UNITED STATES AIR FORCE
JOINT BASE ELMENDORF-RICHARDSON
ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

TREATABILITY STUDY IMPLEMENTATION REPORT
DA089 – ARMORED VEHICLE MAINTENANCE AREA

FINAL

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TREATABILITY STUDY IMPLEMENTATION REPORT
DA089 – ARMORED VEHICLE MAINTENANCE AREA

JOINT BASE ELMENDORF-RICHARDSON, ALASKA

Prepared for
Air Force Civil Engineer Center

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

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EXECUTIVE SUMMARY

The Air Force Civil Engineer Center (AFCEC) has implemented a treatability study at DA089 (formerly known as DA085) – Armored Vehicle Maintenance Area (AVMA), an Operable Unit (OU) E source area, pursuant to the process established in the Fort Richardson Federal Facility Agreement (1994) and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) remedial program, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA). The purpose of the treatability study was to assess the effectiveness of enhanced reductive dechlorination (ERD), which AFCEC considers to be an innovative treatment technology, for treating contaminated groundwater at the site as part of a pilot scale study.

An assessment of the current selected remedy for the AVMA source area in OU E, which consists of institutional controls, natural attenuation of tetrachloroethene (PCE) in groundwater, and long-term monitoring, has estimated the remedial timeframe to achieve cleanup goals and, subsequently, site closeout (SC) at approximately 120 years. This study will evaluate whether the injection of emulsified vegetable oil (EVO) into a PCE-contaminated aquifer is able to enhance the natural degradation of PCE (known as enhanced reductive dechlorination), speed up the cleanup process, and reduce overall life-cycle costs. Additionally, the treatability study tested how easily EVO can be injected into the ground and how far it travels.

This work was conducted by CH2M HILL under subcontract to Weston Solutions, Inc. (WESTON) within the scope of the Joint Base Elmendorf-Richardson (JBER) Performance-Based Remediation (PBR) project authorized by AFCEC Contract Number FA8903-09-D-8589, Task Order 0016. Work was performed in accordance with the *Uniform Federal Policy – Quality Assurance Project Plan DA085 – Armored Vehicle Maintenance Area Treatability Study Work Plan, Joint Base Elmendorf-Richardson, Alaska* (Work Plan). Note that the United States Air Force (USAF) identification number was changed from DA085 to DA089 following the approval of the Work Plan and prior to the submittal of this report.

DA089 is located in the western region of the cantonment area of JBER-Richardson (JBER-R), near the intersection of Otter Lake Road and D Street. DA089 consists of a PCE groundwater plume that originated in the area immediately downgradient from Building 726. Dry cleaning solvents (PCE and/or Stoddard solvent) were stored in underground storage tanks (USTs) at the site from 1951 until 1972, and tank bottoms were disposed of in a dumpster at the site. Low levels of PCE contamination were detected in soils at the Building 726 site, indicating that PCE had been released from the facility.

This report provides an overview of the treatability study implementation activities and initial results. This document includes injection well installation details, baseline soil and groundwater sampling results, and EVO injection data.

Well Installation and Development

Four injection wells and one monitoring well to measure the distribution of EVO (known as a radius of influence [ROI] well) were installed within the area of highest PCE concentrations (known as the target treatment zone), which is hydrologically upgradient of the designated

performance monitoring well (the well used to evaluate the effectiveness of the EVO treatment, AP-4413). The wells were installed within the perched aquifer, which is approximately 65 feet below ground surface (bgs) and is located on top of a silt layer. All wells were installed and developed in accordance with the Work Plan, with the exception of injection wells IW02-4413, IW03-4413, and IW04-4413, which were not developed because they were dry. However, a small amount of water (less than 0.5 foot) was present in these wells prior to EVO injection. The horizontal location, ground surface elevation, and top of well casing elevation were surveyed for each of these wells.

Soil Sampling and Analysis

Four soil samples were collected from the saturated soils within the target treatment zone during well installation. Two of the samples were analyzed for natural oxidant demand (NOD) and fraction of organic carbon (f_{oc}), while all four samples were tested for grain size distribution. NOD results from the soil samples were used to assess the applicability of using in situ chemical oxidation (ISCO) as a contingency option for a future remedy if ERD is unsuccessful at reducing PCE concentrations. Grain size distribution testing was conducted to better understand the subsurface hydrogeology and how that might affect the ability to inject EVO into the ground.

The NOD results indicate that ISCO would be inefficient and expensive to implement; therefore, it is unlikely that ISCO will be considered for any potential future contingency treatment. The grain size testing indicates that the soil is composed primarily of silty gravels and sands.

Baseline Groundwater Sampling and Analysis

Prior to injecting EVO into the groundwater, baseline groundwater samples were collected from wells within the target treatment zone (IW01-4413, AP-4413, and ROI-4413). Because wells IW02-4413, IW03-4413, or IW04-4413 were dry, no baseline groundwater samples were collected. All groundwater samples were analyzed for volatile organic compounds (VOCs), which includes PCE. Additionally, groundwater from AP-4413 was analyzed for other chemical indicators that can help assess the effectiveness of EVO, including total organic carbon (TOC), dissolved mercury, dissolved iron, dissolved manganese, dissolved gases, sulfide, nitrate+nitrite, alkalinity, chloride, sulfate, and volatile fatty acids.

These baseline groundwater sample results show a slight variability in PCE concentrations within the target treatment zone; however, PCE concentrations are generally similar to each other and to historical PCE concentrations measured at AP-4413. The similarity of PCE concentrations throughout the target treatment zone suggests that the ERD effects created by the EVO injections should be relatively uniform.

EVO Injection

An EVO solution (a mixture of EVO and clean water) was injected into each injection well within the target treatment zone. A total of 3,931 gallons of EVO solution (228 gallons of EVO mixed with 3,703 gallons of water) was injected into the four injection wells. An equal amount of EVO solution was injected into each injection well, with the exception of IW03-4413, into which only 53 gallons of EVO solution was injected because of an unreasonably slow injection rate of less than 1 gallon per minute (gpm). After injecting the EVO solution into the wells, an

additional 150 gallons of clean water was injected to flush the EVO solution from each well (except IW03-4413).

Other than at IW03-4413, the silty gravels and sands at DA089 easily accepted the injection of EVO. The injection rate at IW01-4413, IW02-4413, and IW04-4413 (35 gpm) was limited only by the injection system capabilities (injection of up to 40 gpm). The inability of EVO to be efficiently injected at IW03-4413 is likely related to possible well construction issues and/or the lack of well development, because there is practically no difference in lithology across the target treatment zone as noted by injection well boring logs and grain size samples.

Before, during, and after the EVO injections, the wells within the target treatment zone were monitored to assess how far the EVO solution was traveling. Groundwater within the wells was monitored both visually and with a water-level indicator and water quality meter. Visual breakthrough of the EVO solution (which is milky white) in wells confirmed that EVO had travelled at least 22 feet during injection at IW04-4413 and less than 15 feet during injection at IW01-4413. During the injections, visual breakthrough of EVO was also observed in the performance monitoring well AP-4413. Based on these observations, any possible future full-scale implementation of EVO injections should deploy an injection well spacing similar to the 15-foot well spacing of the treatability study.

Remaining Treatability Study Actions

Remaining treatability study activities include the following:

- Quarterly groundwater sampling, the results of which will be used to assess the performance of the EVO injections over time
- Data review and evaluation
- Implementation of contingency—additional round of EVO injections in fall 2014 followed by four additional quarters of groundwater sampling based on discussion of initial quarterly sampling results among the USAF, United States Environmental Protection Agency, and Alaska Department of Environmental Conservation, and the Draft *Uniform Federal Policy-Quality Assurance Project Plan – Addendum DA089 – Armored Vehicle Maintenance Area Treatability Study Work Plan – Additional Injection*.
- Preparation of the Treatability Study Completion Report, which will discuss the results of the initial quarterly performance monitoring, additional injections, and quarterly sampling, and provide recommendations for any further action.

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LIST OF ABBREVIATIONS AND ACRONYMS

°C	degree(s) Celsius
µg/L	microgram(s) per liter
µm	micrometer(s)
ADEC	Alaska Department of Environmental Conservation
AFCEC	Air Force Civil Engineer Center
AFCEE	Air Force Center for Engineering and the Environment
amsl	above mean sea level
AVMA	Armored Vehicle Maintenance Area
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	contaminant of concern
CSM	conceptual site model
DCE	dichloroethene
DO	dissolved oxygen
DPW	United States Army Directorate of Public Works
DQE	data quality evaluation
DQO	data quality objective
DRO	diesel-range organics
DTW	depth to water
EB	equipment blank
ENSR	ENSR Corporation
EPA	United States Environmental Protection Agency
ERD	enhanced reductive dechlorination
ESF	Environmental Staging Facility
EVO	emulsified vegetable oil
FD	field duplicate
f_{oc}	fraction of organic carbon
g/kg	gram(s) per kilogram
gal	gallon(s)
gpm	gallon(s) per minute
GRO	gasoline range organics
IDW	investigative-derived waste
ISCO	in situ chemical oxidation
JBER	Joint Base Elmendorf-Richardson
JBER-R	JBER-Richardson

MCL	maximum contaminant level
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
MS	matrix spike
MSD	matrix spike duplicate
mS/cm	milliSiemen(s) per centimeter
mV	millivolt(s)
N	primary sample
NA	not analyzed
NAVD	North American Vertical Datum
NC	not calculated
NM	not measured
NOD	natural oxidant demand
NTU	nephelometric turbidity units
OR	over range
ORP	oxidation reduction potential
OU	operable unit
PBR	Performance-Based Remediation
PCE	tetrachloroethene
PPE	personal protective equipment
psi	pound(s) per square inch
PVC	polyvinyl chloride
QC	quality control
RI	Remedial Investigation
ROD	Record of Decision
ROI	radius of influence
SARA	Superfund Amendments and Reauthorization Act
SC	site closeout
SOP	Standard Operating Procedure
SPCC	Spill Prevention, Control, and Countermeasure
TB	trip blank
TCE	trichloroethene
TO	Task Order
TOC	total organic carbon
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
UIC	Underground Injection Control
USAF	United States Air Force
UST	underground storage tank
UTM	Universal Trans Mercator

VOC	volatile organic compound
WESTON	Weston Solutions, Inc.
WGS	World Geodetic System
Work Plan	*Uniform Federal Policy-Quality Assurance Project Plan for DA085 – Armored Vehicle Maintenance Area Treatability Study Work Plan*

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1.0 INTRODUCTION

This document provides the details and documentation of the field and construction activities associated with the enhanced reductive dechlorination (ERD) substrate injections for the Treatability Study at DA089 (formerly known as DA085) – Armored Vehicle Maintenance Area (AVMA), a source area in Operable Unit (OU) E, located at Joint Base Elmendorf-Richardson (JBER), Alaska (Figure 1-1). An assessment of the current selected remedy, which consists of institutional controls, natural attenuation of tetrachloroethene (PCE) in groundwater, and long-term monitoring, has estimated the remedial timeframe to achieve cleanup goals and, subsequently, site closeout (SC) at approximately 120 years. This study will evaluate whether the injection of emulsified vegetable oil (EVO) into the PCE-contaminated aquifer is able to enhance the natural degradation of PCE, reduce the time to achieve cleanup goals and, consequently, reduce life-cycle costs for the site.

This document includes injection well installation details, baseline soil and groundwater sampling results, and EVO injection data. A Treatability Study Completion Report will be prepared to document results and conclusions, following the fall 2014 implementation of additional EVO injections (Contingency 1) and an additional four quarters of performance monitoring. The results from implementing this contingency will be used to provide recommendations for future post-Record of Decision (ROD) Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) actions for the consideration of the United States Air Force (USAF), United States Environmental Protection Agency (EPA), and Alaska Department of Environmental Conservation (ADEC).

The DA089 Treatability Study effort is administered by the Air Force Civil Engineer Center (AFCEC). This Treatability Study Implementation Report has been prepared by CH2M HILL in support of Weston Solutions, Inc.'s (WESTON's) prime contract FA8903-09-D-8589 with AFCEC (formerly the Air Force Center for Engineering and the Environment [AFCEE]), Task Order (TO) 0016.

The fieldwork was conducted from July 29, 2013, through September 16, 2013, in accordance with the Final *Uniform Federal Policy-Quality Assurance Project Plan* (*UFP-QAPP) for DA085 – Armored Vehicle Maintenance Area Treatability Study Work Plan* (Work Plan) (United States Air Force [USAF], 2013a). Note that the USAF identification number was changed from DA085 to DA089 following the approval of the Work Plan and prior to the submittal of this report.

The following sections describe the project overview and general characteristics that apply to DA089. Treatability Study implementation details and baseline sampling results for DA089 are presented in Sections 3 and 4.

1.1 Project Objectives

The objectives of the treatability study are to:

- Assess the effectiveness of in situ treatment for reducing PCE concentration in groundwater at the site through ERD using EVO. The effectiveness of the treatability study substrate

injections will be evaluated by calculating the reduction in the concentration of PCE in the performance well as compared to the pre-injection baseline PCE concentrations.

- Evaluate the ability to distribute substrate into the subsurface using permanent injection wells.

- Evaluate amendment dosing requirements and lateral spacing of injection points (radius of influence) required for full-scale application at DA089, pending a post-ROD change (i.e., ROD amendment).

- Assess the ability of the substrate to sustain anaerobic biodegradation (biotic) processes and promote reduction of PCE.

- Assess the potential need for substrate replenishment or other contingency measures.

The approach for the treatability study was described in the Work Plan (USAF, 2013a). The Work Plan describes the injection protocols, data quality objectives (DQOs), sampling methodologies, and analytical program for assessing conditions at DA089 to facilitate success of the treatability study.

1.2 Organization of Report

This report presents the details and documentation of the field and construction activities associated with the ERD substrate injections for the Treatability Study at DA089 and is organized into the following sections:

- **Section 1.0: Introduction –** presents project objectives and the organization of this report.

- **Section 2.0: Conceptual Site Model –** presents a summary of the site history, geology, hydrogeology, and nature and extent of contamination.

- **Section 3.0: Field Activities –** summarizes the field activities associated with implementation of the treatability study.

- **Section 4.0: Results –** presents results of the soil sampling, baseline groundwater sampling and injection monitoring.

- **Section 5.0: Conclusions –** presents observations from the implementation of the treatability study.

- **Section 6.0: Remaining Treatability Study Actions –** summarizes the remaining actions associated with the treatability study.

- **Section 7.0: References –** lists reference material used in preparation of this report.

Tables, figures, and appendixes follow Section 7.0.

2.0 CONCEPTUAL SITE MODEL

2.1 Site Location and Description

DA089 is located in the western region of the cantonment area of Fort Richardson, near the intersection of Otter Lake Road and D Street (Figure 1-1). DA089 consists of a PCE groundwater plume that was investigated as part of the *Remedial Investigation Report, Operable Unit E, Fort Richardson, Alaska* (OU E RI) in 2002 and 2003 (CH2M HILL, 2004). DA089 covers an area of approximately 140 acres on both the northern and southern sides of Davis Highway. The area north of Davis Highway is mostly open fields, grasslands, and woods with numerous small buildings and roads throughout. The area south of Davis Highway is more industrial. Several buildings are situated overlying the footprint of the dissolved PCE plume, including Buildings 726, 728, 730, 732, and 733.

2.2 Site History

DA089 was used as a gravel source in 1950 during construction of the railroad. Later, in the 1950s and 1960s, it served as a military vehicle wash area. Since 1973, the area has been used as a training area and obstacle course (Astley et al., 2001). In addition, the area was used for field maintenance of tanks, which included disposal of oil and other waste material (ENSR Corporation [ENSR], 2000).

DA089 was originally identified as a potential source area from historical aerial photographs, which indicated areas of buried debris, drainage ditches near the former vehicle wash area, and other identified ditches; however, data collected during the 2002 OU E RI (CH2M HILL, 2004) indicated that these areas were not the source area for the contaminated groundwater in the vicinity of the site.

The dissolved-phase PCE contamination in groundwater originated in the area immediately downgradient from Building 726. Dry-cleaning solvents (PCE and/or Stoddard solvent) were stored in underground storage tanks (USTs) at the site from 1951 until 1972, and tank bottoms were disposed of in a dumpster at the site. Low levels of PCE contamination were detected in soils at the Building 726 site, indicating that PCE had been released at the facility (ENSR, 1998). The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) EPA identification number for Fort Richardson is AK6214522157. The installation is included on the CERCLA National Priorities List. OU E is the fifth and final OU to be investigated at Fort Richardson, which includes the DA089 source area.

2.3 Geology and Hydrogeology

DA089 lies on an alluvial plain, often referred to as the Anchorage Lowland. The Elmendorf Moraine can be found approximately 0.5 mile north of the site. The underlying geology at DA089 is complex and highly variable. The Mountain View Fan is approximately 40 to 60 feet thick under most of the site. The fan consists of mostly sands and gravels with localized deposits of silt and clay. There are no wetlands or surface water features located on the site.

Groundwater directly underlying DA089 is encountered in both a shallow perched aquifer and a deeper confined aquifer separated by a low-permeability silt confining layer. The thickness of the

confining layer varies across the site and pinches out toward the northern edge of the site. The northern extent of the confining unit was determined to be adjacent to the Davis Highway, northwest of Building 732. Regional groundwater flow is to the northwest.

In areas where the confining layer is present, a shallow perched aquifer is encountered at approximately 60 feet below ground surface (bgs), and a deeper confined aquifer is encountered at approximately 100 feet bgs. The aquifers merge where the confining layer pinches out, just north of Davis Highway, forming a thick unconfined aquifer. Groundwater flow at the site is complex because of the nature of the geology; however, the general groundwater flow direction is toward the northwest (CH2M HILL, 2004). The hydraulic gradient of the unconfined aquifer generally trends northwesterly, following the topography of the Mountain View Fan.

The sources of groundwater to the unconfined aquifer are precipitation and seepage from Ship Creek. The influence of Ship Creek diminishes away from the creek bed, making precipitation and infiltration the most important contributors to the unconfined aquifer. It is also possible that portions of the unconfined aquifer receive groundwater input by upward flow from the confined aquifer; however, no evidence of this has been found so far. Over most of the cantonment area, the uppermost confining unit has the greatest control on the elevation of groundwater in the unconfined aquifer. Wells drilled into topographic highs of the upper confining unit are often dry. As groundwater drains from these topographic highs to lower elevations, groundwater flow pathways are deflected in directions inconsistent with the overall hydraulic gradient. In addition, contaminants may preferentially move downgradient along topographic lows within the unconfined aquifer. The topographic lows within the unconfined aquifer always contain measurable groundwater, although the topographic highs can drain between infiltration events. In the topographic high areas, unconfined groundwater is often not encountered during drilling (CH2M HILL, 2004).

The thin lens of water within the perched aquifer joins the upper confined aquifer to form the deep unconfined aquifer north of the Davis Highway where the upper confining unit pinches out. Near this boundary, the potentiometric surfaces of the unconfined aquifer and upper confined aquifer are very similar, indicating that the upper confining unit is discontinuous or “leaky” (CH2M HILL, 2004). This phenomenon is seen in AP-3534 and AP-3468. A conceptual site model (CSM) for DA089 is presented on Figure 2-1.

2.4 Source of Contamination

Although a specific source area for PCE contamination at DA089 has not been confidently identified, Building 726 is considered the likely source area (CH2M HILL, 2012). Low concentrations of PCE were detected in soils at the Building 726 site, and historical records indicate that PCE was used at Building 726 (a laundry facility). Former USTs associated with Building 726 were found to have leaked and were removed in 1987. During the tank removal, solvents (PCE and carbon tetrachloride) were detected in the soil beneath the tanks. The contaminated soil was removed, aerated in an adjacent parking lot, and then placed back in the excavation (ENSR, 1998).

Samples collected from confirmation borings following the UST removal and soil excavation at Building 726 showed that concentrations of carbon tetrachloride and PCE in soil were below

concentrations required for unrestricted use (ENSR, 1998). It is likely that PCE-contaminated soil was removed and treated during excavation of the USTs or had attenuated in the soil prior to the time the OU D RI was conducted.

2.5 Nature and Extent of Contamination

The only contaminant of concern (COC) in groundwater identified in the *Record of Decision (ROD) Operable Unit E, Fort Richardson* was PCE (USACE, 2005). No COCs were identified for soil. Although previous RIs conducted at the site did not identify a source for the PCE in groundwater, anecdotal evidence indicated that the source area was associated with laundry operations conducted at Buildings 732 and 726, respectively (United States Army Directorate of Public Works [DPW], 2008). The PCE plume extends approximately 1,200 feet northwest from this apparent Building 726 source.

Soil

During the OU E RI, soil samples were collected from DA089 (CH2M HILL, 2004). The disturbed area east of former Building 45-590 (current Building 45094), where historic photographs show potential areas of contamination, was characterized. No significant source of contamination was identified during the trench excavations.

The principal contaminants in samples from soil borings advanced for the installation of monitoring wells were low-level concentrations of total petroleum hydrocarbons as diesel-range organic [DRO] and gasoline-range organic [GRO] compounds, and volatile organic compounds (VOCs). No source areas for PCE and other contaminants in groundwater were identified at DA089 (CH2M HILL, 2004).

Building 726, now considered the source of the DA089 PCE plume, was investigated as part of the OU D RI, and low levels of PCE were detected in soil samples collected at Building 726 (ENSR, 1998).

Groundwater

Results from the Final *2012 Annual Field Activities Report CERCLA Sites* indicated PCE concentrations in six wells (AP-3468, AP-3534, AP-4341, AP-4342, AP-4411, and AP-4413) with concentrations ranging from 6.8 micrograms per liter (µg/L) in AP-4411 to 88.0 µg/L in AP-4413 (USAF, 2014a). PCE was detected in all of these monitoring wells at concentrations above the maximum contaminant level (MCL) of 5 µg/L (see Figure 2-2). Four of these wells (AP-4341, AP-4342, AP-4411, and AP-4413) are screened across the shallow perched aquifer, directly below DA089, while the other two wells are screened in the unconfined aquifer, downgradient from the point at which the shallow perched aquifer merges with the deeper confined aquifer (CH2M HILL, 2012).

The boundaries of the plume do not appear to be expanding, and no statistically significant increasing trends in the PCE concentrations are apparent from the historical monitoring data, indicating that the plume is stable (USAF, 2014a).

No daughter products of PCE degradation (i.e., trichloroethene [TCE] or dichloroethene [DCE]) were detected during the 2011 or 2012 groundwater sampling events, suggesting that PCE is not being biodegraded via reductive dechlorination. In addition, evaluation of certain geochemical parameters (discussed below) also indicates that the aquifer underlying DA089 is aerobic, and the conditions are not suitable for reductive dechlorination of PCE. The following evaluation is based on a comparison of geochemical indicators from six wells (AP-3468, AP-3534, AP-4341, AP-4342, AP-4411, and AP-4413) within the extent of contamination and crossgradient well AP-3893 (located approximately 1,800 feet northeast of Building 726).

3.0 FIELD ACTIVITIES

Field activities associated with the implementation of the treatability study were performed in accordance with the Work Plan (USAF, 2013a). The following tasks have been completed and are discussed in the following sections:

- Pre-treatability study activities
- Mobilization
- Decontamination
- Well installation
- Well development
- Soil sampling and analysis
- Baseline groundwater sampling and analysis
- Surveying
- Injection of EVO substrate
- Injection monitoring
- Demobilization
- Management of investigative-derived waste (IDW)

A photographic log and field notes of the treatability study field activities are provided in Appendix A.

3.1 Pre-Treatability Study Activities

The following pre-treatability study activities were completed prior to the implementation of the substrate injections at DA089:

- The Work Plan was approved by the United States Environmental Protection Agency (EPA) on September 4, 2013.

- Subcontractors (e.g., driller), equipment, and supplies were procured.

- JBER Utility Clearance was obtained and fully processed prior to well installation.

- A Spill Prevention, Control, and Countermeasure (SPCC) Plan was completed for the EVO that was stored onsite. The SPCC Plan is presented in Appendix B.

3.2 Mobilization

Two mobilizations to the site were conducted as part of the Treatability Study:

- The drilling subcontractor and CH2M HILL personnel mobilized to DA089 on July 29, 2013, to begin well installation activities.

- CH2M HILL personnel mobilized to DA089 on September 15, 2013, to begin substrate injection activities.

3.3 Decontamination

A temporary decontamination pad was set up at DA089 for decontamination of drilling equipment. All downhole equipment was decontaminated via steam cleaning prior to beginning drilling at a new location.

All nondedicated or disposable groundwater and soil sampling equipment was decontaminated prior to and after use by washing equipment with a phosphate-free, laboratory-grade detergent, triple-rinsing with deionized water, and then allowing the equipment to air dry.

3.4 Well Installation

A total of four injection wells and one radius of influence (ROI) well were installed at DA089. The injection wells (IW01-4413, IW02-4413, IW03-4413, and IW04-4413) were installed approximately 15 feet upgradient of AP-4413 and approximately 15 feet apart in a row perpendicular to the direction of groundwater flow. One ROI monitoring well (ROI-4413) was installed at a distance halfway between the center two injection wells (IW02-4413 and IW03-4413). Well installation details are provided in Table 3-1, and the locations of the injection wells and ROI well are shown on Figure 3-1. Well installation was performed in July with verbal approval of EPA and ADEC, prior to formal approval of the Work Plan (USAF, 2013a). All wells were constructed in accordance with EPA guidance (EPA, 2008) and ADEC requirements using an air rotary drilling technique (See Standard Operating Procedures [SOPs] 14 and 15 of the JBER Basewide UFP-QAPP [USAF, 2013b]). Boring logs and well construction diagrams are presented in Appendix C.

Table 3-1: Summary of Well Construction Details

Well Name	Aquifer	Total Borehole Depth (feet bgs)	Borehole Diameter (inches)	Casing Diameter (inches)	Casing Type	Screen Slot Size (inch)	Screen Type	Screen Interval (feet bgs)
IW01-4413	Shallow	72	6	2	PVC-80	0.065	Wire-wound, continuous-slot PVC	67 to 72
IW02-4413	Shallow	70	6	2	PVC-80	0.065		65 to 70
IW03-4413	Shallow	70	6	2	PVC-80	0.065		65 to 70
IW04-4413	Shallow	72	6	2	PVC-80	0.065		65 to 70
ROI-4413	Shallow	72	6	2	PVC-40	0.010	Mill-slot	65 to 70

3.4.1 Casing and Screen

Injection and ROI wells were constructed with new, unused, decontaminated Schedule 80 and 40 polyvinyl chloride (PVC) pipe casing and screen, respectively (Table 3-1), with internal flush-threaded joints that conform to the ASTM International, International Standard F-480-88A, or the National Sanitation Foundation Standard 14 (Plastic Pipe System). Glue or solvent-welded joints were not used in well construction.

Injection well screens were constructed using a continuous 0.065-inch slot, wire-wound design to provide maximum inlet area consistent with strength requirements. Screens were fabricated by

circumferentially wrapping a triangularly shaped wire around a circular array of internal rods or perforated individual channels. The wire configuration produces inlet slots with sharp outer edges, widening inwardly to minimize clogging. For maximum collapse strength, each juncture between the horizontal wire and the vertical rods was made by sonic welding. The ROI well screen was constructed using a 0.010-inch mill slot screen. A threaded PVC cap or point was placed at the bottom of each screen.

3.4.2 Filter Pack and Bentonite Grout

The filter pack material for the injection wells consisted of inert, washed, well-rounded 8/12 silica sand. The filter pack for the ROI well consisted of inert, washed, well-rounded 10/20 silica sand. The filter pack was free of roots, trash, and other deleterious material. The filter pack was placed a minimum of 2 feet above each well screen. The filter pack was tagged continuously during installation to ensure proper placement.

Compressed, uncoated 3/8-inch bentonite chips were used as a seal between the filter pack and cement bentonite grout, with a minimum thickness of 5 feet. Bentonite chips were allowed to hydrate for a minimum of 1 hour prior to the installation of the grout. Above the bentonite chip seal, a cement bentonite grout was installed to within 3 feet of the ground surface. The cement bentonite grout was allowed to hydrate for a minimum of 4 hours prior to the installation of the surface completion.

3.4.3 Surface Completion

The injection and ROI wells were set as aboveground completions. The casings extend approximately 3 feet above ground surface. The PVC well casings are protected with 8-inch-diameter steel aboveground protective casing (extending 3.5 feet above ground surface) surrounded by Enviroblocks. Each PVC riser is capped with an expansion plug, and the steel cap on the protective casing is secured with a combination lock. The steel casing is set in a concrete pad that is flush with the existing road or ground surface.

3.5 Well Development

IW01-4413 and RO1-4413 were developed 10 and 7 days following construction, respectively, to remove fines from the filter pack and to restore hydraulic connectivity to the aquifer. Injection wells IW02-4413, IW03-4413, and IW04-4413 were dry 24 hours following well construction and as such were not developed. Well development consisted of using a combination of surge blocks, bailing, and pumping in accordance with the JBER Basewide UFP-QAPP (USAF, 2013b). Development continued until the pH, temperature, specific conductance, dissolved oxygen, and oxidation reduction potential (ORP) of the produced groundwater had stabilized, and until the development water turbidity stabilizes at a level of less than 10 nephelometric turbidity units (NTU) or until ten casing volumes had been removed. Well development logs are provided in Appendix D. A summary of the well development details is provided in Table 3-2.

Table 3-2: Summary of Well Development

Well ID	Final Two Water Quality Parameter Measurements						Total Volume Removed (gal)	Calculated Well Casing Purge Volume (gal)	Calculated Borehole Purge Volume (gal)	Well Casing Volumes Removed	Borehole Volumes Removed
	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temperature (ºC)	ORP (mV)					
IW01-4413	7.65	0.661	OR	NM	7.2	194.9	32.8	4.8	44.5	68	7.4
	7.65	0.659	OR	NM	6.93	192.1					
Percent difference	0.0	0.3	NC	NC	3.8	1.4					
ROI-4413	7.54	0.634	230	NM	7.63	187.8	21.6	2.2	19.9	98	10.9
	7.66	0.634	200	NM	7.43	187.8					
Percent difference	1.6	0.0	14.0	NC	2.7	0.0					

Notes:

ºC = degree(s) Celsius
DO = dissolved oxygen
gal = gallon(s)
mg/L = milligram(s) per liter
mS/cm = milliSiemen(s) per centimeter
mV = millivolt(s)
NC = not calculated
NM = not measured
OR = over range

3.6 Soil Sampling and Analysis

Subsurface soil samples were collected from soil cores recovered during well installation. The soil samples were collected from within the targeted contaminated aquifer at the boring location. The samples were analyzed for natural oxidant demand (NOD), fraction of organic carbon (f_{oc}), and grain size distribution. Four soil samples were collected from the contaminated aquifer. Analysis of NOD and f_{oc} were used to assess the applicability of using in situ chemical oxidation (ISCO) as a contingency option for future remedial action should the use of ERD be unsuccessful at reducing PCE concentrations. Table 3-3 presents the soil sample locations, depths, and analyses. The analytical results are presented in Section 4.1.

Table 3-3: Soil Samples and Analyses

Field Location	Sample ID	Sample Type	Depth (feet bgs)	NOD (ASTM D7262)	f_{oc} (SW9060)	Grain Size (ASTM D422)
IW01-4413	13Q3IW-01-4413-SO-0	N	67 to 72	X	X	X
ROI-4413	13Q3DA085-ROI-4413-SO-0	N	67 to 72			X
IW03-4413	13Q3IW-03-4413-SO-0	N	67 to 70	X	X	X
IW04-4413	13Q3IW-04-4413-SO-0	N	67 to 72			X

Note:
N = primary sample

3.7 Baseline Groundwater Sampling and Analysis

Baseline groundwater sampling was conducted at one newly installed injection well (IW01-4413), one newly installed ROI monitoring well (ROI-4413), and one performance monitoring well (AP-4413) prior to substrate injection to document pre-injection conditions. Groundwater samples were used to assess the variability of PCE concentrations within the target treatment zone. Additionally, the groundwater sample from the performance monitoring well was analyzed for VOCs, total organic carbon (TOC), dissolved mercury, dissolved iron, dissolved manganese, dissolved gases, sulfide, nitrate+nitrite, alkalinity, chloride, sulfate, and volatile fatty acids. Field quality control (QC) samples were collected during the baseline groundwater sampling. The rationale and objective of the field QC samples are presented in Worksheet #20 of the Work Plan (USAF, 2013a). Field QC samples for DA089 included one field duplicate (FD), one matrix spike/matrix spike duplicate (MS/MSD), one equipment blank (EB), and one trip blank (TB).

Table 3-4 presents the groundwater sample locations and analyses. Groundwater sampling logs are presented in Appendix E.

Table 3-4: Baseline Groundwater Samples and Analyses

Location	Sample ID	Matrix	Sample Type	Collection Date	E310.1	E300.0M	E300.0	E353.2	E376.2	RSK-175	SW6010B	SW9060	SW8260C
IW-01-4413	13Q31W-01-4413-GW-0	Groundwater	N	26-Aug-13									X
AP-4413	AP-4413-13-0830-0	Groundwater	N	26-Aug-13	X	X	X	X	X	X	X	X	X
AP-4413	AP-4413-13-0830-1	Groundwater	FD	26-Aug-13	X	X	X	X	X	X	X	X	X
ROI-4413	13Q3DA085-ROI-4413-0	Groundwater	N	26-Aug-13									X

Notes:

E310.1 = Alkalinity
E300.0M = Volatile fatty acids
E300.0 = Chloride and sulfate
E353.2 = Nitrate+nitrite
E376.2 = Sulfide
RSK-175 = Dissolved gases
SW6010C = Dissolved iron and manganese
SW9060 = Total organic carbon
SW8260C = Volatile organic compounds

3.8 Surveying

Following the installation of injection and ROI wells, the horizontal location, ground surface elevation, and top-of-casing elevation was surveyed by Lantech, an Alaska-licensed surveyor. The accuracy of the horizontal plane survey is ±1 foot and was measured to a reference point on the well casing. The vertical plane survey measurements at the ground surface and on the northern side of the top of the inner casing are accurate to ±0.01 foot. The point at which the elevation was measured on the inner casing was recorded so that future water level measurements can be consistently made from the same location. Survey activities were conducted in accordance with the JBER Basewide UFP-QAPP (USAF, 2013b). Survey data are provided in Table 3-5.

