Final Groundwater Monitoring Report

Amaknak Pre-WWII Tank Farm
Formerly Used Defense Site

Unalaska, Alaska

Property #: F10AK0841-03

ADEC File ID: 2542.38.016

Hazard ID: 1350

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Prepared for

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Task Order 25

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ACL	alternative cleanup level
ADEC	Alaska Department of Environmental Conservation
AST	aboveground storage tank
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAS	Columbia Analytical Services
CDQR	chemical data quality review
DoD	Department of Defense
DRO	diesel range organics
ELAP	Environmental Laboratory Accreditation Program
FES	Fairbanks Environmental Services
FUDS	Formerly Used Defense Site
GNSS	Global Navigation Satellite System
IDW	investigation-derived waste
IRA	interim removal action
LIF-ROST	laser-induced fluorescence rapid optical screening tool
LOD	limit of detection
MED	Manual for Electronic Deliverables
mg/kg	milligrams per kilogram
MS/MSD	matrix spike sample/matrix spike duplicate
msl	mean sea level
MW	monitoring well
NAVD88	North American Vertical Datum of 1988
NOAA	National Oceanic and Atmospheric Administration
PAH	polynuclear aromatic hydrocarbon
PVC	polyvinyl chloride
QC	quality control
QSM	Quality Systems Manual for Environmental Laboratories
RI	remedial investigation
RRO	residual range organics
RTK	real time kinematic
SDG	sample data group
SI	site investigation
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
USACE	United States Army Corps of Engineers
µg/L	micrograms per liter
WGS84	World Geodetic System of 1984

EXECUTIVE SUMMARY

Groundwater samples were collected in October 2012 from six monitoring wells located at the Amaknak Pre-WWII Tank Farm Formerly Used Defense Site in Unalaska, Alaska. Thirteen monitoring wells were located at the former Tank Farm area and are summarized in this report. Four monitoring wells could not be located at the time of the investigation and one monitoring well was found but had been destroyed.

Groundwater samples from the six wells were submitted for the following analyses: benzene, toluene, ethylbenzene, and xylenes, diesel range organics (DRO), residual range organics (RRO), and polynuclear aromatic hydrocarbons (PAHs). Groundwater samples were not collected from four wells due to the presence of free product. All analytical results were below the Alaska Department of Environmental Conservation (ADEC), Method Two cleanup levels, found in 18 Alaska Administrative (AAC) Code 75, Table C. Additionally, results were below the less stringent site-specific alternative cleanup levels (ACLs) established in 2003 for petroleum hydrocarbon ranges.

Water levels were measured in 12 monitoring wells within 1.5 hours of low tide. Groundwater elevations were plotted and groundwater contours showed a general groundwater flow direction towards the southeast. Transducers and data loggers were installed in five wells to continuously record water levels. The limited data set (three days) that was collected by the transducers indicate that a groundwater flow direction reversal may occur resulting from tidal changes.

Historical results indicate that, with one exception, all wells have groundwater concentrations of DRO and RRO that are below ACLs of 15,000 and 11,000 micrograms per liter (µg/L), respectively. The one exception is MW-16N; in 2004 concentrations of DRO and RRO were 49,000 and 47,000 µg/L, respectively. An estimated 3.8 feet of product was recorded in the well in 2008. The well has not been sampled since installation in 2004.

Potential impacts to surface water were estimated by calculating total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH) using analytical results from the sampling event. All TAH and TAqH values were below the regulatory criteria.

Results indicate that even though product exists in some wells, there is no indication of a widespread dissolved plume, likely due to the relative insoluble nature of aged Bunker C fuel.

Continued annual groundwater sampling is planned. Construction of a new warehouse by Delta Western may affect several wells. Delta Western has been in communication with ADEC and USACE in regard to maintaining or decommissioning these wells.

1.0 INTRODUCTION

This report describes groundwater monitoring activities performed in October 2012 at the Amaknak Pre-WWII Tank Farm Formerly Used Defense Site (FUDS) in Unalaska, Alaska. Fairbanks Environmental Services (FES) provided this service under contract to the U.S. Army Corps of Engineers (USACE); Contract Number W911KB-08-D-0003 (Task Order 25).

1.1 Project Overview

The primary project objectives are to evaluate hydrogeologic conditions (including groundwater depth, flow direction, gradient, and contaminant concentrations) over time and document groundwater fluctuations and their relations to tidal oscillations. The purpose of groundwater monitoring is to document the state of contamination in the groundwater and ensure that it does not adversely impact surface water.

1.2 Site Background and Physical Settings

1.2.1 Site Location

The Amaknak Pre-WWII Tank Farm is located on the northeast end of Amaknak Island, adjacent to Dutch Harbor, Alaska, at approximate latitude 53°53'26" north and 166°32'12" west, in Township 72 South, Range 117 West, Seward Meridian, of U.S. Geological Survey Quadrangle Map Unalaska C-2 NW (Figure 1-1).

The site is approximately 1,000 feet long and 500 feet wide and includes the former tank farm and the current Delta Western Fuel Dock situated at the intersection of Biorka Drive and East Point Road, approximately 200 feet west of the intertidal zone of Dutch Harbor (Figure 1-2). All wells at the site are flush mounted and generally located in gravel storage yards or parking areas.

Amaknak Island, located in the Aleutian Islands-Western Alaska Peninsula Land Resource Area, is characterized by a cool maritime climate, often with cloudy and foggy conditions, moderate temperatures, and abundant rainfall. Gale force winds, occasionally approaching 100 miles per hour, are common during storms. The average annual precipitation is about 58 inches. The average annual temperature is 36 to 39 degrees Fahrenheit. The average frost-free period is about 115 to 140 days (Natural Resources Conservation Service, 2004).

1.2.2 Site History

The former Pre-WWII Tank Farm consisted of 10 aboveground storage tanks (ASTs) constructed in the early 1920s and demolished by 1943. The ASTs reportedly held fuel oil, Bunker C, and/or

diesel fuel. Five of the 10 tanks were demolished in 1941. After demolition of the remaining five tanks in 1943, approximately 4 feet of gravel fill material was placed over the entire area. The site was then used for parade grounds, a softball field, and storage area.

No structures currently exist over the former tank area, but buildings (several warehouses and a few businesses) are situated near the former tank locations. The Ounalashka Corporation is the current landowner and leases the property to several organizations (USACE, 2007a).

1.2.3 Summary of Previous Investigations and Removal Actions

Since 1990, the USACE has conducted several site investigations (SIs), remedial investigations (RIs), interim removal actions (IRAs), and remedial actions at the Pre-WWII Tank Farm. The investigations identified soil and groundwater contamination mainly east and southeast of the former Pre-WWII Tank Farm. On the basis of these findings, the USACE excavated and thermally treated a total of approximately 24,000 cubic yards of petroleum-contaminated soil in 1998, 2000, 2001, and 2002. Although remedial efforts have been undertaken at the site, contamination in groundwater and soil remains onsite.

In 2005, remaining soil contamination was delineated using Laser-Induced Fluorescence Rapid Optical Screening Tool (LIF-ROST) technology (USACE, 2006a). Results showed that the site has two distinct types of contamination; a heavier (and less soluble) Bunker C type-petroleum and a lighter diesel-like petroleum. LIF-ROST results were mapped to show total petroleum contamination (indicated by total fluorescence); petroleum contamination was greatest southwest of East Point Road, primarily between Biorka Drive and Delta Way (Figure 1-3).

A groundwater flow model developed for the Pre-WWII Tank Farm indicated that Bunker C fuel oil has been discharging into Iliukiuk Bay for decades but not at a rate or concentration that exceeds water quality standards (USACE, 2005). The model predicts that degradation of the Bunker C fuel oil will eventually overtake the discharge rate until the oil is no longer discharging into the Bay, although some oil will remain in the subsurface.

Groundwater monitoring began in 1999 and is ongoing, as summarized in Table 1-1.

Additional details about the groundwater monitoring program and past results can be found in the Groundwater Monitoring Program annual reports for the years 2000 (USACE, 2001), 2001 (USACE, 2002), 2002 (USACE, 2003), 2003 (USACE, 2004a), 2004 (USACE, 2006b), 2005 (USACE, 2006c), 2006 (USACE, 2006d), and 2007 (USACE, 2008), the Modeling of Groundwater Flow and Bunker C Oil Migration Report (USACE, 2005), and the Amaknak Pre-WWII monitoring well installation and groundwater monitoring reports (USACE, 2011; 2012).

Table 1-1 Groundwater Monitoring Events

Monitoring Event Date	Monitoring Wells Sampled	Report Type
Nov 1999	MW-8, -10, -11, -12, and -13 (First Quarterly Event) MW-2, -3, -14, and -15 (First Semiannual Event)	Data Report
Feb 2000	MW-8, -10, -11, -12, and -13 (Quarterly)	Data Report
May 2000	MW-8, -10, -11, -12, and -13 (Quarterly) MW-2, -14, and -15 (Semiannual)	Data Report
Aug 2000	MW-8, -10, -11, -12, and -13 (Quarterly) MW-2, -14, and -15 (Semiannual)	Annual Report
Dec 2000	MW-8, -10, -11, -12, and -13 (Quarterly) MW-2, -14, and -15 (Semiannual)	Data Report
Mar 2001	MW-8, -10, -11, -12, and -13 (Quarterly)	Data Report
Jun 2001	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly)	Data Report
Sep 2001	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly) MW-2 and -15 (Semiannual)	Annual Report
Feb 2002	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly)	Data Report
May 2002	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly) MW-2 and -15 (Semiannual)	Data Report
Aug 2002	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly)	Data Report
Nov 2002	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly) MW-2 and -15 (Semiannual)	Annual Report
Mar 2003	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly)	Data Report
May 2003	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly) MW-2 and -15 (Semiannual)	Data Report
Sep 2003	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly)	Data Report
Dec 2003	MW-8, -10, -11, -12, -13, -14, MWNLF-2, and MWNLF-3 (Quarterly) MW-2 and -15 (Semiannual)	Annual Report
Jun 2004	MW-2, -5, -6, -8, -11, -12, -13, and -15	Data Report
Nov 2004	MW-2, -3R, -4R, -5, -6, -7R, -8, -11, -12, -13, -15, and -16 (Annual)	Annual Report
Apr/May 2005	MW-2, -3R, -4R, -5, -6, -7R, -12, -15, and -16 (Annual)	Annual Report
May 2006	MW-2, -3R, -5, -7R, -12, -15, and MWNLF-2 (Annual)	Annual Report
Jun 2007	MW-3R, -5, -7R, -8, -10, -12, and -15 (Annual)	Annual Report
May 2008	MW-3R, -5, -7R, -10, -12, and -15 (Annual)	Annual Report
Jun/Jul 2009	MW-3R, -5, -7R, -8R, -12, -15, -17, -18, -19, -20, -21, -22, and -23 (Annual)	Annual Report
2010	USACE funded and scheduled monitoring but was not allowed access to the site	No report
2011	USACE funded and scheduled monitoring but was not allowed access to the site	No report
Sep 2012	MW-3R, MW-7R, MW-8R, MW-10, MW-15, MW-22 (Annual)	Annual Report

1.2.4 Decision Document and Other Reports

A Decision Document has been issued in regard to this site (USACE, 2007b). The document was issued in 2007 and recommended excavation of soil north of Building 549, covering contaminated soil within Building 551, and performing five years of annual groundwater monitoring. The 2007 Decision Document stated that wells would be sampled and analyzed for diesel range organics (DRO) and residual range organics (RRO). Analytical results would be compared to 10 times the ADEC Table C groundwater cleanup levels. The document also stated that total aromatic hydrocarbons (TAH) and total aqueous hydrocarbons (TAqH) would be calculated for wells closest to Dutch Harbor and compared to water quality standards for TAH and TAqH. Furthermore, extent of remaining groundwater contamination would be communicated to property owners and city planners to incorporate the information into their future land management plans.

The first groundwater monitoring associated with the Decision Document was conducted in 2009. Lack of an access agreement prevented sampling in 2010 and 2011.

Other notable documents relevant to this site include a letter by the Alaska Department of Environmental Conservation (ADEC) establishing alternative cleanup levels (ACLs) for the site based on a groundwater use determination (ADEC, 2003) and the 2005 Modeling Report (USACE, 2005).

1.3 Cleanup Levels

Standard and site specific ACLs for the site are shown in the table below:

Table 1-2 Soil and Groundwater Cleanup Levels

Matrix	Contaminant of Concern	Standard ADEC Cleanup Levels[1]	Site-Specific Alternative Cleanup Levels[2]
Soil (mg/kg)	DRO	230	2,300
	RRO	8,300	8,300
Groundwater (µg/L)	DRO	1,500	15,000
	RRO	1,100	11,000
	TAH[3]	10	10
	TAqH[3]	15	15

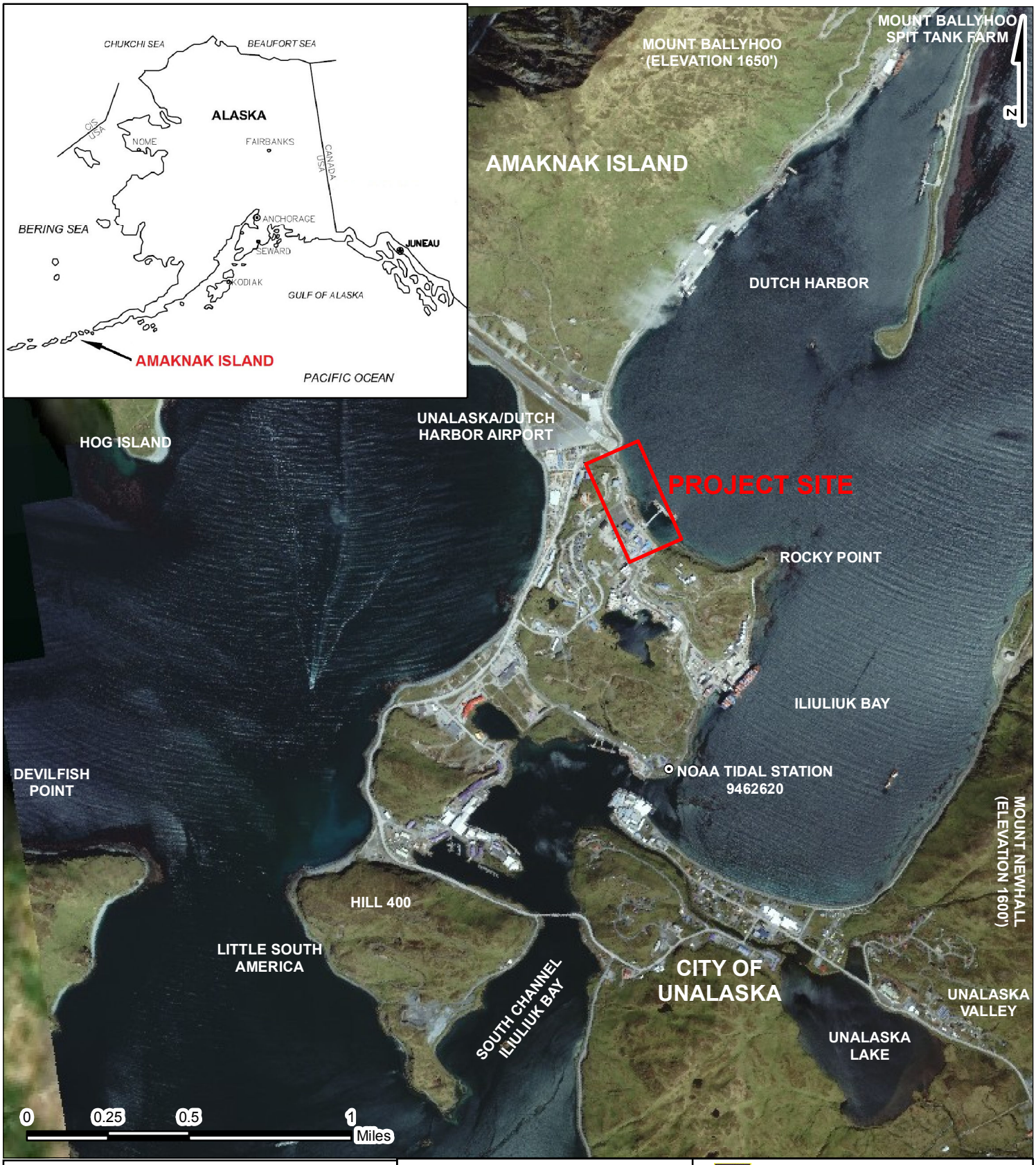
[1] Per 18 Alaska Administrative Code (AAC) 75, Table B2, over 40-inch zone, most stringent of the inhalation, ingestion, and migration-to-groundwater pathways.
[2] Per ADEC Letter (ADEC, 2003), 10 times the standard cleanup level as listed in 18 AAC 75 Table C and the most stringent of the inhalation, ingestion, and ten times the migration-to-groundwater pathways (ADEC, 2011).
[3] Per ADEC 18 AAC 70.020(b) for TAH and TAqH (ADEC, 2012). TAH and TAqH levels apply to groundwater discharging into surface water.
mg/kg – milligrams per kilogram
µg/L – micrograms per liter

1.4 Report Organization

The 2012 field activities are summarized in Section 2. Groundwater analytical results from 2012 are presented in Section 3. Historical results and trend analyses are presented in Section 4. Section 5 provides recommendations.

Additional information is presented in appendices:

Appendix A	Tables and Graphs
Appendix B	CDQR and ADEC Laboratory Data Review Checklist
Appendix C	Field Forms
Appendix D	Transducer Data
Appendix E	Survey Data
Appendix F	Photographic Log
Appendix G	Waste Manifest and Disposal Certificate
Appendix H	Response to Comments



IMAGERY SOURCE:
1. Imagery for Amaknak Island was clipped to reduce file size, and was provided in web form by Alaska Mapped (UAF-GINA/SDMI http://alaskamapped.org/bdl).
2. Inset map is shown for reference only.

COORDINATE SYSTEM:
Projection - Alaska State Plane Zone 10N, feet; Datum - North American Datum of 1983.

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U.S. Army Corps of Engineers
Anchorage, AK

Vicinity Map

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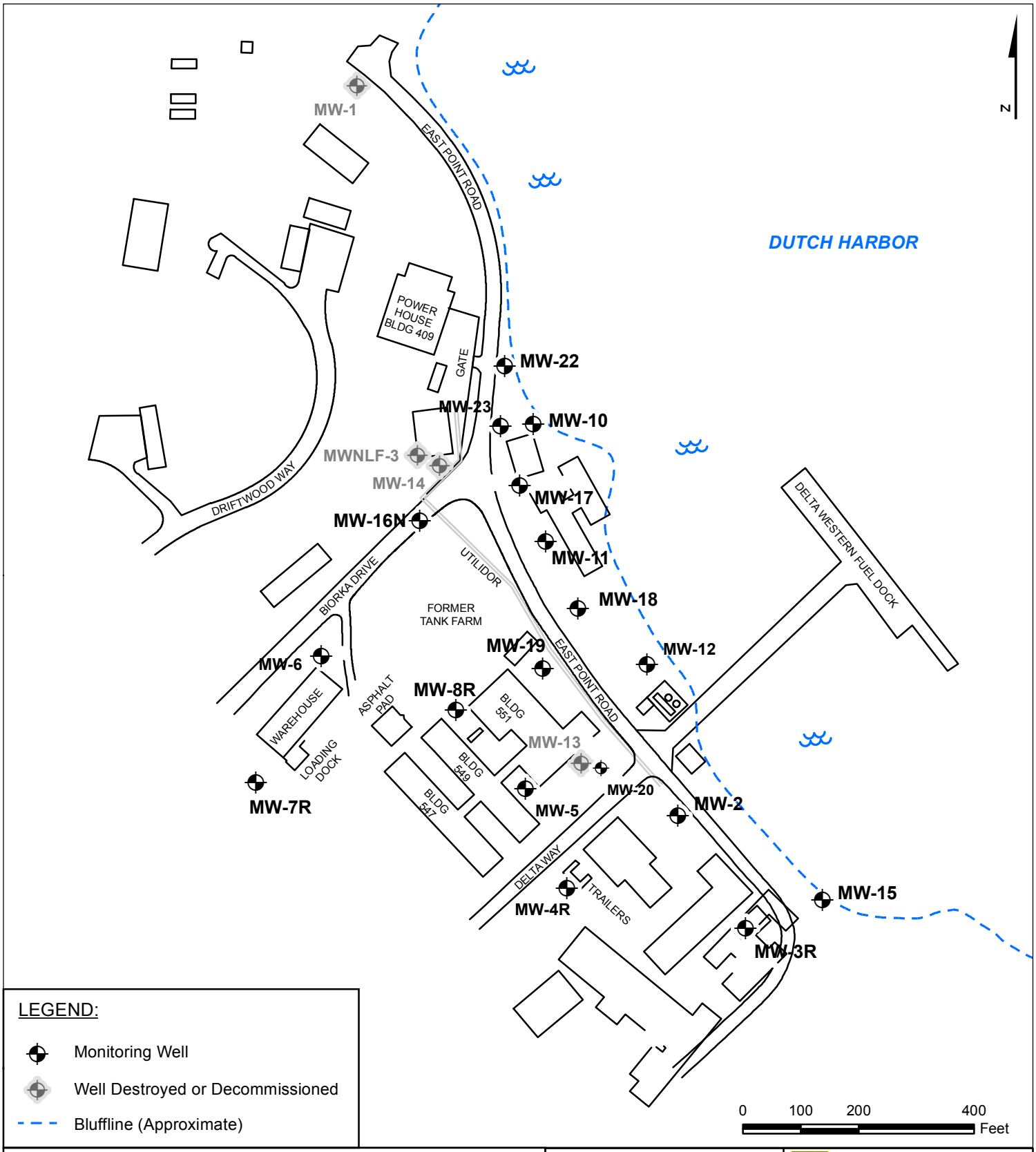
Amaknak Pre-WWII Tank Farm
Formerly Used Defense Site
Unalaska, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	1-1	2/13



SOURCE:
Site features and wells that could not be located were digitized and are based upon AECOM Figure 1-2, "Project Area Map", May 28, 2009.

COORDINATE SYSTEM:
Projection - Alaska State Plane zone 10, feet; Datum - North American Datum of 1983 (NAD83).

Fairbanks Environmental Services
3538 International Street
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Alaska District
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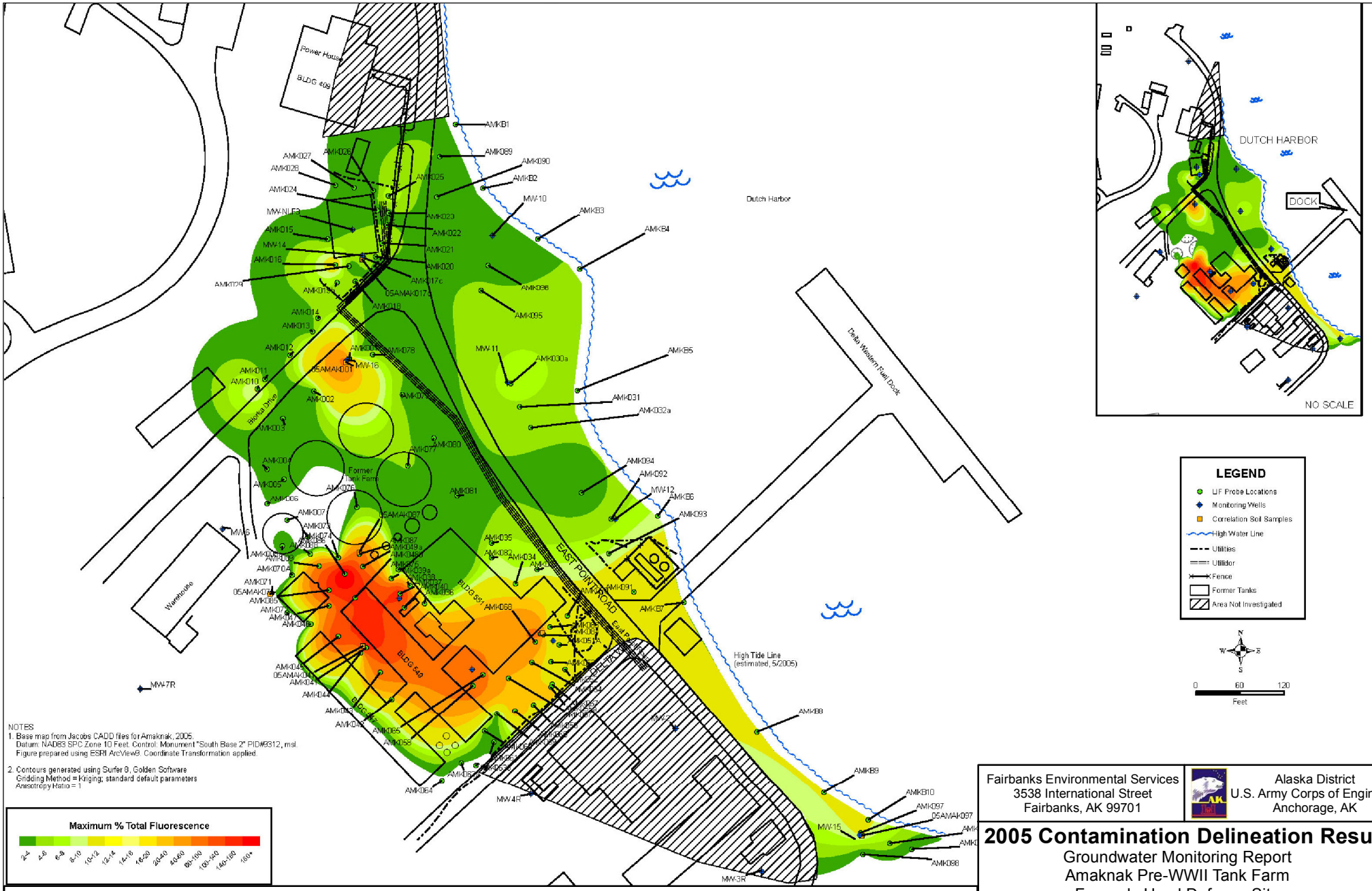
Anchorage, AK

Site Map

Groundwater Monitoring Report
Amaknak Pre-WWII Tank Farm
Formerly Used Defense Site
Unalaska, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	1-2	2/13



SOURCE:
USACE, 2006. Contamination delineation at Pre-WWII Tank Farm, Amaknak Island F10AK0841, Unalaska, Alaska. Prepared by USACE. February.

NOTE:
Greater fluorescence indicates greater petroleum contamination.

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

2005 Contamination Delineation Results

Groundwater Monitoring Report
Amaknak Pre-WWII Tank Farm
Formerly Used Defense Site
Unalaska, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	1-3	2/13

2.0 FIELD ACTIVITIES

Field activities included collection of groundwater samples from six wells, collection of product/water level measurements from thirteen wells, and installation of transducers in five wells (Figure 2-1). Field activities, summarized in Table 2-1, were conducted by ADEC qualified persons Brandie Hofmeister and Kristin Drenzek according to procedures identified in the 2010 Work Plan (FES, 2010); exceptions are noted in Section 2.1.

Table 2-1 Well Condition and Field Activities

Monitoring Well	Well Condition	Install Transducer	Groundwater / Product Level Measurements	Collect Analytical Sample
MW-1	*Destroyed*			
MW-2	Good; trace amount of product	No	**Yes**	No[1]
MW-3R	Poor condition; broken monument	No	**Yes**	**Yes**
MW-4R	*Could not be located*			
MW-5	*Could not be located*			
MW-6	Good	No[1]	**Yes**	No
MW-7R	Fair; no monument lid	**Yes**	**Yes**	**Yes**
MW-8R	Good	**Yes**	**Yes**	**Yes**
MW-10	Monument lid not secure	**Yes**	**Yes**	**Yes**
MW-11	Poor condition; broken	No	**Yes**	No
MW-12	*Could not be located*			
MW-15	Good; casing cut to fit transducer	**Yes**	**Yes**	**Yes**
MW-16N	Good; product	No[1]	**Yes**	No
MW-17	Poor condition; broken	No	**Yes**	No[1]
MW-18	Poor condition; broken	No	**Yes**	No
MW-19	Good; product	No	No[2]	No
MW-20	*Could not be located*			
MW-22	Good	**Yes**	**Yes**	**Yes**
MW-23	*Assumed Destroyed*			

Bolded monitoring wells were scheduled to be sampled per the work plan.
[1] An attempt was made to sample or install a transducer at this well, but was unsuccessful. See Section 2.1.
[2] Product completely coated the probe during groundwater/product level measurements; depth to product was estimated.

2.1 Work Plan Deviations

MW-1 was located but had been destroyed. The well had been completed as a stickup; aboveground portions of the well, including the well casing and protective bollards were found lying on the ground (see photographs in Appendix F). No water level was recorded from the well as planned. The monitoring well and protective bollards were not removed by USACE or with the

knowledge of USACE. Proper decommissioning of the well is recommended. The party responsible for decommissioning this well has not yet been identified. MW-1 was located outside the Pre-WWII tank farm aquifer and its loss does not significantly affect the long term monitoring.

Five wells (MW-4R, MW-5, MW-12, MW-20, and MW-23) could not be located. One of these wells, MW-23, was presumed to be destroyed as construction crews reportedly destroyed a well during installation of a fuel line in the area (Hunter, 2012). However, a city employee later discovered the well and reported that it appears to be good condition (Lund, 2012). During the field investigation, a water sample was taken from nearby MW-10, as MW-23 had been presumed destroyed.

A water level could not be obtained in MW-19 due to free product; the viscous product completely coated the probe and no sound emitted from the instrument. Depth to product was roughly estimated in this well, based on resistance felt when the probe hit the product.

Groundwater samples were not collected from MW-17, MW-18, and MW-19 due to the presence of product. The field crew had also attempted to sample an unscheduled well, MW-2, to replace nearby wells that could not be located or contained measurable product. Because product was also noted in tubing while purging MW-2, this well was not sampled.

Six transducers were scheduled for installation; however, only five transducers were installed. Of the original six wells slated for transducer installation, two contained product (MW-2 and MW-16N), one did not contain a sufficient quantity of water (MW-6), and one could not be located (MW-4R). Transducers from these four wells were relocated to wells MW-7R, MW-15, and MW-22. Transducers were installed in MW-8R and in MW-10 as planned. A sixth transducer was not installed as no other adequate wells were located. Remaining wells were either in poor condition, did not contain sufficient water, or contained product.

Figure 2-2 identifies the wells that could not be located, wells that contained product, wells sampled, and locations of transducers.

2.2 Monitoring Well Conditions and Future Site Work

Several wells were found to be in poor condition, with broken or missing monuments and caps. Wells have been damaged or destroyed due to heavy machinery used in the storage yard and/or repeated contact with graders or snowplows. In particular, wells MW-3R, MW-11, MW-17, and MW-18 were in particularly poor condition. Sometime between the 2009 and 2012 sampling events, MW-11 had been poorly converted from a stick up to a flush mount well.

