 0 to 15 feet bgs, this pathway is considered incomplete for current commercial/industrial and future residential land use scenarios.
Inhalation – outdoor air	Pathway incomplete	Volatile contaminants, including DRO and GRO, were not detected in soil from 0 to 15 feet bgs at concentrations above project screening levels. Because the outdoor inhalation pathway is applicable for soil from 0 to 15 feet bgs, this pathway is considered incomplete for current commercial/industrial and future residential land use scenarios.
Inhalation – indoor air (vapor intrusion)	Pathway potentially complete	This pathway is considered incomplete for a current commercial/industrial land use scenario because there are no buildings within 30 feet of the contamination. Because buildings could be constructed in the future and VOC contamination is above 18 AAC 75 Table B1 levels, this pathway is considered potentially complete for future land use scenarios.
Groundwater ingestion	Pathway potentially complete	Ship Creek serves as the main source of drinking water for JBER-R. There is no complete groundwater to surface water pathway. Although there is no current use of groundwater as a drinking water source and the nearest drinking water well is 2 miles from the site, groundwater could be used as a future drinking water source. This pathway is considered potentially complete for a future residential land use scenario.
Surface water ingestion	Pathway incomplete	The nearest surface water body is Otter Lake, approximately 1.5 miles west of the site. There are no exposed, eroding soils at the site. Sheet flow typically does not come into contact or phase equilibrium with subsurface soil contaminants. Petroleum hydrocarbons tend to be biodegraded relatively close to the source area.
Wild foods ingestion	Insignificant exposure	SS041 is not used for hunting, fishing, or harvesting of wild or farmed foods, and such activities are not anticipated in the future.
Exposure to ecological receptors	Pathway incomplete	There is no contamination in the soil at concentrations above project screening levels at depths from 0 to 15 feet bgs; therefore, the pathway is considered incomplete.

*Results:

"Insignificant exposure" means the pathway is complete; however, receptors are unlikely to be affected by the minimal volume or concentration of remaining contamination.

"Pathway incomplete" means contamination has no potential to contact receptors.

"Pathway potentially complete" means contamination has the potential to contact receptors; however, controls are in place to prevent contact.

Notes:

AAC = *Alaska Administrative Code*

bgs = below ground surface

DRO = diesel-range organics

GRO = gasoline-range organics

JBER-R = Joint Base Elmendorf-Richardson (JBER)-Richardson

VOC = volatile organic compound

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Table 5-2: Summary of Chemicals Above ADEC Table B1 Method Two Cleanup Levels in Soil

Analyte	Most Conservative ADEC Table B1 Method Two Soil Cleanup Level (mg/kg)	Cleanup Level Source	Source Area Maximum Concentration (mg/kg)
VOCs (mg/kg)			
TCE	0.02	E	**0.108**
PCBs (mg/kg)	1	E	**2.3**

Notes:

NA = Not applicable; no screening level exists for this analyte.

U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.

ADEC = Alaska Department of Environmental Conservation

mg/kg = milligram(s) per kilogram

PCB = polychlorinated biphenyl

TCE = trichloroethene

VOC = volatile organic compound

Bold indicates that the analyte was detected

Shading indicates thatthe result exceeded the most conservative Table B1 cleanup level

Cleanup Level Source:

E = 2012 ADEC Table B1 Method 2 Soil Cleanup Level (Under 40 in) - Migration to Groundwater

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Figures

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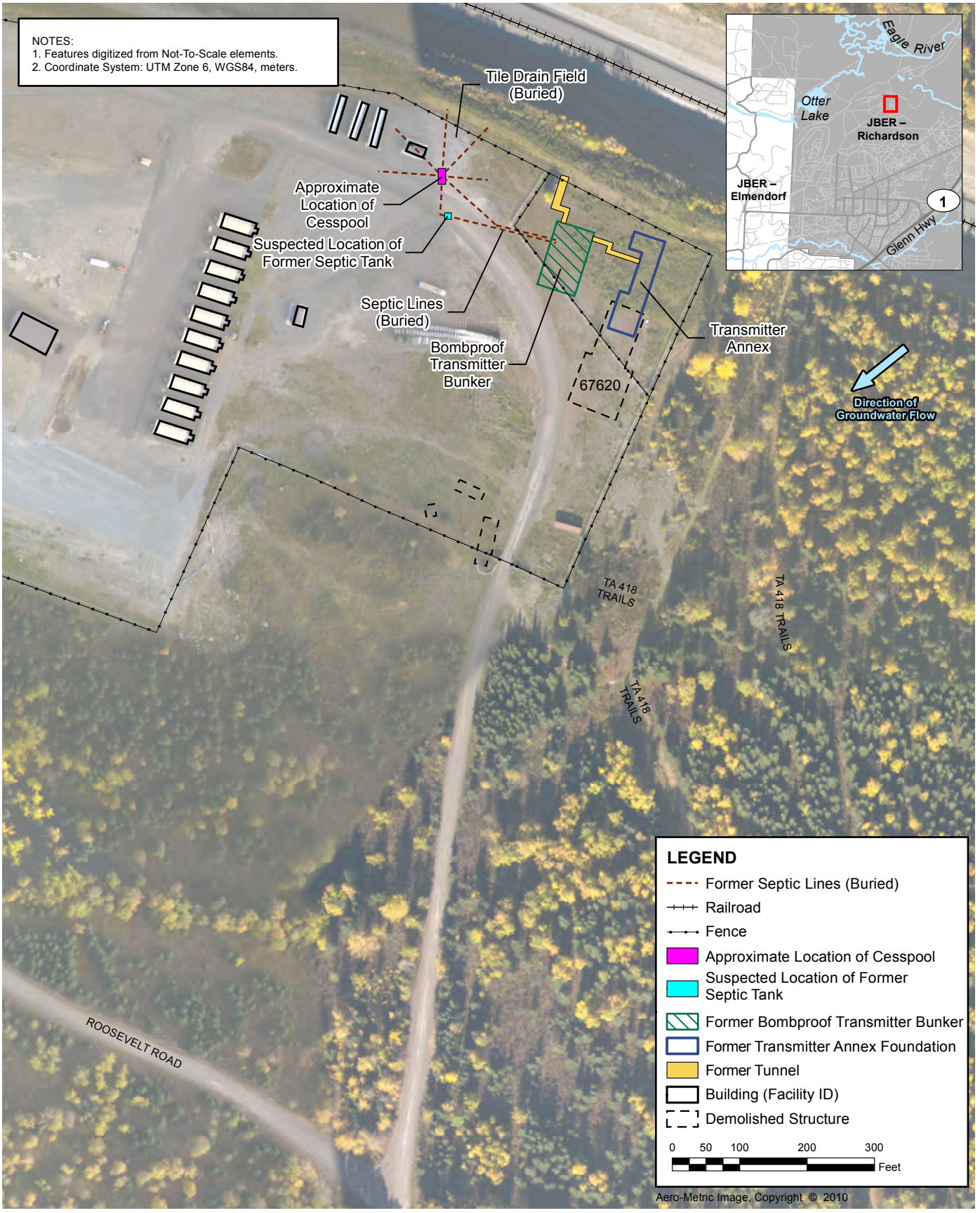

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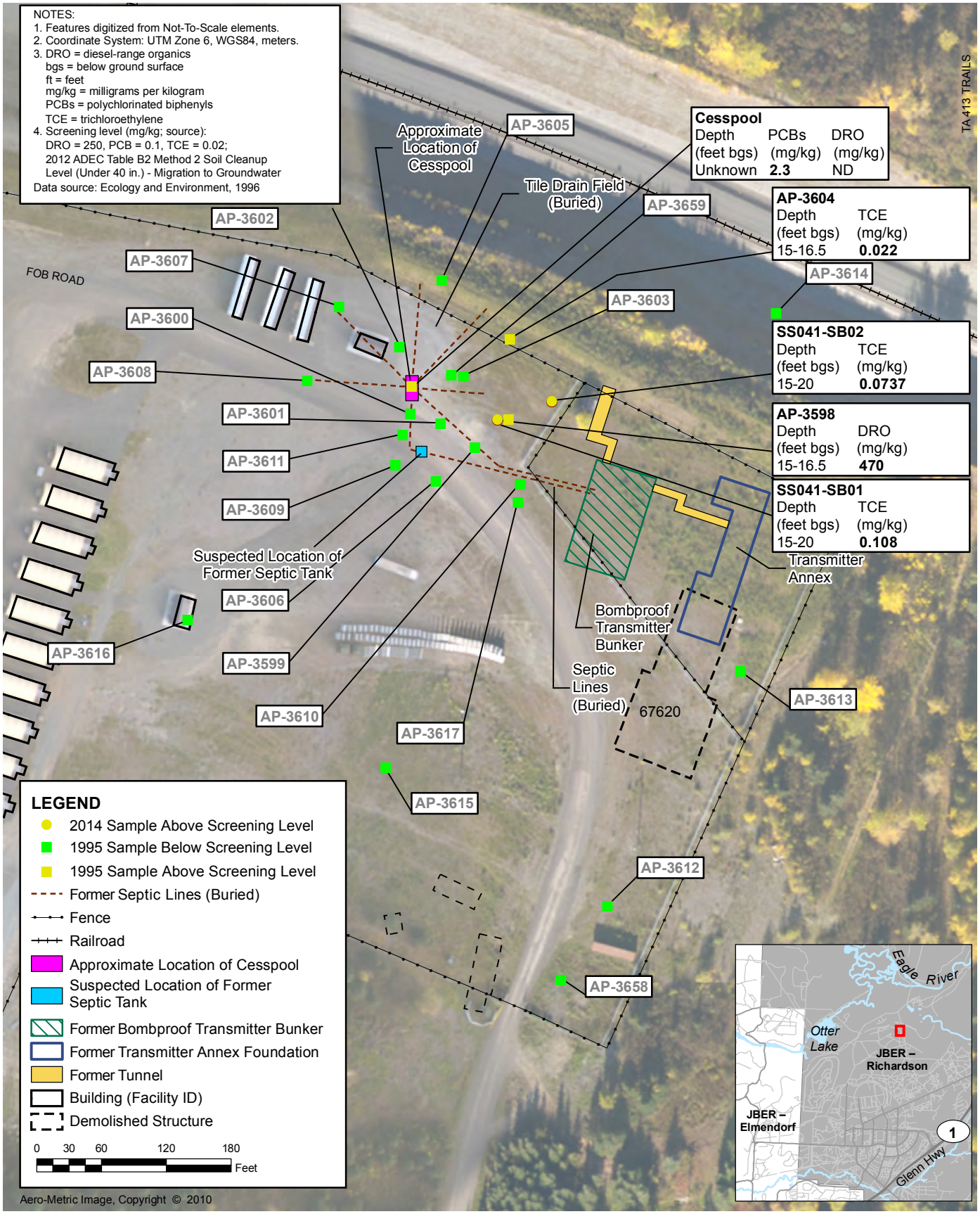
Date: 06 Mar 2014 Drawn by: srudolph R:\AFCEE_JBER_20001102\MapFiles\WorkPlanning\SS041\Figure_1_SS041_SiteLocation.mxd

N
W E
S

SITE LOCATION

Figure
2-1

Site Characterization Report, SS041, Roosevelt Road PCB Site
Joint Base Elmendorf-Richardson, Alaska



ES0626122245575AC SS041_Figure_4-1.ai tdaus 01.08.2015
Date: 10 Sep 2014 Drawn by: jcarr R:\AFCEE_JBER_20001102\MapFiles\WorkPlanning_2014\SS041\Figure_2_SS041_HistoricalProposedSamples.mxd

N
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S

673d AIR BASE WING

SOIL SAMPLE RESULTS

Site Characterization Report, SS041, Roosevelt Road PCB Site
Joint Base Elmendorf-Richardson, Alaska

Figure
4-1

Appendix A
Field Logs and Data Collection Forms

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Appendix A-1
Qualified Person Resume

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Jennifer Ulrich

Staff Geologist

Education

B.S., Geosciences, Fort Lewis College Durango, CO, June, 2012

Relevant Coursework:

- Groundwater/ Geochemistry
- Engineering Geology/ Structural Geology
- Environmental Geology/ Environmental Resources
- Mineralogy/Petrology
- Sedimentology/Stratigraphy /Geomorphology
- Geographic Information Systems
- Geology Field Methods
- Geology Field Camp/ Senior Thesis Seminar

Relevant Experience

Ms. Ulrich is a staff geologist with the Environmental Services Business Group in CH2M HILL's Anchorage office. She has been responsible for sampling crews on projects within Alaska and Washington. Her experience includes site and remedial investigations including evaluating soil and groundwater impacts and conducting long-term monitoring and operations.