Table 3-5: Well Survey Data

Well Name	WGS84 (G1674) UTM Zone 6N (North-Meters)	WGS84 (G1674) UTM Zone 6N (East-Meters)	Measuring Point Elevation NAVD 88 (feet amsl)
IW01-4413	6794413.365	354340.404	290.73
IW02-4413	6794415.993	354343.567	291.12
IW03-4413	6794419.267	354347.219	291.99
IW04-4413	6794422.238	354350.462	292.49
ROI-4413	6794417.766	354345.509	291.09

Notes:
amsl = above mean sea level
NAVD = North American Vertical Datum
UTM = Universal Trans Mercator
WGS = World Geodetic System

3.9 Injection of EVO Substrate

An EVO substrate manufactured by Terra Systems was selected for injection at DA089. The EVO substrate was a custom blend of 60 percent SRS-SD (0.6-micrometer [µm] droplet size) and 40 percent SRS-FR (5-µm droplet size). Each SRS solution contains 60 percent soybean oil and 4 percent potassium or sodium lactate, with the remainder being water, surfactants, and organic and inorganic nutrients (Appendix F). The EVO substrate was supplied by the manufacturer in a 275-gallon tote. One tote was delivered to the site and stored within secondary containment that consisted of an 8- by 8- by 1-foot wooden frame lined with a 20-milliliter plastic liner.

The EVO substrate was mixed with water obtained from a nearby fire hydrant at an approximate 5.5 percent concentration using a tote-mounted injection system (see Photograph 10 in Appendix A). The injection system, powered by a submersible pump, used a Dosatron proportional chemical dispenser (capable of mixing up to 40 gallons per minute [gpm]) to mix a 5 percent solution of EVO and water. Because a 5.5 percent solution was the desired ratio, the injections were done in 275-gallon batches, in which an additional 2.9 gallons of EVO were added to the batch of injection water to make up the 0.5 percent solution deficiency. Injections were performed one well at a time until the injection volume at a given well was met.

Performing the injection one well at a time allowed for the most possible monitoring locations for observing EVO breakthrough and radius of influence (see Section 3.10). Prior to injecting the EVO substrate at each injection well, approximately 100 gallons of water was injected into each well to help determine the possible injection rates and pressures at each injection well. The EVO substrate injections proceeded in the following order: IW04-4413 (easternmost injection well), IW01-4413 (westernmost injection well), IW02-4413, and IW03-4413. A total of 3,931 gallons of EVO solution (228 gallons of EVO) was injected into the four injection wells. The injection rate at IW01-4413, IW02-4413, and IW04-4413 was approximately 35 gpm. A total of only 53 gallons of EVO solution was injected into IW03-4413 at less than 1 gpm before the injection was terminated because of insufficient flow. Following the substrate injections, each injection well (except IW03-4413) was flushed with approximately 150 gallons of clean water. Table 3-6 provides a summary of the EVO injection volumes and masses.

Table 3-6: EVO Injection Summary

Field Location	Total Injection Volume (gallons)	Volume of EVO (gallons)	Mass of EVO (pounds)
IW01-4413	1,269	74	592
IW02-4413	1,290	75	602
IW03-4413	53	3	25
IW04-4413	1,319	77	616

3.10 Injection Monitoring

Injection monitoring was conducted during injection to confirm effective delivery of ERD substrate. Injection volumes were accounted for in two ways: (1) rough estimates of the volume of EVO solution injected were kept by counting batches (each batch was approximately 275 gallons [see Section 3.9]) and (2) an accurate measurement of the volume of EVO solution was kept on an electronic totalizing flow meter mounted inline between the injection system and the wellhead. Flow rates were measured using the instantaneous flow rates function on each electronic totalizing flow meter. Attached to each injection wellhead was a pressure gauge that was used to measure injection pressures. The performance monitoring well (AP-4413), ROI well (ROI-4413), and the injection wells were monitored for ORP, turbidity, specific conductance, temperature, and visual observation (that is, the substrate is milky white) immediately before, during, and after injections by taking grab samples periodically for measurement using a water quality meter. Depth to groundwater measurements were collected in four nearby wells (AP-4413, ROI-4413, AP-4341, and AP-4342) along with the four injection wells twice daily. The ground surface around each injection well was continually monitored for any evidence of surfacing of EVO solution. Parameters were monitored in accordance with the frequency detailed in Table 3-7. Results of injection monitoring are presented in Sections 3.9 and 4.3.

Table 3-7: Injection Monitoring Parameters

Parameter	Frequency
Total volume injected per well	Hourly
Flowrate per well	Hourly
Substrate volume per well	Hourly
Injection pressure at well head	Hourly
Temperature, specific conductance, and color observation	Hourly
ORP and turbidity	Twice daily
Depth to water in nearby wells	Twice daily
Evidence of surfacing	Continually

3.11 Demobilization

Following completion of treatability study activities, equipment was demobilized, and the treatability study area was cleaned and returned to its previous condition to the extent possible.

3.12 Management of IDW

Wastes generated during treatability study activities include general refuse (expended personal protective equipment [PPE], paper towels, plastic bags, and plastic water containers) and IDW (soil drill cuttings, purge water from well sampling, and wastewater from decontamination activities).

Consistent with the Basewide UFP-QAPP (USAF, 2013b), wastes were taken to the Environmental Staging Facility (ESF), which is located at Building 955 on Warehouse Street near the intersection with Otter Lake Road. Access to the facility is coordinated through the current operations contractor, AECOM. Specific wastes were handled as described below:

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

- Soil cuttings were placed into a labeled 55-gallon drum during soil boring advancement and were transported to the ESF. The drum was labeled with date, project name, well/boring number, contents, depths of material, corresponding analytical sample numbers, analysis to be performed, and the contractor point of contact.

- Soil was characterized for appropriate treatment and disposal using soil cuttings sampling results. The analytical results were provided to the JBER ESF operator, who then disposed of cuttings based on the results. Disposal records are on file and available upon request.

- Decontamination and purge 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. After treatment, the water was sampled for

constituents in the JBER water discharge permit and discharged to the storm drain after verifying that constituents were below permit requirements.

3.13 Deviations from the Work Plan

The treatability study field activities were conducted in accordance with the Work Plan (USAF, 2013a) with the following exceptions:

- Because of drilling difficulties and lack of soil recovery, one soil sample was collected from ROI-4413 instead of IW02-4413 and was tested for grain size.
- Injection wells IW02-4413, IW03-4413, and IW04-4413 were not developed resulting from a lack of water within the well at least 24 hours following construction.
- Baseline groundwater samples were not collected from injection wells IW02-4413, IW03-4413, and IW04-4413 because of insufficient water within the well.
- Baseline groundwater samples from IW01-4413 and ROI-4413 were collected with the use of a bailer with a VOC tip because of low water levels.
- Only 53 gallons of EVO solution were injected into IW03-4413 (instead of 1,000 gallons) because of the inability of the well and/or subsurface to accept the solution. The remaining EVO solution was injected equally between the other three injection wells.
- The Underground Injection Control (UIC) notification was inadvertently not submitted to EPA prior to injection. The injection wells for CG039 and DA089 were included in the JBER UIC inventory update provided to EPA on September 19, 2014.

4.0 RESULTS

The results of the soil sampling, baseline groundwater sampling, and injection monitoring are presented in the following sections.

4.1 Soil Analytical and Geotechnical Results

Four subsurface soil samples were collected for laboratory analysis. Two of the soil samples were analyzed for NOD and f_{oc}, and four of the soil samples were tested for grain size distribution (details of sample collection are summarized in Section 3.6). Analytical and grain size distribution results are presented in Table 4-1. Laboratory analytical reports and grain size testing reports are provided in Appendix G.

4.1.1 Natural Oxidant Demand

Two subsurface soil samples collected at the target treatment zone were analyzed using ASTM D7262 (48-hour permanganate NOD). NOD results may be used to determine the applicability of using permanganate as a contingency option for future remedial action should the use of ERD be unsuccessful at reducing PCE concentrations.

The analytical results (Table 4-1) show that NOD within the subsurface at DA089 is heterogeneous, ranging from 3.05 to 16.4 grams per kilogram (g/kg). Typically, NOD results greater than 10 g/kg suggest limited applicability of permanganate treatment.

4.1.2 Fraction Organic Carbon

Results of f_{oc} sampling are used to corroborate NOD sample results when deciding on the use of permanganate. Like the NOD sample results, the f_{oc} sample results show a wide range from 193 to 3,610 milligrams per kilogram (mg/kg). The sample with high NOD results had correspondingly high f_{oc} results, and the sample with lower NOD results had lower f_{oc} results. The f_{oc} results are presented in Table 4-1.

4.1.3 Grain Size Distribution

Grain size distribution testing was conducted to better understand the subsurface hydrogeology and how it might relate to injection hydraulics. Subsurface soils are relatively consistent across the target treatment zone, and are composed primarily of silty gravels and sands. Samples collected from ROI-4413 and IW04-4413 were collected from 67 to 72 feet bgs. Boring logs indicate that the underlying silt layer is present between 69 and 70 feet bgs. Therefore, the collection of the underlying silt layer in the sample may have biased the grain size analysis toward the silt fraction. Soil descriptions for each sample are shown in Table 4-1.

Table 4-1: Soil Sample Results

Field Location	Sample ID	Sample Type	Depth (feet bgs)	NOD (g/kg)	f_{oc} (mg/kg)	Soil Description
IW01-4413	13Q3IW-01-4413-SO-0	N	67 to 72	3.05	193	Silty gravel
ROI-4413	13Q3DA085-ROI-4413-SO-0	N	67 to 72	NA	NA	Gravelly silt with sand
IW03-4413	13Q3IW-03-4413-SO-0	N	67 to 70	16.4	3,610	Poorly-graded gravel with sand
IW04-4413	13Q3IW-04-4413-SO-0	N	67 to 72	NA	NA	Silty gravel with sand

Note:
NA = not analyzed

4.2 Baseline Groundwater Sampling Results

Prior to the injection of EVO into the subsurface, baseline groundwater samples were collected from one newly installed injection well (IW01-4413), one newly installed ROI monitoring well (ROI-4413), and one performance monitoring well (AP-4413) on August 26, 2013. The other three injection wells planned for sampling were dry. Groundwater samples were used to assess the variability of PCE concentrations within the target treatment zone. Additionally, the performance monitoring well groundwater sample was analyzed for VOCs, TOC, dissolved mercury, dissolved iron, dissolved manganese, dissolved gases, sulfide, nitrate+nitrite, alkalinity, chloride, sulfate, and volatile fatty acids. Complete analytical results are included in Appendix H (Table H-1) along with the laboratory analytical reports and the data quality evaluation (DQE) report.

PCE concentrations measured in groundwater samples collected during the baseline groundwater sampling show that PCE concentrations within the target treatment zone are generally consistent with each other and with historical values (see Figure 2-2). Baseline PCE results are shown on Figure 3-1. A summary of PCE concentrations is shown in Table 4-2.

Table 4-2: Baseline Groundwater Sampling Results – PCE

Field Location	Sample ID	Sample Type	PCE (µg/L)
AP-4413	AP-4413-13-0830-0	N	78.8
	AP-4413-13-0830-1	FD	75.7
IW01-4413	13Q31W-01-4413-GW-0*	N	117
ROI-4413	13Q3DA085-ROI-4413-0*	N	72.9

* Samples collected using a bailer with VOC tip because of low water levels.

4.3 Injection Monitoring Results

Injection monitoring was conducted to confirm the delivery of ERD substrate to the subsurface. The injection monitoring process was described in Section 3.10, and substrate injection details were presented in Table 3-6. Results of the EVO distribution monitoring are discussed in the following section and are summarized in Tables 4-3 and 4-4.

Table 4-3 presents a summary of the injection order, injection volume, substrate volume, injection rate, injection pressure, and observations from the injections at IW01-4413, IW02-4413, IW03-4413, and IW04-4413. EVO did not surface during injections.

Baseline water quality parameters were collected from monitoring wells AP-4413 and ROI-4413 prior to beginning injections. Visual breakthrough of the milky white EVO solution was observed in both AP-4413 and ROI-4413 prior to the second round of water quality measurements. Once visual breakthrough was observed, no additional water quality measurements were made. During injection at IW04-4413, the observed ROI was at least 22 feet (the distance to ROI-4413). The observed ROI during injection at IW01-4413 was less than 15 feet because no EVO breakthrough was observed in IW02-4413 located 15 feet away. During injection at IW02-4413, breakthrough of EVO did occur at the downgradient performance monitoring well AP-4413 located approximately 15 feet away. Locations of EVO breakthrough are shown on Figure 3-1.

Depth to water was measured at nearby wells at least twice during the injections (before and after). The three injection wells that were dry following installation (IW02-4413, IW03-4413, and IW04-4413) each contained less than approximately 0.5 foot of water prior to injection. Injection activities resulted in less than a 0.5 foot increase in water levels in wells within the target treatment zone (AP-4413 and ROI-4413) and virtually no difference in water levels in surrounding monitoring wells (AP-4341 and AP-4342). A summary of the depth to water measurements is provided in Table 4-4.

Table 4-3: Injection Monitoring Results

Injection Well	Date	Injection Order	Injection Start Time	Approximate Total Injection Time (min)	Total ERD Injection Volume (gal)	Volume of EVO (gal)	Injection Rate (gpm)		Injection Pressure (psi)		Observations
							Max	Min	Max	Min	
IW01-4413	9/16/13	3rd	10:36	50	1,269	74	35	30	5	0	No breakthrough observed at AP-4413 or IW02-4413
IW02-4413	9/16/13	4th	11:25	40	1,290	75	35	30	0	0	Visual breakthrough observed at AP-4413
IW03-4413	9/16/13	2nd	10:30	66	53	3	< 1	< 1	15	14	Stopped initial injection and moved on to IW01-4413 because of slow injection rate and high pressure. After completing remaining injections, continued at IW03-4413. Unable to inject in IW03-4413, so injected remaining EVO solution equally into IW01-4413, IW02-4413, and IW04-4413
IW04-4413	9/16/13	1st	9:40	45	1,319	77	35	30	0	0	Visual breakthrough observed at IW03-4413 and ROI-4413

Note:
psi = pound(s) per square inch

Table 4-4: Depth to Water Measurements

Date	AP-4413		ROI-4413		AP-4341		AP-4342		IW01-4413		IW02-4413		IW03-4413		IW04-4413	
	Time	DTW	Time	DTW	Time	DTW	Time	DTW	Time	DTW	Time	DTW	Time	DTW	Time	DTW
09/15/13 Pre-Injection	1558	71.42	1556	71.20	1604	63.9	1610	96.56	1557	71.00	1555	71.10	1554	71.95	1553	72.46
09/16/13 Post-Injection	1024	71.46	1018	70.99	1512	63.9	1518	96.49	1224	70.85	1219	70.94	1015	71.48	1406	71.88
	1153	71.16	1104	70.75					1411	70.75	1505	70.93	1408	69.42		
	1412	71.34	1409	70.95												

Note:
DTW = depth to water

5.0 CONCLUSIONS

5.1 Contingency Use of ISCO

Based on the performance monitoring data collected during the treatability study, additional remedial actions (contingency measures) may be employed at DA089 if ERD is unsuccessful at reducing PCE concentrations. Contingency measures are outlined in the Work Plan (USAF, 2013a). Contingency measures will not be implemented without additional regulatory approval.

One contingency outlined in the Work Plan was the use of ISCO by injecting sodium permanganate, depending upon the results of the NOD analyses from DA089.

The results of soil NOD and f_{oc} analyses show variability in subsurface soils. The subsurface soil type is generally consistent in the target treatment area (typically sands and gravels with silt), and the distribution of NOD and f_{oc} do not appear to be related to specific soil types based on the grain size distributions. Typically, NOD results greater than 10 g/kg suggest limited applicability of permanganate treatment. Therefore, because NOD exists at concentrations greater than 10 g/kg within the target treatment zone, it is likely that any potential future contingency use of ISCO would be inefficient and expensive to implement.

5.2 PCE Variability within the Target Treatment Zone

Baseline groundwater samples were collected from one injection well, one ROI well, and one performance monitoring well within the target treatment zone prior to the injection of EVO substrate to assess the variability of PCE concentrations within the target treatment zone. While there is slight variability in PCE concentrations (75.7 to 117 µg/L) within the target treatment zone based on these three data points, PCE concentrations are generally similar to each other (less than half an order of magnitude difference) and to historical PCE concentrations. The lack of variability in PCE concentrations within the target treatment zone suggests that the effects of ERD treatment caused by EVO substrate injection within the target treatment zone should be relatively uniform.

5.3 Substrate Injection Hydraulics

The shallow subsurface lithology at DA089 consists largely of sands and gravels with some silt and easily accepts the injection of EVO. The injection rate at IW01-4413, IW02-4413, and IW04-4413 was only limited by the injection system capabilities (injection of up to 40 gpm), and these wells were injected at a conservative 35 gpm at wellhead pressures of 0 psi. During injection at IW04-4413, the observed ROI was at least 22 feet. The observed ROI during injection at IW01-4413 was less than 15 feet because no EVO breakthrough was observed in IW02-4413 located 15 feet away. However, breakthrough of EVO did occur at the downgradient performance monitoring well AP-4413, also located 15 feet away. Because of lack of nearby monitoring locations downgradient of the performance monitoring well, observations of downgradient distribution of EVO are limited to the 15 feet between the injection wells and performance monitoring well. The ability of the aquifer to accept the injection of EVO and the observed ROI suggest that any possible future full-scale implementation of EVO injections should deploy an injection well spacing of approximately 15 feet.

Because the injection well boring logs and grain size distribution results show practically no difference in lithology within the target treatment zone, the inability of EVO to be injected at IW03-4413 is likely related to a well construction issue and/or the lack of well development.

6.0 REMAINING TREATABILITY STUDY ACTIONS

This Treatability Study Implementation Report outlines the implementation of the treatability study, including injection and monitoring well installation activities, baseline groundwater sampling, soil analysis and substrate selection, and injection field activities.

Remaining treatability study activities include the following:

- Quarterly groundwater performance monitoring
- Data review and evaluation
- Implementation of contingency—additional round of EVO injections in fall 2014 followed by four additional quarters of groundwater sampling, based on discussion of initial quarterly sampling results among the USAF, EPA, and ADEC, and the Draft *Uniform Federal Policy-Quality Assurance Project Plan – Addendum DA089 – Armored Vehicle Maintenance Area Treatability Study Work Plan – Additional Injection* (USAF, 2014b).
- Preparation of the Treatability Study Completion Report, which will discuss the results of the initial quarterly performance monitoring, additional injections, and quarterly sampling, and will provide recommendations for any further action.

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Figures

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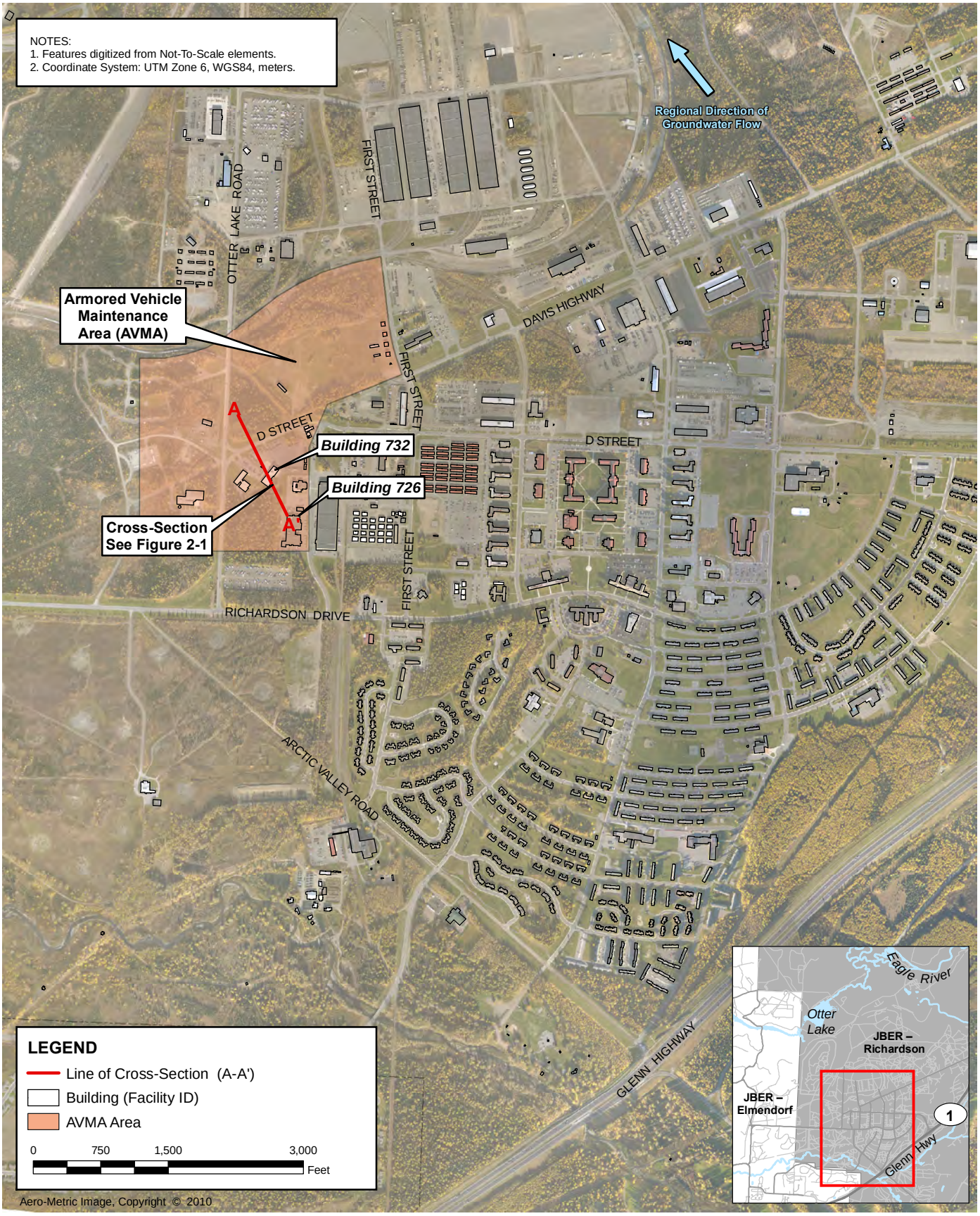

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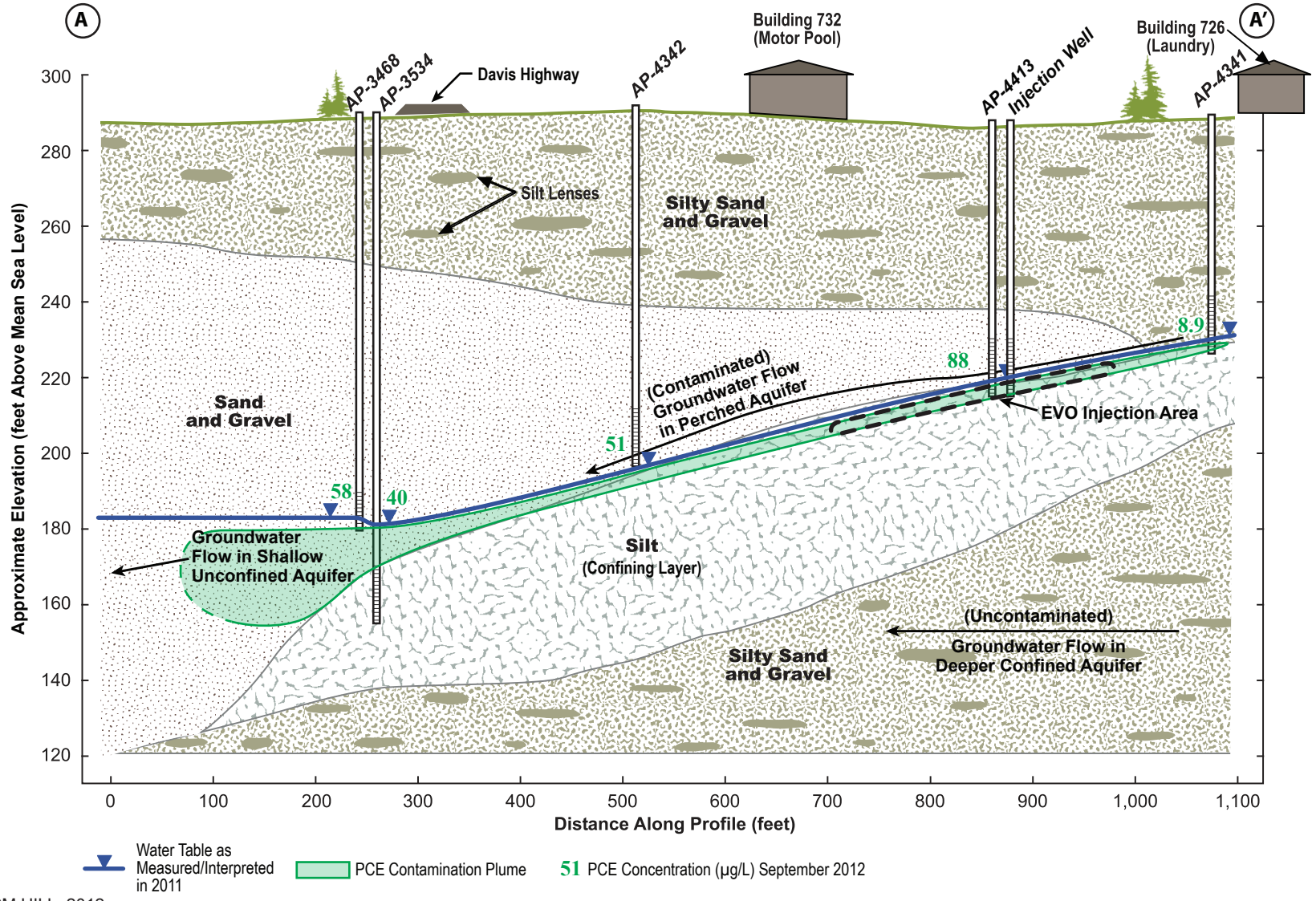
N W E S

673d AIR BASE WING

SITE LOCATION

Figure **1-1**

Treatability Study Implementation Report, DA085
Armored Vehicle Maintenance Area
Joint Base Elmendorf-Richardson, Alaska



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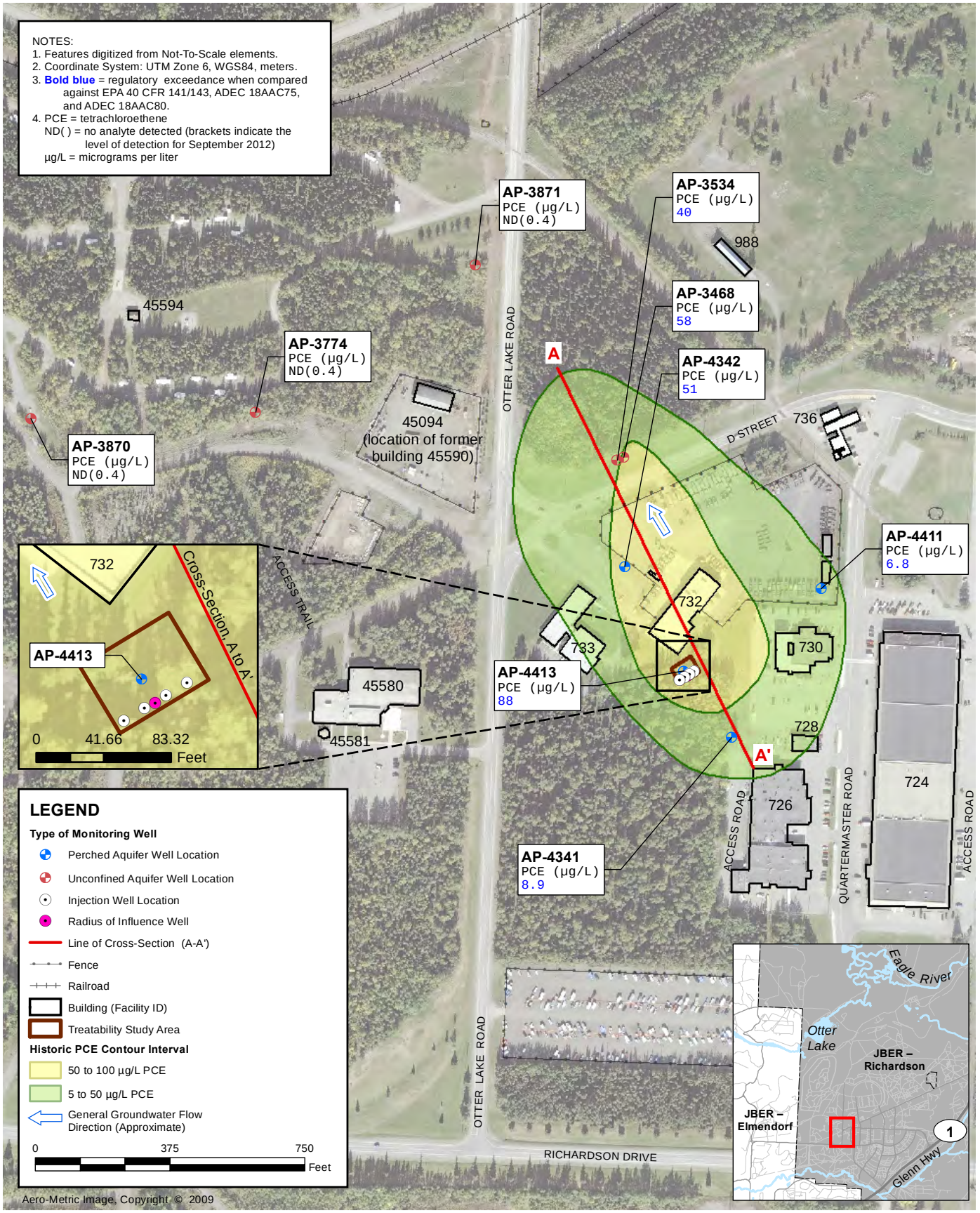
CONCEPTUAL SITE MODEL

Treatability Study Implementation Report, DA085
Armored Vehicle Maintenance Area
Joint Base Elmendorf-Richardson, Alaska

Figure
2-1



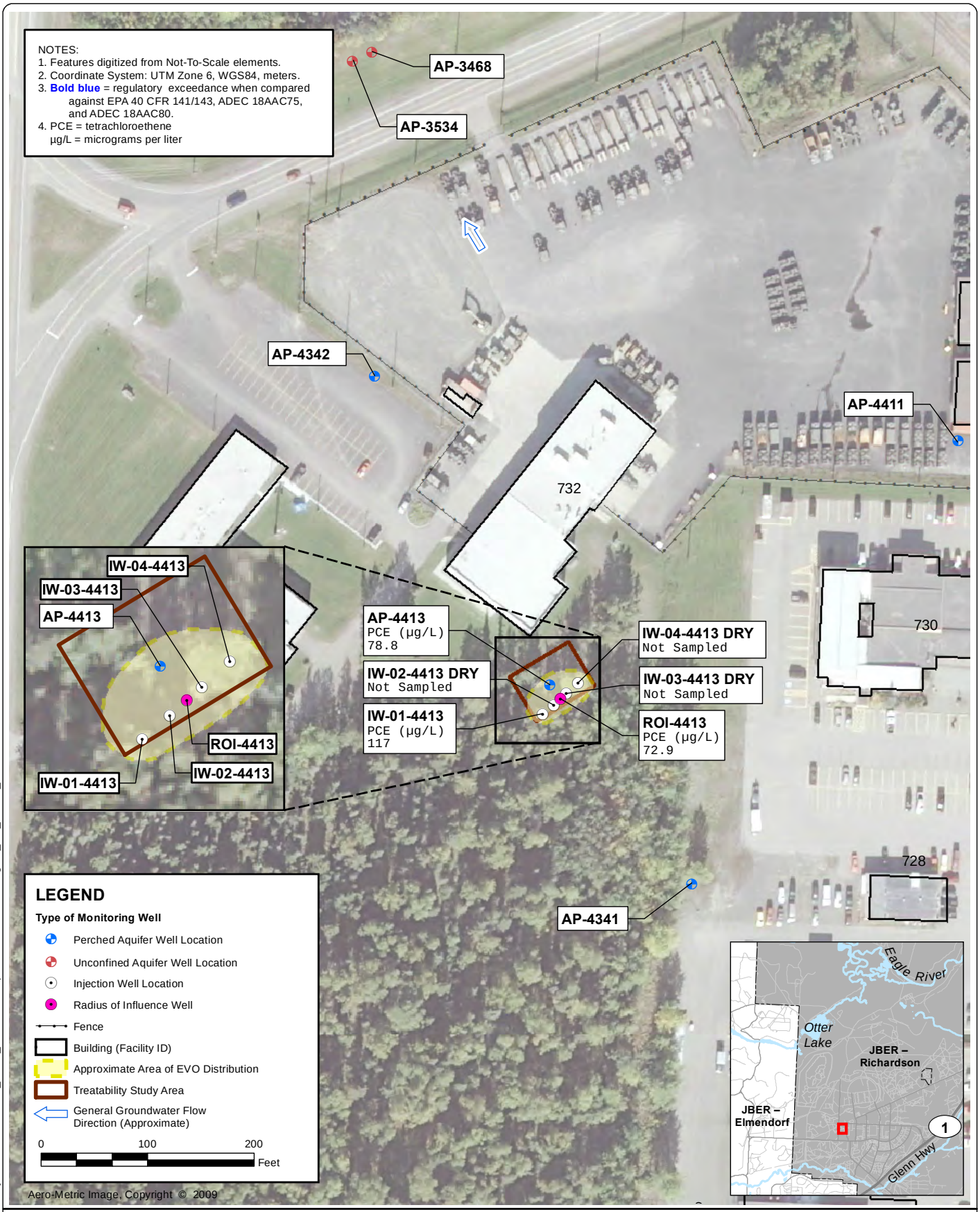
HISTORIC PCE CONCENTRATIONS IN GROUNDWATER – SEPTEMBER 2012

Treatability Study Implementation Report, DA085
Armored Vehicle Maintenance Area
Joint Base Elmendorf-Richardson, Alaska