While on site, the field crew replaced some wells caps and monument bolts/gaskets. In addition, MW-15 was cut down to accommodate a locking well cap equipped with a transducer. The survey was conducted after MW-15 had been cut down.

Subcontractors for Chevron periodically sample monitoring wells MW-3R and MW-15. A semiannual sampling event was scheduled for November 2012. The project manager stated that they did not have time to repair MW-3R during the field visit, but would try to repair the well next year (Lucyk, 2012).

Delta Western is in the process of preparing the parcel east of East Point Road (between Biorka Drive and Delta Way) for construction of a building. The building would presumably be constructed over the current location of monitoring wells MW-11, MW-12, MW-17, and MW-18. Delta Western indicated that they will be in communication with ADEC and USACE regarding the potential decommissioning of these wells (Hunter, 2012).

Additional sewer line work is planned for sections of East Point Road and a portion of Delta Way. No monitoring wells would be impacted but subsurface soils would be disturbed (Lund, 2012).

2.3 Product/Water Level Measurements

Prior to sampling, the static water level in monitoring wells was measured to the nearest 0.01 feet, relative to the top of the monitoring well casing. Water levels, total depths, and the presence of floating product were measured using an electronic oil/water interface probe.

Site-wide water level measurements were taken during the low tide on September 1st, 2012 starting at 12:30 and ending at 14:54. Low tide was at 13:38; observed tides during this time period ranged from -0.89 to -1.21 feet above mean sea level (msl; National Oceanic and Atmospheric Administration [NOAA], 2012). All water levels were measured from a notch or painted mark at the top of each monitoring well.

As noted in Section 2.1 (Work Plan Deviations), five wells could not be located and product/water levels were not collected from those wells. Water and product levels are shown in Table A-1. Water elevation contours are presented in Figure 2-2. Based upon the manual water level measurements the groundwater flow direction at low tide was determined to be towards the southeast, consistent with previous measurements (USACE, 2009; 2012). However, analysis of the preliminary transducer data shows that the groundwater flow direction may be influenced by the tidal stage (Section 2.5).

The depth to product was measured in wells MW-18 and MW-16N. Well MW-18 had trace product while MW-16N had a thickness of 0.01 foot of floating product. The water level meter also indicated that trace product in MW-16N was present 1 foot above the well bottom. This may have been a result of the thick viscous product which was adhering to the interface probe (see photograph in Appendix F).

Water levels could not be accurately recorded in wells MW-11 and MW-19 due to the viscous nature of the product; however the depth to product was measured in MW-11 and estimated in

MW-19. No sound emitted from the probe in MW-19; the measurement was estimated based on resistance felt when the probe hit the product in the well.

Product was not detected with an oil/water interface probe in MW-2 and MW-17, but product was noted inside the disposable sampling tubing during purging (see photographs Appendix F). Sheen was also noted in the purge bucket.

2.4 Groundwater Sampling

Groundwater samples were collected from six monitoring wells (MW-3R, MW-7R, MW-8R, MW-10, MW-15, and MW-22) on September 2nd and September 3rd, 2012 using peristaltic pumps. Groundwater samples were analyzed for the following analyses: benzene, toluene, ethylbenzene, and xylenes (BTEX), DRO, RRO, and polynuclear aromatic hydrocarbons (PAH).

Groundwater parameters were measured in a flow-through cell prior to sampling. Measured parameters included pH, temperature, specific conductivity, turbidity, dissolved oxygen concentration, and oxidation/reduction potential. Water levels were also monitored before and during the purging process; the pump flow rate was controlled to prevent excessive drawdown. Field parameters were recorded on standard groundwater sample forms for each well. Copies of groundwater sample forms and field logbooks are presented in Appendix C.

Once the water quality parameters stabilized, the flow-through cell was disconnected and samples were collected using the peristaltic pump set at a low flow rate. Sample containers for volatile analysis (BTEX) were filled first. Care was taken to minimize aeration and the vials were filled completely to eliminate headspace. All groundwater samples were stored in chilled coolers. Groundwater samples were shipped to Columbia Analytical Services (CAS) from Unalaska, Alaska on September 3rd, 2012. Tables A2, A3, and A4 present the field measurements, sample tracking, and results, respectively (Appendix A). Groundwater results are further discussed in Sections 3.0 and 4.0.

2.5 Transducer Installation and Preliminary Data

YSI Level Scout submersible pressure transducers equipped with data loggers were installed in wells MW-7R, MW-8R, MW-10, MW-15, and MW-22 for continuous measurement of water levels. One YSI Baro Scout transducer was also installed above ground in a bunker south of MW-15 (shown in Figure 2-1) to provide a control in an open system; pressure transducers data will be corrected for atmospheric barometric pressure changes.

The transducers were set to log pressure (in feet of water) once per hour and will record data for at least one year. Data will be used for an evaluation of tidal influences and may include discussion of possible groundwater flow reversal during high tide, determination of net flow direction and velocity, and comparison of results to the 2005 Modeling Report (USACE, 2005).

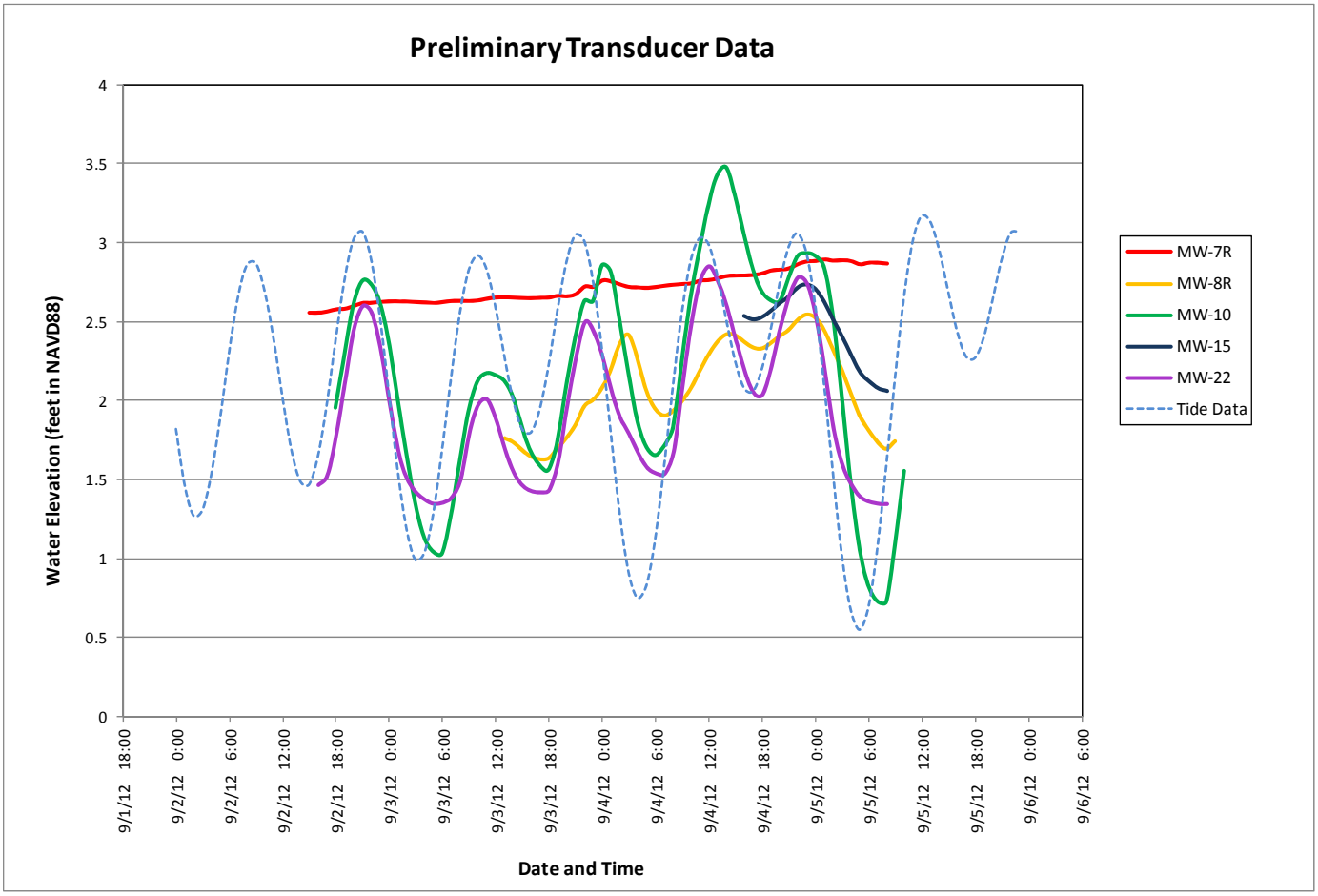
Additional transducer data will be downloaded in 2013, during the next field event.

Preliminary transducer data, collected over several days during this field effort, was downloaded and corrected based on atmospheric pressure readings from the Baro Scout (Appendix D).

Limited transducer data exists for MW-15 (installed on September 4th, 2012) as the polyvinylchloride (PVC) pipe had to be cut to accommodate a locking cap. The PVC pipe was cut on September 4th prior to the vertical survey.

Transducer data is presented in Graph 2-1 with tidal data obtained from NOAA (NOAA, 2012). Wells in close proximity to the shore (MW-10, MW-22) fluctuate with the tides more than wells further inland (MW-7R). Groundwater fluctuations appear to lag and are muted in comparison to tidal changes. The limited transducer data also suggests that the groundwater flow direction may reverse between high and low tides, as inland wells have higher elevations during low tides but have lower elevations during high tides (compared to wells closer to shore). If the flow reversal is significant, net groundwater flow/direction may be different than previously characterized, as previous reports focused only on low tide data.

Graph 2-1: Preliminary Transducer Data



Preliminary results from 2012 are generally consistent with the lag times and efficiencies calculated in the 2005 Modeling Report (USACE, 2005). Tidal efficiency represents the correlation of water levels to tidal oscillations. Results (based on 2003 and 2004 data) are shown in Table 2-2.

Table 2-2: 2003/2004 Tidal Influences

Well ID	Mean Water Level (feet msl)	Lag time (minutes)	Efficiency (ratio)	Mean Error (%)
MW-2	0.55	90	0.43	8.7
MW-3R	0.71	96	0.42	4.6
MW-6	6.63	0	0	5.1
MW-7R	6.54	0	0	27
MW-8	0.73	180	0.32	9.3
MW-10	0.49	36	0.9	1.5
MW-11	1.06	90	0.37	8.4
MW-12	0.38	108	0.49	6
MW-13	0.81	90	0.47	6.4
MW-14	2.42	162	0.03	7.8
MW-15	1.54	168	0.22	12.5

Above data taken directly from the 2005 Modeling Report (USACE, 2005).
msl – mean sea level

2.6 Monitoring Well Survey

Monitoring well locations and elevations were surveyed by Windy Creek Surveys, a professional surveyor. The horizontal locations portion of the field survey was conducted on September 4th, 2012 utilizing 3 JAVAD Triumph-1 Global Navigation Satellite System (GNSS) receivers. Two real time kinematic (RTK) base stations (set to broadcast on different frequencies) were situated over separate 8 inch spikes that were set in ideal locations for a reference station. Each monitoring well was positioned from both base stations, with 4000 series points (based on Point 900) and 5000 series points (based on Point 901). A field inverse check between the two points established for the monitoring wells from separate base stations found a maximum positional variance of 0.22 feet (which is well within the Manual of Electronic Deliverables [MED; USACE, 2009] - Survey Accuracy Requirement of 0.5 meters that is specified for monitoring wells). The 4000 series point numbers are used for the reported monitoring well locations as they were obtained from the RTK base station located at Point 900. Final coordinate listings are based upon a translation from a local assumed World Geodetic System of 1984 (WGS84) base station position, to the position established by the OPUS solution. Refer to OPUS solution for Point 900, based upon September 4th, 2012 static observations.

The vertical control survey was conducted on September 4th, 2012. The Basis of Elevations is the orthometric height in the North American Vertical Datum of 1988 (NAVD88; computed using

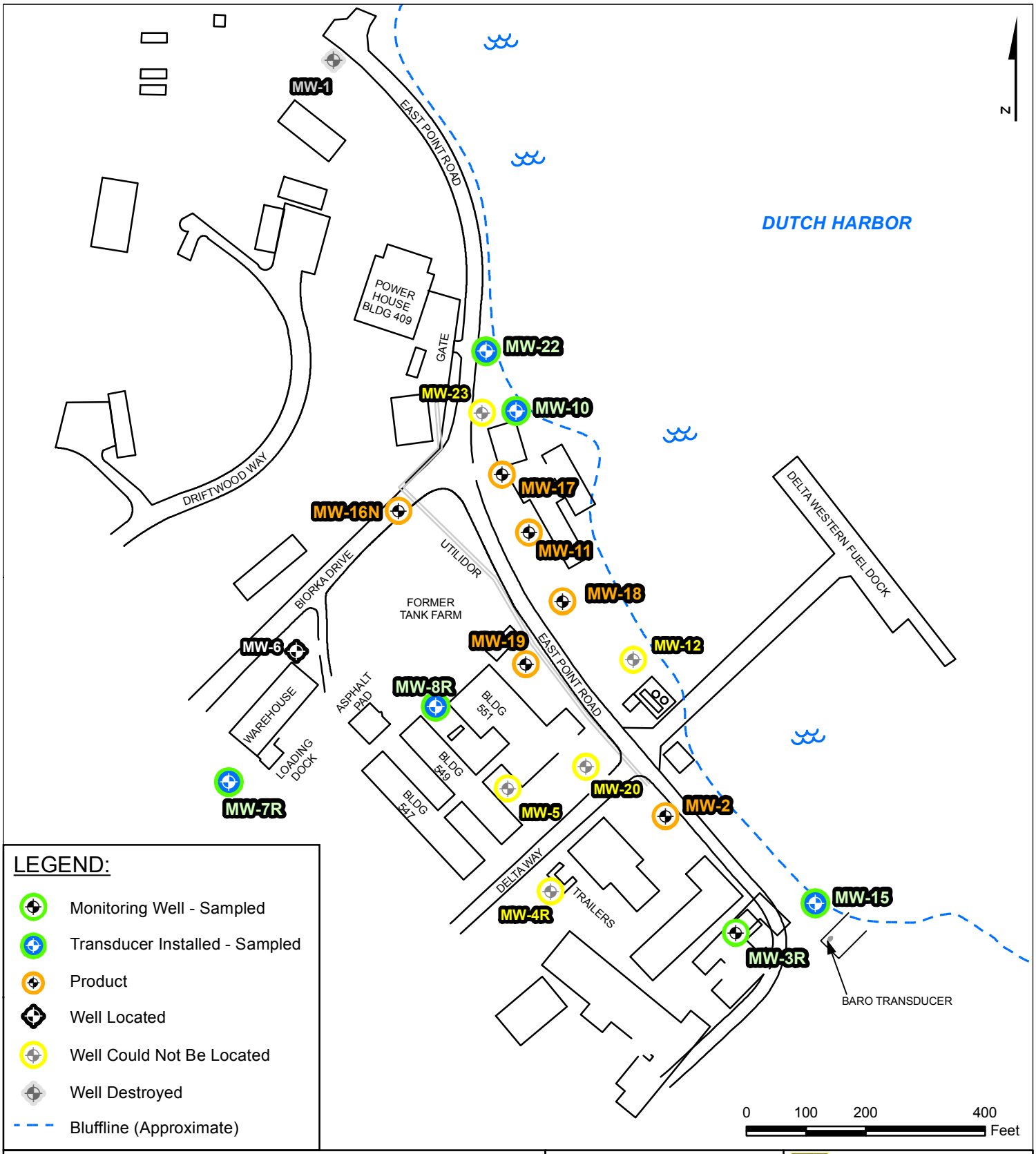
GEIOD12A) that is listed on the OPUS solution for Point 900. Elevations between Point 900 and Point 708 were transferred utilizing RTK GPS. Pseudo-NAVD88 elevations were then established on the top of PVC casings of the wells. A Leica DNA03 level and a fiberglass Leica rod were utilized to complete the level loops that established these elevations, listed to the nearest 0.001 foot. Leica Geo Office 7.0 software was utilized to process the level loops.

Horizontal and vertical survey accuracies were in accordance with the requirements set forth in the Alaska District Corps of Engineers Environmental Program MED. Monitoring well location coordinates and top of casing elevations are provided in Appendix E.

2.7 Investigation-Derived Waste Handling and Disposal

Investigation-derived waste (IDW) included monitoring well purge and decontamination water, which was containerized on-site in appropriately labeled 15-gallon poly drums. Two 15-gallon poly drums containing a total of approximately 25 gallons of water were shipped to Emerald Services of Anchorage, Alaska for disposal. Waste manifests are included in Appendix G.

Solid non-hazardous IDW produced during sampling activities was comprised of sampling gloves, paper towels, and sample tubing. At the end of the sampling event, this solid waste was disposed of at the local landfill.



LEGEND:

- Monitoring Well - Sampled
- Transducer Installed - Sampled
- Product
- Well Located
- Well Could Not Be Located
- Well Destroyed
- Bluffline (Approximate)

SOURCE:
Site features and wells that could not be located were digitized and are based upon AECOM Figure 1-2, "Project Area Map", May 28, 2009.

COORDINATE SYSTEM:
Projection - Alaska State Plane zone 10, feet; Datum - North American Datum of 1983 (NAD83).

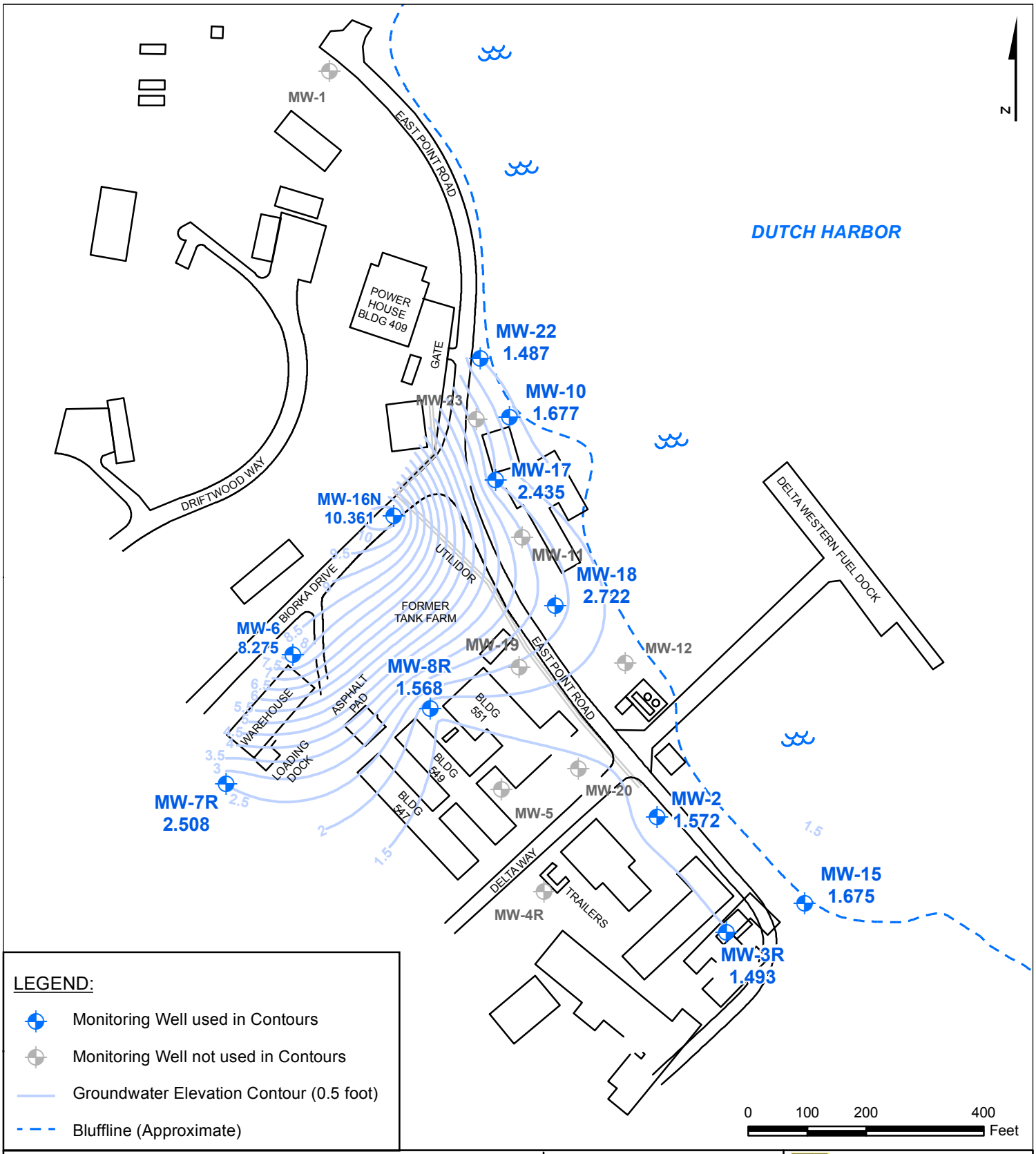
Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

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

Monitoring Well Status

Groundwater Monitoring Report
Amaknak Pre-WWII Tank Farm
Formerly Used Defense Site
Unalaska, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	2-1	2/13



NOTE:
Groundwater levels were taken at low tide. Low tide on September 1, 2012 was at 13:38; groundwater measurements started at 12:30 and ended at 14:54.

SOURCES:
1. Site features and wells that could not be located were digitized and are based upon AECOM Figure 1-2, "Project Area Map", May 28, 2009.
2. Groundwater Contours were created with Surfer v.10, 0.5 foot intervals. Water levels used for elevations were measured by FES on September 1, 2012.

COORDINATE SYSTEM:
Projection - Alaska State Plane zone 10, feet; Datum - North American Datum of 1983 (NAD83).

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U.S. Army Corps of Engineers
Anchorage, AK

Groundwater Elevations

Groundwater Monitoring Report
Amaknak Pre-WWII Tank Farm
Formerly Used Defense Site
Unalaska, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	2-2	2/13

3.0 GROUNDWATER SAMPLE ANALYTICAL RESULTS

Project and QC samples collected from the project site were analyzed by CAS of Kelso, Washington. Analytical results are presented in Appendix A (Table A-4). DRO and RRO contaminant concentrations detected in groundwater samples are shown on Figure 3-1.

As discussed in Section 1.3, the results of the chemical analyses were compared to Table C groundwater cleanup levels (ADEC, 2011), site specific ACLs (ADEC, 2003), and water quality standards (ADEC, 2012).

3.1 Analytical Results

All analytical results were below both the Table C cleanup levels and the site specific ACLs.

The following compounds were detected in analytical samples:

- DRO was detected in all six wells, but was generally below the limit of detection (LOD). Well MW-8R was the only well with a DRO detection above the LOD, with results of 1,100 µg/L for the primary sample and 1,300 µg/L for the field duplicate sample. Results were below both the ADEC Table C cleanup level of 1,500 µg/L and the ACL of 15,000 µg/L.
- RRO was detected in four wells, but all results were below the LOD. The highest concentration of RRO was detected in well MW-8R, with estimated results of 190 µg/L for the primary sample and 260 µg/L for the field duplicate. All concentrations were well below the ADEC Table C cleanup level of 1,100 µg/L and the ACL of 11,000 µg/L.
- BTEX compounds were detected in all six wells, but detections were generally below the LOD. The only exceptions were toluene concentrations in MW-7R and MW-22. While above the LOD, these results are several orders of magnitude below ADEC Table C cleanup levels.
- PAHs were detected in all six wells, though concentrations were several orders of magnitude below ADEC Table C cleanup levels.

3.2 Surface Water Quality Standards

In order to evaluate potential impacts to nearby Iliukiuk Bay/Dutch Harbor, results were compared to ADEC's surface water quality criteria by calculating TAH and TAqH. TAH was calculated using the summation of BTEX results and TAqH was calculated using the summation of BTEX results plus 16 EPA priority PAH results. For values that were non-detect, the LOD value was used.

TAH/TAqH results were generally an order of magnitude below ADEC surface water criteria of 10 and 15 µg/L, respectively. The highest TAH/TAqH values were found in MW-7R, with TAH/TAqH values of 1.70/1.79 µg/L. MW-7R was the most inland well sampled.

3.3 Chemical Data Quality

Project and quality control (QC) data were reviewed in order to assess whether analytical data met data quality objectives and were acceptable for use. The project chemical data were reviewed for deviations to the requirements presented in the Sampling and Analysis Plan, the ADEC Technical Memo 06-002, and the Department of Defense (DoD) Quality Systems Manual (QSM), version 4.2. The results of the review are included in the Chemical Data Quality Review (CDQR) and the ADEC Laboratory Data Review Checklist in Appendix B.

All project and quality control samples were analyzed by CAS of Kelso, Washington. The laboratory is validated by the State of Alaska through the Contaminated Sites Program and is certified through the DoD Environmental Laboratory Accreditation Program (ELAP) for the analytical methods employed. Associated samples were shipped in a single sample data group (SDG) and assigned the report number K1208826. A sample summary table (Table A3) and an analytical results table (Table A4) are included in Appendix A.

Data review found that the completeness goal was met and the review process deemed the analytical results acceptable for project use. Impacts to data quality were minor and generally affected sample results that were one or more orders of magnitude below respective Table C cleanup levels. No data were rejected pursuant to FES's data quality review, and all data may be used as qualified for project purposes. Notable issues are summarized below:

- Surface water was entering monitoring well MW-3R during time of sample collection due to lack of a well monument, well casing below grade, and heavy precipitation at the time of sampling. As a result, the results for sample 1209A3R1WG were qualified (QN) as estimates due to potential lack of groundwater sample integrity. Although laboratory results were generally lower than historical results indicating sample dilution, sheen was noted in parking area surrounding the well. Consequently, impact to data quality and potential bias is unknown.

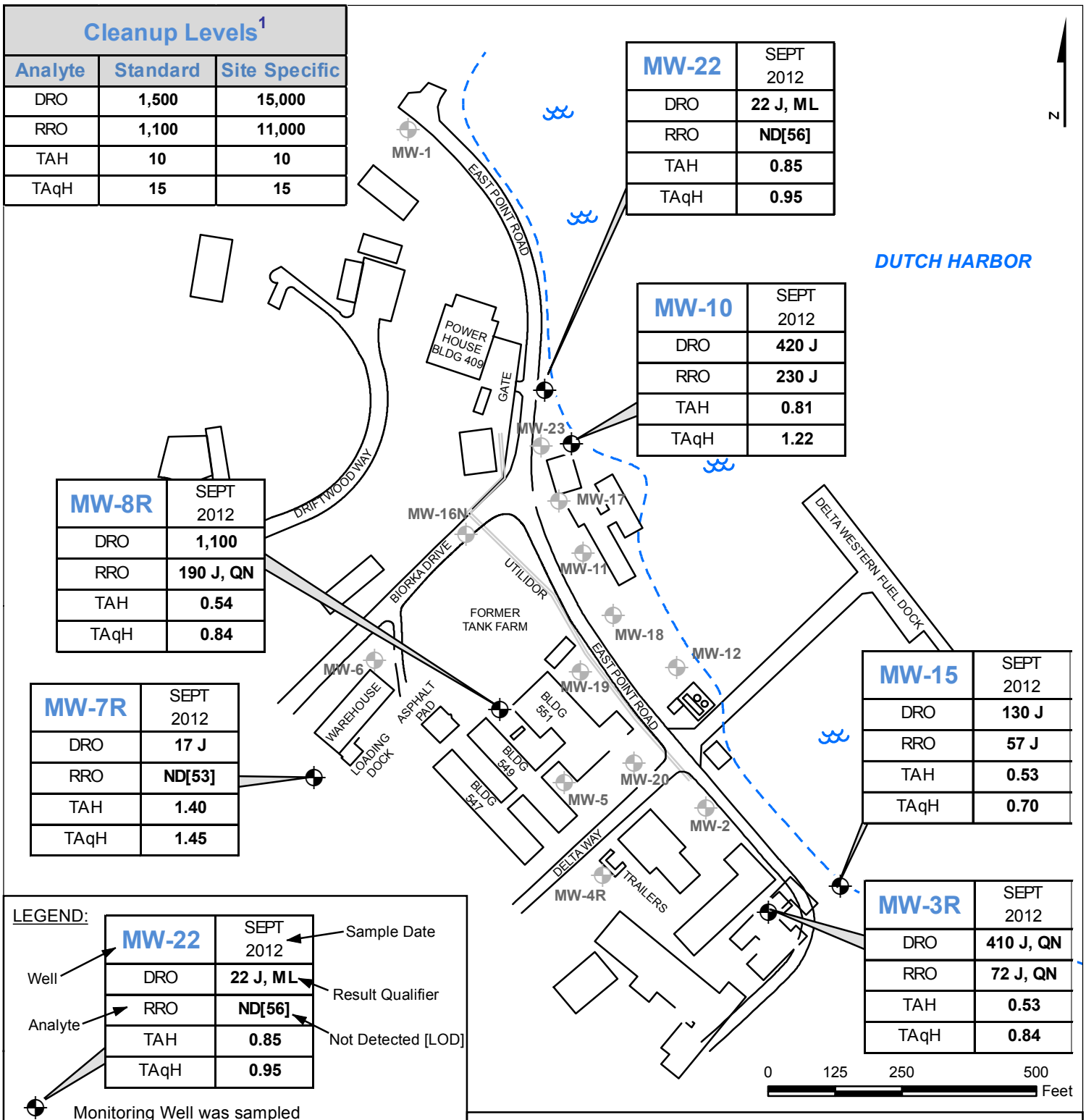
- Due to broken glassware, PAH sample 1209A221WG was re-extracted 2 days outside of the 7 day holding time. PAH results in this sample were qualified (QL) as low estimates. This sample was also used for matrix spike/matrix spike duplicate (MS/MSD) analyses, which were extracted within holding time. Impact to data is likely minor since the sample was extracted only 2 days outside of the recommended holding time and since

most of the spiked MS/MSD results (all but six) were below ADEC cleanup levels. The impact to the six PAHs analytes [Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene] is unknown.