Representative Projects

Staff Geologist; Joint Base Elemendorf-Richardson; Anchorage, Alaska, November 2012 – present. Site Manager of Long Term Monitoring (LTM) sites on JBER-Richardson, including State and CERCLA regulated sites. Manage sub-contractors conducting groundwater monitoring and associated Annual report writing tasks. Help to develop and manage budgets for 2013-2014 field work. Worked with Client to ensure deadlines and quality objectives are met. Served as Safety Coordinator and lead geologist on site investigation and characterization efforts at 37 different sites situated on JBER-Richardson. Served as field team lead supporting LTM sampling efforts at four State-regulated (petroleum hydrocarbon) sites, and two CERCLA regulated (chlorinated solvents) sites. Responsible for authoring annual LTM reports, decision documents, and site characterization reports.

Staff Geologist; Alaska Army National Guard Federal Scout Readiness Centers (FSRCs) February – October 2012. Participated in writing work plans to identify the gaps in the data necessary to complete site characterization requirements with the Alaska Department of Environmental Conservation. Help conduct site investigation efforts at 8 different Alaska Army National Guard FSRCs situated in the Yukon-Kuskokwim Delta. Authored characterization reports identifying the nature and extent of contamination, evaluating cumulative risk, and where necessary, proposing alternative cleanup levels.

Project Experience Prior to CH2M HILL

Staff Scientist/Environmental Field Technician, Sealaska Environmental Services, Poulsbo, Washington, April 2011-March 2012. Conducted long-term monitoring and operations on Department of Defense contracts throughout Washington State Naval Facilities. Provided field support for all of the Northwest Contracts serviced by Sealaska Environmental Services (SES). Locations include, but are not limited to: Sub-Base Bangor, Jackson Park Housing Complex (JPHC), Bremerton Naval Complex (BNC), Naval Air Station Whidbey Island (NASWI), and Keyport, Washington. Field support includes groundwater, surface and sediment sampling, institutional controls, reporting and various maintenance tasks. Performed groundwater sampling tasks associated with bio-venting, air sparging, injection well, and monitoring well remediation techniques. Provided support with core logging (hollow auger system) during shallow monitor well installations and decommissioning. Compiled field data for Naval Installation Restoration Information Solutions (NIRIS) submissions using Microsoft excel. Assisted with task order report writing and editing using Microsoft Office software.

REU Intern, Organization for Tropical Studies-Duke University, Las Cruces Biological Station, San Vito, Costa Rica, June-August 2010. Designed and implemented research project assessing nitrate loading/leaching and evaluation of potential contamination risks within tropical top soils in the Rio Java Watershed, located within the Las Cruces Biological Research Station reforestation project. Evaluated long-term impacts of varying land-use types (urban, agricultural, primary and secondary forests) based on nitrate concentrations, soil moisture and percolation rates. Conducted sample collection and analysis, report writing based on results and oral presentation of findings via power point for peers and mentors within the program.

Site Health and Safety Supervisor, Sealaska Environmental Services, Northwest Washington and Alaska, 2005-2009. Performed duties of Site Safety and Health Supervisor on paving project at Sub-base Bangor, Washington. Conducted daily health and safety briefings with all onsite personnel and sub-contractors. Provide information regarding onsite hazards. Reviewed Site Health and Safety Plan with individuals prior to work, collected and filed all pertinent certificates and training documents for onsite personnel. Maintained daily field logbook and weekly checklists. Observed construction techniques, equipment and health and safety compliance.

Performed duties of Site Health and Safety Supervisor, as well as field support on Long Term Monitoring/Operations (LTM/O) annual sampling event on remote location of Former Naval Complex Adak, Alaska. Conducted daily health and safety briefings with onsite personnel concerning hazards associated with daily tasks. Evaluated hazards on location such as volcanic eruptions and associated gases, generator usage, UXO potential, basic topography of area and limited medical assistance availability. Provided support as team lead for designated sampling locations which included groundwater, surface water, sediment and surface soil sampling, collecting GPS coordinates, and assuring proper protocol during sample collection.

Organized and conducted Long Term Monitoring/Operations (LTM/O) events at Naval Air Station Whidbey Island (NASWI) in Oak Harbor, Washington, as Project Field Lead and Site Safety and Health Supervisor. Each LTM/O event was conducted within the scope of a specific Task Order, consisting of both Sampling and Monitoring. Responsible for all necessary sample

coordination, including ordering of supplies (lab and field equipment), organizing personnel, contacting designated Naval Technical Representative (NTR) regarding progress of events, and creating sample matrices is carried out per each event. All events scheduled met or exceeded specific projected completion goals relative to each assigned task.

Provided field support for all of the Northwest Contracts serviced by Sealaska Environmental Services (SES). Locations include, but are not limited to: Former Naval Complex Adak, AK, Sub-Base Bangor, Jackson Park Housing Complex (JPHC), Bremerton Naval Complex (BNC), Naval Air Station Whidbey Island (NASWI), and Keyport, Washington. Field support includes groundwater, surface and sediment sampling, institutional controls, reporting and various maintenance tasks.

Provided support as Assistant Task Order Manager for Project Manager regarding Task Order 33 (NASWI). Conducted research for development of new wells along SR-20 Oak Harbor, WA, including creation of Traffic Control Plan based on WASHDOT requirements and project objectives. Composition of CPR/CQC reports required for submittal to the Program Manager, Project Manager, NTR, and Quality Control Supervisor while field work was being conducted. All documents generated during the project (such as field forms, field logbook, chains of custody, and any deviations) were organized, filed and submitted to the Project Manager, Chemist, and other applicable personnel.

Composition of quarterly and annual Long Term Monitoring/Operations reports for various sites such as NASWI Area 6, 31, and 42, NASWI Fuel Farms (1,2,3 and 4), JPCH, Keyport and Former Naval Complex Adak, AK.

Certifications

- 40 hr. HAZWOOPER Cert. (Complies with OSHA 29 CFR 1910.120) November 2005
- 8 hr. C4 HAZWOOPER refresher Cert. (OSHA 29 CFR 1910.120) Current (2013)
- First Aid/CPR/AED/BBP Cert. Current (2013)
- Construction Safety and Health Cert. (OSHA compliance) July 2006

Training

- DOT Training (DOT/HM-126F HAZMAT 49 CFR 172, Subpart H) June 2006
- Waste Management Training (40 CFR 265.16) June 2006
- C4 HAZWOPER Supervisor Training August 2006
- Project Management Training December 2006

Educational Awards

- American Geological Institute Minority Participation Program Fall 2011
- Fort Lewis College Writing Program Essay Contest-
  Technical and Professional Writing Category; Honorable Mention Winter 2010
- Inductee; Native American Honor Society of Fort Lewis College Winter 2010
- CO-AMP Academic Achievement Award, Fort Lewis College Fall 2009
- CO-AMP Academic Excellence Award, Fort Lewis College Fall 2009

Volunteer Experience

- President; Geology Club (2011-2012 Fort Lewis College, Durango, CO)
- President; Native American Honor Society (2010-2011 Fort Lewis College, Colorado)
- Presenter; Native American Leadership Forum, Fort Lewis College-Presentation representing Native American Honor Society (2010)
- Collaboration of Leadership in Legislation Impacting Native American Communities.
- Bio-Chemistry Senior Seminar Project, Fort Lewis College (2010)
- Volunteer member of study for diabetes research among Native American students
- Participant; Environmental Science Club, Southern Oregon University- Geology Field Studies
- Explored and sampled locations along Southern Oregon Coastline (2002)

Employment History

February 2012 - Current, CH2M HILL, Anchorage, Alaska, Staff Geologist

April 2011- March 2012, Sealaska Environmental Services, Poulsbo, Washington, Staff Scientist and Environmental Field Technician

June-August 2010, Duke University, Las Cruces Biological Station, San Vito, Costa Rica, REU Intern.

2005-2009, Sealaska Environmental Services, Northwest Washington and Alaska, Site Health and Safety Supervisor.

Appendix A-2
Field Logbook

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JBER SS041 7/18/14

0730 - Field Team Lead (FTL) and Field Quality Manager (FQM) Jennifer Frame (JF) meets Annika Seay (AS) at CH field trailer. Begin prep for day.

0800 - GeoTek, Alaska Inc. (GTA) driller Glen Rawson (GR) and helper Logan Herrmanns (LH) arrive at CH field trailer to begin prep for day.

~~0800~~ 0830 - Hold health and safety kick off. Discuss
- MEC potential
- slips / trips / falls
- biological hazards (mosquitos, wildlife potential)
- access restrictions
- communication
- IDW handling
- contaminants of concern
- utility locates (3rd party in addition to initial)
- weather

0900 - JF, AS and GTA mobe to site.
Project Site: SS041 - Roosevelt Road
Task/Activity for day - advance two soil borings to 30 ft bgs to investigate vertical and lateral extent of contamination
Personnel - Qualified samplers Jennifer Frame and Annika Seay (A. Seay is logbook note taker)
Subcontractors - GeoTek Alaska, Inc. Glen Rawson and Logan Herrmanns

~~0920 - Arrive at~~ Project Number: 457958.09.JF.02/457958.09.HL.03 ATO29

0920 - Arrive at site. Review utility markings (none (N/C), all clear)
Begin set up. Hold additional Health and Safety discussion:
- Stay hydrated. CH has water on site.

Discuss plan for day. Continue set up. Drillers prepare rod for drilling, set up decon pit, get generator set up (for hand power tools) Assessed location of borings relative to the figure from WP

1010 - Begin at SS041-SB01 Note: drillers do not have sample tray for sleeves. Drillers also test emergency stop on rig 8040DT.