Figure

2-2

Date: 11 Dec 2013 Drawn by: lclark R:\AFCEE_JBER_20001102\MapFiles\TSIR\DA085\Figure_2-2_DA085_GWMonitoring.mxd



BASELINE PCE GROUNDWATER CONCENTRATIONS AND EVO INJECTION DISTRIBUTION

Figure **3-1**

Treatability Study Implementation Report, DA085
Armored Vehicle Maintenance Area
Joint Base Elmendorf-Richardson, Alaska

Appendix A
Photographic Log and Field Notes

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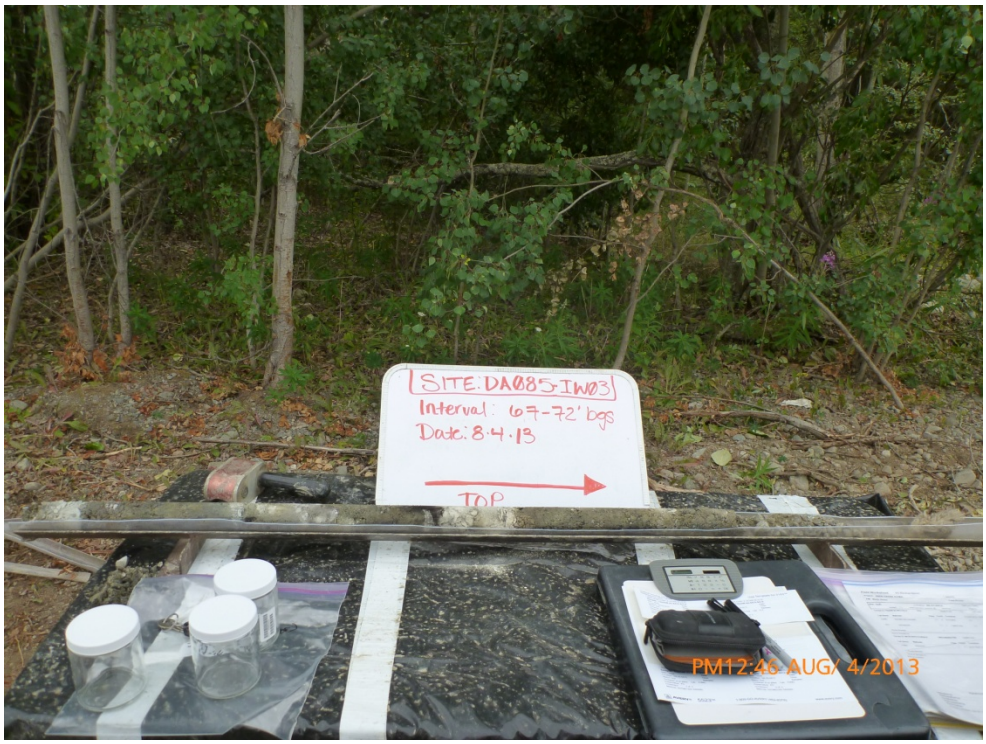
Photograph A-1: DA085-IW-01-4413, interval 67 to 72 feet bgs (July 2013)

Photograph A-2: DA085-R0I-4413, interval 67 to 72 feet bgs (August 2013)



Photograph A-3: DA085-IW03-4413, interval 67 to 72 feet bgs (August 2013)

Photograph A-4: DA085-IW03-4413, soil core 72 feet bgs (August 2013)

Photograph A-5: DA085-IW03-4413, interval 72 to 74.5 feet bgs (August 2013)

Photograph A-6: DA085-IW03-4413, soil core 74.5 feet bgs (August 2013)

Photograph A-7: DA085-IW03-4413, soil core 74.5 feet bgs (August 2013)

Photograph A-8: DA085-IW01-4413, interval 67 to 72 feet bgs (August 2013)

Photograph A-9: DA085-IW01-4413, injection system setup at DA085 (September 2013)

Photograph A-10: Injection system mounted on EVO tote in secondary containment (September 2013). Note rainwater in secondary containment with a few ounces of EVO spilled into it is visibly white

Photograph A-11: Injection system at DA085 (September 2013)

Photograph A-12: EVO batch injection mixing tank (September 2013)

Photograph A-13: Row of injection wells upgradient of performance monitoring well (September 2013)

Photograph A-14: Wellhead assembly and hoses at IW04-4413 (September 2013)

JBER-R CG039 / AVMA 7.29.13

0730 (AS) Annika Seay arrives on base. Communicates about Saturday's activities with site manager Rich Horn (RH).

0745 AS arrives at site trailer. Travis Drewry (TD) and Sean Lee (SL) arrive shortly thereafter.

0800 Hold health and safety meeting. Continuing mobing today - discuss traffic on Poleline, Wildlife, heat / bugs, pinch points, loading / unloading

0830 TD and SL leave for CG039. AS calls Range control. Jeremiah Hunth at trailer. Discusses activity for the day.

0845 AS leaves for CG039.

0900 AS arrives on site. TD & SL are cleaning up. Fix fence back in original position. Pick up trash. Elliott Wilson arrives on site to pick up drum lifter.

1040 TD, SL, AS leave Poleline site with rig and first load of day for AVMA site. Rig is walked down road. AS follows behind in van, with hazards on.

1150 TD, SL, AS arrive at AVMA site. Unload rig. Staging trailer at site. Trees that were cut down have still not been cleared. AS observes new site and makes mental note of possible safety issues / precautions to ~~must~~ AS take.

1200 Mob. to throw away trash and drop off water drums at CH yard. TD & SL refuel, get fuel for rig.

1245 Lunch break. RH joins TD, SL, and AS at lunch. Discuss CG039 and AVMA. RH and AS discuss daily field call.

1320 TD, SL, head out to Poleline to complete site cleanup. AS follows shortly.

1340 AS arrives at CG039 as TD & SL are preparing to leave. All mobe to AVMA.

1350 AS stops by CH trailer, gets water for crew. RH gives AS the site WP. RH and AS mobe to AVMA. TD arrives at AVMA as AS & RH are leaving to retrieve air compressor.

1400 RH goes over site w/ crew. Walks site, discusses possible safety hazards.

1430 Hold H&S meeting regarding new site. Uneven ground, slips / trips / falls are the main concerns. Wildlife is also a possibility as the site backs up to a wooded area. Mosquitos and other flying / stinging insects also a possibility. Still waiting for trees and brush that was removed this weekend to be cleared from the site.

1500 RH leaves site. SL takes compressor to refuel.

1530 SL back on site. TD setting up at IW-01-4413. No drums - EW unavailable to answer phone.

1550 EW returns call - TD & SL mobe to Weston yard to retrieve drums.

JBER-R CC#39/AVMA

1550 (cont'd) AS heads to CH yard for RR break.
1610 TD, SL, AS back on site. TD, SL set up air compressor and cyclone.
1650 Begin at IW-01-4413

Time	Depth	Comments
~~AS 1650 1600~~	~~5~~ 5'	lead rod
1715	10'	5' added
1730	15'	5' added
1740	20'	5' added
1745	25'	5' added
1755	30'	5' added

~~AS 1750~~ Cease drilling for day at 30'. Begin cleanup
1800 AS leaves site for Poseline Rd.
1820 AS arrives at Poseline. Sketches well locations.

Fig 1

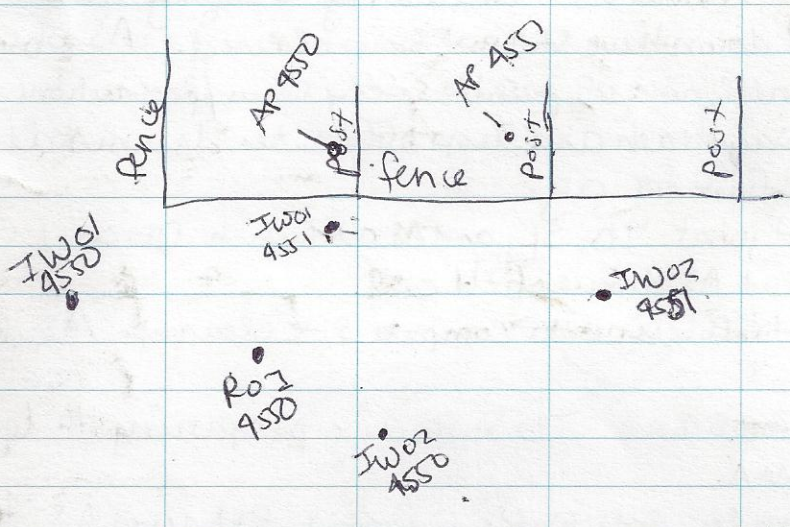
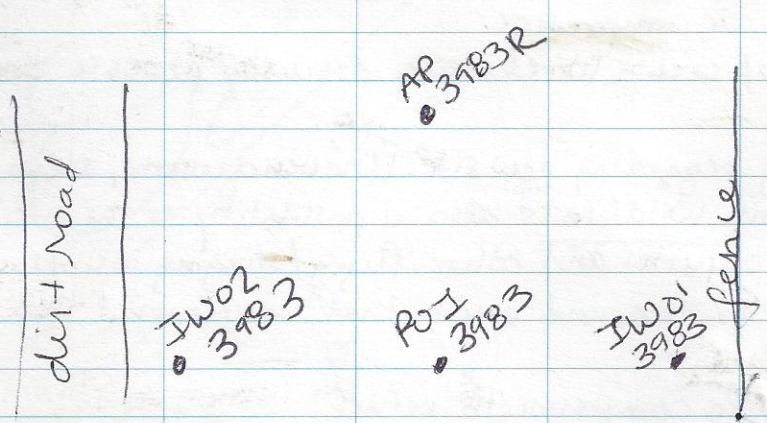


Fig 2



1835 AS finishes sketches, checks out with Range control, leaves Poseline.
1850 AS arrives at trailer site. Drops off van. Gathers paper work. Leaves base.

JBER-R DA0805 7.30.13

0815 AS (Annika Scay) arrives at CH yard. Meets Travis Drewry (TD) and Sean Lee (SL). Packs van for day. TD and SL mobe. to refuel air compressor.

0845 All on site; hold H&S meeting. Bears are being reported more frequently on base - be mindful.

0900 Elliott Wilson arrives on site. Drops off drums.

0905 Begin set up and drilling at IW-01-4413 (left off at 30' yesterday)

Time	Depth	Comments	Time	Depth	Comments
0920	35'	5' added	1115	72'	5' added
0930	40'	5' added			
0945	45'	5' added			
1000	50'	5' added			
1005	55'	5' added			
1030	60'	5' added			
1045	67'	7' added			

1050 pulling rod for macro core at 67'. Begin macro core set up.

1110 Call Rich Horn about setting well - as no water was encountered during drilling. Water was not indicated on the boring log for AP-4413 either, but the well is in the ~~stat~~ AS monitoring network. RH is confident in setting well at depth.

1200 AS collects sample from 67-72' C13Q3DA0805-IW014413-5072 Communicates with Jenn Frame about meeting up later in day. TD and SL pulling rod.

1300 SL leaves site for afternoon errand; TD takes lunch. AS takes samples to CH trailer to get labels.

1320 AS back on site - labels sample jars

1330 TD back on site. Begins setting well. No helper on site.

1500 Well is set - 5' screen, sandpack AS from 72-65', bentonite pell plug from 65-63'. TD adds 5 gal water to hydrate plug. Leaves site to get fuel. AS goes by CH trailer.

1520 AS back on site. TD on site, RH and Jenn Frame on site. Jenn Frame will get information from AS about days work and where we will pick up tomorrow. Talk W/ RH about work progress - rig schedule.

1600 WL ≈ 103.66 BTOC AP-4412 ~~W~~ AS TD = 127' BTOC

1615 RH take WL @ IW-01-4413 WL = 68.65 bgs TD = 72' bgs

1630 TD prepping grout. SL has communicated he is ~~back~~ AS on his way back to site. RH and JF leave site

1645 Collect IDW 40 sample

1650 collect IDW 39 sample

1655 collect IDW 38 sample

JBER-R DA#85 7.30.13

1705 Begin grouting at IW-01-4413

1730 Grout set. 4 bags Portland, 1/2 bag bentonite; 30 gal water. Filled 55' of casing. TD and JL begin decon and clean up for day.

1900 ~~- offsite~~

Jennifer Lane 7.30.13

JBER-R DA085 7.31.13

0800 - meet drillers onsite field trailer (T. Drewry & S. Lee). J. Frame from CH2M onsite today. ~~conduct~~ JUF Pickup field vehicles & head to DA085.

0810 - conduct H&S briefing at site. Topics include tripping hazards, uneven surfaces & potential impalement/puncture hazards from newly cut trees/brush in area, Biological hazards include bears, moose & pedestrian traffic (though very minimal).

0815 - J. Knuth & M. Kelly (GeoTek) onsite to borrow tent for well development at CG039.

0825 - J. Knuth & M. Kelly ~~offsite~~.

0833 - drillers setup cyclone & prep for start on IW-02-4413

TIME	DEPTH (bgs)	COMMENTS
0920	0-5'	5' lead
0954	5-10'	5' added
1005	10-15'	5' added
1015	15-20'	5' added
1027	20-25'	5' added
1034	25-30'	5' added
1047	30-35'	5' added
~~1100~~ JUF 1057	35-40'	5' added → Break for lunch. Drillers will also get fuel ~~for generator~~ JUF

1200 - drillers back onsite. continue on IW-02-4413.

TIME	DEPTH	COMMENTS
~~1210~~	~~40-45'~~	~~5' added~~ JUF → 1210 40-45' (Depth count was correct, drillers miscounted rod)
1238	45-50' ~~40-45'~~ JUF	5' added
1250	50-55' ~~45-50'~~	5' added
1303	55-60' ~~50-55'~~	5' added
1311	60-65' ~~55-60'~~	5' added
1323	65-70' ~~60-65'~~	5' added
1348	70-72' ~~65-70'~~	5' added (5' above ground) only drill down 2' further

1350 - drillers inform that they miscounted rod and are 5' bgs deeper than thought. Sample was anticipated to be collected from 67-72' will collect from ROI-4413 instead (~ 7.5' East).

1411 - E. Wilson & J. Regin (GeoTek) onsite. to pickup trailer & swap out trucks. will be onsite for sometime. Go over H&S plan & applicable AHAs w/ J. Regin.

1415 - Drillers inform that they cannot unlock downhole hammer due to soft silt layer. Will work to unlock

1450 - E. Wilson attempts, no success. Add water to clean; un-successful

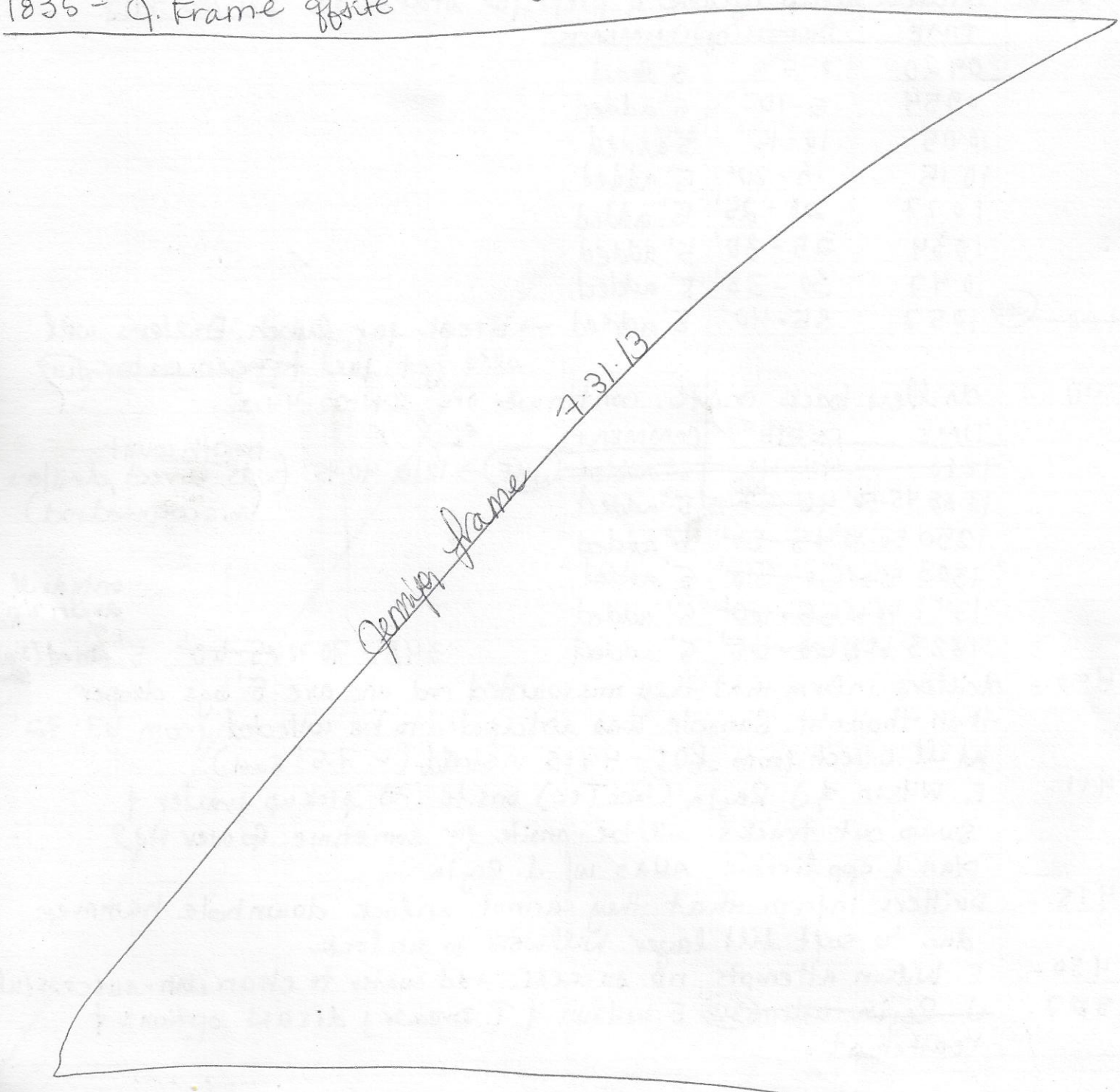
1527 - ~~J. Regin attem~~ JUF E. Wilson & T. Drewry disuss options & reattempt.

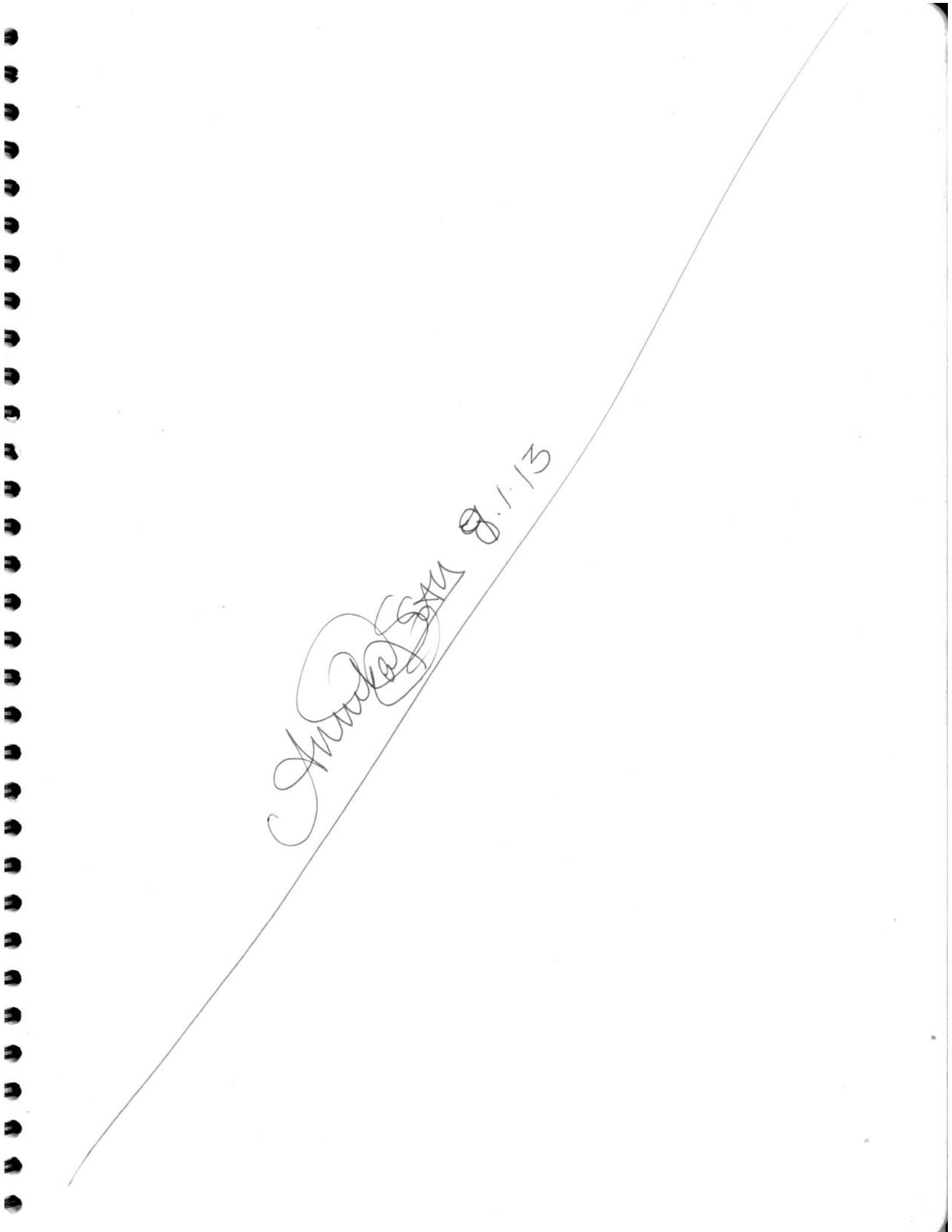
1615 - decide to push to 75' bgs w/out spinning to attempt gain friction on hammer. unsuccessful. Push to 80' bgs - unsuccessful.

1724 - re-assess situation. Driller will attempt to pull up both inner & outer rod. Will need re-drill hole. J. Frame has contacted FTL J. Knuth to discuss. Will leave casing where it is (drillers pulled up ~15' - now at ~65' bgs) & address best path forward tomorrow morning.

1823 - breakdown site for day.

1835 - J. Frame offsite





JBER-R DAϕ58 8-1-13

0800 Annika Seay (AS) arrives at CH trailer. Jennifer Frame (JF) calls to inform AS she got held up at the base checkpoint - will be in soon. Travis Dreary (TD) texts that he will be ~30 min late getting in. Sean Lee (SL) arrives on site. Jeremiah Knuth, Mike Kelley, Rich Ham also at trailer. AS discusses yesterday's activities with JF and the plan for today. RH discusses situation with AS and JF.

0840 TD texts that he is on site. AS and RH head to site. JF will be joining JK and MK at CGϕ39 to develop wells. SL heads to site.

0900 AS and RH arrive at site.
TD and SL begin pulling casing. RH discusses situation with TD, Casing will be pulled and situation reassessed. Set well ~~at~~ AS as called for in IMP.

0940 20' left to pull - AS takes RR break RH onsite with TD & SL.

1000 AS back on site. Hammer is pulled - caking prevented it from being unlocked. It is very wet. TD takes AS. TD = 65' bgs. Had drilled to 80'. ~~TD calling EW about what to do next.~~ Hammer, upon inspection, is broken (2 diamonds along outside broke) TD places call to PM about situation. Will clean and try to remove.

1030 Building manager Seth and RH speak. Path to fire hydrant on site needs to remain clear.

1110 After several attempts, the hammer will not come unlocked. IDW-02-4413 completion is on hiatus. Moving to ROI-4413. PM Elliott Wilson (EW) unable to pick up hammer and run supplies for TD & SL; TD & SL will make trip to GTA shop off Dowling and old Seward, drop off hammer and pick up supplies. Will take lunch during this time. AS will also take lunch and meet TD & SL back at site. RH has left site.

1205 TD, SL leave site. AS leave site.

1400 TD, SL, AS back on site. Set up at ROI-4413

Time	Depth	Comments	Time	Depth	Comments
1530	~~5~~ 3'	Lead rod (3')	1720	48'	5' added
1535	~~10~~ 8'	5' added	1745 AS ~~1730~~	53'	5' added
1545	~~15~~ 13'	5' added	1755	58'	5' added
1555	~~20~~ 18'	5' added	1810	63'	5' added
1605 ~~1615~~	23'	5' added	1825	68'	5' added
1615 ~~1620~~ ~~1630~~ AS	28'	5' added			
1620 ~~1630~~	33'	5' added			
1630	38'	5' added			
1640	43	5' added			

(TD takes RR break at 1640)

JBER-R DA058 8-1-13

1705 TO back on site; commence drilling
1830 TO sample depth - pulling inner casing to get sample.
1905 67-72' Sample pulled. 80% recovery (4' of recovery)
2 1/2 feet is silt. Screen should be placed 65'-70' based on this recovery. 7" of wet silty gravel above the silt layer-
1" of ~~moist~~ AS dry to moist sandy gravel above 6" wet section
1935 Leave site for day.
1920 *late entry* collect sample ROI-4413 (Geotechnical)
2000 AS drops sample coolers off at CH trailer. Leaves keys in trailer.

8/1/13

JBER-R DA085 8.2.13

0800 - meet drillers onsite field office. Pickup supplies & work vehicles. Head to DA085

0810 - onsite DA085. Conduct H&S briefing. Topics include proper lifting techniques, biological hazards (bears, moose, masquitos), slip/trip/fall hazards & hazards associated w/ use of MeOH in Sample Collection.

0820 - discuss placement for RDI-4413. Silt lense observed in core from ~69.5' bgs on. Will set well screen from 65-70' based on observation. Crew setup on well & begins drilling. Left off at ~63' on air rotary last night.

TIME	DEPTH	comments
0857	63-68	* left off here last night
0908	68-70	Push to 70' only. observe cuttings in drum, silt layer appears just at surface. ~~will~~ (JW)

0927 - begin setting well.

1020 - ~~GeoTek~~ (JW) other GeoTek crew shows up to delivery truck/trailer & portland cement. T. Drewry informed that new ring bit will not be ready until late tonight or early tomorrow morning. Drillers will ~~finish wells~~ but complete grout for RDI-4413 & IWD1-4413, decon & other associated tasks today, but will not be able to move forward w/ drilling w/out ring bit. Hydrate bentonite - wait ~1 hr.

1100 - head to lunch. Drillers pickup water for grout mixing

1200 - back onsite. Begin mixing grout.

1240 - setup for grouting

1312 - begin grouting RDI-4413

1411 - use up first grout batch. will need to mix more for IWD1-4413

1459 - begin grouting IWD1-4413

1517 - cold foot onsite to offload excavator. Will return w/ dumpster to complete removal of trees from site.

* Late Entry *

1500 - collect IDW sample (13Q2DA085-IDW40-SO-0)

1505 - collect IDW sample (13Q2DA085-IDW41-SO-0)

1510 - collect IDW sample (13Q2DA085-IDW42-SO-0)

1515 - collect IDW sample (13Q2DA085-IDW43-SO-0)

1520 - collect IDW Sample (13Q2DA085-IDW44-SO-0)

1550 - cold foot back onsite. Discuss plan for removal. Cold foot

still needs fuel. Leave site to get fuel. GeoTek moves 4 drums to truck for transfer to POL yard. tomorrow morning.

1700 - ~~1700~~ Jup GeoTek Decon & wrap-up for day. Cold Foot back onsite. J. Frame offsite. Head to field trailer to drop off samples / vehicle

1730 - End of day.

Jennifer Frame 8.2.13

JBER-R DAP ~~85~~ AS 8.3.13

0800 Annika Seay (AS) meets Travis Drewry (TD) at CH yard. Sean Lee (SL) arrives shortly thereafter. AS retrieves samples in coolers and loads van for the day.

0830 ~~Held~~ HBS Meeting. Discuss biological hazards - spiders are being seen more frequently. Be careful when swatting at them. AS reviews HAZCOM sheet with SL. Mobe to site.

0845 Arrive at site, begin set up at IW-02-4413 to complete.

0955 TD shows AS that ~5' of slough occurred in IW-02-4413, meaning the hole stayed open really well. TD will blow air down hole to clear out. Based on observations from the 2 wells on either side of IW-02-4413, the screen for IW-02-4413 will be set at 65-70'.

1046 Adding 5 gal water to help purge hole.

1125 Rich Horn (RH) calls to check on progress of day

1140 Begin setting screen and adding sand to well.

1215 break for lunch

1315 back from lunch.

1415 AS leaves base to retrieve more Cristo for TD & SL; TD & SL Mix grout and grout well ~30 ft. (3 bags Portland, 1/2 bag bentonite, 30 gal water) Will continue grouting tomorrow. Set up at IW-03-4413.

~~AS~~ ~~1515~~ ASS AS back on site

1510 Begin at IW-03-4413

Time	Depth	Comments	Time	Depth	Comments
1525	5'	lead rod AS	~~1705~~	55'	would have been completed if compressor hadn't shut down
1535	10'	5' added			
1545	15'	5' added			
1555	20'	5' added			
1605	25'	5' added			
1620	30'	5' added			
1630	35'	5' added			
1640	40'	5' added			
1650	45'	5' added			
1700	50'	5' added			

1700 air compressor is overheating (no spills associated). It automatically turns off. ~~IO~~ AS

1710 AS takes IDW44 sample

1715 AS takes IDW45 sample. TD leaves site for RR break.

1730 TD back on site. Start up compressor again - compressor ~~does~~ AS shuts itself off again.

1745 Theory by TD: Possibly the low level of compressor fluid

is causing it to overheat. Elliott Wilson (EW) is not answering his phone. TD reports EW has compressor fluid with him.

1800 AS takes WL at IW-02-4413
DTW 72.41' BTOC, 68.1' bgs
TD 72.9', BTOC 68.7' bgs

1830 AS arrives at CH trailer to drop off Keys and van and samples. AS has informed Richthorn and Jennifer Frame of the air compressor situation.

8·3·13

JBER-R (JWF) DA085 8.4.13

1000 - ~~meet~~ J. Frame meets drillers onsite DA085. Discuss compressor issue. E. Wilson & GeoTek to deliver compressor fluid to drillers (T. Drewry & J. Byrnes).

1010 - conduct H&S briefing. Topics include biological hazards including bees, hornets, bears, moose, physical hazards such as heavy lifting (outer rod ~ 80lbs, inner rod ~ 60lbs) & using rig for assistance where possible / appropriate. Will wait for E. Wilson to arrive w/ compressor fluid before beginning work.

1130 - E. Wilson onsite. Add fluid and begin drilling for day.

TIME	DEPTH	comments
1142	55-60'	add 5'
~~1158~~ (JWF)	~~60-65'~~	~~add 5'; E. Wilson offsite~~ (JWF)
1204	~~62-67'~~ (JWF) 60-62	stop @ 62' to switch to macro core for sample collection ~~62-72'~~ 62-67'*

1210 - pull out innerrod to prep for macro core

1230 - lunch

1300 - return to site

1340 - ~~collect sample 67-72'~~ (JWF) receive core ~~67-72'~~ (JWF) 62-69' confining layer not present in sample. Wet gravelly sand layer begins @ ~ ~~71.2'~~ (JWF) 69.2'. ~~Conseptual site model indicates that silt layer has gradual downward slope to the~~ (JWF). Double check depth bgs w/ tape to confirm. Will drive macrocore 2.5' further to determine ~~where~~ (JWF) depth of confining layer. ~~Collect geotech sample from bothe~~ (JWF) ~~67-74.5'~~ 69.5'

1403 - receive core ~~72~~ (JWF) ~~67-74.5'~~. Silt lense present at ~ ~~74~~ 73' (JWF) bgs. will collect samples from this interval; ~~geotech will include~~ (JWF) ~~67-74.5'~~ (JWF). 67-70'

1410 - prep for well install. Will set well screen from ~~70-75'~~ (JWF) 65-70'

1415 - collect Sample ~~70-70.8'~~ (1302 DA085-IW03-4413-S0-0)

1420 - continue w/ air (JWF) rotary to reach depth

TIME	DEPTH	comments
14 ~~35~~ 28	~~67-70'~~ 62-67'	* pickup where left off before sample
1435	~~70-75'~~ 67-70'	add 5' → only drive 3'

1504 - begin setting well.

1530 - hydrate bentonite; wait ~ 1hr to continue

1620 - drillers head to get wat to mix grout

1640 - back onsite. Mix 1st batch of grout to fill IW03 & ROI-4413

1715 - begin ~~filling~~ (JWF) topping off ROI-4413

JBER-R DA085 8.4.13

1800 - J. Frame off site for day. Drillers finish up & will leave right after ~~me.~~ (me)

Jennifer Frame 8.4.13

JBER-R DAØ85 8.5.13

0800 Annika Seay (AS) meets Travis Drewry (TD) and John Burns (JB) at CH trailer. Jennifer Frame, (JF), Mike Kelly (MK) and Jeremiah Krueth (JK) are also at trailer.