The qualifier codes assigned to data in the September 2012 groundwater data set are defined as follows:

- J – The analyte was detected below the LOD, and is considered an estimate
- B – The result is qualified due to blank contamination
- QN – The result is qualified neutral due to lack of sample integrity or poor field duplicate precision
- QL – The result is qualified low due to extraction outside of holding time
- QH – The result is qualified high due to high surrogate recovery
- ML – The result is qualified low due to matrix interference

Cleanup Levels[1]		
Analyte	Standard	Site Specific
DRO	1,500	15,000
RRO	1,100	11,000
TAH	10	10
TAqH	15	15



MW-22	SEPT 2012
DRO	**22 J, ML**
RRO	**ND[56]**
TAH	**0.85**
TAqH	**0.95**

MW-10	SEPT 2012
DRO	**420 J**
RRO	**230 J**
TAH	**0.81**
TAqH	**1.22**

MW-8R	SEPT 2012
DRO	**1,100**
RRO	**190 J, QN**
TAH	**0.54**
TAqH	**0.84**

MW-7R	SEPT 2012
DRO	**17 J**
RRO	**ND[53]**
TAH	**1.40**
TAqH	**1.45**

MW-15	SEPT 2012
DRO	**130 J**
RRO	**57 J**
TAH	**0.53**
TAqH	**0.70**

MW-3R	SEPT 2012
DRO	**410 J, QN**
RRO	**72 J, QN**
TAH	**0.53**
TAqH	**0.84**

LEGEND:

MW-22	SEPT 2012
DRO	**22 J, ML**
RRO	**ND[56]**
TAH	**0.85**
TAqH	**0.95**

Well — Analyte — Sample Date — Result Qualifier — Not Detected [LOD]

Monitoring Well was sampled

Monitoring Well was not sampled

Bluffline (Approximate)

DATA QUALIFIERS:
J - Result is considered an estaimate value because it was reported below the LOD.
M - Result is considered an estimate (low) due to matrix interference.
QN - Result is qualified as an estimate (neutral) due to a QC failure.

NOTES:
1. Cleanup levels from ADEC Title 18AAC75.345, Table C or from 18AAC70 (surface water criteria). Site specific alternative cleanup levels were established by ADEC on June 27, 2003 as part of the Rocky Point Management Area #1.

2. Analytical samples were collected on September 1-2, 2012 by FES.

3. Site features and wells that could not be located were digitized and are based upon AECOM Figure 1-2, "Project Area Map", May 28, 2009.

COORDINATE SYSTEM:
Projection - Alaska State Plane zone 10, feet; Datum - North American Datum of 1983 (NAD83).

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

Selected Analytical Results

Groundwater Monitoring Report
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Formerly Used Defense Site
Unalaska, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	3-1	2/13

4.0 GROUNDWATER TREND ANALYSIS

Historical concentrations of DRO and RRO are presented in Appendix A, Graphs A-1 through A-12. A brief summary of trends noted is included as Table 4-1 and in the discussion below.

Table 4-1 DRO/RRO Groundwater Trends

Well	Installation Date	Years Product Detected	DRO/RRO Trends and Notes
MW-2	1998	2001, 2004, 2006, 2007, 2008, 2012	DRO/RRO concentrations appear to fluctuate but were below ACLs during the last two sampling events (in 2002, 2005)
MW-3 and MW-3R	2004	2004	Relatively stable DRO/RRO concentrations below ACLs
MW-7R	2004	-	DRO/RRO consistently below ACLs and Table C cleanup levels
MW-8 and MW-8R	2009	-	Product had been detected in MW-8 prior to decommissioning; concentrations of DRO/RRO in MW-8R remain below ACLs since 2001
MW-10	1998	-	DRO/RRO consistently below ACLs and Table C cleanup levels
MW-11	1998/2000	2001, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2012	DRO/RRO concentrations appear to fluctuate but were below ACLs during the last four sampling events (in 2002)
MW-15	1998	-	DRO/RRO consistently below ACLs and generally below Table C cleanup levels
MW-16N	2004	2004, 2005, 2006, 2007, 2008, 2009, 2012	Groundwater samples have not been collected since installation due to the highly viscous, dark brown/black product within the well
MW-17	2009	2009, 2012	DRO/RRO below ACLs in 2009 – not sampled in 2012 due to product
MW-18	2009	2009, 2012	DRO/RRO below ACLs in 2009 – not sampled in 2012 due to product
MW-19	2009	2009, 2012	DRO/RRO below ACLs in 2009 – not sampled in 2012 due to product highly viscous, dark brown/black product within the well
MW-22	2009	-	DRO/RRO not detected above the LOD

Two general trend patterns are observed in the wells. For wells within and immediately near the presumed contaminant source, groundwater contamination tends to fluctuate but has generally decreased with time. Fluctuations of contaminant concentrations in these wells (MW-2, MW-8R, MW-11, MW-16N, MW-17, MW-18, and MW-19) are likely due to the inherent risk of sampling from wells that contain floating product; globules of free product can easily mix into groundwater samples. For example, monitoring well MW-8 historically contained product, but MW-8R (installed adjacent to the well) has not yet had product infiltrate into the well. As a result, the previous two sampling results (where no product was in the well) may be more representative of groundwater within the area.

Groundwater wells further away from the zone of contamination have less fluctuation in DRO and RRO concentrations. Groundwater from these wells (MW-3R, MW-6, MW-7R, MW-10, MW-15, and MW-22) has had results consistently below ACLs and generally below Table C cleanup levels. The two wells in this group that tend to have slightly higher concentrations are MW-3R and MW-15. Groundwater in these wells is likely influenced by a nearby contaminated site (Rocky Point) which lies immediately to the south of these two wells. Chevron periodically samples monitoring wells MW-3R and MW-15 as part of groundwater monitoring for the Rocky Point site.

5.0 RECOMMENDATIONS

Several wells were found to be in very poor condition during the field effort in September 2012. Attempts should be made to repair wells in poor condition, although some wells may be decommissioned as part of the construction of a new warehouse. MW-1, which had been destroyed prior to the field effort, should be properly decommissioned. A summary of recommended activities for 2013 sampling efforts is presented in Table 5-1.

Table 5-1 Recommended 2013 Activities

Monitoring Well	Recommended 2013 Activities
MW-1	Proper Decommissioning
MW-2	Product/water level(s)
MW-3R	Product/water level(s); Sample; Attempt to repair
MW-4R	Attempt to locate; Product/water level(s)
MW-5	Attempt to locate; Product/water level(s); Sample
MW-6	Product/water level(s)
MW-7R	Product/water level(s); Sample; Download transducer data; Attempt to repair.
MW-8R	Product/water level(s); Sample; Download transducer data
MW-10	Product/water level(s); Download transducer data
MW-11	Product/water level(s); Attempt to repair
MW-12	Attempt to locate; Product/water level(s); Sample
MW-15	Product/water level(s); Sample; Download transducer data
MW-16 N	Product/water level(s)
MW-17	Product/water level(s); Sample; Download transducer data; Attempt to repair
MW-18	Product/water level(s); Sample; Attempt to repair
MW-19	Product/water level(s)
MW-22	Product/water level(s); Sample; Download transducer data
MW-23	Product/water level(s); Sample

Notes: MW-1 was destroyed without USACE's knowledge. The party responsible for decommissioning this well has not yet been determined.
Highlighted wells have had product. If product is present, the well will not be sampled.

Additional monitoring events are recommended by the 2007 Decision Document (USACE, 2007b). The next monitoring event is tentatively scheduled for the spring of 2013.

6.0 REFERENCES

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APPENDIX A
Tables and Graphs

TABLE A1: Site-Wide Water/Product Level Measurements

Well ID	Date and Time of Site-Wide Water Level Measurements	Depth to Product (feet btoc)	Water Depth (feet btoc)	Total Depth (feet btoc)	Water Column (feet)	Top of Casing[1] (NAVD88, feet)	Groundwater Elevation (feet NAVD88)
Amaknak Pre-WWII Tank Farm - September 2012							
MW-2	9/1/2012 1355	*Not detected during water level round but present during purging of well*	11.77	17.20	5.43	13.34	1.57
MW-3R	9/1/2012 1345	-	11.65	19.65	8.00	13.14	1.49
MW-6	9/1/2012 1248	-	12.97	13.75	0.78	21.25	8.28
MW-7R	9/1/2012 1230	-	12.55	18.39	5.84	15.06	2.51
MW-8R	9/1/2012 1435	-	12.35	16.90	4.55	13.92	1.57
MW-10	9/1/2012 1311	-	10.01	15.40	5.39	11.69	1.68
MW-11 [1]	9/1/2012 1446	11.70	?	?	?	13.51	?
MW-15 [2]	9/1/2012 1335	-	12.20	15.20	3.00	13.88	1.68
MW-16N	9/1/2012 1420	6.55, 15 [3]	6.56	16.00	9.44	16.92	10.36
MW-17	9/1/2012 1322	*Not detected during water level round but present during purging of well*	10.59	17.35	6.76	13.03	2.44
MW-18	9/1/2012 1454	trace	10.42	16.11	5.69	13.14	2.72
MW-19	9/1/2012 1408	12 [4]	?	?	?	13.49	?
MW-22	9/1/2012 1305	-	8.15	16.30	8.15	9.64	1.49

Notes:

[1] Water depth could not be estimated due to the viscous nature of the product which coated the probe.

[2] Well was cut down following water level measurements to accommodate locking transducer cap. Water levels were adjusted based on the estimated elevation difference of -0.34 feet.

[3] Product detected on top 0.01 inches of water column and again 1 foot from the bottom of the well, underneath 8.44 feet of water. This may have been a result of product adhering to the interface probe. See photograph in Appendix F.

[4] Depth to product is approximate, product coated probe and accurate product or water level readings could not be obtained.

btoc - below top of casing

NAVD88 - North American Datum of 1988

TABLE A2: Field Measurements

Well ID	Sample ID	Sample Date	Sample Matrix	Water Depth[1] (feet btoc)	Drawdown (feet)	Temp (^{o}C)	Conductivity (mS/cm)	DO (mg/L)	pH	ORP (mV)	Turbidity (ntu)
Amaknak Pre-WWII Tank Farm - September 2012											
MW-2	No Sample	9/3/2012	-	11.31	4.31 [2]	7.07	0.466	1.21	5.35	228	842
MW-3R	1209A3R1WG	9/2/2012	Water	10.98	-0.062 [3]	7.74	0.874	1.59	6.01	52.4	16.98
MW-7R	1209A7R1WG	9/2/2012	Water	12.40	0.05	6.85	0.888	0.4	6.30	6.5	13.23
MW-8R	1209A8R1WG	9/3/2012	Water	11.90	0.20	6.83	0.567	0.67	6.07	48.6	8.34
MW-10	1209A101WG	9/2/2012	Water	10.08	0.36	7.52	0.349	0.31	6.68	35.3	11.56
MW-15	1209A151WG	9/2/2012	Water	12.02	0.02	7.32	1.315	1.61	5.61	131.4	1.61
MW-22	1209A221WG	9/2/2012	Water	8.00	0.05	7.68	1.146	4.38	6.83	52.1	0.66

Notes:

[1] Water depth shown was measured at date/time of taking parameters and samples

[2] After well had drawn down 4.31 feet, attempted to purge well dry when product was encountered

[3] Surface water entering well due to poor well condition

btoc - below top of casing

^{0}C - degrees Celcius

DO - dissolved oxygen

mg/L - milligrams per liter

mV - millivolts

mS/cm - milliSiemens per centimeter

ntu - nephelomatic turbidity units

ORP - oxidation reduction potential

pH - potential Hydrogen

Table A3 - Sample Tracking Table

Sample Number	Well ID	Sample Type	Sample Matrix	Sample Date	Sample Time	Sampler Initials	BTEX by 8260C[1]	DRO by AK102[2]	RRO by AK103[2]	PAH by 8270D-SIM[3]	Laboratory Work Order #	Laboratory	Cooler ID	NPDL #
Amaknak Pre-WWII Tank Farm - September 2012														
1209A7R1WG	MW-7R	Primary	Water	9/2/2012	1345	BH/KD	X	X	X	X	K1208826	CAS	12090301, -02, -03	12-085
1209A221WG	MW-22	Primary/MS/MSD	Water	9/2/2012	1510	BH/KD	X	X	X	X	K1208826	CAS	12090301, -02, -03	12-085
1209A101WG	MW-10	Primary	Water	9/2/2012	1650	BH/KD	X	X	X	X	K1208826	CAS	12090301, -02, -03	12-085
1209A151WG	MW-15	Primary	Water	9/2/2012	1810	BH/KD	X	X	X	X	K1208826	CAS	12090301, -02	12-085
1209A3R1WG	MW-3R	Primary	Water	9/2/2012	1935	BH/KD	X	X	X	X	K1208826	CAS	12090301, -02	12-085
1209A8R1WG	MW-8R	Primary	Water	9/3/2012	1220	BH/KD	X	X	X	X	K1208826	CAS	12090301, -02	12-085
1209A8R2WG	MW-8R2	Field Duplicate	Water	9/3/2012	1230	BH/KD	X	X	X	X	K1208826	CAS	12090301, -02	12-085
Trip Blanks														
1209ATB1WQ	Trip Blank #48617	Trip Blank	Water	9/2/2012	800	BH/KD	X				K1208826	CAS	12090301	12-085
1209ATB2WQ	Trip Blank #48618	Trip Blank	Water	9/2/2012	800	BH/KD	X				K1208826	CAS	12090301	12-085

Notes:

[1] Samples are collected in three HCl-preserved, 40 mL VOA vials field-preserved at 4±2°C

[2] Samples are collected in two HCl-preserved, 500 mL amber jars field-preserved at 4±2°C

[3] Samples are collected in two unpreserved, 1 L amber jar containers field-preserved at 4±2°C

BH - Brandie Hofmeister

BTEX - benzene, toluene, ethylbenzene, and isomers of xylene

°C - degrees Celsius

DRO - diesel range organics

HCl - hydrochloric acid

KD - Kristin Drenzek

L - liter

mL - milliliter

MS/MSD - matrix spike/matrix spike duplicate

NPDL - North Pacific Division Laboratory

PAH - polynuclear aromatic hydrocarbons

RRO - residual range organics

VOA - volatile organic analysis

Table A4 - Analytical Results

Amaknak Farm Groundwater Monitoring 2012 Unalaska, Alaska	Client Sample ID		Standard ADEC Cleanup Level [1]	Site Specific ADEC Cleanup Level [1]	1209A101WG	1209A151WG	1209A221WG	1209A3R1WG	1209A7R1WG	1209A8R1WG	1209A8R2WG	1209ATB1WQ	1209ATB2WQ
	Location				MW-10	MW-15	MW-22	MW-3R	MW-7R	MW-8R	MW-8R2	Trip Blank	Trip Blank
	Lab Sample ID				K120882603	K120882604	K120882602	K120882605	K120882601	K120882606	K120882607	K120882608	K120882609
	Sample Type				Primary	Primary	Primary	Primary	Primary	Primary	Field Duplicate	Trip Blank	Trip Blank
	Collection Date				9/2/2012	9/2/2012	9/2/2012	9/2/2012	9/2/2012	9/3/2012	9/3/2012	9/2/2012	9/2/2012
	Matrix				WG	WG	WG	WG	WG	WG	WG	WG	WG
Analyte	**Method**	**Units**			**Result [LOD] Qual**	**Result [LOD] Qual**	**Result [LOD] Qual**	**Result [LOD] Qual**	**Result [LOD] Qual**	**Result [LOD] Qual**	**Result [LOD] Qual**	**Result [LOD] Qual**	**Result [LOD] Qual**
Diesel Range Organics	AK102	µg/L	1500	15000	420 [23] J	130 [21] J	22 [23] J,ML	410 [22] J,QN	17 [21] J	1100 [21]	1300 [23]	- -	- -
Residual Range Organics	AK103	µg/L	1100	11000	230 [57] J	57 [52] J	ND [56]	72 [54] J,QN	ND [53]	190 [51] J,QN	260 [56] J,QN	- -	- -
Benzene	SW8260C	µg/L	5	-	0.1 [0.1] J	ND [0.1]	ND [0.1]	0.08 [0.1] J,QH,QN	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]
Ethylbenzene	SW8260C	µg/L	700	-	0.05 [0.1] J	ND [0.1]	ND [0.1]	ND [0.1] QN	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]	ND [0.1]
Toluene	SW8260C	µg/L	1000	-	0.46 [0.1] J,B	0.23 [0.1] J,B	0.55 [0.1] B	0.2 [0.1] J,B,QH,QN	1.1 [0.1] B	0.24 [0.1] J,B	0.29 [0.1] J,B	0.18 [0.1] J	0.38 [0.1] J
Xylene, Isomers m & p	SW8260C	µg/L	10000	-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2] QN	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
o-Xylene	SW8260C	µg/L	10000	-	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2] QN	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]	ND [0.2]
2-Methylnaphthalene	8270DSIM	µg/L	150	-	0.019 [0.0053] J	0.015 [0.0057] J	ND [0.0055] QL	ND [0.0056] QN	ND [0.0055]	0.0077 [0.0054] J	ND [0.0064]	- -	- -
Acenaphthene	8270DSIM	µg/L	2200	-	0.059 [0.0053]	0.0074 [0.0057] J	ND [0.0055] QL	0.034 [0.0056] QN	ND [0.0055]	0.034 [0.0054]	ND [0.042]	- -	- -
Acenaphthylene	8270DSIM	µg/L	2200	-	ND [0.012]	ND [0.0057]	ND [0.0055] QL	ND [0.006] QN	ND [0.0055]	ND [0.011]	ND [0.009]	- -	- -
Anthracene	8270DSIM	µg/L	1100	-	0.044 [0.0053]	ND [0.0057]	ND [0.0055] QL	0.015 [0.0056] J,QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Benzo(a)anthracene	8270DSIM	µg/L	1.2	-	ND [0.0053]	ND [0.0057]	ND [0.0055] QL	ND [0.0056] QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Benzo(a)pyrene	8270DSIM	µg/L	0.2	-	ND [0.0053]	ND [0.0057]	ND [0.0055] QL	ND [0.0056] QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Benzo(b)fluoranthene	8270DSIM	µg/L	1.2	-	ND [0.0053]	ND [0.0057]	ND [0.0055] QL	ND [0.0056] QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Benzo(g,h,i)perylene	8270DSIM	µg/L	1100	-	ND [0.0053]	ND [0.0057]	ND [0.0055] QL	ND [0.0056] QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Benzo(k)fluoranthene	8270DSIM	µg/L	1.2	-	ND [0.0053]	ND [0.0057]	ND [0.0055] QL	ND [0.0056] QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Chrysene	8270DSIM	µg/L	120	-	ND [0.0053]	ND [0.0057]	ND [0.0055] QL	ND [0.0056] QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Dibenzo(a,h)anthracene	8270DSIM	µg/L	0.12	-	ND [0.0053]	ND [0.0057]	ND [0.0055] QL	ND [0.0056] QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Fluoranthene	8270DSIM	µg/L	1500	-	0.012 [0.0053] J	0.01 [0.0057] J	ND [0.0055] QL	0.0093 [0.0056] J,QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Fluorene	8270DSIM	µg/L	1500	-	0.059 [0.0053]	0.02 [0.0057] J	ND [0.0055] QL	0.052 [0.0056] QN	ND [0.0055]	0.1 [0.0054]	0.11 [0.0053]	- -	- -
Indeno(1,2,3-cd)pyrene	8270DSIM	µg/L	1.2	-	ND [0.0053]	ND [0.0057]	ND [0.0055] QL	ND [0.0056] QN	ND [0.0055]	ND [0.0054]	ND [0.0053]	- -	- -
Naphthalene	8270DSIM	µg/L	730	-	0.15 [0.0053]	0.09 [0.0057]	0.056 [0.0055] QL	0.094 [0.0056] QN	0.011 [0.0055] J	0.096 [0.0054]	0.12 [0.0053]	- -	- -
Phenanthrene	8270DSIM	µg/L	11000	-	0.034 [0.0053]	0.0093 [0.0057] J	ND [0.0055] QL	0.06 [0.0056] QN	ND [0.0055]	0.019 [0.0054] J	0.022 [0.0053]	- -	- -
Pyrene	8270DSIM	µg/L	1100	-	0.023 [0.0053]	0.0086 [0.0057] J	ND [0.0055] QL	0.019 [0.0056] J,QN	ND [0.0055]	0.014 [0.0054] J	0.016 [0.0053] J	- -	- -
TAH [2]		µg/L	10	-	1.01	0.83	1.15	0.78	1.70	0.84	0.89	-	-
TAqH [2]		µg/L	15	-	1.45	1.03	1.29	1.11	1.79	1.17	1.21	-	-

[1] Cleanup levels from ADEC Title 18, Alaska Administrative Code (AAC), Section 75.345, Table C or from 18 AAC 70 (surface water criteria). Site specific alternative cleanup levels were established by ADEC on June 27, 2003 as part of the Rocky Point Management Area #1.

[2] TAH is the summation of BTEX results and TAqH is the summation of BTEX plus 16 EPA priority PAH results. TAH and TAqH were calculated using half the LOD for ND values.

BTEX - Benzene, toluene, ethylbenzene, and xylenes

LOD - Limit of Detection

ND - Non Detect

Qual - Data qualifier

TAH - Total Aromatic Hydrocarbons

TAqH - Total Aqueous Hydrocarbons

µg/L - micrograms per liter

WG - Groundwater Matrix

Data Qualifiers:

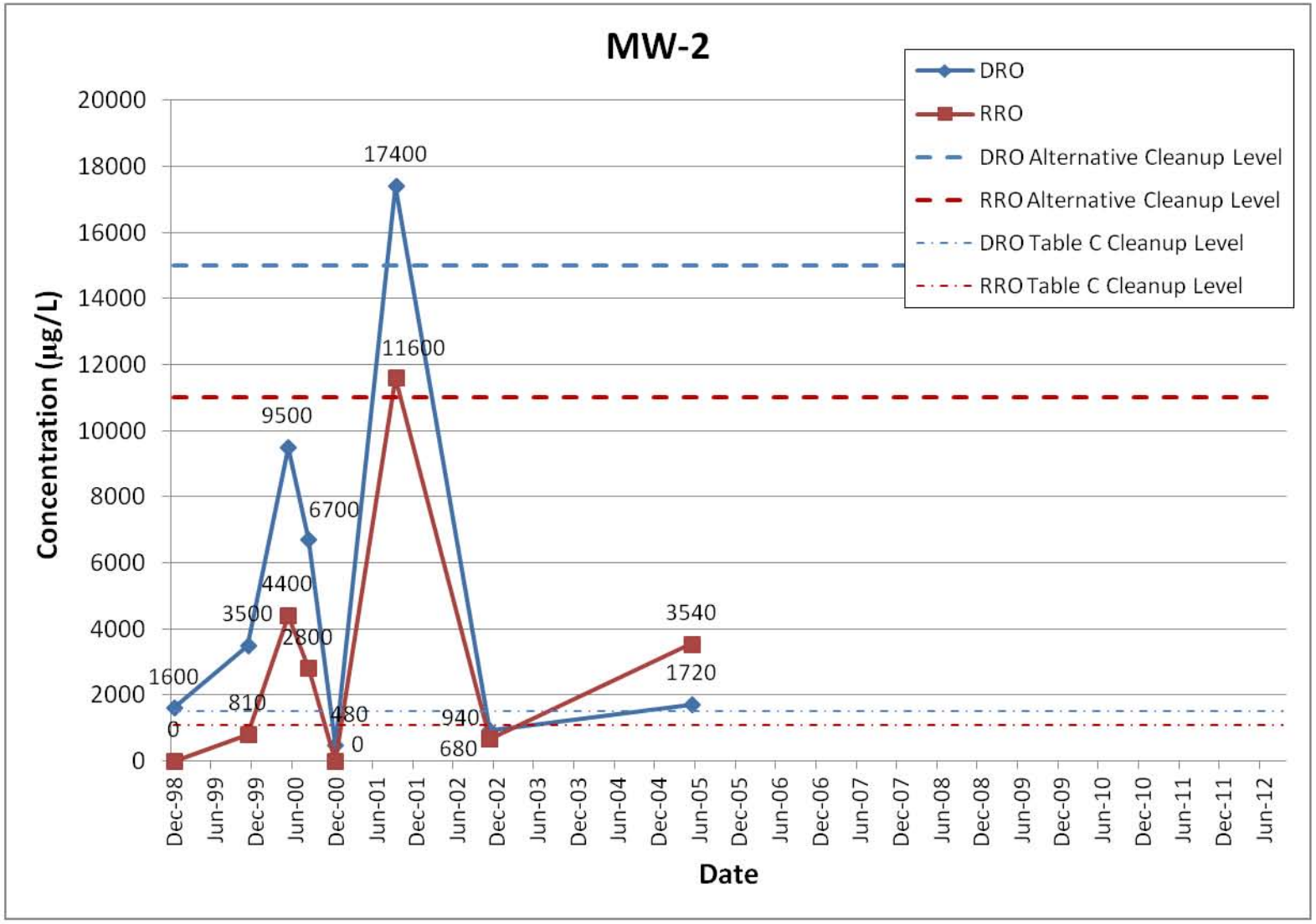
B - Analyte was also detected in a blank at a similar concentration.

J - Result is considered an estimated value because it was reported below the LOD.

M - Result is considered an estimate (biased H-high; L-low; N-neutral) due to matrix interference.

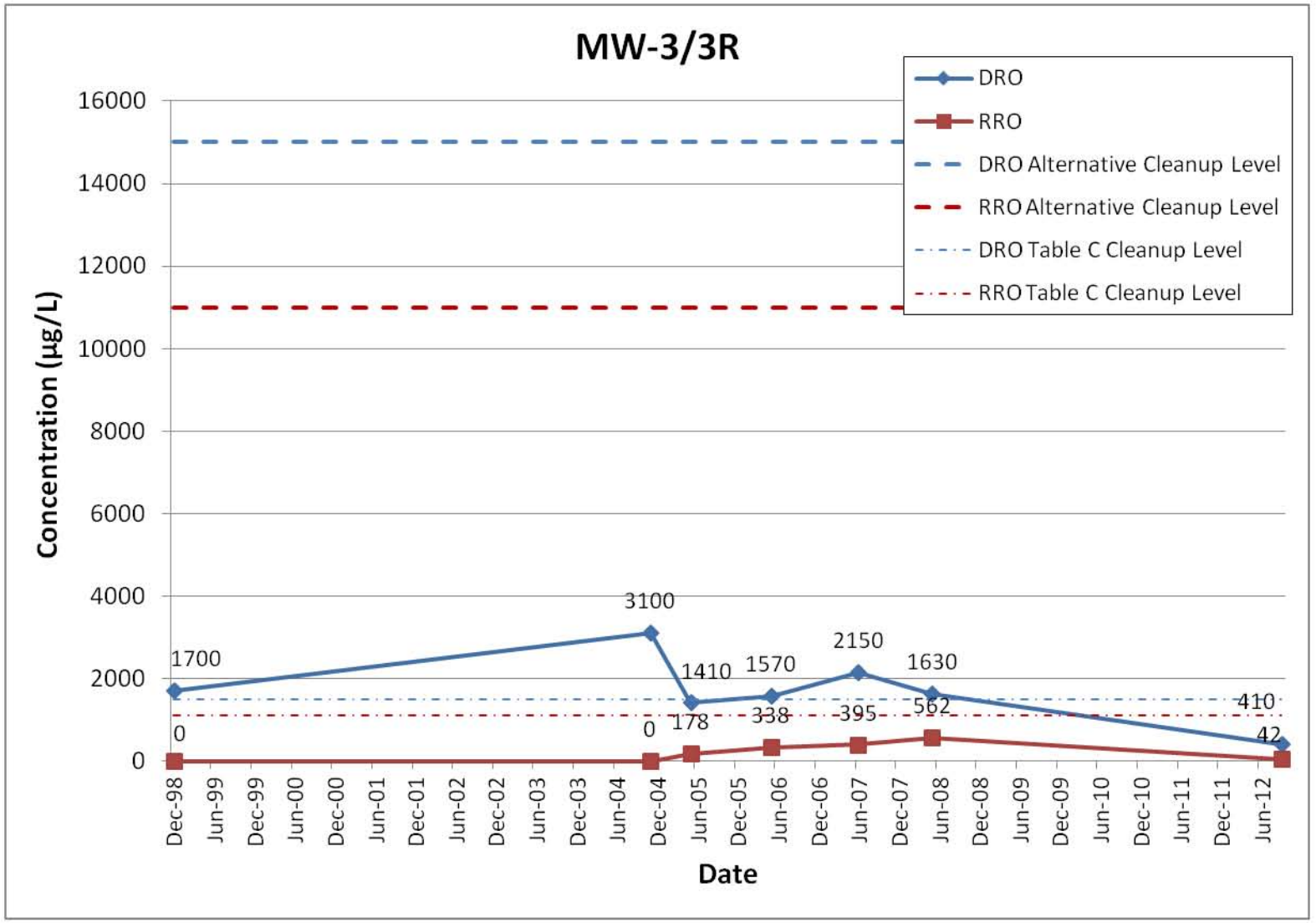
Q - Result is considered an estimate (biased H-high; L-low; N-neutral) due to a QC failure.