1015 - JF scans 0 to 5 ft bgs; PID = 0.0 (fill material)

1025 - Collect sample 1403SS041-SB01-S0-00 at 5 to 10 ft bgs (PID = 0.0) for analysis of:
- AK101
- AK102/103 8270D-SIM
- SW8260C

A Seay 7.18.14

AS

JBER SS041 7.18.14

1030
1035 - Collect sample 14Q3SS041-SB01Q2-SO-0 from 10 to 15 ft bgs (PID = 0.0) for analysis of:
- AK101
- AK102/AK103 SW8270D-SIM
- NWEPH
- NW VPH
- SW8260C

1040 - Collect sample 14Q3SS041-SB01Q3-SO-0 from 15 to 20 ft bgs (PID = 0.0) for analysis of:
- AK101
- AK102/103 SW8082 SW8270D-SIM
- NWEPH
- NW VPH
- SW8260C

Collect sample 14Q3SS041-SB01Q3-SO-0MS and sample 14Q3SS041-SB01Q3-SO-0SD ~~for same analysis as above~~ (JWF) Sample suite limited due to available soil volume

Limited ms/SD to: ~~~~ -AK101, SW8260C, 8082

1055 - Collect sample 14Q3SS041-SB01Q3-SO-1 for same analysis as SB01Q3-SO-0 Move to SS041-SBQ2

1120 - Collect sample 14Q3SS041-SB01Q4-SO-0 from 20 to 25 ft bgs (PID = 0.0) for analysis of:
- AK101
- AK102/AK103 SW8270D SIM
- SW8260C

Begin at SS041-SBQ2

1130 - Collect sample 14Q3SS041-SB01Q5-SO-0 from 25 to 30 ft bgs for analysis of (PID = 0.0)
- AK101
- AK102/AK103 SW8270D-SIM
- SW8260C

1140 - Scan SS04-SBQ2 with PID; PID = 0.0 ppm

1150 - Collect sample 14Q3SS041-SB02Q1-SO-0 from 5 to 10 ft bgs (PID = 0.0 ppm) for analysis of:
- AK101
- AK102/AK103 SW8270D-SIM
- SW8260C
- ASTMD422, ASTMD7263, ASTMD854
- MOISTURE

1155 - Collect sample 14Q3SS041-SB02Q2-SO-0 from 10 to 15 ft bgs (PID: 0.0ppm) for analysis of:
- AK101

AS

Scale: 1 square = _____

1155 cont'd — AK1Ø2/1Ø3 SW827ØDSIM
— SW826ØC

1205 - Collect sample 14Ø3SSØ41-SBØ2Ø3-SO-Ø from 15 to 20 ft bgs for analysis of: (PID = 0.0 ppm)
— AK1Ø1
— AK1Ø2/AK1Ø3 SW8Ø82 SW827ØD-SIM
— SW826ØC

1210 - Collect Sample 14Ø3SSØ41-SBØ2Ø4-SO-Ø from 20 to 25 ft bgs (PID = 0.0 ppm) for analysis of:
— AK1Ø1
— AK1Ø2/1Ø3 SW827ØD-SIM
— SW826ØC

1215 - Collect sample 14Ø3SSØ41-SBØ2Ø5-SO-Ø from 25 to 30 ft bgs (PID =) for analysis of:
— AK1Ø1
— AK1Ø2/1Ø3 SW826ØC
— SW826ØC
— SW9Ø6Ø

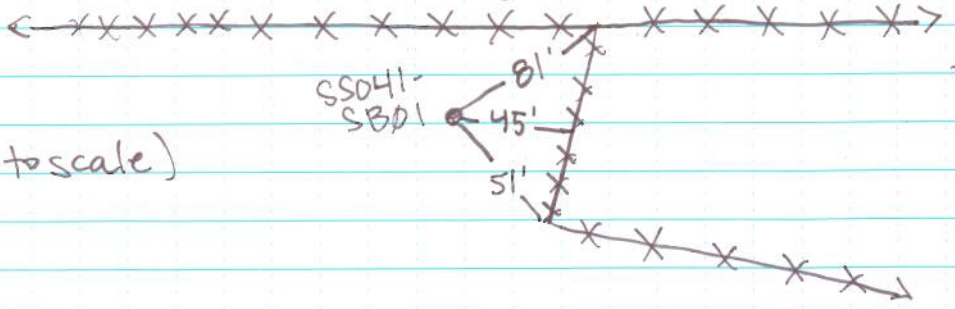
1220 - Collect DUP 14Ø3SSØ41-SBØ2Ø5-SO-1 for analysis of:
— SW9Ø6Ø

Begin site cleanup, Retake swing tie measurements to re-confirm locations.

125Ø - Collect IDW samples ~~ID~~ 14Ø3SSØ41-IDWØ1-SO-Ø, for analysis of:
— AK1Ø1
— AK1Ø2/1Ø3 SW8Ø82 SW827ØD-SIM
— SW826ØC

132Ø - JF and AS perform site review in gated area inside SS041 ~~SS041~~ for evidence of concrete pad. Take photographic evidence of what was seen. Photograph completed site SS041 before leaving. Gate is locked when exiting site. ~~Check out of Range control.~~ DUP

1328 - check out w/ Range control



(Not to scale)

SWING TIE Measurements

1332 - Onsite field office. Drillers onsite also. Pickup bottleware for next site ATØ35.

1350 - onsite ATØ35. Setup on ATØ35-SBØ4.

AS

JBER AT035 7.18.14

1410 - begin drilling after verifying no utility issues
1420 - collect sample 14Q3AT035-SB04001-S0-0 [0-5 ft bgs]
PID = 0.0 ppm. Analyses collected:
- SW8260C low
- SW8260C
- MOISTURE

1435 - collect sample 14Q3AT035-SB04002-S0-0 [5-10 ft bgs]
PID = 0.0 ppm Analysis collected:
- SW8260C low
- SW8260C
- MOISTURE

1450 - collect sample 14Q3AT035-SB04003-S0-0 [10-15 ft bgs]
PID = 0.1 ppm Analysis collected:
- SW8260C low
- SW8260C
- MOISTURE

1455 - collect sample 14Q3AT035-SB04003-S0-1 for analysis of
- SW8260C low
- SW8260C
- MOISTURE

1500 - collect sample 14Q3AT035-SB04004-S0-0 [15 to 20 ft bgs]
PID = 0.0 ~~for analysis of~~ Analysis collected: *Note - no picture due to camera battery dying
- SW8260C low
- SW8260C
- MOISTURE

1520 - collect sample 14Q3AT035-SB04005-S0-0 [20 to 25 ft bgs]
PID = 0.0 Analysis collected: All
- SW8260C low
- SW8260C
- MOISTURE

1530 - collect sample 14Q3AT035-SB04006-S0-0 [25 to 30 ft bgs]
PID = 0.0 Analysis collected: All
- SW8260C low
- SW8260C
- MOISTURE

1540 - collect sample 14Q3AT035-SB04007-S0-0 [30 to 35 ft bgs]
PID = 0.0 Analysis collected: All
- SW8260C low
- SW8260C
- MOISTURE

Amanda Sgm 7.18.14

Scale: 1 square = .1 ft

JBER ~~ASAT035~~ AT035 7.18.14

1550 - Collect sample 14Q3AT035-SB0408-SO-0 [35 to 40 ft bgs]
PID = 0.0 ppm Analysis collected:
- SW8260C Low
- SW8260C
- MOISTURE

1600 - Collect sample 14Q3AT035-SB0409-SO-0 [40 to 45 ft bgs]
PID = 0.1 ppm Analysis collected:
- SW8260 C Low
- SW8260C
- MOISTURE

1610 - Begin site cleanup ~~for the day~~.

1630 - back to field office. JUF signs BeoTek daily.
- 30ft x 2 @ SS041 = 60 ft
- 45ft x 1 @ AT035 = 45 ft
* DAY'S TOTAL = 105ft *

1700 - Drillers offsite. Will return 7/21/14 meet @ 0800 & continue to sample @ AT035. AC heads to Range control to drop off key for SS041. JUF remains & completes daily logs, scan ~~email COCs to SMs, PMs, & Chemists~~ JUF

~~1900~~ JUF

1745 - Collect EB for SS041 using shoe from SS041 for analyses:
- pack samples for shipment. some confusion regarding TB needs. Contact J. Becket to verify how many/what type of TB is needed for SS041.
  - AK101 = 1x10mL MeOH
  - ~~AT~~ SW8260C = 1x10mL MeOH
  - NW-VPH = 2x10mL MeOH

1815 - team has to re-adjust samples in coolers for SS041 to maintain ≤20 MeOH preserved samples/cooler for shipment. Requires team adjust COCs as well.

2130 - team offsite. JUF to ship samples.

Amanda Seath 7.18.14

FTL QC'd JUF 7/18/14

Appendix A-3
Soil Boring Logs

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CH2MHILL

PROJECT NUMBER: 457958.09.JF.02	BORING NUMBER: SS041-SB01 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site SS041 Additional Site Characterization LOCATION: JBER-R - Site SS041

DRILLING CONTRACTOR : GeoTek Alaska, Inc. EASTING (NAD83 SPZN4 feet): --- NORTHING (NAD83 SPZN4 feet): ---

DRILLING METHOD AND EQUIPMENT : Direct Push, Geoprobe 8040DT GROUND SURFACE ELEVATION: (ft)

WATER LEVEL: Not Encountered START : 7/18/2014 END : 7/18/2014 LOGGER : A. Seay

DEPTH BELOW GROUND SURFACE (ft)	RECOVERY (feet)	SAMPLE ID	GRAPHIC LOG	SOIL DESCRIPTION	PID (ppm) HEAD SPACE	LOGGING NOTES
				WELL-GRADED GRAVEL WITH SAND (GW), olive gray, medium to coarse grained, sub-angular to angular, loose, dry, cobbles greater than 2.9 inch (possible fill material in this interval).	0.0	No sample, possible fill material from 0 to 5 ft bgs
5		14Q3SS041-SB0101-SO-0		**WELL-GRADED GRAVEL WITH SAND (GW)**, olive gray, medium to coarse grained, sub-angular to angular, loose, dry, cobbles greater than 2.9 inch.	0.0	
10		14Q3SS041-SB0102-SO-0		**WELL-GRADED GRAVEL WITH SAND (GW)**, olive gray, medium to coarse grained, sub-angular to angular, loose, dry, cobbles greater than 2.9 inch.	0.0	
15		14Q3SS041-SB0103-SO-0 14Q3SS041-SB0103-SO-1		**WELL-GRADED GRAVEL WITH SAND (GW)**, olive gray, increase in coarse grained sand, sub-angular to angular, loose, dry, cobbles greater than 2.9 inch, 9 inch very fine grained, very moist, low plasticity silt lens at 10 to 10.9 feet bgs.	0.0	MS and SD samples collected at this interval
20		14Q3SS041-SB0104-SO-0		**WELL-GRADED GRAVEL WITH SAND (GW)**, olive gray, medium to coarse grained sand, sub-angular to angular, loose, dry, increase in cobble size (greater than 4 inch).	0.0	
25		14Q3SS041-SB0105-SO-0		**WELL-GRADED GRAVEL WITH SAND AND SILT (GW)**, olive gray, medium to coarse grained sand, sub-angular to angular, loose, dry, cobbles greater than 4 inch, 1 foot very fine grained, moist, low plasticity silt lens at 26 to 27 feet bgs; 1 in. very fine grained, very moist sand lens in silt lens, decrease in cobble size and frequency.	0.0	
30				Boring terminated at 30 feet.		
35						

CH2MHILL

PROJECT NUMBER: 457958.09.JF.02	BORING NUMBER: SS041-SB02 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site SS041 Additional Site Characterization LOCATION: JBER-R - Site SS041

DRILLING CONTRACTOR : GeoTek Alaska, Inc. EASTING (NAD83 SPZN4 feet): --- NORTHING (NAD83 SPZN4 feet): ---

DRILLING METHOD AND EQUIPMENT : Direct Push, Geoprobe 8040DT GROUND SURFACE ELEVATION: (ft)