0805 JF hold health and safety meeting for DAØ85 and Poleline Road. Continues to watch for traffic on Poleline and wildlife at each site.

0815 TD and JB go refuel air compressor. Will meet AS at site.

0830 AS, TD, and JB meet on site. TD and JB begin set up. A DQR was not filled out for 8.4.13 – AS signed one for JF.

0845 AS leaves site for RR break while TD and JB continue set up

0910 AS back on site. TD & SL have driven casing, are lowering hammer.

0920 Begin at IW-04-4413 AS leaves site to meet JF & give her 200' WL meter

Time	Depth	Comments	Time	Depth	Comments
0920	5'	lead rod	1045	45'	5' added
0935	10'	5' added	1055	50'	5' added
0950	15'	5' added	1105	55'	5' added
1000	20'	5' added	1110	60'	5' added
1010	25'	5' added	1120	65'	5' added
1015	30'	5' added	1130	67'	
1025	35'	5' added			
1035	40'	5' added			

0945 AS back on site

0950 JF calls for information on depths and screen intervals for wells at CGØ39

1130 Pulling inner casing for macro core sampling

1155 Inner casing pulled TD & JB break for lunch. AS heads to CH trailer.

1230 AS, TD, JB back on site

1250 Begin retrieving macro core sample

1310 Collect IW-04-4413 geotech sample (67-72')
~~80~~% recovery, a little over 4' recovery 69.11 – 72' is silt.
68.11 – 69.11 is a wet "moist sandy gravel. Top 1' of interval is a dry-moist gravelly sand. Propose screen at 65-70'
TD & JB leave site to get more AVC

1320 Collect IDW46 sample

1330 Collect IDW47 sample

1400 TD & JB back on site. Continue at IW-01-4413

1510 WL @ IW-03-4413 73.4' BTOC, 69.04' bgs
TD = ~~79.75~~ 73.5' BTOC, 70.4' bgs
Adding sand to IW-04-4413 70 – 63.5' sand (3½ bags)
~~Sa~~ bentonite 63.5' – 60' 1 bucket pell plug used

JBER-R DA085 8.5.13

1535 AS leaves base to put gas in van.
1600 AS back on base. Goes by CH trailer to drop off samples.
1630 Gets text from Elliott Wilson about ~~rig~~ rig being in the shop tomorrow - discusses with JF.
1640 Back at site. Calls Rich Horn; missed his call earlier.
1700 Take WL at IW-04-4413. Well is dry. TD = 73.05' BTOC, 69.53' bgs. TD & SL begin grouting well.
1725 Well is grouted. Grout pipe is stuck in well - got it unlodged. Grout for IW-03 & IW-04 is within 10 feet of surface.
1730 Attempting another WL at IW-04-4413. Still dry. Very bottom of probe has water on it, but not enough to reach sensor. AS calls RH and informs him of grout levels and of IW-04-4413 being dry. TD uses rig to try to smooth out area around the wells where the rig has been. JB cleans grout mixer
1745 TD cleans rig. AS makes sure all the IDW drums are labeled and have tape on top of the lid indicating 'CH' site ##, drum ##, and date of origination.
1900 AS texts RH; informs of what we have left to do at the site. Will empty and clean decon pit and take drums to IDW yard tomorrow. AS heads back to CH trailer to drop off van and leave base for the day.

8.5.13

JBER-R DA085 8.6.13

0900 - meet drillers onsite A. Seay, ~~J. Frame~~ (JUF) J. Knuth (CH2M Hill) & M. Kelly, J. Byrnes (GeoTek). Discuss plan for demob/ well completions at DA085 & well development at CG039

0810 - J. Frame onsite. Conduct health & safety briefing. Topics include slips, trips, falls, heavy lifting, traffic safety.

0820 - head to DA085. Other team parts to CG039

0930 - J. Frame & J. Byrnes onsite DA085. Begin well completions E. Wilson (GeoTek) also onsite.

~~0930~~ (JUF) 0920 E. Wilson offsite

0950 - J. Byrnes head to home depot to pickup additional supplies for completions. J. Frame will check back in intermittently at site. T. Drewry will also be onsite throughout the day to continue demob.

1300 - J. Frame offsite for day. J. Knuth will continue as support for DA085 for remainder of the day.

1530 - J. Byrnes finishes well completions at DA085. offsite for rest of day

1830 - M. Kelly & A. Seay done for day

1900 - T. Drewry demob complete from DA085

Jennifer Frame 8.6.13

9/15/13 POLELINE ROAD TREATABILITY STUDY EVO INJECTIONS

PERSONNEL: ANDREW CASTOR MARK AUGUSTYN WEATHER: 40°, SUNNY HIGH 63°

0800 ARRIVE AT FIELD OFFICE. LOAD SUPPLIES IN FIELD TRUCK.

0830 ARRIVE AT POLELINE ROAD DISPOSAL AREA TO CONTINUE INJECTIONS AT AP-3983 TARGET TREATMENT ZONE. WILL CONTINUE ALTERNATING INJECTIONS AT IW01-3983 AND IW02-3983.

900 BEGIN INJECTING STARTING AT IW01-3983

1030 FINISH INJECTING. INJECTED 610 GALLONS EVO AND 1300 lbs FERROUS SULFATE

TOTAL INJECTION VOLUME 10,800 GALLONS

OIL BREAKTHROUGH AT AP-3989

1130 BEGIN TRANSPORTING EQUIPMENT TO AVMA.

1530 FINISH TRANSPORTING EQUIPMENT TO AVMA. BEGIN SETTING UP AT AVMA.

1600 MEASURE WATER LEVELS

1700 TEST INJECTION WELLS WITH WATER. ALL WELLS FREELY ACCEPT INJECTION AT 0 PSI AND >30 GPM EXCEPT IW03 WHICH HAD 10 PSI AND 30 GPM. WE WILL INJECT TOMORROW WITH EVO.

1800 DEPART SITE.

9/15/13 AVMA TREATABILITY STUDY GROUNDWATER LEVELS AND BASELINE

AP-4413		IW01-4413		IW02-4413		IW03-4413		IW04-4413	
TIME	DTW	TIME	DTW	TIME	DTW	TIME	DTW	TIME	DTW
1558	71.62	1557	71.00	1555	71.40	1554	71.95	1553	72.46
1024	71.46	~~1024~~	~~70.85~~	1009	70.99	1005	71.48	1406	71.88
1153	71.46	1411	70.75	1505	70.93	1408	69.92		
1412	71.39								

~~AP-4411~~		AP-4341		AP-4342		~~AP-3534~~		~~AP-3468~~	
TIME	DTW	TIME	DTW	TIME	DTW	~~TIME~~	~~DTW~~	~~TIME~~	~~DTW~~
1556	71.20	1404	63.87	1610	96.56				
1008	70.99	1512	63.85	1518	96.49				
~~1104~~	70.75								
1409	70.95								

AP-4412		~~AP-3469~~	
TIME	DTW	~~TIME~~	~~DTW~~
1559	>100		

AP-4413 BASELINE GROUNDWATER QUALITY MEASUREMENTS

TEMP	PH	COND	ORP	TURBIDITY	
7.20	7.82	289	-209.3	34.1	CLEAR

ROI-4413

TEMP	PH	COND	ORP	TURBIDITY	~~COLOR~~
7.08	7.41	309	-202.3	OVER RANGE	CORAY, CLOUDY

BREAKTHROUGH AT IW03, ROI AFTER INJECTING IW04
NO BREAKTHROUGH AT IW02 OR 4413 AFTER INJECTING IW01
BREAKTHROUGH AT AP-4413 AFTER INJECTING IW02
DID NOT TAKE GW QUALITY READINGS AT AP-4413 AND ROI-4413 FOLLOWING OIL BREAKTHROUGH

9/4/13 AVMA TREATABILITY STUDY EVO INJECTIONS

PERSONNEL: ANDREW CASTER, MARK AUGUSTYN, JENN FRAME

WEATHER: CLEAR, 38°

0730 ARRIVE AT FIELD OFFICE, GATHER SUPPLIES

0745 CONDUCT SPCC PLAN TRAINING.

0925 MOB TO AVMA AND BEGIN SETTING UP FOR EVO INJECTIONS. PLAN TO INJECT 4000 GALLONS OF EVO SOLUTION CONTAINING 225 GALLONS OF EVO. ADD AN ADDITIONAL 3 GALLONS OF EVO PER 275 GALLON BATCH TO MAKE UP REMAINING.

0940 BEGIN INJECTING IW04-4413

1013 FINISH INJECTING IW04-4413

1130 BEGIN INJECTING IW03-4413 WELL ONLY INJECTING AT 1-2 GPM. WILL SWITCH TO IW01-4413.

1026 BEGIN INJECTING IW01-4413

1120 FINISH INJECTING IW01-4413

1125 BEGIN INJECTING IW02-4413

1155 FINISH INJECTING IW02-4413.

1150 BEGIN INJECTING IW03-4413. INJECTING VERY SLOWLY AT 15 PSI. UNREGADABLE BY FLOW METER

1250 STOP INJECTING IW03-4413. INJECTING AT < 1 GPM. WILL DISTRIBUTE REMAINING INJECTATE INTO THE OTHER THREE INJECTION WELLS

1345 FINISH INJECTING AT AVMA. BEGIN FLUSHING INJECTION SYSTEM AND WELLS

1400 MEASURE WATER LEVELS AND BEGIN INJECTION SYSTEM CLEANUP AND TEAR DOWN.

1415 DONNA BAUMGER ARRIVES ONSITE.

1550 FINISH CLEANUP AT AVMA AND DEPART SITE.

9/16/13 AVMA EVO INJECTION BATCH CONT

IW04-4413

BATCH	TIME	VOLUME	ADDED EVO	PRESSURE	TOTALIZER
1	941	275	3	0	276
2	950	275	3	0	555
3	1000	275	3	0	835
4	1008	275	3	0	1002
11 CONT	1301	275	3	0	1047
12	1310	275	5	0	+ 272
					1319

IW03-4413

BATCH	TIME	VOLUME	ADDED EVO	PRESSURE	TOTALIZER	
4 CONT	1020	275	3	14	18 *	
11 CONT	1158	275	2	15	53 *	TOTALIZER NOT WORKING

STOP INJECTING AT IW03-4413 WILL DISTRIBUTE REMAINING INJECTATE TO THE OTHER THREE WELLS

IW01-4413

BATCH	TIME	VOLUME	ADDED EVO	PRESSURE	TOTALIZER
4 CONT	1036	275	3	0	90
5	1040	275	3	0	385
6	1050	275	3	5	664
7	1100	275	3	0	956
8	1113	275	3	0	1001
14	1333	275	9	0	1269

IW02-4413

BATCH	TIME	VOLUME	ADDED EVO	PRESSURE	TOTALIZER
8 CONT	1122	275	3	0	242
9	1130	275	3	0	532
10	1138	275	3	0	814
11	1145	275	3	0	1000
13	1320	275	9	0	1290

TOTAL VOLUME OF INJECTATE = 3931 GALLONS CONSISTING OF 228 GALLONS EVO

Appendix B
Spill Prevention, Control, and Countermeasure Plan

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Tier I Qualified Facility SPCC Plan

This SPCC Plan was developed for Joint Base Elmendorf-Richardson for the Armored Vehicle Maintenance Area, Building 732 PCE Contamination remediation project. When completed and signed by the owner or operator of the facility meets the applicability criteria in §112.3(g)(1). This template addresses the requirements of 40 CFR part 112. Maintain a complete copy of the Plan at the facility if the facility is normally attended at least four hours per day, or for a facility attended fewer than four hours per day, at the nearest field office. When making operational changes at a facility that are necessary to comply with the rule requirements, the owner/operator should follow state and local requirements (such as for permitting, design and construction) and obtain professional assistance, as appropriate.

Facility Description

Facility Name: Joint Base Elmendorf-Richardson - DA085 - Armored Vehicle Maintenance Area (AVMA)

Facility Address: Otter Lake Road and D Street

City: Anchorage State: Alaska ZIP: 99506

County: Anchorage Borough Tel. Number: (801) 558 - 6032

Owner or Operator Name: CH2M HILL

Owner or Operator Address: 160 W. 68th Avenue

City: Anchorage State: Alaska ZIP: 99518

County: Anchorage Borough Tel. Number: (907) 267-2600

I. Self-Certification Statement (§112.6(a)(1))

The owner or operator of a facility certifies that each of the following is true in order to utilize this template to comply with the SPCC requirements:

I Corey Schwabenlander certify that the following is accurate:

1. I am familiar with the applicable requirements of 40 CFR part 112;
2. I have visited and examined the facility;
3. This Plan was prepared in accordance with accepted and sound industry practices and standards;
4. Procedures for required inspections and testing have been established in accordance with industry inspection and testing standards or recommended practices;
5. I will fully implement the Plan;
6. This facility meets the following qualification criteria (under §112.3(g)(1)):
   a. The aggregate aboveground oil storage capacity of the facility is 10,000 U.S. gallons or less; and
   b. The facility has had no single discharge as described in §112.1(b) exceeding 1,000 U.S. gallons and no two discharges as described in §112.1(b) each exceeding 42 U.S. gallons within any twelve month period in the three years prior to the SPCC Plan self-certification date, or since becoming subject to 40 CFR part 112 if the facility has been in operation for less than three years (not including oil discharges as described in §112.1(b) that are the result of natural disasters, acts of war, or terrorism); and
   c. There is no individual oil storage container at the facility with an aboveground capacity greater than 5,000 U.S. gallons.
7. This Plan does not deviate from any requirement of 40 CFR part 112 as allowed by §112.7(a)(2) (environmental equivalence) and §112.7(d) (impracticability of secondary containment) or include any measures pursuant to §112.9(c)(6) for produced water containers and any associated piping;
8. This Plan and individual(s) responsible for implementing this Plan have the full approval of management and I have committed the necessary resources to fully implement this Plan.

I also understand my other obligations relating to the storage of oil at this facility, including, among others:

1. To report any oil discharge to navigable waters or adjoining shorelines to the appropriate authorities. Notification information is included in this Plan.
2. To review and amend this Plan whenever there is a material change at the facility that affects the potential for an oil discharge, and at least once every five years. Reviews and amendments are recorded in an attached log [See Five Year Review Log and Technical Amendment Log in Attachments 1.1 and 1.2.]
3. Optional use of a contingency plan. A contingency plan:
   a. May be used in lieu of secondary containment for qualified oil-filled operational equipment, in accordance with the requirements under §112.7(k), and;
   b. Must be prepared for flowlines and/or intra-facility gathering lines which do not have secondary containment at an oil production facility, and;
   c. Must include an established and documented inspection or monitoring program; must follow the provisions of 40 CFR part 109; and must include a written commitment of manpower, equipment and materials to expeditiously remove any quantity of oil discharged that may be harmful. If applicable, a copy of the contingency plan and any additional documentation will be attached to this Plan as Attachment 2.

I certify that I have satisfied the requirement to prepare and implement a Plan under §112.3 and all of the requirements under §112.6(a). I certify that the information contained in this Plan is true.

Signature _____ Title: Assistant Project Manager

Name Corey Schwabenlander Date: 9/9/2013

II. Record of Plan Review and Amendments

Five Year Review (§112.5(b)):

Complete a review and evaluation of this SPCC Plan at least once every five years. As a result of the review, amend this Plan within six months to include more effective prevention and control measures for the facility, if applicable. Implement any SPCC Plan amendment as soon as possible, but no later than six months following Plan amendment. Document completion of the review and evaluation, and complete the Five Year Review Log in Attachment 1.1. If the facility no longer meets Tier I qualified facility eligibility, the owner or operator must revise the Plan to meet Tier II qualified facility requirements, or complete a full PE certified Plan.

Table G-1 Technical Amendments (§§112.5(a), (c) and 112.6(a)(2))	
This SPCC Plan will be amended when there is a change in the facility design, construction, operation, or maintenance that materially affects the potential for a discharge to navigable waters or adjoining shorelines. Examples include adding or removing containers, reconstruction, replacement, or installation of piping systems, changes to secondary containment systems, changes in product stored at this facility, or revisions to standard operating procedures.	☒
Any technical amendments to this Plan will be re-certified in accordance with Section I of this Plan template. *[§112.6(a)(2)]* **[See Technical Amendment Log in Attachment 1.2]**	☒

III. Plan Requirements

1. Oil Storage Containers (§112.7(a)(3)(i)):

Table G-2 Oil Storage Containers and Capacities		
This table includes a complete list of all oil storage containers (aboveground containers[a] and completely buried tanks[b]) with capacity of 55 U.S. gallons or more, unless otherwise exempt from the rule. For mobile/portable containers, an estimated number of containers, types of oil, and anticipated capacities are provided.		☒
Oil Storage Container *(indicate whether aboveground (A) or completely buried (B))*	**Type of Oil**	**Shell Capacity (gallons)**
A – Tote stored in Conex Container	Emulsified vegetable oil (EVO)	275

See attached Figure 1 for oil storage location.

A small spill kit will be located adjacent to the oil storage location area

Total Aboveground Storage Capacity [c]	275	gallons
Total Completely Buried Storage Capacity	0	gallons
Facility Total Oil Storage Capacity	275	gallons

[a] Aboveground storage containers that must be included when calculating total facility oil storage capacity include: tanks and mobile or portable containers; oil-filled operational equipment (e.g. transformers); other oil-filled equipment, such as flow-through process equipment. Exempt containers that are not included in the capacity calculation include: any container with a storage capacity of less than 55 gallons of oil; containers used exclusively for wastewater treatment; permanently closed containers; motive power containers; hot-mix asphalt containers; heating oil containers used solely at a single-family residence; and pesticide application equipment or related mix containers.

[b] Although the criteria to determine eligibility for qualified facilities focuses on the aboveground oil storage containers at the facility, the completely buried tanks at a qualified facility are still subject to the rule requirements and must be addressed in the template; however, they are not counted toward the qualified facility applicability threshold.

[c] Counts toward qualified facility applicability threshold.

2. Secondary Containment and Oil Spill Control (§§112.6(a)(3)(i) and (ii), 112.7(c) and 112.9(c)(2)):

Table G-3 Secondary Containment and Oil Spill Control	
Appropriate secondary containment and/or diversionary structures or equipment[a] is provided for all oil handling containers, equipment, and transfer areas to prevent a discharge to navigable waters or adjoining shorelines. The entire secondary containment system, including walls and floor, is capable of containing oil and is constructed so that any discharge from a primary containment system, such as a tank or pipe, will not escape the containment system before cleanup occurs.	☒

[a] Use one of the following methods of secondary containment or its equivalent: (1) Dikes, berms, or retaining walls sufficiently impervious to contain oil; (2) Curbing; (3) Culverting, gutters, or other drainage systems; (4) Weirs, booms, or other barriers; (5) Spill diversion ponds; (6) Retention ponds; or (7) Sorbent materials.

Table G-4 below identifies the tanks and containers at the facility with the potential for an oil discharge; the mode of failure; the flow direction and potential quantity of the discharge; and the secondary containment method and containment capacity that is provided.

Table G-4 Containers with Potential for an Oil Discharge

Area	Type of failure (discharge scenario)	Potential discharge volume (gallons)	Direction of flow for uncontained discharge	Secondary containment method[a]	Secondary containment capacity (gallons)
Bulk Storage Containers and Mobile/Portable Containers[b]					
1- 275-Gallon Totes of EVO	Puncture, improper storage, improper handling	275	Localized	20ml. poly lined 8'x8'x1' Conex container, with wood frame	~479 gallons in Conex Container
Tote Unloading Operations	Incidental releases during transfer operations, puncture of tote during unloading	1	Localized	Absorbent, Absorbent Booms, and Pads(active), Stored in Conex	4 gallons of absorbent capacity
Tote Dispensing Operations	Incidental releases during dispensing operations, release valve operational error	1	Localized	Absorbent, Absorbent Booms, and Pads(active), Stored in Conex	4 gallons of absorbent capacity

[a] Use one of the following methods of secondary containment or its equivalent: (1) Dikes, berms, or retaining walls sufficiently impervious to contain oil; (2) Curbing; (3) Culverting, gutters, or other drainage systems; (4) Weirs, booms, or other barriers; (5) Spill diversion ponds; (6) Retention ponds; or (7) Sorbent materials.

[b] For storage tanks and bulk storage containers, the secondary containment capacity must be at least the capacity of the largest container plus additional capacity to contain rainfall or other precipitation.

3. Inspections, Testing, Recordkeeping and Personnel Training (§§112.7(e) and (f), 112.8(c)(6) and (d)(4), 112.9(c)(3), 112.12(c)(6) and (d)(4)):

Table G-5 Inspections, Testing, Recordkeeping and Personnel Training	
An inspection and/or testing program is implemented for all aboveground bulk storage containers and piping at this facility. *[§§112.8(c)(6) and (d)(4), 112.9(c)(3), 112.12(c)(6) and (d)(4)]*	☒

The following is a description of the inspection and/or testing program (e.g. reference to industry standard utilized, scope, frequency, method of inspection or test, and person conducting the inspection) for all aboveground bulk storage containers and piping at this facility:

Monthly visual inspections are conducted on the following equipment:

- Aboveground Portable Containers (STI SP001 Portable Container – see Monthly Inspection checklist. Attachment 5)

Integrity testing can be performed through visual examination of portable containers. Service life for portable container is provided below. If container is to be used past that time, the portable container must be U.S. Department of Transportation (DOT) tested and recertified.

- Plastic portable container - every 7 years
- Steel portable container - every 12 years
- Stainless Steel portable container - every 17 years

Inspection, testing, and maintenance records are maintained with the SPCC Plan for a period of three years. The monthly inspection form can be found in this document as Attachment 5.

Inspections, tests, and records are conducted in accordance with written procedures developed for the facility. Records of inspections and tests kept under usual and customary business practices will suffice for purposes of this paragraph. *[§112.7(e)]*	☒
A record of the inspections and tests are kept at the facility or with the SPCC Plan for a period of three years. *[§112.7(e)]* **[See Inspection Log and Schedule in Attachment 3.1]**	☒
Inspections and tests are signed by the appropriate supervisor or inspector. *[§112.7(e)]*	☒
Personnel, training, and discharge prevention procedures [§112.7(f)] Personnel responsible for oil-handling operations at the facility are trained on the following topics: • Applicable pollution control laws, rules, and regulations; • Operation and maintenance of equipment to prevent oil discharges; • Purpose and overview of SPCC Plan; • Review of potential spill areas and drainage routes; • Review of emergency response procedures; • Review of spill cleanup equipment locations and the proper use of the equipment; • Recent spill events (if any), subsequent response and corrective action. Personnel responsible for inspections are trained on proper inspection procedures, frequency of inspections, record-keeping requirements, and procedures for reporting and correcting detected problems. The EVO Injection project is not expected to exceed one year in duration; however, if the project and oil storage	☒

containers are onsite for more than one year, annual refresher training and exercises/drills are completed in association with this SPCC Plan. Oil-handling personnel are trained in the operation and maintenance of equipment to prevent discharges; discharge procedure protocols; applicable pollution control laws, rules, and regulations; general facility operations; and, the contents of the facility SPCC Plan. *[§112.7(f)]*	
A person who reports to facility management is designated and accountable for discharge prevention. *[§112.7(f)]* Name/Title: Corey Schwabenlander / Project Manager	☒
Discharge prevention briefings are conducted for oil-handling personnel annually to assure adequate understanding of the SPCC Plan for that facility. Such briefings highlight and describe past reportable discharges or failures, malfunctioning components, and any recently developed precautionary measures. *[§112.7(f)]* **[See Oil-handling Personnel Training and Briefing Log in Attachment 3.4]**	☒

4. Security (excluding oil production facilities) §112.7(g):

Table G-6 Implementation and Description of Security Measures	
Security measures are implemented at this facility to prevent unauthorized access to oil handling, processing, and storage area.	☒

Access to the facility must be gained through the Joint Base Elmendorf-Richardson security station, which is manned 24 hours per day. Additionally, fencing is in place on all sides of the facility. Fencing is also provided around the secondary containment.

Sufficient lighting is provided to allow for detection of spills at night and to prevent vandalism. Joint Base Richardson-Elmendorf has sufficient lighting at the facility to assist in the discovery of discharge during hours of darkness and to prevent discharges through acts of vandalism.

5. Emergency Procedures and Notifications (§112.7(a)(3)(iv) and 112.7(a)(5)):

Table G-7 Description of Emergency Procedures and Notifications

The following is a description of the immediate actions to be taken by facility personnel in the event of a discharge to navigable waters or adjoining shorelines *[§112.7(a)(3)(iv) and 112.7(a)(5)]*:

Initial Spill Response

In the event of a spill of any amount, the person who first discovers the spill or release shall immediately contact the Project Manager at (801) 558-6032. In the event of a spill after business hours or for emergency response, 911 will be contacted. Note the size of the spill, the location, the material, if hazards are present (i.e. fire, explosions) and whether the spill is contained or still releasing.

Do the following only if you have adequate training to do so without risk to your own personal safety:

- Evacuate personnel to a safe distance.
- Stop the material from spilling (shut off valves, turn drum upright, etc.).
- Contain the spill with available equipment (dirt berms, absorbent socks, sand bags, etc.)
- Shut off ignition sources such as motors, electrical power, etc.
- Divert spill to an area where it will cause less harm using dikes or berms.
- Clean up the spill, if within capabilities
- Stand by to direct emergency response personnel when they arrive.

If the spill is small has not contaminated any open water, reached a drain, or contaminated significant quantities of soil and you are fully aware of how to protect yourself from all hazards associated with the material, then proceed as follows:

1. DO NOT FLUSH INTO STORM SEWER OR DRAINAGE DITCH.
2. DO NOT ADD WATER TO FLUSH OUT THE STORM SEWER OR STRUCTURE.
3. Collect all spilled material in a properly labeled, approved hazardous waste container.
4. Clean all surfaces or objects that have been contaminated by the spilled material.
5. Collect all disposable, contaminated objects and cleanup materials and place in a properly labeled, approved hazardous waste container.

If you are uncertain what to do, treat the situation as a worst-case emergency.

Notification Procedures

1. Base PM will be notified of spill by CH2MHILL PM/EM.

2. Alaska Department of Environmental Conservation (ADEC) will be notified by the Base PM (via telephone and written notice) of any spills in the following circumstances:
   - Any amount spilled to water will be reported immediately.
   - Spills to land greater than 55 gallons will be reported immediately.
   - Spills to land greater than 10 gallons, but less than 55 gallons, will be reported within 48 hours of identifying the spill.
   - Spills to land of 1 to 10 gallons will be recorded in a spill reporting log and submitted to ADEC monthly.
   - Spills to impermeable secondary containment greater than 55 gallons will be reported within 48 hours.

3. Base PM will notify NRC

DISPOSAL

Any contaminated materials, including absorbents, cloth, soil, wood, etc. that cannot be decontaminated should be placed in an approved United Nations specification drum for storage and final offsite disposal as hazardous waste. Offsite disposal shall be overseen and managed by Project Manager

6. Contact List (§112.7(a)(3)(vi)):

Table G-8 Contact List	
Contact Organization / Person	**Telephone Number**
National Response Center (NRC)	1-800-424-8802
EPA Regional Administrator (RA) Dennis McLerran 1200 6th Ave. Suite 900 Seattle, WA. 98101	(206)-553-0479
Key Facility Personnel	
Designated Person Accountable for Discharge Prevention: Project Manager - Primary (Corey Schwabenlander)	Cell: (801) 558 - 6032
Project Manager - Secondary (Leah Waller)	Cell: (916) 402 - 1467
Environmental Manager (Nancy Ballantyne)	Cell: (303) 885 - 9954
Alaska Department of Environmental Conservation (ADEC) - Central Alaska Response Team	Normal Business Hours (907) 269 - 3063
	Outside Business Hours 1 - 800 - 478 - 9300
Local Fire Department	911
Local Police Department	911
State of Alaska Emergency Operations Center (EOC)	(907) 428-7100
Hospital	(907) 276 - 1131
Other Contact References: Base Project Manager Donna Baumler JBER RPM, 673D CES/CEANR	907) 384-2318

7. NRC Notification Procedure (§112.7(a)(4) and (a)(5)):

Table G-9 NRC Notification Procedure	
In the event of a discharge of oil to navigable waters or adjoining shorelines, the following information identified in Attachment 4 will be provided to the National Response Center immediately following identification of a discharge to navigable waters or adjoining shorelines **[See Discharge Notification Form in Attachment 4]**: *[§112.7(a)(4)]*	☒

- The exact address or location and phone number of the facility;
- Date and time of the discharge;
- Type of material discharged;
- Estimate of the total quantity discharged;
- Estimate of the quantity discharged to navigable waters;
- Source of the discharge;
- Description of all affected media;
- Cause of the discharge;
- Any damages or injuries caused by the discharge;
- Actions being used to stop, remove, and mitigate the effects of the discharge;
- Whether an evacuation may be needed; and
- Names of individuals and/or organizations who have also been contacted.

8. SPCC Spill Reporting Requirements (Report within 60 days) (§112.4):

Joint Base Elmendorf-Richardson - DA085 - AVMA will submit information to the EPA Regional Administrator (RA), Dennis McLerran, located at 1200 6th Ave. Suite 900 Seattle, WA. 98101, and the appropriate agency or agencies in charge of oil pollution control activities in the State in which the facility is located within 60 days from one of the following discharge events:

A single discharge of more than 1,000 U.S. gallons of oil to navigable waters or adjoining shorelines or
Two discharges to navigable waters or adjoining shorelines each more than 42 U.S. gallons of oil occurring within any twelve month period

You must submit the following information to the RA:

(1) Name of the facility;
(2) Your name;
(3) Location of the facility;
(4) Maximum storage or handling capacity of the facility and normal daily throughput;
(5) Corrective action and countermeasures you have taken, including a description of equipment repairs and replacements;
(6) An adequate description of the facility, including maps, flow diagrams, and topographical maps, as necessary;
(7) The cause of the reportable discharge, including a failure analysis of the system or subsystem in which the failure occurred; and
(8) Additional preventive measures you have taken or contemplated to minimize the possibility of recurrence
(9) Such other information as the Regional Administrator may reasonably require pertinent to the Plan or discharge

* * * * *

Alaska Department of Environmental Conservation (ADEC) will be notified via written forms provided as Attachment 6 and 7 of this SPCC Plan.

A. Onshore Facilities (excluding production) (§§112.8(b) through (d), 112.12(b) through (d)):

The owner or operator must meet the general rule requirements as well as requirements under this section. Note that not all provisions may be applicable to all owners/operators. For example, a facility may not maintain completely buried metallic storage tanks installed after January 10, 1974, and thus would not have to abide by requirements in §§112.8(c)(4) and 112.12(c)(4), listed below. **In cases where a provision is not applicable, write "N/A".**

Table G-10 General Rule Requirements for Onshore Facilities		N/A
Drainage from diked storage areas is restrained by valves to prevent a discharge into the drainage system or facility effluent treatment system, except where facility systems are designed to control such discharge. Diked areas may be emptied by pumps or ejectors that must be manually activated after inspecting the condition of the accumulation to ensure no oil will be discharged. *[§§112.8(b)(1) and 112.12(b)(1)]*	☐	☒
Valves of manual, open-and-closed design are used for the drainage of diked areas. *[§§112.8(b)(2) and 112.12(b)(2)]*	☐	☒
The containers at the facility are compatible with materials stored and conditions of storage such as pressure and temperature. *[§§112.8(c)(1) and 112.12(c)(1)]*	☒	☐
Secondary containment for the bulk storage containers (including mobile/portable oil storage containers) holds the capacity of the largest container plus additional capacity to contain precipitation. Mobile or portable oil storage containers are positioned to prevent a discharge as described in §112.1(b). *[§112.6(a)(3)(ii)]*	☒	☐
If uncontaminated rainwater from diked areas drains into a storm drain or open watercourse the following procedures will be implemented at the facility: *[§§112.8(c)(3) and 112.12(c)(3)]*		
• Bypass valve is normally sealed closed	☐	☒
• Retained rainwater is inspected to ensure that its presence will not cause a discharge to navigable waters or adjoining shorelines	☐	☒
• Bypass valve is opened and resealed under responsible supervision	☐	☒
• Adequate records of drainage are kept **[See Dike Drainage Log in Attachment 3.3]**	☐	☒
For completely buried metallic tanks installed on or after January 10, 1974 at this facility *[§§112.8(c)(4) and 112.12(c)(4)]*:		
• Tanks have corrosion protection with coatings or cathodic protection compatible with local soil conditions.	☐	☒
• Regular leak testing is conducted.	☐	☒
For partially buried or bunkered metallic tanks *[§112.8(c)(5) and §112.12(c)(5)]*:		
• Tanks have corrosion protection with coatings or cathodic protection compatible with local soil conditions.	☐	☒
Each aboveground bulk container is tested or inspected for integrity on a regular schedule and whenever material repairs are made. Scope and frequency of the inspections and inspector qualifications are in accordance with industry standards. Container supports and foundations are regularly inspected. **[See Inspection Log and Schedule and Bulk Storage Container Inspection Schedule in Attachments 3.1 and 3.2]** *[§112.8(c)(6) and §112.12(c)(6)(i)]*	☒	☐
Outsides of bulk storage containers are frequently inspected for signs of deterioration, discharges, or accumulation of oil inside diked areas. **[See Inspection Log and Schedule in Attachment 3.1]** *[§§112.8(c)(6) and 112.12(c)(6)]*	☒	☐
For bulk storage containers that are subject to 21 CFR part 110 which are shop-fabricated, constructed of austenitic stainless steel, elevated and have no external insulation, formal visual inspection is conducted on a regular schedule. Appropriate qualifications for personnel performing tests and inspections are documented. **[See Inspection Log and Schedule and Bulk Storage Container Inspection Schedule in Attachments 3.1 and 3.2]** *[§112.12(c)(6)(ii)]*	☐	☒

Table G-10 General Rule Requirements for Onshore Facilities		N/A
Each container is provided with a system or documented procedure to prevent overfills for the container. Describe: Totes are not filled on site.	☒	☐
Liquid level sensing devices are regularly tested to ensure proper operation **[See Inspection Log and Schedule in Attachment 3.1]**. *[§112.6(a)(3)(iii)]*	☐	☒
Visible discharges which result in a loss of oil from the container, including but not limited to seams, gaskets, piping, pumps, valves, rivets, and bolts are promptly corrected and oil in diked areas is promptly removed. *[§§112.8(c)(10) and 112.12(c)(10)]*	☒	☐
Aboveground valves, piping, and appurtenances such as flange joints, expansion joints, valve glands and bodies, catch pans, pipeline supports, locking of valves, and metal surfaces are inspected regularly. **[See Inspection Log and Schedule in Attachment 3.1]** *[§§112.8(d)(4) and 112.12(d)(4)]*	☒	☐
Integrity and leak testing are conducted on buried piping at the time of installation, modification, construction, relocation, or replacement. **[See Inspection Log and Schedule in Attachment 3.1]** *[§§112.8(d)(4) and 112.12(d)(4)]*	☐	☒

ATTACHMENT 1 – Five Year Review and Technical Amendment Logs

ATTACHMENT 1.1 – Five Year Review Log

I have completed a review and evaluation of the SPCC Plan for this facility, and will/will not amend this Plan as a result.