Graph A-1 MW-2 Petroleum Hydrocarbon Concentrations Over Time



Note – Historical non-detect results are assumed to be zero for graphing purposes

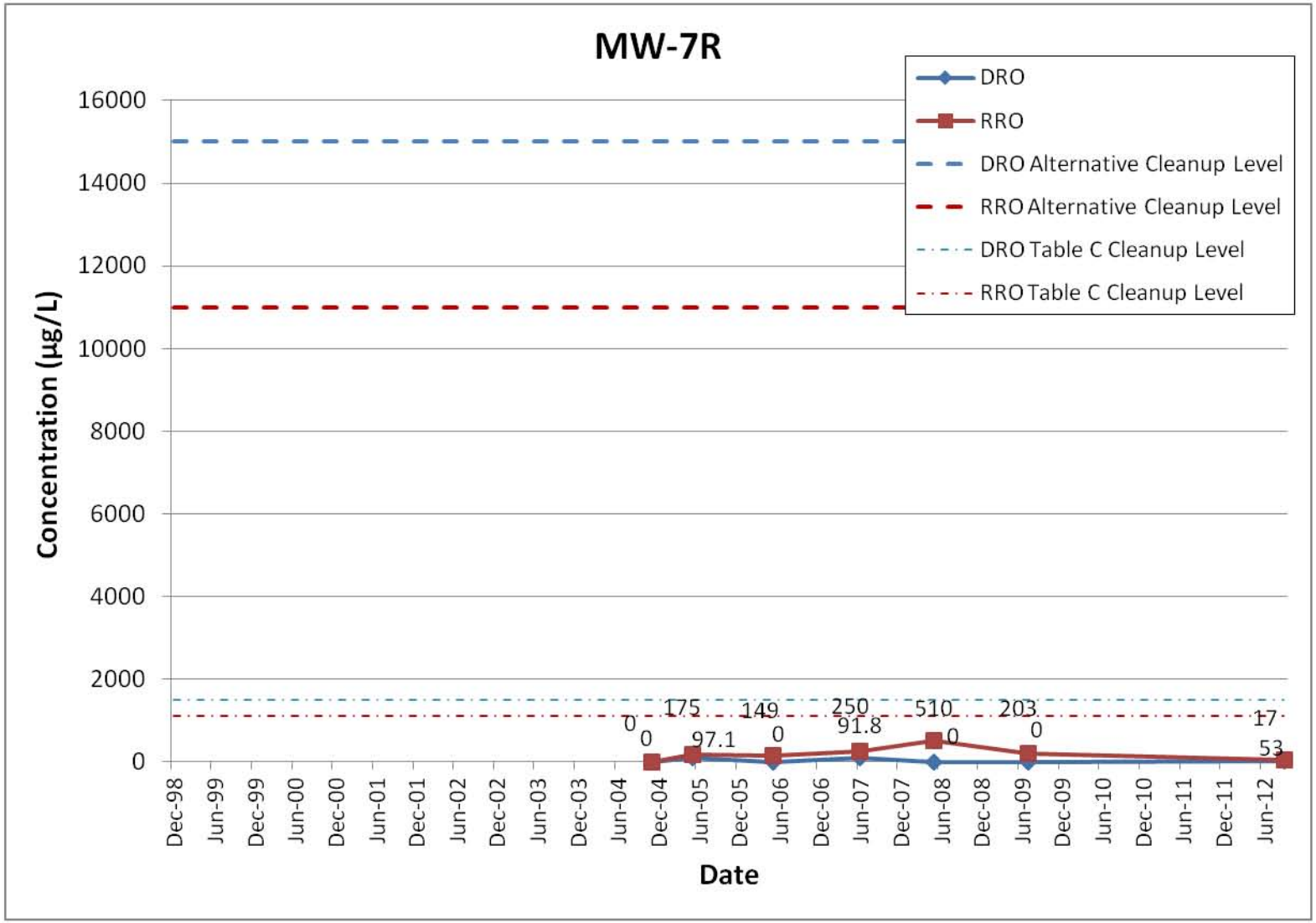
Graph A-2 MW-3/3R Petroleum Hydrocarbon Concentrations Over Time



Note – Historical non-detect results are assumed to be zero for graphing purposes

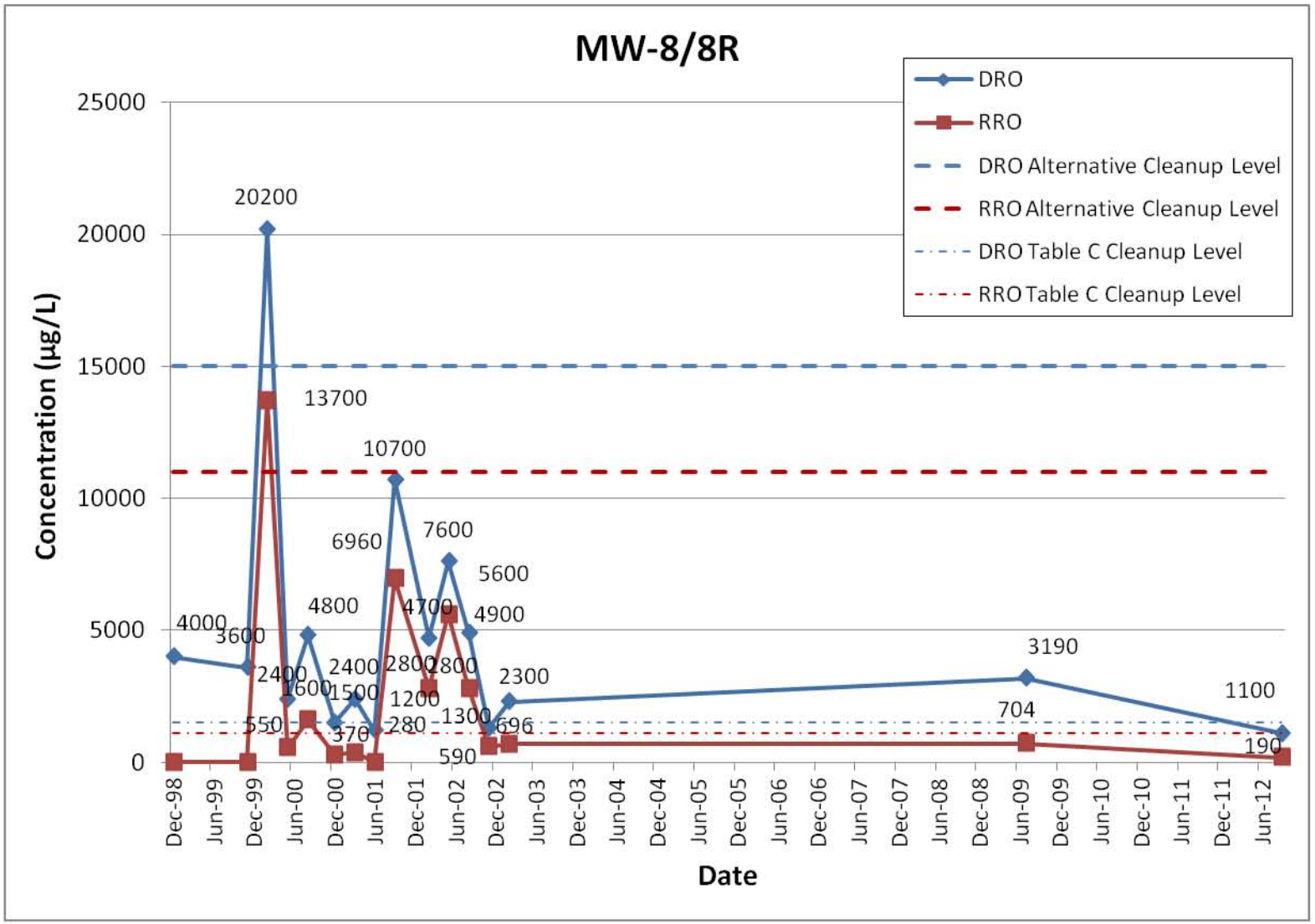
Analytical results for MW-3 are presented through 2004; 2005 through 2012 data are from MW-3R

Graph A-3 MW-7R Petroleum Hydrocarbon Concentrations Over Time



Note – Historical non-detect results are assumed to be zero for graphing purposes

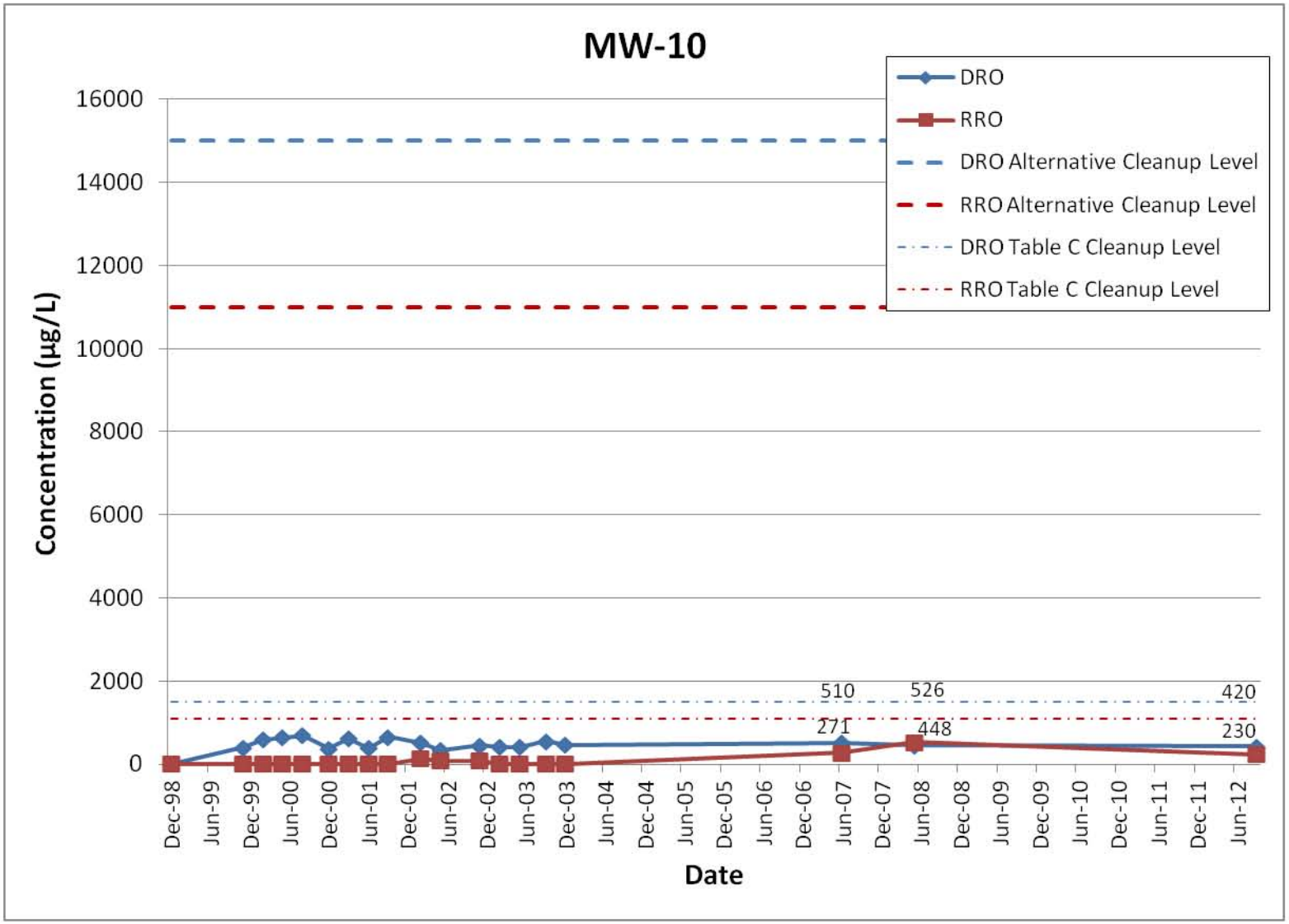
Graph A-4 MW-8/8R Petroleum Hydrocarbon Concentrations Over Time



Notes – Historical non-detect results are assumed to be zero for graphing purposes

Analytical results for MW-8 are presented through 2003; 2009 and 2012 data are from MW-8R

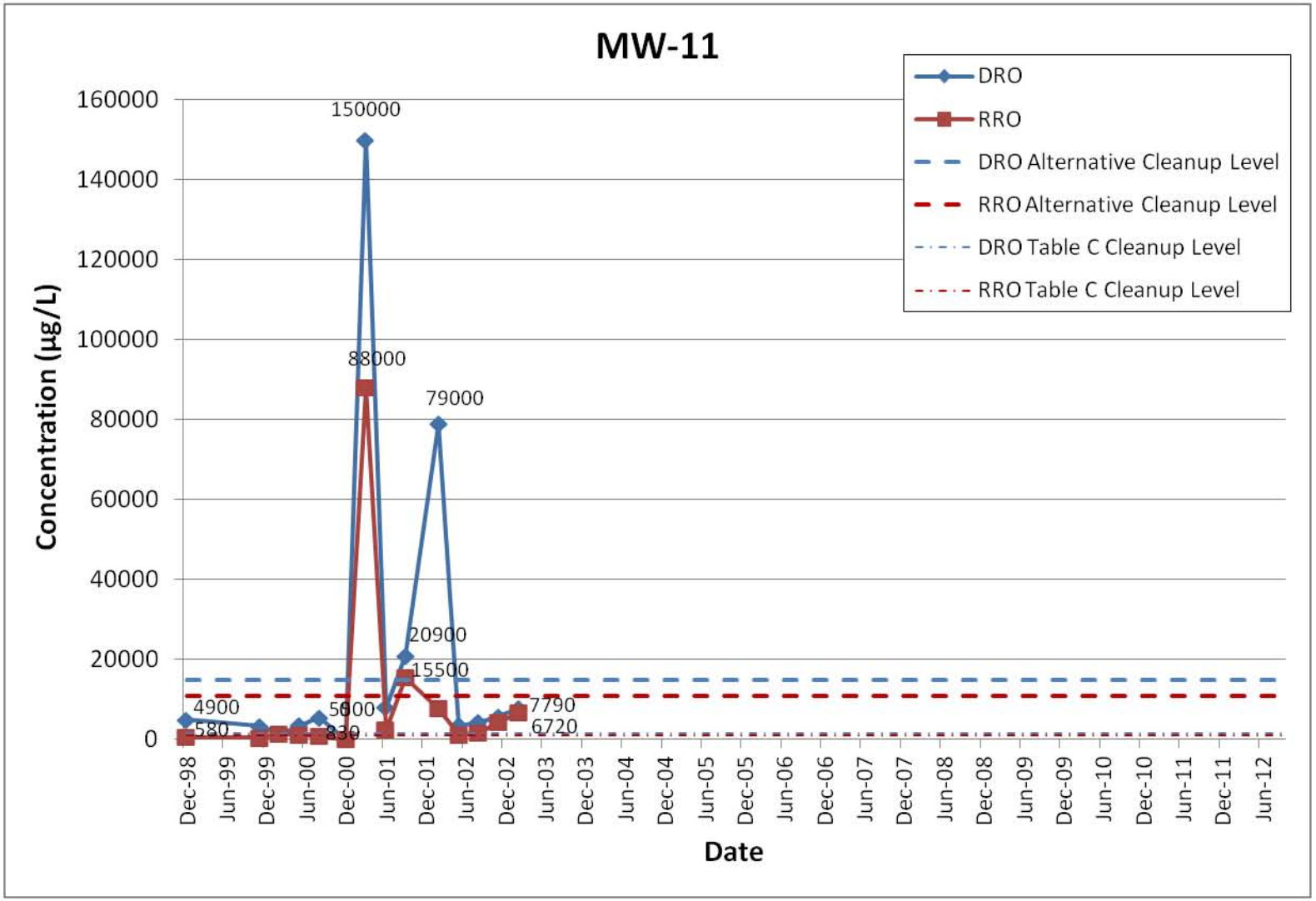
Graph A-5 MW-10 Petroleum Hydrocarbon Concentrations Over Time



Notes – Historical non-detect results are assumed to be zero for graphing purposes

For clarity, only numerical results from the last three sampling events are shown

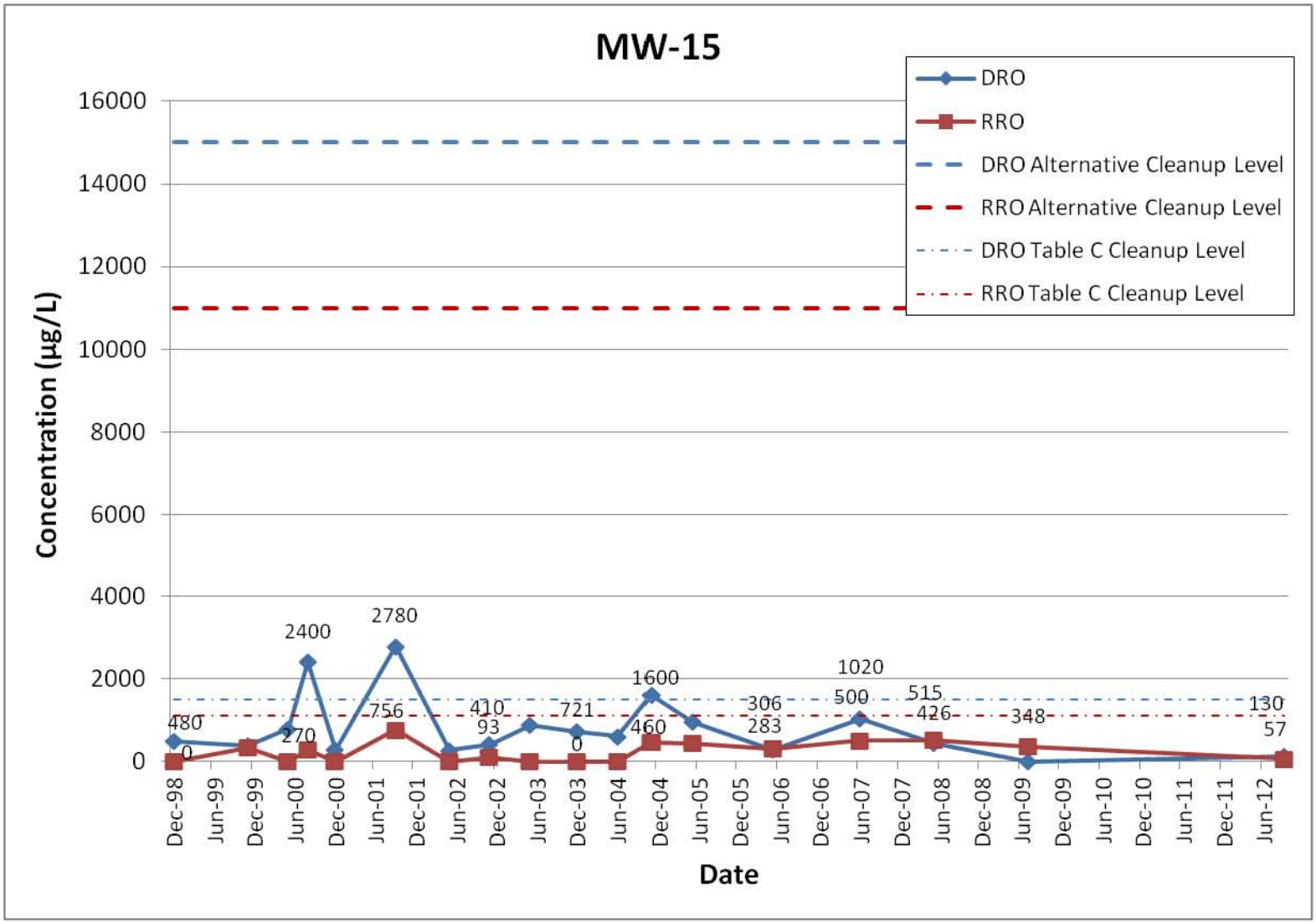
Graph A-6 MW-11 Petroleum Hydrocarbon Concentrations Over Time



Notes – Historical non-detect results are assumed to be zero for graphing purposes

For clarity, only selected numerical results are shown

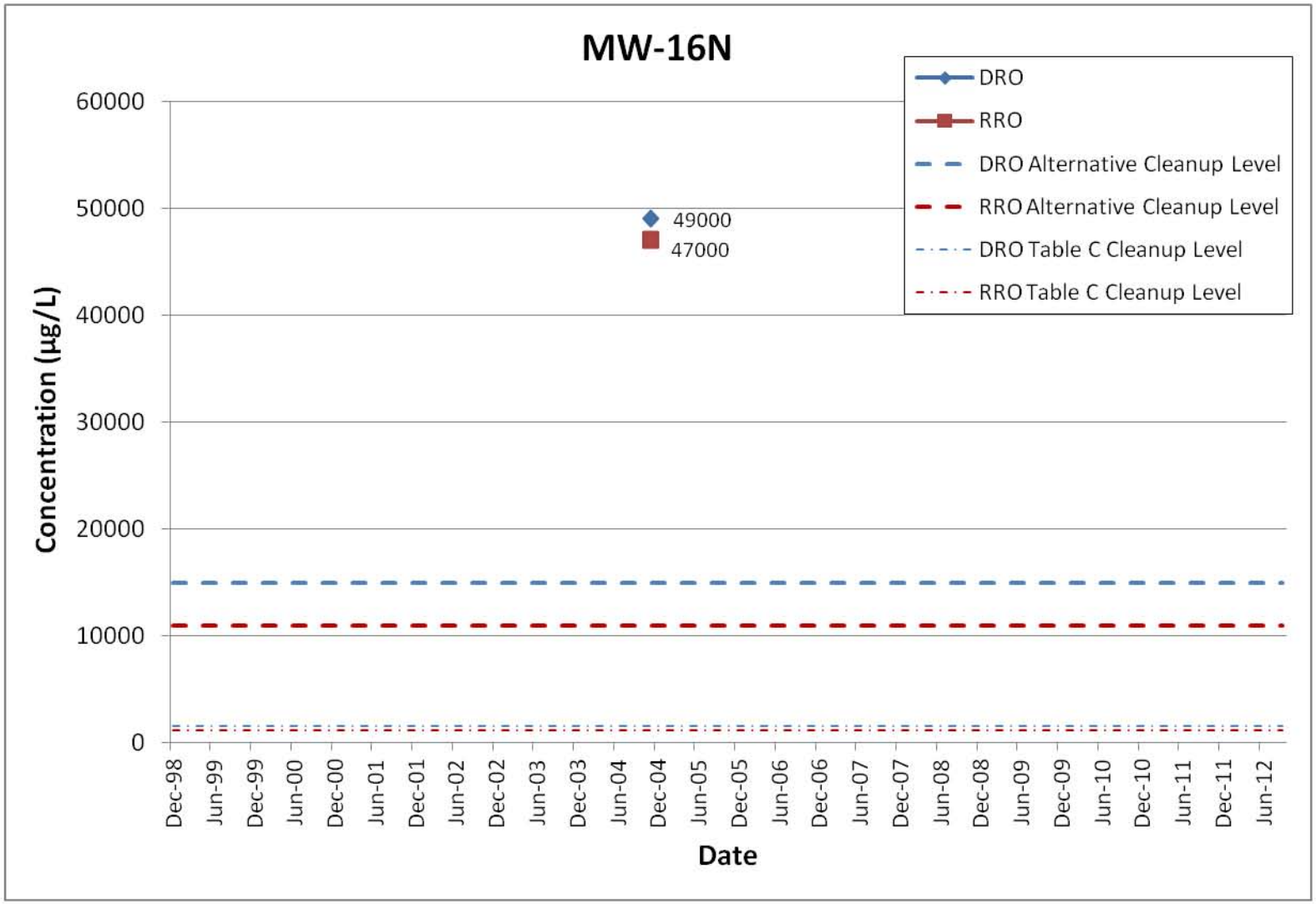
Graph A-7 MW-15 Petroleum Hydrocarbon Concentrations Over Time



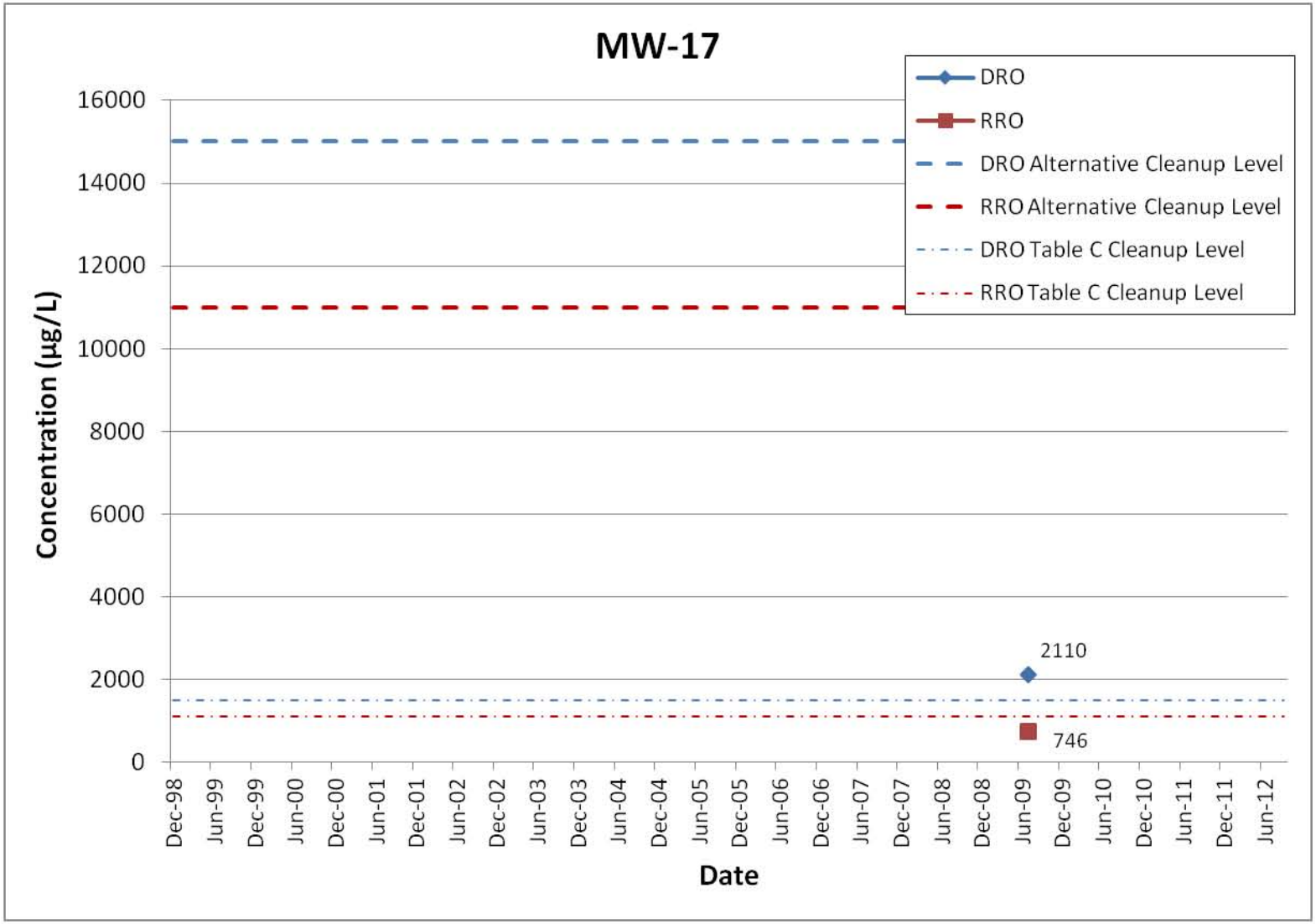
Notes – Historical non-detect results are assumed to be zero for graphing purposes

For clarity, only selected results are shown

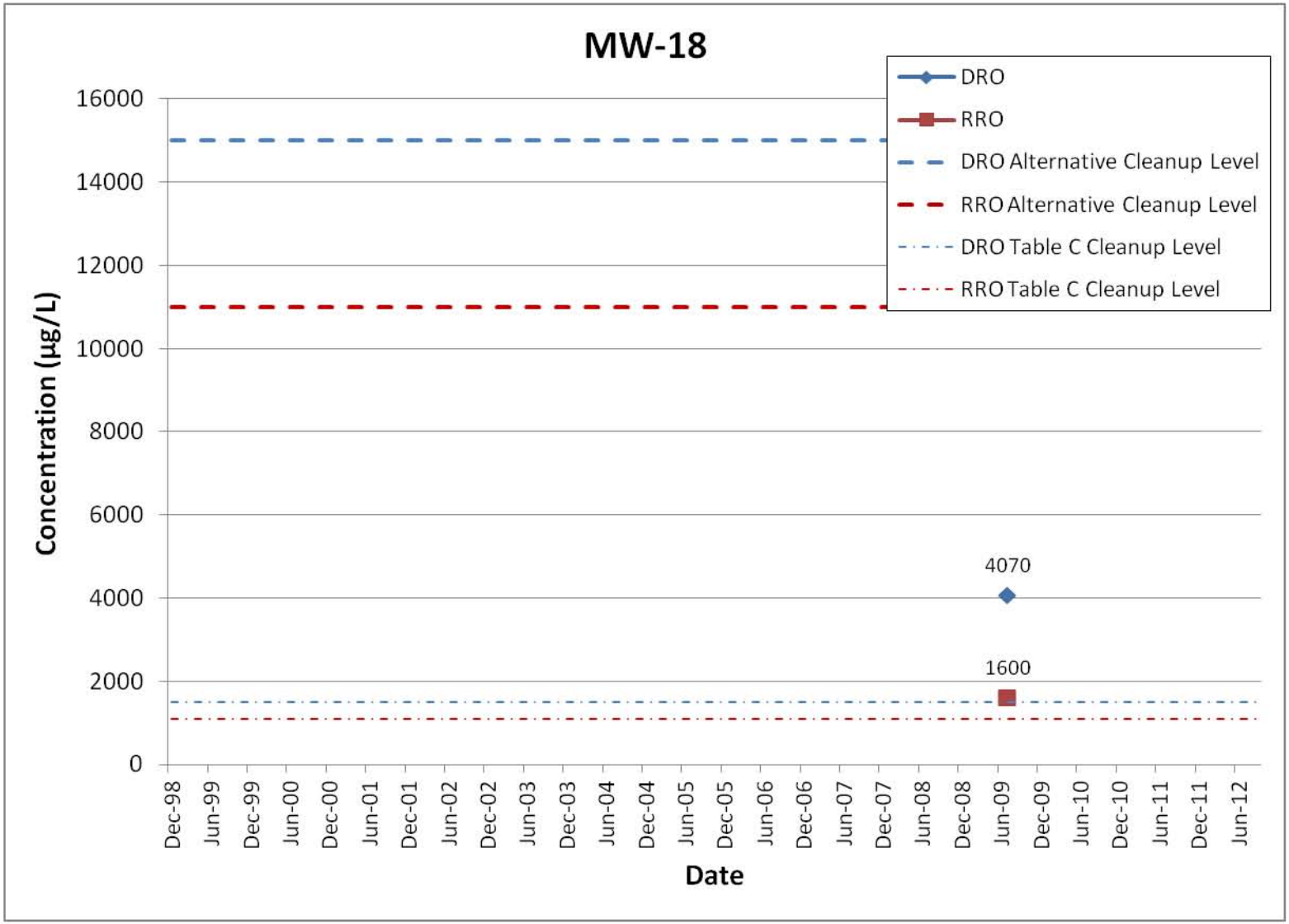
Graph A-8 MW-16N Petroleum Hydrocarbon Concentrations Over Time