WATER LEVEL: Not Encountered START : 7/18/2014 END : 7/18/2014 LOGGER : A. Seay

DEPTH BELOW GROUND SURFACE (ft)	RECOVERY (feet)	SAMPLE ID	GRAPHIC LOG	SOIL DESCRIPTION	PID (ppm) HEAD SPACE	LOGGING NOTES
				WELL-GRADED GRAVEL WITH SAND (GW), olive gray, medium to coarse grained, sub-angular to angular, loose, dry, cobbles greater than 2.9 inch (possible fill material in this interval).	0.0	No sample, possible fill material from 0 to 5 ft bgs
5		14Q3SS041-SB0201-SO-0		**WELL-GRADED GRAVEL WITH SAND (GW)**, olive gray, medium to coarse grained, sub-angular to angular, loose, dry, cobbles greater than 2.9 inch (possible fill material in this interval); orange iron oxidation observed from 5 to 6 feet bgs.	0.0	
10		14Q3SS041-SB0202-SO-0		**WELL-GRADED GRAVEL WITH SAND (GW)**, olive gray, medium to coarse grained, sub-angular to angular, loose, dry, cobbles greater than 2.9 inch (possible fill material in this interval); orange iron oxidation observed from 5 to 6 feet bgs.	0.0	
15		14Q3SS041-SB0203-SO-0		**WELL-GRADED GRAVEL WITH SAND (GW)**, dark brown with gray, medium grained gravel with coarse grained sand and increase in cobbles, subangular, loose, dry, iron oxidation; wet at 15.5 to 16.5 feet bgs.	0.0	
20		14Q3SS041-SB0204-SO-0		**POORLY GRADED SAND (SP)**, dark brown, medium grained sand with gravel, sub-rounded, loose, moist, some angular cobbles from 23 to 23.5 feet bgs.	0.0	
25		14Q3SS041-SB0205-SO-0 14Q3SS041-SB0205-SO-1		**POORLY GRADED SAND (SP)**, dark brown, medium grained sand with gravel, sub-rounded, loose, moist, some angular cobbles from 23 to 23.5 feet bgs.	0.0	
30				Boring terminated at 30 feet.		
35						

Appendix A-4
Chain-of-Custody Forms

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1 of 3

CH2MHILL Ap[illegible] Sciences Lab
CHAIN OF CUSTOD[illegible] RECORD
AND AGREEMENT TO PERFORM SERVICES

Chain of Custody Record

1100 NE Circle B[illegible] uite 300
Corvallis, OR 973[illegible]
(541) 768-3120

Client Contact	Analysis Turnaround Time	Preservation Used	For Lab Use Only:
Project Name: SS041 JBER PBR	**TAT is business days**	6 1 6 6 1 6 6	Job / SDG No.:
Project # or PO #: 457958.09.JF.02	TAT if different from below _____	**Analysis Requested**	Custody Seals intact? ☐Yes ☐No
Company Name: CH2M Hill	☒14 days (STD) ☐3 day *		Cooler Temp :____°C ☐Yes ☐No
Address: 949 E 36th AVe suite500	☐7 days * ☐2 days *		Therm ID No.:____Therm Exp.____
City/State/Zip: ANC, AK 99508	☐5 days * ☐1 day *		Packing Material: Circle below
Project Manager: Jennifer Frame	* (Surcharges will apply)		Ice Blue Ice Box Bubble Wrap
Phone #: 907 792 9633			Radiological Screen? ☐Yes ☐No
Report to email: Bernice.kidd@CH2M.com			

Sample Identification (Limit of 20 characters)	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix (Water, Soil, Air)	Total # of Cont.	AK 101	AK102/103 SW8270D-SIM	SW8200C	NWVPH	SW8082	AK101	SW8260C (Petro-related)	SW9060	SW8260C (Full-Suite)	Sample Specific Notes:	Lab ID:
14Q3SS041-SOSBTB01	7/18/14	0800	G	W	2	X			X						Remainder of TB01 in other cooler	
14Q3SS041-SOSBTB03	7/18/14	0830	G	W	2						X	N/A		X		
14Q3SS041-SB203-SO-0	7/18/14	1205	G	S	3		X			X	X	N/A		X		
14Q3SS041-SB204-SO-0	7/18/14	1210	G	S	3		X				X	X				
14Q3SS041-SB205-SO-0	7/18/14	1215	G	S	4		X			N/A	X	X	X			
14Q3SS041-SB205-SO-1	7/18/14	1220	G	S	1								X			
14Q3SS041-SB102-SO-0	7/18/14	1030	G	S	2				X						Remainder of 0102 in seperate cooler	
14Q3SS041-SB103-SO-0	7/18/14	1050	G	S	2				X						Remainder of 0103 in seperate cooler	
14Q3SS041-SB103-SO-1	7/18/14	1055	G	S	2				X						Remainder of 0103-1 in seperate cooler	

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other MeOH+SWV

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste?
☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☒Unknown

Sample Disposal (A fee may be added if samples are retained longer than 30 day per client request, samples are returned to client, or classified as hazardous.)
☐Return to Client ☒Disposal by Lab ☐Archive for _____ months

Sampled By: Annika Seay	Date/Time: 7.18.14 / 1220	Relinquished by: Jennifer Frame	Date/Time: 7/18/14 2000
Received by:	Date/Time:	Relinquished by:	Date/Time:
Received by:	Date/Time:	Relinquished by:	Date/Time:
Received in Laboratory by:	Date/Time:	Shipped Via: ☐UPS ☐Fed-Ex ☐USPS ☐Other	Tracking #:

Special Instructions/QC Requirements

DOC CONTROL ID: ASL1081-0214

FTL 9/4

CH2MHILL A[illegible] Sciences Lab
CHAIN OF CUSTO[illegible]RECORD
AND AGREEMENT TO PERFORM SERVICES

1100 NE Circle [illegible]uite 300
Corvallis, OR 973[illegible]
(541) 768-3120

Chain of Custody Record

Client Contact	Analysis Turnaround Time
Project Name: JBER	**TAT is business days**
Project # or PO #: 457958.09.JF.02	TAT if different from below _____
Company Name: CH2M HILL	☑ 14 days (STD) ☐ 3 day *
Address: 949 E 36th Ave	☐ 7 days * ☐ 2 days *
City/State/Zip: Anchorage, AK 99508	☐ 5 days * ☐ 1 day *
Project Manager: Jennifer Frame	* (Surcharges will apply)
Phone #: 907.792.9633	
Report to email: bernice.kidd@ch2m.com	

Sample Identification (Limit of 20 characters)	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix (Water, Soil, Air)	Total # of Cont.	Preservation Used: 2 2 2 2 1 2 1	Analysis Requested: AK101	AK102/103	NWEPH	NWVPH	SW8082	SW8260C	SW8270D-SIM			Sample Specific Notes:	Lab ID:
14Q33S041-SOSBEB01	7.18.14	1745	G	water	16		X	X	X	X	X	X	X				
14Q33S041-~~FB~~SOSBTB02	7/18/14	0700	G	W	6		X			X		X					

Preservation Used: 1= Ice, (2= HCl); 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste?
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be added if samples are retained longer than 30 day per client request, samples are returned to client, or classified as hazardous.)
☐ Return to Client ☑ Disposal by Lab ☐ Archive for _____ months

Sampled By: Annika Seay	Date/Time: 7.18.14/1745	Relinquished by: Jennifer Nelich (JNF)	Date/Time: 7/20/14 ~~7/18/14~~ 2000 2000
Received by:	Date/Time:	Relinquished by:	Date/Time:
Received by:	Date/Time:	Relinquished by:	Date/Time:
Received in Laboratory by:	Date/Time:	Shipped Via: ☐ UPS ☐ Fed-Ex ☐ USPS ☐ Other	Tracking #:

Special Instructions/QC Requirements

For Lab Use Only:
Job / SDG No.:
Custody Seals intact? ☐ Yes ☐ No
Cooler Temp :____°C ☐ Yes ☐ No
Therm ID No.:____Therm Exp.____
Packing Material: Circle below
Ice Blue Ice Box Bubble Wrap
Radiological Screen? ☐ Yes ☐ No

FTV 9/4/14

CH2MHILL Applied Sciences Lab
CHAIN OF CUSTODY RECORD
AND AGREEMENT TO PERFORM SERVICES

Chain of Custody Record

1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
(541) 768-3120

Client Contact	Analysis Turnaround Time	Preservation Used
Project Name: SS041 JBER PBR	TAT is business days	6 1 6 1 1
Project # or PO #: 457958.09.JF.02	TAT if different from below _____	Analysis Requested
Company Name: CH2M HILL	☑ 14 days (STD) ☐ 3 day *	
Address: 949 E. 36th Suite 500	☐ 7 days * ☐ 2 days *	
City/State/Zip: Anchorage, AK 99508	☐ 5 days * ☐ 1 day *	
Project Manager: Jennifer Frame	* (Surcharges will apply)	
Phone #: 907 792 9633		
Report to email: Bernice.Kido@CH2M.com		

For Lab Use Only:
Job / SDG No.:
Custody Seals intact? ☐Yes ☐No
Cooler Temp :____°C ☐Yes ☐No
Therm ID No.:____Therm Exp.____
Packing Material: Circle below
Ice Blue Ice Box Bubble Wrap
Radiological Screen? ☐Yes ☐No

Sample Identification (Limit of 20 characters)	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix (Water, Soil, Air)	Total # of Cont.	AK101	AK102/103 SW8270D-SIM	SW8260C (Petroleum Related) NW EPH	SW8082	SW9060	SW8260C (Full Suite)			Sample Specific Notes:	Lab ID:
14Q3SS041-SB0101-SO-0	7/18/14	1025	G	S	3	X	X	X							
14Q3SS041-SB0102-SO-0	7/18/14	1030		S	~~4~~ 5	X	X	X	X	NA				VPH sample for 0102 in seperate cooler	
14Q3SS041-SB0103-SO-0	7/18/14	1050		S	~~4~~ 5	X	X	NA	X	X		X		VPH sample for 0103 in seperate cooler	
14Q3SS041-SB0103-SO-0MS	7/18/14	1050		S	3	X		NA		X		X		~~VPH sample for 0103 MS in seperate cooler~~ JWP	
14Q3SS041-SB0103-SO-0SD	7/18/14	1050		S	3	X		NA		X		X		~~VPH sample for 0103 SD in seperate cooler~~ JWP	
14Q3SS041-SB0103-SO-1	7/18/14	1055		S	~~4~~ 5	X	X	NA	X	X		X		VPH sample for 0103-1 in seperate cooler	
14Q3SS041-SB0104-SO-0	7/18/14	1120		S	3	X	X	X							
14Q3SS041-SB0105-SO-0	7/18/14	1130		S	3	X	X	X							
14Q3SS041-SB0201-SO-0	7/18/14	1150		S	3	X	X	X							
14Q3SS041-SB0202-SO-0	7/18/14	1155		S	3	X	X	X							
14Q3SS041-SOSBTB01	7/18/14	0800	↓	W	2	X		NA				X		VPH sample for TB01 in seperate cooler	
~~14Q3SS041-SB0205-SO-0~~	~~7/18/14~~	~~1215~~		S	4	X	X	X			X				

Add'l sample info #2

Preservation Used: 1= Ice, 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= Other MeOH + Surr

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste?
☐Non-Hazard ☐Flammable ☐Skin Irritant ☐Poison B ☑Unknown

Sample Disposal (A fee may be added if samples are retained longer than 30 day per client request, samples are returned to client, or classified as hazardous.)
☐Return to Client ☑Disposal by Lab ☐Archive for _____ months

Sampled By: Annika Seay	Date/Time: 7.18.14/1215	Relinquished by: Jennifer Frame JWP	Date/Time: ~~7/18/14~~ 7/20/14 2000
Received by:	Date/Time:	Relinquished by:	Date/Time:
Received by:	Date/Time:	Relinquished by:	Date/Time:
Received in Laboratory by:	Date/Time:	Shipped Via: ☐UPS ☐Fed-Ex ☐USPS ☐Other	Tracking #:

Special Instructions/QC Requirements
- VPH samples in seperate cooler
- SW8082 in same 4oz Jar as AK102/103, SW8270D-SIM where collected