Table G-13 Review and Evaluation of SPCC Plan for Facility			
Review Date	Plan Amendment		Name and signature of person authorized to review this Plan
	Will Amend	Will Not Amend	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	
	☐	☐	

ATTACHMENT 1.2 – Technical Amendment Log

Any technical amendments to this Plan will be re-certified in accordance with Section I of this Plan template.

Table G-15 Description and Certification of Technical Amendments		
Review Date	Description of Technical Amendment	Name and signature of person certifying this technical amendment

ATTACHMENT 2 – Oil Spill Contingency Plan and Checklist

THERE IS NO QUALIFIED OIL-FILLED OPERATIONAL EQUIPMENT AT THIS FACILITY. THEREFORE, THE FACILITY IS NOT REQUIRED TO MEET 40 CFR 109.

An oil spill contingency plan and written commitment of resources is required for:

- Flowlines and intra-facility gathering lines at oil production facilities and
- Qualified oil-filled operational equipment which has no secondary containment.

An oil spill contingency plan meeting the provisions of 40 CFR part 109, as described below, and a written commitment of manpower, equipment and materials required to expeditiously control and remove any quantity of oil discharged that may be harmful is attached to this Plan.	☐

Complete the checklist below to verify that the necessary operations outlined in 40 CFR part 109 - Criteria for State, Local and Regional Oil Removal Contingency Plans - have been included.

Table G-15 Checklist of Development and Implementation Criteria for State, Local and Regional Oil Removal Contingency Plans (§109.5)[a]	
(a) Definition of the authorities, responsibilities and duties of all persons, organizations or agencies which are to be involved in planning or directing oil removal operations.	☐
(b) Establishment of notification procedures for the purpose of early detection and timely notification of an oil discharge including:	
(1) The identification of critical water use areas to facilitate the reporting of and response to oil discharges.	☐
(2) A current list of names, telephone numbers and addresses of the responsible persons (with alternates) and organizations to be notified when an oil discharge is discovered.	☐
(3) Provisions for access to a reliable communications system for timely notification of an oil discharge, and the capability of interconnection with the communications systems established under related oil removal contingency plans, particularly State and National plans (e.g., NCP).	☐
(4) An established, prearranged procedure for requesting assistance during a major disaster or when the situation exceeds the response capability of the State, local or regional authority.	☐
(c) Provisions to assure that full resource capability is known and can be committed during an oil discharge situation including:	
(1) The identification and inventory of applicable equipment, materials and supplies which are available locally and regionally.	☐
(2) An estimate of the equipment, materials and supplies which would be required to remove the maximum oil discharge to be anticipated.	☐
(3) Development of agreements and arrangements in advance of an oil discharge for the acquisition of equipment, materials and supplies to be used in responding to such a discharge.	☐
(d) Provisions for well defined and specific actions to be taken after discovery and notification of an oil discharge including:	
(1) Specification of an oil discharge response operating team consisting of trained, prepared and available operating personnel.	☐
(2) Pre-designation of a properly qualified oil discharge response coordinator who is charged with the responsibility and delegated commensurate authority for directing and coordinating response operations and who knows how to request assistance from Federal authorities operating under existing national and regional contingency plans.	☐
(3) A preplanned location for an oil discharge response operations center and a reliable communications system for directing the coordinated overall response operations.	☐
(4) Provisions for varying degrees of response effort depending on the severity of the oil discharge.	☐
(5) Specification of the order of priority in which the various water uses are to be protected where more than one water use may be adversely affected as a result of an oil discharge and where response operations may not be adequate to protect all uses.	☐
(6) Specific and well defined procedures to facilitate recovery of damages and enforcement measures as provided for by State and local statutes and ordinances.	☐

[a] The contingency plan must be consistent with all applicable state and local plans,

Area Contingency Plans, and the National Contingency Plan (NCP)

ATTACHMENT 3 – Inspections, Dike Drainage and Personnel Training Logs

ATTACHMENT 3.1 – Inspection Log and Schedule

Table G-16 Inspection Log and Schedule

This log is intended to document compliance with §§112.6(a)(3)(iii), 112.8(c)(6), 112.8(d)(4), 112.9(b)(2), 112.9(c)(3), 112.9(d)(1), 112.9(d)(4), 112.12.(c)(6), and 112.12(d)(4), as applicable.

Date of Inspection	Container / Piping / Equipment	Describe Scope (or cite Industry Standard)	Observations	Name/ Signature of Inspector	Records maintained separately [a]
	Tote Storage Area (Conex Container)	MonthlyVisual Inspections (Attachment 5)	TOTE IN GOOD CONDITION SECONDARY CONTAINMENT IN GOOD CONDITION	ANDREW CASTOR	☐
	Small Spill Kit	Monthly Visual Inspections (Document on Attachment 5)	GOOD CONDITION	ANDREW CASTOR	☐
					☐
					☐
					☐

[a] Indicate in the table above if records of facility inspections are maintained separately at this facility.

ATTACHMENT 3.2 – Bulk Storage Container Inspection Schedule – onshore facilities (excluding production):

To comply with integrity inspection requirement for bulk storage containers, inspect/test each shop-built aboveground bulk storage container on a regular schedule in accordance with a recognized container inspection standard based on the minimum requirements in the following table.

Table G-17 Bulk Storage Container Inspection Schedule

Container Size and Design Specification	Inspection requirement
Portable containers (including drums, totes, and intermodal bulk containers (IBC)) 275 Gallon Tote	Visually inspect monthly for signs of deterioration, discharges or accumulation of oil inside diked areas
55 to 1,100 gallons with sized secondary containment N/A	Visually inspect monthly for signs of deterioration, discharges or accumulation of oil inside diked areas plus any annual inspection elements per industry inspection standards
1,101 to 5,000 gallons with sized secondary containment and a means of leak detection[a] N/A	
1,101 to 5,000 gallons with sized secondary containment and no method of leak detection[a] N/A	Visually inspect monthly for signs of deterioration, discharges or accumulation of oil inside diked areas, plus any annual inspection elements and other specific integrity tests that may be required per industry inspection standards

[a] Examples of leak detection include, but are not limited to, double-walled tanks and elevated containers where a leak can be visually identified.

ATTACHMENT 3.3 – Dike Drainage Log

Table G-18 Dike Drainage Log						
Date	Bypass valve sealed closed	Rainwater inspected to be sure no oil (or sheen) is visible	Open bypass valve and reseal it following drainage	Drainage activity supervised	Observations	Signature of Inspector
*** Currently there are no diked areas at the facility, therefore this log is not applicable and does not need to be completed*						

ATTACHMENT 3.4 – Oil-handling Personnel Training and Briefing Log

Table G-19 Oil-Handling Personnel Training and Briefing Log

Date	Description / Scope	Attendees
9-10-13	Reviewed traing presentation	Mark Augustyn Corey Schwabenlander Andrew Castor

ATTACHMENT 4 – Discharge Notification Form

In the event of a discharge of oil to navigable waters or adjoining shorelines, the following information will be provided to the National Response Center **[also see the notification information provided in Section 7 of the Plan]**:

Table G-20 Information provided to the National Response Center in the Event of a Discharge			
Discharge/Discovery Date		Time	
Facility Name			
Facility Location (Address/Lat-Long/Section Township Range)			
Name of reporting individual		Telephone #	
Type of material discharged		Estimated total quantity discharged	Gallons/Barrels
Source of the discharge		Media affected	☐ Soil ☐ Water (specify) ☐ Other (specify)
Actions taken			
Damage or injuries	☐ No ☐ Yes (specify)	Evacuation needed?	☐ No ☐ Yes (specify)
Organizations and individuals contacted	☐ National Response Center 800-424-8802 Time ☐ Cleanup contractor (Specify) Time ☐ Facility personnel (Specify) Time ☐ State Agency (Specify) Time ☐ Other (Specify) Time		

ATTACHMENT 5 – Portable Containers Inspection – Monthly

STI SP001 Portable Container Monthly Inspection Checklist

General Inspection Information:

Inspection Date: 9/16/15 Retain Until Date: 9/16/16 (36 months from inspection date)

Prior Inspection Date: NA Inspector Name: ANDREW CASTOR

Containers Inspected (ID #'s): NA

Inspection Guidance:

- For equipment not included in this Standard, follow the manufacturer recommended inspection/testing schedules and procedures.
- The periodic AST Inspection is intended for monitoring the external AST condition and its containment structure. This visual inspection does not require a Certified Inspector. It shall be performed by an owner's inspector who is familiar with the site and can identify changes and developing problems.
- (*) designates an item in a non-conformance status. This indicates that action is required to address a problem.
- Non-conforming items important to tank or containment integrity require evaluation by an engineer experienced in AST design, a Certified Inspector, or a tank manufacturer who will determine the corrective action. Note the non-conformance and corresponding corrective action in the comment section.
- Retain the completed checklists for 36 months.

Item	Area: AVMA		Area:		Area:		Area:	
1.0 AST Containment/Storage Area								
1.1 ASTs within designated storage area?	X Yes	☐ No*	☐ Yes	☐ No*	☐ Yes	☐ No*	☐ Yes	☐ No*
1.2 Debris, spills, or other fire hazards in containment or storage area?	☐ Yes*	X No	☐ Yes*	☐ No	☐ Yes*	☐ No	☐ Yes*	☐ No
1.3 Water in outdoor secondary containment?	☐ Yes*	X No	☐ Yes*	☐ No	☐ Yes*	☐ No	☐ Yes*	☐ No
1.4 Drain valves operable and in a closed position?	☐ Yes	X No*	☐ Yes*	☐ No	☐ Yes*	☐ No	☐ Yes*	☐ No
1.5 Egress pathways clear and gates/doors operable?	X Yes	☐ No*	☐ Yes*	☐ No	☐ Yes*	☐ No	☐ Yes*	☐ No

ATTACHMENT 5 – Portable Containers Inspection – Monthly (Continued)

Item	Area: AVMA	Area:	Area:	Area:
2.0 Leak Detection				
2.1 Visible signs of leakage around the container or storage area?	☐Yes* ☒No	☐Yes* ☐No	☐Yes* ☐No	☐Yes* ☐No
3.0 Container				
3.0 Noticeable container distortions, buckling, denting or bulging?	☐Yes* ☒No	☐Yes* ☐No	☐Yes* ☐No	☐Yes* ☐No

Comments: TOTE IN GOOD CONDITION
SECONDARY CONTAINMENT IN GOOD CONDITION
NO LEAKS

ATTACHMENT 6 - ADEC Oil & Hazardous Substances Spill Notification Form

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

OIL & HAZARDOUS SUBSTANCES SPILL NOTIFICATION FORM

ADEC USE ONLY

ADEC SPILL #:	ADEC FILE #:	ADEC LC:

PERSON REPORTING:	PHONE NUMBER:	REPORTED HOW? (ADEC USE ONLY) ☐ Phone ☐ Fax ☐ Troopers
DATE/TIME OF SPILL:	DATE/TIME DISCOVERED:	DATE/TIME REPORTED:
INCIDENT LOCATION/ADDRESS:	DATUM: ☐ NAD27 ☐ NAD83 ☐ WGS84 ☐ Other LAT. LONG.	PRODUCT SPILLED:

QUANTITY SPILLED:	QUANTITY CONTAINED:	QUANTITY RECOVERED:	QUANTITY DISPOSED:
☐ gallons ☐ pounds	☐ gallons ☐ pounds	☐ gallons ☐ pounds	☐ gallons ☐ pounds

	POTENTIAL RESPONSIBLE PARTY:	OTHER PRP, IF ANY:	VESSEL NAME:
Name/Business:			
Mailing Address:			VESSEL NUMBER:
Contact Name:			> 400 GROSS TON VESSEL: ☐ Yes ☐ No
Contact Number:			

SOURCE OF SPILL:	CAUSE CLASSIFICATION: ☐ Accident ☐ Human Factors ☐ Structural/Mechanical ☐ Other
CAUSE OF SPILL: ☐ Under Investigation	
CLEANUP ACTIONS:	
DISPOSAL METHODS AND LOCATION:	

AFFECTED AREA SIZE:	SURFACE TYPE: *(gravel, asphalt, name of river etc.)*	RESOURCES AFFECTED/THREATENED: *(Water sources, wildlife, wells, etc.)*
COMMENTS:		

ADEC USE ONLY

SPILL NAME:	NAME OF DEC STAFF RESPONDING:	C-PLAN MGR NOTIFIED? ☐ Yes ☐ No

DEC RESPONSE:	CASELOAD CODE:	CLEANUP CLOSURE ACTION:
☐ Phone follow-up ☐ Field visit ☐ Took Report	☐ First and Final ☐ Open/No LC ☐ LC Assigned	☐ NFA ☐ Monitoring ☐ Transferred to CS or STP

COMMENTS:	Status of Case: ☐ Open ☐ Closed	DATE CASE CLOSED:

REPORT PREPARED BY:	DATE:

Revised 2/5/2008

ATTACHMENT 7 - ADEC Monthly Oil Spill Reporting Log

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
MONTHLY OIL SPILL REPORTING LOG

FACILITY NAME AND ADDRESS:
REPORT MONTH/YEAR:
REPORTED BY:

Only for minor spills, solely to land, not to creeks, sewers or storm drains.
(see Discharge Reporting requirements, 18 AAC 75.300)

LARGE SPILLS, HAZARDOUS SUBSTANCE SPILLS OR SPILLS AFFECTING WATERWAYS MUST BE REPORTED IMMEDIATELY.

Call the nearest ADEC office for more information:
Anchorage: 269-3063 **Fairbanks**: 451-2121 **Juneau**: 465-5340 **After Hours:** 1-800-478-9300

DATE / TIME OF SPILL	LOCATION	PRODUCT SPILLED	QTY SPILLED (GALLONS)	CAUSE OF SPILL & AREA AFFECTED	WHO RESPONDED	CLEANUP & METHOD / PLACE OF DISPOSAL

Appendix C
Soil Boring Logs and Well Construction Diagrams

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CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-01-4413	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651373.57 EASTING (NAD83 SPZN4 feet):1690492.43 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 287.85 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 7/29/13 16:50 END : 7/30/13 17:30 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
5					**GRAVELLY SILT (ML)**, grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
10					**GRAVELLY SILT (ML)**, grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
15					**GRAVELLY SILT (ML)**, grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
20					**GRAVELLY SILT (ML)**, grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
25					**GRAVELLY SAND (SP)**, grayish black, coarse, moist, angular, loose.		rock fragments
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-01-4413	SHEET 2 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651373.57 EASTING (NAD83 SPZN4 feet):1690492.43 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 287.85 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 7/29/13 16:50 END : 7/30/13 17:30 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					GRAVELLY SAND (SP), grayish brown, coarse, dry, angular, loose.		rock fragments
35					**SILTY SAND (SM)**, grayish brown, low plasticity; fine, moist, soft, rounded, loose.		rock fragments
40					**SILTY SAND (SM)**, grayish brown, low plasticity; fine, moist, soft, rounded, loose.		rock fragments
45					**GRAVELLY SAND (GP)**, grayish brown, coarse, moist, angular, loose.		rock fragments
50					**GRAVELLY SILT (ML)**, gray, low plasticity; fine, moist, soft, rounded, loose.		rock fragments
55					**GRAVELLY SILT (ML)**, gray, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-01-4413	SHEET 3 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651373.57 EASTING (NAD83 SPZN4 feet):1690492.43 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 287.85 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 7/29/13 16:50 END : 7/30/13 17:30 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
65					**GRAVELLY SILT (ML)**, gray, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
70					**GRAVELLY SILT (ML)**, grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments, interval began with dry gravel and silt, then wet silty gravel, and the bottom 2.5' was very compact, dry silt
							Boring terminated at 72 feet
75							
80							
85							
90							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-02-4413	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651382.63 EASTING (NAD83 SPZN4 feet):1690502.42 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 287.74 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 7/31/13 09:15 END : 8/3/13 14:15 LOGGER : Frame

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					GRAVELLY SAND (SW), grayish brown, coarse, dry, angular, very loose.		
5					**GRAVELLY SAND (SW)**, grayish brown, coarse, moist, angular, very loose.		
10					**GRAVELLY SAND (SW)**, grayish brown, coarse, moist, angular, very loose.		
15					**GRAVELLY SAND (SW)**, grayish brown, coarse, moist, angular, loose.		
20					**GRAVELLY SAND (SW)**, grayish brown, coarse, moist, angular, loose.		
25					**SANDY GRAVEL (GW)**, grayish brown, coarse, dry, angular, loose.		
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:
457958	DA085-IW-02-4413 SHEET 2 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651382.63 EASTING (NAD83 SPZN4 feet):1690502.42 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 287.74 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 7/31/13 09:15 END : 8/3/13 14:15 LOGGER : Frame

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					SANDY GRAVEL (GW), grayish brown, coarse, dry, angular, loose.		
35					**SANDY GRAVEL (GW)**, grayish brown, coarse, dry, angular, loose.		
40					**SANDY GRAVEL (GW)**, grayish brown, coarse, dry, angular, loose.		
45					**SANDY GRAVEL (GW)**, grayish brown, coarse, dry, angular, loose.		
50					**SANDY GRAVEL (GW)**, grayish brown, coarse, dry, angular, loose.		
55					**SANDY GRAVEL (GW)**, grayish brown, coarse, dry, angular, loose.		
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-02-4413	SHEET 3 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651382.63 EASTING (NAD83 SPZN4 feet):1690502.42 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 287.74 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 7/31/13 09:15 END : 8/3/13 14:15 LOGGER : Frame

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
65					**SANDY SILT (ML)**, grayish brown, low plasticity; fine, dry, very soft, loose.		
					SANDY SILT (ML), grayish brown, low plasticity; fine, dry, very soft, loose.		
70					**SANDY SILT (ML)**, grayish brown, low plasticity; fine, dry, very soft, loose.		
					SILT (ML), gray, low plasticity; fine, dry, very soft, loose.		Boring terminated at 72 feet
75							
80							
85							
90							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-03-4413	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651394.03 EASTING (NAD83 SPZN4 feet):1690513.98 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 288.50 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 8/3/13 15:08 END : 8/4/13 16:40 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					SANDY GRAVEL (GP), grayish brown, coarse, dry, angular, loose.		Lead rod
5					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
10					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
15					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
20					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
25					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
30					**SANDY GRAVEL (GP)**, grayish black, coarse, dry, angular, loose.		rock fragments
35							

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-03-4413	SHEET 2 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651394.03 EASTING (NAD83 SPZN4 feet):1690513.98 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 288.50 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 8/3/13 15:08 END : 8/4/13 16:40 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					SANDY GRAVEL (GP), grayish brown, coarse, dry, angular, loose.		rock fragments
40					**SANDY GRAVEL (GP)**, gray, coarse, dry, angular, loose.		rock fragments
45					**SANDY GRAVEL (GP)**, gray, coarse, dry, angular, loose.		rock fragments
50					**SANDY GRAVEL (GP)**, gray, coarse, dry, angular, loose.		rock fragments
55					**SANDY GRAVEL (GP)**, gray, coarse, dry, angular, loose.		rock fragments
60					**SANDY GRAVEL (GP)**, gray, coarse, dry, angular, loose.		rock fragments
65							
	67.0						
			0.0		**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.	13Q3IW-01-4413-SO-0	rock fragments
	69.0						
70	70.0		0.0		Soil Description on next page		

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-03-4413	SHEET 3 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651394.03 EASTING (NAD83 SPZN4 feet):1690513.98 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 288.50 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 8/3/13 15:08 END : 8/4/13 16:40 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					SILT (ML), grayish brown, low plasticity; fine, dry, soft, very dense.		Slightly deeper than previous borings, will set screen from 65-70 feet bgs Boring terminated at 70 feet
75							
80							
85							
90							
95							
100							
105							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-04-4413	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651404.33 EASTING (NAD83 SPZN4 feet):1690524.20 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 288.96 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 8/5/13 09:20 END : 8/5/13 15:10 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					SANDY GRAVEL (GP), grayish brown, coarse, dry, angular, loose.		Lead rod
5					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
10					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
15					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
20					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
25					**SANDY GRAVEL (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-04-4413	SHEET 2 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651404.33 EASTING (NAD83 SPZN4 feet):1690524.20 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 288.96 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 8/5/13 09:20 END : 8/5/13 15:10 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					SAND (SW), grayish black, fine, moist, rounded, loose.		rock fragments, organic matter, slightly moist, with some gravel
35					**GRAVELLY SILT (ML)**, grayish brown, low plasticity; fine, dry, soft, rounded, loose.		Gravels observed with silt
40					**GRAVELLY SAND (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
45					**GRAVELLY SAND (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
50					**GRAVELLY SAND (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
55					**GRAVELLY SAND (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
60							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-IW-04-4413	SHEET 3 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651404.33 EASTING (NAD83 SPZN4 feet):1690524.20 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 288.96 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 8/5/13 09:20 END : 8/5/13 15:10 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
65							
					SANDY GRAVEL (GP), grayish brown, coarse, moist, angular, dense.		rock fragments
70					**SILT (ML)**, grayish brown, low plasticity; fine, dry, soft, rounded, dense.		Very little moisture
							Boring terminated at 72 feet
75							
80							
85							
90							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-ROI-4413	SHEET 1 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651388.90 EASTING (NAD83 SPZN4 feet):1690508.81 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 287.94 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 8/1/13 14:00 END : 8/2/13 13:12 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
5							
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
10							
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
15							
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
20							
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
25							
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
30							

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-ROI-4413	SHEET 2 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651388.90 EASTING (NAD83 SPZN4 feet):1690508.81 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 287.94 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 8/1/13 14:00 END : 8/2/13 13:12 LOGGER : Seay

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					GRAVELLY SILT (ML), grayish brown, low plasticity; fine, dry, soft, rounded, loose.(Soil Description Repeated)		
35					**GRAVELLY SILT (ML)**, grayish brown, low plasticity; fine, dry, soft, rounded, loose.		rock fragments
40					**GRAVELLY SAND (GP)**, grayish brown, fine, dry, angular, loose.		rock fragments
45					**GRAVELLY SAND (GP)**, grayish brown, coarse, dry, angular, loose.		rock fragments
50					**GRAVELLY SAND (GP)**, grayish black, coarse, moist, angular, loose.		rock fragments
55					**GRAVELLY SAND (GP)**, grayish brown, coarse, moist, angular, loose.		rock fragments
60					**GRAVELLY SILT (ML)**, grayish brown, low plasticity; coarse, dry, soft, angular, loose.		rock fragments

CH2MHILL

PROJECT NUMBER:	BORING NUMBER:	
457958	DA085-ROI-4413	SHEET 3 OF 3

SOIL BORING LOG

PROJECT : JBER LOCATION : DA089

NORTHING (NAD83 SPZN4 feet):2651388.90 EASTING (NAD83 SPZN4 feet):1690508.81 DRILLING CONTRACTOR : GeoTek Alaska, Inc.

ELEVATION: 287.94 feet NAVD88 DRILLING METHOD AND EQUIPMENT : Geoprobe 8040DT, Direct Push

WATER LEVEL: --- feet bgs START : 8/1/13 14:00 END : 8/2/13 13:12 LOGGER : Seay

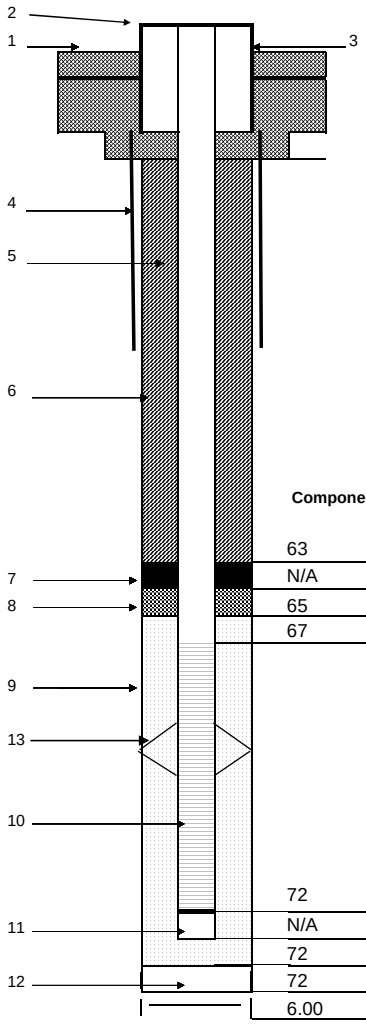
DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	SAMPLE RECOVERY (feet)	PID (ppm)	GRAPHIC LOG	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	SAMPLE ID	DRILLING AND LITHOLOGY NOTES
					GRAVELLY SILT (ML), grayish brown, low plasticity; coarse, dry, soft, angular, loose.(Soil Description Repeated)		
65					**GRAVELLY SILT (ML)**, grayish brown, low plasticity; coarse, dry, soft, angular, loose.		rock fragments
					SANDY GRAVEL (GP), gray, coarse, dry, angular, medium dense.		rock fragments, some moisture toward 68.6 feet bgs
70					**SILTY GRAVEL (GM)**, gray, low plasticity; fine, wet, medium, rounded, medium dense. **SILT (ML)**, grayish brown, low plasticity; fine, dry, soft, rounded, very dense.		rock fragments
							Boring terminated at 72 feet
75							
80							
85							
90							

CH2MHILL

PROJECT NUMBER	WELL NUMBER
457958	DA085-IW-01-4413

WELL COMPLETION DIAGRAM

PROJECT NAME :	JBER-R			LOCATION NAME:	DA085
NORTHING:	6794413.365	EASTING:	354340.404	DRILLING CONTRACTOR:	Geotek
START DATE:	07/29/2013	END DATE:	07/30/2013	DRILLING METHOD:	Air rotary
BOREHOLE DIAMETER:	6.0 inches			DRILLING EQUIPMENT:	Geoprobe
TOTAL BOREHOLE DEPTH:	72 feet bgs			LOGGED BY:	A. Seay



Component Depths BGS

63	Top of transition seal (feet bgs)
N/A	Top of transition sand (feet bgs)
65	Top of filter pack (feet bgs)
67	Top of screen (feet bgs)
72	Bottom of screen (feet bgs)
N/A	Bottom of sump (feet bgs)
72	Bottom of filter pack (feet bgs)
72	Bottom of borehole (feet bgs)
6.00	Borehole Diameter (inches)

NOTE: DRAWING NOT TO SCALE

1- Ground elevation at well	287.85	feet NAVD 88
2- Top of casing elevation	290.73	feet NAVD 88
3- Surface completion type	Above Ground Momument	
a) Diameter	6	inches
b) Concrete pad dimensions	12	inches
c) Bollards	Enviroblocks	
4- Conductor casing type	N/A	
a) Diameter	N/A	inches
b) Length	N/A	feet
5- Well casing type	Schedule 80 PVC	
a) Diameter	2	inches
b) Length	67	feet
6- Sanitary seal type	Cement Grout (2% bentonite)	
a) Method of placement	Tremie pipe	
b) Volume used	78	gallons
c) Calculated volume	N/A $feet^3$	gallons
7- Transition seal type	Bentonite pellets	
a) Quantity used	1	50 lb bags
b) Calculated quantity	N/A $feet^3$	50 lb bags
8- Transition filter pack type	N/A	
a) Quantity used	N/A	100 lb bags
b) Calculated quantity	N/A $feet^3$	100 lb bags
9- Filter pack type	8/12 Silica Sand	
a) Quantity used	1.5	100 lb bags
b) Calculated quantity	N/A $feet^3$	100 lb bags
10- Screen type / slot size	Continuous wire wrap PVC	
a) Diameter	2	inches
b) Length	5	feet
c) Slot size	0.065	inches
11- Sump / end cap type	PVC Slip-cap	
a) Diameter	2.00	inches
b) Length	0.00	feet
12- Backfill type	N/A	
a) Quantity used	N/A	
b) Calculated quantity	N/A	
13- Centralizer type	N/A	
a) Depths	N/A	feet bgs

Well Development

Start Date/Time:	8/9/2013 2:42 pm	
End Date/Time:	8/12/2013 2:02 pm	
Measured Depth to Water	71.62	feet bgs
Development Method:	Bail/Pump	
Duration:	N/A	hours
Purgevolume:	32.8	gallons
Volume of water injected:	N/A	gallons
Calculated well volume:	44.5	gallons

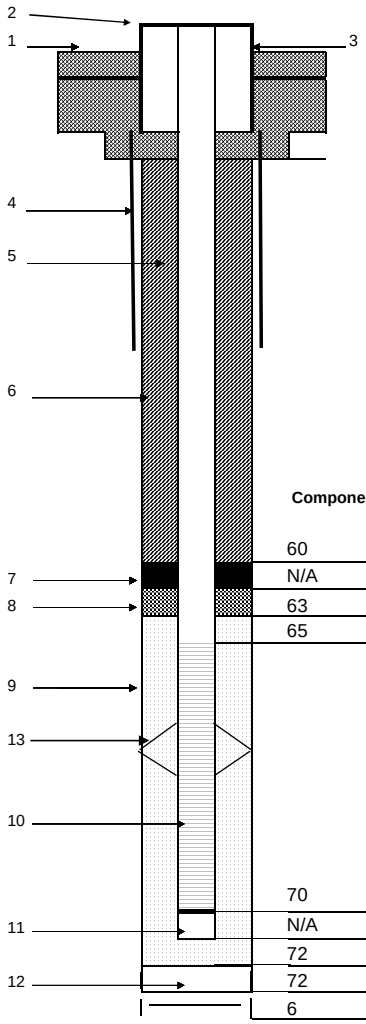
Comments:

CH2MHILL

PROJECT NUMBER	WELL NUMBER
457958	DA085-IW-02-4413

WELL COMPLETION DIAGRAM

PROJECT NAME :	JBER-R			LOCATION NAME:	DA085
NORTHING:	6794415.993	EASTING:	354343.567	DRILLING CONTRACTOR:	Geotek
START DATE:	07/31/2013	END DATE:	07/31/2013	DRILLING METHOD:	Air rotary
BOREHOLE DIAMETER:	6.0 inches			DRILLING EQUIPMENT:	Geoprobe
TOTAL BOREHOLE DEPTH:	72 feet bgs			LOGGED BY:	A. Seay



Component Depths BGS

60	Top of transition seal (feet bgs)
N/A	Top of transition sand (feet bgs)
63	Top of filter pack (feet bgs)
65	Top of screen (feet bgs)
70	Bottom of screen (feet bgs)
N/A	Bottom of sump (feet bgs)
72	Bottom of filter pack (feet bgs)
72	Bottom of borehole (feet bgs)
6	Borehole Diameter (inches)

NOTE: DRAWING NOT TO SCALE

1- Ground elevation at well	287.74	feet NAVD 88
2- Top of casing elevation	291.12	feet NAVD 88
3- Surface completion type	Above Ground Momument	
a) Diameter	6	inches
b) Concrete pad dimensions	12	inches
c) Bollards	Enviroblocks	
4- Conductor casing type	N/A	
a) Diameter	N/A	inches
b) Length	N/A	feet
5- Well casing type	Schedule 40 PVC	
a) Diameter	2	inches
b) Length	65	feet
6- Sanitary seal type	Cement Grout (2% bentonite)	
a) Method of placement	Tremie pipe	
b) Volume used	75	gallons
c) Calculated volume	N/A $feet^3$	gallons
7- Transition seal type	Bentonite pellets	
a) Quantity used	1	50 lb bags
b) Calculated quantity	N/A $feet^3$	50 lb bags
8- Transition filter pack type	N/A	
a) Quantity used	N/A	100 lb bags
b) Calculated quantity	N/A $feet^3$	100 lb bags
9- Filter pack type	8/12 Silica Sand	
a) Quantity used	3	100 lb bags
b) Calculated quantity	N/A $feet^3$	100 lb bags
10- Screen type / slot size	Continuous wire wrap PVC	
a) Diameter	2	inches
b) Length	5	feet
c) Slot size	0.065	inches
11- Sump / end cap type	PVC Slip-cap	
a) Diameter	2	inches
b) Length	0.00	feet
12- Backfill type	N/A	
a) Quantity used	N/A	
b) Calculated quantity	N/A	
13- Centralizer type	N/A	
a) Depths	N/A	feet bgs

Well Development

Start Date/Time:	N/A	
End Date/Time:	N/A	
Measured Depth to Water	N/A	feet bgs
Development Method:	N/A	
Duration:	N/A	hours
Purgevolume:	N/A	gallons
Volume of water injected:	N/A	gallons
Calculated well volume:	N/A	gallons