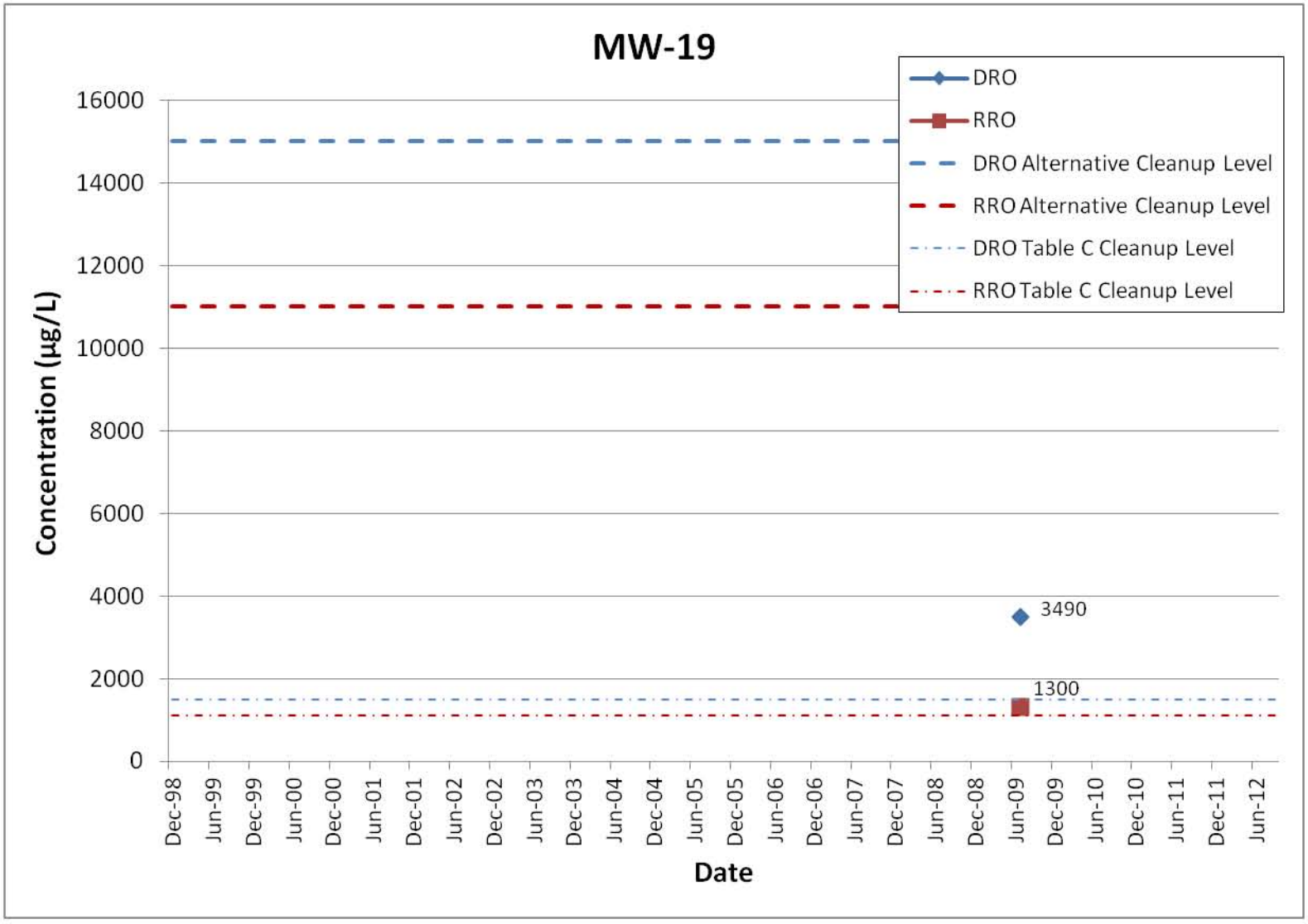
Graph A-9 MW-17 Petroleum Hydrocarbon Concentrations Over Time



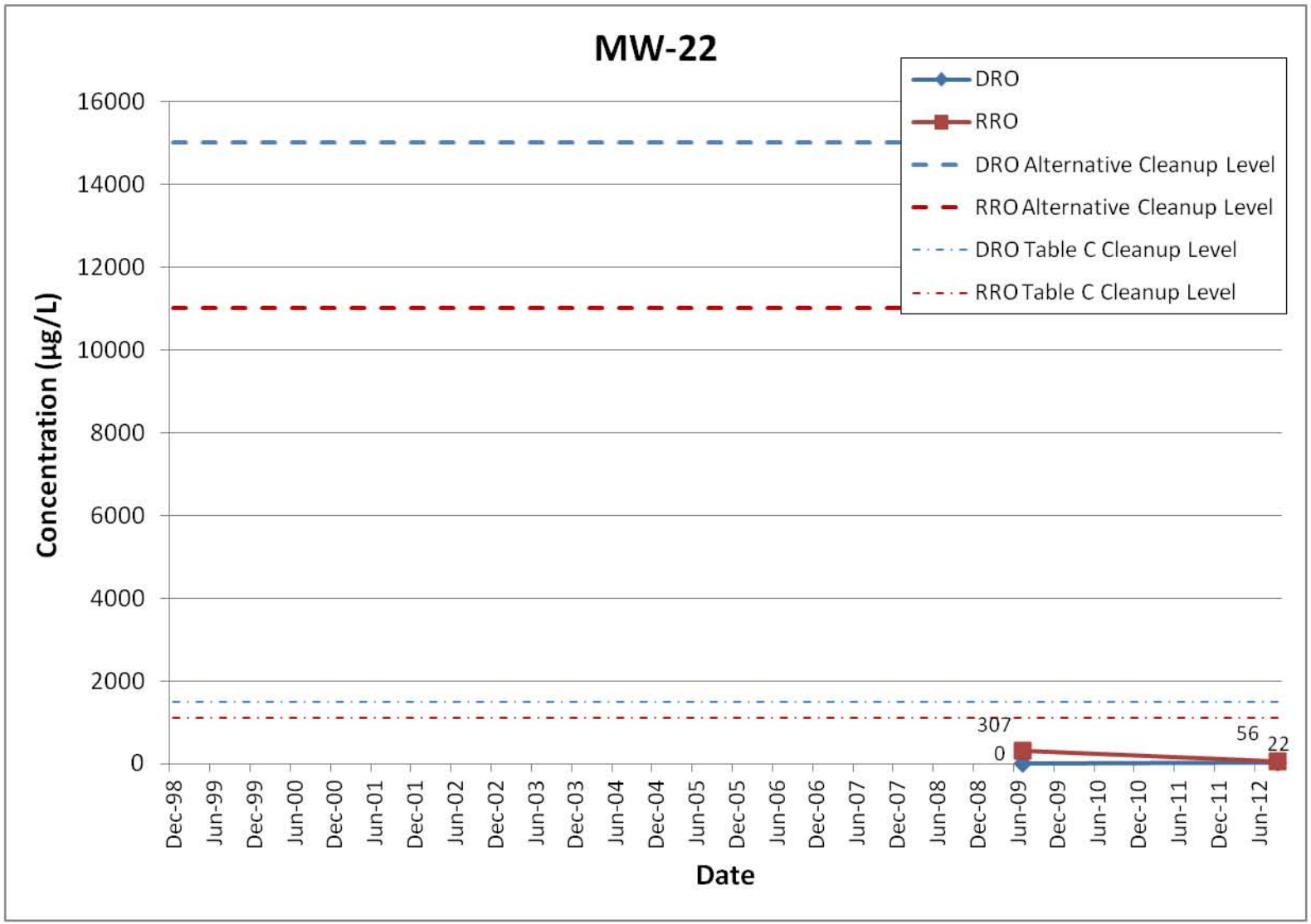
Graph A-10 MW-18 Petroleum Hydrocarbon Concentrations Over Time



Graph A-11 MW-19 Petroleum Hydrocarbon Concentrations Over Time



Graph A-12 MW-22 Petroleum Hydrocarbon Concentrations Over Time



APPENDIX B
CDQR and ADEC Laboratory Data Review Checklist

FINAL

CHEMICAL DATA QUALITY REVIEW

Amaknak Pre WWII Tank Farm FUDS

Unalaska, Alaska

NPDL # 12-085

Prepared: February 21, 2012

Prepared for

Army Corps of Engineers - Alaska District

Prepared by

Fairbanks Environmental Services, Inc.

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

Michael Boese
Project Chemist

LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
°C	degrees Celsius
CAS	Columbia Analytical Services
CDQR	Chemical Data Quality Report
COC	chain of custody
DoD	Department of Defense
DL	detection limit
DQO	data quality objective
DRO	diesel range organics
ELAP	Environmental Laboratory Accreditation Program
FES	Fairbanks Environmental Services
FUDS	Formerly Used Defense Site
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOD	limit of detection
LOQ	limit of quantification
MS/MSD	matrix spike/matrix spike duplicate
ND	non-detect
PAH	polynuclear aromatic hydrocarbon
QAPP	Quality Assurance Project Plan
QC	quality control
QSM	Quality Systems Manual
RPD	relative percent difference
RRO	residual range organics
SAP	Sampling and Analysis Plan
SDG	sample data group
µg/L	micrograms per liter

1.0 INTRODUCTION

This Chemical Data Quality Review (CDQR) presents the data quality review of groundwater samples collected by Fairbanks Environmental Services (FES) during September 2012 at the Amaknak Pre WWII Tank Farm Formerly Used Defense Site (FUDS) in Unalaska, Alaska. Groundwater sample tracking and analytical results tables are presented in Appendix A. All cited documents within the CDQR are listed in the reference section (Section 6.0) of the Annual Report.

FES reviewed project and quality control (QC) analytical data to assess whether the data met the designated quality objectives and were acceptable for project use. The project data were reviewed for deviations to the requirements presented in the Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP), the Alaska Department of Environmental Conservation (ADEC) Technical Memo 06-002, and the Department of Defense (DoD) Quality Systems Manual for Environmental Laboratories (QSM), Version 4.2. The review included evaluation of the following: sample collection and handling, holding times, blanks (to assess contamination), project sample and laboratory quality control sample duplicates (to assess precision), laboratory control samples (LCSs) and sample surrogate recoveries (to assess accuracy), and matrix spike sample (MS) recoveries (to assess matrix effects). Limits of Detection (LODs) were compared to 18 Alaska Administrative Code (AAC) 75.345 groundwater cleanup levels (ADEC, 2011). Calibration curves and continuing calibration verification recoveries were not reviewed. Quality control deviations that do not impact data quality (e.g., high LCS recovery associated with non-detect results), are not discussed. More elaborate data quality descriptions are reported in the ADEC Laboratory Data Review Checklist, which is included at the end of Appendix B.

Groundwater sample data quality is discussed in Section 2. Applicable data quality indicators are discussed for each method under separate subheadings. Data that did not meet acceptance criteria have been described and the associated samples and data quality implications or qualifications are summarized.

1.1 Analytical Methods and Data Quality Objectives

The analytical methods and associated data quality objectives (DQOs) used for this review were presented in the Work Plan (FES, 2010). The DQOs represent the minimum acceptable QC limits and goals for analytical measurements and are used as comparison criteria during data quality review to determine both the quality and usability of the analytical data. Table B1 below summarizes the analytical methods employed, and the associated DQO goals, for groundwater samples collected at the former Amaknak Pre WWII Tank Farm site during 2012.

Table B1 – Groundwater Sample Analytical Methods and Data Quality Objectives

Parameter	Preparation Method	Analytical Method	Limit of Detection (µg/L)	Precision (RPD, %)	Accuracy (%)	Completeness (%)
Diesel-Range Organics (DRO)	3510C	AK102	20	20	75-125	90
Residual-Range Organics (RRO)	3510C	AK103	50	20	60-120	90
Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX)	5030B	8260C	0.1 [a]	30	Analyte specific[b]	90
Polynuclear Aromatic Hydrocarbons (PAHs)	3520C	8270D SIM	0.005	30	Analyte specific[b]	90

[a] – The limit of detection for Xylenes is 0.02 µg/L.
[b] – The analyte specific recoveries are consistent with QSM v 4.2.
Analytical deviations from the Work Plan are discussed in Section 2.1.
µg/L – micrograms per liter
RPD – relative percent difference

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

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

In addition to these criteria for the six DQOs described above, sample collection and handling procedures and blank samples were reviewed to ensure overall data quality. Sample collection

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

1.2 Data Qualifiers

Table B2 below outlines general flagging criteria used for this project, listed in increasing severity, to indicate QC deficiencies. Data were qualified pursuant to findings determined in the review of project data.

Table B2 – Data Qualifier Definitions

Qualifier	Definition
J	Analytical result is considered an estimated value because the concentration is less than the laboratory Limit of Quantitation (LOQ).
MN, MH, ML	Analytical result is considered an estimated value (biased H-high, N-neutral, or L- low) due to matrix interference.
B	Analytical result is considered a high estimated value due to contamination present in a blank sample.
QN, QH, QL	Analytical result is considered an estimated value (biased H-high, N-neutral, or L- low) due to a quality control failure.
R	Analytical result is rejected and is not suitable for project use.

1.3 Summary of Groundwater Samples

A total of 7 groundwater samples were collected from wells at Amaknak Pre WWII Tank Farm. The samples consisted of 6 primary samples and 1 field duplicate sample. In addition, two trip blank samples were analyzed for the sample shipment containing volatiles samples. Project samples were analyzed by the following analytical methods:

- Diesel range organics (DRO) by AK Method 102
- Residual range organics (RRO) by AK Method 103
- Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) by EPA Method 8260C
- Polynuclear aromatic hydrocarbons (PAHs) by EPA Method 8270D-SIM

All project and quality control samples were analyzed by Columbia Analytical Services (CAS) of Kelso, Washington. CAS Kelso is approved by the State of Alaska through the Contaminated Sites Program and certified through the DoD Environmental Laboratory Accreditation Program (ELAP) for the methods listed above.

Groundwater samples were shipped in a single sample data group (SDG) and assigned the CAS report number K1208826. A sample tracking table (Table A3) and an analytical results table (Table A4) are included in Appendix A.

2.0 GROUNDWATER DATA QUALITY REVIEW

This section presents the findings of the data quality review and the resulting data qualifications for groundwater samples. All samples were analyzed by CAS and are included in a single SDGs (K1208826).

2.1 Work Plan Deviations

The following analytical deviations to the 2010 Work Plan were noted upon review of the laboratory deliverables.

- BTEX by updated method 8260C was employed instead of method 8260B, which was listed in the Work Plan. The method variation was acceptable as the laboratory is ELAP certified for the updated method, and the method versions have equivalent reporting and control limits.
- PAH samples were analyzed by updated method 8270D-SIM instead of method 8270C-SIM, which was listed in the Work Plan. The method variation was acceptable as the laboratory is ELAP certified for the updated method, and the method versions have equivalent reporting and control limits.

2.2 Sample Collection

Groundwater sample collection activities were recorded on sample collection forms provided in Appendix C. The forms were reviewed to ensure that well drawdown and groundwater parameters were stable prior to sample collection, and that all parameters met the low-flow sampling criteria (Puls and Barcelona, 1996; ADEC, 2010). When applicable, groundwater samples were inspected in the field, as well as upon receipt at the laboratory, to ensure sample vials did not contain headspace. Groundwater levels were evaluated to determine if any levels were above the monitoring well screen interval during sample collection. All sample collection noteworthy issues or discrepancies are identified below.

- Surface water was reportedly entering monitoring well MW-3R during time of sample collection. As a result, the results for sample 1209A3R1WG were qualified (QN) as estimates due to potential lack of groundwater sample integrity. The DRO and RRO results were generally lower that previous results indicating that the sample collected from this well may have been diluted by the surface water infiltration. Sheen was noted in several areas of the parking lot surrounding the well but results from MW-3R were at least one order of magnitude below ADEC groundwater cleanup levels. Impact to data quality resulting from surface water infiltration is unknown.

2.3 Sample Handling

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

Holding Time

- PAH sample 1209A221WG was extracted 2 days outside of the 7 day holding time specified by the method. The original sample was extracted within holding time, but the extract was lost when the glass collector broke during the concentration step. The PAH results for this sample were qualified (QL) as low estimates. Note that this sample was also used for MS and MSD analysis, which were extracted within holding time. Impact to data is likely minor since the sample was extracted only 2 days outside of the recommended holding time and since most of the spiked MS/MSD results (extracted within holding time) were below ADEC cleanup levels.

Documentation

- The sample container labels for one sample were slightly different than the sample number on the COC forms (containers were numbered 1209A2201WG and COC form listed 1209A221WG). The samples were confirmed by the sample time, and there was no impact to data.
- The incorrect box (DRO/RRO) was inadvertently marked for four PAH samples on COC form associated with cooler # 12090301. Since the HCl preserved DRO/RRO jars for these four samples were included in cooler # 12090302 and unpreserved PAH jars were included with cooler # 12090301, the error was easily recognizable and corrected by the project laboratory.

Temperature Discrepancies

There was one temperature discrepancy noted in the data package.

- One of three coolers (ID numbers 12090302) was received at CAS with cooler a temperature (6.2°C) slightly above the acceptable range of 4°±2°C. No data were impacted because the blank temperature was acceptable at 6.0°C.

2.4 Blanks

Method blanks and trip blanks were utilized to assess potential cross-contamination of project samples. Method blanks assess laboratory cross-contamination and were analyzed at a minimum frequency of one per analytical batch. Trip blanks assess potential shipment and storage cross-contamination and accompanied all samples collected for volatile analyses. Equipment blanks were not used because disposable tubing and peristaltic pumps were used for groundwater sample collection. Blank contaminations that resulted in data qualification are summarized below. See the associated ADEC Laboratory Data Review Checklist for more elaborate data quality descriptions.

Method Blanks

No analytes were detected in method blank samples that resulted in data qualification.

Trip Blanks

Toluene was detected in both trip blanks analyzed for this project. The Toluene results in all project samples were qualified (B) since they were within 10 times the Toluene concentration detected in the blanks. Impact to data was minor as the reported Toluene concentrations in project samples were at least three orders of magnitude below the ADEC cleanup level.

2.5 Laboratory Control Samples

Spike compounds were added to blank samples to assess laboratory extraction and instrumentation performance. LCSs were analyzed at the proper frequency (one per analytical batch) for all methods to ensure the batches were operating within control criteria. Precision of the analytical recovery procedure was evaluated for batches containing a LCSD. All methods requiring the performance of a LCSD (i.e., Alaska fuel methods) were performed accordingly. All LCS and LCSD had acceptable recoveries, and all RPDs between LCS/LCSD samples were within acceptance limits.

2.6 Matrix Spike Samples and Duplicates

Spike compounds were added to project samples to assess potential matrix interference. MS and MSDs were performed at the proper frequency of one per each extraction batch, unless noted below. Precision of the MS/MSD recovery procedure was evaluated using the RPD calculated from the MS/MSD pair. The following MS/MSD issues were noted.

- MS/MSD analysis was not performed for 8260C batches KWG1210395 and KWG1210757 or 8270D-SIM batch KWG1210256 although sufficient sample volume was provided. Impact to data is likely minor as the associated LCS/LCSD showed acceptable batch accuracy and precision, and MS/MSDs analyzed with other 8260C/8270D-SIM batches on project samples had acceptable recoveries and RPDs.
- The MS and MSD recoveries for DRO method AK102, performed on sample 1209A221WG, were below the acceptable range. Consequently, the DRO concentration in parent sample 1209A221WG was qualified as a low estimate (ML). Impact is minor as the MS recoveries were marginally less than the lower QC limit and the DRO result in the parent sample is 2 orders of magnitude below the ADEC cleanup level.

2.7 Surrogate Recovery

Surrogate compounds were added to each DRO, RRO, BTEX, and PAH project sample by the laboratory prior to analysis. Surrogate recoveries were then calculated as percentages and reported by the laboratory as a measure of analytical extraction efficiency. All surrogate recoveries in groundwater samples were within acceptable tolerance limits with one exception:

- The recovery of method 8260C surrogate toluene-d8 at 121% was slightly above the acceptable range (85-120%) for project sample 1209A3R1WG. As a result, detected BTEX

analytes (Benzene and Toluene) were qualified as high estimates (QH). Impact to data was minor as the other three surrogates had acceptable recoveries and reported Benzene and Toluene concentrations in this project sample were one and four orders of magnitude below respective ADEC cleanup levels.

2.8 Field Duplicates

Detected field duplicate sample results are summarized in Table B3. The duplicate frequency met the 10 percent requirement in the Work Plan. A total of one field duplicate sample was collected for six project groundwater samples. Note that the LOD was used in place of non-detected (ND) results for RPD calculation purposes.

Table B3 – Summary of Groundwater Sample Field Duplicate

Analyte	1209A8R1WG (Primary)	1209A8R2WG (Field Duplicate)	RPD, %	Comparable Criteria Met?[1]
DRO	1100	1300	17	Yes
RRO	**190 J,QN**	**260 J,QN**	**31**	**No**
Toluene	0.24 J,B	0.29 J,B	19	Yes
2-Methylnaphthalene	0.0077 J	ND[0.0064]	21	Yes
Acenaphthene	0.034	ND [0.042]	21	Yes
Fluorene	0.10	0.11	10	Yes
Naphthalene	0.096	0.12	22	Yes
Phenanthrene	0.019	0.022	15	Yes
Pyrene	0.014 J	0.016 J	13	Yes

Only detected analytes are presented. All results are in µg/L. ND – non-detect; RPD – relative percent difference
J – Result is estimated because it is reported below the Limit of Quantitation.
QN – Result is estimated due to field duplicate comparison criterion exceedance.
B – Result may be due to cross-contamination, as indicated by a similar (within 10x) detection in associated blank sample.
[1] – RPD of 30 percent was used for evaluating water-matrix field duplicate samples.

The field duplicate sample (1209A8R2WG) results were comparable to all project sample (1209A8R1WG) results, except for RRO. However, the detected RRO concentrations in the aforementioned samples were reported below the Limit of Quantitation (i.e. J flagged) and, by definition, subject to greater variability. The RRO results in the field duplicate pair were qualified (QN) due to poor field precision. Impact to data quality was minor as detected RRO results in these samples were more than one order of magnitude below the ADEC cleanup level.

2.9 Sensitivity

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

Analytical sensitivity was evaluated to verify that the detected results and or LODs met the applicable groundwater cleanup levels. All associated ADEC Table C groundwater cleanup levels

listed in 18AAC 75.345 were met for all analytes and, therefore, all data is acceptable for project use.

2.10 Summary of Qualified Results

Overall, the review process deemed the groundwater project data acceptable for use. Several results were qualified; however, data quality impact is minor and no data were rejected. Table B4 provides a summary of groundwater sample results qualified pursuant to FES's review, including the associated sample numbers, analytes and the reason for qualification.

Table B4 – Summary of FES Qualified Groundwater Results

Data Package	Sample Numbers	Analyte	Qualification	Explanation
K1208826	1209A3R1WG	All	QN	Potential Lack of Sample Integrity
	1209A221WG	All PAH	QL	Extracted Outside of Holding Time
	1209A101WG 1209A151WG 1209A221WG 1209A3R1WG 1209A7R1WG 1209A8R1WG 1209A8R2WG	Toluene	B	Trip Blank contamination
	1209A3R1WG	Benzene Toluene	QH	High Surrogate Recovery
	1209A221WG	DRO	ML	MS and MSD Failed Recovery Criteria
	1209A8RIWG 1209A8R2WG	RRO	QN	Poor Field Duplicate Precision

2.11 Completeness and Summary of Data Quality

Only 5 of the proposed 11 wells listed in the Work Plan were sampled, for reasons described in the bullets below. Additionally, a groundwater sample was collected from unscheduled well MW-10 (in lieu of well MW-23) because MW-23 could not be located and was presumed to be destroyed. MW-23 was discovered by city workers a couple weeks after this field effort was completed. The discrepancies to the sampling program are summarized below:

- MW-5 and MW-12 could not be located
- MW-17, MW-18, and MW-19 contained floating product
- MW-23 could not be located, but nearby well MW-10 was sampled instead

Groundwater samples were collected from all proposed wells that could be located, and no data were rejected, so a completeness score of 100 percent was calculated for the groundwater data associated with this project. Therefore, the 90 percent completeness criterion was met. Overall, the review process deemed the groundwater project data acceptable for use. Some sample results were qualified; however, the impact to data quality impact was generally minor. Notable data quality issues that may have impacted data are discussed below.

- Surface water was reportedly entering monitoring well MW-3R during time of sample collection. As a result, the results for sample 1209A3R1WG were qualified (QN) as estimates due to potential lack of groundwater sample integrity. Although laboratory results were generally lower than historical results indicating sample dilution, sheen was noted in parking area surrounding the well. Consequently, impact to data quality and potential bias is unknown.
- Due to broken glassware, PAH sample 1209A221WG was re-extracted 2 days outside of the 7 day holding time. PAH results in this sample were qualified (QL) as low estimates. This sample was also used for MS and MSD analysis, which were extracted within holding time. Impact to data is likely minor since the sample was extracted only 2 days outside of the recommended holding time and since most of the spiked MS/MSD results (all but six) were below ADEC cleanup levels. The impact to the six PAHs analytes [Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene] is unknown, however.

Laboratory Data Review Checklist

Completed by: Mike Boese

Title: Chemist Date: 10/23/12

CS Report Name: Amaknak GW Monitoring Report (final) Report Date: Feb 2013

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: CAS - Kelso Laboratory Report Number: K1208826

ADEC File Number: 2542.38.016 ADEC RecKey Number: 1350

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      □■Yes □ No □NA (Please explain.) Comments:

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
      □Yes □ No □■NA (Please explain.) Comments:

      No samples were transferred.

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      □■Yes □ No □NA (Please explain.) Comments:

   b. Correct analyses requested?
      □■Yes □ No □NA (Please explain.) Comments:

      However, the incorrect box was inadvertently checked for 4 samples on COC for cooler # 12090301 (DRO/RRO box was marked but unpreserved PAH jars were included in the cooler). HCl preserved jars were included for these samples in cooler # 12090302.

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      □Yes □■ No □NA (Please explain.) Comments:

      One of three cooler temperatures was slightly above the acceptable range at 6.2° C. The blank temperature was acceptable, however, so there was no impact to sample quality.

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:

Samples were documented to be in good condition.

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

□■ Yes □ No □NA (Please explain.) Comments:

In addition to the incorrect box checked on COC # 12090301 (see 2b), the sample number for sample 1209A221WG was incorrectly listed as 1209A2201WG on one of more sample jars. The samples were confirmed by the sample time listed.

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

Comments:

No impact to data quality. See 3a, b, c, and d above.

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:

c. Were all corrective actions documented?

□■ Yes □ No □NA (Please explain.) Comments:

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

Comments:

Case narrative does not discuss impact to data, it only identifies data quality issues.

5. Samples Results

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

There was an error with the COC form (see 2b), but the correct analyses were performed and reported.

□■ Yes □ No □NA (Please explain.) Comments:

b. All applicable holding times met?
□ Yes □ ■No □NA (Please explain.) Comments:

PAH sample 1209A221WG was extracted 2 days outside of the 7 day holding time. The original sample was extracted within holding time, but the extract was lost when the glass collector during the concentration step. The PAH results in this sample were qualified (QL) as low estimates. Note that this sample was also used for MS and MSD analysis, and these were extracted within holding time. Impact to data is likely minor since the sample was extracted only 2 days outside of the recommended holding time and since most of the spiked MS/MSD results (extracted within holding time) were below ADEC cleanup levels.

c. All soils reported on a dry weight basis?
□Yes □ No □■ NA (Please explain.) Comments:

No soil samples were analyzed.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
□■ Yes □ No □NA (Please explain.) Comments:

e. Data quality or usability affected?
Comments:

The impact to PAH in sample 1209A221WG is likely minor as all but six analytes in the MS/MSD (which was extracted within holding time) exceeded ADEC GW cleanup levels. The impact on the six PAH analytes [Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, and Indeno(1,2,3-cd)pyrene] is unknown, however.

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:

Benzo(a)anthracene was detected in the 8270D-SIM method blank for batchKWG1210256, but this PAH was not detected in project samples and no data were impacted.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
□Yes □ No □■ NA (Please explain.) Comments:

No project samples were impacted by Method Blank contamination.

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

No impact to data as no project samples were impacted by MB contamination.

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:

However, MS/MSDs were not performed with each batch including the following: 8260C batches KWG1210395 and KWG1210757 8270SIM batch KWG1210256

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
□Yes □ No □■ NA (Please explain.) Comments:

No metals or inorganic analyses were performed.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)
□■ Yes □ No □NA (Please explain.) Comments:

The LCS and LCSD recoveries were acceptable. However, the MS and MSD recoveries for DRO at 69% and 73% respectively performed on parent sample 1209A221WGwere below the acceptable range of (75-125).

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)
□■ Yes □ No □NA (Please explain.) Comments:

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

The DRO result in parent sample 1209A221WGwas qualified (ML) due to the low MS and MSD recoveries.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
□■Yes □ No □NA (Please explain.) Comments:

LCS results indicate that batch accuracy and precision were acceptable. See 6bv for discussion on sample qualified due to poor MS recovery.

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

LCS data indicate batch accuracy and precision were acceptable. The DRO result in sample 1209A221WG may be low biased, but the impact is negligible since the MS/MSD recoveries were marginally low and the DRO result in the parent sample is 2 orders of magnitude below the default ADEC cleanup level

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:

The 8260C surrogate at 121% recover was slightly above the acceptable recovery range of 85-120) in sample 1209A3R1WG. As a result, detected analytes (benzene and Toluene) were qualified (QH) as high estimates.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
□■Yes □ No □NA (Please explain.) Comments:

See 6cii

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

Impact to data was minor. Even though Benzene and Toluene were qualified as high estimates due to elevated surrogate recovery, the results are one and four orders of magnitude below cleanup respective levels. Further, the other three 8260C surrogates had acceptable recoveries.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
□Yes □ No □NA (Please explain.) Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

□■Yes □ No □NA (Please explain.) Comments:

Two trip blanks (1209ATB1WQ and 1209ATB2WQ) were provided with cooler #12090301.

iii. All results less than PQL?

□■Yes □ No □NA (Please explain.) Comments:

However, Toluene was detected in both Trip Blanks below the PQL.

iv. If above PQL, what samples are affected?

Comments:

The toluene results in ALL associated project samples were within 10 times the trip blank concentrations and were qualified (B)

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

Comments:

Impact to data was minor as the detected Toluene concentrations in project samples were at least three orders of magnitude below the cleanup level.

e. Field Duplicate

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

□■Yes □ No □NA (Please explain.) Comments:

Sample 1209A8R2WG is a field duplicate of 1209A8R1WG.

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 (%) = Absolute value of: $\frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

□Yes □■ No □NA (Please explain.) Comments:

The <30% RPD criterion was met for all analytes except RRO. The RPD for RRO was 31%. However, both results were J flagged and have increased error at those low reporting levels. These RRO results were qualified QN due to imprecision.

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

Comments:

Impact to RRO data was minor as the RPD was just above the limit, and the results were reported below the LOQ (J flagged). Both results are an order of magnitude below the default ADEC GW cleanup level.

f. Decontamination or Equipment Blank (If not used explain why).

□Yes □ No □■NA (Please explain.) Comments:

A Peristaltic Pump and new tubing was used to collect GW samples, therefore, there was no need to collect an equipment blank sample.

i. All results less than PQL?

□Yes □ No □■NA (Please explain.) Comments:

See 6F above.

ii. If above PQL, what samples are affected?

Comments:

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

Comments:

There was no impact to data since a Peristaltic Pump and new tubing was used to collect GW samples, therefore, there was no need to collect an equipment blank sample.

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

a. Defined and appropriate?