~~14Q3SS041-SB0205-SO-1~~	~~7/18/14~~	~~1220~~	G	S	1						1 X		~~SW9060 only~~ JWP

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Seattle
5755 8th Street E.
Tacoma, WA 98424
Tel. 253-922-2310
Fax 253-922-5047
www.testamericainc.com

☐ Rush

☐ Short Hold

Chain of Custody Record

Chain of Custody Number: 25602

Page 1 of 1

Client: CH2M HILL

Client Contact: Bernice Kidd

Telephone Number (Area Code)/Fax Number: 907-762-3818

Lab Contact:

Sampler: Jenn Ulrich

Billing Contact:

Address: 949 E 36th Ave Ste 500

City: Anchorage

State: AK

Zip Code: 99508

Project Name and Location (State): JBER

Contract/Purchase Order/Quote No.: 457958 09.JF.02

Date:

Lab Number:

Analysis (Attach list if more space is needed)

Special Instructions/ Conditions of Receipt

Sample I.D. and Location/Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	Containers	ASTM D422, ASTM D 7263	ASTM D854	MOISTURE
14Q355Φ41-SBΦ2Φ1-So-Φ	7.18.14	1150				X							2	X		X

Cooler: ☐ Yes ☐ No Cooler Temp: _____

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1

Turn Around Time Required (business days): ☐ 24 Hours ☐ 48 Hours ☐ 5 Days ☐ 10 Days ☐ 15 Days ☒ Other STANDARD

QC Requirements (Specify)

1. Relinquished By Sign/Print: Morgan Bruno — Date: 7/24/14 — Time: 1400

2. Relinquished By Sign/Print — Date — Time

1. Received By Sign/Print — Date — Time

2. Received By Sign/Print — Date — Time

3. Received By Sign/Print — Date — Time

TAL-8

Appendix A-5
Photo Log

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Photograph A5-1: SS041-SB01, Interval 0-5 feet below ground surface (July 2014).

Photograph A5-2: SS041-SB01, Interval 5-10 feet below ground surface (July 2014).

Photograph A5-3: SS041-SB01, Interval 10-15 feet below ground surface (July 2014).

Photograph A5-4: SS041-SB01, Interval 15-20 feet below ground surface (July 2014).

Photograph A5-5: SS041-SB01, Interval 25-30 feet below ground surface (July 2014).

Photograph A5-6: SS041-SB02, 8040DT rig setup at SS041-SB02 facing North (July 2014).

Photograph A5-7: SS041-SB02, 8040DT rig setup at SS041-SB02 facing East (July 2014).

Photograph A5-8: Site overview picture (July 2014).

Photograph A5-9: SS041-SB02, Interval 0-5 feet below ground surface (July 2014).

Photograph A5-10: SS041-SB02, Interval 5-10 feet below ground surface (July 2014).

Photograph A5-11: SS041-SB02, Interval 10-15 feet below ground surface (July 2014).

Photograph A5-12: SS041-SB02, Interval 15-20 feet below ground surface (July 2014).

Photograph A5-13: SS041-SB02, Interval 20-25 feet below ground surface (July 2014).

Photograph A5-14: SS041-SB02, Interval 25-30 feet below ground surface (July 2014).

Photograph A5-15: Exposed SW corner of transmitter annex pad; densely wooded area, no other concrete exposed (July 2014).

Photograph A5-16: Surrounding area of exposed pad, densely wooded (July 2014).

Photograph A5-17: Exposed transmitter annex concrete pad (July 2014).

Photograph A5-18: View of secondary fence that houses former transmitter annex pad (July 2014).

Photograph A5-19: View of interior within secondary fence area (July 2014).

Photograph A5-20: View of interior within secondary fence area (July 2014).

Photograph A5-21: View of sampling area (July 2014).

Appendix A-6
Survey Elevation Measurements and Coordinates

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Table A-6: Survey Elevation Measurements and Coordinates

Location	Ground Surface Elevation (feet amsl)	Northing	Easting
SS041-SB01	262.4	2663985.0496	1695881.3435
SS041-SB02	262.53	2664002.842	1695922.6435

Notes:
amsl = above mean sea level
Survey data were provided in the Alaska State Plane coordinate system, zone 4. Horizontal data are referenced to the North American Datum 1983 (NAD83, 2011 Adjustment). The unit of measure for NAD83, Alaska State Plane, Zone 4 is U.S. Survey Feet. Vertical data are referenced to the North American Vertical Datum of 1988 (NAVD88). The unit of measure for NAVD88 is U.S. Survey Feet.

Appendix B
Laboratory Reports and Data Quality Review

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Appendix B-1
Data Quality Evaluation Report
(includes ADEC Checklists)

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JOINT BASE ELMENDORF-RICHARDSON, SS041 – ROOSEVELT ROAD – 2014 DATA QUALITY EVALUATION REPORT

Introduction

The objective of this data quality evaluation (DQE) report is to assess the data quality of analytical results for soil samples collected at SS041 – Roosevelt Road at Joint Base Elmendorf-Richardson (JBER). Samples were collected and analyzed in support of the Preliminary Assessment/Site Investigation at this site. The data may also be used to support future activities such as feasibility studies, risk assessments, fate and transport modeling and remedial actions. Individual method requirements and guidelines from the *United States Air Force, Joint Base Elmendorf-Richardson, Alaska, Environmental Restoration Program, Basewide Uniform Federal Policy Quality Assurance Project Plan (April 2014) (*JBER UFP-QAPP) were used in this assessment.

This report is intended as a general data quality assessment designed to summarize data issues.

Analytical Data

This DQE report covers 10 primary soil samples, two soil field duplicates (FDs), one equipment blank (EB) and four trip blanks (TBs). All samples were collected July 18, 2014. A list of samples associated with this DQE is included in Attachment B1-1.

The Work Plan requires a collection frequency of 10 percent for FDs and 5 percent for matrix spike/matrix spike duplicate (MS/MSD) sets and EBs; collection frequencies are outlined by method in Table B1-1 below. The required frequency was met for each method with the following exceptions:

- A MS/MSD was not collected for Methods AK102/103, NW EPH, NW VPH, SW8270D-SIM and Lloyd Kahn.
- An EB was not collected for Method Lloyd Kahn.

Table B1-1: Percentage of FD, EB and MS/MSD Collected by Method

Method	Matrix	Count of Primary Samples	Count of FDs	Percent of FDs	Count of MS/MSDs	Percent of MS/MSDs	Count of EBs	Percent of EBs
AK101	Soil	10	1	10	1	10	1	10
AK102/103	Soil	10	1	10	0	0	1	10
NW EPH	Soil	2	1	50	0	0	1	50
NW VPH	Soil	2	1	50	0	0	1	50
SW8082	Soil	2	1	50	1	50	1	50
SW8260C	Soil	10	1	10	1	10	1	10
SW8270D-SIM	Soil	10	1	10	0	0	1	10
Lloyd Kahn	Soil	1	1	100	0	0	0	0

The sample results were reported as one sample delivery group (SDG) (N2288). The analyses were performed by Applied Sciences Laboratory in Corvallis, Oregon (CHMC, Department of Defense Environmental Laboratory Accreditation Program Certification #ADE-1485) and TestAmerica Laboratories Inc. in Seattle, Washington (TAMS, Department of Defense Environmental Laboratory Accreditation Program Certification #L2236). Samples were collected and shipped via overnight carrier to CHMC; CHMC was responsible for shipment of samples to TAMS.

Eight methods were used to analyze the environmental samples. Selected samples were analyzed for one or more of the following analytes/methods in Table B1-2.

Table B1-2: Analytical Parameters by Matrix and Laboratory

Parameter	Method	Laboratory
GRO	AK101	CHMC
DRO/RRO	AK102/103	CHMC
Extractable petroleum hydrocarbon speciation	NW EPH	TAMS
Volatile petroleum hydrocarbon speciation	NW VPH	TAMS
Volatile organic compounds	SW8260C	CHMC
Polychlorinated biphenyls	SW8082	CHMC
TOC	Lloyd Kahn	CHMC
Polycyclic aromatic hydrocarbons	SW8270D-SIM	CHMC

Notes:
DRO = diesel-range organics
GRO = gasoline-range organics
RRO = residual-range organics
TOC = total organic carbon

The assessment of data includes a review of: (1) the chain-of-custody (COC) documentation; (2) holding-time compliance; (3) the required quality control (QC) samples at the specified frequencies; (4) method blanks; (5) laboratory control sample/laboratory control sample duplicates (LCS/LCSD); (6) surrogate spike recoveries; (7) MS/MSD samples; and (8) initial and continuing calibration information and other method-specific criteria as defined by the JBER UFP-QAPP.

Field samples were also reviewed to ascertain field compliance and data quality issues. This included a review of FDs, an EB and TBs.

Data flags were assigned according to the JBER UFP-QAPP. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there will be only one final flag. A final flag is applied to the data and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are defined below:

- **J** = The analyte was positively identified, and the quantitation is an estimation because of discrepancies in meeting certain analyte-specific quality control criteria. Or the analyte was

positively identified, but the associated concentration is estimated above the method detection limit and below the limit of quantitation (LOQ).

- **R** = The data are rejected because of deficiencies in meeting QC criteria and may not be used for decision making.

- **B** = The analyte was detected in the sample at a concentration less than or equal to five times (10 times for common laboratory contaminants) the blank concentration.

- **U** = The analyte was analyzed for, but the analyte was not detected.

- **UJ** = The analyte was not detected; however, the result is estimated because of discrepancies in meeting certain analyte-specific QC criteria.

Findings

The overall summaries of the data validation findings are contained in the following sections and Table B1-3.

Also included as documentation of data validation findings is the Alaska Department of Environmental Conservation Laboratory Data Review Checklist (Version 2.7, January 2010). A checklist is provided for each laboratory SDG and can be found in Attachment B1-2.

Holding Times

All holding-time criteria were met.

Calibration

All initial and continuing calibration criteria were met.

Method Blanks

Method blanks were analyzed at the required frequency and were free of contamination with the following exceptions:

- C10-C12 Aromatics, C5-C6 aliphatics, C8-C10 aromatics and total VPH were detected below the LOQ in the method blanks for Method NW VPH. Eight associated results detected less than five times the blank concentrations were qualified as estimated and flagged “B”. Three associated results detected greater than five times the blank concentrations, and one nondetected result, were not qualified.

- Fluoranthene and naphthalene were detected below the LOQ in the method blanks for Method SW8270D-SIM. Eight associated results detected less than five times the blank concentrations were qualified as estimated and flagged “B”. Eleven associated results detected greater than five times the blank concentrations, and three nondetected results, were not qualified.

Trip Blanks

Four TBs were collected and were free of contamination with the following exceptions:

- GRO was detected below the LOQ in the TBs for Method AK101. Eleven associated results detected less than five times the blank concentrations were qualified as estimated and flagged "B".

- C10-C12 Aromatics, C8-C10 aromatics and total VPH were detected below the LOQ in the TBs for Method NW VPH. Seven associated results detected less than five times the blank concentrations were qualified as estimated and flagged "B". Two associated results detected greater than five times the blank concentrations were not qualified.

Equipment Blanks

One EB was collected and was free of contamination with the exceptions listed below.

- DRO and RRO were detected below the LOQ in the EB for Method AK102/103. Ten associated sample results detected greater than five times the blank concentrations, and twelve nondetected results, were not qualified.

- C12-C16 Aliphatics and C21-C34 aliphatics were detected below the LOQ in the EB for Method NW EPH. Three associated sample results detected greater than five times the blank concentrations, and three nondetected results, were not qualified.