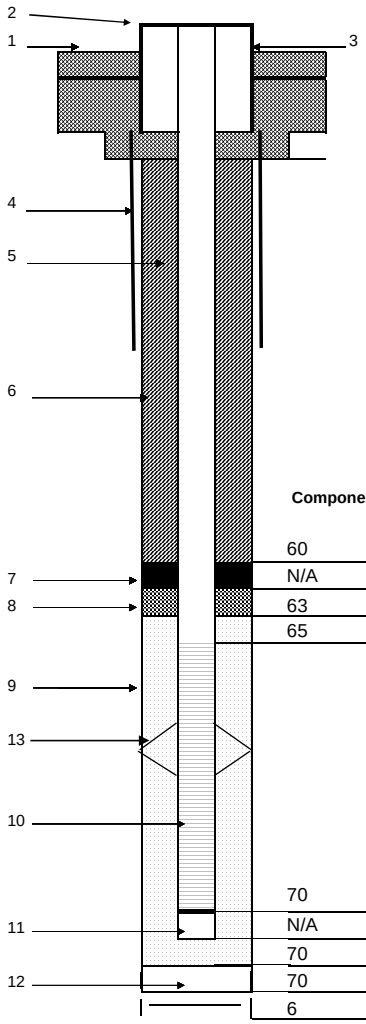
Comments: Well was dry following installation. Well was not developed

CH2MHILL

PROJECT NUMBER	WELL NUMBER
457958	DA085-IW-03-4413

WELL COMPLETION DIAGRAM

PROJECT NAME :	JBER-R			LOCATION NAME:	DA085
NORTHING:	6794419.267	EASTING:	354347.219	DRILLING CONTRACTOR:	Geotek
START DATE:	08/03/2013	END DATE:	08/04/2013	DRILLING METHOD:	Air rotary
BOREHOLE DIAMETER:	6.0 inches			DRILLING EQUIPMENT:	Geoprobe
TOTAL BOREHOLE DEPTH:	70 feet bgs			LOGGED BY:	J. Frame



Component Depths BGS

60	Top of transition seal (feet bgs)
N/A	Top of transition sand (feet bgs)
63	Top of filter pack (feet bgs)
65	Top of screen (feet bgs)
70	Bottom of screen (feet bgs)
N/A	Bottom of sump (feet bgs)
70	Bottom of filter pack (feet bgs)
70	Bottom of borehole (feet bgs)
6	Borehole Diameter (inches)

NOTE: DRAWING NOT TO SCALE

1- Ground elevation at well	288.50	feet NAVD 88
2- Top of casing elevation	291.99	feet NAVD 88
3- Surface completion type	Above Ground Momument	
a) Diameter	6	inches
b) Concrete pad dimensions	12	inches
c) Bollards	Enviroblocks	
4- Conductor casing type	N/A	
a) Diameter	N/A	inches
b) Length	N/A	feet
5- Well casing type	Schedule 80 PVC	
a) Diameter	2	inches
b) Length	65	feet
6- Sanitary seal type	Cement Grout (2% bentonite)	
a) Method of placement	Tremie pipe	
b) Volume used	75	gallons
c) Calculated volume	N/A $feet^3$	gallons
7- Transition seal type	Bentonite pellets	
a) Quantity used	1	50 lb bags
b) Calculated quantity	N/A $feet^3$	50 lb bags
8- Transition filter pack type	N/A	
a) Quantity used	N/A	100 lb bags
b) Calculated quantity	N/A $feet^3$	100 lb bags
9- Filter pack type	8/12 Silica Sand	
a) Quantity used	2	100 lb bags
b) Calculated quantity	N/A $feet^3$	100 lb bags
10- Screen type / slot size	Continuous wire wrap PVC	
a) Diameter	2	inches
b) Length	5	feet
c) Slot size	0.065	inches
11- Sump / end cap type	PVC Slip-cap	
a) Diameter	2	inches
b) Length	0.00	feet
12- Backfill type	N/A	
a) Quantity used	N/A	
b) Calculated quantity	N/A	
13- Centralizer type	N/A	
a) Depths	N/A	feet bgs

Well Development

Start Date/Time:	N/A	
End Date/Time:	N/A	
Measured Depth to Water	N/A	feet bgs
Development Method:	N/A	
Duration:	N/A	hours
Purgevolume:	N/A	gallons
Volume of water injected:	N/A	gallons
Calculated well volume:	N/A	gallons

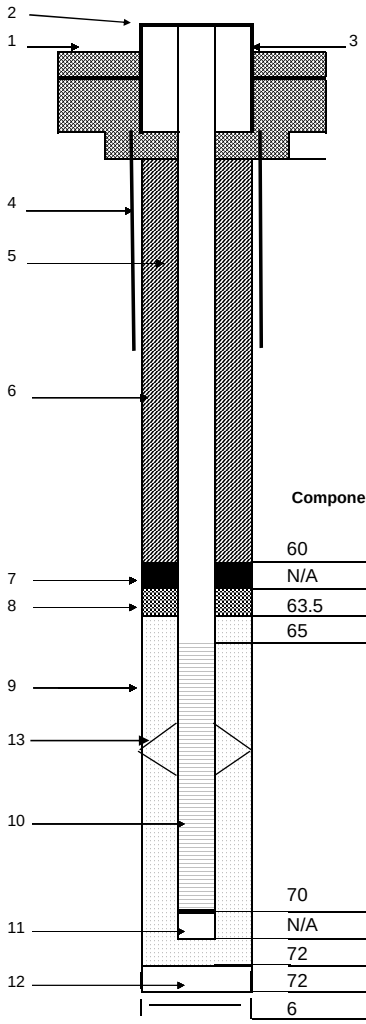
Comments: Well was dry following installation. Well was not developed

CH2MHILL

PROJECT NUMBER	WELL NUMBER
457958	DA085-IW-04-4413

WELL COMPLETION DIAGRAM

PROJECT NAME :	JBER-R			LOCATION NAME:	DA085
NORTHING:	6794422.238	EASTING:	354350.462	DRILLING CONTRACTOR:	Geotek
START DATE:	08/05/2013	END DATE:	08/05/2013	DRILLING METHOD:	Air rotary
BOREHOLE DIAMETER:	6.0 inches			DRILLING EQUIPMENT:	Geoprobe
TOTAL BOREHOLE DEPTH:	72 feet bgs			LOGGED BY:	A. Seay



Component Depths BGS

60	Top of transition seal (feet bgs)
N/A	Top of transition sand (feet bgs)
63.5	Top of filter pack (feet bgs)
65	Top of screen (feet bgs)
70	Bottom of screen (feet bgs)
N/A	Bottom of sump (feet bgs)
72	Bottom of filter pack (feet bgs)
72	Bottom of borehole (feet bgs)
6	Borehole Diameter (inches)

NOTE: DRAWING NOT TO SCALE

1- Ground elevation at well	288.96		feet NAVD 88
2- Top of casing elevation	292.49		feet NAVD 88
3- Surface completion type	Above Ground Momument		
a) Diameter	6		inches
b) Concrete pad dimensions	12		inches
c) Bollards	Enviroblocks		
4- Conductor casing type	N/A		
a) Diameter	N/A		inches
b) Length	N/A		feet
5- Well casing type	Schedule 80 PVC		
a) Diameter	2		inches
b) Length	65		feet
6- Sanitary seal type	Cement Grout (2% bentonite)		
a) Method of placement	Tremie pipe		
b) Volume used	75		gallons
c) Calculated volume	N/A	$feet^3$	gallons
7- Transition seal type	Bentonite pellets		
a) Quantity used	1		50 lb bags
b) Calculated quantity	N/A	$feet^3$	50 lb bags
8- Transition filter pack type	N/A		
a) Quantity used	N/A		100 lb bags
b) Calculated quantity	N/A	$feet^3$	100 lb bags
9- Filter pack type	8/12 Silica Sand		
a) Quantity used	2		100 lb bags
b) Calculated quantity	N/A	$feet^3$	100 lb bags
10- Screen type / slot size	Continuous wire wrap PVC		
a) Diameter	2		inches
b) Length	5		feet
c) Slot size	0.065		inches
11- Sump / end cap type	PVC Slip-cap		
a) Diameter	2		inches
b) Length	0.00		feet
12- Backfill type	N/A		
a) Quantity used	N/A		
b) Calculated quantity	N/A		
13- Centralizer type	N/A		
a) Depths	N/A		feet bgs

Well Development

Start Date/Time:	N/A	
End Date/Time:	N/A	
Measured Depth to Water	N/A	feet bgs
Development Method:	N/A	
Duration:	N/A	hours
Purgevolume:	N/A	gallons
Volume of water injected:	N/A	gallons
Calculated well volume:	N/A	gallons

Comments: Well was dry following installation. Well was not developed

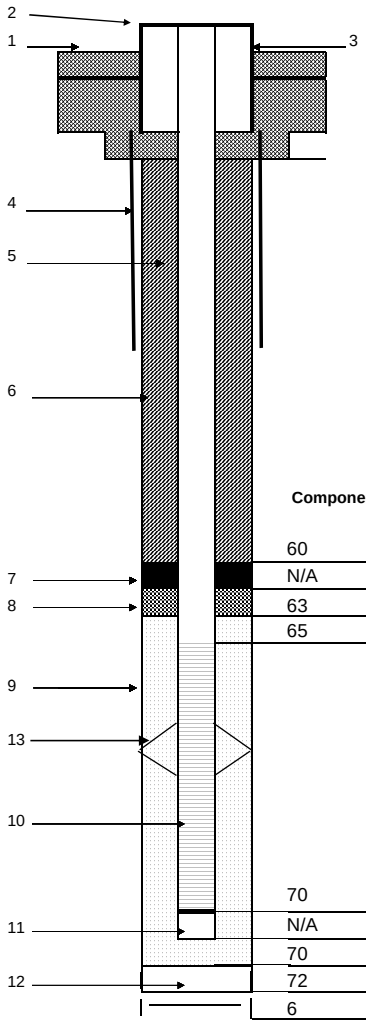
CH2MHILL

PROJECT NUMBER 457958

WELL NUMBER DA085-ROI-4413

WELL COMPLETION DIAGRAM

PROJECT NAME :	JBER-R			LOCATION NAME:	DA085
NORTHING:	6794417.766	EASTING:	354345.509	DRILLING CONTRACTOR:	Geotek
START DATE:	08/01/2013	END DATE:	08/02/2013	DRILLING METHOD:	Air rotary
BOREHOLE DIAMETER:	6.0 inches			DRILLING EQUIPMENT:	Geoprobe
TOTAL BOREHOLE DEPTH:	72 feet bgs			LOGGED BY:	A. Seay



Component Depths BGS

60	Top of transition seal (feet bgs)	
N/A	Top of transition sand (feet bgs)	
63	Top of filter pack (feet bgs)	
65	Top of screen (feet bgs)	
70	Bottom of screen (feet bgs)	
N/A	Bottom of sump (feet bgs)	
70	Bottom of filter pack (feet bgs)	
72	Bottom of borehole (feet bgs)	
6	Borehole Diameter (inches)	

NOTE: DRAWING NOT TO SCALE

1- Ground elevation at well	287.94		feet NAVD 88
2- Top of casing elevation	291.09		feet NAVD 88
3- Surface completion type	Above Ground Momument		
a) Diameter	6		inches
b) Concrete pad dimensions	12		inches
c) Bollards	Enviroblocks		
4- Conductor casing type	N/A		
a) Diameter	N/A		inches
b) Length	N/A		feet
5- Well casing type	Schedule 40 PVC		
a) Diameter	2		inches
b) Length	65		feet
6- Sanitary seal type	Cement Grout (2% bentonite)		
a) Method of placement	Tremie pipe		
b) Volume used	75		gallons
c) Calculated volume	N/A	$feet^3$	gallons
7- Transition seal type	Bentonite pellets		
a) Quantity used	1		50 lb bags
b) Calculated quantity	N/A	$feet^3$	50 lb bags
8- Transition filter pack type	N/A		
a) Quantity used	N/A		100 lb bags
b) Calculated quantity	N/A	$feet^3$	100 lb bags
9- Filter pack type	Pre-pack filter 20/40 (1x5 ft sections)		
a) Quantity used	N/A		100 lb bags
b) Calculated quantity	N/A	$feet^3$	100 lb bags
10- Screen type / slot size	Mill-slot		
a) Diameter	2		inches
b) Length	5		feet
c) Slot size	0.010		inches
11- Sump / end cap type	PVC scew cap		
a) Diameter	2		inches
b) Length	0.00		feet
12- Backfill type	N/A		
a) Quantity used	N/A		
b) Calculated quantity	N/A		
13- Centralizer type	N/A		
a) Depths	N/A		feet bgs

Well Development

Start Date/Time:	8/9/2013 9:40 am	
End Date/Time:	8/12/2013 12:47 pm	
Measured Depth to Water	71.85	feet bgs
Development Method:	Surge, pump, bail	
Duration:	N/A	hours
Purgevolume:	21.6	gallons
Volume of water injected:	N/A	gallons
Calculated well volume:	19.8	gallons

Comments:

Appendix D
Well Development Logs

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Date 8.9.13

Start time: 1442

IW-01-4413

(B) Well Depth - 74.65' BTOC

(C) Depth to water - 71.62' BTOC

(B-C=D) length of static water column in well - 3.03

(A) unit casing volume - 1.47

(E) well casing volume - 4.454

x 10

Measurments taken
8.12.13
Start. 1328
End: 1402

total purge volume 44.54

Round	Time	WL	Volume Purged	pH	cond	turb.	DO.	temp	ORP
1	~~1300~~ 1328	71.65'		7.36	0.545	overrange	N/A	9.84	214.8
2	1333		28.8	~~7.31~~ 7.61	0.653	overrange	N/A	7.37	217.0
3	1338	71.64'	29.6	7.68	0.659	overrange	N/A	6.93	207.8
4	1343		30.4	7.67	0.660	overrange	N/A	7.22	204.5
5	1348	71.65'	31.2	7.67	0.661	overrange	N/A	6.87	201.8
6	1353		32	7.65	0.661	overrange	N/A	7.20	194.9
7	1358	71.65'	32.8	7.65	0.654	overrange	N/A	6.93	192.1
8									
9									

SOP-09 Attachment 1

WELL DEVELOPMENT DATASHEET

ROI ~~HS~~

SHEET 1 OF 1

CH2MHILL

Well ID: ~~IW-03~~ 4413

Project: JBER-R

Location: DA085

Project #: 457958

Date: 8-9-13

Start Time: 0940

End Time: 1350 (-1 hr break)

Development Contractor/Geologist:

Field Notebook #: Date Well Installed:

Well Information and Purge Volume Calculation

Casing ID (inch):	Unit Casing Volume (A) (gal/ft):
0.75	0.02
1	0.04
1.5	0.09
2	0.16
3	0.37
4	0.65
5	1.02
6	1.47
7	2.00
8	2.61
10	4.08
12	5.88

Total Well Depth (B) (ft btoc): 73.2'

Depth to Water (C) (ft btoc): - 71.85'

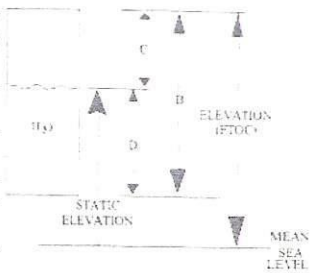
Length of Static Water Column in Well (feet): (B - C = D) = 1.35'

Unit Casing Volume (A) (gal/ft): x 1.47

Well Casing Volume (E) (gal): (D x A = E) = 1.98

x 10

Total Purge Volume (F) (gal): (E x 10 well volumes = F) = 19.85



Well Screened Interval (ft btoc): Approx. Sediment Depth in Well (ft)

Development Methods

Method: ☑ Surging ☑ Pumping ☑ Bailing ☐ Other Describe:

Surge time per interval (min): Number of development intervals:

Pump: ☐ Perist. ☑ Bladder ☐ Subm ☐ Other Describe:

Purge time per interval (min): Purge Flow Rate (gpm): Total purge volume (gals):

Total purge time (min): Pump Intake Depth (ft btoc):

Bailer: ☐ Poly ☑ Teflon ☐ S steel ☐ Other Describe:

Bailer Volume (gals): (0.25 / 0.33) Required Bailer Volumes: Total purge volume (gals):

Criteria for Stable Parameters

Parameter	Working Range (YSI 556MPS)	Stability Criteria	Depth to Water Stabilization	
			Time	DTW
Temperature	-5 to 45°C	± 1.0 °C		
pH	0 to 14 NTU	± 0.1		
Conductivity	0 to 200 mS/cm	± 3%		
ORP	-999 to +999 mV	± 10 mV		
Dissolved Oxygen	0 to 50 mg/L	± 10% or 0.2 mg/L		
Turbidity	0 to 1000 NTU	± 10% (≤10 NTU)		

Measurements taken 8-12-13

Begin. 0900
Ind: 1000
Let set
2 hrs
Begin: 1200
End: 1247

Instrument Observations

Round	Time	Water Level (ft BTOC)	Volume Purged (gallons)	pH	Cond (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp (C)	ORP (mV)
1	1212			7.22	0.689	358	N/A	7.32	240.9
2	1215	71.85'	20.13	7.46	0.658	overrange	N/A	7.52	238.6
3	1220	71.88'	20.34	7.60	0.641	overrange	N/A	7.86	230.2
4	1225	71.85'	20.55	7.53	0.634	628.7	N/A	7.55	210.0
5	1230	71.86'	20.76	7.72	0.633	582	N/A	7.78	190.6
6	1235	71.85'	20.97	7.73	0.633	389	N/A	7.66	187.0
7	1240	71.85'	21.18	7.57	0.634	308	N/A	7.65	187.1
8	1245	71.85'	21.39	7.54	0.634	230	N/A	7.63	187.8
9	1250	71.85'	21.6	7.66	0.634	200	N/A	7.43	187.8

Notes: Draw-down should ideally be less than 0.3 feet from the original depth to groundwater
Minimal draw-down achieved and measured by: 1) pumping at a low rate (approximately 1 liter/ 3 minutes or .1 gal/min) and 2) continually measuring water levels in the well

Sensory Observations

Color: Clear, Amber, Tan, (Brown), Grey, Milky White, Other:

Odor: (None), Low, Medium, High, Very Strong, H2S, Fuel Like, Chemical ?, Unknown

Turbidity: None, Low, (Medium), High, Very Turbid, Heavy Silts

Comments:

Revised February 2010

Appendix E
Groundwater Sampling Logs

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Groundwater Sampling Record

Project Name: JBER GW LTM
Well ID: AP-4413
Project Location: DA 085
Sample No.: AP-4413-13-0830-0
Project Number:
Sampler(s): M. Oakley & J Brann
Date/Time: 8/26/13
Weather: 60° F Sun

Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia.=0.653 gal/ft)
1215	75.41 ☒ Meas. ☐ Hist.	72.22 Initial	3.19	0.52

Water Level Measurement Method: ☒ Electric Tape ☐ Other:
Well Evacuation Method: ☐ Peristaltic Pump ☒ Submersible Pump ☐ Bailer ☐ Other:
Purge Rate: 190 mL/min
Begin Purge: Time: 1220 Total Volume Purged: 1.2
End Purge: Time: 1315 Well Volumes Purged: <3
Purge Water Disposed: ☒ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquabin ☐ Other:

Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:
Sample Time: 1315
Sample Collection Method: ☒ Pump Type: QED Bladder Dedicated ☐ Y ☒ N ☐ Bailer ☐ Other:
Decon Procedure: ☐ N/A ☒ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:
Sample Description (color, turbidity, odor, sheen, etc.): Clear, no odor, no sheen

Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
2	500 mL	☐ Glass ☒ Plastic	E300.0 E375.4
1	500 mL	☐ Glass ☒ Plastic	E310.1
1	125 mL	☐ Glass ☒ Plastic	E353.2
1	125 mL	☐ Glass ☒ Plastic	E376.1
6	40 mL	☒ Glass ☐ Plastic	RSK-175 & 8260C
1 & 1	1-500 mL & 1-125 mL	☐ Glass ☒ Plastic	6020A & 6010B Diss.

Notes: 0.0 ppm in well 1 250 mL glass 9060
Also collect here: AP-4413-13-0830-0MS AP-4413-13-0830-0SD and AP-4413-13-0830-1 @1320

Sampler Signature: M Oakley

Date: 8/26/13 Well ID: AP-4413

Well Evacuation / Field Parameters

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/ Turbidity
1245	72.29	0.2	7.50	0.440	9.30	7.47	55.6	615
1249	72.25	0.35	7.27	0.440	8.96	6.98	60.0	366
1253	72.25	0.5	7.08	0.444	8.70	6.71	62.7	189
1257	72.25	0.7	7.04	0.445	8.80	6.63	61.6	91.3
1302	72.25	0.9	7.06	0.447	8.64	6.66	54.3	57.4
1310	72.25	1.2	7.22	0.449	8.82	6.74	47.9	39.0

Notes :

Groundwater Sampling Record

Project Name: JBER GW LTM
Project Location: DA 085
Project Number:
Date/Time: 8/26/13
Well ID: ROI-4413
Sample No.: 13Q3DA085-ROI-4413-0
Sampler(s): M. Oakley & J. Bramm
Weather: 60°F & Sun

Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia.=0.653 gal/ft)
1100	73.31 ☒ Meas. ☐ Hist.	71.85 Initial	1.46	0.24

Water Level Measurement Method: ☒ Electric Tape ☐ Other:
Well Evacuation Method: ☐ Peristaltic Pump ☐ Submersible Pump ☒ Bailer ☐ Other:
Purge Rate:
Begin Purge: Time: 1100
End Purge: Time: 1145
Total Volume Purged: 0.8 gal
Well Volumes Purged: 3
Purge Water Disposed: ☒ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquabin ☐ Other:

Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:
Sample Time: 1145
Sample Collection Method: ☐ Pump Type: Dedicated ☐ Y ☐ N ☒ Bailer ☐ Other:
Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other: w/VOC tip
Sample Description (color, turbidity, odor, sheen, etc.): Clear, no odor, no sheen

Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
3	40 mL	☒ Glass ☐ Plastic	8260C
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	

Notes: Due to low water, Jennifer Frame directed Alpha to sample well with Bailer (Teflon) w/VOC tip. Collect sample after purging 3-well volumes w/out stable parameters
0.0 ppm in well

Sampler Signature: Monica Oakley

Date: 8/26/13 Well ID: ROI-4413

Well Evacuation / Field Parameters

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/ Turbidity
1102		0.1	7.16	0.530	8.79	4.79	163.0	gray 239
1105		0.2	6.89	0.479	9.35	4.99	144.6	487
1108		0.3	6.77	0.474	9.26	4.77	149.1	448
1110		0.4	6.78	0.477	9.49	6.14	76.3	328
1114		0.5	6.77	0.479	9.44	6.22	79.3	249
	(Pause to allow some recharge)							
1125		0.6	6.93	0.477	9.75	6.82	76.2	336
1130		0.7	6.99	0.481	9.85	7.32	60.6	314
1135		0.8	6.75	0.477	9.58	6.98	71.3	276

Notes :

Groundwater Sampling Record

Project Name: JBER GW LTM
Project Location: DAOBS
Project Number:
Date/Time: 8/26/13
Well ID: MW-01-4413
Sample No.: 13Q31W-01-4413-GW-0
Sampler(s): M. Oakley J. Brann
Weather: 60°F Sun

Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia.=0.653 gal/ft)
1150	74.75 ☒ Meas. ☐ Hist.	71.61 Initial	3.14	0.51

Water Level Measurement Method: ☒ Electric Tape ☐ Other:
Well Evacuation Method: ☐ Peristaltic Pump ☐ Submersible Pump ☒ Bailer ☐ Other:
Purge Rate:
Begin Purge: Time: 1150 Total Volume Purged: 1.6
End Purge: Time: 1205 Well Volumes Purged: 3
Purge Water Disposed: ☒ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquabin ☐ Other:

Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:
Sample Time: 1205
Sample Collection Method: ☐ Pump Type: Dedicated ☐ Y ☐ N ☒ Bailer ☐ Other:
Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other: VOC T, P
Sample Description (color, turbidity, odor, sheen, etc.): Clear, no odor, no sheen

Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
3	40 mL	☒ Glass ☐ Plastic	8260C
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	

Notes: Due to low water & slow recharge, Jennifer directed Athna to sample w/ Teflon bailer & VOC tip.
0.0 ppm in well

Sampler Signature: M Monique Oakley

Date: 8/26/13 Well ID: 160-01-4413

Well Evacuation / Field Parameters

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/ Turbidity
1153		0.1	6.96	0.497	8.32	7.25	54.8	Gray 342
1154		0.25	6.97	0.498	9.66	7.16	55.7	879
1157		0.5	6.86	0.500	9.59	7.22	49.8	532
1159		0.9	6.72	0.498	9.38	7.03	55.0	466
1200		1.1	6.82	0.498	9.46	6.97	57.7	
1202		1.3	6.71	0.498	9.09	6.86	58.8	460
1203		1.5	6.71	0.498	9.08	6.89	54.5	340

Notes :

Groundwater Sampling Record

Project Name: JBER GW LTM
Project Location: DA085
Project Number:
Date/Time: 8/29/13

Well ID: IW-02-4413
Sample No.: /
Sampler(s): O. Stewart, J. Brann
Weather:

Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia.=0.653 gal/ft)
1510	72.35 ☒ Meas. ☐ Hist.	71.68 Initial	0.67	0.110 ~~0.442~~ gal

Water Level Measurement Method: ☒ Electric Tape ☐ Other:
Well Evacuation Method: ☐ Peristaltic Pump ☐ Submersible Pump ☒ Bailer ☐ Other:
Purge Rate:
Begin Purge: Time: Total Volume Purged:
End Purge: Time: Well Volumes Purged:
Purge Water Disposed: ☒ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquabin ☐ Other:

Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:
Sample Time: N/A
Sample Collection Method: ☐ Pump Type: Dedicated ☐ Y ☐ N ☒ Bailer ☐ Other:
Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:
Sample Description (color, turbidity, odor, sheen, etc.):

Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	
		☐ Glass ☐ Plastic	

Notes: Attempted to purge w/ disposable bailer but was not successful due to low water.

Sampler Signature:

Date: _____ Well ID: _____

Well Evacuation / Field Parameters

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/ Turbidity

Notes :

Appendix F
Terra Systems SRS Specification Sheet and Alpha Chemical Certificate of Analysis

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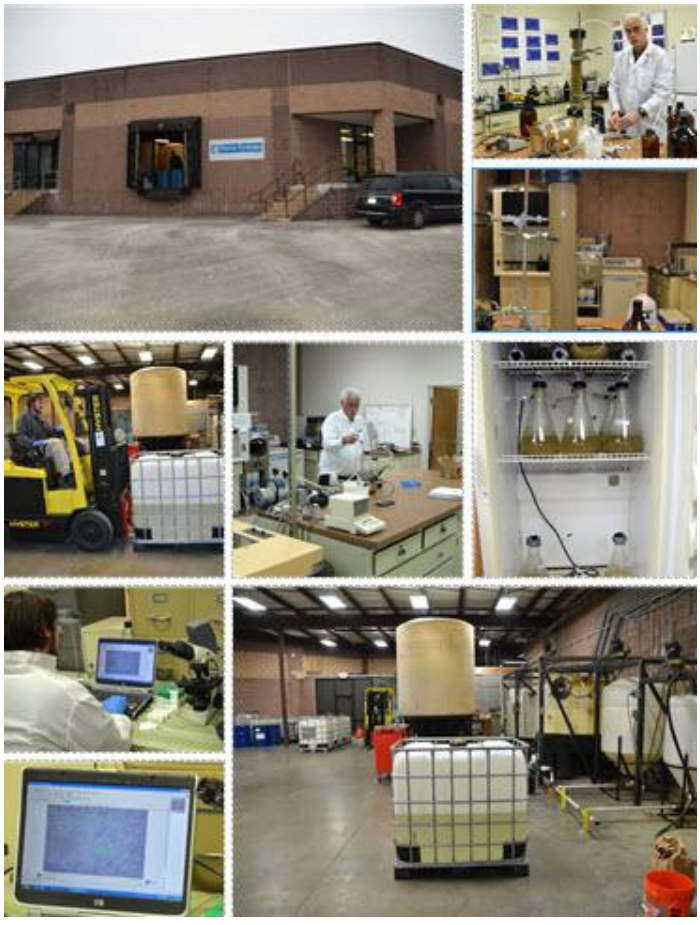
Terra Systems Capabilities Document

Research – Product Development – Manufacturing – Distribution

Core Competencies

1. Operates its own U.S. manufacturing plant with a full time U.S. production staff
2. Flexible manufacturing process that enables the company to produce five unique formulations of SRS® emulsified vegetable oil substrate packages and customer designed formulations
3. Quality control lab on the manufacturing floor
4. On-site R&D and Treatability Study Laboratory
5. Sustainable Partnership program for minimizing carbon footprint of remediation projects
6. Data management and process visualization
7. Distribution system with Just-In-Time Delivery



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Phone 302-798-9553 - Fax 302-798-9554
Email: mfree@terrasystems.net On the Web: www.terrasystems.net

Summary of In-Situ Bioremediation Products

Offering Anaerobic and Aerobic In-Situ Bioremediation Solutions

Terra Systems, Inc.'s scientists have been developing in-situ bioremediation technology since the 1980's. Our roots go back to Richard Raymond, Sr. who received the first patent for in-situ bioremediation of petroleum hydrocarbons in the 1970's. Today, Terra Systems, Inc. offers proven bioremediation products backed by a strong Research & Development program unmatched by any of our competitors, focused on the advancement of bioremediation technology and implementation cost reduction. Our emulsified products have assisted site remediation companies with green remediation alternatives for over 12 years and include a family of patented SRS® products.

Terra Systems operates its own manufacturing facilities so we can easily setup "***Just-In-Time***" manufacturing and delivery of SRS® to your site. We work closely with the on-site project managers to produce and deliver SRS® based on real-time site conditions. The benefit of this is that if you run into any injection delays, you don't have to worry about on-site storage of large amounts of material especially in hot weather. As a product supplier, we view environmental consulting companies as our customers, not our competitors and our goal is to make you successful with your clients.

Product	Description	Benefit
SRS®-SD	60% soybean oil, at least 4% potassium or sodium lactate, which are both soluble substrates that rapidly generates anaerobic conditions. Proprietary organic and inorganic nutrients such as yeast extract, nitrogen and phosphorus, which have been shown to support growth of the anaerobic microbial population. A neutral pH for optimum aquifer conditions. >250 ppb Vitamin B_{12}, which He et al. 2007 demonstrated is an important micronutrient to enhance dechlorination activity. **0.6 µm droplet size** and a **nonionic** (does not have a charge) **surfactant mixture**.	Proprietary surfactant mixture doesn't have a charge and will not adhere readily to the positively charged soil particles. This combined with a small droplet size will result in greater distribution in the aquifer. Ideal for groundwater flow rates (gwfr's) of less than **0.5 ft/day**. Nutrient package for optimal bacteria growth.
SRS®-FR	60% soybean oil, at least 4% potassium or sodium lactate, which are both soluble substrates that rapidly generates anaerobic conditions. Proprietary organic and inorganic nutrients such as yeast extract, nitrogen and phosphorus, which have been shown to support growth of the anaerobic microbial population. A neutral pH for optimum aquifer conditions. >250 ppb Vitamin B_{12}, which He et al. 2007 demonstrated is an important micronutrient to enhance dechlorination activity. **5 µm droplet size** and an **anionic** (has a negative charge) **surfactant mixture**.	Proprietary natural emulsifier has a negative charge and will adhere more readily to the positively charged soil particles than a nonionic surfactant. This increased "***stickiness***" combined with a larger droplet size (5 µm) will result in more adsorption of SRS®-FR in fractured bedrock system or other highly permeable aquifers. Ideal for gwfr's of **0.5 ft/day or more**. Nutrient package for optimal bacteria growth.
SRS®-C	SRS®-C is a defined by the client and can be a specific client recipe or special packaging requirements.	Packaging in 5 gallon buckets, 50/50 mix of SRS®-SD and SRS®-FR, or can increase lactate from 4% to 7%.

Product	Description	Benefit
SRS®-M	60% soybean oil, at least 4% potassium or sodium lactate, which are both soluble substrates that rapidly generates anaerobic conditions. Proprietary organic and inorganic nutrients such as yeast extract, nitrogen and phosphorus, which have been shown to support growth of the anaerobic microbial population. A neutral pH for optimum aquifer conditions. >250 ppb Vitamin B_{12}, which He et al. 2007 demonstrated is an important micronutrient to enhance dechlorination activity. A proprietary food grade reductant is included which will reduce hexavalent chromium (Cr^{6+}) and other metals. The concentration of the abiotic reductant can be adjusted depending on the metal concentrations.	The microbial population removes the oxygen, nitrate, sulfate and other competing electron acceptors. The redox potential is depressed, which results in the reduction and precipitation of the Cr^{6+}. The slow release characteristics of SRS®-M maintain reducing conditions for up to 24 months with a single application. The proprietary food grade reductant reduces $Cr^{6+ \text{ to }} Cr^{3+}$ Ideal for sites with both chlorinated solvents (PCE, TCE) and Cr^{6+} contamination.
SRS®-B	60% soybean oil, at least 4% potassium or sodium lactate, which are both soluble substrates that rapidly generates anaerobic conditions. Proprietary organic and inorganic nutrients such as yeast extract, nitrogen and phosphorus, which have been shown to support growth of the anaerobic microbial population. A neutral pH for optimum aquifer conditions. >250 ppb Vitamin B_{12}, which He et al. 2007 demonstrated is an important micronutrient to enhance dechlorination activity.	SRS®-$B_{uffered}$ is offered in four standard "***off the shelf***" concentrations (1%, 5%, 10% and 15%) based on the buffering capacity of the aquifer (groundwater and soil) or it can be custom blended depending upon the site's pH. It provides immediate and long-term pH optimization at your site and sustains optimal pH conditions for dechlorination to occur. Ideal for sites where the **pH is <4.**
QRS® & QRS®-Plus	60% sodium lactate substrate with the option to fortify with a proprietary nutrient package (QRS®-Plus) .	Soluble quick release sodium lactate substrate with an optional proprietary nutrient package and Vitamin B_{12} (standard).provides an immediate carbon source and arrives "injection ready", which provides short-term sustainable, in-situ anaerobic remediation.
EZVI-Mixed Micro/Nano or EZV - Nano	10% - 17% Mixed Micro/Nano Scale or 10 - 17% Nano Scale Emulsified Zero Valent Iron	A combination of zero valent iron (ZVI), biodegradable soybean oil, surfactants, and water that form a stable emulsion particle (or micelles) that contain ZVI particles in water surrounded by an oil-liquid layer. The exterior oil layer has similar hydrophobic properties as chlorinated compounds. The emulsion attracts the contaminants and pulls them into the interior reactive zone for degradation.

Microbubbler	Oxygen Generator and Oxygen Spargers	An oxygen generator concentrates oxygen from air to greater than 90%. The standard unit can produce 27 pounds of oxygen daily using 120 volt power. The Microbubbler Oxygen Spargers generate fine (<5 μm) bubbles for maximal oxygen distribution.

Summary of In-Situ Treatability Laboratory Services

Offering Anaerobic and Aerobic In-Situ Lab Treatability Studies

Introduction

Terra Systems, Incorporated's Treatability Laboratory is located at 130 Hickman Road, Suite 1, Claymont, DE. 19703. Terra Systems is one of the most experienced companies in conducting treatability studies. Our laboratory has conducted over 200 studies to evaluate enhanced anaerobic bioremediation of chlorinated solvents, in situ chemical oxidation, monitored natural attenuation of chlorinated solvents and petroleum and enhanced aerobic bioremediation of petroleum. TSI can evaluate the benefits of inorganic nutrient additions, pH control, or various oxygen sources from sparged oxygen, slow release oxygen compounds, or hydrogen peroxide. TSI has an EPA permit DER000002360 to accept and dispose of hazardous wastes from treatability studies.

In Situ Chemical Oxidation

TSI has conducted treatability studies at over 100 sites in support of in situ chemical oxidation using potassium and sodium permanganate, activated persulfate, catalyzed hydrogen peroxide, or ozone and in situ chemical reduction of volatile organics, semivolatiles organics, and metals. Targeted compounds range from aromatics like benzene, toluene, ethylbenzene, xylenes; polynuclear aromatic hydrocarbons; chlorinated solvents such as perchloroethene, trichloroethene, 1,1,1-trichloroethane, carbon tetrachloride, and others. TSI does not perform in situ chemical oxidation or in situ reduction field projects, but works with a number of environmental engineering consultants including ERM, AMEC, TRC, Moraine Environmental, URS, GZA, and others to evaluate chemical oxidant demand and effectiveness in the laboratory before the consultants go to pilot or full-scale implementation. Analytical samples can be submitted to any laboratory selected by the consultant.

In Situ Aerobic Bioremediation Treatability Studies

TSI has extensive experience in evaluating in situ aerobic biodegradation of petroleum hydrocarbons ranging from gasoline and diesel to heavier products such as No. 6 Fuel oil. TSI can evaluate the benefits of inorganic nutrient additions, pH control, or various oxygen sources from sparged oxygen, slow release oxygen compounds, or hydrogen peroxide.

In Situ Anaerobic Bioremediation

TSI has conducted more than eighty anaerobic bioremediation studies over the past 20 years investigating the fate of chlorinated solvents such perchloroethene, trichloroethene, cis-1,2-dichloroethene, vinyl chloride, 1,2-

dichloroethane, carbon tetrachloride, chloroform, methylene chloride, Dinoseb, 1,1,1-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, chloroethane, and petroleum. We can evaluate different substrates, amendments to adjust pH, nutrients, or the need for bioaugmentation to promote the complete dechlorination of the solvents. TSI personnel conducted a number of the microcosm studies in support of the Remediation Technology Development Forum (RTDF) project at Dover Air Force Base. TSI also operated the pilot system which was the first field demonstration of bioaugmentation to promote the complete dechlorination of trichloroethene and cis-1,2-dichloroethene to ethene. TSI was a participant in the SABRE (Source Area BioRemediation Evaluation) project in Great Britain, which conducted laboratory and field investigations of bioremediation of trichloroethene dense nonaqueous phase liquids. The treatability study which TSI participated in used over 100 microcosms to evaluate the effects of substrates, nutrient addition, bioaugmentation, and trichloroethene dosage on the dechlorination of trichloroethene. TSI's emulsified vegetable product, SRS®, was selected as the optimal electron donor and was used in subsequent column and field studies.

Monitored Natural Attenuation

TSI has done a number of assessments of monitored natural attenuation of chlorinated solvents and petroleum hydrocarbons in soils, groundwater, and sediments both in laboratory evaluations and from field monitoring data.

Other Services

TSI can determine the number of culturable total bacteria and numbers of specific degraders such as gasoline or diesel. TSI offers light hydrocarbon gas analyses to quantify biodegradation products such as methane, acetylene, ethene, and ethane.

Equipment

TSI has a gas chromatograph dedicated to the analyses of chlorinated solvents and light hydrocarbon gases. We also work closely with other analytical laboratories when other analyses are needed or when certified analyses are required. TSI possess a laboratory chemical hood to safely conduct treatability studies with volatile constituents. The TSI laboratory also has an anaerobic chamber used to set up anaerobic microcosm studies. General laboratory equipment include centrifuge, temperature controlled shaker table, ovens, pH meters, redox meters, conductivity meters, dissolved oxygen, spectrophotometer, microscope, and other miscellaneous equipment.

USDA Permit to Receive Foreign Soils

TSI has a permit from the United States Department of Agriculture allowing it to import soils from outside of the continental United States. The permit number is P330-10-00222. The labels that need to be attached to the shipping container with the soil sample, copies of the USDA permit, and shipping instructions can be provided upon request.

EPA Hazardous Waste Small Generator ID

TSI has an EPA Hazardous Waste Small Generator permit. Our EPA Permit number is DEN201200001. We report the number and quantity of treatability study samples to the Delaware Department of Natural Resources and Conservation yearly.

Treatability Sample Disposal

Upon receipt, samples are logged in. When the samples are used in the treatability study, the quantity of soil remaining is recorded. Upon the completion of the studies, the treatability samples can be returned to the client or sent for disposal at licensed disposal facilities with shipment by licensed hazardous waste transporters.

Personnel

The treatability studies will be conducted under the supervision of Michael D. Lee, Ph.D. He has over 25 years of experience in bioremediation and monitored natural attenuation. Erich Hauptmann is a technician who provides support for the treatability studies; he has worked in the treatability laboratory for more than four years.

Appendix G
Soil and Investigative-Derived Waste Analytical Results and Geotechnical Results (electronic only)

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Appendix H
Groundwater Analytical Results Table, Data Quality Evaluation Report, and Laboratory Analytical Report (electronic only)

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DA085 – Groundwater Raw Analytical Results

Summary of Chemicals Detected in Groundwater: Site OUE AVMA (FTRS-89)

Analyte	Screening Level	Screening Level Source	Location: IW-01-4413 Sample ID: 13Q31W-01-4413-GW-0 Sample Depth (feet): 999 - 999 Sample Date: 8/26/2013	Location: AP-4413 Sample ID: AP-4413-13-0830-0 Sample Depth (feet): 999 - 999 Sample Date: 8/26/2013	Location: AP-4413 Sample ID: AP-4413-13-0830-1 Sample Depth (feet): 999 - 999 Sample Date: 8/26/2013	Location: ROI-4413 Sample ID: 13Q3DA085-ROI-4413-0 Sample Depth (feet): 999 - 999 Sample Date: 8/26/2013
Metals (mg/L)						
Iron, dissolved	--	--	- -	- -	**0.0173 J**	- -
Manganese, dissolved	--	--	- -	- -	**0.000601 B**	- -
VOCs (µg/L)						
1,1,1,2-Tetrachloroethane	--	--	0.25 U	0.25 U	- -	0.25 U
1,1,1-Trichloroethane	200	EPA MCL	0.25 U	0.25 U	- -	0.25 U
1,1,2,2-Tetrachloroethane	--	--	0.25 U	0.25 U	- -	0.25 U
1,1,2-Trichloroethane	5	EPA MCL	0.25 U	0.25 U	- -	0.25 U
1,1,2-Trichlorotrifluoroethane	--	--	0.25 U	0.25 U	- -	0.25 U
1,1-Dichloroethane	--	--	0.25 U	- -	0.25 U	0.25 U
1,1-Dichloroethene	7	EPA MCL	0.25 U	- -	0.25 U	0.25 U
1,1-Dichloropropene	--	--	0.25 U	- -	0.25 U	0.25 U
1,2,3-Trichlorobenzene	--	--	0.25 U	0.25 U	- -	0.25 U
1,2,3-Trichloropropane	--	--	0.25 U	0.25 U	- -	0.25 U
1,2,4-Trichlorobenzene	70	EPA MCL	0.25 U	0.25 U	- -	0.25 U
1,2,4-Trimethylbenzene	--	--	0.25 U	0.25 U	- -	0.25 U
1,2-Dibromo-3-Chloropropane	0.2	EPA MCL	0.25 U	- -	0.25 U	0.25 U
1,2-Dichlorobenzene	600	EPA MCL	0.25 U	- -	0.25 U	0.25 U
1,2-Dichloroethane	5	EPA MCL	0.25 U	- -	0.25 U	0.25 U
1,2-Dichloropropane	5	EPA MCL	0.25 U	- -	0.25 U	0.25 U
1,3,5-Trimethylbenzene	--	--	0.25 U	0.25 U	- -	0.25 U
1,3-Butadiene	--	--	0.25 U	0.25 U	- -	0.25 U
1,3-Dichlorobenzene	--	--	0.25 U	- -	0.25 U	0.25 U
1,3-Dichloropropane	--	--	0.25 U	- -	0.25 U	0.25 U
1,4-Dichlorobenzene	75	EPA MCL	0.25 U	- -	0.25 U	0.25 U
2,2-Dichloropropane	--	--	0.25 U	- -	0.25 U	0.25 U
2-Butanone (MEK)	--	--	1 U	1 U	- -	1 U
2-Chlorotoluene	--	--	0.25 U	- -	0.25 U	0.25 U
2-Hexanone	--	--	1 U	1 U	- -	1 U
4-Chlorotoluene	--	--	0.25 U	- -	0.25 U	0.25 U
4-Methyl-2-Pentanone (MIBK)	--	--	1 U	1 U	- -	1 U
Acetone	--	--	**1.31 B**	1 U	- -	**4.41 B**
Benzene	5	EPA MCL	0.25 U	0.25 U	- -	0.25 U
Bromobenzene	--	--	0.25 U	0.25 U	- -	0.25 U
Bromochloromethane	--	--	0.25 U	0.25 U	- -	0.25 U
Bromodichloromethane	--	--	0.25 U	0.25 U	- -	0.25 U
Bromoform	--	--	0.25 U	0.25 U	- -	0.25 U
Bromomethane	--	--	0.25 U	0.25 U	- -	0.25 U
Carbon Disulfide	--	--	0.25 U	- -	0.25 U	0.25 U
Carbon Tetrachloride	5	EPA MCL	**0.97**	**0.6**	- -	**0.6**
Chlorobenzene	100	EPA MCL	0.25 U	- -	0.25 U	0.25 U
Chloroethane	--	--	0.25 U	- -	0.25 U	0.25 U
Chloroform	--	--	**1.35**	**1.02**	- -	**0.94**
Chloromethane	--	--	0.25 U	- -	0.25 U	0.25 U
cis-1,2-Dichloroethene	70	EPA MCL	0.25 U	- -	0.25 U	0.25 U
cis-1,3-Dichloropropene	--	--	0.25 U	- -	0.25 U	0.25 U
Cyclohexane	--	--	0.25 U	- -	0.25 U	0.25 U
Dibromochloromethane	--	--	0.25 U	- -	0.25 U	0.25 U
Dibromomethane	--	--	0.25 U	- -	0.25 U	0.25 U
Dichlorodifluoromethane	--	--	0.25 U	0.25 U	- -	0.25 U
Ethylbenzene	700	EPA MCL	0.25 U	- -	0.25 U	0.25 U
Ethylene Dibromide	0.05	EPA MCL	0.25 U	- -	0.25 U	0.25 U
Hexachlorobutadiene	--	--	0.25 U	0.25 U	- -	0.25 U
Isopropylbenzene	--	--	0.25 U	0.25 U	- -	0.25 U
m,p-Xylene	10,000	EPA MCL	0.5 U	0.5 U	- -	0.5 U
Methyl tert-Butyl Ether	--	--	0.25 U	0.25 U	- -	0.25 U
Methylene Chloride	5	EPA MCL	0.25 U	0.25 U	- -	0.25 U
n-Butylbenzene	--	--	0.25 U	0.25 U	- -	0.25 U
n-Hexane	--	--	0.25 U	- -	0.25 U	0.25 U
n-Propylbenzene	--	--	0.25 U	0.25 U	- -	0.25 U
Naphthalene	--	--	0.25 U	0.25 U	- -	0.25 U
o-Xylene	10,000	EPA MCL	0.25 U	0.25 U	- -	0.25 U

DA085 – Groundwater Raw Analytical Results

Summary of Chemicals Detected in Groundwater: Site OUE AVMA (FTRS-89)

Analyte	Screening Level	Screening Level Source	Location: IW-01-4413	AP-4413		ROI-4413
		Sample ID:	*13Q31W-01-4413-GW-0*	*AP-4413-13-0830-0*	*AP-4413-13-0830-1*	*13Q3DA085-ROI-4413-0*
		Sample Depth (feet):	*999 - 999*	*999 - 999*	*999 - 999*	*999 - 999*
		Sample Date:	*8/26/2013*	*8/26/2013*	*8/26/2013*	*8/26/2013*
p-Isopropyltoluene	--	--	0.25 U	- -	0.25 U	0.25 U
sec-Butylbenzene	--	--	0.25 U	0.25 U	- -	0.25 U
Styrene	100	EPA MCL	0.25 U	0.25 U	- -	0.25 U
tert-Butylbenzene	--	--	0.25 U	0.25 U	- -	0.25 U
Tetrachloroethene (PCE)	5	EPA MCL	**117**	**78.8**	- -	**72.9**
Toluene	100	EPA MCL	0.25 U	0.25 U	- -	0.25 U
Total Xylenes	10,000	EPA MCL	0.75 U	0.75 U	- -	0.75 U
trans-1,2-Dichloroethene	100	EPA MCL	0.25 U	- -	0.25 U	0.25 U
trans-1,3-Dichloropropene	--	--	0.25 U	- -	0.25 U	0.25 U
Trichloroethene (TCE)	5	EPA MCL	0.25 U	0.25 U	- -	0.25 U
Trichlorofluoromethane	--	--	0.25 U	0.25 U	- -	0.25 U
Vinyl Acetate	--	--	0.5 U	0.5 U	- -	0.5 U
Vinyl Chloride	2	EPA MCL	0.25 U	0.25 U	- -	0.25 U
Dissolved Gases (µg/L)						
Ethane	--		- -	- -	0.27 U	- -
Ethylene	--		- -	- -	0.27 U	- -
Methane	--		- -	- -	**0.184 B**	- -
General Chemistry (mg/L)						
Alkalinity, bicarb. (as $CaCO_3$)	--	--	- -	**149**	- -	- -
Alkalinity, carb. (as $CaCO_3$)	--	--	- -	- -	5 U	- -
Alkalinity, bicarb. (as $CaCO_3$)	--	--	- -	**149**	- -	- -
Chloride	--	--	- -	**43.6**	- -	- -
Nitrogen, Nitrate-Nitrite	10	EPA MCL	- -	- -	**3.6**	- -
Sulfate	--	--	- -	**24.1**	- -	- -
Sulfide	--	--	- -	**0.017 J**	- -	- -
Total Alkalinity	--	--	- -	**149**	- -	- -
Total Organic Carbon	--	--	- -	- -	**0.482 B**	- -
Organic Acids by IC (µg/L)						
Acetic Acid	--	--	- -	- -	60 U	- -
Butyric Acid	--	--	- -	- -	120 U	- -
Butyric Acid	--	--	- -	- -	120 U	- -
Formic Acid	--	--	- -	- -	60 U	- -
Lactic Acid	--	--	- -	- -	60 U	- -
Propionic Acid	--	--	- -	- -	60 U	- -
Pyruvic Acid	--	--	- -	- -	120 U	- -

Notes:

µg/L= microgram(s) per liter

B = The analyte was detected in the associated method and/or calibration blank.

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

mg/L = milligram(s) per liter

NA = not analyzed

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

Bold indicates that the analyte was detected.

Shading indicates that the result exceeded screening criteria.

JOINT BASE ELMENDORF-RICHARDSON – ARMORED VEHICLE MAINTENANCE AREA, DA089 AND POLELINE ROAD DISPOSAL AREA, CG039 – LONG-TERM MONITORING AND TREATABILITY STUDY – 2013 DATA QUALITY EVALUATION REPORT

Introduction

The objective of this data quality evaluation (DQE) report is to assess the data quality of analytical results for groundwater samples collected at the Joint Base Elmendorf-Richardson (JBER) Armored Vehicle Maintenance Area (DA089) and Poleline Road Disposal Area (CG039). Samples were collected and analyzed in support of the long-term monitoring and treatability studies at these sites. 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 (March 2013) (*JBER 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 28 primary samples, five field duplicates (FDs), five equipment blanks (EBs) and four trip blanks (TBs). All samples were collected August 15 through September 23, 2013. A list of samples associated with this DQE is included in Attachment H-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 H-1 below. The required frequency was met for each method with the following exceptions:

- A MS/MSD was not collected for Method E310.1; MS/MSD analysis is not typical for this method.
- A FD was not collected for Method SW7470A.

Table H-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	Groundwater	1	1	100	1	100	1	100
AK102/103	Groundwater	1	1	100	1	100	1	100
E300.0	Groundwater	19	4	21	4	21	4	21
E300.0M	Groundwater	5	2	40	2	40	2	40
E310.1	Groundwater	4	2	50	NA	NA	2	50
E353.2	Groundwater	19	4	21	4	21	4	21

Table H-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
E376.2	Groundwater	4	2	50	2	50	2	50
RSK-175	Groundwater	19	4	21	1	5.3	4	21
SW6010B	Groundwater	19	4	21	4	21	4	21
SW7470A	Groundwater	3	0	0	1	33	1	33
SW8260C	Groundwater	27	5	18	6	33	5	18
SW9060	Groundwater	4	2	50	2	50	2	50

The sample results were reported as five sample delivery groups (SDG) (M2526, M2594, M2615, M2646, and M2839). The analyses were performed by Applied Sciences Laboratory in Corvallis, Oregon.

Twelve methods were used to analyze the environmental samples. Samples were collected and shipped via overnight carrier to the laboratory. Selected samples were analyzed for one or more of the following analytes/methods in Table H-2.

Table H-2: Analytical Parameters

Parameter	Method
GRO	AK101
DRO/RRO	AK102/103
Chloride and sulfate	E300
Volatile fatty acids	E300.0M
Alkalinity	E310.1
Nitrate+nitrite	E353.2
Sulfide	E376.2
Dissolved gases	RSK-175
Iron and manganese	SW6010B
Mercury	SW7470A
Volatile organic compounds	SW8260C
TOC	SW9060

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 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) matrix spike/matrix spike duplicate (MS/MSD) samples; and (8) initial and continuing calibration information and other method-specific criteria as defined by the JBER QAPP.

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

Data flags were assigned according to the JBER 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 H-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 H-2 to this DQE.

Holding Times

All holding-time criteria were met with the following exceptions:

- Samples AP-4413-13-0830-0 and AP-4413-13-0830-1 were analyzed two days outside of holding time for Method E376.2. One associated detected result was qualified as estimated and flagged "J"; one associated nondetected result was qualified as estimated and flagged "UJ".

- Samples 13Q3CG039-AP3747-GW-0 and 13Q3CG039-AP4353-GW-0 were analyzed one day outside of holding time for Method SW8260C. Sixteen associated detected results were qualified as estimated and flagged "J"; 126 associated nondetected results were qualified as estimated and flagged "UJ".

Calibration

All initial and continuing calibration criteria were met with one exception:

- The recovery of chloroethane was greater than JBER QAPP criteria in a continuing calibration verification for Method SW8260C, indicating associated sample results are possibly biased high. Eleven associated nondetected results were not qualified.

Method Blanks

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

- DRO was detected below the LOQ in a method blank for Method AK102/103. Two associated sample results detected less than five times the blank concentration were qualified as estimated and flagged "B".

- Lactic acid was detected below the LOQ in a method blank for Method E300.0M. Three associated nondetected results were not qualified.

- Alkalinity was detected below the LOQ in a method blank for Method E310.1. Four associated results detected greater than five times the blank were not qualified.

- Methane was detected below the LOQ in a method blank for Method RSK-175. One associated sample result detected less than five times the blank concentration was qualified as estimated and flagged "B".

- Dissolved manganese was detected below the LOQ in the method blanks for Method SW6010B. Four associated sample results detected less than five times the blank concentrations were qualified as estimated and flagged "B". Six associated results detected greater than five times the blank concentrations were not qualified.

- TOC was detected above the LOQ in a method blank for Method SW9060. Two associated sample results detected less than five times the blank concentration were qualified as estimated and flagged "B".

Calibration Blanks

Chloride was detected below the LOQ in a continuing calibration blank (CCB) for Method E300.0. Four associated results detected greater than five times the blank concentrations were not qualified.

Trip Blanks

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

- Methane was detected below the LOQ in the TBs for Method RSK-175. Fifteen associated sample results detected less than five times the blank concentration were qualified as estimated and flagged "B". Five associated sample results detected greater than five times the blank concentrations, and three associated nondetected results, were not qualified.

Equipment Blanks

Five EBs were collected and were free of contamination with the exceptions listed below:

- DRO and RRO were detected below the LOQ in an EB for Method AK102/103. Two associated sample results detected less than five times the blank concentration were qualified as estimated and flagged "B". Two associated nondetected sample results were not qualified.

- Chloride and sulfate were detected above or below the LOQ in the EBs for Method E300.0. Four associated sample results detected less than five times the blank concentration were qualified as estimated and flagged "B". Twenty-one associated sample results detected greater than five times the blank concentrations were not qualified.

- Acetic acid was detected below the LOQ in an EB for Method E300.0M. Four associated nondetected sample results were not qualified.

- Alkalinity was detected below the LOQ in an EB for Method E310.1. Eight associated sample results detected greater than five times the blank concentrations were not qualified.

- Methane was detected below the LOQ in the EBs for Method RSK-175. Sixteen associated sample results detected less than five times the blank concentration were qualified as estimated and flagged "B". Four associated sample results detected greater than five times the blank concentrations, and three associated nondetected results, were not qualified.

- Dissolved iron and dissolved manganese were detected below the LOQ in the EBs for Method SW6010B. Fourteen associated sample results detected less than five times the blank concentrations were qualified as estimated and flagged "B". Seven associated sample results detected greater than five times the blank concentrations, and eight associated nondetected results, were not qualified.

- Acetone, chloroform, trichlorothene, tetrachloroethene and toluene were detected below or above the LOQ in the EBs for Method SW8260C. Twenty-two associated sample results detected less than five times the blank concentrations were qualified as estimated and flagged

"B". Twenty-eight associated sample results detected greater than five times the blank concentrations, and 49 associated nondetected results, were not qualified.

- TOC was detected below the LOQ in an EB for Method SW9060. Two associated sample results detected less than five times the blank concentration were qualified as estimated and flagged "B". Four associated sample results detected greater than five times the blank concentrations were not qualified.

Field Duplicates

Five FD sets were collected. Precision was acceptable with the following exceptions:

- The relative percent difference (RPD) of methane was greater than JBER QAPP criteria in FD set 13Q3CG039-AP4550-GW-0/13Q3CG039-AP4550-GW-1 for Method RSK-175. 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 samples for MS/MSD analysis. All acceptance criteria were met with the following exception:

- The recovery of nitrate+nitrite was less than JBER QAPP criteria in the MS of sample AP-4413-13-0830-0 for Method E353.2. The associated detected result was qualified as estimated and flagged "J".

- The recovery of trichloroethene was less than JBER QAPP criteria in the MSD of sample 13Q3CG039-IW014551-GW-0 for Method SW8260C. The associated detected result was qualified as estimated and flagged "J".

- The RPD of formic acid was greater than JBER QAPP criteria in the MS/MSD set of sample 13Q3CG039-AP4550-GW-0 for Method E300.0M. The associated nondetected result was not qualified.

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 M2526.** Sample ID 13Q3CG039-1W02-4551-GW-01 on chain of custody is 13Q3CG039-IW02-4551-GW-1 on container labels. Sample logged in and analyzed as 13Q3CG039-IW02-4551-GW-1.

  Sample 13Q3CG039-IW02-4551-GW-1 was labeled as 13Q3CG039-IW02-4551-GW-0FD. Sample logged in and analyzed as 13Q3CG039-IW02-4551-GW-1.

  Chain of custody requested Method E375.4 for sulfate. Sampled logged in and analyzed for sulfate by E300.0.

  MS/MSD analysis requested for Method E310.1 was not logged in and analyzed; MS/MSD analysis is not typical for this method.

- **SDG M2594.** No discrepancies noted.

- **SDG M2615.** Metals bottles received for samples AP-4414-14-0830-0, AP-4414-14-0830-0MS, AP-4414-14-0830-0MSD, AP-4414-14-0830-1 are mislabeled. All sample IDs start with 13Q3DA085 on bottle. Samples logged in and analyzed per the chain of custody.

  Sulfide bottle received for sample AP-4414-14-0830-0 is mislabeled. Sample ID starts with 13Q3DA085 on bottle. Sample logged in and analyzed per the chain of custody.

- **SDG M2646.** Sample 13Q3DA085-AP3468-GW-0 for Method E376.1 was incorrectly preserved. Sample analysis was canceled.

- **SDG M2839.** No discrepancies noted.

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 QAPP. The following summary highlights the data evaluation findings for the above defined events:

1. No data were rejected and completeness was 100 percent for all method/matrix/analyte combinations.

2. Approximately 50 percent of the AK102/103 data were qualified due to low-level detections in a laboratory blank and EB. The degree to which blank contamination was observed is within reasonable method expectations considering the small size of the dataset.

3. Approximately 9 percent of the E300.0 data were qualified due to low-level detections in the EBs. The degree to which blank contamination was observed suggests a contamination issue during sample collection.

4. Approximately 22 percent of the RSK-175 data were qualified due to low-level detections in the TBs and EBs. The degree to which blank contamination was observed suggests a contamination issue during sample collection and sample handling/shipping.

5. Approximately 34 percent of the SW6010B data were qualified due to low-level detections in the laboratory blanks and EBs. The degree to which blank contamination was observed suggests a contamination issue during sample collection.

6. Less than one percent of the SW8260C data were qualified due to low-level detections in the EBs. The degree to which blank contamination was observed is within reasonable method expectations.

7. Approximately 33 percent of the SW9060 data were qualified due to low-level detections in a laboratory blank and EB. The degree to which blank contamination was observed suggests a contamination issue at the laboratory; sample detections in the EB were similar to the laboratory blank concentration.

8. A FD RPD exceedance was observed for Method RSK-175; one result was qualified as estimated.

9. Two samples were analyzed outside of holding time for Method E376.2, and two samples were analyzed outside of holding time for Method SW8260C; 215 results were qualified as estimated.

10. MS and MSD recovery exceedances were observed for Methods SW8260C and E353.2; two results were qualified as estimated.

11. 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 H-3: Validation Flags

Native ID	Method	Analyte	Final Result	Units	Validation Flag	Validation Reason
13Q31W-01-4413-GW-0	SW8260C	Acetone	1.31	µg/L	B	EB<LOQ
13Q3CG039-AP3747-GW-0	RSK-175	Methane	0.0995	µg/L	B	EB<LOQ
		Methane	0.0995	µg/L	B	TB<LOQ
	SW6010B	Iron, dissolved	40.8	µg/L	B	EB<LOQ
	SW8260C	1,1,1,2-Tetrachloroethane	0.25	µg/L	UJ	HTa>UCL
		1,1,1-Trichloroethane	0.25	µg/L	UJ	HTa>UCL
		1,1,2,2-Tetrachloroethane	0.58	µg/L	J	HTa>UCL
		1,1,2-Trichloroethane	0.34	µg/L	J	HTa>UCL
		1,1,2-Trichloro-1,2,2-trifluoroethane	0.25	µg/L	UJ	HTa>UCL
		1,1-Dichloroethane	0.25	µg/L	UJ	HTa>UCL
		1,1-Dichloroethene	0.25	µg/L	J	HTa>UCL
		1,1-Dichloropropene	0.25	µg/L	UJ	HTa>UCL
		1,2,3-Trichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		1,2,3-Trichloropropane	0.25	µg/L	UJ	HTa>UCL
		1,2,4-Trichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		1,2,4-Trimethylbenzene	0.25	µg/L	UJ	HTa>UCL
		1,2-Dichloroethane	0.25	µg/L	UJ	HTa>UCL
		1,2-Dichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		1,2-Dibromo-3-chloropropane	0.25	µg/L	UJ	HTa>UCL
		1,2-Dichloropropane	0.25	µg/L	UJ	HTa>UCL
		Ethylene dibromide	0.25	µg/L	UJ	HTa>UCL
		1,3,5-Trimethylbenzene	0.25	µg/L	UJ	HTa>UCL
		1,3-Butadiene	0.25	µg/L	UJ	HTa>UCL
		1,3-Dichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		1,3-Dichloropropane	0.25	µg/L	UJ	HTa>UCL
		1,4-Dichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		2,2-Dichloropropane	0.25	µg/L	UJ	HTa>UCL
		2-Butanone	1	µg/L	UJ	HTa>UCL
		2-Chlorotoluene	0.25	µg/L	UJ	HTa>UCL
		2-Hexanone	1	µg/L	UJ	HTa>UCL
		4-Chlorotoluene	0.25	µg/L	UJ	HTa>UCL
		4-Methyl-2-pentanone	1	µg/L	UJ	HTa>UCL
		Acetone	1	µg/L	UJ	HTa>UCL
		Benzene	0.25	µg/L	UJ	HTa>UCL
		Bromobenzene	0.25	µg/L	UJ	HTa>UCL
		Bromochloromethane	0.25	µg/L	UJ	HTa>UCL
		Bromodichloromethane	0.25	µg/L	UJ	HTa>UCL
		Bromoform	0.25	µg/L	UJ	HTa>UCL
		Bromomethane	0.25	µg/L	UJ	HTa>UCL
		Carbon disulfide	0.25	µg/L	UJ	HTa>UCL
		Carbon tetrachloride	0.57	µg/L	J	HTa>UCL

Table H-3: Validation Flags

Native ID	Method	Analyte	Final Result	Units	Validation Flag	Validation Reason
		Chlorobenzene	0.25	µg/L	UJ	HTa>UCL
		Chloroethane	0.25	µg/L	UJ	HTa>UCL
		Chloroform	0.6	µg/L	J	HTa>UCL
		Chloromethane	0.25	µg/L	UJ	HTa>UCL
		cis-1,2-Dichloroethene	3.97	µg/L	J	HTa>UCL
		cis-1,3-Dichloropropene	0.25	µg/L	UJ	HTa>UCL
		Cyclohexane	0.25	µg/L	UJ	HTa>UCL
		Dibromochloromethane	0.25	µg/L	UJ	HTa>UCL
		Dibromomethane	0.25	µg/L	UJ	HTa>UCL
		Dichlorodifluoromethane	0.25	µg/L	UJ	HTa>UCL
		Ethylbenzene	0.25	µg/L	UJ	HTa>UCL
		Hexachlorobutadiene	0.25	µg/L	UJ	HTa>UCL
		Isopropylbenzene	0.25	µg/L	UJ	HTa>UCL
		m,p-Xylene	0.5	µg/L	UJ	HTa>UCL
		Methyl tert-butyl ether	0.25	µg/L	UJ	HTa>UCL
		Methylene chloride	0.25	µg/L	UJ	HTa>UCL
		Naphthalene	0.25	µg/L	UJ	HTa>UCL
		n-Butylbenzene	0.25	µg/L	UJ	HTa>UCL
		n-Hexane	0.25	µg/L	UJ	HTa>UCL
		n-Propylbenzene	0.25	µg/L	UJ	HTa>UCL
		o-Xylene	0.25	µg/L	UJ	HTa>UCL
		p-Isopropyltoluene	0.25	µg/L	UJ	HTa>UCL
		sec-Butylbenzene	0.25	µg/L	UJ	HTa>UCL
		Styrene	0.25	µg/L	UJ	HTa>UCL
		Trichloroethene	82.1	µg/L	J	HTa>UCL
		tert-Butylbenzene	0.25	µg/L	UJ	HTa>UCL
		Tetrachloroethylene	0.78	µg/L	J	HTa>UCL
		Toluene	0.25	µg/L	UJ	HTa>UCL
		trans-1,2-Dichloroethene	1.36	µg/L	J	HTa>UCL
		trans-1,3-Dichloropropene	0.25	µg/L	UJ	HTa>UCL
		Trichlorofluoromethane	0.25	µg/L	UJ	HTa>UCL
		Vinyl acetate	0.5	µg/L	UJ	HTa>UCL
		Vinyl chloride	0.25	µg/L	UJ	HTa>UCL
		Xylenes, total	0.75	µg/L	UJ	HTa>UCL
13Q3CG039-AP3748-GW-0	RSK-175	Methane	0.0421	µg/L	B	EB<LOQ
		Methane	0.0421	µg/L	B	TB<LOQ
	SW6010B	Iron, dissolved	13.3	µg/L	B	EB<LOQ
		Manganese, dissolved	1.16	µg/L	B	EB<LOQ
13Q3CG039-AP3748-GW-1	SW6010B	Iron, dissolved	11	µg/L	B	EB<LOQ
		Manganese, dissolved	0.978	µg/L	B	EB<LOQ

Table H-3: Validation Flags

Native ID	Method	Analyte	Final Result	Units	Validation Flag	Validation Reason
13Q3CG039-AP3983R-GW-0	E300.0	Chloride	2.4	mg/L	B	EB>LOQ
	SW8260C	Acetone	0.93	µg/L	B	EB<LOQ
		Chloroform	1.25	µg/L	B	EB<LOQ
13Q3CG039-AP4344-GW-0	RSK-175	Methane	0.0218	µg/L	B	EB<LOQ
		Methane	0.0218	µg/L	B	TB<LOQ
	SW6010B	Iron, dissolved	12.3	µg/L	B	EB<LOQ
		Manganese, dissolved	0.466	µg/L	B	EB<LOQ
		Manganese, dissolved	0.466	µg/L	B	LB<LOQ
13Q3CG039-AP4353-GW-0	SW8260C	1,1,1,2-Tetrachloroethane	0.25	µg/L	UJ	HTa>UCL
		1,1,1-Trichloroethane	0.25	µg/L	UJ	HTa>UCL
		1,1,2,2-Tetrachloroethane	47	µg/L	J	HTa>UCL
		1,1,2-Trichloroethane	1.44	µg/L	J	HTa>UCL
		1,1,2-Trichloro-1,2,2-trifluoroethane	0.25	µg/L	UJ	HTa>UCL
		1,1-Dichloroethane	0.25	µg/L	UJ	HTa>UCL
		1,1-Dichloroethene	1.05	µg/L	J	HTa>UCL
		1,1-Dichloropropene	0.25	µg/L	UJ	HTa>UCL
		1,2,3-Trichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		1,2,3-Trichloropropane	0.25	µg/L	UJ	HTa>UCL
		1,2,4-Trichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		1,2,4-Trimethylbenzene	0.25	µg/L	UJ	HTa>UCL
		1,2-Dichloroethane	0.25	µg/L	UJ	HTa>UCL
		1,2-Dichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		1,2-Dibromo-3-chloropropane	0.25	µg/L	UJ	HTa>UCL
		1,2-Dichloropropane	0.25	µg/L	UJ	HTa>UCL
		Ethylene dibromide	0.25	µg/L	UJ	HTa>UCL
		1,3,5-Trimethylbenzene	0.25	µg/L	UJ	HTa>UCL
		1,3-Butadiene	0.25	µg/L	UJ	HTa>UCL
		1,3-Dichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		1,3-Dichloropropane	0.25	µg/L	UJ	HTa>UCL
		1,4-Dichlorobenzene	0.25	µg/L	UJ	HTa>UCL
		2,2-Dichloropropane	0.25	µg/L	UJ	HTa>UCL
		2-Butanone	1	µg/L	UJ	HTa>UCL
		2-Chlorotoluene	0.25	µg/L	UJ	HTa>UCL
		2-Hexanone	1	µg/L	UJ	HTa>UCL
		4-Chlorotoluene	0.25	µg/L	UJ	HTa>UCL
		4-Methyl-2-pentanone	1	µg/L	UJ	HTa>UCL
		Acetone	1	µg/L	UJ	HTa>UCL
		Benzene	0.25	µg/L	UJ	HTa>UCL
		Bromobenzene	0.25	µg/L	UJ	HTa>UCL
		Bromochloromethane	0.25	µg/L	UJ	HTa>UCL
		Bromodichloromethane	0.25	µg/L	UJ	HTa>UCL

Table H-3: Validation Flags

Native ID	Method	Analyte	Final Result	Units	Validation Flag	Validation Reason
		Bromoform	0.25	µg/L	UJ	HTa>UCL
		Bromomethane	0.25	µg/L	UJ	HTa>UCL
		Carbon disulfide	0.25	µg/L	UJ	HTa>UCL
		Carbon tetrachloride	0.25	µg/L	UJ	HTa>UCL
		Chlorobenzene	0.25	µg/L	UJ	HTa>UCL
		Chloroethane	0.25	µg/L	UJ	HTa>UCL
		Chloroform	0.25	µg/L	UJ	HTa>UCL
		Chloromethane	0.25	µg/L	UJ	HTa>UCL
		cis-1,2-Dichloroethene	38.1	µg/L	J	HTa>UCL
		cis-1,3-Dichloropropene	0.25	µg/L	UJ	HTa>UCL
		Cyclohexane	0.25	µg/L	UJ	HTa>UCL
		Dibromochloromethane	0.25	µg/L	UJ	HTa>UCL
		Dibromomethane	0.25	µg/L	UJ	HTa>UCL
		Dichlorodifluoromethane	0.25	µg/L	UJ	HTa>UCL
		Ethylbenzene	0.25	µg/L	UJ	HTa>UCL
		Hexachlorobutadiene	0.25	µg/L	UJ	HTa>UCL
		Isopropylbenzene	0.25	µg/L	UJ	HTa>UCL
		m,p-Xylene	0.5	µg/L	UJ	HTa>UCL
		Methyl tert-butyl ether	0.25	µg/L	UJ	HTa>UCL
		Methylene chloride	0.25	µg/L	UJ	HTa>UCL
		Naphthalene	0.25	µg/L	UJ	HTa>UCL
		n-Butylbenzene	0.25	µg/L	UJ	HTa>UCL
		n-Hexane	0.25	µg/L	UJ	HTa>UCL
		n-Propylbenzene	0.25	µg/L	UJ	HTa>UCL
		o-Xylene	0.25	µg/L	UJ	HTa>UCL
		p-Isopropyltoluene	0.25	µg/L	UJ	HTa>UCL
		sec-Butylbenzene	0.25	µg/L	UJ	HTa>UCL
		Styrene	0.25	µg/L	UJ	HTa>UCL
		Trichloroethene	227	µg/L	J	HTa>UCL
		tert-Butylbenzene	0.25	µg/L	UJ	HTa>UCL
		Tetrachloroethylene	3.23	µg/L	J	HTa>UCL
		Toluene	0.25	µg/L	UJ	HTa>UCL
		trans-1,2-Dichloroethene	12.4	µg/L	J	HTa>UCL
		trans-1,3-Dichloropropene	0.25	µg/L	UJ	HTa>UCL
		Trichlorofluoromethane	0.25	µg/L	UJ	HTa>UCL
		Vinyl acetate	0.5	µg/L	UJ	HTa>UCL
		Vinyl chloride	0.25	µg/L	UJ	HTa>UCL
		Xylenes, total	0.75	µg/L	UJ	HTa>UCL
13Q3CG039-AP4550-GW-0	E300.0	Chloride	3.47	mg/L	B	EB>LOQ
	RSK-175	Methane	53.3	µg/L	J	FD>RPD
	SW8260C	Chloroform	0.7	µg/L	B	EB<LOQ

Table H-3: Validation Flags

Native ID	Method	Analyte	Final Result	Units	Validation Flag	Validation Reason
13Q3CG039-AP4550-GW-1	E300.0	Chloride	2.93	mg/L	B	EB>LOQ
	RSK-175	Methane	0.0482	µg/L	B	EB<LOQ
		Methane	0.0482	µg/L	B	FD>RPD
		Methane	0.0482	µg/L	B	TB<LOQ
	SW8260C	Acetone	0.97	µg/L	B	EB<LOQ
		Chloroform	0.75	µg/L	B	EB<LOQ
13Q3CG039-AP4551-GW-0	E300.0	Chloride	3.54	mg/L	B	EB>LOQ
	SW8260C	Chloroform	1.14	µg/L	B	EB<LOQ
13Q3CG039-AP5246-GW-0	RSK-175	Methane	0.0389	µg/L	B	EB<LOQ
		Methane	0.0389	µg/L	B	TB<LOQ
	SW6010B	Iron, dissolved	27.8	µg/L	B	EB<LOQ
13Q3CG039-AP5683-GW-0	RSK-175	Methane	0.0303	µg/L	B	EB<LOQ
		Methane	0.0303	µg/L	B	TB<LOQ
	SW6010B	Manganese, dissolved	1.31	µg/L	B	EB<LOQ
13Q3CG039-IW013983-GW-0	SW8260C	Chloroform	0.62	µg/L	B	EB<LOQ
13Q3CG039-IW014550-GW-0	SW8260C	Acetone	2.75	µg/L	B	EB<LOQ
		Chloroform	0.88	µg/L	B	EB<LOQ
13Q3CG039-IW014551-GW-0	SW8260C	Acetone	0.52	µg/L	B	EB<LOQ
		Chloroform	1.17	µg/L	B	EB<LOQ
		Trichloroethene	2690	µg/L	J	SD<LCL
13Q3CG039-IW023983-GW-0	SW8260C	Chloroform	0.69	µg/L	B	EB<LOQ
13Q3CG039-IW024550-GW-0	SW8260C	Acetone	1.28	µg/L	B	EB<LOQ
13Q3CG039-IW02-4551-GW-0	SW8260C	Chloroform	1.14	µg/L	B	EB<LOQ
13Q3CG039-IW02-4551-GW-1	SW8260C	Chloroform	1.22	µg/L	B	EB<LOQ
13Q3DA085-AP3468-GW-0	RSK-175	Methane	0.0376	µg/L	B	EB<LOQ
		Methane	0.0376	µg/L	B	TB<LOQ
	SW8260C	Acetone	0.85	µg/L	B	EB>LOQ
13Q3DA085-AP3534-GW-0	RSK-175	Methane	0.0214	µg/L	B	EB<LOQ
		Methane	0.0214	µg/L	B	TB<LOQ
	SW8260C	Acetone	1.29	µg/L	B	EB>LOQ
13Q3DA085-AP3774-GW-0	RSK-175	Methane	0.042	µg/L	B	EB<LOQ
		Methane	0.042	µg/L	B	TB<LOQ
13Q3DA085-AP3870-GW-0	RSK-175	Methane	0.031	µg/L	B	EB<LOQ
		Methane	0.031	µg/L	B	TB<LOQ
13Q3DA085-AP3871-GW-0	SW8260C	Acetone	0.76	µg/L	B	EB>LOQ
13Q3DA085-AP3893-GW-0	RSK-175	Methane	0.176	µg/L	B	EB<LOQ
	SW6010B	Iron, dissolved	38	µg/L	B	EB<LOQ
13Q3DA085-AP4341-GW-0	AK102/103	TPH-diesel	39.1	µg/L	B	EB<LOQ
		TPH-diesel	39.1	µg/L	B	LB<LOQ
	RSK-175	Methane	0.0418	µg/L	B	EB<LOQ
		Methane	0.0418	µg/L	B	TB<LOQ

Table H-3: Validation Flags

Native ID	Method	Analyte	Final Result	Units	Validation Flag	Validation Reason
13Q3DA085-AP4341-GW-1	AK102/103	TPH-diesel	32.6	µg/L	B	EB<LOQ
		TPH-diesel	32.6	µg/L	B	LB<LOQ
	RSK-175	Methane	0.0356	µg/L	B	EB<LOQ
		Methane	0.0356	µg/L	B	TB<LOQ
	SW8260C	Acetone	0.54	µg/L	B	EB>LOQ
13Q3DA085-AP4342-GW-0	RSK-175	Methane	0.25	µg/L	B	EB<LOQ
		Methane	0.25	µg/L	B	LB<LOQ
		Methane	0.25	µg/L	B	TB<LOQ
	SW6010B	Manganese, dissolved	2.84	µg/L	B	EB<LOQ
		Manganese, dissolved	2.84	µg/L	B	LB<LOQ
13Q3DA085-AP4411-GW-0	SW6010B	Iron, dissolved	81.1	µg/L	B	EB<LOQ
	SW8260C	Toluene	0.81	µg/L	B	EB<LOQ
13Q3DA085-ROI-4413-0	SW8260C	Acetone	4.41	µg/L	B	EB<LOQ
AP-4413-13-0830-0	E353.2	Nitrate/nitrite-N	3.48	mg/L	J	MS<LCL
	E376.2	Sulfide	0.017	mg/L	J	HTa>UCL
	RSK-175	Methane	0.136	µg/L	B	EB<LOQ
		Methane	0.136	µg/L	B	TB<LOQ
	SW6010B	Manganese, dissolved	0.387	µg/L	B	EB<LOQ
		Manganese, dissolved	0.387	µg/L	B	LB<LOQ
	SW9060	Total organic carbon	0.478	mg/L	B	EB<LOQ
		Total organic carbon	0.478	mg/L	B	LB>LOQ
AP-4413-13-0830-1	E376.2	Sulfide	0.0142	mg/L	UJ	HTa>UCL
	RSK-175	Methane	0.184	µg/L	B	EB<LOQ
		Methane	0.184	µg/L	B	TB<LOQ
	SW6010B	Manganese, dissolved	0.601	µg/L	B	EB<LOQ
		Manganese, dissolved	0.601	µg/L	B	LB<LOQ
	SW9060	Total organic carbon	0.482	mg/L	B	EB<LOQ
		Total organic carbon	0.482	mg/L	B	LB>LOQ

Notes:

µg/L = microgram(s) per liter
mg/L = milligram(s) per liter

EB<LOQ = Equipment blank concentration less than the limit of quantitation
EB>LOQ = Equipment blank concentration greater than the limit of quantitation
FD>RPD = Field duplicate relative percent difference criterion exceeded
Hta>UCL = Analytical holding time exceeded
LB<LOQ = Laboratory blank concentration less than the limit of quantitation
LB>LOQ = Laboratory blank concentration greater 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 H-1: Samples Associated with DQE

Sample ID	Collection Date	Sample Type	Matrix
13Q3CG039-EB01-GW-0	19-Aug-13	EB	Water
13Q3CG039-GWEB01	23-Aug-13	EB	Water
13Q3CG039-IW02-4551-GW-0EB	19-Aug-13	EB	Water
13Q3DA085-EB01-GW-0	26-Aug-13	EB	Water
13Q3DA085-EB02-GW-0	30-Aug-13	EB	Water
13Q3CG039-AP3748-GW-1	23-Aug-13	FD	Groundwater
13Q3CG039-AP4550-GW-1	16-Aug-13	FD	Groundwater
13Q3CG039-IW02-4551-GW-1	19-Aug-13	FD	Groundwater
13Q3DA085-AP4341-GW-1	27-Aug-13	FD	Groundwater
AP-4413-13-0830-1	26-Aug-13	FD	Groundwater
13Q31W-01-4413-GW-0	26-Aug-13	N	Groundwater
13Q3CG039-AP3747-GW-0	20-Aug-13	N	Groundwater
13Q3CG039-AP3748-GW-0	23-Aug-13	N	Groundwater
13Q3CG039-AP3983R-GW-0	15-Aug-13	N	Groundwater
13Q3CG039-AP4344-GW-0	23-Aug-13	N	Groundwater
13Q3CG039-AP4353-GW-0	20-Aug-13	N	Groundwater
13Q3CG039-AP4550-GW-0	16-Aug-13	N	Groundwater
13Q3CG039-AP4551-GW-0	15-Aug-13	N	Groundwater
13Q3CG039-AP5246-GW-0	23-Aug-13	N	Groundwater
13Q3CG039-AP5683-GW-0	22-Aug-13	N	Groundwater
13Q3CG039-IW013983-GW-0	16-Aug-13	N	Groundwater
13Q3CG039-IW014550-GW-0	16-Aug-13	N	Groundwater
13Q3CG039-IW014551-GW-0	16-Aug-13	N	Groundwater
13Q3CG039-IW023983-GW-0	16-Aug-13	N	Groundwater
13Q3CG039-IW024550-GW-0	16-Aug-13	N	Groundwater
13Q3CG039-IW02-4551-GW-0	19-Aug-13	N	Groundwater
13Q3DA085-AP3468-GW-0	28-Aug-13	N	Groundwater
13Q3DA085-AP3468-GW-0RE	23-Sep-13	N	Groundwater
13Q3DA085-AP3534-GW-0	28-Aug-13	N	Groundwater
13Q3DA085-AP3774-GW-0	29-Aug-13	N	Groundwater
13Q3DA085-AP3870-GW-0	29-Aug-13	N	Groundwater
13Q3DA085-AP3871-GW-0	28-Aug-13	N	Groundwater
13Q3DA085-AP3893-GW-0	28-Aug-13	N	Groundwater
13Q3DA085-AP4341-GW-0	27-Aug-13	N	Groundwater
13Q3DA085-AP4342-GW-0	26-Aug-13	N	Groundwater
13Q3DA085-AP4411-GW-0	29-Aug-13	N	Groundwater

Attachment H-1: Samples Associated with DQE

Sample ID	Collection Date	Sample Type	Matrix
13Q3DA085-ROI-4413-0	26-Aug-13	N	Groundwater
AP-4413-13-0830-0	26-Aug-13	N	Groundwater
13Q3CG039-GWTB01	20-Aug-13	TB	Water
13Q3CG039-TB01-GW-0	15-Aug-13	TB	Water
13Q3DA085-TB01-GW-0	27-Aug-13	TB	Water
13Q3DA085-TB01-GW-0	26-Aug-13	TB	Water

Notes:

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

Attachment H-2: Laboratory Data Review Checklists

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Attachment H-2: Laboratory Data Review Checklist

CompletedBy	Berney Kidd		
Title	Project Chemist	Date	11/12/2013
CS Report Name		ReportDate	8/27/2013
Consultant Firm	CH2M Hill		
Laboratory Name	Applied Sciences Laboratory	Laboratory Report Number	M2526
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:

No samples transferred.

2. Chain of Custody (COC)

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

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

b. Correct analyses requested?

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

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?

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

Samples received at 4.1C.

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:

Sample ID 13Q3CG039-1W02-4551-GW-01 on chain of custody is 13Q3CG039-IW02-4551-GW-1 on container labels. Sample logged in and analyzed as 13Q3CG039-IW02-4551-GW-1.
Sample 13Q3CG039-IW02-4551-GW-1 was labeled as 13Q3CG039-IW02-4551-GW-0FD. Sample logged in and analyzed as 13Q3CG039-IW02-4551-GW-1.
Chain of custody requested Method E375.4 for sulfate. Sampled logged in and analyzed for sulfate by E300.0.
MS/MSD analysis requested for Method E310.1 was not logged in and analyzed; MS/MSD analysis is not typical for this method.

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

Comments:

All data are usable as qualified.

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:

E300.0:
Chloride detected in the EB and CCB.
E300.0M:
Acetic acid detected in the EB.
MS/MSD RPD exceedance.
E310.1:
Target analytes detected in the EB.
E353.2:
No items of interest.
E376.2:
No items of interest.
RSK-175:
Methane detected in the RB and TB.
FD RPD exceedance.
SW6010B:
Target analyte detected in the EB.
SW7470A:
No items of interest.
SW9060:
TOC detected in the EB.
SW8260C:
Target analytes detected in the EB.
CCV recovery exceedance.

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 qualified.

5. Samples Results

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

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

b. All applicable holding times met?

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

c. All soils reported on a dry weight basis?

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

No soil samples reported.

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 comparison to cleanup levels, see site-specific report.

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

Comments:

All data are usable as qualified.

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: Alkalinity for E310.1.

iii. If above PQL, what samples are affected?

Comments:

13Q3CG039-AP3983R-GW-0, 13Q3CG039-AP4550-GW-0, 13Q3CG039-AP4550-GW-1, 13Q3CG039-AP4551-GW-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 greater than five times the blank concentration and non-detects were not qualified.

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

Comments:

No data affected, associated samples detected greater than five times the blank concentration.

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:

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

Comments:

All data are usable as qualified.

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:

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: Methane for RSK-175.

iv. If above PQL, what samples are affected?
Comments:

13Q3CG039-AP3983R-GW-0, 13Q3CG039-AP4550-GW-0, 13Q3CG039-AP4550-GW-1, 13Q3CG039-AP4551-GW-0

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

Associated sample detects less than five times the blank concentration 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 RSK-175: Methane (13Q3CG039-AP4550-GW-0, %RPD 199.64 vs 30), Methane (13Q3CG039-AP4550-GW-1, %RPD 199.64 vs 30), associated sample results were flagged J.

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: Chloride for E300.0.

These analytes had Equipment Blank detects: Acetic Acid for E300.0M.

These analytes had Equipment Blank detects: Alkalinity for E310.1.

These analytes had Equipment Blank detects: Methane for RSK-175.

These analytes had Equipment Blank detects: Dissolved Manganese for SW6010B.

These analytes had Equipment Blank detects: Acetone, Chloroform, Trichloroethene, Toluene for SW8260C.

These analytes had Equipment Blank detects: Total Organic Carbon for SW9060.

ii. If above PQL, what samples are affected?

13Q3CG039-AP3983R-GW-0, 13Q3CG039-AP4550-GW-0, 13Q3CG039-AP4550-GW-1, 13Q3CG039-AP4551-GW-0, 13Q3CG039-IW013983-GW-0, 13Q3CG039-IW014550-GW-0, 13Q3CG039-IW014551-

GW-0, 13Q3CG039-IW023983-GW-0, 13Q3CG039-IW024550-GW-0, 13Q3CG039-IW02-4551-GW-0, 13Q3CG039-IW02-4551-GW-1

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

Associated sample detects less than five times (10 times for acetone) the blank concentrations were flagged 'B'. Associated sample detects greater than five times the blank concentration and non-detects were not qualified.

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

a. Defined and appropriate?

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

Calibration:

Chloride was detected in a continuing calibration blank for Method E300.0. Associated samples 13Q3CG039-AP3983R-GW-0, 13Q3CG039-AP4550-GW-0, 13Q3CG039-AP4550-GW-1, 13Q3CG039-AP4551-GW-0 were detected greater than five times the blank concentration and were not qualified.

The recovery of chloroethane was greater than the upper control limit in a continuing calibration verification for Method SW8260C. Associated samples 13Q3CG039-AP3983R-GW-0, 13Q3CG039-AP4550-GW-0, 13Q3CG039-AP4550-GW-1, 13Q3CG039-AP4551-GW-0, 13Q3CG039-IW013983-GW-0, 13Q3CG039-IW014550-GW-0, 13Q3CG039-IW014551-GW-0, 13Q3CG039-IW023983-GW-0, 13Q3CG039-IW024550-GW-0, 13Q3CG039-IW02-4551-GW-0, 13Q3CG039-IW02-4551-GW-1 were nondetect and no data were qualified.

Matrix:

These samples were flagged for Matrix spike duplicate recovery criteria less than the lower control limit: TCE (13Q3CG039-IW014551-GW-0, SD 69% LCL = 70 UCL = 130) for SW8260C. Associated detected result flagged "J".

The RPD of formic acid was greater than criteria in the MS/MSD set of sample 13Q3CG039-AP4550-GW-0 for Method E300.0M. The associated nondetected result was not qualified.

Laboratory Data Review Checklist

CompletedBy	Berney Kidd		
Title	Project Chemist	Date	11/12/2013
CS Report Name		ReportDate	9/24/2013
Consultant Firm	CH2M Hill		
Laboratory Name	Applied Sciences Laboratory	Laboratory Report Number	M2594
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:

No samples transferred.

2. Chain of Custody (COC)

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

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

b. Correct analyses requested?

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

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?

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

Samples received at 4.2C and 4.8C.

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:

No discrepancies.

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

Comments:

All data are usable as qualified.

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:

SW8260C:
No items of interest.
RSK-175:
No items of interest.
SW6010B:
No items of interest.
E300.0:
No items of interest.
E353.2:
No items of interest.

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 qualified.

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:

Samples 13Q3CG039-AP3747-GW-0 and 13Q3CG039-AP4353-GW-0 were analyzed one day outside of holding time for Method SW8260C. Associated detected results were qualified as estimated and flagged "J"; associated nondetected results were qualified as estimated and flagged "UJ".

c. All soils reported on a dry weight basis?

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

No soil samples reported.

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 comparison to cleanup levels, see site-specific report.

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

Comments:

All data are usable as qualified.

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: Manganese, dissolved for SW6010B.

iii. If above PQL, what samples are affected?

Comments:

13Q3CG039-AP3747-GW-0, 13Q3CG039-AP3748-GW-0, 13Q3CG039-AP3748-GW-1, 13Q3CG039-AP4344-GW-0, 13Q3CG039-AP4353-GW-0, 13Q3CG039-AP5246-GW-0, 13Q3CG039-AP5683-GW-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 concentration 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:

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

All data are usable as qualified.

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:

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: Methane for RSK-175.

iv. If above PQL, what samples are affected?

Comments:

13Q3CG039-AP3747-GW-0, 13Q3CG039-AP3748-GW-0, 13Q3CG039-AP3748-GW-1, 13Q3CG039-AP4344-GW-0, 13Q3CG039-AP4353-GW-0, 13Q3CG039-AP5246-GW-0, 13Q3CG039-AP5683-GW-0

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

Comments:

Associated sample detects less than five times the blank concentration 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:

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

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

No field duplicate Relative Percent Difference exceedences.

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: Methane for RSK-175.

These analytes had Equipment Blank detects: Iron,dissolved, Manganese, dissolved for SW6010B.

ii. If above PQL, what samples are affected?

13Q3CG039-AP3747-GW-0, 13Q3CG039-AP3748-GW-0, 13Q3CG039-AP3748-GW-1, 13Q3CG039-AP4344-GW-0, 13Q3CG039-AP4353-GW-0, 13Q3CG039-AP5246-GW-0, 13Q3CG039-AP5683-GW-0

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

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

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

a. Defined and appropriate?

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

No other flags applied.

Laboratory Data Review Checklist

CompletedBy	Berney Kidd		
Title	Project Chemist	Date	11/12/2013
CS Report Name		ReportDate	9/27/2013
Consultant Firm	CH2M Hill		
Laboratory Name	Applied Sciences Laboratory	Laboratory Report Number	M2615
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:

No samples transferred.

2. Chain of Custody (COC)

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

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

b. Correct analyses requested?

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

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?

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

Samples received at 5.7C.

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:

Metals bottles received for samples AP-4414-14-0830-0, AP-4414-14-0830-0MS, AP-4414-14-0830-0MSD, AP-4414-14-0830-1 are mislabeled. All sample IDs start with 13Q3DA085 on bottle. Samples logged in and analyzed per the chain of custody.
Sulfide bottle received for sample AP-4414-14-0830-0 is mislabeled. Sample ID starts with 13Q3DA085 on bottle. Sample logged in and analyzed per the chain of custody.

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

Comments:

All data are usable as qualified.

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:

SW9060:
No items of interest.
E310.1:
No items of interest.
E376.2:
Holding Time(s):
E376.2: Samples were analyzed outside of holding time.
SW8260C:
No items of interest.
RSK-175:
No items of interest
SW6010B:
No items of interest.
E300.0M:
No items of interest.
E300.0:
No items of interest.
E353.2:
Matrix Spike/Matrix Spike Duplicate(s):
E353.2: MS recovery of Nitrate/Nitrite-N (88%) in AP-4413-13-0830-0MS did not meet acceptance criteria of 90-110%.

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 qualified.

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:

Samples AP-4413-13-0830-0 and AP-4413-13-0830-1 were analyzed two days outside of holding time for Method E376.2. Associated detected results were qualified as estimated and flagged “J”; associated nondetected results were qualified as estimated and flagged “UJ”.

c. All soils reported on a dry weight basis?

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

No soil samples reported.

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 comparison to cleanup levels, see site-specific report.

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

Comments:

All data are usable as qualified.

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: Lactic Acid for E300.0M.

These analytes had Method Blank detects: Methane for RSK-175.

These analytes had Method Blank detects: Manganese, dissolved for SW6010B.

These analytes had Method Blank detects: Total Organic Carbon for SW9060.

iii. If above PQL, what samples are affected?

Comments:

13Q3DA085-AP4342-GW-0, AP-4413-13-0830-0, AP-4413-13-0830-1

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:

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

Comments:

All data are usable as qualified.

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:

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: Methane for RSK-175.

iv. If above PQL, what samples are affected?

Comments:

13Q3DA085-AP4342-GW-0, AP-4413-13-0830-0, AP-4413-13-0830-1

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:

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

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

No field duplicate Relative Percent Difference exceedences.

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: Chloride for E300.0.

These analytes had Equipment Blank detects: Methane for RSK-175.

These analytes had Equipment Blank detects: Manganese, dissolved for SW6010B.

These analytes had Equipment Blank detects: Acetone, Tetrachloroethene, Toluene for SW8260C.

These analytes had Equipment Blank detects: Total Organic Carbon for SW9060.

ii. If above PQL, what samples are affected?

13Q31W-01-4413-GW-0, 13Q3DA085-AP4342-GW-0, 13Q3DA085-ROI-4413-0, AP-4413-13-0830-0, AP-4413-13-0830-1

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

Associated sample detects less than five times (10 times for acetone) the blank concentrations were flagged 'B'. Associated sample detects greater than five times the blank concentration and non-detects

were not qualified.

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 recovery less than the lower control limit: Nitrate/Nitrite-N (AP-4413-13-0830-0, %R = 88 LCL 90 UCL =110) for E353.2. Associated detected result flagged "J".

Laboratory Data Review Checklist

CompletedBy	Berney Kidd		
Title	Project Chemist	Date	11/12/2013
CS Report Name		ReportDate	9/20/2013
Consultant Firm	CH2M Hill		
Laboratory Name	Applied Sciences Laboratory	Laboratory Report Number	M2646
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:

No samples transferred.

2. Chain of Custody (COC)

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

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

b. Correct analyses requested?

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

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?

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

Samples received at 2.1C.

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:

Sample 13Q3DA085-AP3468-GW-0 for Method E376.1 was incorrectly preserved. Sample analysis was canceled.

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

Comments:

All data are usable as qualified.

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:

SW8260C:
No items of interest.
RSK-175:
No items of interest.
AK101:
No items of interest.
AK102/103:
No items of interest.
SW6010B:
No items of interest.
E300.0:
No items of interest.
E353.2:
No items of interest.

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 qualified.

5. Samples Results

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

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

b. All applicable holding times met?

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

c. All soils reported on a dry weight basis?

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

No soil samples reported.

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 comparison to cleanup levels, see site-specific report.

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

Comments:

All data are usable as qualified.

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: TPH-Diesel for AK102/103.

iii. If above PQL, what samples are affected?

Comments:

13Q3DA085-AP4341-GW-0, 13Q3DA085-AP4341-GW-1,

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 concentration were flagged 'B'.

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:

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

All data are usable as qualfied.

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 qualfied.

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: Methane for RSK-175.

iv. If above PQL, what samples are affected?

Comments:

13Q3DA085-AP3468-GW-0, 13Q3DA085-AP3534-GW-0, 13Q3DA085-AP3774-GW-0, 13Q3DA085-AP3870-GW-0, 13Q3DA085-AP3871-GW-0, 13Q3DA085-AP3893-GW-0, 13Q3DA085-AP4341-GW-0, 13Q3DA085-AP4341-GW-1, 13Q3DA085-AP4411-GW-0,

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

Comments:

Associated sample detects less than five times the blank concentration 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:

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

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

No field duplicate Relative Percent Difference exceedences.

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: TPH-Diesel, TPH-Oil for AK102/103.

These analytes had Equipment Blank detects: Chloride, Sulfate for E300.0.

These analytes had Equipment Blank detects: Methane for RSK-175.

These analytes had Equipment Blank detects: Iron, dissolved for SW6010B.

These analytes had Equipment Blank detects: Acetone, Toluene for SW8260C.

ii. If above PQL, what samples are affected?

13Q3DA085-AP3468-GW-0, 13Q3DA085-AP3534-GW-0, 13Q3DA085-AP3774-GW-0, 13Q3DA085-AP3870-GW-0, 13Q3DA085-AP3871-GW-0, 13Q3DA085-AP3893-GW-0, 13Q3DA085-AP4341-GW-0, 13Q3DA085-AP4341-GW-1, 13Q3DA085-AP4411-GW-0

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

Associated sample detects less than five times (10 times for acetone) the blank concentrations were flagged 'B'. Associated sample detects greater than five times the blank concentration and non-detects were not qualified.

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

a. Defined and appropriate?

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

No other flags applied.

Laboratory Data Review Checklist

CompletedBy	Berney Kidd		
Title	Project Chemist	Date	11/12/2013
CS Report Name		ReportDate	10/3/2013
Consultant Firm	CH2M Hill		
Laboratory Name	Applied Sciences Laboratory	Laboratory Report Number	M2839
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:

No samples transferred.

2. Chain of Custody (COC)

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

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

b. Correct analyses requested?

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

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?

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

Sample received at 4.2C.

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:

E353.2:
COC handwritten.

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

Comments:

All data are usable as qualified.

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:

E353.2:
No items of interest.

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 qualified.

5. Samples Results

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

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

b. All applicable holding times met?

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

c. All soils reported on a dry weight basis?

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

No soil samples reported.

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 comparison to cleanup levels, see site-specfic report.

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

Comments:

All data are usable as qualified.

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:

iii. If above PQL, what samples are affected?

Comments:

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

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

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

Comments:

All data are 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:

No organics reported.

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:

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

All data are usable as qualified.

c. Surrogates - Organics Only

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

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

No organics reported.

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:

No organics reported.

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 organics reported.

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

All data are usable as qualified.

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

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

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

No volatiles reported.

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:

No volatiles reported.

iii. All results less than PQL?

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

No volatiles reported.

iv. If above PQL, what samples are affected?

Comments:

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

Comments:

No volatiles reported.

e. Field Duplicate

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

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

No FD included, resample only.

ii. Submitted blind to lab?

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

No FD included, resample only.

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:

No FD included, resample only.

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

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

No FD included, resample only.

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:

ii. If above PQL, what samples are affected?

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

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

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

No other flags applied.