□■Yes □ No □NA (Please explain.) Comments:

APPENDIX C
Field Forms

Groundwater Sample Form | **Amaknak** | **Unalaska, Alaska**

Project #: 5025-04 | Site Location: Amaknak Pre WWII Tank Farm

Date: 9/2/12 | Probe/Well #: MW-7R

Time: ~~1330~~ 1345 | Sample ID: 1209A7R01WG (D)

Sampler: BH/KD

Weather: LT RAIN/WIND/50's | Outside Temperature: 50s

QA/QC Sample ID/Time/LOCID: — | MS/MSD Performed? Yes (No)

Purge Method: (Peristaltic Pump) / Submersible Pump | Sample Method: (Peristaltic Pump) / Submersible Pump

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 3 | Water Level: Keck

Free Product Observed in Probe/Well? Yes (No) | If Yes, Depth to Product: —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 18.39

Depth to Water from TOC (feet): - 12.40

Column of Water in Probe/Well (feet): = 5.99

Volume to be Purged

Column of Water in Probe/Well (feet): x 5.99

Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.17) or 4" (X.065)

Min. Volume of Water in Probe/Well Casing (gal): = 1.02 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Field Parameters		3% (min of 0.2°)	*At least 3 of the 5 parameters below must stabilize* 3%	10%	0.1 Units	10 Millivolts	10%	4 Inches
Gallons Removed	Minutes Purged	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH (pH unit)	Potential (mV)	Turbidity (NTU)	Water Level
(START 1310) 0.25	10	7.04	0.897	0.73	6.39	6.3	46.5	12.45
0.375	15	6.97	0.890	0.55	6.37	5.2	42.4	12.45
0.50	20	6.89	0.889	0.56	6.36	4.4	38.8	12.45
0.70	25	6.88	0.887	0.49	6.34	5.3	27.3	12.45
0.875	30	6.82	0.889	0.44	6.32	7.4	20.7	12.45
1.0	35	6.84	0.887	0.40	6.31	7.1	15.58	12.45
1.125	40	6.85	0.888	0.40	6.30	6.5	13.23	12.45

Did groundwater parameters stabilize? Yes/No If no, why not? —

Did drawdown stabilize? (Yes)/No If no, why not? —

Was flowrate between 0.03 and 0.15 GPM? Yes/(No) If no, why not? SLIGHTLY SLOWER - 0.025 GPM

Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: INITIAL RUST COLOR DISSIPATED w/ time

Well Condition: Lock Y/(N) Labeled Y/(N) Comments: MONUMENT LID BROKEN

Tubing Set at (middle of wetted casing volume): Approx. 17.5 feet below Top of Casing

Sheen: Yes/(No) Odor: Yes/(No) Notes/Comments: ADDED TRANSDUCER, REPLACED CAP, ADDED LOCK

Laboratory Analyses (Circle): (DRO) (RRO) (BTEX) (PAH)

Purge Water

Gallons generated: 1.125 Discharged through GAC (Yes /(No)) If No, why not? CONTAINERIZED FOR SHIPMENT

Sampler's Initials: KD/BH

Groundwater Sample Form | **Amaknak** | **Unalaska, Alaska**

Project #: 5025-04
Site Location: Amaknak Pre WWII Tank Farm
Date: 9/2/2012
Probe/Well #: MW-22
Time: 1510
Sample ID: 1209A22 (1WG)
Sampler: BH/KD
Weather: WINDY, MOSTLY CLOUDY
Outside Temperature: 50s
QA/QC Sample ID/Time/LOCID:
MS/MSD Performed? Yes/No

Purge Method: Peristaltic Pump / Submersible Pump
Sample Method: Peristaltic Pump / Submersible Pump

Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 3 Water Level: Rock

Free Product Observed in Probe/Well? Yes/No If Yes, Depth to Product: —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 16.30
Depth to Water from TOC (feet): - 8.00
Column of Water in Probe/Well (feet): = 8.30

Volume to be Purged

Column of Water in Probe/Well (feet): x 8.30
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.17) or 4" (X.065)
Min. Volume of Water in Probe/Well Casing (gal): = 1.411 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Field Parameters		3% (min of 0.2°)	*At least 3 of the 5 parameters below must stabilize* 3%	10%	0.1 Units	10 Millivolts	10%	4 Inches
Gallons Removed	Minutes Purged	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH (pH unit)	Potential (mV)	Turbidity (NTU)	Water Level
0.25	5	7.71	1.095	4.12	6.53	17.8	4.92	8.00
0.50	10	7.80	1.103	4.43	6.62	24.7	3.24	8.00
0.75	15	7.73	1.134	4.36	6.76	32.4	4.44	8.03
1.0	20	7.61	1.143	4.34	6.79	38.3	3.06	8.03
1.2	25	7.73	1.141	4.35	6.81	44.1	1.13	8.04
1.4	30	7.64	1.147	4.39	6.83	50.5	1.88	8.05
1.65	35	7.68	1.146	4.38	6.83	52.1	0.66	8.05

(START 1430)

Did groundwater parameters stabilize? Yes/No If no, why not?
Did drawdown stabilize? Yes/No If no, why not?
Was flowrate between 0.03 and 0.15 GPM? Yes/No If no, why not?

Water Color: Clear Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock Y/N Labeled Y/N Comments: LABELED CAP - MONUMENT LID RUSTY, DIDN'T LABEL
Tubing Set at (middle of wetted casing volume): Approx. 11 feet below Top of Casing
Sheen: Yes/No Odor: Yes/No Notes/Comments:

Laboratory Analyses (Circle): DRO RRO BTEX PAH

Purge Water

Gallons generated: 1.65 Discharged through GAC (Yes / No) If No, why not? CONTAINERIZED FOR SHIPMENT
Sampler's Initials: KD/BH

Groundwater Sample Form | **Amaknak** | **Unalaska, Alaska**

Project #: 5025-04
Site Location: Amaknak Pre WWII Tank Farm
Date: 9/2/12
Probe/Well #: MW-10
Time: 1650
Sample ID: 1209A101WG
Sampler: BH/KD
Weather: MOSTLY CLOUDY/WIND
Outside Temperature: 50s
QA/QC Sample ID/Time/LOCID: ———
MS/MSD Performed? Yes/No

Purge Method: (Peristaltic Pump) / Submersible Pump
Sample Method: (Peristaltic Pump) / Submersible Pump
Equipment Used for Sampling: YSI # 6 Turbidity Meter #: 3 Water Level: KECK

Free Product Observed in Probe/Well? Yes/(No) If Yes, Depth to Product: —

Column of Water in Probe/Well
Total Depth in Probe/Well (feet): 15.40
Depth to Water from TOC (feet): - 10.08
Column of Water in Probe/Well (feet): = 5.32

Volume to be Purged
Column of Water in Probe/Well (feet): x 5.32
Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.17) or 4" (X 0.65)
Min. Volume of Water in Probe/Well Casing (gal): = 3.46 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Field Parameters		3% (min of 0.2°)	At least 3 of the 5 parameters below must stabilize: 3%	10%	0.1 Units	10 Millivolts	10%	4 Inches
Gallons Removed	Minutes Purged	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH (pH unit)	Potential (mV)	Turbidity (NTU)	Water Level
0.25	5	8.70	0.513	1.31	6.86	43.7	47.7	10.32
0.5	10	8.48	0.403	0.78	6.81	43.2	26.0	10.40
0.625	15	8.38	0.398	0.73	6.79	43.5	24.5	10.50
0.75	20	8.18	0.386	0.64	6.76	43.9	26.7	10.55
0.875	25	7.82	0.372	0.48	6.73	43.3	23.0	10.55
1.0	30	7.63	0.366	0.40	6.70	43.1	18.57	10.51
1.25	35	7.56	0.359	0.33	6.68	42.3	16.84	10.46
1.40	40	7.53	0.354	0.31	6.68	37.5	11.87	10.46
1.625	45	7.52	0.349	0.31	6.68	35.3	11.56	10.44

(1615 START)

Did groundwater parameters stabilize? (Yes)/No If no, why not?
Did drawdown stabilize? Yes/(No) If no, why not? INITIAL DRAWDOWN, STABILIZED IN LAST 4 READINGS.
Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?
Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:
Well Condition: Lock Y/(N) Labeled (Y)/N Comments:
Tubing Set at (middle of wetted casing volume): Approx. 12 feet below Top of Casing
Sheen: Yes/(No) Odor: Yes/(No) Notes/Comments:

Laboratory Analyses (Circle): (DRO) (RRO) (BTEX) (PAH)

Purge Water
Gallons generated: 1.625 Discharged through GAC (Yes / (No)) If No, why not? CONTAINERIZED FOR SHIPMENT
Sampler's Initials: KD/BH

Groundwater Sample Form | **Amaknak** | **Unalaska, Alaska**

Project #: 5025-04 | Site Location: Amaknak Pre WWII Tank Farm

Date: 9/2/12 | Probe/Well #: MW-15

Time: 1810 | Sample ID: 1209A15/WG

Sampler: BH/KD

Weather: PARTLY CLOUDY/WINDY | Outside Temperature: 50s

QA/QC Sample ID/Time/LOCID: | MS/MSD Performed? Yes/(No)

Purge Method: (Peristaltic Pump) / Submersible Pump | Sample Method: (Peristaltic Pump) / Submersible Pump

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 3 | Water Level: Rock

Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 15.54

Depth to Water from TOC (feet): - 12.02

Column of Water in Probe/Well (feet): = 3.52

Volume to be Purged

Column of Water in Probe/Well (feet): x 3.52

Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.17) or 4" (X 0.65)

Min. Volume of Water in Probe/Well Casing (gal): = 2.29 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Field Parameters		3% (min of 0.2°)	*At least 3 of the 5 parameters below must stabilize* 3%	10%	0.1 Units	10 Millivolts	10%	4 Inches
Gallons Removed	Minutes Purged	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH (pH unit)	Potential (mV)	Turbidity (NTU)	Water Level
START 1740								
0.25	5	7.53	1.123	1.44	5.63	118.9	4.23	12.07
0.4	10	7.38	1.146	1.00	5.61	127.8	3.75	12.05
0.625	15	7.32	1.193	1.28	5.61	130.0	1.72	12.05
0.875	20	7.35	1.225	1.45	5.62	131.5	1.65	12.05
1.15	25	7.40	1.298	1.66	5.63	128.5	1.97	12.05
1.45	30	7.34	1.302	1.64	5.61	129.8	1.90	12.04
1.7	35	7.32	1.315	1.61	5.61	131.4	1.61	12.04

Did groundwater parameters stabilize? (Yes)/No If no, why not?

Did drawdown stabilize? (Yes)/No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?

Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other:

Well Condition: Lock Y/(N) Labeled Y/(N) Comments:

Tubing Set at (middle of wetted casing volume): Approx. 14 feet below Top of Casing

Sheen: Yes/(No) Odor: Yes/(No) Notes/Comments:

Laboratory Analyses (Circle): (DRO) (RRO) (BTEX) (PAH)

Purge Water

Gallons generated: 1.7 Discharged through GAC (Yes /(No)) If No, why not? CONTAINERIZED FOR SHIPMENT/OFF-SITE DISPOSAL

Sampler's Initials: KD/BH

Groundwater Sample Form | **Amaknak** | **Unalaska, Alaska**

Project #: 5025-04 | Site Location: Amaknak Pre WWII Tank Farm

Date: 9/2/12 | Probe/Well #: MW-3R

Time: 1935 | Sample ID: 1209A3R1WG

Sampler: BH/KD

Weather: PARTLY CLOUDY | Outside Temperature: 50s

QA/QC Sample ID/Time/LOCID: — | MS/MSD Performed? Yes/No

Purge Method: Peristaltic Pump / Submersible Pump | Sample Method: Peristaltic Pump / Submersible Pump

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 3 | Water Level: Rock

Free Product Observed in Probe/Well? Yes/No | If Yes, Depth to Product: —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 19.65

Depth to Water from TOC (feet): - 10.98

Column of Water in Probe/Well (feet): = 8.67

Volume to be Purged

Column of Water in Probe/Well (feet): x 8.67

Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.17) or 4" (X.065)

Min. Volume of Water in Probe/Well Casing (gal): = 1.47 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Field Parameters		3% (min of 0.2°)	At least 3 of the 5 parameters below must stabilize: 3%	10%	0.1 Units	10 Millivolts	10%	4 Inches
Gallons Removed	Minutes Purged	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH (pH unit)	Potential (mV)	Turbidity (NTU)	Water Level
0.15	5	7.74	0.874	1.59	6.01	52.4	16.98	11.00
0.375	10	7.40	0.797	0.76	5.98	49.3	9.60	11.00
0.55	15	7.17	0.771	0.60	5.97	46.9	7.66	10.98
0.75	20	6.99	0.765	0.55	5.95	47.1	67.1	10.97 (*)
1.0	25	7.08	0.763	0.89	5.94	43.2	49.8	10.96
1.125	30	6.98	0.764	0.74	5.95	44.2	67.5	10.95
1.375	35	6.82	0.765	0.88	5.93	42.1	57.2	10.94
1.625	40	6.83	0.763	0.44	5.94	44.4	41.1	10.94
1.80	45	6.97	0.751	0.42	5.93	45.8	37.5	10.94
2.0	50	10.96	0.743	0.36	5.91	50.6	25.5	10.94
2.25	55	6.88	0.737	0.31	5.90	50.3	17.7	10.95
2.5	60	6.64	0.735	0.28	5.88	50.6	17.43	10.92
2.75	65	6.80	0.719	0.28	5.88	50.9	15.28	10.93
2.85	68	6.76	0.730	0.30	5.88	52.2	15.57	10.92

Did groundwater parameters stabilize? Yes/No If no, why not? (*) SURFACE WATER / MUD FROM PARKING LOT SEEMS ENTERING WELL DUE TO POOR CONDITION OF

Did drawdown stabilize? Yes/No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? Yes/No If no, why not?

Water Color: Clear / Yellow / Orange / Brown/Black (Sand/Silt) Other: STARTED CLEAR, see Above.

Well Condition: Lock Y/N Labeled Y/N Comments: VERY POOR CONDITION, MONUMENT BENT + BROKEN, NO LID.

Tubing Set at (middle of wetted casing volume): Approx. 13 feet below Top of Casing

Sheen: Yes/No Odor: Yes/No Notes/Comments: Replaced CAP + ADDED LOCK

Monument casing bent - 1.5 inches

Laboratory Analyses (Circle): DRO / RRO / BTEX / PAH

Purge Water

Gallons generated: 2.85 Discharged through GAC (Yes / No) If No, why not? ATTEMPTING TO REMOVE H2O FROM CASING + RE-DIRECT FLOW, HOWEVER H2O CONTAINERIZED FOR SHIPMENT

Sampler's Initials: BH

Groundwater Sample Form | **Amaknak** | **Unalaska, Alaska**

Project #: 5025-04 | Site Location: Amaknak Pre WWII Tank Farm

Date: 9/3/12 | Probe/Well #: MW-2

Time: 1015 | Sample ID: N/A

Sampler: BH/KO

Weather: PARTLY CLOUDY/SUN | Outside Temperature: 50

QA/QC Sample ID/Time/LOCID: — | MS/MSD Performed? Yes/(No)

Purge Method: (Peristaltic Pump) / Submersible Pump | Sample Method: (Peristaltic Pump) / Submersible Pump

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 3 | Water Level: KOOK

Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: SMALL AMT. OF PRODUCT ON TUBING FROM CASING

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 17.20

Depth to Water from TOC (feet): - 11.31

Column of Water in Probe/Well (feet): = 5.89

Volume to be Purged

Column of Water in Probe/Well (feet): x 5.89

Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.17) or 4" (X.065)

Min. Volume of Water in Probe/Well Casing (gal): = 1.00 (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Field Parameters		3% (min of 0.2°)	At least 3 of the 5 parameters below must stabilize: 3%	10%	0.1 Units	10 Millivolts	10%	4 Inches
Gallons Removed	Minutes Purged	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH (pH unit)	Potential (mV)	Turbidity (NTU)	Water Level
0.125	10	7.52	0.462	1.90	5.35	281.7	308	13.55
0.20	15	7.59	0.464	2.71	5.35	250.8	517	13.80
0.50	20	7.07	0.466	1.21	5.35	228.0	842	15.62
	25	— TURNED OFF TO LOWER TUBING						
	30	— SMALL SPECKS OF PRODUCT ENCOUNTERED						
	35	@ DEPTH						
		10:10 - DISCONTINUED PURGING, WILL NOT SAMPLE WELL.						

(START 933) (RE-START 940)

Did groundwater parameters stabilize? Yes/(No) If no, why not? DISCONTINUED PARAMETERS, NOT SAMPLING

Did drawdown stabilize? Yes/(No) If no, why not? WELL DREW DOWN

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not? —

Water Color: Clear Yellow Orange (Brown/Black (Sand/Silt)) Other: TURBID, DID NOT CLEAR

Well Condition: Lock Y/N Labeled Y/N | Comments: —

Tubing Set at (middle of wetted casing volume): Approx. 13 feet below Top of Casing

Sheen: (Yes)/No | Odor: (Yes)/No | Notes/Comments: 4" PLUG OF SILTY WATER W/ SHEEN AFTER INITIAL START

Laboratory Analyses (Circle): DRO RRO BTEX PAH (NONE)

Purge Water

Gallons generated: 0.625 | Discharged through GAC (Yes/(No)) | If No, why not? CONTAINERIZED FOR SHIPMENT

Sampler's Initials: BH/KO

Groundwater Sample Form | **Amaknak** | **Unalaska, Alaska**

Project #: 5025-04 | Site Location: Amaknak Pre WWII Tank Farm

Date: 9/3/12 | Probe/Well #: MW-8R

Time: 1220 | Sample ID: 1209A8R1WG

Sampler: BH/KD

Weather: SUNNY! | Outside Temperature: 50s

QA/QC Sample ID/Time/LOCID: DUPLICATE 1209A8R2WG/1230/MW-8R | MS/MSD Performed? Yes/(No)

Purge Method: (Peristaltic Pump) / Submersible Pump | Sample Method: (Peristaltic Pump) / Submersible Pump

Equipment Used for Sampling: YSI # 6 | Turbidity Meter #: 3 | Water Level: Keck

Free Product Observed in Probe/Well? Yes/(No) | If Yes, Depth to Product: —

Column of Water in Probe/Well

Total Depth in Probe/Well (feet): 16.90

Depth to Water from TOC (feet): - 11.90

Column of Water in Probe/Well (feet): = 5.00

Volume to be Purged

Column of Water in Probe/Well (feet): X 5.00

Circle: Gallons per foot of 1.25" (X 0.064) or 2" (X 0.17) or 4" (X.065)

Min. Volume of Water in Probe/Well Casing (gal): = (1 Casing Vol)

Remove at least 1 casing volume while micropurging well/probe at a rate of 0.03 to 0.15 GPM

Field Parameters		3% (min of 0.2°)	*At least 3 of the 5 parameters below must stabilize* 3%	10%	0.1 Units	10 Millivolts	10%	4 Inches
Gallons Removed	Minutes Purged	Temperature (°C)	Conductivity (mS/cm)	Dissolved O_2 (mg/L)	pH (pH unit)	Potential (mV)	Turbidity (NTU)	Water Level
—	5	—	SLOWLY	PURGING				
0.125	10	7.74	0.493	6.97	6.13	59.0	51.7	12.15
0.3	15	6.93	0.559	1.38	6.05	53.0	21.7	12.12
0.6	20	6.85	0.566	0.88	6.05	48.1	13.97	12.11
0.75	25	6.84	0.567	0.69	6.06	47.9	9.30	12.11
0.95	30	6.83	0.567	0.67	6.07	48.6	8.34	12.10

1150 START

Did groundwater parameters stabilize? (Yes)/No If no, why not?

Did drawdown stabilize? (Yes)/No If no, why not?

Was flowrate between 0.03 and 0.15 GPM? (Yes)/No If no, why not?

Water Color: (Clear) Yellow Orange Brown/Black (Sand/Silt) Other: SMALL AMT. OF RUST INITIALLY

Well Condition: Lock (Y)/N Labeled (Y)/N Comments: LABELED

Tubing Set at (middle of wetted casing volume): Approx. 13.5 feet below Top of Casing

Sheen: Yes/(No) Odor: Yes/(No) Notes/Comments:

Laboratory Analyses (Circle): (DRO) (RRO) (BTEX) (PAH)

Purge Water

Gallons generated: 0.95 Discharged through GAC (Yes / (No)) If No, why not? CONTAINERIZED FOR SHIPMENT

Sampler's Initials: KD

FIELD BOOK
#12KD03

AUGUST 30 - SEPTEMBER 5, 2012

Rite in the Rain.
ALL-WEATHER
JOURNAL
№ 391

AMAKNAK
ISLAND PRE WWII TANK FARM

5025-04
(PROJECT #)

FES

CONTRACT #W911KB-08-D-0003
TASK ORDER 25

Rite in the Rain
ALL-WEATHER WRITING PAPER

Name KRISTIN DRENZEK + BRANDIE HOFMEISTER – FES

Address 2400 SPENARD RD STE 301
ANCHORAGE, AK 99503

Phone 907-277-7111

Project AMAKNAK ISLAND PILE
WWII TANK FARM
AMAKNAK ISLAND (DUTCH HARBOR) ALASKA

Clear Vinyl Protective Slipcovers (Item No. 30) are available for this style of notebook.
Helps protect your notebook from wear & tear. Contact your dealer or the J. L. Darling Corporation

CONTENTS

PAGE	REFERENCE	DATE

IMPORTANT PHONE NUMBERS

FES ANCHORAGE OFFICE — 907-277-7111
FES FAIRBANKS OFFICE — 907-452-1006
CRAIG MARTIN CELL — 907-452-2466
MIKE BOESE CELL — 907-441-1346
CHRIS BOESE CELL — 907-378-4630

TIM HUNTER (DELTA WESTERN) 359-1291
BOB CUSHEN (INDUSTRIAL SUPPLY) 359-2183
DENISE RAMUN (OUNALASHKA) 581-1276
ROBERT LUND (TZ ENGINEERING) 359-3264

PARTLY CLOUDY 50s

8/30/12 —— AMAKNAK ——

1030 ANCHORAGE: KRISTIN DRENZEK AND BRANDIE HOFMEISTER ARRIVE AT ANCHORAGE AIRPORT.

1230: FLIGHT TO DUTCH HARBOR DEPARTS ON TIME.

1615: DUTCH HARBOR: ARRIVE IN DUTCH HARBOR.

NOTE: LEVEL D PPE IS WORN FOR THIS FIELD JOB UNLESS OTHERWISE INDICATED IN THIS FIELD BOOK.

1620: KRISTIN DRENZEK PICKS UP RENTAL VAN FROM NORTH PORT RENTALS WHILE BRANDIE HOFMEISTER WAITS FOR CHECKED BAGS.

1635: PICK UP SAMPLE COOLERS AT ALASKA AIR CARGO - 6 COOLERS.

1645: GO TO DELTA WESTERN OFFICE ON SITE AND MEET WITH TIM HUNTER, OPERATIONS MANAGER. (Cell: 359-1291). PLAN TO CHECK IN WITH TIM TOMORROW MORNING AT 8:30 FOR A SITE WALK.

1700 PICK UP CARGO FROM A.C.E.

1715 FIND REMNANTS OF MW-1 (DESTROYED) PRESENT ARE BROKEN PVC PIPE, FELLED BOLLARDS, CASING (STICK UP) W/ PVC PIECES AND BENTONITE ON GROUND.

8/30/12 —— AMAKNAK ——

50s PARTLY CLOUDY

1730 Continue walking project area. Most wells could not be immediately located. Wells located in reconnaissance were
- MW-1 (destroyed)
- MW-7R (partially buried)
- MW-8R
- MW-11 (under pilings)

Some vehicles and gravel overlying MW locations may have to be moved.

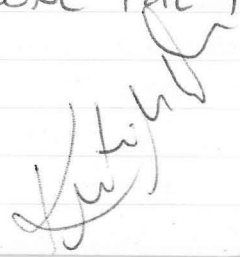
1805 Talk with Bob Cushen, Industrial supply regarding MW-5. He said he could move a forklift that may be over the well. #-359-2183

1835 Head to hotel

1845 CHECK IN TO HOTEL

1905 BRING EQUIPMENT INTO HOTEL, CHECK LAB COOLERS FOR COMPLETENESS.

1930 DONE FOR THE DAY.



Rite in the Rain

8/31/12 ——— AMAKNAK ——— 50s light rain

730 PACK SAMPLE COOLER ICE IN A BAG FOR STORAGE IN HOTEL FREEZER.

0800 PLUG IN PERISTALTIC PUMPS FOR CHARGING

0830 ARRIVE AT SITE TO MEET W/ TIM HUNTER
WALK SITE AND DISCUSS SAFETY AT SITE.
LOCATE MW-12, MW-11, MW-17
MAY HAVE TO MOVE EQUIPMENT TO ACCESS MW-12, MW-17
TIM REQUESTED TO MEET WITH US AT 5 PM TO WORK ON MW-20 (IN BUSY PARKING LOT) AND MW-5 (POSSIBLY UNDER DISCARDED CONCRETE).
TIM IS PRETTY SURE THAT THE FUEL PIPELINE CONTRACTOR DESTROYED MW-23 AND MW-22 NOT DOCUMENTED BUT CONTRACTOR HIT "PVC PIPE" AND THOUGHT IT WAS BURIED (OLD) UTILITIES, AS THERE IS A LOT OF OLD FILL & TRASH IN THE AREA.
TIM DISCUSSED THE PROBLEMS

8/31/12 ——— AMAKNAK ——— 50s Light Rain

WITH HAVING MWs IN AN ACTIVE LOT - ~~WE~~ ESPECIALLY WHEN USING A GRADER | PLAN IN WINTER TIME W/ LIMITED VISIBILITY.

0900 CONTINUE TO LOOK FOR MW-12, LIKELY UNDER CONEX

0930 MEET W/ BRUCE M AT HORIZON LINES - HE REQUESTED THAT WE WAIT UNTIL NOON OR AFTER HOURS TO WORK ON MW-4R AS THERE ARE LOTS OF ACTIVITY GOING ON IN THE LOT.

0945 WALK TO MW-15 - LOCATED EAST OF FUEL PIPELINE

1000 CONTINUE SITE RECON W/O LOCATING ADDITIONAL WELLS

1030 HEAD TO OUNALASHKA CORP TO MEET WITH DENISE RANKIN (PROP OWNER)

1100 LUNCH BREAK

1130 RETURN TO SITE

8/31/12 — AMAKNAK — SOS LT. RAIN

1200 TRY TO LOCATE MW-4R (IN BUSY AREA; BRUCE REQUESTED THAT WE GO THERE ONLY @ NOON OR AFTER 5 DUE TO HEAVY TRAFFIC. COULD NOT LOCATE; ONSITE WORKER SAID THAT THEY REGULARLY ADD GRAVEL AND IS LIKELY UNDER SEVERAL FEET OF FILL.

1230 MOVE TO MW-2. COULD NOT LOCATE.

1300 RETURN TO NORTHERN PART OF SITE TO ASSESS WELLS

1315 LOCATE MW-22 WELL IS IN GOOD CONDITION ~1' BELOW GRADE. LOCKED COMBINATION (0911) AND WELL CAP IN GOOD CONDITION

1345 LOOK FOR MW-23 - CLEARLY IN AREA THAT WAS CLEARED FOR FUEL LINE. ASSUMED DESTROYED

1400 LOCATE MW-11 WELL HAS CLEARLY

8/31/12 — AMAKNAK — SOS RAIN 7

BEEN CUT DOWN AND BOLLARDS REMOVED

1430 CONTACT CRAIG MARTIN TO UPDATE ON PROJECT

1500 CONTACT TOM REED (P.M.) TO GIVE PROJECT UPDATE. PROVIDED LIST OF FOUND WELLS, # DESTROYED WELLS PROVIDED CELL PHONE #

1515 CONTACTED T.T.T REGARDING PERI PUMPS - BEEPING ISSUE.

1530 CONTINUE WORKING DIGGING OUT MW-11. WELL - WELL CASING WAS COVERED IN MUD. WELL CASING FILLED W/ SAND (NOT BENTONITE) AND WATER WAS NOTED TO BE COMING UP ANNULUS. INSIDE OF PVC WELL NOTED TO BE MUDDY. INTEGRITY OF WELL IS UNKNOWN

1600 LOOK AT WELL MW-18. NO WELL CAP PRESENT AND WELL MONUMENT

8/31/12 — AMAKNAK — 50s LT RAIN

NOT SECURE. TOP OF PVC IS BROKEN. WELL MONUMENT (STEEL PORTION) IS BENT. WELL CAP WILL NOT FIT IN BROKEN PVC.

1620 Head to Hardware store to pick up extra tools

1645 Head back to site to meet with Tim Hunter and associates to discuss MW-12 and MW-5

1700 BTI meets w/ Tim Hunter, Tyler Zimmerman, Richard and Robert Lund to discuss moving equipment.

1730 Locate MW-10 general area w/ Richard. He will move debris on top of well so we can access

1800 Continue discussion w/ Tim Hunter and Tyler Zimmerman.

1815 Robert Lund walks site tries to locate MW-5, MW-20 (no luck)

1830 Tim Hunter discusses the possibility of decommissioning

8/31/12 — AMAKNAK — 40s LT RAIN

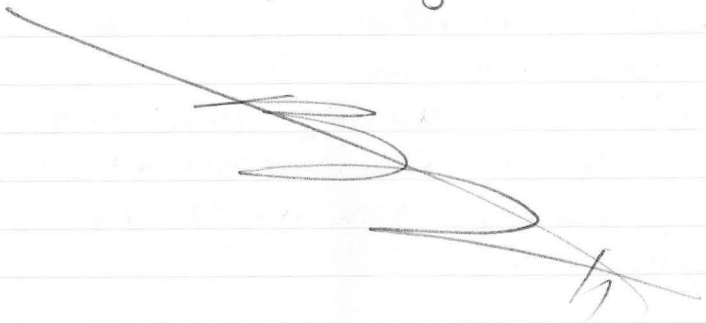
wells that will be impacted by the future construction of the building. BH suggests that he review ADEC literature and seek ADEC and Corps approval to decommission wells.

1900 KD, BH Continue to look for MW-5, ~~and~~ MW-20, and MW-2 with new coordinates sent by PES-Fairbanks. No luck

1930 Richard locates MW-10

2000 Return to hotel, unload vehicle, catch up on paperwork and send email to client

2100 Done for day



9/1/12 — AMAKNAK — 40s-50s rain

→ NOTE LOW TIDE. TODAY @ 1338 ←

0745 Load up van; check on blue ice in hotel freezer; rearrange

0815 Head to site; discuss safety concerns enroute. Watch for big trucks, slips, trips, falls, be aware of heavy equipment and keeping warm & dry.

0830 CHECK IN WITH TIM HUNTER AT DELTA WESTERN OFFICE

0845 CONTINUE LOOKING FOR WELLS 16N AND 6, UNSUCCESSFUL AGAIN. GPS COORDINATES FOR 16N PUT IT AROUND THE ROAD CENTERLINE. TOM REED (USACE) SUGGESTED THAT THIS WELL MIGHT BE A STICKUP - THE MW-1 WAS USING THE AREA FOR STORAGE FOR/WHILE CONSTRUCTING NEW POWER PLANT BUILDING. NO SIGNS OF STICKUP.