- C10-C12 Aromatics, C6-C8 aliphatics and total VPH were detected below the LOQ in the EB for Method NW VPH. Six associated sample results detected greater than five times the blank concentrations, and three nondetected results, were not qualified.

- Phenanthrene, naphthalene, 1-methylnaphthalene, fluorene and 2-methylnaphthalene were detected below the LOQ in the EB for Method SW8270D-SIM. Forty associated results detected greater than five times the blank concentrations, and 15 nondetected results, were not qualified.

Field Duplicates

Two FD sets were collected and precision was acceptable with the following exceptions:

- The relative percent differences (RPD) of C8-C10 aromatics and C5-C6 aliphatics were greater than JBER UFP-QAPP criteria in FD set 14Q3SS041-SB0103-SO-0/14Q3SS041-SB0103-SO-1 for Method NW VPH. Three associated detected results were qualified as estimated and flagged "J"; one associated nondetected result was qualified as estimated and flagged "UJ".

- The RPD of TOC was greater than JBER UFP-QAPP criteria in FD set 14Q3SS041-SB0205-SO-0/14Q3SS041-SB0205-SO-1 for Method Lloyd Kahn. Two associated detected results were qualified as estimated and flagged "J".

Matrix Spike Samples

The results of MS/MSD analyses provide information about the possible influence of the matrix on either accuracy or precision of the measurements. The field crew designated a sample for MS/MSD analysis. All acceptance criteria were met with the following exceptions:

- The recoveries of vinyl chloride 1,3-butadiene were less than JBER UFP-QAPP criteria in the MS and/or MSD of sample 14Q3SS041-SB0103-SO-0 for Method SW8260C. The associated nondetected results were qualified as estimated and flagged "UJ".

Surrogates

Surrogates were added to all samples for the methods requiring their use. Surrogate recoveries met criteria.

Laboratory Control Samples

LCS/LCSDs were analyzed and all accuracy and precision criteria were met.

Internal Standards

All internal standard acceptance criteria were met.

Tentatively Identified Compounds

Tentatively identified compounds were not reported.

Chain-of-Custody and Sample Receipt Discrepancies

- **SDG N2288.** Samples 14Q3SS041-SB0205-SO-0 and 14Q3SS041-SB0205-SO-1 requested for TOCs by SW9060 on the chain of custody. The associated quote for the project references Method Lloyd Kahn; samples were logged in and reported by Method Lloyd Kahn.

Overall Assessment

The final activity in the data quality evaluation is an assessment of whether the data meet the data quality objectives. The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and the resulting analytical data can be used to support the decision making process. The precision, accuracy, representativeness, completeness and comparability are addressed in the JBER UFP-QAPP. The following summary highlights the data evaluation findings for the above defined events:

1. Completeness for all method/matrix/analyte combinations was 100 percent.

2. All AK101 data were qualified due to low-level detections in the TBs. The degree to which blank contamination was observed suggests a contamination issue during sample collection or shipping.

3. Approximately 43 percent of the NW VPH data were qualified due to low-level detections in the TBs and laboratory blanks. The degree to which blank contamination was observed is within reasonable method expectations considering the small size of the dataset.

4. Approximately four percent of SW8270D-SIM data were qualified due to low-level detections in the laboratory blanks. The degree to which blank contamination was observed is within reasonable method expectations.

5. FD RPD exceedances were observed for Methods NW VPH and Lloyd Kahn; six results were qualified as estimated.

6. MS/MSD recovery exceedances were observed for Method SW8260C; three results were qualified as estimated.

7. Although data were qualified as estimated due to QC exceedances as noted, overall precision and accuracy of the data, as measured by field and laboratory QC indicators suggest that data are usable for projects objectives.

Table B1-3: Validation Flags

Sample ID	Method	Analyte	Final Result	Units	Final Flag	Reason
14Q3SS041-SB0101-SO-0	AK101	TPH-gasoline	0.265	mg/kg	B	TB<LOQ
	SW8270D-SIM	Fluoranthene	0.425	µg/kg	B	LB<LOQ
14Q3SS041-SB0102-SO-0	AK101	TPH-gasoline	0.774	mg/kg	B	TB<LOQ
	NW VPH	C10-C12 aromatics	0.13	mg/kg	B	LB<LOQ
		C10-C12 aromatics	0.13	mg/kg	B	TB<LOQ
		C5-C6 aliphatics	0.39	mg/kg	B	LB<LOQ
		C8-C10 aromatics	0.13	mg/kg	B	TB<LOQ
		C8-C10 aromatics	0.13	mg/kg	B	LB<LOQ
		Total VPH	0.84	mg/kg	B	TB<LOQ
		Total VPH	0.84	mg/kg	B	LB<LOQ
14Q3SS041-SB0103-SO-0	AK101	TPH-gasoline	0.487	mg/kg	B	TB<LOQ
	NW VPH	C10-C12 aromatics	0.47	mg/kg	B	TB<LOQ
		C10-C12 aromatics	0.47	mg/kg	B	LB<LOQ
		C5-C6 aliphatics	0.54	mg/kg	B	LB<LOQ
		C5-C6 aliphatics	0.54	mg/kg	B	FD>RPD
		C8-C10 aromatics	0.6	mg/kg	B	TB<LOQ
		C8-C10 aromatics	0.6	mg/kg	B	LB<LOQ
		C8-C10 aromatics	0.6	mg/kg	B	FD>RPD
		Total VPH	2.1	mg/kg	B	LB<LOQ
		Total VPH	2.1	mg/kg	B	TB<LOQ
	SW8260C	1,3-Butadiene	21.9	µg/kg	UJ	MS<LCL
		Vinyl chloride	21.9	µg/kg	UJ	MS<LCL
		Vinyl chloride	21.9	µg/kg	UJ	SD<LCL
	SW8270D-SIM	Fluoranthene	0.742	µg/kg	B	LB<LOQ
14Q3SS041-SB0103-SO-1	AK101	TPH-gasoline	0.562	mg/kg	B	TB<LOQ
	NW VPH	C5-C6 aliphatics	0.16	mg/kg	UJ	FD>RPD
		C8-C10 aromatics	3.3	mg/kg	J	FD>RPD
		Total VPH	5.8	mg/kg	B	TB<LOQ
	SW8270D-SIM	Fluoranthene	0.58	µg/kg	B	LB<LOQ
14Q3SS041-SB0104-SO-0	AK101	TPH-gasoline	0.325	mg/kg	B	TB<LOQ
	SW8270D-SIM	Fluoranthene	0.394	µg/kg	B	LB<LOQ
14Q3SS041-SB0105-SO-0	AK101	TPH-gasoline	0.453	mg/kg	B	TB<LOQ
	SW8270D-SIM	Fluoranthene	0.244	µg/kg	B	LB<LOQ
14Q3SS041-SB0201-SO-0	AK101	TPH-gasoline	0.38	mg/kg	B	TB<LOQ
	SW8270D-SIM	Fluoranthene	0.789	µg/kg	B	LB<LOQ

Table B1-3: Validation Flags

Sample ID	Method	Analyte	Final Result	Units	Final Flag	Reason
14Q3SS041-SB0202-SO-0	AK101	TPH-gasoline	0.498	mg/kg	B	TB<LOQ
	SW8270D-SIM	Fluoranthene	0.521	µg/kg	B	LB<LOQ
14Q3SS041-SB0203-SO-0	AK101	TPH-gasoline	0.536	mg/kg	B	TB<LOQ
14Q3SS041-SB0204-SO-0	AK101	TPH-gasoline	0.354	mg/kg	B	TB<LOQ
14Q3SS041-SB0205-SO-0	AK101	TPH-gasoline	0.408	mg/kg	B	TB<LOQ
	SW8270D-SIM	Naphthalene	1.07	µg/kg	B	LB<LOQ
	SW9060	Total organic carbon	89.3	mg/kg	J	FD>RPD
14Q3SS041-SB0205-SO-1	SW9060	Total organic carbon	278	mg/kg	J	FD>RPD

Notes:

µg/kg = microgram(s) per kilogram
mg/kg = milligram(s) per kilogram

FD>RPD = Field duplicate relative percent difference criterion exceeded
LB<LOQ = Laboratory blank concentration less than the limit of quantitation
MS<LCL = Matrix spike recovery less than the lower control limit
SD<LCL = Matrix spike duplicate recovery less than the lower control limit
TB<LOQ = Trip blank concentration less than the limit of quantitation

Attachment B1-1: Samples Associated with DQE

Sample ID	Collection Date	Sample Type	Matrix
14Q3SS041-SOSBEB01	18-Jul-14	EB	Water
14Q3SS041-SB0103-SO-1	18-Jul-14	FD	Soil
14Q3SS041-SB0205-SO-1	18-Jul-14	FD	Soil
14Q3SS041-SB0101-SO-0	18-Jul-14	N	Soil
14Q3SS041-SB0102-SO-0	18-Jul-14	N	Soil
14Q3SS041-SB0103-SO-0	18-Jul-14	N	Soil
14Q3SS041-SB0104-SO-0	18-Jul-14	N	Soil
14Q3SS041-SB0105-SO-0	18-Jul-14	N	Soil
14Q3SS041-SB0201-SO-0	18-Jul-14	N	Soil
14Q3SS041-SB0202-SO-0	18-Jul-14	N	Soil
14Q3SS041-SB0203-SO-0	18-Jul-14	N	Soil
14Q3SS041-SB0204-SO-0	18-Jul-14	N	Soil
14Q3SS041-SB0205-SO-0	18-Jul-14	N	Soil
14Q3SS041-SOSBTB01	18-Jul-14	TB	Water
14Q3SS041-SOSBTB02	18-Jul-14	TB	Water
14Q3SS041-SOSBTB03	18-Jul-14	TB	Water
14Q3SS041-SOSBTB04	18-Jul-14	TB	Water

Notes:

EB = equipment blank
FD = field duplicate
N = primary sample
TB = trip blank

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Attachment B1-2: ADEC Checklist

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Laboratory Data Review Checklist

CompletedBy	Berney Kidd		
Title	Project Chemist	Date	10/8/2014
CS Report Name		ReportDate	9/23/2014
Consultant Firm	CH2M Hill		
Laboratory Name	Applied Sciences Laboratory	Laboratory Report Number	N2288
ADEC File Number		ADECRecKeyNumber	

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:

NWEPH and NWVPH analysis performed at TestAmerica Seattle.

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:

Samples received at 1.9C.

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 acceptance range, insufficient or missing samples, etc.?

◉ Yes ○ No ○ NA (Please explain.) Comments:

Samples 14Q3SS041-SB0205-SO-0 and 14Q3SS041-SB0205-SO-1 requested for TOCs by SW9060 on the chain of custody. The associated quote for the project references Method Lloyd Kahn; samples were logged in and reported by Method Lloyd Kahn.

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

Comments:

All data are usable as reported.

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:

No discrepancies.

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:

All data are usable as reported.

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:

For details see site-specific report.

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

Comments:

All data are usable as reported.

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:

These analytes had Method Blank detects: Fluoranthene, Naphthalene for SW8270D-SIM.

These analytes had Method Blank detects: C10-C12 Aromatics, C5-C6 Aliphatics, C8-C10 Aromatics, Total VPH for NWVPH.

iii. If above PQL, what samples are affected?

Comments:

Associated samples: 14Q3SS041-SB0101-SO-0, 14Q3SS041-SB0102-SO-0, 14Q3SS041-SB0103-SO-0, 14Q3SS041-SB0103-SO-1, 14Q3SS041-SB0104-SO-0, 14Q3SS041-SB0105-SO-0, 14Q3SS041-SB0201-SO-0, 14Q3SS041-SB0202-SO-0, 14Q3SS041-SB0203-SO-0, 14Q3SS041-SB0204-SO-0, 14Q3SS041-SB0205-SO-0.

Affected samples: 14Q3SS041-SB0101-SO-0, 14Q3SS041-SB0102-SO-0, 14Q3SS041-SB0103-SO-0, 14Q3SS041-SB0103-SO-1, 14Q3SS041-SB0104-SO-0, 14Q3SS041-SB0105-SO-0, 14Q3SS041-SB0201-SO-0, 14Q3SS041-SB0202-SO-0, 14Q3SS041-SB0205-SO-0

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

Associated sample detects less than five times the blank concentrations were flagged 'B'. Associated sample detects greater than five times the blank concentration and non-detects were not qualified.

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

Comments:

Some data qualified as estimated.; usable as qualified.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

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/DMSD, 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:

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

○ Yes ○ No ◉ NA (Please explain.) Comments:

No data flagged.

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

All data are usable as reported.

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 surrogate exceedances.

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

Comments:

All data are usable as reported.

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:

iii. All results less than PQL?

○ Yes ◉ No ○ NA (Please explain.) Comments:

These analytes had Trip Blank detects: TPH-Gasoline for AK101.

These analytes had Trip Blank detects: C10-C12 Aromatics, C8-C10 Aromatics, Total VPH for NWVPH.

iv. If above PQL, what samples are affected?

Comments:

Associated and affected samples: 14Q3SS041-SB0101-SO-0, 14Q3SS041-SB0102-SO-0, 14Q3SS041-SB0103-SO-0, 14Q3SS041-SB0103-SO-1, 14Q3SS041-SB0104-SO-0, 14Q3SS041-SB0105-SO-0, 14Q3SS041-SB0201-SO-0, 14Q3SS041-SB0202-SO-0, 14Q3SS041-SB0203-SO-0, 14Q3SS041-SB0204-SO-0, 14Q3SS041-SB0205-SO-0.

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

Comments:

Associated sample detects less than five times the blank concentrations were flagged 'B'. Associated sample detects greater than five times the blank concentration and non-detects were not qualified.

e. Field Duplicate

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

ii. Submitted blind to lab?

◉ Yes ○ No ○ NA (Please explain.) Comments:

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

$$RPD\ (\%) = \text{Absolute Value of: } \frac{(R1 - R2) \times 100}{((R1 + R2)/2)}$$

Where R1 = Sample Concentration
R2 = Field Duplicate Concentration

○ Yes ◉ No ○ NA (Please explain.) Comments:

These samples were out of control for SW9060 FD set 14Q3SS041-SB0205-SO-0/14Q3SS041-SB0205-SO-1: Total Organic Carbon (RPD 103% vs 50%), associated sample results were flagged J.

These samples were out of control for NWVPH FD set 14Q3SS041-SB0103-SO-0/14Q3SS041-SB0103-SO-1: C5-C6 Aliphatics (%RPD 108.57 vs 50), C8-C10 Aromatics (%RPD 138.46 vs 50), associated detected sample results were flagged J and nondetected results were flagged UJ.

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

Data qualified as estimated; usable as qualified.

f. Decontamination or Equipment Blank (if applicable)

◉ Yes ○ No ○ NA (Please explain.) Comments:

i. All results less than PQL?

○ Yes ◉ No ○ NA (Please explain.) Comments:

These analytes had Equipment Blank detects: DRO and RRO for AK102/103.

These analytes had Method Blank detects: 1-Methylnaphthalene, 2-Methylnaphthalene, Fluorene, Naphthalene, Phenanthrene for SW8270D-SIM.

These analytes had Method Blank detects: C10-C12 Aromatics, C6-C8 Aliphatics, Total VPH for NWVPH.

These analytes had Method Blank detects: C12-C16 Aliphatics, C21-C34 Aliphatics for NWEPH.

ii. If above PQL, what samples are affected?

Associated samples: 14Q3SS041-SB0101-SO-0, 14Q3SS041-SB0102-SO-0, 14Q3SS041-SB0103-SO-0, 14Q3SS041-SB0103-SO-1, 14Q3SS041-SB0104-SO-0, 14Q3SS041-SB0105-SO-0, 14Q3SS041-SB0201-SO-0, 14Q3SS041-SB0202-SO-0, 14Q3SS041-SB0203-SO-0, 14Q3SS041-SB0204-SO-0, 14Q3SS041-SB0205-SO-0.

No samples affected.

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

Data are usable as reported.

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

◉ Yes ○ No ○ NA (Please explain.) Comments:

Matrix:

These samples were flagged for Matrix spike duplicate recovery criteria less than the lower control limit: Vinyl Chloride (14Q3SS041-SB0103-SO-0, %R = 49 LCL=60 UCL=125) for SW8260C. Associated nondetected result was qualified as estimated and flagged UJ.

These samples were flagged for Matrix spike recovery less than the lower control limit: 1,3-Butadiene (14Q3SS041-SB0103-SO-0, %R = 66 LCL=70 UCL=130), Vinyl Chloride (14Q3SS041-SB0103-SO-0, %R = 45 LCL=60 UCL=125) for SW8260C. Associated nondetected results were qualified as estimated and flagged UJ.

Appendix B-2
Geotechnical Analysis

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Summary of Laboratory Test Results

Ft Richardson CH2M Hill (457958.09.HL.03)

NGE-TFT Project #: 3464-13(VIII)

CH2M Hill Sample ID	Moisture Content ASTM D2216 (% By Dry Mass)	Particle Size Analysis ASTM C136/D422/D6913 (% By Mass)			Bulk Density ASTM D7263 (pcf)	Specific Gravity ASTM D854	Unified Soil Classification ASTM D2487
		Gravel	Sand	Silt/Clay			
14Q3AT035-SB0803-SO-0	**3.5**	**51.9**	**41.6**	**6.5**	**119.3**	**2.692**	**(GW-GM) Well graded gravel with silt and sand**
14Q3AT035-SB1103-SO-0	**5.0**	**47.6**	**44.0**	**8.4**	**116.3**	**2.682**	**(GW-GM) Well graded gravel with silt and sand**
14Q3SS041-SB0201-SO-0	**3.5**	**54.6**	**37.3**	**8.1**	**130.2**	**2.673**	**(GW-GM) Well graded gravel with silt and sand**

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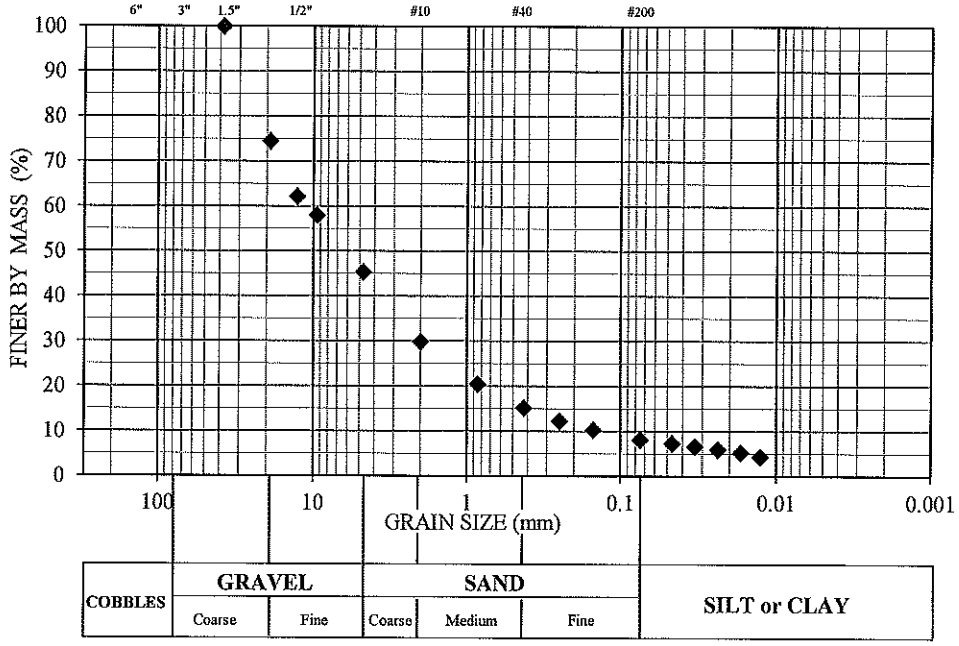
PROJECT CLIENT:	CH2M Hill
PROJECT NAME:	JBER R
PROJECT NO.:	3464-13
SAMPLE LOC.:	
NUMBER/ DEPTH:	14Q3SS041-SB0201-SO-0
DESCRIPTION:	Well-graded gravel w/ silt and sand
DATE RECEIVED:	7/24/2014
TESTED BY:	JA
REVIEWED BY:	AF

% GRAVEL:	54.6	USC:	GW-GM
% SAND:	37.3	USACOE FC:	S1
% SILT/CLAY:	8.1	.02 mm:	5.6

ASTM D1557 (uncorrected)	pcf
ASTM D4718 (corrected)	pcf
OPTIMUM M.C. (corrected)	%
NATURAL M.C.	3.5 %

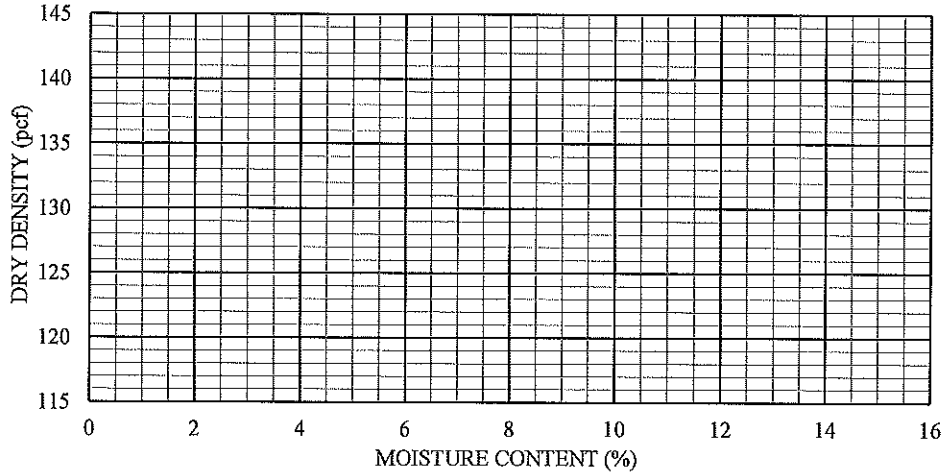
PARTICLE SIZE ANALYSIS ASTM D422 / C136



SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (U.S.)	TOTAL % PASSING	SPECIFICATION
152.40	6"		
76.20	3"		
38.10	1.5"	100	
19.00	3/4"	74	
12.70	1/2"	62	
9.50	3/8"	58	
4.75	#4	45	
2.00	#10	30	
0.85	#20	20	
0.43	#40	15	
0.25	#60	12	
0.15	#100	10	
0.075	#200	8.1	

MOISTURE-DENSITY RELATIONSHIP ASTM D1557



HYDROMETER RESULT

ELAPSED TIME (MIN)	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1	0.0467	7.3
2	0.0334	6.6
4	0.0239	6.0
8	0.0170	5.3
15	0.0127	4.3
30		
60		
250		
1440		