0915 LOCATE MW-06! WELL IN FAIR CONDITION EXCEPT MONUMENT NOT SECURED. WATER IN CASING.

0945 MEET WITH ROBERT LUND

9/1/12 — AMAKNAK — 50s RAIN

1045 FINISHED SITE WALK WITH ROBERT LUND. ABLE TO LOCATE MW-3R, MW-2, AND MW-16N, USING RTK THAT PICKED UP RUSSIAN SATELLITES. GAVE US LOCATIONS ON MW-4R, MW-5, MW-20, AND MW-12, BUT WELL NOT FOUND DURING PRELIMINARY DIGGING EFFORTS ON THESE WELLS SO FAR.

1100 Continue looking for MW-12 no luck.

1130 Return to hotel to get decon water

1200 Start GW level round - see next page

1209 Forgot tools @ hotel — run back ½ way.

1455 - FINISHED WATER LEVELS. CONTAINERIZE ALCONOX + RINSE WATER IN A 20-gal POLY DRUM. CLEAN OUT VAN + CONTAIN ALL ITEMS THAT CAME INTO CONTACT W/ PRODUCT.

Rain in the Rain

9/01/12 — AMAKNAK — SOS RAIN

~~TIME~~ (BTH) GROUNDWATER LEVELS

WELL (name)	DEPTH(ft) DTP	DTW	TD	TIME/NOTE	(WELL CONDITION)
MW-7R	—	12.55	18.39	1230	NO LOCK / HAS NOTCH
MW-6	—	12.97	13.75	1248	MONUMENT NOT SECURED NO LOCK / HAS NOTCH
MW-22	—	8.15	16.30	1305	GOOD
MW-10	—	10.01	15.40	1311	FAIR WATER IN MONUMENT 4" WELL
MW-17	—	10.59	17.35	1322	NO COVER (BROKEN) MONUMENT BENT
MW-15 (*)	—	12.54 (*)	15.54 (*)	1335	FAIR 4" well CAP DOESN'T HAVE SEAL
MW-3R	—	11.65	19.65	1345	NO LID MONUMENT CASING BENT
MW-2	—	11.77	17.20	1355	NO LOCK BENT
MW-19	12	?	?	1408	GOOD (product)
MW-16N	6.55	6.56	16.00	1420	LABELED MW-16 product
↳	15	~~15~~			product sounding again under H2O
MW-8R	—	12.35	16.90	1435	GOOD
MW-11	11.7	?	?	1446	Poor NO LID
MW-18	trace	10.16	15.87	1454	Poor NO LID
		10.25	15.96		
		10.42	16.11		

to cut toc top of cap

(*) NOTE: WELL MW-15 WILL BE CUT TO ACCOMMODATE LOCKING CAP NEEDED FOR TRANSDUCER. SEE PG. 25.

9/1/12 — AMAKNAK — SOS RAIN

1600 MAKE SECOND ROUND CHECK ON WELLS THAT ARE CANDIDATES FOR TRANSDUCERS TO SEE IF LOCKING WELL CAPS WOULD FIT UNDER LID.

→ MW-7R: WILL INSTALL TRANSDUCER, WILL REPLACE CAP W/ NEW LOCKING CAP. MONUMENT CAP WILL NOT CLOSE/ SECURE WITH EXISTING OR NEW CAP, WILL TRY TO FIND SOMETHING TO PROTECT WELL.

→ MW-8R: WILL INSTALL TRANSDUCER. APPEARS TO BE PLENTY OF ROOM FOR LOCKING CAP.

→ MW-22: WILL INSTALL TRANSDUCER. DO NOT NEED TO REPLACE CAP.

→ MW-10: WILL INSTALL TRANSDUCER. DO NOT NEED TO REPLACE CAP.

→ MW-2: CANDIDATE FOR TRANSDUCER, MAY HAVE TO CUT DOWN PVC.

→ MW-15: WILL INSTALL TRANSDUCER. WILL NEED TO CUT DOWN PVC AND REPLACE CAP W/ LOCKING CAP

(*) SEE PG. 25 FOR DETAILS

50's

9/1/12 ——— AMAKNAK ——— LT. RAIN

1700 HEAD TO HARDWARE STORE TO BUY EXTRA BOLTS, GASKETS, + CAP FOR MW-18. LOOK FOR TOOL TO CUT DOWN PVC ON MW-15 (4-INCH).

1730 LEAVE ALASKA STEP SUPPLY, COULD NOT FIND TOOL TO CUT WELL. HEAD TO TRUE VALUE - (CLOSED).

1745 TALK TO ERIC CAUSING (SURVEYOR) AND CHECK IN CRAIG MARTIN (PROGRAM MANAGER / FES). WRITE STATUS EMAIL TO CLIENT SUMMARIZING FIELD PROGRESS. PLANNED TOMORROWS ACTIVITIES

1845 DONE FOR DAY.

9/2/12 ——— AMAKNAK ——— 40s

0700 SET UP TRANSDUCERS FOR INSTALLATION. TRANSDUCERS PROGRAMMED WITH THE FOLLOWING INFORMATION:

LOGGING EVENT: Test 1
Test Name: AMAKNAK
SCAN (TIME INTERVAL): 1 HOUR
Time (Absolute): 2012/9/2 @ 12:00:00 to 2015/9/2 @ 12:00:00

ALL TRANSDUCERS + BARO SCOUT ZEROED.
ALL TRANSDUCERS + BARO SCOUT HAVE DAR + TIME SYNCHRONIZED W/ LAPTOP.

WELL	TRANSDUCER SN	TRANSDUCER DEPTH (*)	TOTAL DEPTH
BARO	909368	N/A	N/A
MW-2	1010499	16.20	17.20
MW-7R	1007539	17.39	18.39
MW-8R	1007541	15.90	16.90
MW-10	1007542	14.40	15.40
MW-15	1007540	Need to cut see pg: 25	15.54
MW-22	1007538	15.30	16.30

TRANSDUCERS INSTALLED 1 FOOT ABOVE TOTAL DEPTH of WELL. (*) CABLE LENGTH ADJUSTED FOR HANGING DISTANCE FROM TOC. CABLE TOP TO TOC = 0.21 feet. (14.56)

9/2/12 — AMAKNAK — 40S CLOUDY

1000 FINISHED PROGRAMMING, MEASURING + CUTTING TRANSDUCER CABLES TO LENGTH.

1010 CALIBRATE YSI #7 (SN 09J100051, YSI 556 MPS) AND YSI #6 (SAME MODEL, SN 07K100596). DETAILS BELOW.

YSI	Conductivity pre	Conductivity post	pH 7 pre	pH 7 post	pH 4 pre	pH 4 post	ORP pre	ORP post	DO pre	DO post
6	1.069	1.000	7.23	7.00	3.76	4.00	222.5	240	10.64	9.18
7	1.082	1.000								

↳ DISCOVERED THAT BACKUP YSI #7 DOES NOT SEEM TO HAVE ORP PROBE.

DISCONTINUE CALIBRATION OF BACKUP.

YSI #6 @ time of cal TEMP = 16.65 / BAROMMTTY = 743.4

LOT #S / EXPIRATION DATES OF YSI CAL SOLUTIONS:

- CONDUCTIVITY: LOT 10G100475 / exp 1/2013
- pH 7: LOT 12D3S / exp April 24, 2014
- pH 4: LOT 12D2R / exp April 26, 2014
- ORP: LOT 3570 / exp 9/2016

CALIBRATE TURBIDIMETERS (BOTH OAKTON T-10) #2 (SN 208608) AND #3 (333378). STANDARD LOTS/EXP:

800 NTU: LOT C254118 / exp 12/13
100 NTU: LOT C254117 / exp 12/13
20 NTU: LOT C254116 / exp 12/13
0.02 NTU: LOT C253769 / exp 12/13

9/2/12 — AMAKNAK — 50S WIND!

1045 BREAK FOR LUNCH

1800 BRING COOLERS DOWN INTO VAN, STOP TO GET ICE FOR TODAY SO AS NOT TO USE UP FROZEN GEL ICE IN HOTEL FREEZER (LAB DID NOT SEND AS MUCH ICE AS USUAL).

1245 ARRIVE ON-SITE, SET UP ON MW-7R. COLLECT SAMPLE NUMBER 1209A7R01WG AT 1345. SAMPLES COLLECTED FOR DRO/RRO (AK102/103), BTEX (SW8260C), PAH (SW8270DSim). BTEX COLLECTED FIRST IN 40-ML HCl VOA VIAL, 3ea. DRO/RRO COLLECTED IN SMALL VOLUME 500ML HCl-PRESERVED, THEN PAH IN 1-L UNPRESERVED JARS.

SITE WORKER THAT CAME OVER DURING SAMPLING SAID HE WOULD TRY TO MAKE CONCRETE OR LARGE BOULDERS TO HELP PROTECT WELL (NO EA LID ON MONUMENT). THIS AREA IS A SNOW-DUMP IN WINTER.

DECON WATER LEVEL INDICATOR.

9/2/12 — AMAKNAK — SOS MOSTLY CLOUDY WIND

1415 INSTALL TRANSDUCER IN WELL MW-7R. REPLACE WELL CAP AND ADD LOCK (0911).
CONTAINERIZE 1.125 gal OF PURGE WATER FROM MW-7R IN 20-gal BLUE POLY DRUM.

1425 - SET UP ON WELL MW-22 TO COLLECT SAMPLE 1209A22**8**1WG.
COLLECTING AN MS/MSD SAMPLE.
SAME CONTAINERS/ANALYSIS FOR ALL WELLS AT THIS SITE (See PG. 17).
SAMPLE TIME = 1510 (pH tested ~2 in DRUM/RBW)

1547 - FINISHED COLLECTING PRIMARY + MS/MSD.
CONTAINERIZE 1.65 gal PURGE H2O IN 20-gal POLY DRUM.
DECONTAMINATE WATER LEVEL INDICATOR.

1549 - INSTALL TRANSDUCER IN WELL MW-22. REPLACE CAP, USE EXISTING LOCK (0911).
PLACE LABELED ORANGE CONE + ROCKS AROUND WELL.

1610 SET UP ON MW-10.

9/2/12 — AMAKNAK — SOS CLOUDY

1615 - START PURGING MW-10. WELL INITIALLY DRAWS DOWN FROM 10.08 INITIAL WATER LEVEL TO 10.55 AFTER REMOVAL OF 0.875 gal OF WATER. PUMP (PURGE RATE) WAS SLOWED AFTER INITIAL DRAW-DOWN AND RECOVERED, WITH A FINAL WATER LEVEL OF 10.44. (4" WELL CASING)

1650 - COLLECT SAMPLE 1209A101WG.
CONTAINERIZE 1.625 gal PURGE WATER + DECON WATER LEVEL INDICATOR.

1722 - INSTALL TRANSDUCER IN MW-10.
ADD LOCK (0911), USE EXISTING CAP

1735 - SET UP ON MW-15

1740 START PURGING

1810 COLLECT SAMPLE 1209A151WG.
CONTAINERIZE 1.7 gal PURGE WATER.
PVC NEEDS TO BE CUT DOWN BEFORE A TRANSDUCER CAN BE INSTALLED. (See PAGE 25)

9/2/12 — ANVAKNAK — 50s PARTLY CLOUD

1850 SET UP ON MW-3R. WATER INITIALLY CLEAR BUT HAVING TROUBLE PREVENTING SURFACE H2O/MUD FROM ENTERING DAMAGED MONUMENT CASING. TURBIDITY SPIKED, SO CONTINUED TO PURGE.

1950 KRISTIN DRENEK LEAVES SITE TO PICK UP ERIC CAUSING (SURVEYOR) AT AIRPORT. BRANDIE HOFMEISTER CONTINUES PURGING/SAMPLING MW-3R. *ERIC'S BAGS (SURVEY EQUIP.) DID NOT MAKE FLIGHT.

2005 DEPART AIRPORT W/ ERIC CAUSING.

2010 BACK AT MW-3R TO MEET BRANDIE, THEN TAKE ERIC TO HOME TO CHECK-IN

2030 BACK ON MW-3R, SAMPLING FINISHED, LOAD VAN + ~~MOVE TO~~ CLEAN UP. PUMP SURFACE/RAIN H2O OUT OF MONUMENT CASING AT MW-2.

2100 HEAD BACK TO HOTEL. BRING IN SAMPLE COOLERS AND REFRESH ICE. ALSO BRING IN YSI, TURBIDIMETERS, CALIBRATION SOLUTIONS.

2130 DONE FOR DAY.

9/3/12 — ANVAKNAK — 40s CLOUDY

0800 ORGANIZE GEAR, CHECK IN W/ OFFICE.

0830 CALIBRATE YSI #6 + TURBIDIMETER #3.

YSI #6	CONDUCTIVITY	pH7	pH4	ORP	DO
pre	1.021	7.07	3.98	235.1	10.00
post	1.000	7.00	4.00	240.0	9.89

@ temp = 16.67, baro mmHg = 758.5

0900 MEET UP WITH ERIC CAUSING IN LOBBY, DRIVE TO SITE.

0930 SET UP ON MW-2. THIS WELL HISTORICALLY HAD PRODUCT. NO PRODUCT DURING H2O-LEVELS. AS WE WERE PURGING WE NOTICED IMMEDIATELY SHEEN + 9" OF SILTY DUG FOLLOWED BY RELATIVELY CLEAR WATER. THE WATER DREW DOWN QUICKLY (IMMEDIATELY). AS WATER LEVELS APPROACHED THE BOTTOM of the well, OILY SLUDGE/SEDIMENT CAME OUT. BECAUSE of the STICKY NATURE OF THE PRODUCT it QUICKLY COATED THE TUBING.

1025 Will not sample as water will encounter oily sludge along ~~with~~ tubing.

9/3/12 — ANAKNAK — SUNNY — SOS

1045 CHECK IN W/ FAIRBANKS OFFICE CLEAN UP WELL, RUN SURVEYOR TO HOTEL. CHANGE OUT DECON WATER, CONTAINERIZE DIRTY DECON WATER FROM MW-2. CHECK ON FLIGHTS @ AIRPORT, NO OPENINGS UNTIL 9/6 SO BRANDIE WILL DEPART THIS AFTERNOON AS SCHEDULED.

1140 SET UP ON MW-8R TO COLLECT PRIMARY SAMPLE 1209A8R1WG @ 1220 AND DUPLICATE 1209A8R2WG @ 1230, LOG ID = MW-8R2

1255 FINISHED SAMPLING MW-8R.

1258 INSTALL TRANSDUCER IN MW-8R, REPLACE CAP + USE EXISTING LOCK (0911).

1330 START SETTING UP ON MW-17 AS WATER STARTING COMING UP, NOTICED BLACK PRODUCT IN PENSTALTIC PUMP TUBING. DECIDED TO NOT SAMPLE DUE TO AMOUNT OF PRODUCT

1350 PACK UP VAN AND HEAD TO AIRPORT. TO SHIP IDW WATER. OFFICE CLOSED.

1400 ORGANIZE GEAR FOR SHIPMENT

9/3/12 — ANAKNAK — SUNNY → RAIN — SOS

1545 FINISHED PACKING COOLERS + WRITING COCS. SHIP 3 COOLERS GOLDSTREAK TO CAS, HOLD FOR PICKUP @ PDX. AIRBILL #027-74132144

1600 PACK SAMPLING GEAR TO SEND STANDARD AIR CARGO TO ANCHORAGE.

1630 ALL GEAR FROM VAN SHIPPED EXCEPT WHAT IS NEEDED FOR REMAINING WORK.

1700 BRANDIE HARVESTEN TO AIRPORT, DEPARTS FIELD JOB (FLIGHT DELAYED, DEPARTS ≈ 1900).

... KRISTIN DRENZEK + ERIC CADSIVO CHECK AIRPORT AT 1730, 1930, AND 2030 FOR ERIC'S SURVEY EQUIPMENT.

2100 ERIC'S GPSes + TRIPODS ARRIVE! LOAD HIS GEAR + RETURN TO HOTEL. DONE FOR THE NIGHT.

9/4/12 —— AMAKNAK —— SOS RAIN WIND

830 KRISTIN DRENZEK & ERIC COUSINO HEAD TO SITE TO START SURVEYING EFFORT.

1030 BOTH BASE STATIONS SET UP. KRISTIN DRENZEK CHECKS ON SAMPLE COOLERS (THEY ARE ON PLANE) + SHIPS PURGE WATER TO EMBARQ.

1300 FINISHED W/ HORIZONTAL SURVEY OF ALL WELLS.

1330 HEAD OUT TO SPIT TO FIND VERTICAL CONTROL.

1430 DROP Horiz SURVEY GEAR OFF AT HOME TO DRY OUT.

1530 CUT MW-15 PVC [14.4" + 0.16" = TRANSDUCER DEPTH (14.56")] TO ACCOMMODATE LOCKING CAP. INSTALL TRANSDUCER IN MW-15 AT 1540, 14.56"

1550 START VERTICAL SURVEY.

1640-50 Remove transducer from MW-27

1740-45 Remove transducer from MW-10.

1755 MW-11 elev. is TOP of CAP

1822-28 Remove transducer from MW-8R

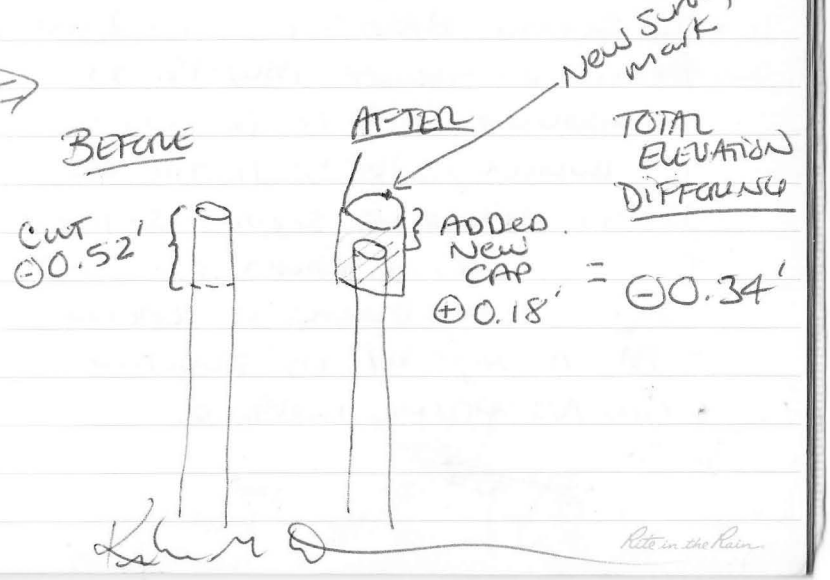
1845-50 Remove transducer from MW-7R.

9/4/12 —— AMAKNAK —— SOS RAIN WINDS

2000 FINISHED VERTICAL WELL SURVEY. PACK & DRY GEAR, BACK TO HOME TO GRAB HORIZONTAL SURVEY GEAR + COLLECT POINTS FOR RECOGNIZABLE AERIAL FEATURES. ERIC COLLECTS POINTS ON THE DECK BY DELTA WESTERN'S OFFICE, SOME CONCRETE FOUNDATIONS, + OTHER FEATURES.

2115 DONE WITH HORIZONTAL + VERTICAL SURVEY EFFORTS. DONE FOR THE NIGHT.

MW-15 DETAILS:



9/5/12 — AMAKNAK — SOS RAIN/WIND

0800 START DAY. DOWNLOAD BARO SCOUT DATA, RETRIEVE ALL READINGS

0815 MEET UP WITH ERIC CASINO FOR ONE MORE VERTICAL (GROUNDLEVEL) TIE IN ON A MONUMENT.

0855-0900 DOWNLOAD TRANSDUCER DATA FROM MW-7R (SN 1007539)

0910-0915 DOWNLOAD TRANSDUCER DATA FROM MW-8R (SN 1007541)

0920 DROP ERIC OFF AT AIR CARGO, RUN BACK TO SITE.

0935-0950 REMOVE/DOWNLOAD TRANSDUCER DATA FROM MW-15 (SN 1007540).

1000 SECURE BARO SCOUT IN BUNKER BEHIND (S-SE OF) MW-15. TIED TRANSDUCER TO PIPE IN SOUTH END OF BUNKER, JUST UP TO THE RIGHT BEFORE ENTERING SECOND SET OF DOORS / INTERIOR ROOM ON SOUTH END. TRANSDUCER IS LABELED + HAS A NOTE W/ ITS FUNCTION + CONTACT PHONE NUMBER.

9/5/12 — AMAKNAK — PACK CAMP

1040-50 DOWNLOAD TRANSDUCER DATA FROM MW-22 (SN 1007538)

1055-1100 DOWNLOAD TRANSDUCER DATA FROM MW-10 (SN 1007542).

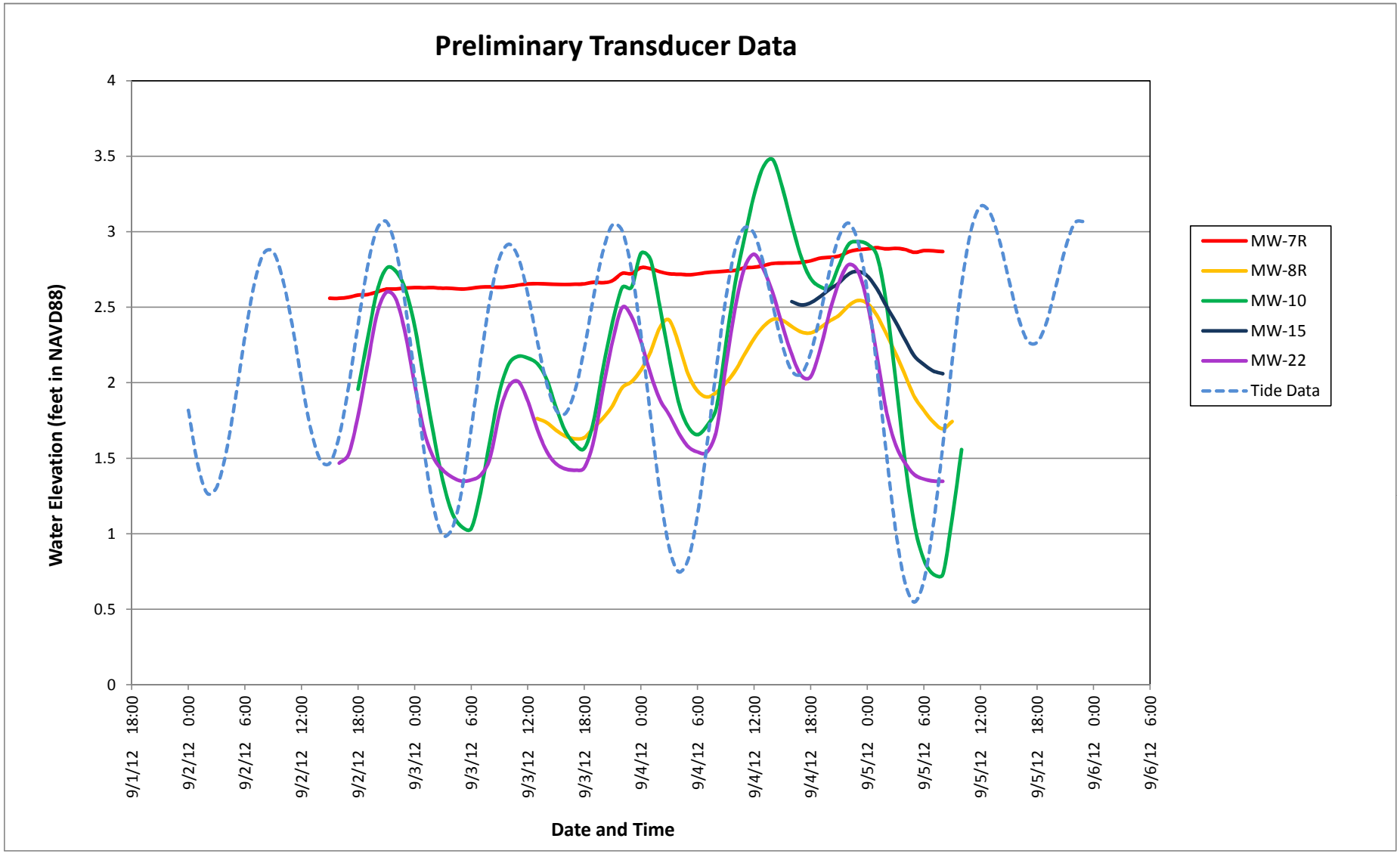
1100-1145 FINISH SECURING (TO THE EXTENT PRACTICAL) ALL THE WELLS. REPLACE CAPS, BOLTS, GASKETS AND ADD LOCKS IF LOCKS WERE MISSING OR UNLOCKED. MAKE SURE WELLS ARE LABELED.

1145 PACK FIELD GEAR, CHECK OUT OF HOTEL, GET GAS, RETURN RENTAL VAN, CHECK IN FOR FLIGHT.

1300 AT AIRPORT, WAIT FOR FLIGHT TO DEPART.

1640 LAND IN ANCHORAGE, ALL CHECKED BAGS ARRIVED ALSO. FINISHED W/ FIELD JOB AT 1700.

APPENDIX D
Transducer Data


Preliminary Transducer Data
Water Elevation (feet in NAVD88)
4
3.5
3
2.5
2
1.5
1
0.5
0
9/1/12 18:00
9/2/12 0:00
9/2/12 6:00
9/2/12 12:00
9/2/12 18:00
9/3/12 0:00
9/3/12 6:00
9/3/12 12:00
9/3/12 18:00
9/4/12 0:00
9/4/12 6:00
9/4/12 12:00
9/4/12 18:00
9/5/12 0:00
9/5/12 6:00
9/5/12 12:00
9/5/12 18:00
9/6/12 0:00
9/6/12 6:00
Date and Time
MW-7R
MW-8R
MW-10
MW-15
MW-22
Tide Data

Appendix D - Transducer Data

Date	Time	Groundwater Elevation - NAVD88 (feet)					Tidal Data - NAVD88 (feet)	Tidal Data - MLLW (feet)
		MW-7R	**MW-8R**	**MW-10**	**MW-15**	**MW-22**	**NOAA Station 9462620**	**NOAA Station 9462620**
9/2/2012	*12:00:00*						2.017	1.73
	13:00:00	*Transducer installed*					1.687	1.4
	14:00:00	*9/2/12 at 14:15*				*Transducer installed*	1.487	1.2
	15:00:00	2.558424				*9/2/12 at 15:49*	1.467	1.18
	16:00:00	2.55864		*Transducer installed*		1.467639	1.647	1.36
	17:00:00	2.565754		*9/2/12 at 17:22*		1.526706	1.977	1.69
	18:00:00	2.579631		1.956534		1.781261	2.387	2.1
	19:00:00	2.583536		2.287367		2.119682	2.767	2.48
	20:00:00	2.600293		2.602538		2.452291	3.017	2.73
	21:00:00	2.619371		2.756263		2.599421	3.067	2.78
	22:00:00	2.619658		2.73864		2.556556	2.887	2.6
	23:00:00	2.626111		2.622135		2.327637	2.517	2.23
9/3/2012	0:00:00	2.630167		2.375758		1.989793	2.037	1.75
	1:00:00	2.628377		2.014808		1.680811	1.547	1.26
	2:00:00	2.628817		1.660374		1.502985	1.177	0.89
	3:00:00	2.624814		1.346319		1.421125	0.987	0.7
	4:00:00	2.623988		1.134373		1.373827	1.037	0.75
	5:00:00	2.618951		1.045504		1.348778	1.287	1
	6:00:00	2.625295		1.034363		1.356522	1.697	1.41
	7:00:00	2.631985		1.276365		1.388834	2.147	1.86
	8:00:00	2.633815		1.619902		1.501988	2.557	2.27
	9:00:00	2.630594		1.940025		1.798372	2.827	2.54
	10:00:00	2.636663		2.124982		1.977383	2.917	2.63
	11:00:00	2.64632	*Transducer installed*	2.174685		2.007633	2.827	2.54
	12:00:00	2.653895	*9/3/12 at 12:58*	2.162394		1.878974	2.587	2.3
	13:00:00	2.655106	1.761903	2.126467		1.692627	2.277	1.99
	14:00:00	2.653489	1.736059	2.022468		1.545095	1.997	1.71
	15:00:00	2.650407	1.685643	1.833431		1.462852	1.817	1.53
	16:00:00	2.649548	1.64535	1.676463		1.429093	1.797	1.51
	17:00:00	2.652304	1.628394	1.592692		1.421796	1.947	1.66
	18:00:00	2.654055	1.63583	1.565226		1.437965	2.227	1.94
	19:00:00	2.664901	1.700418	1.751113		1.620468	2.577	2.29
	20:00:00	2.66141	1.765295	2.102416		1.967571	2.877	2.59
	21:00:00	2.675739	1.847696	2.403295		2.275769	3.047	2.76
	22:00:00	2.72325	1.965165	2.628875		2.496503	3.007	2.72
	23:00:00	2.72183	2.005924	2.632041		2.436981	2.747	2.46
9/4/2012	0:00:00	2.761487	2.082268	2.856873		2.272439	2.317	2.03
	1:00:00	2.754519	2.199084	2.81578		2.061079	1.787	1.5
	2:00:00	2.734899	2.364019	2.503646		1.888774	1.277	0.99
	3:00:00	2.720364	2.414466	2.169146		1.787837	0.907	0.62
	4:00:00	2.717819	2.258433	1.867665		1.667111	0.747	0.46
	5:00:00	2.714269	2.058463	1.708311		1.577186	0.827	0.54
	6:00:00	2.719988	1.945383	1.655707		1.541635	1.127	0.84
	7:00:00	2.728945	1.904965	1.715701		1.540986	1.587	1.3
	8:00:00	2.734088	1.934533	1.83542		1.682814	2.097	1.81
	9:00:00	2.739069	1.997357	2.254416		2.10567	2.557	2.27
	10:00:00	2.743237	2.077914	2.663349		2.498213	2.887	2.6
	11:00:00	2.760555	2.188129	2.965759		2.764529	3.027	2.74
	12:00:00	2.764027	2.291457	3.243565		2.850116	2.987	2.7
	13:00:00	2.775564	2.372229	3.433696		2.749216	2.787	2.5
	14:00:00	2.789883	2.419193	3.475488	*Transducer installed*	2.5891	2.507	2.22
	15:00:00	2.791794	2.413021	3.289238	*9/4/12 at 15:40*	2.377595	2.247	1.96
	16:00:00	2.792924	2.371864	3.047534	2.537539	2.185694	2.077	1.79
	17:00:00	2.796332	2.335895	2.828408	2.51532	2.047148	2.057	1.77
	18:00:00	2.806436	2.329141	2.689922	2.529622	2.040271	2.197	1.91
	19:00:00	2.825046	2.363234	2.636279	2.570314	2.220128	2.447	2.16
	20:00:00	2.82931	2.408003	2.631634	2.619026	2.46656	2.737	2.45
	21:00:00	2.838249	2.445236	2.776796	2.660424	2.663854	2.967	2.68
	22:00:00	2.865027	2.508234	2.914406	2.718907	2.780553	3.057	2.77
	23:00:00	2.881031	2.543598	2.934167	2.737383	2.740355	2.937	2.65
9/5/2012	0:00:00	2.884521	2.525403	2.917234	2.70755	2.530403	2.607	2.32
	1:00:00	2.893624	2.447382	2.845024	2.624248	2.188082	2.107	1.82
	2:00:00	2.885527	2.324082	2.531562	2.510598	1.817207	1.547	1.26
	3:00:00	2.889178	2.19712	2.022115	2.403875	1.59054	1.027	0.74
	4:00:00	2.881846	2.049661	1.478524	2.286027	1.46954	0.677	0.39
	5:00:00	2.862845	1.906089	1.058266	2.176763	1.391	0.547	0.26
	6:00:00	2.873915	1.815722	0.82716	2.120603	1.362648	0.687	0.4
	7:00:00	2.872461	1.739428	0.731236	2.077678	1.348806	1.057	0.77
	8:00:00	2.867886	1.694895	0.729542	2.060127	1.347222	1.577	1.29
	9:00:00	*Transducer removed*	1.742543	1.103784	*Transducer removed*	*Transducer removed*	2.137	1.85
	10:00:00	*at 8:59*	*Transducer removed*	1.556801	*at 9:43*	*at 10:46*	2.647	2.36
	11:00:00		*at 9:09*	*Transducer removed*			3.007	2.72
	12:00:00			*at 10:58*			3.167	2.88

NOTES: All Transducers were removed from wells on 9/5/2012 to download data. Transducers were replaced in wells immediately following the data download.

Tidal data obtained from NOAA was converted from MLLW to NAVD88 by adding +0.287, the averaged difference from the OPUS solution.

APPENDIX E
Survey Data

Windy Creek Surveys, LLC. 2650 Monteverde Rd., Fairbanks, AK. 99709

"Survey support for environmental monitoring" Phone: (907) 455-6776, Fax: (907) 455-6776
Email: **ejc@windycreeksurveys.com**

October 22, 2012

Re: Formerly Used Defense Site
Amaknak Pre-WWII Tank Farm Site

Mr. Craig Martin
Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

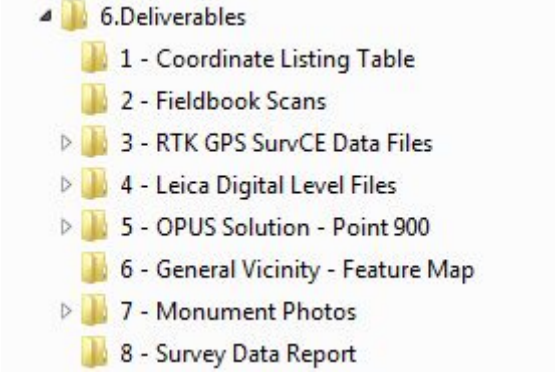
Dear Mr. Martin,

This letter is to serve as our Survey Report for the Amaknak Pre-WWII Tank Farm Site Monitor Well Survey.

The horizontal locations portion of the field survey was conducted on September 4th, 2012 utilizing 3 JAVAD Triumph-1 GNSS receivers. Two RTK base stations (set to broadcast on different frequencies) were situated over separate 8" spikes that were set in ideal locations for a reference station. Each monitoring well was positioned from both base stations, with 4000 series points (based on Point 900) and 5000 series points(based on Point 901). A field inverse check between the two points established for the monitoring wells from separate base stations found a maximum positional variance of 0.22' (which is well within the Manual of Electronic Deliverables - Survey Accuracy Requirement of 0.5 meters that is specified for monitoring wells). We chose to use 4000 series point numbers for the reported monitoring well locations as they were obtained from the RTK base station located at Point 900. Final coordinate listings are based upon a translation from a local assumed WGS84 base station position, to the position established by the OPUS solution. Refer to OPUS solution for Point 900, based upon September 4th, 2012 static observations.

The vertical control survey was conducted on September 4th, 2012. The Basis of Elevations, is the orthometric height [NAVD88(Computed using GEIOD12A)], that is listed on the OPUS solution for Point 900. Elevations between Point 900 and Point 708 were transferred utilizing RTK GPS. Pseudo-NAVD88 elevations were then established on the top of PVC of the wells. A Leica DNA03 level and a fiberglass Leica rod were utilized to complete the level loops that established these elevations, listed to the nearest 0.001'. Leica Geo Office 7.0 software was utilized to process the level loops.

Survey Data deliverables include a Survey Data Report listing the Monitoring Well positions in NAD83, Alaska State Plane Zone 10 with the elevations listed in NAVD88 feet, as per the requirements set forth in the COE 2009 Manual for Electronic Deliverables. A comma delimited file including all of the wells, .pdf copies of the fieldbook, and the RTK GPS SurvCE data files have been included as per the Manual. Also included is a listing the of Monitoring Well positions in CGS WGS84 latitude/longitude in decimal degrees with the elevations in NAVD88 feet, as per the requirements set forth in the COE 2011 Manual for Electronic Deliverables.. An image of the Survey Data file structure can be seen below.



Windy Creek Surveys, LLC.
2650 Monteverde Rd., Fairbanks, AK. 99709
"Survey support for environmental monitoring"
Phone: (907) 455-6776, Fax: (907) 455-6776
Email: ejc@windycreeksurveys.com

The Alaska State Plane Zone 10 (feet) Survey Data Table coordinate listing is as follows:

Column A	Column B	Column C	Column D	Column E	Column F
4000	1190152.12	5316069.14	9.637	MW-22	DATE:09-04-2012 TIME:12:52:30
4001	1190052.24	5316118.99	11.687	MW-10	DATE:09-04-2012 TIME:12:56:35
4003	1189945.90	5316095.58	13.025	MW-17	DATE:09-04-2012 TIME:13:02:54
4004	1189848.86	5316140.52	13.505	MW-11	DATE:09-04-2012 TIME:13:06:28
4005	1189733.52	5316196.71	13.142	MW-18	DATE:09-04-2012 TIME:13:10:15
4006	1189374.29	5316369.40	13.342	MW-2	DATE:09-04-2012 TIME:13:15:54
4007	1189228.52	5316619.75	13.875	MW-15	DATE:09-04-2012 TIME:13:20:00
4008	1189179.12	5316486.46	13.143	MW-3R	DATE:09-04-2012 TIME:13:23:57
4009	1189557.66	5315984.91	13.918	MW-8R	DATE:09-04-2012 TIME:13:31:03
4010	1189628.21	5316135.56	13.492	MW-19	DATE:09-04-2012 TIME:13:44:01
4011	1189884.68	5315922.48	16.921	MW-16N	DATE:09-04-2012 TIME:13:49:58
4012	1189649.59	5315751.71	21.245	MW-6	DATE:09-04-2012 TIME:13:53:59
4014	1189430.81	5315638.60	15.058	MW-7R	DATE:09-04-2012 TIME:14:00:38
6025	1189249.39	5316827.01	15.24	CONC.COR.PILLBOX	DATE:09-04-2012 TIME:21:53:14
6026	1189257.01	5316825.04	15.37	CONC.COR.PILLBOX	DATE:09-04-2012 TIME:21:53:28
6027	1189255.03	5316817.43	15.38	CONC.COR.PILLBOX	DATE:09-04-2012 TIME:21:53:40
6028	1189247.43	5316819.42	15.35	CONC.COR.PILLBOX	DATE:09-04-2012 TIME:21:53:57
6029	1189563.51	5316341.82	16.39	TF.CONC.WALL	DATE:09-04-2012 TIME:22:03:44
6030	1189591.34	5316370.42	16.33	TF.CONC.WALL	DATE:09-04-2012 TIME:22:04:33
6031	1189633.20	5316330.14	16.35	TF.CONC.WALL	DATE:09-04-2012 TIME:22:05:26
6032	1189604.90	5316301.57	16.47	TF.CONC.WALL	DATE:09-04-2012 TIME:22:05:54

The information provided is intended to comply with all of the requirements set forth in the COE Manual for Electronic Deliverables.

Sincerely,

10/22/12

X Eric J. Cousino

Eric J. Cousino, PLS

OPUS SOLUTION - POINT 900

FILE: WCS_341_0904a.12o OP1350255049871

NGS OPUS SOLUTION REPORT
==========

All computed coordinate accuracies are listed as peak-to-peak values.
For additional information: http://www.ngs.noaa.gov/OPUS/about.jsp#accuracy

USER: ejc@windycreeksurveys.com DATE: October 14, 2012
RINEX FILE: wcs_248r.12o TIME: 22:53:51 UTC

SOFTWARE: page5 1209.04 master62.pl 082112 START: 2012/09/04 17:31:00
EPHEMERIS: igs17042.eph [precise] STOP: 2012/09/04 22:22:00
NAV FILE: brdc2480.12n OBS USED: 11977 / 12233 : 98%
ANT NAME: JAV_TRIUMPH-1 NONE # FIXED AMB: 67 / 70 : 96%
ARP HEIGHT: 1.743 OVERALL RMS: 0.014(m)

REF FRAME: NAD_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2012.6771)

X:	-3663252.325(m)	0.010(m)	-3663253.335(m)	0.010(m)
Y:	-876918.770(m)	0.015(m)	-876917.716(m)	0.015(m)
Z:	5129827.768(m)	0.021(m)	5129828.158(m)	0.021(m)

LAT:	53 53 39.02532	0.002(m)	53 53 39.01350	0.002(m)
E LON:	193 27 44.20569	0.015(m)	193 27 44.13668	0.015(m)
W LON:	166 32 15.79431	0.015(m)	166 32 15.86332	0.015(m)
EL HGT:	20.042(m)	0.024(m)	20.791(m)	0.024(m)
ORTHO HGT:	3.876(m)	0.042(m)	[NAVD88 (Computed using GEOID12A)]	

	UTM COORDINATES (UTM Zone 03)	STATE PLANE COORDINATES (5010 AK10)
Northing (Y) [meters]	5972843.135	362920.766
Easting (X) [meters]	398951.335	1620286.622
Convergence [degrees]	-1.24247490	7.54070228
Point Scale	0.99972530	1.00001921
Combined Factor	0.99972216	1.00001607

US NATIONAL GRID DESIGNATOR: 3UUV8895172843(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DM7466	AB02 NIKOLSKI__AK2007 CORS ARP	N525814.189	W1685116.748	185129.1
DM7475	AC10 CPSARICHEFAK2008 CORS ARP	N543121.302	W1645312.152	128436.7
DG7414	AV09 HAYSTACK__AK2004 CORS ARP	N535232.293	W1663230.542	2082.4

NEAREST NGS PUBLISHED CONTROL POINT

AE3910	DUT A	N535341.380	W1663220.981	119.3

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

COORDINATE LISTING

Point ID	ASPC Z10 Northing	ASPC Z10 Easting	Pseudo-NAVD88 Elevation	Point Description
700	1190566.91	5315890.58	13.0	BCMON.BLM
701	1190510.08	5315830.55	41.5	ALMON.PND#723
702	1190574.92	5315969.67	11.2	ALCAP
704	1189933.68	5315949.69	16.215	YPC
705	1189477.99	5316258.00	13.203	2"ALCAP
706	1189651.05	5316136.55	13.1	2"ALCAP
707	1192495.73	5320538.16	11.6	BCMON.SBASE
708	1190330.85	5316063.34	3.933	YPC
900	1190682.55	5315890.36	12.717	SET.8"SPIKE
901	1189947.83	5315705.87	63.7	SET.8"SPIKE
6024	1189249.81	5316825.88	15.489	USC&GS.BCMON.#12
4000	1190152.12	5316069.14	9.637	MW-22
4001	1190052.24	5316118.99	11.687	MW-10
4003	1189945.90	5316095.58	13.025	MW-17
4004	1189848.86	5316140.52	13.505	MW-11
4005	1189733.52	5316196.71	13.142	MW-18
4006	1189374.29	5316369.40	13.342	MW-2
4007	1189228.52	5316619.75	13.875	MW-15
4008	1189179.12	5316486.46	13.143	MW-3R
4009	1189557.66	5315984.91	13.918	MW-8R
4010	1189628.21	5316135.56	13.492	MW-19
4011	1189884.68	5315922.48	16.921	MW-16N
4012	1189649.59	5315751.71	21.245	MW-6
4014	1189430.81	5315638.60	15.058	MW-7R

LEGEND:

- BLM SURVEY MONUMENT
- NGS CONTROL MONUMENT
- GPS CONTROL POINT
- PRIMARY MONUMENT [ALUMINUM CAP]
- SECONDARY CORNER
- MW MONITORING WELL
- XX POINT NUMBER

0 50 100 200 300
SCALE: 1" = 100 FEET

ALEUTIAN ISLANDS RECORDING DISTRICT

DATE OF SURVEY BEGINNING SEPTEMBER 2, 2012 ENDING SEPTEMBER 5, 2012	NAME OF SURVEYOR WINDY CREEK SURVEYS 2650 MONTEVERDE ROAD FAIRBANKS, ALASKA 99709

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA 99701

F.U.D.S. MONITOR WELL SURVEY AMAKNAK ISLAND PRE-WWII TANK FARM

LOCATED ADJACENT TO
EAST POINT ROAD
TOWNSHIP 73 SOUTH, RANGE 118 WEST
SEWARD MERIDIAN, ALASKA

SCALE:	DRAWN BY: EJC	CHECKED: EJC	SHEET
1"=100'	DATE: 10/21/12	DATE: 12/14/12	1 OF 1

APPENDIX F
Photographic Log

Photograph 1 – Well MW-1 was destroyed. View to the southeast.

Photograph 2 – Well casing and monument for destroyed MW-1.

Photograph 3 – Location of Well MW-2. View to the east.

Photograph 4 – Product on tubing at MW-2 during purging; well was not sampled. View to the north.

Photograph 5 – Close up shot of MW-3R, well is in poor condition with broken monument.

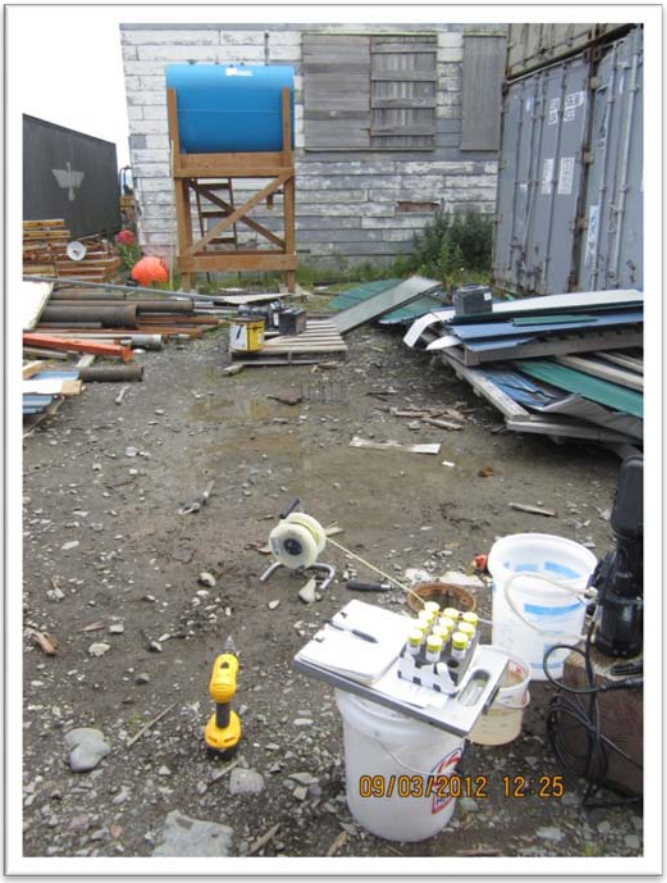
Photograph 6 – Sampling well MW-3R, view to the east.

Photograph 7 – Locating well MW-6 with a metal detector, view to the north.

Photograph 8 – Well MW-6, close up.

Photograph 9 – Sampling well MW-7R, view to the north.

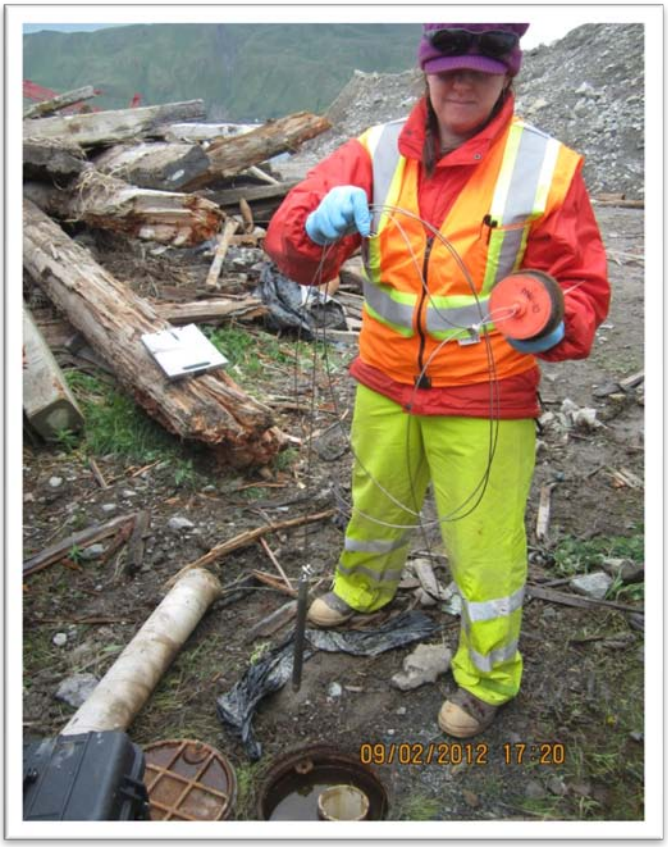
Photograph 10 – Installing transducer in well MW-7R, view to the north.



Photograph 11 – Sampling well MW-8R, view to the north.

Photograph 12 – Installing transducer in MW-8R.

Photograph 13 – Sampling well MW-10, view to the north.



Photograph 14 – Installing transducer in MW-10, view to the south.

Photograph 15 – Locating well MW-11; this well was previously a stick-up, but was cut down to a flushmount during construction activities. View to the south.

Photograph 16 – Collecting a water level measurement at well MW-11. A tall cap was installed over well due to surface water ponding, when survey was conducted for this well the elevation measured was to the top of the cap.

Photograph 17 – Sampling well MW-15, view to the west.

Photograph 18 – Installing transducer and locking cap on well MW-15, piece of PVC cut to accommodate locking cap is visible in center of photograph. View to the east.

Photograph 19 – Locating well MW-16N, view to the north.

Photograph 20 – Discovering product while attempting to measure water level at MW-16N. Product was detected at approximately 6.55 feet (with a thickness of 0.01 feet) and again at 15 feet near the bottom of the water column (total depth in well was 16 feet).

Photograph 21 – Location of well MW-17, view to the north.

Photograph 22 – Condition of well MW-17, monument broken during construction activities.

Photograph 23 – Product located on tubing in MW-17 during purging; did not sample well. View to the south.

Photograph 24 – Location of well MW-18, view to the northeast.

Photograph 25 – MW-18 had no cap and a destroyed monument. .

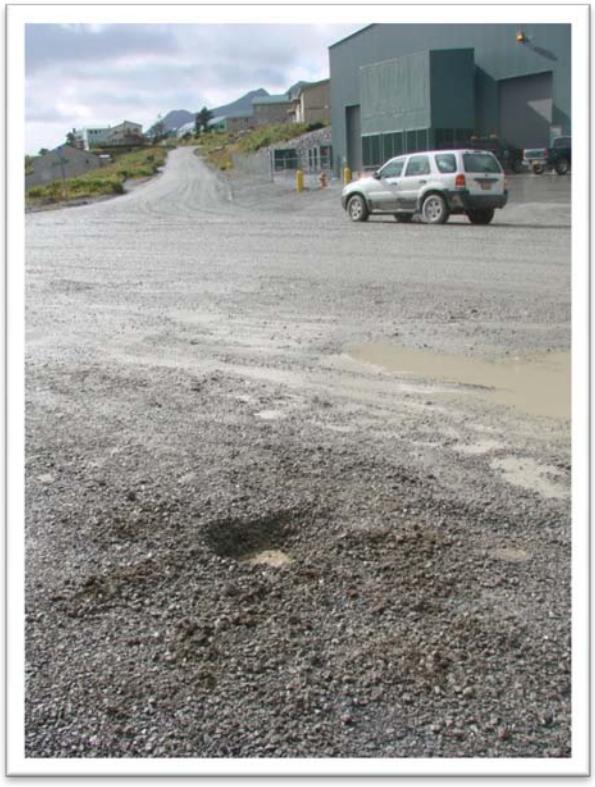
Photograph 26 – Location of well MW-19, view to the southwest.

Photograph 27 – Water level could not be obtained in MW-19 due to viscous product completely coating the probe. Depth to product was measured at approximately 12 feet.

Photograph 28 – Sampling well MW-22, view to the east.

Photograph29 – Installing transducer in well MW-22, view to the southeast.

Photograph 30 – Location of baro scout transducer, zip tied inside bunker south of well MW-15.



Photograph 31 – Well MW-23, presumed destroyed but discovered by a city employee following completion of field work. View to the west.

APPENDIX G
Waste Manifest and Disposal Certificate

*** IN CASE OF EMERGENCY CALL 1-800-424-9300 Contract# 7619 *** ✓ 95-914-AK17534 BS

NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite (12 pitch) typewriter)

NON-HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No.: EXEMPT

Manifest Document No.: 17534A

2. Page 1 of 1

3. Generator's Name and Mailing Address:
FAIRBANKS ENVIRONMENTAL
1919 INTERNATIONAL STREET
FAIRBANKS, AK 99701

Site Address: FAIRBANKS ENVIRONMENTAL
DUTCH HARBOR, AK 99692

BRANDIE

4. Generator's Phone: (907) 452-1006

5. Transporter 1 Company Name: ACE AIR CARGO

6. US EPA ID Number: AKR000200295

A. State Transporter's ID

B. Transporter 1 Phone: (907) 334-5100

7. Transporter 2 Company Name: EMERALD ALASKA, INC

8. US EPA ID Number: AKR000004184

C. State Transporter's ID

D. Transporter 2 Phone: (907) 258-1558

9. Designated Facility Name and Site Address:
EMERALD ALASKA, INC.
2020 VIKING DRIVE
ANCHORAGE, AK 99501

10. US EPA ID Number: AKR000004184

E. State Facility's ID

F. Facility's Phone: (907) 258-1558

11. WASTE DESCRIPTION	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt./Vol.
a. *MATERIAL NOT REGULATED BY D.O.T.	1	DF DM	275 gal 100 Lbs	P
b.				
c.				
d.				

GENERATOR

G. Additional Descriptions of Materials Listed Above

1)AK02906 GROUNDWATER / IDW WATER

H. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

Shipper's Certification: This is to certify that the above-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

16. GENERATOR'S CERTIFICATION: I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

Printed/Typed Name	Signature	Date: Month	Day	Year
KRISTIN M. DRENZEK		09	04	12

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date: Month	Day	Year
CHRIS DIAZ		09	04	12

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name	Signature	Date: Month	Day	Year
Shane a'Lell		9	12	12

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in Item 19.

Printed/Typed Name	Signature	Date: Month	Day	Year
Maria Stromberg		9	13	12

NON-HAZARDOUS WASTE

Tracking Log

Date Received 09/13/2012 Manifest 17534A TSDF EMERALD ALASKA, INC.

PO Number 95-914-AK17534 BS Generator FAIRBANKS ENVIRONMENTA Reported by DARYLG Account Manager

Page Line	Count	Container	Profile	Sampled	Non-Reg	Lab Pack	Container Size/Type	Oil/Fuel	Water	Antifreeze	Sludge	Solid	Storage Location	Incomplete
1	1	ANC011329P	AK02906		Y		DF55	-	25	-	-	-	PAD1	
1	2	ANC011330P	AK02906		Y		DF55	-	25	-	-	-	PAD1	
Total	**2**							**0**	**50**	**0**	**0**	**0**		

Total Gallons: 50

CERTIFICATE OF DISPOSAL/RECYCLE

GENERATOR: FAIRBANKS ENVIRONMENTAL

DUTCH HARBOR AK 99692

DISPOSAL FACILITY: EMERALD ALASKA, INC.
2020 VIKING DRIVE
ANCHORAGE AK 99501

EPA ID NUMBER: EXEMPT
MANIFEST/DOCUMENT #: 17534A
DATE OF DISPOSAL/RECYCLE: 09/13/2012

LINE	WASTE DESCRIPTION	CONTAINERS	TYPE	QUANTITY	UOM
1	GROUNDWATER / IDW WATER	1	DF55	100	P

I certify, on behalf of the above listed treatment facility, that to the best of my knowledge, the above described waste was managed in compliance with all applicable laws, regulations, permits, and licenses on the date listed above.

PREPARED BY: MARIA STERNBERG

SIGNATURE: _____ **DATE:** 9/13/2012

APPENDIX H
Response to Comments

REVIEW COMMENTS

PROJECT: Amaknak Island Pre-WWII Tank Farm
DOCUMENT: Draft 2012 Groundwater Monitoring Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	**DATE:** February 12, 2013 **REVIEWER: Meghan Dooley** **PHONE: 907-269-3056**	**Action taken on comment by:**

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn N – comment noted (if neither, explain)	CONTRACTOR RESPONSE	ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Page ES-1, Executive Summary	Paragraph 2: Site specific cleanup levels were approved in 2003 for groundwater because of a 350 determination; however Table C must be met in order to remove ICs.	A	Both Table C cleanup levels and alternative cleanup levels will be used throughout the document.	A
2.	Page 1-1, Section 1.1	The purpose of groundwater monitoring is to document the state of contamination in the groundwater and ensure that it does not adversely impact surface water.	A	The following sentence will be added to Section 1.1. *"The purpose of groundwater monitoring is to document the state of contamination in the groundwater and ensure that it does not adversely impact surface water."*	A
3.	Page 1-4, Section 1.2.4	The Decision Document was never finalized. If there are any issues with access in future monitoring events please contact ADEC immediately.	N	The decision document was finalized, but a letter of concurrence was not requested from ADEC.	D
4.	Page 1-4, Table 1-2	Please use Table C cleanup levels as the final endpoint for groundwater. Please apply throughout document including appendix A tables and figures.	A	Both Table C cleanup levels and alternative cleanup levels will be used throughout the document.	A
5.	Page 2-1, Table 2-1	MW-6 is listed in the table as being in good condition and in Figure 2-1 as decommissioned or destroyed. Groundwater elevation at W-6 is labeled on Figure 2-2. Please make consistent.	N	MW-6 was located, as indicated in both the figures and text. The symbol used for MW-6 in Figure 2-1 is described in the legend as "well located." The wells that were decommissioned or destroyed (such as MW-1) use a translucent grey (not black) symbol. The"well located" symbol will be altered to better differentiate it from the decommissioned/destroyed wells.	A

REVIEW COMMENTS

PROJECT: Amaknak Island Pre-WWII Tank Farm
DOCUMENT: Draft 2012 Groundwater Monitoring Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	**DATE:** February 12, 2013 **REVIEWER: Meghan Dooley** **PHONE: 907-269-3056**	**Action taken on comment by:**

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn N – comment noted (if neither, explain)	CONTRACTOR RESPONSE	ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
6.	Page 2-2, Section 2.1	Are there coordinates for the missing wells? The location of the missing monitoring wells should be verified and attempted to be found again.	A	Coordinates are available for the missing wells and were used during the fall 2012 field visit. Wells at the site were particularly difficult to locate as they are generally below grade in heavily trafficked parking areas. Another attempt at finding the missing wells will be conducted during the next round of groundwater sampling.	A
7.	Page 2-6, Section 2.6	Was MW-15 surveyed after it was cut down?	A	MW-15 was surveyed after it was cut down. Groundwater measurements taken before the well was cut down were adjusted accordingly. See Table A-1.	A
8.	Page 3-2, Section 3.3	Why was surface water entering MW-3R during sampling?	A	Surface water was entering MW-3R during sampling due to the lack of a well monument, a well casing below grade, and heavy precipitation.	A
9.	Figure 3-1	Please include product thickness measurements on the figure.	N	Due to the viscous nature of the product, product thicknesses were unable to be obtained in all but one of the wells. Table A-1 shows the water depth and depth to product.	A
10.	Page 5-1, Table 5-1	Please add MW-1 to list for decommissioning. Any wells found destroyed need to be properly decommissioned and reinstalled. If wells historically containing product are found to not hold product (ex MW-11, 16N, 19) a sample should be collected.	A	MW-1 will be added to the list for decommissioning. However, the party responsible for decommissioning this well has not yet been determined. The well and protective bollards were destroyed without USACE's knowledge.	A

PROJECT: Amaknak Pre-WWII Tank Farm LTM **REVIEW COMMENTS**		**DOCUMENT: 2012 Draft Groundwater Monitoring Report**		
DATE: 14 Feb 2013		**REVIEWER: Tom Reed**		
Item No.	**Location (page, par., sen.)**	**COMMENTS**	**Review** **A – Comment Accepted** **W – Comment Withdrawn** **N - Noted**	**Contractor Response**
1.	Sect. 1.2.3 1st para	USACE also has performed Remedial Action at the site	A	The first sentence will be changed to *"Since 1990, the USACE has conducted several site investigations (SIs), remedial investigations (RIs), interim removal actions (*IRAs) *and remedial actions at the Pre-WWII Tank Farm."*
2.	Page 1-3 Table 1-1	Please add in table for the summers of 2010 and 2011 USACE funded and scheduled Monitoring, but was not allowed access to the site.	A	Two additional rows will be added for the 2010 and 2011 years. Text in the table will say "*USACE funded and scheduled monitoring but was not allowed access to the site."*
3.	Section 2.1 MW-1 discussion	Please add that the MW and protective bollards were not removed by USACE or with the knowledge of USACE. Also, it does not appear that ADEC was notified of the well's removal. It is not in scope of this contract to decommission the well. USACE position is the responsible party for decommissioning this well has not yet been determined. Also groundwater aquifer in the vicinity of MW-1 appears to be outside the PRE-WWII Tank Farm aquifer and therefore this loss of this well does not significantly affect the LTM.	A	The following will be added before the third sentence of the first paragraph: *"The monitoring well and protective bollards were not removed by USACE or with the knowledge of USACE."* The following will be added to the end of the first paragraph: "*The party responsible for decommissioning this well has not yet been identified. MW-1 was located outside the Pre-WWII tank farm aquifer and its loss does not significantly affect the long term monitoring."*
4.	Section2.2, 2nd para in section	Was the well survey before or after the well was cut? If after a correction should be made to the height.	A	MW-15 was surveyed after it was cut down. The following sentence will be added to the second paragraph. *"The survey was conducted after MW-15 had been cut down."*