HYDRAULIC COND. (ASTM D2438)	
DEGRADATION (ATM T-313)	
PLASTICITY INDEX ASTM 4318	

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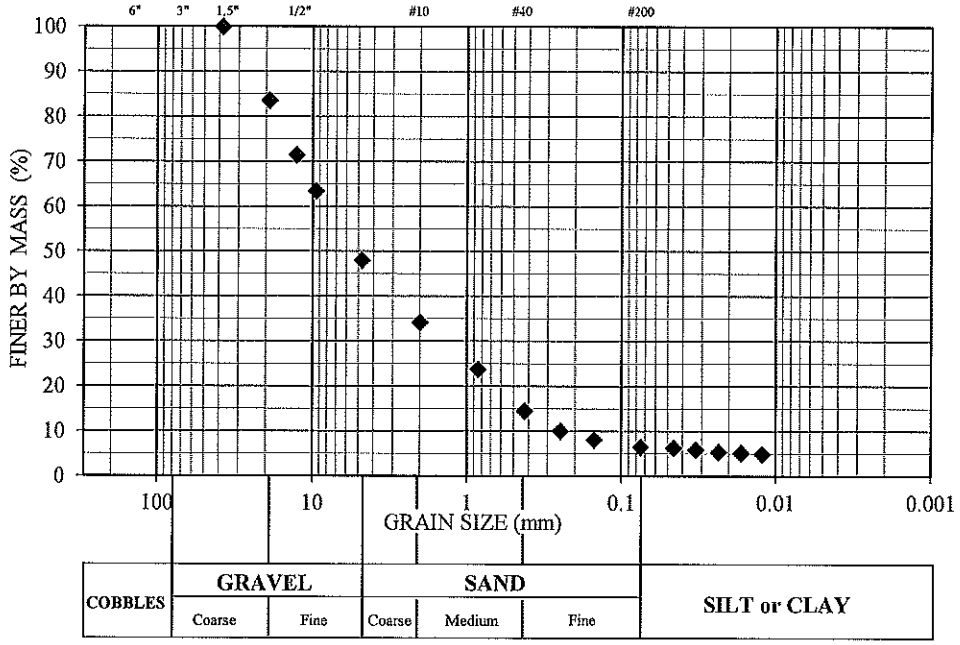
PROJECT CLIENT:	CH2M Hill
PROJECT NAME:	JBER R
PROJECT NO.:	3464-13
SAMPLE LOC.:	
NUMBER/ DEPTH:	14Q3AT035-SB0803-SO-0
DESCRIPTION:	Well-graded gravel w/ silt and sand
DATE RECEIVED:	7/24/2014
TESTED BY:	JA
REVIEWED BY:	AF

% GRAVEL:	51.9	USC:	GW-GM
% SAND:	41.6	USACOE FC:	S1
% SILT/CLAY:	6.5	.02 mm:	5.3

ASTM D1557 (uncorrected)	pcf
ASTM D4718 (corrected)	pcf
OPTIMUM M.C. (corrected)	%
NATURAL M.C.	3.5 %

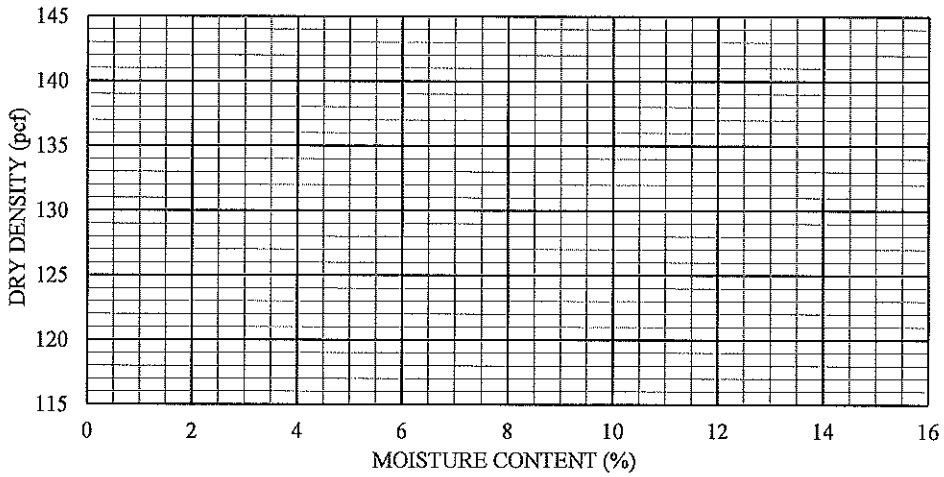
PARTICLE SIZE ANALYSIS ASTM D422 / C136



SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (U.S.)	TOTAL % PASSING	SPECIFICATION
152.40	6"		
76.20	3"		
38.10	1.5"	100	
19.00	3/4"	84	
12.70	1/2"	71	
9.50	3/8"	63	
4.75	#4	48	
2.00	#10	34	
0.85	#20	24	
0.43	#40	15	
0.25	#60	10	
0.15	#100	8	
0.075	#200	6.5	

MOISTURE-DENSITY RELATIONSHIP ASTM D1557



HYDROMETER RESULT

ELAPSED TIME (MIN)	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1	0.0458	6.4
2	0.0328	5.9
4	0.0234	5.4
8	0.0167	5.1
15	0.0122	4.9
30		
60		
250		
1440		

HYDRAULIC COND. (ASTM D2438)	
DEGRADATION (ATM T-313)	
PLASTICITY INDEX ASTM 4318	

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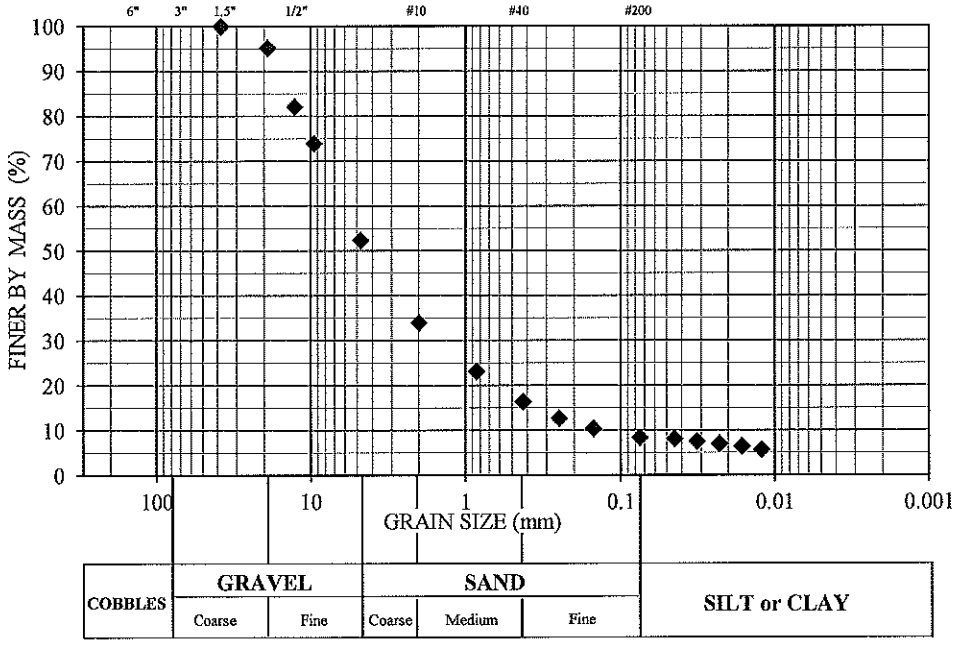
Laboratory Testing · Geotechnical Engineering · Instrumentation · Construction Monitoring Services · Thermal Analysis

PROJECT CLIENT:	CH2M Hill
PROJECT NAME:	JBER R
PROJECT NO.:	3464-13
SAMPLE LOC.:	
NUMBER/ DEPTH:	14Q3AT035-SB1103-SO-0
DESCRIPTION:	Well-graded gravel w/ silt and sand
DATE RECEIVED:	7/24/2014
TESTED BY:	JA
REVIEWED BY:	AF

% GRAVEL:	47.6	USC:	GW-GM
% SAND:	44.0	USACOE FC:	F1
% SILT/CLAY:	8.4	.02 mm:	6.8

ASTM D1557 (uncorrected)	pcf
ASTM D4718 (corrected)	pcf
OPTIMUM M.C. (corrected)	%
NATURAL M.C.	5.0 %

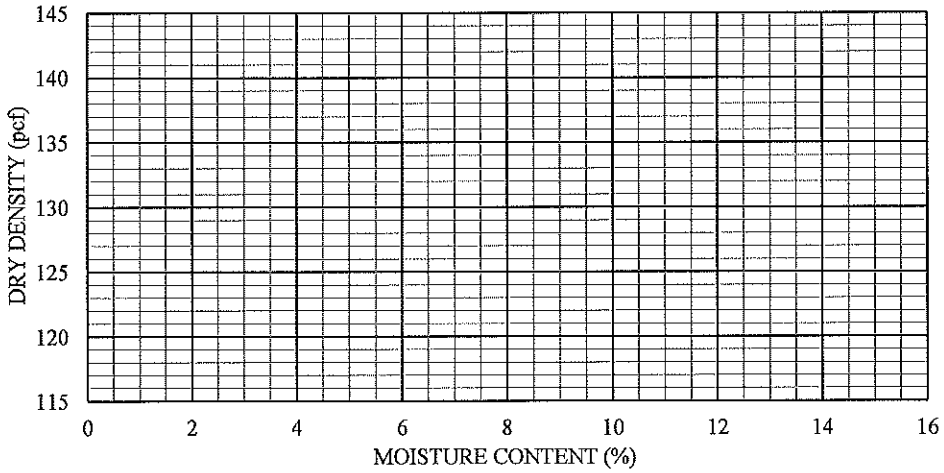
PARTICLE SIZE ANALYSIS ASTM D422 / C136



SIEVE ANALYSIS RESULT

SIEVE SIZE (mm)	SIEVE SIZE (U.S.)	TOTAL % PASSING	SPECIFICATION
152.40	6"		
76.20	3"		
38.10	1.5"	100	
19.00	3/4"	95	
12.70	1/2"	82	
9.50	3/8"	74	
4.75	#4	52	
2.00	#10	34	
0.85	#20	23	
0.43	#40	16	
0.25	#60	13	
0.15	#100	10	
0.075	#200	8.4	

MOISTURE-DENSITY RELATIONSHIP ASTM D1557



HYDROMETER RESULT

ELAPSED TIME (MIN)	DIAMETER (mm)	TOTAL % PASSING
0		
0.5		
1	0.0448	8.1
2	0.0319	7.6
4	0.0229	7.0
8	0.0164	6.5
15	0.0122	5.7
30		
60		
250		
1440		

HYDRAULIC COND. (ASTM D2438)	
DEGRADATION (ATM T-313)	
PLASTICITY INDEX ASTM 4318	

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Appendix C
ADEC's Ecoscoping Form

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Appendix C: ADEC's Ecoscoping Form

Site Name: SS041 - Roosevelt Road PCB Site
Completed by: Joy Chen
Date: 10/10/2014

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 – *describe observations below and evaluate all of the remaining sections without taking any off-ramps.*
☒ No – *go to next section.*

Comments:

• No visible staining of surface soils.
• No observed stunted vegetation.
• There is no significant surface water runoff or sediment transport from the site to surface water bodies. The nearest surface water body is Otter Lake, located approximately 1.5 mile west of the site.
• No contaminant was detected in soil between zero to 15 feet below ground surface at concentration in excess of the screening levels.

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 water body)
☐ 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

Aquatic Exposure Routes

☐ 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 visible staining of surface soils.
• No observed stunted vegetation.
• There is no significant surface water runoff or sediment transport from the site to surface water bodies. The nearest surface water body is Otter Lake, located approximately 1.5 mile west of the site.
• No contaminant was detected in soil between zero to 15 feet below ground surface at concentration in excess of the screening levels.

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-, threatened-, or species of special concern 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 Conceptual Site Model Guidance) and submit it with the form to you 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:
