

**UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA**

ENVIRONMENTAL RESTORATION PROGRAM

ST703 REMOVAL ACTION REPORT

JANUARY 2002

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ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFB	Air Force Base
ASR	Alaska Soil Recycling
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, xylenes
DRO	diesel-range organics
EPA	U.S. Environmental Protection Agency
GRO	gasoline-range organics
mg/kg	milligram per kilogram
mg/L	milligram per liter
PAHs	polynuclear aromatic hydrocarbons
PID	photoionization detector
POL	petroleum, oil, and lubricant
ppm	parts per million
SERA	State-Elmendorf Environmental Restoration Agreement
TERC	Total Environmental Restoration Contract
USACE	U.S. Army Corps of Engineers
USAED	U.S. Army Engineer District, Alaska
USAF	U.S. Air Force
UST	underground storage tank

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1.0 INTRODUCTION

This report summarizes the removal of petroleum, oil, and lubricants (POL) impacted soil and collection of soil confirmation samples at Site ST703 on Elmendorf Air Force Base (AFB), Alaska, during the summer of 2001. The work was performed in support of the U.S. Air Force (USAF) 3rd Civil Engineering Squadron under the U.S. Army Engineer District, Alaska, (USAED) Total Environmental Restoration Contract (TERC), Contract No. DACA 85-95-D-0018, Task Order No. 12.

1.1 PROJECT BACKGROUND

Site ST703 is included in the State-Elmendorf Environmental Restoration Agreement (SERA) program. This cooperative agreement between the USAF and Alaska Department of Environmental Conservation (ADEC) addresses Elmendorf AFB's solid waste, underground storage tank (UST), and POL spill program areas. The SERA requires that Elmendorf AFB perform necessary assessments, monitoring, remediation, and closure of these applicable sites, as well as new sites identified subsequent to the issuance of the SERA.

Elmendorf AFB sites were investigated in phases under the SERA program. Each phase defines a group of sites that were addressed during a specific time or phase of the ongoing program and does not refer to the different types of investigations or steps in a specific process. In some cases, the succeeding SERA investigations were performed to fill data gaps identified in previous SERA investigations. Site ST703 was investigated under SERA Phase VII in 1998. A summary of the SERA investigation results is provided in Section 1.2 and complete results are in the SERA Phase VII ST703 Release Investigation Report (USAF 1999).

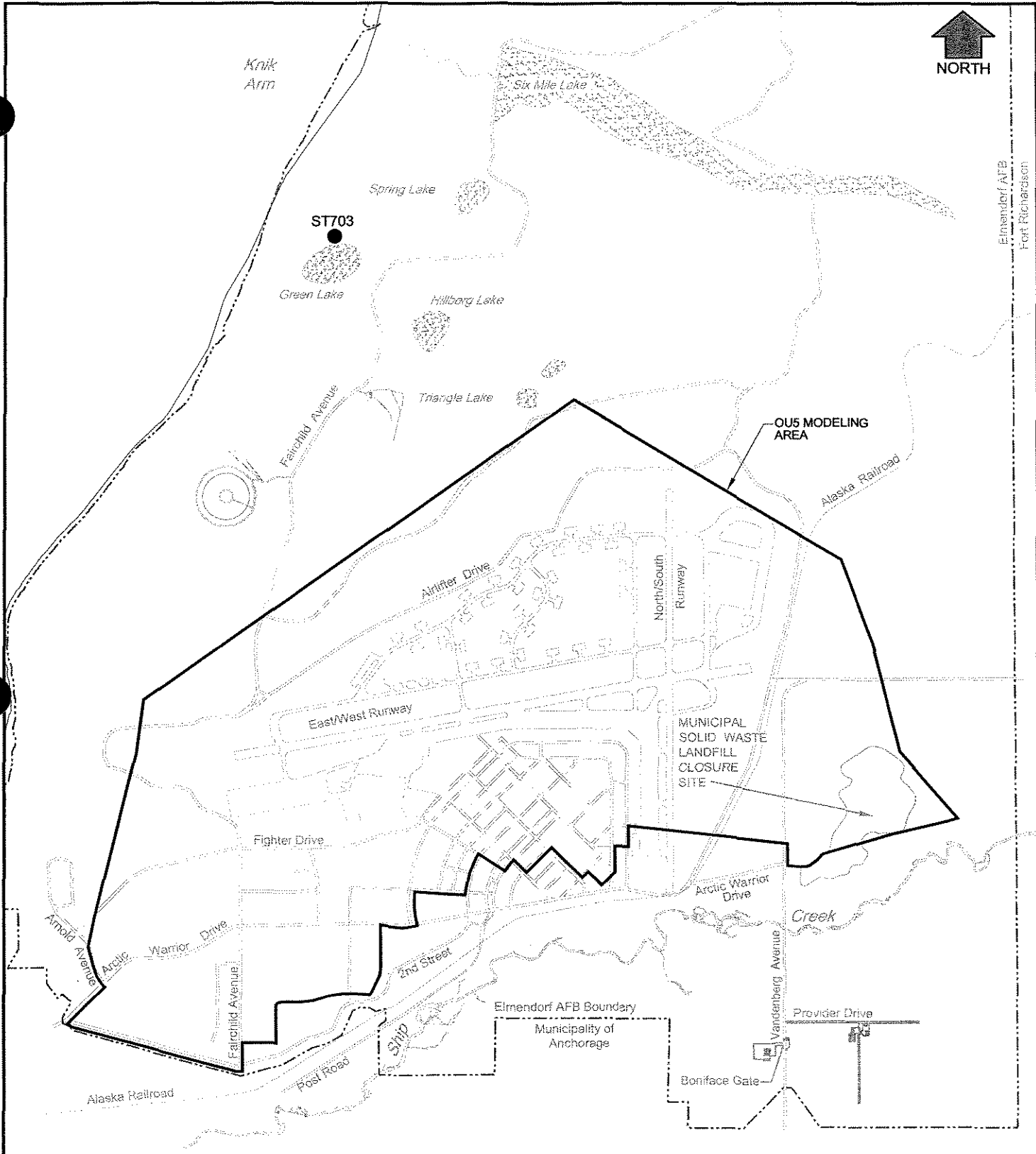
The SERA investigation report and site history were reviewed in spring 2001 to evaluate site conditions and develop corrective actions for the site if required. Site ST703 was recommended for excavation of shallow contamination. Shallow contamination is defined as contamination between 0 to 15 feet below ground surface (bgs). Additional information on the evaluation and recommendation can be found in the Corrective Action Plan, SERA IV, V, VII, and VIII Sites (USAF 2001).

1.2 SITE BACKGROUND

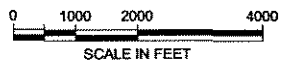
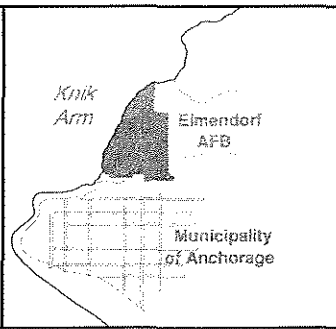
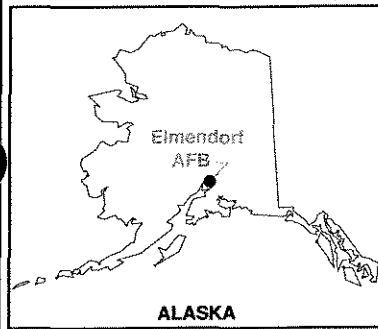
Building 26282 (former Building #52-651) was a log cabin located approximately 40 feet from Green Lake (see Figure 1-1). A 1,000-gallon single-walled UST, STMP476, was removed from the northwest side of the building in July 1997. The tank held heating oil for the building. The UST removal excavation was approximately 15 feet long by 9 feet wide by 6 feet deep. Piping between the tank and building was also removed at the time of tank removal (USAF 1998). The depth to groundwater is 10.5 feet bgs. Locally, groundwater is presumed to flow towards Green Lake.

During the UST removal, five samples and one duplicate sample were collected from the excavation. Samples were analyzed for diesel-range organics (DRO) and benzene, toluene, ethylbenzene, xylenes (BTEX) only. DRO concentrations in the excavation ranged from 202 milligram per kilogram (mg/kg) at a location near the piping run (approximately 4 feet bgs) to 9,150 mg/kg at a depth of 6 feet bgs near the bottom center of the tank. Benzene was detected at 0.159 mg/kg in the sample collected from the west side of the south wall and 0.127 mg/kg in the sample collected near the fill end. It was noted that an intermittent clay layer was present at approximately 6 feet bgs (USAF 1998).

The SERA release investigation was conducted in 1998; during this investigation, five borings were drilled and two monitoring wells were installed at Site ST703 to delineate the extent of soil and groundwater contamination. The soil borings were advanced in the vicinity of the former UST excavation. The monitoring wells were located hydraulically downgradient on the south side of the cabin between the former UST location and Green Lake. Maximum concentrations in soil samples were DRO at 11,000 mg/kg, gasoline-range organics (GRO) at 294 mg/kg, and benzene at 0.16 mg/kg. Maximum concentrations were detected in boring 703BH04 drilled between the former tank location and the cabin. Concentrations of petroleum hydrocarbons decreased with depth and were lower in samples collected from the clay layer, indicating that the clay layer may be acting as a confining unit. Groundwater samples collected from the groundwater monitoring wells did not have significant contaminant levels; naphthalene was the only compound detected at a maximum of 0.0002




Elmendorf AFB
Fort Richardson



ST703 LOCATION MAP

ELMENDORF AFB, ALASKA

PROJECT MANAGER: M. Pogany	FILE NAME: Report Sites	DATE: Jan. 28, 02
	LAYOUT TAB: ST703 Loc	FIGURE NO.: 1-1
	FILE LOCATION: Elmendorf \ 05M31201 \ Report Sites	

milligrams per liter (mg/L) (USAF 1999). Summary data from the SERA investigation is provided in Appendix A for reference.

1.3 REMOVAL SUMMARY

The removal effort included excavation, transportation and thermal treatment of soil, field screening, confirmation sampling, and site restoration.

Prior to the 2001 excavation activities, Building 26282 was removed. A total of 249 tons of soil were excavated and transported to Alaska Soil Recycling (ASR) in Anchorage, Alaska, for thermal treatment. A photoionization detector (PID) was used to evaluate the horizontal and vertical extent of the soil contamination. Seven confirmation samples were collected from the floor of the excavation. The site was backfilled with clean fill material. A more detailed explanation of the work performed is provided in Section 2.0.

2.0 FIELD ACTIVITIES

Field activities were conducted at the site as described below. The project schedule is presented in Table 2-1.

**Table 2-1
Project Schedule**

TASK	DATES
Removal of overburden	12 July 2001
Field screening and soil excavation and transportation to the thermal treatment facility	12 – 13 July 2001
Confirmation soil sample collection for laboratory analysis	13 July 2001
Excavation of additional soil in one area and collection of one additional confirmation sample	23 July 2001
Excavation backfilling and site restoration	23 – 24 July 2001

2.1 SOIL EXCAVATION

Prior to initiating activity at the site, the USAF obtained approval from ADEC to transport the POL contaminated soil to ASR for thermal treatment, and a “Base Civil Engineer Work Clearance Request” form (Utility Clearance) was completed and approved for work at the site.

Soil excavation was initiated near the approximate location of soil boring 703BH04, where the highest contamination levels were detected during the SERA investigation, and continued based on visible staining and PID field screening. As soil was removed from the excavation, direct PID readings were obtained by placing the tip of the PID probe adjacent to the freshly exposed soil (typically in the excavator bucket) to obtain a gross indication of volatile fuel contamination in the soil. Soil was also field screened in accordance with the UST Procedures Manual (ADEC 1999), Section 4.4.2 for headspace PID readings. These readings were obtained by partially filling resealable freezer bags with soil and allowing the vapors to volatilize in the headspace. The samples were heated by placing the freezer bags in a hot water bath for approximately 5 to 10 minutes. The tip of the PID was then placed inside the bags to collect a headspace reading.

Soil near the surface with no visible staining and PID readings of 0 parts per million (ppm) was stockpiled onsite as clean material to be used as backfill. Approximately 130 cubic yards were stockpiled for use as backfill. This material was sampled to confirm that it met 18 *Alaska Administrative Code* (AAC) 75 (ADEC 2000a) requirements for use as backfill. All other excavated material was transported to ASR for thermal treatment. Soil excavation continued until field screening readings and visual observation indicated that contamination had been removed along the north, east, and west sidewalls. Excavation continued to the south until a wood utilidor surrounded by clay was encountered at 6 feet bgs parallel to the lake and PID readings were less than 2 ppm along the utilidor. It appeared that the utilidor and the clay layer limited migration towards the lake. Soil excavation continued in a vertical direction slightly into the clay layer encountered between 5 to 6 feet bgs. Excavation was terminated in the clay layer to limit vertical migration of contaminants through a more permeable layer below. Excavation was limited to 6 to 12 inches into the clay layer as a precaution due to the proximity to Green Lake because the bottom of the excavation was at or below the water elevation of Green Lake.

Six confirmation samples were collected from the bottom of the excavation. Analytical results indicated that contamination remained above 18 AAC 75 (ADEC 2000a) Method Two cleanup criteria at three locations. Additional soil was excavated from the area of highest remaining contamination (sampling location EL-A200804) to 6 feet bgs, and one additional sample was collected.

Petroleum-impacted wood debris was encountered in the excavation. This material was transported to the Anchorage Regional Landfill for disposal. See Appendix B for waste disposal documentation.

Soil removal resulted in an excavation with maximum dimensions of 50 feet long, 25 feet wide, and 6.5 feet deep. A total of 249 tons of soil were excavated and transported to ASR for thermal treatment. All soil from the 2001 SERA removal actions was consolidated at ASR. Treatment of all soil was completed in September 2001 and confirmation of treatment is provided in Appendix B. Treated soil was returned to the Elmendorf AFB Municipal Solid Waste Landfill Closure Site in November 2001.

2.2 CONFIRMATION SAMPLE COLLECTION

Seven confirmation samples were collected from the excavation and two confirmation samples were collected from the stockpiled soil. ADEC Underground Storage Tanks regulation 18 AAC 78 (ADEC 2000b) was used to determine the number of samples. Regulation 18 AAC 78.090 requires that at least two samples be collected for the first 250 square feet of excavated pit area and one sample collected for each additional 250 square feet of excavated pit area. The excavated pit area at ST703 was approximately 1,250 square feet. Sample locations are identified in Figure 2-1. The samples were analyzed for the compounds and associated analytical methods listed in Table 2-2. Analytical results are presented in Section 3.0.

**Table 2-2
Confirmation Sample Analytical Methods**

Compound	Method	Frequency
GRO	AK101E	All samples except EL-A201201
DRO	AK102E	100 percent of samples
BTEX	SW8260B	All samples except EL-A201201

Notes:
BTEX = benzene, toluene, ethylbenzene, and xylenes
DRO = diesel-range organics
GRO = gasoline-range organics

Sample analyses were selected based on the UST Procedures Manual (ADEC 1999), Table 2 for diesel fuel, SERA investigation analytical results, and ADEC regulations. Four samples, including one from the location of highest contaminant concentrations, were analyzed for polynuclear aromatic hydrocarbons (PAHs) during the SERA investigation. The samples contained low concentrations of some PAHs but contaminants were detected below 18 AAC 75 Method Two cleanup criteria. One sample, 703BH04, from 5 feet bgs had a method reporting limit of 1.8 mg/kg which is greater than the cleanup level for benzo-a-pyrene and dibenzo-a,h-anthracene of 1 mg/kg. Since these constituents were not detected at the method reporting limit and all other PAH levels were below cleanup levels, PAHs were not considered a contaminant of concern. The PAH data collected during the SERA investigation

BUILDING
26288



LIMITS OF EXCAVATION

DRIVEWAY

EL-A200802 (5' bgs)	
GRO = 36.3	
DRO = 369	
B = ND (0.0188)	
E = ND (0.0361)	
T = 0.026 J	
X = 0.0238 J	

APPROXIMATE LOCATION
OF SERA SOIL BORING
703BH04

EL-A200805 (6.5' bgs)	
GRO = ND (3.86)	
DRO = 11.5	
B = ND (0.0201)	
E = ND (0.0386)	
T = 0.0347 J	
X = 0.0266 J	

EL-A200803 (5.5' bgs)	
GRO = 11.6	
DRO = 25.4	
B = ND (0.02)	
E = ND (0.0386)	
T = 0.0285 J	
X = 0.0239 J	

EL-A200801 (6' bgs)	
GRO = 41.3	
DRO = 45.7	
B = ND (0.0196)	
E = ND (0.0377)	
T = 0.0279 J	
X = 0.026 J	

703WL01

703WL02

EL-A200806 (6.5' bgs)	
GRO = 15.6	
DRO = 378	
B = ND (0.0145)	
E = 0.0145 J	
T = 0.0253 J	
X = 0.02 J	

EL-A200804 (5.5' bgs)	
GRO = 287	
DRO = 6,080	
B = 0.0159 J	
E = 0.149	
T = 0.121	
X = 0.3046	

EL-A201201 (6' bgs)	
GRO = -	
DRO = 4,850	
B = -	
E = -	
T = -	
X = -	

BUILDING
26278

GREEN LAKE

NOTES :

ALL UNITS IN mg/kg
CLEANUP CRITERIA EXCEEDANCES IN BOLD
DEPTH TO GROUNDWATER = 10.5' bgs

- bgs = BELOW GROUND SURFACE
- J = RESULT IS ESTIMATED
- GRO = GASOLINE-RANGE ORGANICS
- DRO = DIESEL-RANGE ORGANICS
- B = BENZENE
- E = ETHYLBENZENE
- T = TOLUENE
- X = TOTAL XYLENES
- () = LABORATORY REPORTING LIMIT
- ND = NOT DETECTED
- = NOT ANALYZED

LEGEND

- x SOIL SAMPLE LOCATION
- ⊕ SERA MONITORING WELL LOCATION
- ⊕ SERA SOIL BORING LOCATION



ST703 SITE MAP

ELMENDORF AFB, ALASKA

PROJECT MANAGER: M. Pogany	FILE NAME: Report Sites	DATE: Jan. 31, 02
LAYOUT TAB: ST703		FIGURE NO.: 2-1
FILE LOCATION: Elmendorf \05M31201 Report Sites		



will be used to evaluate this site under 18 AAC 75 Method Two. A summary of SERA analytical results is provided in Appendix A.

2.3 EXCAVATION BACKFILLING AND SITE RESTORATION

After receipt of sample results confirming that the maximum volume of contaminated soil had been removed, the excavation was backfilled, regraded, and seeded. Backfill material was transported from a fill source location on Elmendorf AFB; sieve analysis and modified proctor results for the material are provided in Appendix C. The backfill material was placed in 12-inch lifts and compacted with the excavator bucket and by passing equipment over the area. A 6-inch layer of topsoil and Curlex blanket was placed over the area. The site was reseeded with a mixture developed for the local climate.

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3.0 ANALYTICAL RESULTS

The confirmation soil samples collected from the excavation were submitted to CT&E Environmental Services, Inc., for analysis. A trip blank was included in the cooler and analyzed for GRO and BTEX. Quality control samples were collected at a frequency of 10 percent of all 2001 SERA site removal action samples. A data quality assessment is included as Appendix D.

The analytical results for the confirmation samples and trip blank are presented in Table 3-1, and confirmation sample results are shown in Figure 2-1. Analytical results were compared to 18 AAC 75 (ADEC 2000a) Method Two regulatory criteria (18 AAC 75.341, Method Two, Tables B-1 and B-2, Under 40 Inch Zone, most stringent criteria). Three of the six initial samples collected within the excavation exceeded the DRO regulatory criteria of 250 mg/kg. Two of the samples had DRO at approximately 375 mg/kg and one (EL-A200804) had **DRO at 6,080 mg/kg**. Additional soil was excavated at soil sample location EL-A200804 following receipt of analytical results and an additional sample (EL-A201201) was collected at this location. Excavation was limited to 6 feet bgs to prevent excavation through the clay layer. This sample was only analyzed for DRO and contained a DRO concentration of 4,850 mg/kg, exceeding the DRO regulatory criteria of 250 mg/kg. This can be compared to the DRO concentration of Sample EL-A200804, which had a DRO concentration of 6,080 mg/kg, just 0.5 foot above Sample EL-A201201. All other contaminants were below regulatory criteria.

Analytical results from samples (EL-A200807 and EL-A200808) collected from the west and east stockpiles met 18 AAC 75 (ADEC 2000a) Method One, Category A cleanup criteria for GRO, DRO, and BTEX. This soil was used as backfill.

The analytical data are included in Appendix D.

Table 3-1
Confirmation Sample Analytical Results
Site ST703

				Location Sample ID Depth BGS	north end near sidewall EL-A200801 6 feet	north area of excavation in center EL-A200802 5 feet	northeast area of excavation EL-A200803 5.5 feet	east center of excavation EL-A200804 5.5 feet	west center of excavation EL-A200805 6.5 feet
Analyte	Method	Units	Cleanup Criteria ¹						
Gasoline Range Organics	AK101	mg/kg	300		41.3 [3.77]	36.3 [3.61]	11.6 [3.86]	287 [27.4]	ND [3.86]
Diesel Range Organics	AK102	mg/kg	250		45.7 [11.4]	369 [11]	25.4 [11.2]	6080 [110]	11.5 [11.5]
Benzene	SW8260B	mg/kg	0.02		ND [0.0196]	ND [0.0188]	ND [0.02]	0.0159 [0.0285] J	ND [0.0201]
Ethylbenzene	SW8260B	mg/kg	5.5		ND [0.0377]	ND [0.0361]	ND [0.0386]	0.149 [0.0548]	ND [0.0386]
Toluene	SW8260B	mg/kg	5.4		0.0279 [0.0377] J	0.026 [0.0361] J	0.0285 [0.0386] J	0.121 [0.0548]	0.0347 [0.0386] J
Total Xylenes	SW8260B	mg/kg	78		0.026 [0.0377] J	0.0238 [0.0361] J	0.0239 [0.0386] J	0.3046 [0.0548]	0.0266 [0.0386] J
				Location Sample ID Depth BGS	south end near sidewall EL-A200806 6.5 feet	west stockpile EL-A200807 NA	east stockpile EL-A200808 NA	Location of EL-A200804 EL-A201201 6 feet	Trip Blank EL-A200705 NA
Analyte	Method	Units	Cleanup Criteria ¹						
Gasoline Range Organics	AK101	mg/kg	300		15.6 [2.78]	ND [3.68]	ND [3.3]	-	ND [2.6]
Diesel Range Organics	AK102	mg/kg	250		378 [11.4]	6.78 [11.1] J	ND [10.4]	4850 [144]	-
Benzene	SW8260B	mg/kg	0.02		ND [0.0145]	ND [0.0191]	ND [0.0172]	-	ND [0.0135]
Ethylbenzene	SW8260B	mg/kg	5.5		0.0145 [0.0278] J	ND [0.0368]	ND [0.033]	-	ND [0.026]
Toluene	SW8260B	mg/kg	5.4		0.0253 [0.0278] J	0.0298 [0.0368] J	0.0264 [0.033] J	-	ND [0.026]
Total Xylenes	SW8260B	mg/kg	78		0.02 [0.0278] J	0.0269 [0.0368] J	0.0201 [0.033] J	-	ND [0.026]

Notes:

¹ ADEC regulatory criteria based on 18 AAC 75 Method Two (18 AAC 75.341, Method Two, Tables B1 and B2, Under 40-inch Zone, Most Stringent Criteria).

Highlighted values exceed 18 AAC 75 Method Two Cleanup Criteria

BGS = below ground surface

J = Result is below laboratory reporting limit.

mg/kg = milligrams per kilogram

ND = Analyte not detected

ug/kg = micrograms per kilogram

[] = laboratory reporting limit

- = Not Analyzed

4.0 CONCLUSIONS

The objective of the removal action at Site ST703 was to reduce risk by excavating soil with contaminant concentrations above regulatory criteria, as outlined in 18 AAC 75 (ADEC 2000a). Sample results from the SERA investigation and this removal action confirm that the site meets 18 AAC 75.340 and 75.341 Method Two cleanup criteria for GRO, BTEX, and PAHs. DRO results at three of six sampling locations exceeded the regulatory criteria. Contaminated soil was excavated and removed to the maximum extent possible. Excavation was limited to 6 to 12 inches into the clay layer to protect the integrity of the clay layer.

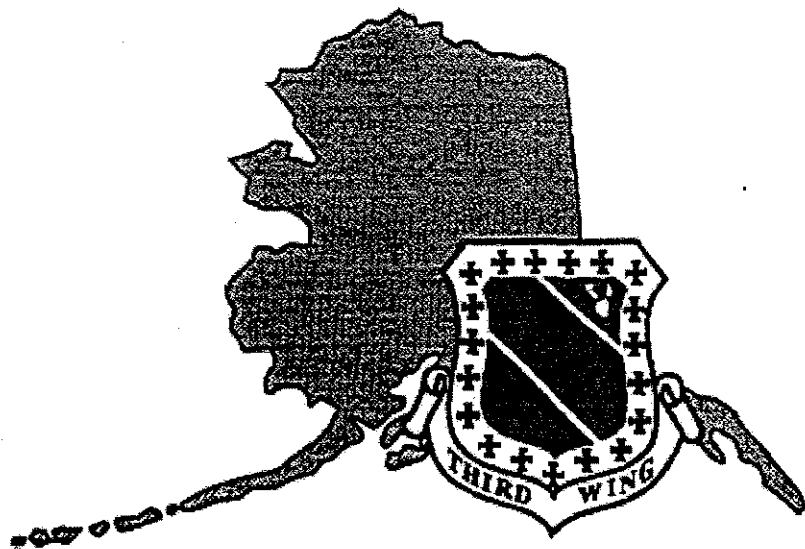
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APPENDIX A
SERA Investigation Results



**UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA**

ENVIRONMENTAL QUALITY PROGRAM

**STMP 476
SERA PHASE VII ST 703
RELEASE INVESTIGATION REPORT
FINAL DRAFT**

FEBRUARY 1999

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3.0 RESULTS

3.1 1998 SERA VII Field Program

3.1.1 Soil Boring/Monitoring Well Installation

On June 30, July 1, and July 2, 1998, a series of five soil borings (703BH01 through 703BH05) and two monitoring wells (703WL01 and 703WL02) were drilled at Green Lake cabin. Figure 3-1 shows the location of soil borings. The five soil borings were located in the vicinity of the former tank excavation. The two wells were located in (presumed) hydraulically downgradient locations on the south side of the cabin. Of the two wells, the one on the east side (703WL02) was shifted west because of an on-site septic system that could not be accurately located in the field.

The five soil borings located in the excavation were sampled continuously (every 2 feet) to depths ranging from 6 to 12 feet. A possible confining unit was encountered at approximately 5 feet and was logged as clay and silt. ATH screening results indicated that contaminants were not migrating through the silt unit. A petroleum odor was noted on samples collected as deep as 6 feet in borings 703BH01, 703BH02, 703BH03, and 703BH04. Field observations did not indicate the presence of significant amounts of petroleum constituents in 703BH05. All borings were terminated while still in the silt unit to prevent vertical migration of contaminants in case a more permeable unit was found to be present below it.

Monitoring well 703WL01 was sampled continuously from grade to a depth of 12 feet. A petroleum odor was noted in the drill cuttings from approximately 8 feet bgs. There had been no recovery in the sample driven from 6 to 8 feet, and there was no indication of petroleum in the 8 to 10 foot sample. The boring was terminated at 10 feet and an offset hole was drilled in order to determine if there was truly petroleum present at approximately 8 feet bgs. The 6 to 8 foot sample was collected in the offset hole and submitted for laboratory analysis. The offset hole was advanced to 12 feet and completed as the monitoring well; soils were predominantly silt and sand. The water level was measured at approximately 10.5 feet bgs while drilling; the well screen was placed from 6 to 16 feet bgs.

Monitoring well 703WL02 was sampled continuously starting at 4 feet bgs to a total depth of 12 feet bgs. The only ATH result above background was the sample collected from 6 to 8 feet, which had a result of 6 PID units. This sample was also noted as having a slight petroleum odor. Water was measured while drilling at approximately 13 feet bgs. The well was screened from 6 to 16 feet bgs.

Soil samples were submitted to the laboratory for DRO, GRO, and BTEX analysis. Select samples were also submitted for PAH analysis. During the work planning stage, ADEC and

EAFB agreed that analysis for RRO would not be required at ST703 because the former UST was known to have held diesel fuel.

3.1.2 Well Development and Sampling

Monitoring well 703WL01 and 703WL02 were developed over a 2 day period as the wells were purged dry and the groundwater was slow to recover (less than 80% recovery in 3 hours). The wells were purged dry three times and considered developed.

Due to the slow groundwater recovery rate, the on-site wells were purged dry once, allowed to recover, and then samples were collected for laboratory analysis of DRO, GRO/BTEX, and PAHs.

3.2 Discussion of Findings

3.2.1 Soil Findings

Soil sample results indicate that petroleum hydrocarbons have impacted soils at ST703 in excess of Method One Level B and Method Two chemical-specific cleanup standards. Figure 3-1 shows soil locations and results, and Appendix C contains all sample results.

Following the Method Two soil cleanup standards (outlined in Section 2.8.3), the exposure pathway with the most stringent values was chosen for comparison with analytical results. Because, in most cases, the migration to groundwater exposure pathway has the most stringent cleanup values, sample results are compared to values for this exposure pathway unless otherwise noted. Table 2-3 shows cleanup standards under the migration to groundwater exposure pathway for typical petroleum hydrocarbon chemicals of concern (COCs) under the SERA program.

DRO was found in boreholes 703BH01, 703BH02, and 703BH04 in excess of the ADEC Method Two cleanup standard of 250 mg/Kg, at depths ranging from 4.5 to 6 feet bgs. These three borings are on the east and south sides of the former UST location. **The highest concentration of DRO detected, 11,100 mg/Kg, was measured in 703BH04 at 5 feet bgs.** In all three borings, DRO concentrations decreased with depth; it is likely that the clay and silt layer first observed at approximately 5 feet bgs is deterring further vertical migration of DRO.

Benzene was also detected in excess of the Method Two cleanup standard, 0.02 mg/Kg, in borings 703BH02 and 703BH04. **The highest benzene concentration measured was 0.258 mg/Kg in 703BH04 at 10.5 feet bgs.** GRO, ethylbenzene, toluene, and xylene were not detected above their respective Method Two cleanup standards.

52-668
WELL #24

DRIVEWAY

GENERAL
GROUNDWATER
FLOW
DIRECTION

APPROXIMATE
LIMITS OF EXCAVATION
AS VISUALLY IDENTIFIED
DURING 1998 RELEASE
INVESTIGATION

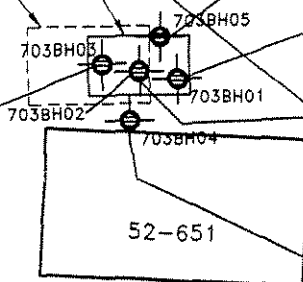
LIMITS OF EXCAVATION
AS SHOWN IN TANK
REMOVAL REPORT

Depth	6'
DRO	11.1
GRO	(1.70) U
B	(0.0426) U
T	(0.0426) U
E	(0.0426) U
X	(0.0426) U

Depth	5'	10'
DRO	285	7.75
GRO	14.3	(1.38) U
B	(0.0284) U	(0.0346) U
T	0.138	(0.0346) U
E	0.0372	(0.0346) U
X	0.1707	0.2168

Depth	2.5'
DRO	37.8
GRO	(1.14) U
B	(0.0285) U
T	(0.0285) U
E	(0.0285) U
X	(0.0285) U

Depth	4.5'	4.5' Dup.	6'
DRO	5680	4730	20.5
GRO	92.1	NA	(3.76) U
B	0.0401	NA	(0.094) U
T	0.35	NA	(0.094) U
E	0.804	NA	(0.094) U
X	3.23	NA	(0.094) U



Depth	6'
DRO	9.17 b
GRO	(2.45) U
B	(0.0613) U
T	(0.0613) U
E	(0.0613) U
X	(0.0613) U



Depth	7.5'
DRO	10.9 b
GRO	(2.85) U
B	(0.0712) U
T	(0.0712) U
E	(0.0712) U
X	(0.0712) U

Depth	5'	5' Dup.	6'	10.5'
DRO	11100	10300	3350	6.55 b
GRO	294	294	134	6.15
B	0.16	0.0718	(0.0518) U	0.258
T	0.254	1.78	0.0896	0.574
E	1.8	1.23	1.42	0.211
X	5.29	6.4	2.29	0.968

GREEN LAKE



0 15 30
APPROX. SCALE IN FEET

LEGEND

- 1998 SOIL BORING LOCATION
- 1998 MONITORING WELL LOCATION

NOTE: ANALYTICAL SOIL RESULTS
REPORTED AS mg/Kg

- UST = UNDERGROUND STORAGE TANK
- DRO = DIESEL RANGE ORGANICS
- GRO = GASOLINE RANGE ORGANICS
- B = BENZENE
- T = TOLUENE
- E = ETHYLBENZENE
- X = TOTAL XYLENES
- U = UNDETECTED AT LABORATORY MRL
- NA = NOT ANALYZED
- b = ANALYTE FOUND IN BLANK ASSOCIATED WITH SAMPLE

SOURCE: SOURCE: ELMENDORF G7-5 1995

3 CES/CEVQ
SERA VII
ELMENDORF AFB, ALASKA

FIGURE 3-1
ST703, BLDG. 52-651
1998 SOIL BORING LOCATIONS
AND SAMPLE RESULTS

DATE: 1/22/99	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 9000-168/ 703SB898
C/SC: 1:30	DISK: 26/98	PM: E. HEDFIELD	CHECKED: E. HEDFIELD
			PROJECT: FXSB 95701123

Two soil borings were installed farther downgradient (703WL01 and 703WL02), between the cabin and the shore of Green Lake to determine if petroleum hydrocarbons are present on the south side of the cabin. Although low levels of DRO were detected in soil samples in these two borings (9.17 and 10.9 mg/Kg DRO), DRO levels were well below the ADEC Method Two cleanup standard. GRO and BTEX compounds were not detected in these samples.

Four soil samples (those containing the highest PID readings) were also analyzed for PAHs; although low concentrations of some PAHs were detected in the soil samples, the concentrations detected are below the ADEC Method Two soil cleanup standards. This data will support the development of an alternate cleanup level (ACL) for DRO in soil.

When comparing benzene results to the ADEC Method Two cleanup standard, it is important to note that original data quality objectives for this project were based on the ADEC UST Matrix Score Sheet cleanup standards applicable at the time (18 AAC 78.315). The sensitivity goal for benzene was specified at 0.050 mg/Kg (USAF 1998b), which met the UST Matrix Score Sheet Level A cleanup standard for benzene of 0.1 mg/Kg. However, the newly promulgated Method Two soil cleanup standard for benzene of 0.02 mg/Kg is lower than the method reporting limit specified to the analytical laboratory. When significant levels of DRO and GRO were reported in project samples, dilutions were necessary to accurately report the detected BTEX compounds. These dilutions often elevated the detection limit for the BTEX compounds to greater than the Method Two benzene standard. Therefore, in cases where benzene was reported as not detected at a MRL greater than 0.02 mg/Kg, the benzene results are indeterminate when determining whether the Method Two benzene standard was exceeded.

Qualitative interpretation of DRO chromatograms show that samples from 703BH01 and 703BH02 exhibit the characteristics of a weathered middle distillate product, while samples from 703BH04 exhibit the characteristics of a middle distillate product. The Data Assessment Report, in Appendix A, provides further details on the qualitative interpretation.

A silt/clay layer was encountered at approximately 5 to 6 feet below grade on the north side of the cabin (in the tank excavation) and on the south side of the cabin. The samples collected from 2 to 6 feet bgs in BH01 were saturated; no other samples had significant free water present. Concentrations of petroleum hydrocarbons were lower in samples collected from the clay layer, indicating that the unit may be acting as a confining unit. Any water that perches above this unit would presumably migrate towards Green Lake. Figures 3-3 and 3-4 are cross section diagrams of ST703. Appendix B contains boring logs for ST703.

The lateral extent of soil contamination on the south and southeast sides of the former UST has not been fully defined. It is possible that contamination extends underneath the cabin; however, the presence of the cabin prevents further sampling immediately south of existing borings. The soils north and west of the former UST have been adequately characterized, as have the soils on the south side of the cabin.

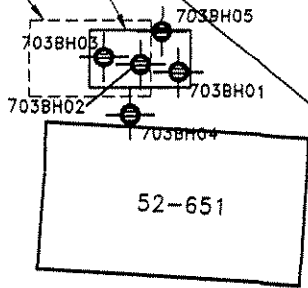
52-668
WELL #24

DRIVEWAY

GENERAL
GROUNDWATER
FLOW
DIRECTION

APPROXIMATE
LIMITS OF EXCAVATION
AS VISUALLY IDENTIFIED
DURING 1998 RELEASE
INVESTIGATION

LIMITS OF EXCAVATION
AS SHOWN IN TANK
REMOVAL REPORT



DRO	(0.102) U
GRO	(0.04) U
B	(0.001) U
T	(0.001) U
E	(0.001) U
X	(0.001) U

703WL01

703WL02

DRO	(0.11) U
GRO	(0.04) U
B	(0.001) U
T	(0.001) U
E	(0.001) U
X	(0.001) U

GREEN LAKE



0 15 30

APPROX. SCALE IN FEET

LEGEND

- 1998 SOIL BORING LOCATION
- 1998 MONITORING WELL LOCATION

NOTE: ANALYTICAL WATER RESULTS
REPORTED AS mg/L

- UST = UNDERGROUND STORAGE TANK
- DRO = DIESEL RANGE ORGANICS
- GRO = GASOLINE RANGE ORGANICS
- B = BENZENE
- T = TOLUENE
- E = ETHYLBENZENE
- X = TOTAL XYLENES
- U = UNDETECTED AT LABORATORY MRL

SOURCE: SOURCE: ELMENDORF G7-5 1995

3 CES/CEVQ
SERA VII
ELMENDORF AFB, ALASKA

FIGURE 3-2

ST703, BLDG. 52-651
1998 GROUNDWATER SAMPLE RESULTS

DATE: 1/22/99	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 9000-168/ 703GW898
C/SC: 1:30	DISK: 2698	PM: E. HEDFIELD	CHECKED: E. HEDFIELD
			PROJECT: FXSB 95701123

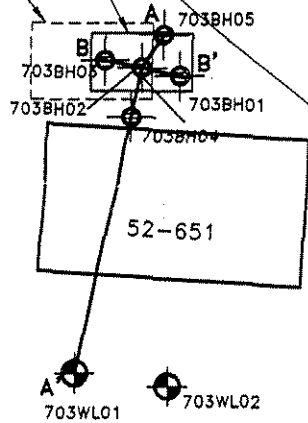
52-668
WELL #24

DRIVEWAY

GENERAL
GROUNDWATER
FLOW
DIRECTION

APPROXIMATE
LIMITS OF EXCAVATION
AS VISUALLY IDENTIFIED
DURING 1998 RELEASE
INVESTIGATION

LIMITS OF EXCAVATION
AS SHOWN IN TANK
REMOVAL REPORT





GREEN LAKE



0 15 30

APPROX. SCALE IN FEET

LEGEND

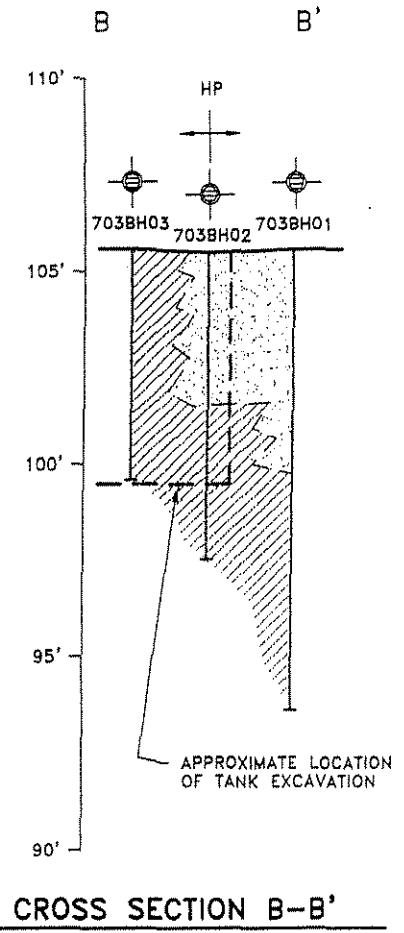
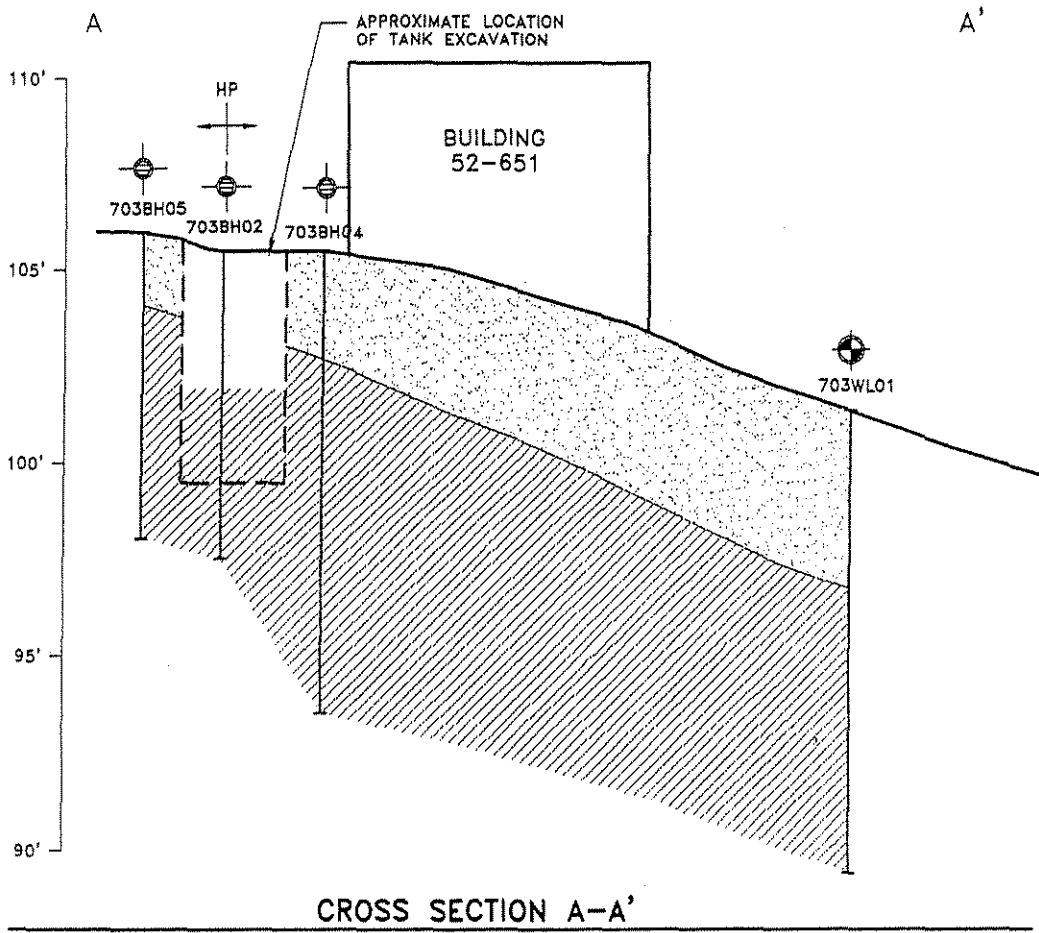
-  1998 SOIL BORING LOCATION
-  1998 MONITORING WELL LOCATION

SOURCE: SOURCE: ELMENDORF G7-5 1995



3 CES/CEVQ
SERA VII
ELMENDORF AFB, ALASKA

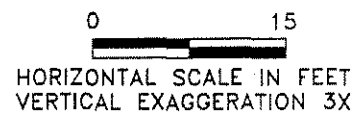
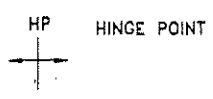
FIGURE 3-3
ST703, BLDG. 52-651
SITE MAP SHOWING
CROSS SECTIONS

DATE: 1/13/99	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 9000-168/ 70398
C/SC: 1:30	DISK: 26/98	PM: E. HEDFIELD	CHECKED: E. HEDFIELD
			PROJECT: FXSB 95701123



LEGEND

-  SANDS AND GRAVELS (<12% FINES)
-  SILT/CLAY, SAND AND GRAVELS W/>12% FINES



DRAWING: 9000-168/
703CS98

DRAWN: SR

C/SC: 1:15

DISK: 26/98

DATE: 10/09/98

CHECK: J.S.

FIGURE 3-4
ST703, BLDG. 52-651
CROSS SECTIONS A-A' AND B-B'

3 CES/CEVQ
SERA VII
ELMENDORF AFB, ALASKA
PROJECT FXSB 95701123

APPENDIX D

**Data Quality Assessment
Analytical Data Package**

Sample Summary Table

Location	Sample ID	Laboratory	Lab Sample ID	Collection Date	Matrix	Secondary Lab	Secondary Lab Sample ID
JE01ELM-ST703SP01-01SO	EL-A200801	CTE	1014345006	7/13/01	SO		
JE01ELM-ST703SP02-01SO	EL-A200802	CTE	1014345007	7/13/01	SO		
JE01ELM-ST703SP03-01SO	EL-A200803	CTE	1014345008	7/13/01	SO		
JE01ELM-ST703SP04-01SO	EL-A200804	CTE	1014345009	7/13/01	SO		
JE01ELM-ST703SP05-01SO	EL-A200805	CTE	1014345010	7/13/01	SO		
JE01ELM-ST703SP06-01SO	EL-A200806	CTE	1014345011	7/13/01	SO		
JE01ELM-ST703SP07-01SO	EL-A200807	CTE	1014345012	7/13/01	SO		
JE01ELM-ST703SP8	EL-A200808	CTE	1014345013	7/13/01	SO		
JE01ELM-ST703SP04-02SO	EL-A201201	CTE	1014792001	7/23/01	SO	-	-
	EL-A201402	CTE	1014792002	7/28/01	SO	CAS	K2105461-001
	EL-A201402	CTE	1014792003	7/28/01	SO	CAS	K2105461-002

DATA QUALITY ASSESSMENT

Sample collection, handling, analysis and reporting procedures were followed as defined in the Field Sampling Plan (FSP) and Quality Assurance Project Plans (QAPP). Most data acceptance criteria were met with the few exceptions defined in this section.

The analytical data was provided by the laboratory in both hardcopy and electronic formats. One hundred percent of the analytical hardcopy data and fifty percent of the electronic data was reviewed. The primary laboratory, CT&E Environmental Services, Inc. (CT&E), supported the analytical requirements of the 2001 field effort.

The completeness check and electronic data review was done by Jacobs. This process included a review of the analytical methodology, chain of custody (COC) and sample receipt records, sample holding times, laboratory and field blank results, analytical reporting limits, surrogates, laboratory control samples, calibrations, matrix spikes and duplicates, run logs, and extraction logs. The data were reviewed against the Quality Assurance Project Plan and EPA *National Functional Guidelines* (EPA 1994, 1999).

The quality assurance project plan (QAPP), laboratory acceptance criteria and the Environmental Protection Agency (EPA) *National Functional Guidelines* (EPA 1994, 1999) were referenced by Jacobs to assess the data usability and apply validation qualifiers to the summary tables. The Jacobs project chemist performed a completeness check on the hardcopy data and reviewed the hardcopy and electronic data to evaluate comparability and accuracy. The review process did not include verification of calculations.

The analytical data quality objectives (DQO) for this field investigation shall be met when the quality of the sample data meet precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS) requirements as defined in the field sampling plan (FSP), QAPP, laboratory quality assurance project plan (LQAPP), and analytical methods. These DQO were evaluated by reviewing the following QA parameters and criteria:

- PRECISION
 - Matrix Spike Duplicates (MSD); and
 - Field Duplicates.

- ACCURACY
 - Calibrations - initial and continuing; acceptance, frequency;
 - Surrogates - recovery, frequency;
 - Lab Control Samples/Spikes (LCS);
 - Matrix Spikes (MS);
 - Retention Times;
 - Relative Response Factors (RRFs); Relative Standard Deviation (%RSD);
 - Method Blanks;
 - Tune Criteria gas chromatography/mass spectroscopy (GC/MS) - acceptability, frequency; and
 - Internal Standards (GC/MS) - acceptability, frequency.

- REPRESENTATIVENESS
 - Sample Chain-of-Custody;
 - Holding Times and Preservation; and
 - Work Plans.

- COMPARABILITY
 - Standard Operating Procedures (SOPs); and
 - Established analytical methods.

- COMPLETENESS
 - Samples (field, QA, and QC);
 - Data Packages (forms, runlogs, extraction logs, etc.); and
 - Ninety-five percent completeness.

- SENSITIVITY
 - Analytical laboratory reporting limits

All reported data within this package should be considered valid unless otherwise noted and may be biased (qualifications noted in the body of this report). The qualifiers used to flag data are defined as follows:

- “U” - synonymous with “ND” for nondetect; not detected above the reporting limit (practical quantitation limit); final numerical result becomes the reporting limit flagged with “U.”
- “J” - analyte was positively identified, but numerical value of concentration is approximate due to compromised quality control or inherent inability to analyze the sample (e.g. matrix effects).
- “UJ” - the analyte was not reported above the practical quantitation limit, but the reported quantitation limit is approximate (due to compromised quality control or inherent inability to analyze the sample).
- “UR” - the analyte was not detected above the reporting limit, but sample results were rejected due to significant deficiencies in quality control(s) or inherent ability to analyze the sample (e.g. matrix effects).

The qualifiers listed above, or “flags”, are hyphenated in the report to reflect the basic rationale behind the qualification (e.g. “J-S”). The following qualifiers were used in the text of this report to indicate which QA/QC protocols were not met:

- S - surrogate recovery;
- L - lab control sample;
- C - calibration;
- T - instrument 12-hour tuning criteria;
- M - matrix spike and/or spike duplicate;
- I - internal standard;
- B - method blank;
- H - holding times;
- P - incorrect or inadequate preservation methods;
- E - value exceeds instrument calibration range;
- TE – sample cooler temperatures; and
- UB/RL – although the analyte was detected, the result should be considered nondetected at the reporting limit or reported value due to potential laboratory contamination.

DATA QUALITY SUMMARY

In general, the overall quality of the data was acceptable. The data quality was determined as acceptable, estimated, or rejected. Acceptable data are associated with QC data that meet all QC criteria or with QC samples that did not meet QC criteria but data quality objectives were not affected. Estimated (J) results are considered inaccurate due to a bias created by matrix interference or QC acceptance criteria which were not met. Rejected data are not usable.

All Chain-of-Custody (COC) sample identification numbers include EL (Elmendorf – various sites), -A (Alaska), four numbers (COC number) followed by two additional numbers that identify the samples collected in sequence that are specific to the location and analytical suite of analyses (i.e. EL-A200801). This sample appears on COC number 2008, and is the first sample collected for GRO. For ease in referring to the results tables and readability of this report, the last six digits of the sample identification number will be used to identify each sample (i.e. 200801 would identify EL-A200801 found on COC # 2008). The original COC is on file in the Jacobs Anchorage office with the original data package. An extra dash was occasionally used on this project to separate the sample number from the COC number (e.g. EL-A2008-01) and will remain unchanged in this text as it appears in the analytical summary table, data tables, and COCs.

The term “positive result(s)” is used to identify all analytes that are detected above the laboratory reporting limit. The term “nondetected” refers to results that are less than the laboratory reporting limit and are therefore not reported by the laboratory. “All results” refers to both nondetected and positive results. Details of the evaluation are provided in the following section by method and include the associated samples and analytes:

Gasoline Range Organics (GRO) AK101. Overall, the quality of the data are acceptable with the following qualifications:

- Holding Times and Sample Handling: All holding time and sample handling criteria were met.
- Method Blanks: GRO was not detected in the method blanks.
- Reporting Limits: All minimum reporting limit requirements were met.
- Surrogates: Surrogate recoveries exceeded recovery limits for samples EL-A200801, EL-A200802, EL-A200803, and EL-A200804 due to matrix interference. Sample results are considered estimated (J-S).
- LCS: All acceptance criteria were met.
- Calibration: All acceptance criteria were met.
- MS/MSD: All acceptance criteria were met.

Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX) by SW8260B. Overall, the quality of the data are acceptable with the following qualifications:

- Holding Times and Sample Handling: All holding time and sample handling criteria were met.
- Method Blanks: Target analytes were not detected in the method blanks; therefore, data were not qualified based on this criteria.
- Reporting Limits: All minimum reporting limit requirements were met.
- Surrogates: All acceptance criteria were met.
- LCS: All acceptance criteria were met.
- Calibration: All acceptance criteria were met.
- MS/MSD: All acceptance criteria were met.

Diesel Range/Residual Range Organics (DRO/RRO) AK102/103. Overall, the quality of the data are acceptable with the following qualifications:

- Holding Times and Sample Handling: All hold time criteria were met.
- Method Blanks: Target analytes were not detected in the method blanks; therefore, data were not qualified based on this criteria.
- Reporting Limits: All minimum reporting limit requirements were met.
- Surrogates: Surrogate recoveries in EL-A200802, EL-A200803, EL-A200806 and EL-A201201 exceeded limits due to matrix interference. Surrogate recovery limits were exceeded in sample EL-A200804 due to dilution. The results in these samples are considered estimated (J-S).
- LCS: All acceptance criteria were met.
- Calibration: All acceptance criteria were met.
- MS/MSD: All acceptance criteria were met

Total Organic Carbon (TOC) SW9060

. Overall, the quality of the data are acceptable with the following qualifications:

- Holding Times and Sample Handling: All hold time criteria were met.
- Method Blanks: Target analytes were not detected in the method blanks; therefore, data were not qualified based on this criteria.
- Reporting Limits: All minimum reporting limit requirements were met.
- Surrogates: All acceptance criteria were met.
- LCS: All acceptance criteria were met
- Calibration: All acceptance criteria were met.
- MS/MSD: All acceptance criteria were met.

Considering these noncompliance issues the data are still considered usable. The overall project completeness goal of 95 percent was met.

Location	E01ELM-ST703SP01-01SO	JE01ELM-ST703SP02-01SO	JE01ELM-ST703SP03-01SO	JE01ELM-ST703SP04-01SO	JE01ELM-ST703SP05-01SO
Sample ID	EL-A200801	EL-A200802	EL-A200803	EL-A200804	EL-A200805
Laboratory	CTE	CTE	CTE	CTE	CTE
Lab Sample ID	1014345006	1014345007	1014345008	1014345009	1014345010
Collection Date	7/13/01	7/13/01	7/13/01	7/13/01	7/13/01
Matrix	SO	SO	SO	SO	SO

Analyte	Method	Units										
Total Solids	A2540G	PERCENT	90.4	[0]	91.3	[0]	92.4	[0]	90	[0]	85.7	[0]
Gasoline Range Organics	AK101	MG/KG	41.3	[3.77]J-S	36.3	[3.61]J-S	11.6	[3.86]J-S	287	[27.4]J-S	ND	[3.86]
Diesel Range Organics	AK102	MG/KG	45.7	[11.4]J-S	369	[11]J-S	25.4	[11.2]J-S	6080	[110]J-S	11.5	[11.5]
Total Organic Carbon (TOC) SW9060		MG/KG										
Total Organic Carbon (TOC) D4129		PERCENT										
Benzene	SW8260B	MG/KG	ND	[0.0196]	ND	[0.0188]	ND	[0.02]	0.0159	[0.0285]J	ND	[0.0201]
Ethylbenzene	SW8260B	MG/KG	ND	[0.0377]	ND	[0.0361]	ND	[0.0386]	0.149	[0.0548]	ND	[0.0386]
Toluene	SW8260B	MG/KG	0.0279	[0.0377]J	0.026	[0.0361]J	0.0285	[0.0386]J	0.121	[0.0548]	0.0347	[0.0386]J
Total Xylenes	SW8260B	MG/KG	0.026	[0.0377]J	0.0238	[0.0361]J	0.0239	[0.0386]J	0.3046	[0.0548]	0.0266	[0.0386]J

Notes:
 J= Result is below laboratory reporting limits and is considered estimated (J)
 ND= Analyte not detected
 [] = laboratory reporting limit

Location	JE01ELM-ST703SP06-01SO	JE01ELM-ST703SP07-01SO	JE01ELM-ST703SP8	JE01ELM-ST703SP04-02SO			
Sample ID	EL-A200806	EL-A200807	EL-A200808	EL-A201201	EL-A2014 01/1014792002	EL-A2014 02/1014792003	
Laboratory	CTE	CTE	CTE	CTE	CASK	CASK	
Lab Sample ID	1014345011	1014345012	1014345013	1014792001	K210546101	K210546102	
Collection Date	7/13/01	7/13/01	7/13/01	7/23/01	7/28/01	7/28/01	
Matrix	SO	SO	SO	SO	SO	SO	

Analyte	Method	Units								
Total Solids	A2540G	PERCENT	90.2	[0]	91	[0]	95.2	[0]	87.2	[0]
Gasoline Range Organics	AK101	MG/KG	15.6	[2.78]	ND	[3.68]	ND	[3.3]	-	-
Diesel Range Organics	AK102	MG/KG	378	[11.4]	6.78	[11.1] J	ND	[10.4]	4850	[144] J-S
Total Organic Carbon (TOC) SW9060		MG/KG							-	-
Total Organic Carbon (TOC) D4129		PERCENT							2800	[500]
Benzene	SW8260B	MG/KG	ND	[0.0145]	ND	[0.0191]	ND	[0.0172]	-	-
Ethylbenzene	SW8260B	MG/KG	0.0145	[0.0278] J	ND	[0.0368]	ND	[0.033]	-	-
Toluene	SW8260B	MG/KG	0.0253	[0.0278] J	0.0298	[0.0368] J	0.0264	[0.033] J	-	-
Total Xylenes	SW8260B	MG/KG	0.02	[0.0278] J	0.0269	[0.0368] J	0.0201	[0.033] J	-	-

Notes:
 J= Result is less than laboratory reporting limits and is considered estimated (J)
 ND= Analyte is nondetect
 [] = laboratory reporting limit



4300 B STREET, SUITE 600, ANCHORAGE, ALASKA 99503-5922
TELEPHONE (907) 563-3322 FAX (907) 563-3320

CHAIN OF CUSTODY RECORD

USE A BALLPOINT PEN, BLACK INK, AND PRESS FIRMLY. INSTRUCTIONS ARE ON THE BACK *Page 1 of 2*

PROJECT NAME: <i>Elmendorf SERA sites</i>					LABORATORY NAME & ADDRESS: <i>CT&E Environmental Services</i>				
PROJECT NUMBER: <i>05m31201</i>					<i>200 W. Kotze Drive</i>				
WBS CODE:			CONTRACT / D.O. No. <i>Anchorage, AK 99518</i>						
(Jesse Container Control #)	COLLECTION		DATE	TIME	METHOD	TEMP	PRES	ANALYSIS REQUESTED	LABORATORY
SAMPLE NUMBER	DATE	TIME							
<i>6</i> EL-A2008 01	<i>7/13/01</i>	<i>1545</i>	<i>WW</i>	<i>1</i>	<i>4oz. glass Septum</i>	<i>methanol, 40C</i>	<i>SO</i>	<i>AK101, SW82608 (BTEX)</i>	
EL-A2008 01	<i>7/13/01</i>	<i>1545</i>	<i>WW</i>	<i>1</i>	<i>8oz. glass Amber</i>	<i>40C</i>	<i>SO</i>	<i>AK102</i>	
<i>7</i> EL-A2008 02	<i>7/13/01</i>	<i>1555</i>	<i>WW</i>	<i>1</i>	<i>4oz. glass Septum</i>	<i>methanol, 40C</i>	<i>SO</i>	<i>AK101, SW82608 (BTEX)</i>	
EL-A2008 02	<i>7/13/01</i>	<i>1555</i>	<i>WW</i>	<i>1</i>	<i>8oz. glass Amber</i>	<i>40C</i>	<i>SO</i>	<i>AK102</i>	
<i>8</i> EL-A2008 03	<i>7/13/01</i>	<i>1600</i>	<i>WW</i>	<i>1</i>	<i>4oz. glass Septum</i>	<i>methanol, 40C</i>	<i>SO</i>	<i>AK101, SW82608 (BTEX)</i>	
EL-A2008 03	<i>7/13/01</i>	<i>1600</i>	<i>WW</i>	<i>1</i>	<i>8oz. glass Amber</i>	<i>40C</i>	<i>SO</i>	<i>AK102</i>	
<i>9</i> EL-A2008 04	<i>7/13/01</i>	<i>1610</i>	<i>WW</i>	<i>1</i>	<i>4oz. glass Septum</i>	<i>methanol, 40C</i>	<i>SO</i>	<i>AK101, SW82608 (BTEX)</i>	
EL-A2008 04	<i>7/13/01</i>	<i>1610</i>	<i>WW</i>	<i>1</i>	<i>8oz. glass Amber</i>	<i>40C</i>	<i>SO</i>	<i>AK102</i>	
<i>10</i> EL-A2008 05	<i>7/13/01</i>	<i>1620</i>	<i>WW</i>	<i>1</i>	<i>4oz. glass Septum</i>	<i>methanol, 40C</i>	<i>SO</i>	<i>AK101, SW82608 (BTEX)</i>	
COMMENTS:									
COLLECTED & RELEASED BY: <i>L. W. M.</i> DATE: <i>7/13/01</i> TIME: <i>17:05</i> TURNAROUND TIME: <i>7 day TAT</i>									
RECEIVED BY: <i>Weatherhead</i> DATE: <i>7/13/01</i> TIME: <i>17:15</i> RELINQUISHED BY: DATE: TIME:									
RECORD RETURNED BY: DATE: TIME: SHIPPING NUMBER:									

**1014345
RUSH**



4300 B STREET, SUITE 800, ANCHORAGE, ALASKA 99503-5922
 TELEPHONE (907) 563-3322 FAX (907) 563-3320

CHAIN OF CUSTODY RECORD

USE A BALLPOINT PEN, BLACK INK, AND PRESS FIRMLY. INSTRUCTIONS ARE ON THE BACK *Page 2 of 2*

PROJECT NAME: <i>Elmendorf SERA SITES</i>				LABORATORY NAME & ADDRESS: <i>CT&E Environmental Services</i>				
PROJECT NUMBER: <i>05m31201</i>				<i>200 W. Potter Drive</i>				
WBS CODE:		CONTRACT / D.O. No.		<i>Anchorage, AK 99518</i>				
(Jesse-Container Control #)	COLLECTION		DATE	TIME	METHOD	VOL	SD	ANALYSIS
	SAMPLE NUMBER	DATE						
<i>10</i>	<i>EL-A2008 05</i>	<i>7/13/01 1620</i>	<i>WN</i>	<i>1</i>	<i>802 glass amber</i>	<i>40C</i>	<i>SD</i>	<i>AK102</i>
<i>11</i>	<i>EL-A2008 06</i>	<i>7/13/01 1625</i>	<i>WN</i>	<i>1</i>	<i>402 glass septum</i>	<i>method, 40C</i>	<i>SD</i>	<i>AK101, SW8260B (BTEX)</i>
<i>12</i>	<i>EL-A2008 06</i>	<i>7/13/01 1625</i>	<i>NW</i>	<i>1</i>	<i>802 glass amber septum</i>	<i>40C</i>	<i>SD</i>	<i>AK102</i>
<i>13</i>	<i>EL-A2008 07</i>	<i>7/13/01 1635</i>	<i>WN</i>	<i>1</i>	<i>402 glass septum</i>	<i>method, 40C</i>	<i>SD</i>	<i>AK101, SW8260B (BTEX)</i>
	<i>EL-A2008 07</i>	<i>7/13/01 1635</i>	<i>WN</i>	<i>1</i>	<i>802 glass amber septum</i>	<i>40C</i>	<i>SD</i>	<i>AK102</i>
<i>14</i>	<i>EL-A2008 08</i>	<i>7/13/01 1645</i>	<i>WN</i>	<i>1</i>	<i>402 glass septum</i>	<i>method, 40C</i>	<i>SD</i>	<i>AK101, SW8260B (BTEX)</i>
	<i>EL-A2008 08</i>	<i>7/13/01 1645</i>	<i>NW</i>	<i>1</i>	<i>802 glass amber</i>	<i>40C</i>	<i>SD</i>	<i>AK102</i>
COMMENTS:								
COLLECTED & RELEASED BY <i>W. E. Wall</i>			DATE <i>7/13/01</i>	TIME <i>17:05</i>	TURNAROUND TIME <i>7 day TAT</i>			
RECEIVED BY <i>W. E. Wall</i>			DATE <i>7/13/01</i>	TIME <i>17:05</i>	RELINQUISHED BY			DATE <i>1/1</i>
RECORD RETURNED BY			DATE <i>1/1</i>	TIME	SHIPPING NUMBER:			

1014345
RUSH

Case Narrative

Customer: JACOBSE

Jacobs Engineering Group

Project: 1014345

Elmendorf SERA Sites 05M31201

NPDL WO: NA

1014345001 PS

DRO/RRO - Unknown hydrocarbon with several peaks.

DRO/RRO - Surrogate recoveries are outside controls due to matrix interference.

1014345002 PS

DRO/RRO - Unknown hydrocarbon with several peaks.

DRO - Surrogate recovery is outside controls due to matrix interference.

1014345003 PS

DRO/RRO - Pattern consistent with weathered middle distillate.

DRO/RRO - Surrogate recoveries are outside controls due to matrix interference.

GRO/BTEX - Surrogate recovery is biased high due to matrix interference. Results are not affected.

1014345006 PS

DRO - Pattern consistent with weathered middle distillate.

GRO/BTEX - Surrogate recovery is biased high due to matrix interference. Results are not affected.

1014345007 PS

DRO - Pattern consistent with weathered middle distillate.

DRO - Surrogate recovery is outside controls due to matrix interference.

GRO/BTEX - Surrogate recovery is biased high due to matrix interference. Results are not affected.

1014345008 PS

DRO - Pattern consistent with weathered middle distillate.

DRO - Surrogate recovery is outside controls due to matrix interference.

1014345009 PS

DRO - Pattern consistent with weathered middle distillate.

DRO - Surrogate recovery is outside controls due to matrix interference.

GRO/BTEX - Surrogate recovery is biased high due to matrix interference. Results are not affected.

1014345010 PS

DRO - Unknown hydrocarbon with several peaks.

1014345011 PS

DRO - Pattern consistent with weathered middle distillate.

DRO - Surrogate recovery is outside controls due to matrix interference.

1014345014 BMS

DRO/RRO - Surrogate/s are biased high due to interference by method required petroleum spike.

PAHSIM - MS recovery for Acenaphthylene, Fluoranthene, Pyrene and Benzo(b)fluoranthene is outside QC goals.

The LCS/LCSD met all recovery and RPD goals. The results are not significantly affected.

8260 - Surrogate 4-Bromofluorobenzene is biased high and did not meet QC recovery goals. All internal standards met QC recovery goals.

RRO - MS does not meet recovery goals. Sample may not be homogeneous.

Case Narrative

Customer: JACOBSE

Jacobs Engineering Group

Project: 1014345

Elmendorf SERA Sites 05M31201

NPDL WO: NA

1014345015 BMSD

DRO/RRO - Surrogate/s are biased high due to interference by method required petroleum spike.

PAHSIM - MS recovery for Acenaphthylene, Fluoranthene, Pyrene and Benzo(b)fluoranthene is outside QC goals. The LCS/LCSD met all recovery and RPD goals. The results are not significantly affected.

PAHSIM - RPD for Acenaphthylene is outside QC goals. The LCS/LCSD met all recovery and RPD goals. The results are not significantly affected.

8260 - Surrogate 4-Bromofluorobenzene is biased high and did not meet QC recovery goals. All internal standards met QC recovery goals.

378244 LCS

DRO/RRO LCS/LCSD - Surrogate/s are biased high due to interference by method required petroleum spike.

379273 LCS

DRO/RRO LCS/LCSD - Surrogate/s are biased high due to interference by method required petroleum spike.

378245 LCSD

DRO/RRO LCS/LCSD - Surrogate/s are biased high due to interference by method required petroleum spike.

379274 LCSD

DRO/RRO LCS/LCSD - Surrogate/s are biased high due to interference by method required petroleum spike.

379167 CCV

PAHSIM - CCV recovery for Phenanthrene (biased high) and Anthracene (biased low) is outside QC goals. These compounds were not reported under this CCV. The results are not significantly affected.



CT&E Ref.# 1014345006
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M31201
 Client Sample ID EL-A200801
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 07/27/2001 20:43
 Collected Date/Time 07/13/2001 15:45
 Received Date/Time 07/13/2001 17:45
 Technical Director Stephen C. Ede

Released By *Heather Hall*

Sample Remarks:

DRO/RRO - Pattern consistent with weathered middle distillate.
 GRO/BTEX - Surrogate recovery is biased high due to matrix interference. Results are not affected.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Solids								
Total Solids	90.4	0.00	%	SM20 2540G			07/17/01	DMR
Volatile Fuels Department								
Gasoline Range Organics	41.3	3.77	mg/Kg	AK101 GRO		07/13/01	07/22/01	RMV
Surrogates								
1,4-Difluorobenzene <Surr>	87.4		%	AK101 GRO	60-120	07/13/01	07/22/01	RMV
4-Bromofluorobenzene <Surr>	394	!	%	AK101 GRO	50-150	07/13/01	07/22/01	RMV
Semivolatile Organic Fuels Department								
Diesel Range Organics	45.7	11.4	mg/Kg	AK102 DRO		07/16/01	07/17/01	MCM
Surrogates								
5a Androstane <surr>	118		%	AK102 DRO	50-150	07/16/01	07/17/01	MCM
Volatile Gas Chromatography/Mass Spectroscopy								
Benzene	0.0196 U	0.0196	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Toluene	0.0279	0.0196	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Ethylbenzene	0.0196 U	0.0196	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
P & M -Xylene	0.0260	0.0196	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
o-Xylene	0.0196 U	0.0196	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Surrogates								
1,2-Dichloroethane-D4 <surr>	94		%	BTEX by SW8260B	74-133	07/13/01	07/19/01	GMD
Toluene-d8 <surr>	96.9		%	BTEX by SW8260B	78-134	07/13/01	07/19/01	GMD
4-Bromofluorobenzene <Surr>	82.5		%	BTEX by SW8260B	72-141	07/13/01	07/19/01	GMD



CT&E Ref.# 1014345006
Client Name Jacobs Engineering Group
Project Name/# Elmendorf SERA Sites 05M31201
Client Sample ID EL-A200801
Matrix Soil/Solid
Ordered By

Client PO#
Printed Date/Time 07/27/2001 20:43
Collected Date/Time 07/13/2001 15:45
Received Date/Time 07/13/2001 17:45
Technical Director Stephen C. Ede

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
<u>Volatile Gas Chromatography/Mass Spectroscopy</u>								
Dibromofluoromethane <sur>	101		%	BTEX by SW8260B	78-128	07/13/01	07/19/01	GMD



CT&E Ref.# 1014345007
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M31201
 Client Sample ID EL-A200802
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 07/27/2001 20:43
 Collected Date/Time 07/13/2001 15:55
 Received Date/Time 07/13/2001 17:45
 Technical Director Stephen C. Ede

Released By *Deborah Hall*

Sample Remarks:

DRO/RRO - Pattern consistent with weathered middle distillate.
 DRO/RRO - Surrogate recoveries are outside controls due to matrix interference.
 GRO/BTEX - Surrogate recovery is biased high due to matrix interference. Results are not affected.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Solids								
Total Solids	91.3	0.00	%	SM20 2540G			07/17/01	DMR
Volatile Fuels Department								
Gasoline Range Organics	36.3	3.61	mg/Kg	AK101 GRO		07/13/01	07/22/01	
Surrogates								
1,4-Difluorobenzene <Surr>	86.9		%	AK101 GRO	60-120	07/13/01	07/22/01	RMV
4-Bromofluorobenzene <Surr>	234	!	%	AK101 GRO	50-150	07/13/01	07/22/01	RMV
Semivolatile Organic Fuels Department								
Diesel Range Organics	369	11.0	mg/Kg	AK102 DRO		07/16/01	07/17/01	MCM
Surrogates								
5a Androstane <surr>	241	!	%	AK102 DRO	50-150	07/16/01	07/17/01	MCM
Volatile Gas Chromatography/Mass Spectroscopy								
Benzene	0.0188 U	0.0188	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Toluene	0.0260	0.0188	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Ethylbenzene	0.0188 U	0.0188	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
P & M -Xylene	0.0238	0.0188	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
o-Xylene	0.0188 U	0.0188	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Surrogates								
1,2-Dichloroethane-D4 <surr>	93.9		%	BTEX by SW8260B	74-133	07/13/01	07/19/01	
Toluene-d8 <surr>	99		%	BTEX by SW8260B	78-134	07/13/01	07/19/01	GMD



CT&E Ref.# 1014345007
Client Name Jacobs Engineering Group
Project Name/# Elmendorf SERA Sites 05M31201
Client Sample ID EL-A200802
Matrix Soil/Solid
Ordered By

Client PO#
Printed Date/Time 07/27/2001 20:43
Collected Date/Time 07/13/2001 15:55
Received Date/Time 07/13/2001 17:45
Technical Director Stephen C. Ede

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
<u>Volatile Gas Chromatography/Mass Spectroscopy</u>								
4-Bromofluorobenzene <Surr>	85.2		%	BTEX by SW8260B	72-141	07/13/01	07/19/01	GMD
Dibromofluoromethane <surr>	98.8		%	BTEX by SW8260B	78-128	07/13/01	07/19/01	GMD



CT&E Ref.# 1014345008
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M31201
 Client Sample ID EL-A200803
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 07/27/2001 20:43
 Collected Date/Time 07/13/2001 16:00
 Received Date/Time 07/13/2001 17:45
 Technical Director Stephen C. Ede

Released By *Maathey Hall*

Sample Remarks:

DRO - Pattern consistent with weathered middle distillate.
 DRO - Surrogate recoveries outside controls due to matrix interference.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Solids								
Total Solids	92.4	0.00	%	SM20 2540G			07/17/01	DMR
Volatile Fuels Department								
Gasoline Range Organics	11.6	3.86	mg/Kg	AK101 GRO		07/13/01	07/22/01	RMV
Surrogates								
1,4-Difluorobenzene <Surr>	86.4		%	AK101 GRO	60-120	07/13/01	07/22/01	RMV
4-Bromofluorobenzene <Surr>	62.1		%	AK101 GRO	50-150	07/13/01	07/22/01	RMV
Semivolatile Organic Fuels Department								
Diesel Range Organics	25.4	11.2	mg/Kg	AK102 DRO		07/16/01	07/17/01	MCM
Surrogates								
5a Androstane <surr>	152	!	%	AK102 DRO	50-150	07/16/01	07/17/01	MCM
Volatile Gas Chromatography/Mass Spectroscopy								
Benzene	0.0200 U	0.0200	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Toluene	0.0285	0.0200	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Ethylbenzene	0.0200 U	0.0200	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
P & M -Xylene	0.0239	0.0200	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
o-Xylene	0.0200 U	0.0200	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Surrogates								
1,2-Dichloroethane-D4 <surr>	96.4		%	BTEX by SW8260B	74-133	07/13/01	07/19/01	GMD
Toluene-d8 <surr>	95.3		%	BTEX by SW8260B	78-134	07/13/01	07/19/01	GMD
4-Bromofluorobenzene <Surr>	81		%	BTEX by SW8260B	72-141	07/13/01	07/19/01	GMD



CT&E Ref.# 1014345008
Client Name Jacobs Engineering Group
Project Name/# Elmendorf SERA Sites 05M31201
Client Sample ID EL-A200803
Matrix Soil/Solid
Ordered By

Client PO#
Printed Date/Time 07/27/2001 20:43
Collected Date/Time 07/13/2001 16:00
Received Date/Time 07/13/2001 17:45
Technical Director Stephen C. Ede

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
<u>Volatile Gas Chromatography/Mass Spectroscopy</u>								
Dibromofluoromethane <sur>	101		%	BTEX by SW8260B	78-128	07/13/01	07/19/01	GMD



CT&E Ref.# 1014345009
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M3 1201
 Client Sample ID EL-A200804
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 07/27/2001 20:43
 Collected Date/Time 07/13/2001 16:10
 Received Date/Time 07/13/2001 17:45
 Technical Director Stephen C. Ede

Released By *Heather Hall*

Sample Remarks:

DRO/RRO - Pattern consistent with weathered middle distillate.
 DRO/RRO - Surrogate recoveries are outside controls due to matrix interference.
 GRO/BTEX - Surrogate recovery is biased high due to matrix interference. Results are not affected.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Solids								
Total Solids	90.0	0.00	%	SM20 2540G			07/17/01	DMR
Volatile Fuels Department								
Gasoline Range Organics	287	27.4	mg/Kg	AK101 GRO		07/13/01	07/22/01	
Surrogates								
1,4-Difluorobenzene <Surr>	85.4		%	AK101 GRO	60-120	07/13/01	07/22/01	RMV
4-Bromofluorobenzene <Surr>	1050	!	%	AK101 GRO	50-150	07/13/01	07/22/01	RMV
Semivolatile Organic Fuels Department								
Diesel Range Organics	6080	110	mg/Kg	AK102 DRO		07/16/01	07/18/01	MCM
Surrogates								
5a Androstane <surr>	1060	!	%	AK102 DRO	50-150	07/16/01	07/18/01	MCM
Volatile Gas Chromatography/Mass Spectroscopy								
Benzene	0.0159F	0.0285	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Toluene	0.121	0.0285	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Ethylbenzene	0.149	0.0285	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
P & M -Xylene	0.252	0.0285	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
o-Xylene	0.0526	0.0285	mg/Kg	BTEX by SW8260B		07/13/01	07/19/01	GMD
Surrogates								
1,2-Dichloroethane-D4 <surr>	92.2		%	BTEX by SW8260B	74-133	07/13/01	07/19/01	
Toluene-d8 <surr>	97.4		%	BTEX by SW8260B	78-134	07/13/01	07/19/01	GMD



CT&E Ref.# 1014345009
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M31201
 Client Sample ID EL-A200804
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 07/27/2001 20:43
 Collected Date/Time 07/13/2001 16:10
 Received Date/Time 07/13/2001 17:45
 Technical Director Stephen C. Ede

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
<u>Volatile Gas Chromatography/Mass Spectroscopy</u>								
4-Bromofluorobenzene <Surr>	80.7		%	BTEX by SW8260B	72-141	07/13/01	07/19/01	GMD
Dibromofluoromethane <surr>	97.2		%	BTEX by SW8260B	78-128	07/13/01	07/19/01	GMD



CT&E Ref.# 1014345010
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M31201
 Client Sample ID EL-A200805
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 07/27/2001 20:43
 Collected Date/Time 07/13/2001 16:20
 Received Date/Time 07/13/2001 17:45
 Technical Director Stephen C. Ede

Released By *Deborah Hall*

Sample Remarks:

DRO - Unknown hydrocarbon with several peaks.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Solids								
Total Solids	85.7	0.00	%	SM20 2540G			07/17/01	DMR
Volatile Fuels Department								
Gasoline Range Organics	3.86 U	3.86	mg/Kg	AK101 GRO		07/13/01	07/24/01	RMV
Surrogates								
1,4-Difluorobenzene <Surr>	95.9		%	AK101 GRO	60-120	07/13/01	07/24/01	RMV
4-Bromofluorobenzene <Surr>	73.4		%	AK101 GRO	50-150	07/13/01	07/24/01	RMV
Semivolatile Organic Fuels Department								
Diesel Range Organics	11.5	11.5	mg/Kg	AK102 DRO		07/16/01	07/17/01	MCM
Surrogates								
5a Androstane <surr>	124		%	AK102 DRO	50-150	07/16/01	07/17/01	MCM
Volatile Gas Chromatography/Mass Spectroscopy								
Benzene	0.0201 U	0.0201	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Toluene	0.0347	0.0201	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Ethylbenzene	0.0100F	0.0201	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
P & M -Xylene	0.0266	0.0201	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
o-Xylene	0.0201 U	0.0201	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Surrogates								
1,2-Dichloroethane-D4 <surr>	95.9		%	BTEX by SW8260B	74-133	07/13/01	07/20/01	GMD
Toluene-d8 <surr>	99.5		%	BTEX by SW8260B	78-134	07/13/01	07/20/01	GMD
4-Bromofluorobenzene <Surr>	89.5		%	BTEX by SW8260B	72-141	07/13/01	07/20/01	GMD
Dibromofluoromethane <surr>	103		%	BTEX by SW8260B	78-128	07/13/01	07/20/01	GMD



CT&E Ref.# 1014345011
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M31201
 Client Sample ID EL-A200806
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 07/27/2001 20:43
 Collected Date/Time 07/13/2001 16:25
 Received Date/Time 07/13/2001 17:45
 Technical Director Stephen C. Ede

Released By *Deborah Wall*

Sample Remarks:

DRO - Pattern consistent with weathered middle distillate.
 DRO - Surrogate recoveries outside controls due to matrix interference.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Solids								
Total Solids	90.2	0.00	%	SM20 2540G			07/17/01	DMR
Volatile Fuels Department								
Gasoline Range Organics	15.6	2.78	mg/Kg	AK101 GRO		07/13/01	07/22/01	RMV
Surrogates								
1,4-Difluorobenzene <Surr>	89.5		%	AK101 GRO	60-120	07/13/01	07/22/01	RMV
4-Bromofluorobenzene <Surr>	87.2		%	AK101 GRO	50-150	07/13/01	07/22/01	RMV
Semivolatile Organic Fuels Department								
Diesel Range Organics	378	11.4	mg/Kg	AK102 DRO		07/16/01	07/17/01	MCM
Surrogates								
5a Androstane <surr>	211	!	%	AK102 DRO	50-150	07/16/01	07/17/01	MCM
Volatile Gas Chromatography/Mass Spectroscopy								
Benzene	0.0145 U	0.0145	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Toluene	0.0253	0.0145	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Ethylbenzene	0.0145	0.0145	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
P & M -Xylene	0.0200	0.0145	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
o-Xylene	0.0145 U	0.0145	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Surrogates								
1,2-Dichloroethane-D4 <surr>	95.5		%	BTEX by SW8260B	74-133	07/13/01	07/20/01	GMD
Toluene-D8 <surr>	100		%	BTEX by SW8260B	78-134	07/13/01	07/20/01	GMD
4-Bromofluorobenzene <Surr>	79.8		%	BTEX by SW8260B	72-141	07/13/01	07/20/01	GMD



CT&E Ref.# 1014345011
Client Name Jacobs Engineering Group
Project Name/# Elmendorf SERA Sites 05M31201
Client Sample ID EL-A200806
Matrix Soil/Solid
Ordered By

Client PO#
Printed Date/Time 07/27/2001 20:43
Collected Date/Time 07/13/2001 16:25
Received Date/Time 07/13/2001 17:45
Technical Director Stephen C. Ede

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
<u>Volatile Gas Chromatography/Mass Spectroscopy</u>								
Dibromofluoromethane <sur>	101		%	BTEX by SW8260B	78-128	07/13/01	07/20/01	GMD



CT&E Ref.# 1014345012
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M31201
 Client Sample ID EL-A200807
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 07/27/2001 20:43
 Collected Date/Time 07/13/2001 16:35
 Received Date/Time 07/13/2001 17:45
 Technical Director Stephen C. Ede

Released By *Deborah Hall*

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Solids								
Total Solids	91.0	0.00	%	SM20 2540G			07/17/01	DMR
Volatile Fuels Department								
Gasoline Range Organics	3.68 U	3.68	mg/Kg	AK101 GRO		07/13/01	07/22/01	RMV
Surrogates								
1,4-Difluorobenzene <Surr>	88.2		%	AK101 GRO	60-120	07/13/01	07/22/01	RMV
4-Bromofluorobenzene <Surr>	52		%	AK101 GRO	50-150	07/13/01	07/22/01	RMV
Semivolatile Organic Fuels Department								
Diesel Range Organics	6.78F	11.1	mg/Kg	AK102 DRO		07/16/01	07/17/01	MCM
Surrogates								
5a Androstane <surr>	143		%	AK102 DRO	50-150	07/16/01	07/17/01	MCM
Volatile Gas Chromatography/Mass Spectroscopy								
Benzene	0.0191 U	0.0191	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Toluene	0.0298	0.0191	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Ethylbenzene	0.0191 U	0.0191	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
P & M -Xylene	0.0269	0.0191	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
o-Xylene	0.0191 U	0.0191	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Surrogates								
1,2-Dichloroethane-D4 <surr>	96.7		%	BTEX by SW8260B	74-133	07/13/01	07/20/01	GMD
Toluene-d8 <surr>	97.3		%	BTEX by SW8260B	78-134	07/13/01	07/20/01	GMD
4-Bromofluorobenzene <Surr>	89.7		%	BTEX by SW8260B	72-141	07/13/01	07/20/01	GMD
Dibromofluoromethane <surr>	103		%	BTEX by SW8260B	78-128	07/13/01	07/20/01	GMD



CT&E Ref.# 1014345013
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M31201
 Client Sample ID EL-A200808
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 07/27/2001 20:43
 Collected Date/Time 07/13/2001 16:45
 Received Date/Time 07/13/2001 17:45
 Technical Director Stephen C. Ede

Released By *Deborah Hall*

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Solids								
Total Solids	95.2	0.00	%	SM20 2540G			07/17/01	DMR
Volatile Fuels Department								
Gasoline Range Organics	3.30 U	3.30	mg/Kg	AK101 GRO		07/13/01	07/22/01	RMV
Surrogates								
1,4-Difluorobenzene <Surr>	89.2		%	AK101 GRO	60-120	07/13/01	07/22/01	RMV
4-Bromofluorobenzene <Surr>	52.9		%	AK101 GRO	50-150	07/13/01	07/22/01	RMV
Semivolatile Organic Fuels Department								
Diesel Range Organics	10.4 U	10.4	mg/Kg	AK102 DRO		07/16/01	07/17/01	MCM
Surrogates								
5a Androstane <surr>	147		%	AK102 DRO	50-150	07/16/01	07/17/01	MCM
Volatile Gas Chromatography/Mass Spectroscopy								
Benzene	0.0172 U	0.0172	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Toluene	0.0264	0.0172	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Ethylbenzene	0.0172 U	0.0172	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
P & M -Xylene	0.0201	0.0172	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
o-Xylene	0.0172 U	0.0172	mg/Kg	BTEX by SW8260B		07/13/01	07/20/01	GMD
Surrogates								
1,2-Dichloroethane-D4 <surr>	95.7		%	BTEX by SW8260B	74-133	07/13/01	07/20/01	GMD
Toluene-d8 <surr>	96.4		%	BTEX by SW8260B	78-134	07/13/01	07/20/01	GMD
4-Bromofluorobenzene <Surr>	92.9		%	BTEX by SW8260B	72-141	07/13/01	07/20/01	GMD
Dibromofluoromethane <surr>	101		%	BTEX by SW8260B	78-128	07/13/01	07/20/01	GMD

Case Narrative

Customer: JACOBSE

Jacobs Engineering Group

Project: 1014792

Elmendorf SERA Sites 05M31201

NPDL WO: NA

1014792001 PS

DRO - Pattern consistent with weathered middle distillate.

DRO - Surrogate does not meet QC goals due to matrix interference. Results are not affected.

382561 LCS

DRO/RRO LCS/LCSD - Surrogate/s are biased high due to interference by method required petroleum spike.

382562 LCSD

DRO/RRO LCS/LCSD - Surrogate/s are biased high due to interference by method required petroleum spike.



CT&E Ref.# 1014792001
 Client Name Jacobs Engineering Group
 Project Name/# Elmendorf SERA Sites 05M31201
 Client Sample ID EL-A201201
 Matrix Soil/Solid
 Ordered By

Client PO#
 Printed Date/Time 08/20/2001 19:24
 Collected Date/Time 07/23/2001 14:30
 Received Date/Time 07/30/2001 9:39
 Technical Director Stephen C. Ede

Released By *Heather Hall*

Sample Remarks:

DRO - Pattern consistent with weathered middle distillate.
 DRO - Surrogate does not meet QC goals due to matrix interference. Results are not affected.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
<u>Solids</u>								
Total Solids	87.2	0.00	%	SM20 2540G			08/01/01	DMR
<u>Semivolatile Organic Fuels Department</u>								
Diesel Range Organics	4850	144	mg/Kg	AK102 DRO		08/02/01	08/03/01	MCM
<u>Surrogates</u>								
5a Androstane <surr>	652	!	%	AK102 DRO	50-150	08/02/01	08/03/01	MCM

COLUMBIA ANALYTICAL SERVICES, INC.

Client: CT& E Environmental Services, Inc.
Project: 05M31201
Sample Matrix: Soil

Service Request No.: K2105461
Date Received: 8/1/01

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for samples designated for Tier III validation deliverables including summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt

Two soil samples were received for analysis at Columbia Analytical Services on 8/1/01. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

Total Organic Carbon by EPA Method 9060

No anomalies associated with the analysis of these samples were observed.

Approved by _____ Date 8/16/01

00004

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: CT&E Environmental Services, Inc.
Project: 05M31201
Sample Matrix: Soil

Service Request: K2105461
Date Collected: 7/28/01
Date Received: 8/1/01

Carbon, Total Organic

Prep Method: NONE
Analysis Method: 9060
Test Notes:

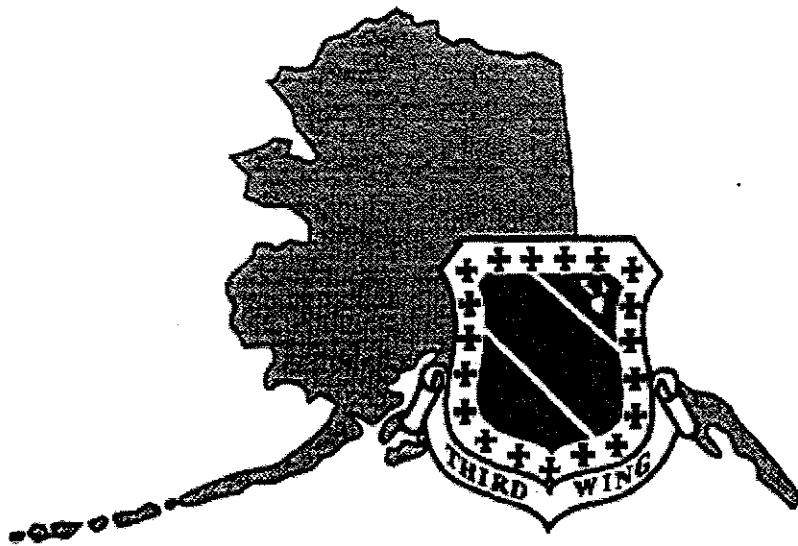
Units: mg/Kg (ppm)
Basis: Dry

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
EL-A2014 01/1014792002	K2105461-001	500	1	NA	8/14/01	2800	
EL-A2014 02/1014792003	K2105461-002	500	1	NA	8/14/01	2200	
Method Blank	K2105461-MB	500	1	NA	8/14/01	ND	

Approved By: _____



Date: 8/15/01



**UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA**

ENVIRONMENTAL QUALITY PROGRAM

**STMP 476
SERA PHASE VII ST 703
RELEASE INVESTIGATION REPORT
FINAL DRAFT**

FEBRUARY 1999

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- C ANALYTICAL DATA
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LIST OF ACRONYMS

AAC	Alaska Administrative Code
ACL	Alternate cleanup level
ADEC	Alaska Department of Environmental Conservation
ATH	Ambient temperature headspace
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and xylenes
COC	Chemical of concern
cy	Cubic yard
DRO	Diesel range organic
EAFB	Elmendorf Air Force Base
FID	Flame ionization detector
GRO	Gasoline range organic
HDPE	Disposable high-density polyethylene
LNAPL	Light nonaqueous-phase liquid
MAP	Management Action Plan
MS/MSD	Matrix spike/matrix spike duplicate
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PID	Photoionization detector
POL	Petroleum, oil, and lubricants
ppm	Parts per million
QA	Quality assurance
QC	Quality control
SERA	State-Elmendorf Environmental Restoration Agreement
TOC	Total organic carbon
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
UST	Underground storage tank

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EXECUTIVE SUMMARY

ST703 is the former location of an underground storage tank (UST) adjacent to Building 52-651, the Green Lake Cabin. The 1,000-gallon tank, STMP 476, held diesel fuel for the building's heating system. The UST was removed in July 1997. Analytical results of soil samples collected from the excavation at the time of tank removal showed the site to be impacted by petroleum, oil, and lubricant (POL) products.

A release investigation was conducted at ST703 under SERA Phase VII in 1998 following the standard site investigation approach, with 7 borings drilled (2 completed as groundwater monitoring wells). Analytical results indicated that the site was impacted by petroleum hydrocarbons in excess of Alaska Department of Environmental Conservation (ADEC) Method Two soil cleanup standards.

At ST703, soil has been impacted by petroleum hydrocarbons in the vicinity of the former UST. Levels of diesel range organics (DRO) up to 11,000 mg/Kg and benzene up to 0.258 mg/Kg have been measured on site in excess of the ADEC Method Two soil cleanup standards of 250 mg/Kg DRO and 0.02 mg/Kg benzene. No other petroleum hydrocarbon constituents exceeded cleanup standards. In general, contamination appears to be limited to the soils above a clay layer that was first observed at approximately 5 to 6 feet bgs. The extent of petroleum-impacted soil has not been determined to the south and southeast sides of the former UST location, as the presence of the cabin prevented drilling any further to the south of boring 703BH04.

Groundwater samples collected from two wells installed between the former UST location and the shore of Green Lake have not been impacted by petroleum hydrocarbons. Because ST703 is not located within the Operable Unit (OU) 5 Model Area, any impact to groundwater would need to be addressed as part of the SERA investigation.

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1.0 INTRODUCTION

This report presents the findings of the State-Elmendorf Environmental Restoration Agreement (SERA) Phase VII release investigation at ST703, Building 52-651 Green Lake Cabin, on Elmendorf Air Force Base (EAFB).

1.1 SERA

SERA is a cooperative agreement between the U.S. Air Force (USAF) and the State of Alaska Department of Environmental Conservation (ADEC), signed in October 1992. SERA addresses EAFB's solid waste, underground storage tank (UST), and petroleum, oil and lubricant (POL) spill program areas, and does not include sites already addressed in EAFB's Federal Facility Agreement (sites subject to the Comprehensive Environmental Response, Compensation, and Liability Act). SERA requires EAFB to perform any necessary assessment, monitoring, remediation, and closure of solid waste, UST, and POL spill sites identified in SERA, as well as new sites identified subsequent to the issuance of SERA.

The approach to SERA fieldwork is based on whether or not a site is located within the Operable Unit (OU) 5 Model Area of EAFB (shown in Figure 1-3). EAFB has provided the following guidance regarding technical approaches to the implementation of SERA:

- **Presumptive Remedy Approach:** For those sites within the modeled area, the presumptive remedy for soil contamination will be bioventing. EAFB guidance states that site investigation will include sufficient soil sampling to verify the extent of contaminated soil, a bioventing treatability study, and groundwater sampling, if required. Soil boreholes are to be configured to 1) verify the extent of contamination, and 2) support placement of bioventing equipment (vent well and monitoring arrays). EAFB further specifies that, at a minimum, four boreholes will be drilled, with a borehole placed directly over the area of contamination (e.g., former UST footprint) for installation of a biovent well, and three boreholes placed just outside the suspected perimeter of the contaminated zone. Additional soil and groundwater sampling will be conducted as necessary. Sites found to not be treatable by bioventing or those in which free-phase product is present on the water table will subsequently be addressed by the standard approach (below). EAFB has also provided the directive that, unless free product is found on the water table, groundwater contaminants (dissolved phase) will not be investigated for sites in the OU5 Model Area.
- **Standard Site Investigation Approach:** For those sites not within the OU5 Model Area or sites determined to not be treatable by bioventing or those in which free-phase product is present on the water table, site investigations will be conducted to

fully characterize environmental features of the site and the full extent and nature of the contamination.

Because ST703 is not in the OU5 Model Area, the standard site investigation approach was conducted.

1.2 Regional Setting

EAFB is located in Southcentral Alaska, along the head of Cook Inlet and adjacent to the City of Anchorage (Figure 1-1). EAFB comprises 13,130 acres, bordered to the north and west by Cook Inlet, to the east by Fort Richardson, and to the south by the City of Anchorage. Land use at EAFB is varied. Nearly half (6,053 acres) of the Base has been developed for airfield operations (runways, taxiways, and maintenance areas) and support operations, including housing and recreational facilities. The remaining acreage (7,077 acres) is basically undeveloped and includes 1,416 acres of wetlands, lakes, and ponds.

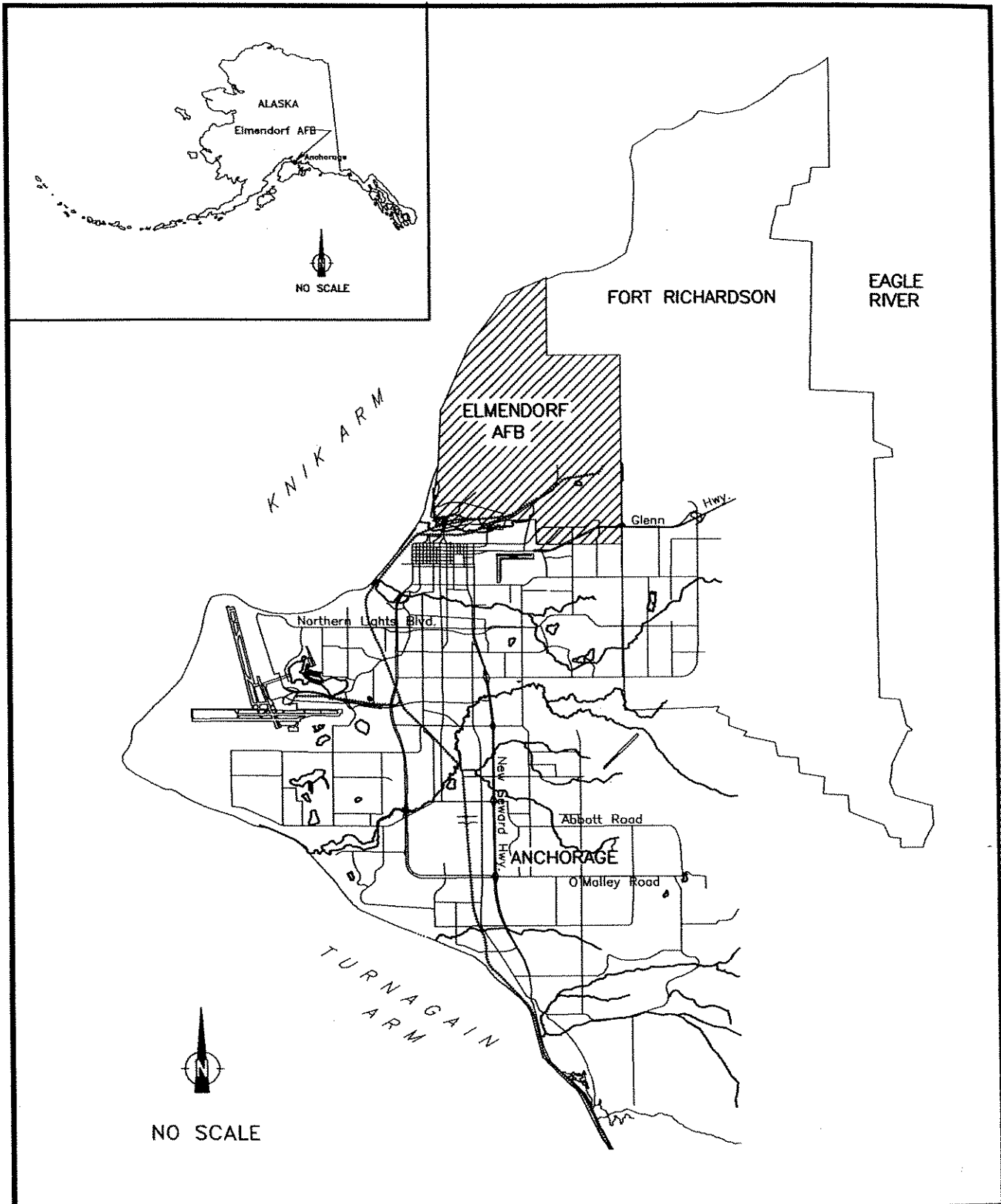
EAFB lies within the Cook Inlet-Susitna Lowlands, which is bordered on the west by the Alaska Range and on the east by the Kenai, Chugach, and Talkeetna mountain ranges. The Elmendorf terminal moraine traverses the Base northeast to southwest. The southern boundary of the Elmendorf Moraine is a ridge line running along the north side of the east-west runway.

Groundwater flow is divided by the Elmendorf Moraine. Groundwater flow north of the moraine is to the northwest towards Knik Arm of Cook Inlet. Groundwater flow south of the moraine is south and west toward Ship Creek. ST703 is located on the north side of the Elmendorf Moraine and is not in the OU5 Model Area. Figure 1-2 shows the location of ST703 on EAFB, and Figure 1-3 shows the regional groundwater flow direction at EAFB.

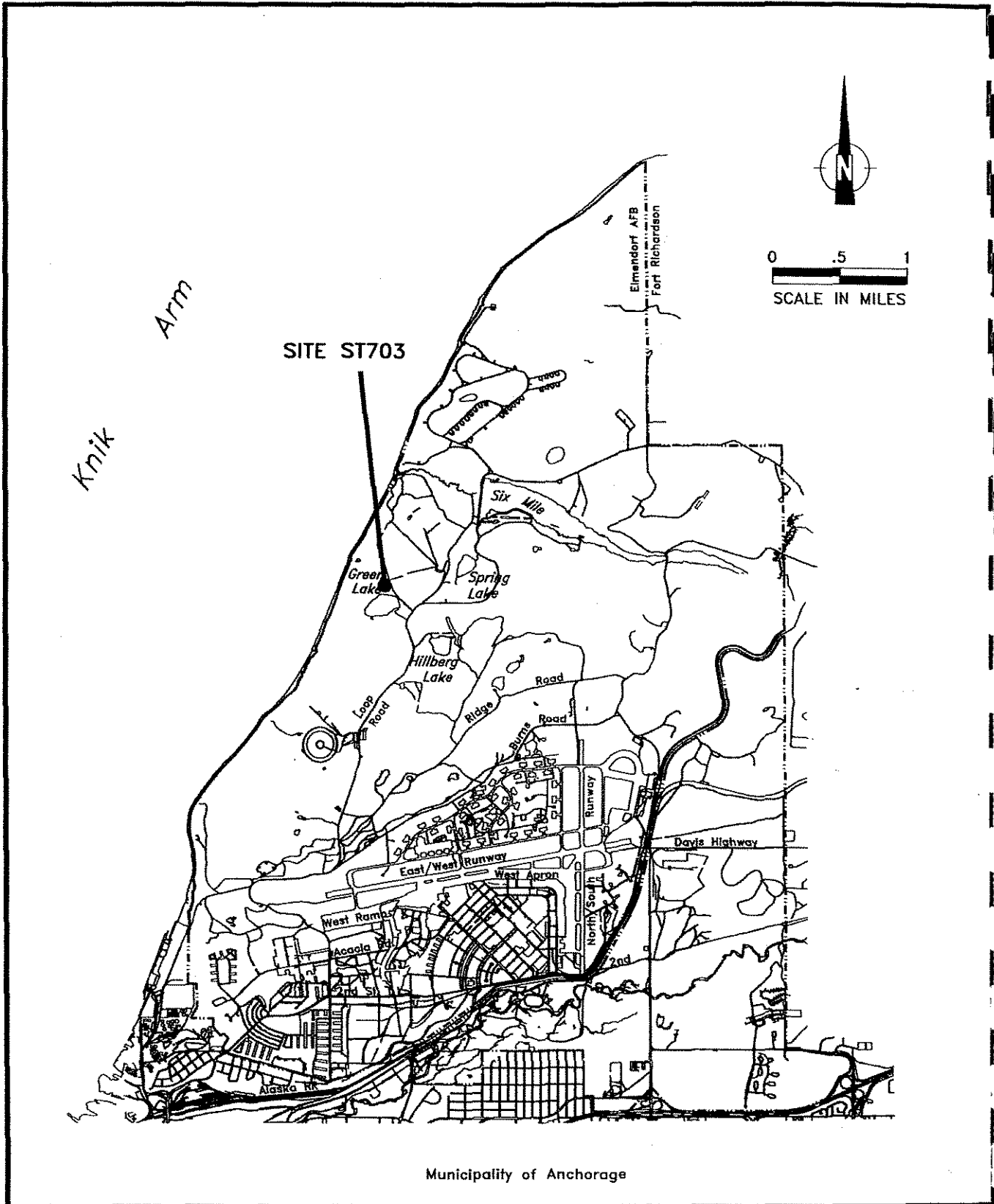
1.3 Site Background

Building 52-651 is a log cabin located approximately 40 feet from Green Lake (Figure 1-2). A 1,000-gallon, single-walled UST, STMP476, was removed from the northwest side of Building 52-651 in July 1997. The tank reportedly held heating oil for this building. The excavation was approximately 15 feet long by 9 feet wide by 6 feet deep. Piping between the tank and building was also removed at the time of tank removal (USAF 1998a). An ADEC Level B cleanup standard was determined for this site at the time of the UST removal: 100 mg/Kg gasoline range organics (GRO), 200 mg/Kg diesel range organics (DRO), 0.5 mg/Kg benzene, and 15 mg/Kg total benzene, toluene, ethylbenzene, and xylenes (BTEX). **There is a well (assumed potable water) located approximately 160 feet north of the cabin and presumably hydraulically upgradient. Locally, groundwater is presumed to flow towards Green Lake.**

During the tank removal, five samples and one duplicate were collected from the excavation, and one sample was collected from the stockpiled soil. Samples were analyzed for DRO and BTEX only. DRO concentrations in the excavation were in excess of Level B standards and ranged from 202 mg/Kg (193 mg/Kg for the duplicate) at a location near the piping run



DRAWING: 9000-168/ SITELOCA C/SC: 1:2 DATE: 5/14/98	DRAWN: ABB/SR DISK: 26/98 CHECK: J.S.	FIGURE 1-1 ELMENDORF AFB LOCATION MAP	3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 957011Z3
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Municipality of Anchorage


<p>DRAWING: 9000-168/ F36053/A-D C/SC: 1:5500 DATE: 8/29/98</p> <p>DRAWN: SSR ZIP: 26/98 CHECK: J.S.</p>	<p>FIGURE 1-2 SITE LOCATION MAP</p>	<p>3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 957011Z3</p>
--	---	--

SOURCE: Boundaries of Elmendorf Moraine and Regional Groundwater Flow Patterns South of Elmendorf Moraine Interpreted From:

- 1.) CRREL 1997 Interim Draft. *The Glacial Geology and Stratigraphy of Fort Richardson: A Synthesis of The Hydrogeologic Framework* and,
- 2.) *Basewide Support and Groundwater Monitoring Program, Annual Report of Groundwater Sampling Activities Final*, March 1996.

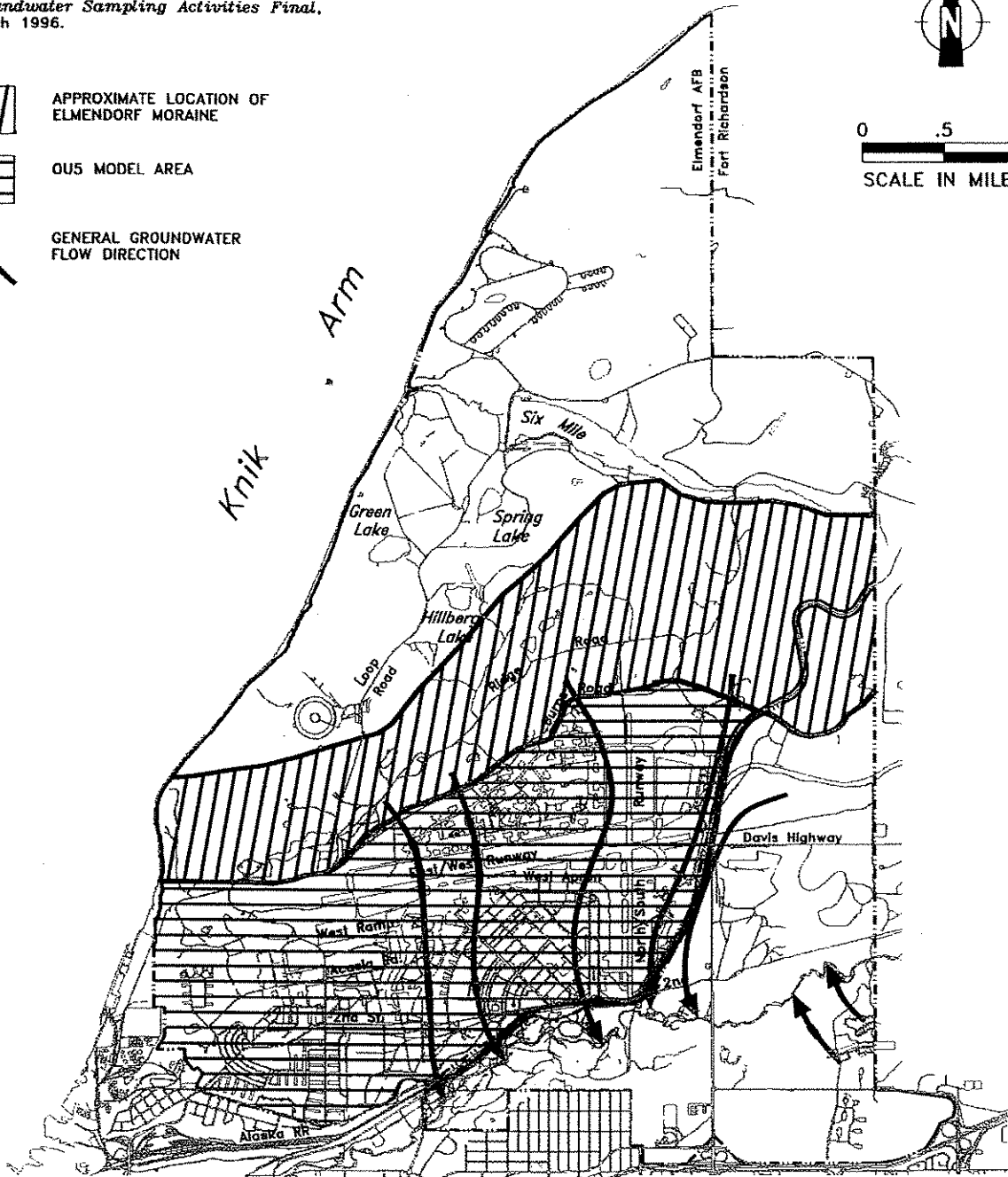
 APPROXIMATE LOCATION OF ELMENDORF MORAINES

 OUS MODEL AREA

 GENERAL GROUNDWATER FLOW DIRECTION



0 .5 1
SCALE IN MILES



Municipality of Anchorage

DRAWING: 9000-168/ RGFP/A-D
C/SC: 1:5500
DATE: 1/13/99

DRAWN: SSR
ZIP: 26/98
CHECK: J.S.

FIGURE 1-3
REGIONAL GROUNDWATER
FLOW PATTERNS

3 CES/CEVQ
SERA VII
ELMENDORF AFB, ALASKA
PROJECT FXSB 957011Z3

(approximately 4 feet bgs), to 9,150 mg/Kg at a depth of 6 feet below ground surface (bgs) near the bottom center of the tank. Benzene was detected in two samples collected from the excavation but did not exceed the Level B standard (0.159 mg/Kg in the sample collected from the west side of the south wall and 0.127 mg/Kg in the sample collected near the fill end). The DRO concentration detected in the soil stockpile was 6,730 mg/Kg, with a concentration of benzene detected at 0.0863 mg/Kg. During the tank removal, it was noted that there is an intermittent clay layer present at approximately 6 feet bgs.

During the UST removal, the depth to groundwater was estimated to be between 16 and 50 feet bgs for the purpose of completing the ADEC Matrix Score sheet. However, due to the close proximity of this site to the shore of Green Lake, it is anticipated that groundwater is present at a shallower depth.

1.4 Report Outline

This report is divided into the following sections:

Section 1.0 provides an introduction to the report and describes the regional setting and site background.

Section 2.0 summarizes field methods employed in the release investigation. This section also discusses methods and standards used in data interpretation.

Section 3.0 describes the 1998 fieldwork and discusses all findings to date for the site.

Section 4.0 provides conclusions of the release investigation, identifies any remaining data gaps, and provides disposition recommendations for the site.

Section 5.0 presents a list of documents cited in this report.

The Data Assessment Report, which includes a discussion of data quality and chromatogram interpretations, is provided in Appendix A. Boring logs are provided in Appendix B. Analytical data are provided in Appendix C. Appendix D contains completed ADEC forms for the UST investigation. Photographs taken during fieldwork are provided in Appendix E.

3.0 RESULTS

3.1 1998 SERA VII Field Program

3.1.1 Soil Boring/Monitoring Well Installation

On June 30, July 1, and July 2, 1998, a series of five soil borings (703BH01 through 703BH05) and two monitoring wells (703WL01 and 703WL02) were drilled at Green Lake cabin. Figure 3-1 shows the location of soil borings. The five soil borings were located in the vicinity of the former tank excavation. The two wells were located in (presumed) hydraulically downgradient locations on the south side of the cabin. Of the two wells, the one on the east side (703WL02) was shifted west because of an on-site septic system that could not be accurately located in the field.

The five soil borings located in the excavation were sampled continuously (every 2 feet) to depths ranging from 6 to 12 feet. A possible confining unit was encountered at approximately 5 feet and was logged as clay and silt. ATH screening results indicated that contaminants were not migrating through the silt unit. A petroleum odor was noted on samples collected as deep as 6 feet in borings 703BH01, 703BH02, 703BH03, and 703BH04. Field observations did not indicate the presence of significant amounts of petroleum constituents in 703BH05. All borings were terminated while still in the silt unit to prevent vertical migration of contaminants in case a more permeable unit was found to be present below it.

Monitoring well 703WL01 was sampled continuously from grade to a depth of 12 feet. A petroleum odor was noted in the drill cuttings from approximately 8 feet bgs. There had been no recovery in the sample driven from 6 to 8 feet, and there was no indication of petroleum in the 8 to 10 foot sample. The boring was terminated at 10 feet and an offset hole was drilled in order to determine if there was truly petroleum present at approximately 8 feet bgs. The 6 to 8 foot sample was collected in the offset hole and submitted for laboratory analysis. The offset hole was advanced to 12 feet and completed as the monitoring well; soils were predominantly silt and sand. The water level was measured at approximately 10.5 feet bgs while drilling; the well screen was placed from 6 to 16 feet bgs.

Monitoring well 703WL02 was sampled continuously starting at 4 feet bgs to a total depth of 12 feet bgs. The only ATH result above background was the sample collected from 6 to 8 feet, which had a result of 6 PID units. This sample was also noted as having a slight petroleum odor. Water was measured while drilling at approximately 13 feet bgs. The well was screened from 6 to 16 feet bgs.

Soil samples were submitted to the laboratory for DRO, GRO, and BTEX analysis. Select samples were also submitted for PAH analysis. During the work planning stage, ADEC and

EAFB agreed that analysis for RRO would not be required at ST703 because the former UST was known to have held diesel fuel.

3.1.2 Well Development and Sampling

Monitoring well 703WL01 and 703WL02 were developed over a 2 day period as the wells were purged dry and the groundwater was slow to recover (less than 80% recovery in 3 hours). The wells were purged dry three times and considered developed.

Due to the slow groundwater recovery rate, the on-site wells were purged dry once, allowed to recover, and then samples were collected for laboratory analysis of DRO, GRO/BTEX, and PAHs.

3.2 Discussion of Findings

3.2.1 Soil Findings

Soil sample results indicate that petroleum hydrocarbons have impacted soils at ST703 in excess of Method One Level B and Method Two chemical-specific cleanup standards. Figure 3-1 shows soil locations and results, and Appendix C contains all sample results.

Following the Method Two soil cleanup standards (outlined in Section 2.8.3), the exposure pathway with the most stringent values was chosen for comparison with analytical results. Because, in most cases, the migration to groundwater exposure pathway has the most stringent cleanup values, sample results are compared to values for this exposure pathway unless otherwise noted. Table 2-3 shows cleanup standards under the migration to groundwater exposure pathway for typical petroleum hydrocarbon chemicals of concern (COCs) under the SERA program.

DRO was found in boreholes 703BH01, 703BH02, and 703BH04 in excess of the ADEC Method Two cleanup standard of 250 mg/Kg, at depths ranging from 4.5 to 6 feet bgs. These three borings are on the east and south sides of the former UST location. **The highest concentration of DRO detected, 11,100 mg/Kg, was measured in 703BH04 at 5 feet bgs. In all three borings, DRO concentrations decreased with depth; it is likely that the clay and silt layer first observed at approximately 5 feet bgs is deterring further vertical migration of DRO.**

Benzene was also detected in excess of the Method Two cleanup standard, 0.02 mg/Kg, in borings 703BH02 and 703BH04. The highest benzene concentration measured was 0.258 mg/Kg in 703BH04 at 10.5 feet bgs. GRO, ethylbenzene, toluene, and xylene were not detected above their respective Method Two cleanup standards.

52-668
WELL #24

DRIVEWAY

GENERAL
GROUNDWATER
FLOW
DIRECTION

APPROXIMATE
LIMITS OF EXCAVATION
AS VISUALLY IDENTIFIED
DURING 1998 RELEASE
INVESTIGATION

LIMITS OF EXCAVATION
AS SHOWN IN TANK
REMOVAL REPORT

Depth	6'
DRO	11.1
GRO	(1.70) U
B	(0.0426) U
T	(0.0426) U
E	(0.0426) U
X	(0.0426) U

Depth	5'	10'
DRO	285	7.75
GRO	14.3	(1.38) U
B	(0.0284) U	(0.0346) U
T	0.138	(0.0346) U
E	0.0372	(0.0346) U
X	0.1707	0.2168

Depth	2.5'
DRO	37.8
GRO	(1.14) U
B	(0.0285) U
T	(0.0285) U
E	(0.0285) U
X	(0.0285) U

Depth	4.5'	4.5' Dup.	6'
DRO	5680	4730	20.5
GRO	92.1	NA	(3.76) U
B	0.0401	NA	(0.094) U
T	0.35	NA	(0.094) U
E	0.804	NA	(0.094) U
X	3.23	NA	(0.094) U

52-651

Depth	6'
DRO	9.17 b
GRO	(2.45) U
B	(0.0613) U
T	(0.0613) U
E	(0.0613) U
X	(0.0613) U

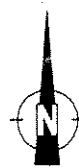
703WL01

703WL02

Depth	7.5'
DRO	10.9 b
GRO	(2.85) U
B	(0.0712) U
T	(0.0712) U
E	(0.0712) U
X	(0.0712) U

Depth	5'	5' Dup.	6'	10.5'
DRO	11100	10300	3350	6.55 b
GRO	294	294	134	6.15
B	0.16	0.0718	(0.0518) U	0.258
T	0.254	1.78	0.0896	0.674
E	1.8	1.23	1.42	0.211
X	5.29	6.4	2.29	0.968

GREEN LAKE



0 15 30

APPROX. SCALE IN FEET

LEGEND

- 1998 SOIL BORING LOCATION
- 1998 MONITORING WELL LOCATION

NOTE: ANALYTICAL SOIL RESULTS
REPORTED AS mg/Kg

- UST = UNDERGROUND STORAGE TANK
- DRO = DIESEL RANGE ORGANICS
- GRO = GASOLINE RANGE ORGANICS
- B = BENZENE
- T = TOLUENE
- E = ETHYLBENZENE
- X = TOTAL XYLENES
- U = UNDETECTED AT LABORATORY MRL
- NA = NOT ANALYZED
- b = ANALYTE FOUND IN BLANK ASSOCIATED WITH SAMPLE

SOURCE: SOURCE: ELMENDORF G7-5 1995

3 CES/CEVQ
SERA VII
ELMENDORF AFB, ALASKA

FIGURE 3-1
ST703, BLDG. 52-651
1998 SOIL BORING LOCATIONS
AND SAMPLE RESULTS

DATE: 1/22/99	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 9000-168/ 7035B898
C/SC: 1:30	DISK: 26/98	PM: E. HEDFIELD	CHECKED: E. HEDFIELD
			PROJECT: FXSB 95701123

Two soil borings were installed farther downgradient (703WL01 and 703WL02), between the cabin and the shore of Green Lake to determine if petroleum hydrocarbons are present on the south side of the cabin. Although low levels of DRO were detected in soil samples in these two borings (9.17 and 10.9 mg/Kg DRO), DRO levels were well below the ADEC Method Two cleanup standard. GRO and BTEX compounds were not detected in these samples.

Four soil samples (those containing the highest PID readings) were also analyzed for PAHs; although low concentrations of some PAHs were detected in the soil samples, the concentrations detected are below the ADEC Method Two soil cleanup standards. This data will support the development of an alternate cleanup level (ACL) for DRO in soil.

When comparing benzene results to the ADEC Method Two cleanup standard, it is important to note that original data quality objectives for this project were based on the ADEC UST Matrix Score Sheet cleanup standards applicable at the time (18 AAC 78.315). The sensitivity goal for benzene was specified at 0.050 mg/Kg (USAF 1998b), which met the UST Matrix Score Sheet Level A cleanup standard for benzene of 0.1 mg/Kg. However, the newly promulgated Method Two soil cleanup standard for benzene of 0.02 mg/Kg is lower than the method reporting limit specified to the analytical laboratory. When significant levels of DRO and GRO were reported in project samples, dilutions were necessary to accurately report the detected BTEX compounds. These dilutions often elevated the detection limit for the BTEX compounds to greater than the Method Two benzene standard. Therefore, in cases where benzene was reported as not detected at a MRL greater than 0.02 mg/Kg, the benzene results are indeterminate when determining whether the Method Two benzene standard was exceeded.

Qualitative interpretation of DRO chromatograms show that samples from 703BH01 and 703BH02 exhibit the characteristics of a weathered middle distillate product, while samples from 703BH04 exhibit the characteristics of a middle distillate product. The Data Assessment Report, in Appendix A, provides further details on the qualitative interpretation.

A silt/clay layer was encountered at approximately 5 to 6 feet below grade on the north side of the cabin (in the tank excavation) and on the south side of the cabin. The samples collected from 2 to 6 feet bgs in BH01 were saturated; no other samples had significant free water present. Concentrations of petroleum hydrocarbons were lower in samples collected from the clay layer, indicating that the unit may be acting as a confining unit. Any water that perches above this unit would presumably migrate towards Green Lake. Figures 3-3 and 3-4 are cross section diagrams of ST703. Appendix B contains boring logs for ST703.

The lateral extent of soil contamination on the south and southeast sides of the former UST has not been fully defined. It is possible that contamination extends underneath the cabin; however, the presence of the cabin prevents further sampling immediately south of existing borings. The soils north and west of the former UST have been adequately characterized, as have the soils on the south side of the cabin.

52-668
WELL #24

DRIVEWAY

GENERAL
GROUNDWATER
FLOW
DIRECTION

APPROXIMATE
LIMITS OF EXCAVATION
AS VISUALLY IDENTIFIED
DURING 1998 RELEASE
INVESTIGATION

LIMITS OF EXCAVATION
AS SHOWN IN TANK
REMOVAL REPORT

703BH05
703BH01
703BH02
703BH04

52-651

DRO	(0.102) U
GRO	(0.04) U
B	(0.001) U
T	(0.001) U
E	(0.001) U
X	(0.001) U

703WL01

703WL02

DRO	(0.11) U
GRO	(0.04) U
B	(0.001) U
T	(0.001) U
E	(0.001) U
X	(0.001) U

GREEN LAKE



0 15 30

APPROX. SCALE IN FEET

LEGEND

1998 SOIL BORING LOCATION

1998 MONITORING WELL LOCATION

UST = UNDERGROUND STORAGE TANK
DRO = DIESEL RANGE ORGANICS
GRO = GASOLINE RANGE ORGANICS
B = BENZENE
T = TOLUENE
E = ETHYLBENZENE
X = TOTAL XYLENES
U = UNDETECTED AT LABORATORY MRL

NOTE: ANALYTICAL WATER RESULTS
REPORTED AS mg/L

SOURCE: SOURCE: ELMENDORF G7-5 1995

3 CES/CEVQ
SERA VII
ELMENDORF AFB, ALASKA

FIGURE 3-2

ST703, BLDG. 52-651
1998 GROUNDWATER SAMPLE RESULTS

DATE: 1/22/99	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 9000-158/ 703GW898
C/SC: 1:30	DISK: 2698	PM: E. HEDFIELD	CHECKED: E. HEDFIELD
			PROJECT: FXSB 957011Z3

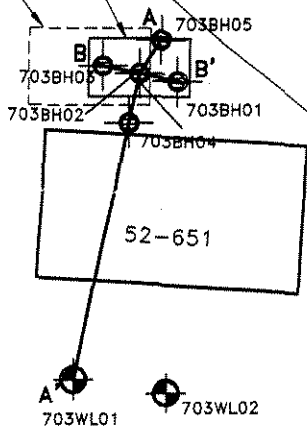
52-668
WELL #24

DRIVEWAY

GENERAL
GROUNDWATER
FLOW
DIRECTION

APPROXIMATE
LIMITS OF EXCAVATION
AS VISUALLY IDENTIFIED
DURING 1998 RELEASE
INVESTIGATION

LIMITS OF EXCAVATION
AS SHOWN IN TANK
REMOVAL REPORT



GREEN LAKE



0 15 30

APPROX. SCALE IN FEET

LEGEND

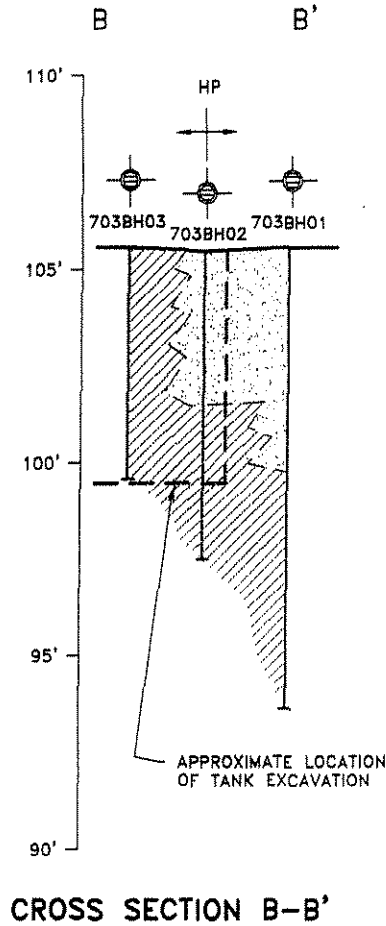
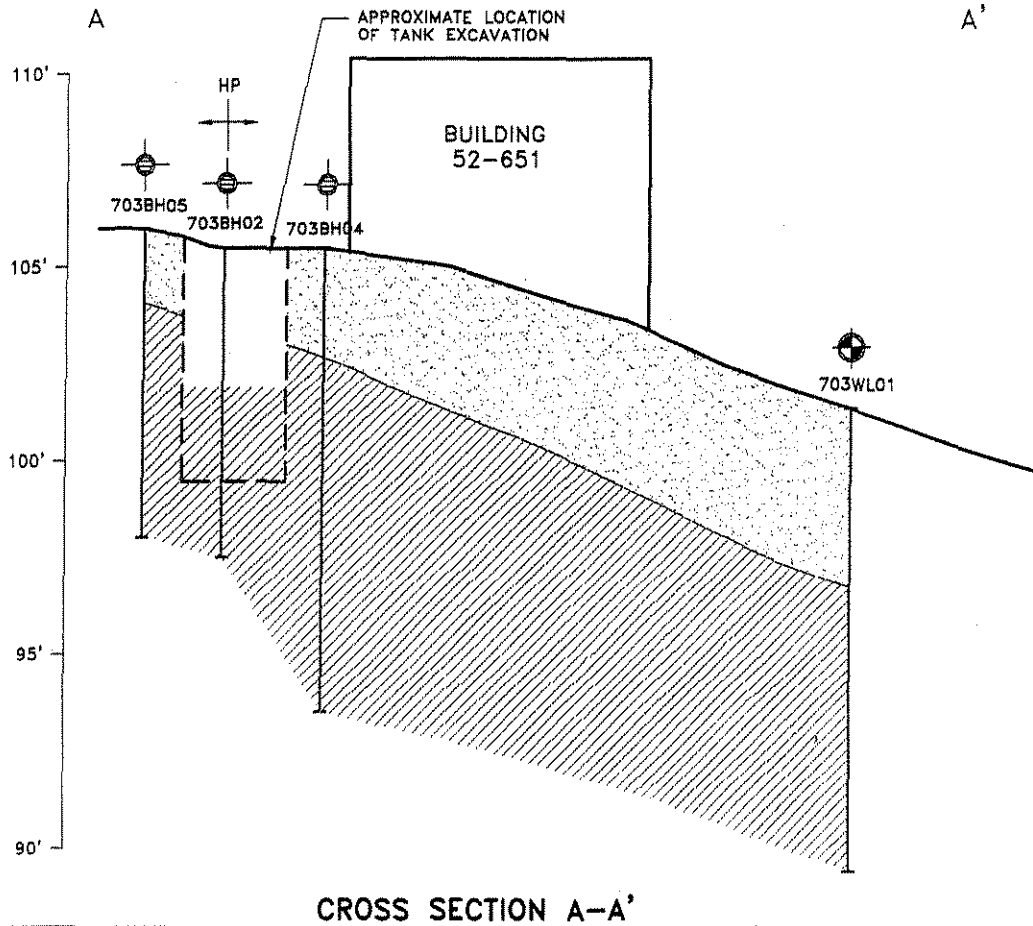
- 1998 SOIL BORING LOCATION
- 1998 MONITORING WELL LOCATION

SOURCE: SOURCE: ELMENDORF G7-5 1995



3 CES/CEVQ
SERA VII
ELMENDORF AFB, ALASKA

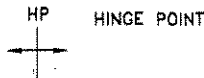
FIGURE 3-3
ST703, BLDG. 52-651
SITE MAP SHOWING
CROSS SECTIONS

DATE: 1/13/99	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 9000-168/ 70398
C/SC: 1:30	DISK: 26/98	PM: E. HEDFIELD	CHECKED: E. HEDFIELD
			PROJECT: FXSB 95701123



LEGEND

-  SANDS AND GRAVELS (<12% FINES)
-  SILT/CLAY, SAND AND GRAVELS W/>12% FINES



DRAWING: 9000-188/
703CS98

DRAWN: SR

C/SC: 1:15

DISK: 26/98

DATE: 10/09/98

CHECK: J.S.

FIGURE 3-4
ST703, BLDG. 52-651
CROSS SECTIONS A-A' AND B-B'

3 CES/CEVQ
SERA VII
ELMENDORF AFB, ALASKA
PROJECT FXSB 957011Z3

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4.0 CONCLUSIONS

4.1 Summary

At ST703, soil has been impacted by petroleum hydrocarbons in the vicinity of the former UST. Levels of DRO up to 11,000 mg/Kg and benzene up to 0.258 mg/Kg have been measured on site in excess of the ADEC Method Two soil cleanup standards of 250 mg/Kg DRO and 0.02 mg/Kg benzene. In general, contamination appears to be limited to the soils above a clay layer that was first observed at approximately 5 to 6 feet bgs. The extent of petroleum-impacted soil has not been determined to the south and southeast sides of the former UST location, as the presence of the cabin prevented drilling any further to the south of boring 703BH04.

Groundwater samples collected from two wells installed between the former UST location and the shore of Green Lake have not been impacted by petroleum hydrocarbons. Because ST703 is not located within the OU5 Model Area, any impact to groundwater would need to be addressed as part of the SERA investigation.

4.2 Data Gaps

- It is currently not known whether soil contamination extends under the cabin, south of the former UST location. Further characterization to the south and southeast is needed.

5.0 REFERENCES

- Alaska Department of Environmental Conservation (ADEC). 1999. 18 AAC 75, Oil and Other Hazardous Substances Pollution Control Regulations, Article 3. January 22.
- Combs, Leonard. 1998. EAFB Water/Wastewater Department. Personal communication with Mike Field of ENSR regarding water supply Well #24. July 7.
- Hinchee, R.E., S.K. Ong, R.N. Miller, D.C. Downey, and R. Frandt. 1992. *Protocol for a Field Treatability Test for Bioventing*. Prepared for U.S. Air Force, Brooks AFB, Texas.
- U.S. Air Force (USAF). 1998a. UST Decommissioning and Site Assessment – STMP 476, Building 52-651. Prepared for Air Force Center for Environmental Excellence/Elmendorf Air Force Base by ASRC Contracting Company, Inc. Final. February.
- _____. 1998b. SERA Phase VII Release Investigations Work Plan. Elmendorf Air Force Base, Alaska. Final. June.
- Walworth, J.L. and C.M. Reynolds. 1995. "Bioremediation of a Petroleum-Contaminated Cryic Soil: Effects of Phosphorus, Nitrogen, and Temperature." *Journal of Soil Contamination*. 4(3):299-310.

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Appendix B

Boring Logs

BORING LOG

CLIENT: US Air Force

PROJECT NAME: SERA VII

SITE: ST-703

ENSR JOB NUMBER: 9000-168

LOGGED BY: J. SHAPIRO REVIEWED BY: S. WRENN

DRILLED BY: HUGHES DRILLING

RIG: CME 75, 4.25" ID HSA w/ 340# hammer, 3" OD SS

BORING NUMBER: 703BH01

BORING DEPTH (ft): 12

BORING DIAMETER (in): 8.25

GROUND ELEVATION (ft): 105.6

FIELD PARTY: R. LAFATA

DATE STARTED: 06/30/98

DATE COMPLETED: 06/30/98

NORTHING: 2660064.71

EASTING: 1669182.07

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
0 5 10 15 20			703 BH01SO 5.0N1	SS	2	0		GP-GM	Dark brown topsoil.
					3				Dark brown POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), gravels 1/4" to 2" diameter, subangular to subrounded, and silty fine to coarse sand, dry.
					4				
					8				
				SS	1	NR			No recovery on first or second attempts.
					1				
					1/12"				
				SS	WOH/12"	109			Dark brown, lithology similar to above, 1" thick band of dark gray coloration towards top, organics through, slight petroleum odor, wet.
					1				
					2				
				SS	4	15			Gray SANDY SILT (ML), fine sand, in bottom of sampler.
					3				Dark gray SILT (ML), little gravel at 1/4" diameter, subangular to subrounded, poorly graded, dry. Band of olive gray coloring at approximately 7 ft bgs (2" thick).
	3								
	6								
SS	4	51		Dark gray SANDY SILT (ML), fine sand, little gravel, 1" diameter, subrounded, poorly graded, very stiff, dry.					
	7								
	10								
	13								
SS	5	0		Lithology similar to above, moist; two-inch lens of dark gray medium sand at approximately 11 ft bgs, wet.					
	6								
	8								
	8								
Bottom of HSA to 10 ft, last sample interval 10 to 12 ft.									
WOH = Weight of Hammer.									
NR = No Reading.									

BORING LOG

CLIENT: US Air Force

PROJECT NAME: SERA VII

SITE: ST-703

ENSR JOB NUMBER: 9000-168

LOGGED BY: J. SHAPIRO REVIEWED BY: S. WRENN

DRILLED BY: HUGHES DRILLING

RIG: CME 75, 4.25" ID HSA w/ 340# hammer, 3" OD SS

BORING NUMBER: 703BH03

BORING DEPTH (ft): 6

BORING DIAMETER (in): 8.25

GROUND ELEVATION (ft): 105.6

FIELD PARTY: R. LAFATA

DATE STARTED: 07/01/98

DATE COMPLETED: 07/01/98

NORTHING: 2660067.0600

EASTING: 1669170.3783

DEPTH feet	LENGTH RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
0			SS	1	0		SM	Dark brown-black topsoil.
0.2			SS	2				Dark brown SILTY SAND WITH GRAVEL (SM), medium sand, and gravel 1/4" to 2" diameter, subangular-subrounded, poorly graded, rootlets throughout, dry.
0.4			SS	2				Lithology similar to above, moist.
0.6		703 BH03SC 2.5NI	SS	3	0.6		SP	Yellowish-orange POORLY GRADED SAND WITH GRAVEL (SP), medium sand, some gravel, 1/4" and 1" diameter, subangular to subrounded, poorly graded, moist.
0.8			SS	5			ML	Dark brown SILT (ML), organic rich, wood fibers, moist.
1.0			SS	2				Lithology similar to above.
1.2			SS	1	0			Olive gray SANDY SILT (ML), little gravel, 1/4" diameter, subrounded, poorly graded, some iron oxide staining from 4.5' to 5', moist.
1.4			SS	3				
1.6			SS	5				
1.8				5				Bottom of HSA to 4 ft, last sample interval 4 to 6 ft bgs.

BORING LOG

CLIENT: US Air Force

PROJECT NAME: SERA VII

SITE: ST-703

ENSR JOB NUMBER: 9000-168

LOGGED BY: J. SHAPIRO REVIEWED BY: S. WRENN

DRILLED BY: HUGHES DRILLING

RIG: CME 75, 4.25" ID HSA w/ 340# hammer, 3" OD SS

BORING NUMBER: 703BH05

BORING DEPTH (ft): 8

DATE STARTED: 07/01/98

BORING DIAMETER (in): 8.25

DATE COMPLETED: 07/01/98

GROUND ELEVATION (ft): 106.0

NORTHING: 2660071.2090

FIELD PARTY: R. LAFATA

EASTING: 1669179.4158

DEPTH feet	LENGTH RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
0			SS	2	0		SP	Dark brown topsoil, dry.
2			SS	2				Light brown POORLY GRADED GRAVEL WITH SAND (SP), medium to coarse sand, some gravel, 1/4" to 1" diameter, subrounded, poorly graded, dry.
3			SS	3	7.0		ML	Dark brown SANDY SILT (ML), organic rich, some gravel, 2" diameter, subrounded, poorly graded, chunks of wood in bottom of spoon.
3			SS	3				No recovery.
7			SS	7				No recovery.
11			SS	11				No recovery.
12		703 BH05SS 6.0N1	SS	6	0.2			Dark gray SANDY SILT (ML), some gravel to 3" diameter, subrounded, poorly graded, cobble jammed in shoe, moist.
12			SS	12				
12			SS	12				
8								Bottom of HSA to 6 ft, last sample interval 6 to 8 ft bgs.

BORING LOG

CLIENT: US Air Force

PROJECT NAME: SERA VII

SITE: ST-703

ENSR JOB NUMBER: 9000-168

LOGGED BY: J. SHAPIRO REVIEWED BY: S. WRENN

DRILLED BY: HUGHES DRILLING

RIG: CME 75, 4.25" ID HSA w/ 340# hammer, 3" OD SS

BORING NUMBER: 703WL01-A

BORING DEPTH (ft): 12

BORING DIAMETER (in): 8.25

WELL DEPTH (ft):

WELL DIAMETER (in):

GROUND ELEVATION (ft):

TOP OF CASING ELEV (ft):

FIELD PARTY: R. LAFATA

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 07/01/98

DATE COMPLETED: 07/01/98

NORTHING:

EASTING:

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
0				SS	2			SP	Light brown POORLY GRADED SAND WITH GRAVEL (SP), medium sand, some gravel, predominantly 1/4" and 1" diameter, subrounded, poorly graded, dry to moist.	
2				SS	2			CL	3" plug of dark brown CLAY (CL), little fine gravel, subrounded at bottom.	
3				SS	2			GP	Lithology similar to 3" plug above.	
4				SS	4	0		GP	Light brown POORLY GRADED GRAVEL WITH SAND (GP), gravels 1/4" to 2" diameter, subrounded, poorly graded, dry.	
6				SS	6	0		GP	Lithology similar to above.	
8				SS	3	0		ML	Dark brown SILT (ML), organic rich, roots throughout, bits of coal, moist.	
10				SS	3	0		ML	No recovery - small, plug of saturated clay. Driller noticed petroleum hydrocarbon odor in cuttings at 8'.	
12				SS	6	0		ML		
14				SS	12	0		ML	Medium gray SANDY SILT WITH GRAVEL (ML), gravel 1/4" to 3/4" diameter, subrounded, poorly graded, moist.	
16				SS	3	0		SP-SM	Dark gray POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), fine sand, some gravel to 1" diameter, subrounded, poorly graded, wet.	
18				SS	4	0		SP-SM	Dark gray POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), fine sand, some gravel to 1" diameter, subrounded, poorly graded, wet.	
20				SS	8	0		SP-SM	Dark gray POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), fine sand, some gravel to 1" diameter, subrounded, poorly graded, wet.	

703 WLOISO 9.ON1

Grain Size Analysis: 22% Gravel, 42% Sand, 36% Fines.

Water level measured while drilling at approximately 10' bgs.

Driller noticed petroleum odor in cuttings at 8' but there was no recovery in 6 to 8' split spoon, began offset hole. (See 703WL01). 703WL01-A grouted to grade.

BORING LOG

CLIENT: US Air Force

PROJECT NAME: SERA VII

SITE: ST-703

ENSR JOB NUMBER: 9000-168

LOGGED BY: J. SHAPIRO REVIEWED BY: S. WRENN

DRILLED BY: HUGHES DRILLING

RIG: CME 75, 4.25" ID HSA w/ 340# hammer, 3" OD SS

BORING NUMBER: 703WL02

BORING DEPTH (ft): 16

BORING DIAMETER (in): 8.25

WELL DEPTH (ft): 11

WELL DIAMETER (in): 2

GROUND ELEVATION (ft): 102.0

TOP OF CASING ELEV (ft): 101.86

FIELD PARTY: R. LAFATA

SCREEN LENGTH (ft): 10

SCREEN TYPE: SLOTTED PVC

SLOT SIZE (in): 0.020

FILTER PACK: 10-20 COLORADO SAND

DATE STARTED: 07/02/98

DATE COMPLETED: 07/02/98

NORTHING: 2660015.8930

EASTING: 1669180.6025

DEPTH feet	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
5			SS	3 4 4 5	0		SP-SM	Dark brown POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), fine to medium sand, gravel to 1.5" diameter, subrounded, well graded, little silt, dry to moist.	<p>2" sch. 40 PVC</p> <p>Bentonite Chips</p> <p>#10-20 Colorado Silica Sand</p> <p>2" PVC 0.020" Slotted Screen</p>
6.0		703 WL02SD 7.5N1	SS	1 2 2 2	6.0		CL/ML	Dark brown, CLAY/SILT (CL/ML), organic rich, fibers, moist, one cobble, rounded.	
8			SS	2 3 4 7	0			Greenish-gray CLAY (CL) with thin lenses of fine sand, slight hydrocarbon odor, wet to moist.	
10			SS	8 11 13 7	0			Greenish-gray SANDY CLAYEY SILT (ML), fine sand, some gravel to 1.5" diameter, subrounded, poorly graded, moist, rootlets/organics also present.	
13			SS		0			Lithology similar to above, dark gray, moist.	
16							SP-SM	Dark gray POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), fine to medium sand, and gravel, 1/4" to 3" diameter, subangular to subrounded, well graded, little silt, wet.	
								Bottom of HSA to 16 ft bgs.	
								Water level measured at 13' bgs after installing well.	



A Division of DOWL, Incorporated
 4040 B Street Anchorage, Alaska 99503
 (907) 562-2000 FAX (907) 563-3953

Client: Commercial Testing & Engineering Co.

Project: Sera VII, 9000-168

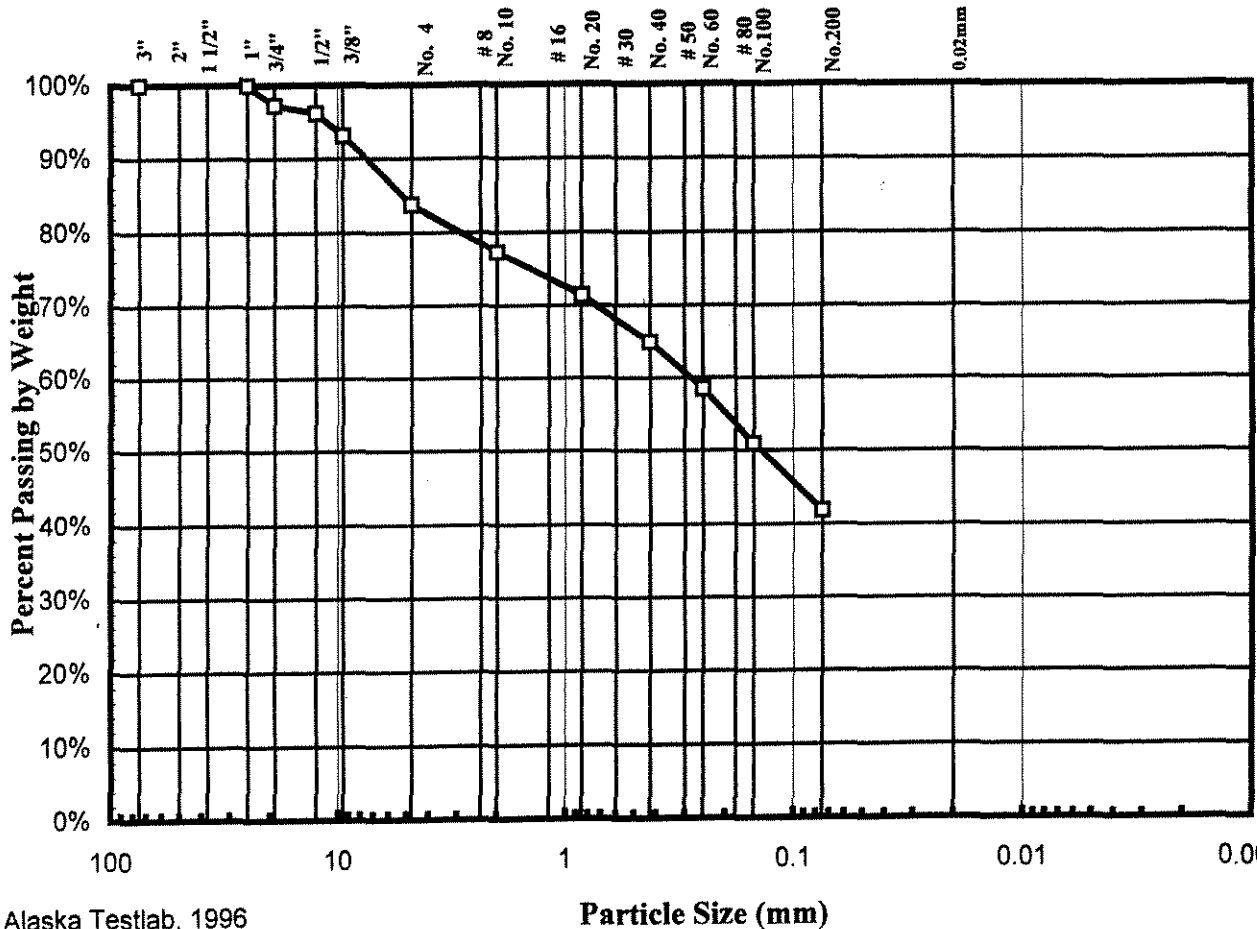
Location: 98.3815-22

Client No. 703BH02SO4.0NI

Submitted by Client

Engineering Classification: Silty SAND with Gravel, SM

Frost Classification: Not Measured



**PARTICLE-SIZE
 DIST. ASTM D422/C36**

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W.O. A27975

Lab No. 2212

Received: July 23, 1998

Reported: 7/29/98

SIZE	PASSING SPECIFICATION
+3 in Not Included in Test = ~0%	
3"	
2"	
1 1/2"	
1"	100%
3/4"	97%
1/2"	96%
3/8"	93%
No. 4	84%
Total Wt. of Coarse Fraction = 432.1g	
No. 8	
No. 10	77%
No. 16	
No. 20	71%
No. 30	
No. 40	65%
No. 50	
No. 60	58%
No. 80	
No. 100	51%
No. 200	42%
Total Wt. of Fine Fraction = 361.8g	
0.02 mm	

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David L. Andersen, P.E., General Manager



A Division of DOWL, Incorporated
 4040 B Street Anchorage, Alaska 99503
 (907) 562-2000 FAX (907) 563-3953

Client: Commercial Testing & Engineering Co.

Project: Sera VII, 9000-168

Location: 98.3815-24

Client No. 703WL01SO9.0NI

Submitted by Client

Engineering Classification: Silty SAND with Gravel, SM

Frost Classification: Not Measured

PARTICLE-SIZE
DIST. ASTM D422/C36

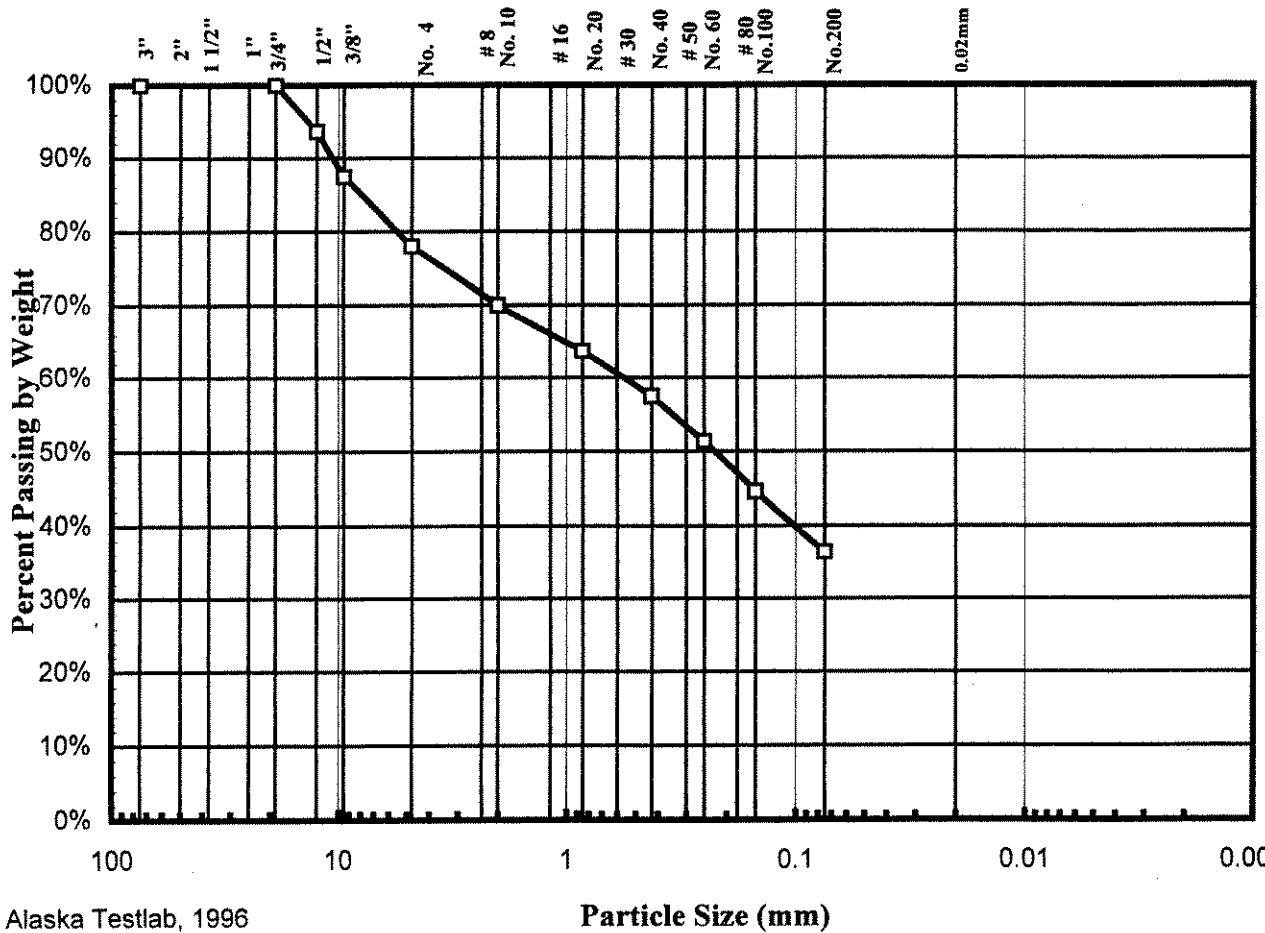
W.O. A27975

Lab No. 2214

Received: July 23, 1998

Reported: 7/29/98

SIZE	PASSING SPECIFICATION
+3 in Not Included in Test = -0%	
3"	
2"	
1 1/2"	
1"	
3/4"	100%
1/2"	94%
3/8"	87%
No. 4	78%
Total Wt. of Coarse Fraction = 365.7g	
No. 8	
No. 10	70%
No. 16	
No. 20	64%
No. 30	
No. 40	57%
No. 50	
No. 60	51%
No. 80	
No. 100	45%
No. 200	36%
Total Wt. of Fine Fraction = 284.4g	
0.02 mm	



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David L. Andersen, P.E., General Manager

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Appendix C
Analytical Data

Analytical Results from the verified USACE EDF1.2a database are presented.

Analytical results summary table notations are:

- FIELD_ID = Field Identification Number.
- LAB_ID = Laboratory Identification Number.
- WS = Water Matrix.
- SO = Soil Matrix.
- ANALYSIS = EPA or ADEC analysis method.
- MRL = Method Reporting Limit.
- Dilfac = Dilution factor for samples.
- Date = Sample Collection Date.

ST 703
Building 52-651, Green Lake Cabin
SERA VII 1998 Analytical Results Summary

FIELD ID	LAB ID	DATE	MATRIX	ANALYSIS		PARAMETER	RESULT	UNITS	MRL	Dilfac	V Rcd
703BH01SO5.0N1	983360001	06/30/98	SO	AK102	SW3550	Diesel Range Organics	285	MG/KG	4.75	0.998	
703BH01SO5.0N1	983360001	06/30/98	SO	E160.3	NONE	Total Solids	84.1	PERCENT		1	
703BH01SO5.0N1	983360001	06/30/98	SO	AK101	AK101PR	Gasoline Range Organics	14.3	MG/KG	1.14	0.477	
703BH01SO5.0N1	983360001	06/30/98	SO	AK101	AK101PR	Benzene	0.0284	U MG/KG	0.0284	0.477	
703BH01SO5.0N1	983360001	06/30/98	SO	AK101	AK101PR	Toluene	0.138	MG/KG	0.0284	0.477	BJ
703BH01SO5.0N1	983360001	06/30/98	SO	AK101	AK101PR	Ethylbenzene	0.0372	MG/KG	0.0284	0.477	J
703BH01SO5.0N1	983360001	06/30/98	SO	AK101	AK101PR	o-Xylene	0.0477	MG/KG	0.0284	0.477	J
703BH01SO5.0N1	983360001	06/30/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.123	MG/KG	0.0284	0.477	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Acenaphthene	1900	U UG/KG	1900	968.561	
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Acenaphthylene	1900	U UG/KG	1900	968.561	
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Anthracene	2.69	UG/KG	1.9	0.969	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Benzo(a)anthracene	3.74	UG/KG	1.9	0.969	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Benzo(a)pyrene	3.74	J UG/KG	1.9	0.969	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Benzo(b)fluoranthene	8.56	UG/KG	1.9	0.969	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Benzo(g,h,i)perylene	3.23	UG/KG	1.9	0.969	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Benzo(k)fluoranthene	1.9	U UG/KG	1.9	0.969	UR
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Chrysene	4.61	UG/KG	1.9	0.969	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Dibenzo(a,h)anthracene	1.9	U UG/KG	1.9	0.969	UR
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Fluoranthene	7.65	UG/KG	1.9	0.969	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Fluorene	1900	U UG/KG	1900	968.561	
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Indeno(1,2,3-cd)pyrene	3.99	J UG/KG	1.9	0.969	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Naphthalene	1900	U UG/KG	1900	968.561	
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Phenanthrene	5.32	UG/KG	1.9	0.969	J
703BH01SO5.0N1	983360001	06/30/98	SO	PAHSIM	SW3550	Pyrene	1.9	U UG/KG	1.9	0.969	UR
703BH01SO10.0N1	983360002	06/30/98	SO	AK102	SW3550	Diesel Range Organics	7.75	MG/KG	4.23	0.998	B
703BH01SO10.0N1	983360002	06/30/98	SO	E160.3	NONE	Total Solids	94.5	PERCENT		1	
703BH01SO10.0N1	983360002	06/30/98	SO	AK101	AK101PR	Gasoline Range Organics	1.38	U MG/KG	1.38	0.654	
703BH01SO10.0N1	983360002	06/30/98	SO	AK101	AK101PR	Benzene	0.0346	U MG/KG	0.0346	0.654	
703BH01SO10.0N1	983360002	06/30/98	SO	AK101	AK101PR	Toluene	0.0346	U MG/KG	0.0346	0.654	
703BH01SO10.0N1	983360002	06/30/98	SO	AK101	AK101PR	Ethylbenzene	0.0346	U MG/KG	0.0346	0.654	
703BH01SO10.0N1	983360002	06/30/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.146	MG/KG	0.0346	0.654	
703BH01SO10.0N1	983360002	06/30/98	SO	AK101	AK101PR	o-Xylene	0.0708	MG/KG	0.0346	0.654	
703BH02SO4.5N1	983360003	06/30/98	SO	AK102	SW3550	Diesel Range Organics	5680	MG/KG	94.4	19.561	
703BH02SO4.5N1	983360003	06/30/98	SO	E160.3	NONE	Total Solids	82.9	PERCENT		1	
703BH02SO4.5N1	983360003	06/30/98	SO	AK101	AK101PR	Gasoline Range Organics	92.1	MG/KG	1.58	0.654	J
703BH02SO4.5N1	983360003	06/30/98	SO	AK101	AK101PR	Benzene	0.0401	MG/KG	0.0394	0.654	J
703BH02SO4.5N1	983360003	06/30/98	SO	AK101	AK101PR	Toluene	0.35	MG/KG	0.0394	0.654	J
703BH02SO4.5N1	983360003	06/30/98	SO	AK101	AK101PR	Ethylbenzene	0.804	MG/KG	0.0394	0.654	J
703BH02SO4.5N1	983360003	06/30/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	1.08	MG/KG	0.0394	0.654	J
703BH02SO4.5N1	983360003	06/30/98	SO	AK101	AK101PR	o-Xylene	2.15	MG/KG	0.0394	0.654	J
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Acenaphthene	2000	U UG/KG	2000	979.163	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Acenaphthylene	2000	U UG/KG	2000	979.163	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Anthracene	9.67	UG/KG	2	0.979	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Benzo(a)anthracene	20.9	UG/KG	2	0.979	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Benzo(a)pyrene	11.3	J UG/KG	2	0.979	J
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Benzo(b)fluoranthene	16.1	UG/KG	2	0.979	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Benzo(g,h,i)perylene	7.8	UG/KG	2	0.979	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Benzo(k)fluoranthene	4.64	UG/KG	2	0.979	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Chrysene	14.9	UG/KG	2	0.979	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Dibenzo(a,h)anthracene	2	U UG/KG	2	0.979	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Fluoranthene	37.3	UG/KG	2	0.979	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Fluorene	2000	U UG/KG	2000	979.163	
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Indeno(1,2,3-cd)pyrene	6.2	J UG/KG	2	0.979	J
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Naphthalene	21600	J UG/KG	2000	979.163	J
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Phenanthrene	58	UG/KG	2	0.979	J
703BH02SO4.5N1	983360003	06/30/98	SO	PAHSIM	SW3550	Pyrene	39.3	UG/KG	2	0.979	

FOOTNOTES:

- U = Compound not detected at the method reporting limit (MRL).
- J = Result reported is considered an estimate value.
- Dilfac = Dilution factor applied to sample analysis.
- V_Rcd = Validation recommendation qualifier by USAED-AK data review contractor (Attachment D).
- DUP = Duplicate sample.

ST 703
Building 52-651, Green Lake Cabin
SERA VII 1998 Analytical Results Summary

FIELD ID	LAB ID	DATE	MATRIX	ANALYSIS		PARAMETER	RESULT	UNITS	MRL	Diffac	V_Rcd
703BH02SO4.5 DUP	983360004	06/30/98	SO	AK102	SW3550	Diesel Range Organics	4730	MG/KG	95.3	19.808	
703BH02SO4.5 DUP	983360004	06/30/98	SO	E160.3	NONE	Total Solids	83.1	PERCENT		1	
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Acenaphthene	1800 U	UG/KG	1800	918.932	
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Acenaphthylene	1800 U	UG/KG	1800	918.932	
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Anthracene	14.1	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Benzo(a)anthracene	51	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Benzo(a,h)perylene	30.1 J	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Benzo(b)fluoranthene	43	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Benzo(g,h,i)perylene	15.6	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Benzo(k)fluoranthene	11.2	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Chrysene	34.9	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Dibenzo(a,h)anthracene	1.8 U	UG/KG	1.8	0.919	UJ
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Fluoranthene	73.8	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Fluorene	1800 U	UG/KG	1800	918.932	
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Indeno(1,2,3-cd)pyrene	15.6 J	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Naphthalene	19500 J	UG/KG	1800	918.932	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Phenanthrene	57.1	UG/KG	1.8	0.919	J
703BH02SO4.5 DUP	983360004	06/30/98	SO	PAHSIM	SW3550	Pyrene	81.6	UG/KG	1.8	0.919	J
703BH02SO6.0N1	983360005	06/30/98	SO	AK102	SW3550	Diesel Range Organics	20.5	MG/KG	4.64	0.981	
703BH02SO6.0N1	983360005	06/30/98	SO	E160.3	NONE	Total Solids	84.6	PERCENT		1	
703BH02SO6.0N1	983360005	06/30/98	SO	AK101	AK101PR	Gasoline Range Organics	3.76 U	MG/KG	3.76	1.24	
703BH02SO6.0N1	983360005	06/30/98	SO	AK101	AK101PR	Benzene	0.094 U	MG/KG	0.094	1.24	
703BH02SO6.0N1	983360005	06/30/98	SO	AK101	AK101PR	Toluene	0.094 U	MG/KG	0.094	1.24	
703BH02SO6.0N1	983360005	06/30/98	SO	AK101	AK101PR	Ethylbenzene	0.094 U	MG/KG	0.094	1.24	
703BH02SO6.0N1	983360005	06/30/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.094 U	MG/KG	0.094	1.24	
703BH02SO6.0N1	983360005	06/30/98	SO	AK101	AK101PR	o-Xylene	0.094 U	MG/KG	0.094	1.24	
703BH03SO2.5N1	983360016	07/01/98	SO	AK102	SW3550	Diesel Range Organics	37.8	MG/KG	4.18	0.97	
703BH03SO2.5N1	983360016	07/01/98	SO	E160.3	NONE	Total Solids	92.8	PERCENT		1	
703BH03SO2.5N1	983360016	07/01/98	SO	AK101	AK101PR	Gasoline Range Organics	1.14 U	MG/KG	1.14	0.529	
703BH03SO2.5N1	983360016	07/01/98	SO	AK101	AK101PR	Benzene	0.0285 U	MG/KG	0.0285	0.529	
703BH03SO2.5N1	983360016	07/01/98	SO	AK101	AK101PR	Toluene	0.0285 U	MG/KG	0.0285	0.529	
703BH03SO2.5N1	983360016	07/01/98	SO	AK101	AK101PR	Ethylbenzene	0.0285 U	MG/KG	0.0285	0.529	
703BH03SO2.5N1	983360016	07/01/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.0285 U	MG/KG	0.0285	0.529	
703BH03SO2.5N1	983360016	07/01/98	SO	AK101	AK101PR	o-Xylene	0.0285 U	MG/KG	0.0285	0.529	
703BH04SO5.0N1	983360024	07/01/98	SO	AK102	SW3550	Diesel Range Organics	11100	MG/KG	4.06	0.92	J
703BH04SO5.0N1	983360024	07/01/98	SO	E160.3	NONE	Total Solids	90.7	PERCENT		1	
703BH04SO5.0N1	983360024	07/01/98	SO	AK101	AK101PR	Gasoline Range Organics	294	MG/KG	6.2	2.814	J
703BH04SO5.0N1	983360024	07/01/98	SO	AK101	AK101PR	Benzene	0.16	MG/KG	0.155	2.814	J
703BH04SO5.0N1	983360024	07/01/98	SO	AK101	AK101PR	Toluene	0.254	MG/KG	0.155	2.814	BJ
703BH04SO5.0N1	983360024	07/01/98	SO	AK101	AK101PR	Ethylbenzene	1.8	MG/KG	0.155	2.814	J
703BH04SO5.0N1	983360024	07/01/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	4.52	MG/KG	0.155	2.814	J
703BH04SO5.0N1	983360024	07/01/98	SO	AK101	AK101PR	o-Xylene	0.77	MG/KG	0.155	2.814	J
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Acenaphthene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Acenaphthylene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Anthracene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Benzo(a)anthracene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Benzo(a)pyrene	1800 U	UG/KG	1800	980.453	UR
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Benzo(b)fluoranthene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Benzo(g,h,i)perylene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Benzo(k)fluoranthene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Chrysene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Dibenzo(a,h)anthracene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Fluoranthene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Fluorene	4010	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Indeno(1,2,3-cd)pyrene	1800 U	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Naphthalene	15300 J	UG/KG	1800	980.453	J
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Phenanthrene	4220	UG/KG	1800	980.453	
703BH04SO5.0N1	983360024	07/01/98	SO	PAHSIM	SW3550	Pyrene	1800 U	UG/KG	1800	980.453	

FOOTNOTES:

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- J = Result reported is considered an estimate value.
- Diffac = Dilution factor applied to sample analysis.
- V_Rcd = Validation recommendation qualifier by USAED-AK data review contractor (Attachment D).
- DUP = Duplicate sample.

ST 703
Building 52-651, Green Lake Cabin
SERA VII 1998 Analytical Results Summary

FIELD ID	LAB ID	DATE	MATRIX	ANALYSIS		PARAMETER	RESULT	UNITS	MRL	Dilfac	V	Red
703BH04SO5.0 DUP	983360025	07/01/98	SO	AK102	SW3550	Diesel Range Organics	10300	MG/KG	4.12	0.931	J	
703BH04SO5.0 DUP	983360025	07/01/98	SO	E160.3	NONE	Total Solids	90.4	PERCENT			1	
703BH04SO5.0 DUP	983360025	07/01/98	SO	AK101	AK101PR	Gasoline Range Organics	294	MG/KG	9.68	4.374	J	
703BH04SO5.0 DUP	983360025	07/01/98	SO	AK101	AK101PR	Benzene	0.0718	MG/KG	0.0484	0.875	J	
703BH04SO5.0 DUP	983360025	07/01/98	SO	AK101	AK101PR	Toluene	1.78	MG/KG	0.0484	0.875	J	
703BH04SO5.0 DUP	983360025	07/01/98	SO	AK101	AK101PR	Ethylbenzene	1.23	MG/KG	0.0484	0.875	J	
703BH04SO5.0 DUP	983360025	07/01/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	2.77	MG/KG	0.0484	0.875	J	
703BH04SO5.0 DUP	983360025	07/01/98	SO	AK101	AK101PR	o-Xylene	3.63	MG/KG	0.0484	0.875	J	
703BH04SO6.0N1	983579014	07/01/98	SO	AK102	SW3550	Diesel Range Organics	3350	MG/KG	45.1	9.809	J	
703BH04SO6.0N1	983579014	07/01/98	SO	E160.3	NONE	Total Solids	87.0	PERCENT			1	
703BH04SO6.0N1	983579014	07/01/98	SO	AK101	AK101PR	Gasoline Range Organics	134	MG/KG	2.07	1.035		
703BH04SO6.0N1	983579014	07/01/98	SO	AK101	AK101PR	Benzene	0.0518	MG/KG	0.0518	1.035	UR	
703BH04SO6.0N1	983579014	07/01/98	SO	AK101	AK101PR	Toluene	0.0896	MG/KG	0.0518	1.035	BJ	
703BH04SO6.0N1	983579014	07/01/98	SO	AK101	AK101PR	Ethylbenzene	1.42	MG/KG	0.0518	1.035	J	
703BH04SO6.0N1	983579014	07/01/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	1.89	MG/KG	0.0518	1.035	J	
703BH04SO6.0N1	983579014	07/01/98	SO	AK101	AK101PR	o-Xylene	0.406	MG/KG	0.0518	1.035	J	
703BH04SO10.5N1	983360020	07/01/98	SO	AK102	SW3550	Diesel Range Organics	6.55	MG/KG	4.15	0.959	B	
703BH04SO10.5N1	983360020	07/01/98	SO	E160.3	NONE	Total Solids	92.5	PERCENT			1	
703BH04SO10.5N1	983360020	07/01/98	SO	AK101	AK101PR	Gasoline Range Organics	6.15	MG/KG	1.43	0.662		
703BH04SO10.5N1	983360020	07/01/98	SO	AK101	AK101PR	Benzene	0.258	MG/KG	0.0358	0.662		
703BH04SO10.5N1	983360020	07/01/98	SO	AK101	AK101PR	Toluene	0.674	MG/KG	0.0358	0.662		
703BH04SO10.5N1	983360020	07/01/98	SO	AK101	AK101PR	Ethylbenzene	0.211	MG/KG	0.0358	0.662		
703BH04SO10.5N1	983360020	07/01/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.726	MG/KG	0.0358	0.662		
703BH04SO10.5N1	983360020	07/01/98	SO	AK101	AK101PR	o-Xylene	0.242	MG/KG	0.0358	0.662		
703BH05SO6.0N1	983579013	07/01/98	SO	AK102	SW3550	Diesel Range Organics	11.1	MG/KG	4.22	0.992	BJ	
703BH05SO6.0N1	983579013	07/01/98	SO	E160.3	NONE	Total Solids	94.0	PERCENT			1	
703BH05SO6.0N1	983579013	07/01/98	SO	AK101	AK101PR	Gasoline Range Organics	1.7	MG/KG	1.7	0.801		
703BH05SO6.0N1	983579013	07/01/98	SO	AK101	AK101PR	Benzene	0.0426	MG/KG	0.0426	0.801		
703BH05SO6.0N1	983579013	07/01/98	SO	AK101	AK101PR	Toluene	0.0426	MG/KG	0.0426	0.801		
703BH05SO6.0N1	983579013	07/01/98	SO	AK101	AK101PR	Ethylbenzene	0.0426	MG/KG	0.0426	0.801		
703BH05SO6.0N1	983579013	07/01/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.0426	MG/KG	0.0426	0.801		
703BH05SO6.0N1	983579013	07/01/98	SO	AK101	AK101PR	o-Xylene	0.0426	MG/KG	0.0426	0.801		
703WL01SO6.0N1	983360014	07/01/98	SO	AK102	SW3550	Diesel Range Organics	9.17	MG/KG	4.3	0.987	B	
703WL01SO6.0N1	983360014	07/01/98	SO	E160.3	NONE	Total Solids	91.9	PERCENT			1	
703WL01SO6.0N1	983360014	07/01/98	SO	AK101	AK101PR	Gasoline Range Organics	2.45	MG/KG	2.45	0.39		
703WL01SO6.0N1	983360014	07/01/98	SO	AK101	AK101PR	Benzene	0.0613	MG/KG	0.0613	0.39		
703WL01SO6.0N1	983360014	07/01/98	SO	AK101	AK101PR	Toluene	0.0613	MG/KG	0.0613	0.39		
703WL01SO6.0N1	983360014	07/01/98	SO	AK101	AK101PR	Ethylbenzene	0.0613	MG/KG	0.0613	0.39		
703WL01SO6.0N1	983360014	07/01/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.0613	MG/KG	0.0613	0.39		
703WL01SO6.0N1	983360014	07/01/98	SO	AK101	AK101PR	o-Xylene	0.0613	MG/KG	0.0613	0.39		
703WL02SO7.5N1	983360015	07/02/98	SO	AK102	SW3550	Diesel Range Organics	10.9	MG/KG	4.68	0.976	B	
703WL02SO7.5N1	983360015	07/02/98	SO	E160.3	NONE	Total Solids	83.4	PERCENT			1	
703WL02SO7.5N1	983360015	07/02/98	SO	AK101	AK101PR	Gasoline Range Organics	2.85	MG/KG	2.85	1.187		
703WL02SO7.5N1	983360015	07/02/98	SO	AK101	AK101PR	Benzene	0.0712	MG/KG	0.0712	1.187		
703WL02SO7.5N1	983360015	07/02/98	SO	AK101	AK101PR	Toluene	0.0712	MG/KG	0.0712	1.187		
703WL02SO7.5N1	983360015	07/02/98	SO	AK101	AK101PR	Ethylbenzene	0.0712	MG/KG	0.0712	1.187		
703WL02SO7.5N1	983360015	07/02/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.0712	MG/KG	0.0712	1.187		
703WL02SO7.5N1	983360015	07/02/98	SO	AK101	AK101PR	o-Xylene	0.0712	MG/KG	0.0712	1.187		

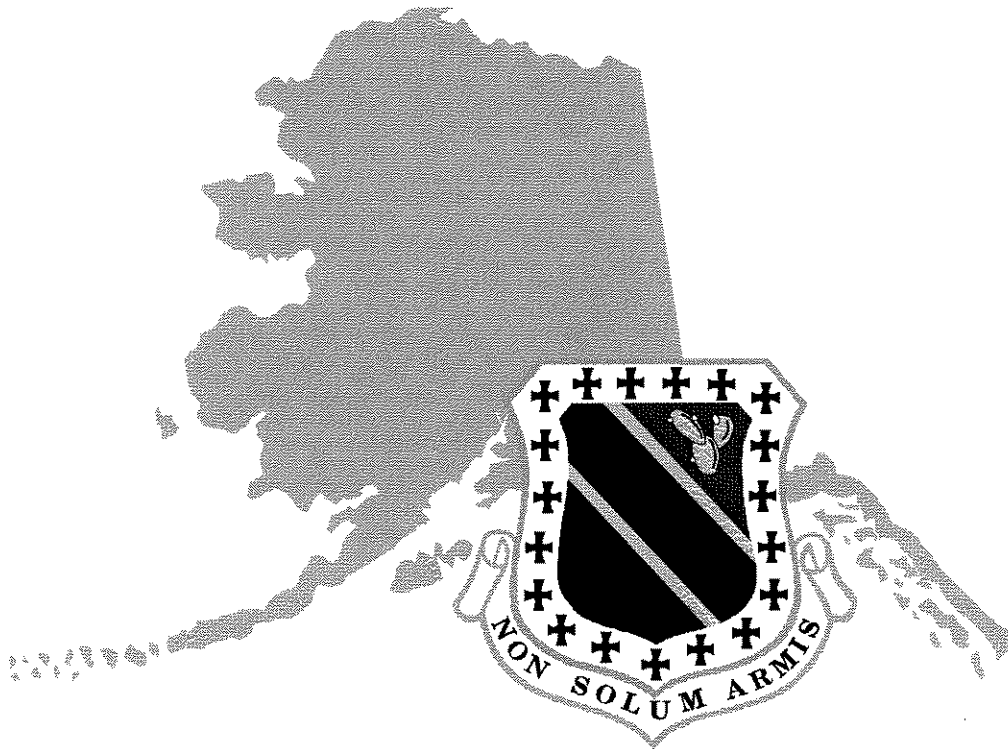
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- V_Red = Validation recommendation qualifier by USAED-AK data review contractor (Attachment D).
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ST 703
Building 52-651, Green Lake Cabin
SERA VII 1998 Analytical Results Summary

FIELD ID	LAB ID	DATE	MATRIX	ANALYSIS		PARAMETER	RESULT	UNITS	MRL	Dilfac	V_Rcd
703WL01WGN1	984328001	08/07/98	WS	AK102	SW3510	Diesel Range Organics	0.102	U	MG/L	0.102	1.02
703WL01WGN1	984328001	08/07/98	WS	AK101	SW5030A	Gasoline Range Organics	0.04	U	MG/L	0.04	1
703WL01WGN1	984328001	08/07/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1
703WL01WGN1	984328001	08/07/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1
703WL01WGN1	984328001	08/07/98	WS	AK101	SW5030A	Ethylbenzene	0.001	U	MG/L	0.001	1
703WL01WGN1	984328001	08/07/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.001	U	MG/L	0.001	1
703WL01WGN1	984328001	08/07/98	WS	AK101	SW5030A	o-Xylene	0.001	U	MG/L	0.001	1
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Acenaphthene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Acenaphthylene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Anthracene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Benzo(a)anthracene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Benzo(a)pyrene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Benzo(b)fluoranthene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Benzo(g,h,i)perylene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Benzo(k)fluoranthene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Chrysene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Dibenzo(a,h)anthracene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Fluoranthene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Fluorene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Indeno(1,2,3-cd)pyrene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Naphthalene	0.203	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Phenanthrene	0.057	U	UG/L	0.057	1.136
703WL01WGN1	984328001	08/07/98	WS	PAHSIM	SW3510	Pyrene	0.057	U	UG/L	0.057	1.136
703WL02WGN1	984328002	08/07/98	WS	AK102	SW3510	Diesel Range Organics	0.11	U	MG/L	0.11	1.099
703WL02WGN1	984328002	08/07/98	WS	AK101	SW5030A	Gasoline Range Organics	0.04	U	MG/L	0.04	1
703WL02WGN1	984328002	08/07/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1
703WL02WGN1	984328002	08/07/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1
703WL02WGN1	984328002	08/07/98	WS	AK101	SW5030A	Ethylbenzene	0.001	U	MG/L	0.001	1
703WL02WGN1	984328002	08/07/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.001	U	MG/L	0.001	1
703WL02WGN1	984328002	08/07/98	WS	AK101	SW5030A	o-Xylene	0.001	U	MG/L	0.001	1
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Acenaphthene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Acenaphthylene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Anthracene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Benzo(a)anthracene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Benzo(a)pyrene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Benzo(b)fluoranthene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Benzo(g,h,i)perylene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Benzo(k)fluoranthene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Chrysene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Dibenzo(a,h)anthracene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Fluoranthene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Fluorene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Indeno(1,2,3-cd)pyrene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Naphthalene	0.135	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Phenanthrene	0.057	U	UG/L	0.057	1.149
703WL02WGN1	984328002	08/07/98	WS	PAHSIM	SW3510	Pyrene	0.057	U	UG/L	0.057	1.149
Trip Blank	984328003	08/10/98	WS	SW8021B	SW5030A	Benzene	0.001	U	MG/L	0.001	1
Trip Blank	984328003	08/10/98	WS	SW8021B	SW5030A	Toluene	0.001	U	MG/L	0.001	1
Trip Blank	984328003	08/10/98	WS	SW8021B	SW5030A	Ethylbenzene	0.001	U	MG/L	0.001	1
Trip Blank	984328003	08/10/98	WS	SW8021B	SW5030A	m,p-Xylene (Sum of Isomers)	0.001	U	MG/L	0.001	1
Trip Blank	984328003	08/10/98	WS	SW8021B	SW5030A	o-Xylene	0.001	U	MG/L	0.001	1
703BH05WQEB1	983360026	07/01/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1
703BH05WQEB1	983360026	07/01/98	WS	AK101	SW5030A	Ethylbenzene	0.001	U	MG/L	0.001	1
703BH05WQEB1	983360026	07/01/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.001	U	MG/L	0.001	1
703BH05WQEB1	983360026	07/01/98	WS	AK101	SW5030A	o-Xylene	0.001	U	MG/L	0.001	1
703BH05WQEB1	983360026	07/01/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1

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Dilfac = Dilution factor applied to sample analysis.
V_Rcd = Validation recommendation qualifier by USAED-AK data review contractor (Attachment D).
DUP = Duplicate sample.



**UST DECOMMISSIONING AND SITE
ASSESSMENT-STMP 476, BUILDING 52-651**

**UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA**

FINAL

FEBRUARY 1998

REPORT DOCUMENTATION PAGE

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LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFB	Air Force Base
AFID	Air Force Identification Number
BTEX	benzene, toluene, ethylbenzene, and xylenes
bgs	below ground surface
cy	cubic yards
DO	Delivery Order
DOD	Department of Defense
DRO	diesel range organics
ft	feet
LEL	lower explosive limit
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
ND	non-detect
PID	photoionization detector
ppm	parts per million
QAPP	quality assurance program plan
RRO	residual range organics
STMP	Storage Tank Management Program
TSCA	Toxic Substances Control Act
UST	underground storage tank

1.0 INTRODUCTION

1.1 GENERAL DISCUSSION

The United States Air Force performed the removal and assessment of an unregulated underground storage tank (UST) at Building 52-651, located on Elmendorf Air Force Base (AFB), Alaska. The sectional description for the UST is the northwest 1/4 of the northwest 1/4 of Section 28 Township 14 North, Range 3 West, Anchorage. The Storage Tank Management Plan (STMP) number for this tank is 476.

The purposes of this project were to:

- Remove and decommission UST STMP 476
- Perform a site assessment for closure in accordance with Alaska's Underground Storage Tank Regulations (18 AAC 78)
- Document removal and decommissioning actions in a site summary and closure report.

The project location map is provided as Figure 1. The UST was located adjacent to the north side of Building 52-651 between the building and the access road, as shown on Figure 2. The tank was reported to contain heating oil and was connected to the heating system in Building 52-651.

On July 21, 1997, the unregulated UST referenced above was removed. The UST was a 1,000 gallon single-wall steel tank. The age and date of service for the tank are unknown.

UST STMP 476 removal activities included:

- Excavating and removing UST STMP 476
- Removing associated piping

- Screening soil with a photoionization detector (PID)
- Sampling soil for laboratory analysis.

Soil was field-screened and samples were collected and analyzed for the presence of diesel range organics (DRO), and benzene, toluene, ethylbenzene, and xylenes (BTEX). Sample collecting, handling, and documenting were performed in accordance with an approved standard quality assurance program plan (QAPP) on file with Alaska Department Environmental Conservation (ADEC).

1.2 REPORT CONTENTS AND FORMAT

This report documents the decommissioning procedures performed for UST STMP 476, located at the Building 52-651 on Elmendorf AFB.

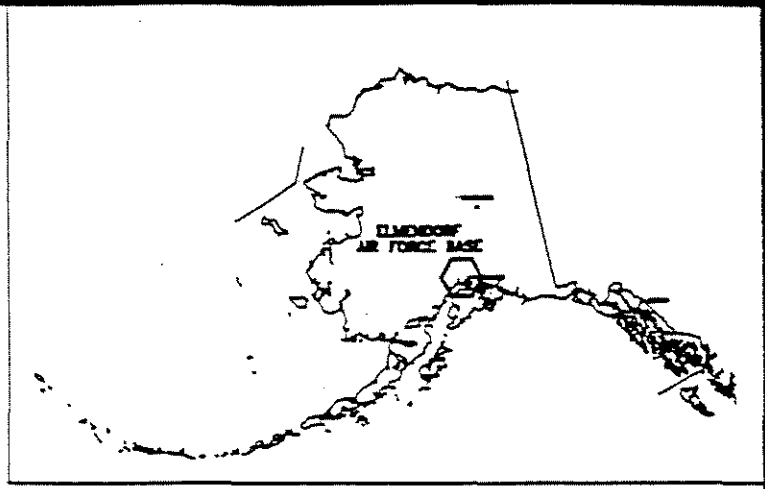
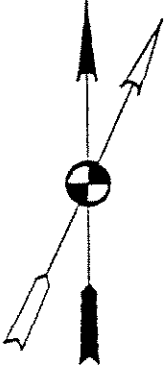
The report provides:

- Project scope and execution
- Field operations description
- Laboratory testing description
- Conclusions and recommendations
- Site location maps
- Laboratory analyses results
- Chain-of-custody documentation
- Field notes
- ADEC matrix score sheet, and
- Photographs.

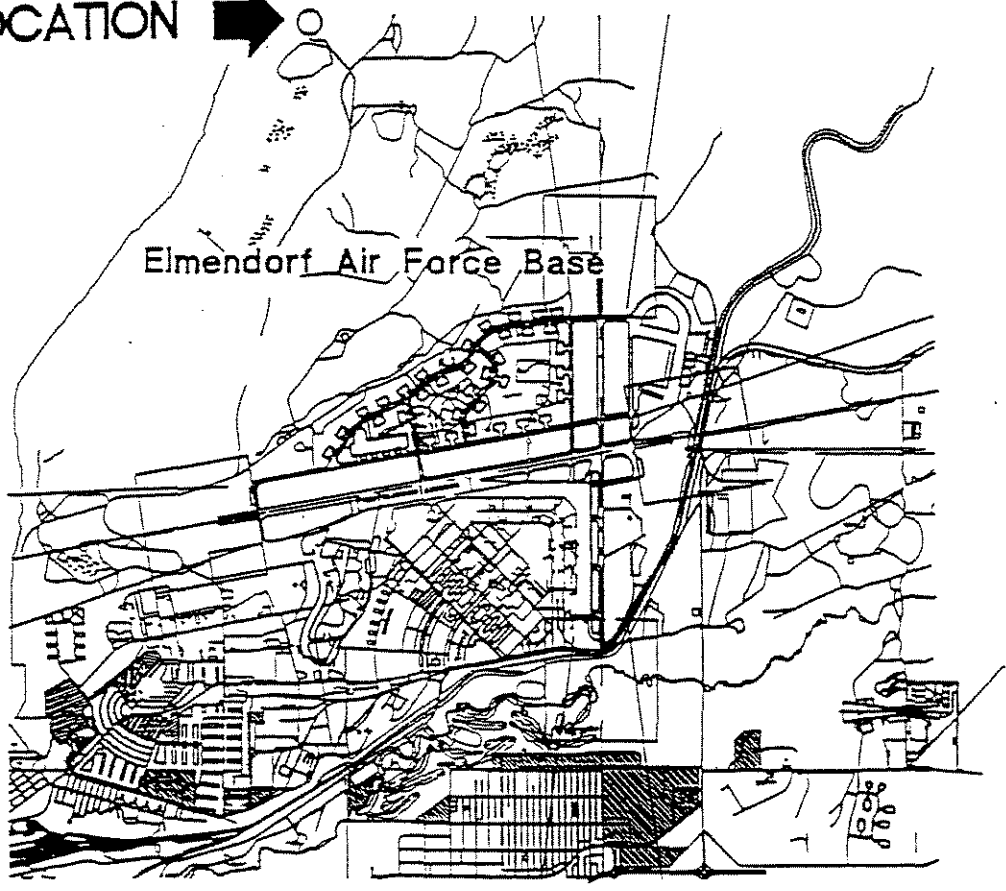
Table 1 summarizes field screening results, and a tabular summary of laboratory analytical results is provided in Table 2. The laboratory data report is provided in Appendix A, chain-of-custody documentation is found in Appendix B, and field notes are presented in Appendix C.

The ADEC Soil Cleanup Matrix Score Sheet is provided in Appendix D, with photographs in Appendix E.

NORTH



LOCATION



Municipality of Anchorage

FIGURE 1

PROJECT LOCATION MAP
 STMP 476 - BUILDING 52-651
 ELMENDORF AIR FORCE BASE, ALASKA
 UNITED STATES AIR FORCE

BTJ	8-13-97	
TB	8-13-97	
NA		LOC-MAP

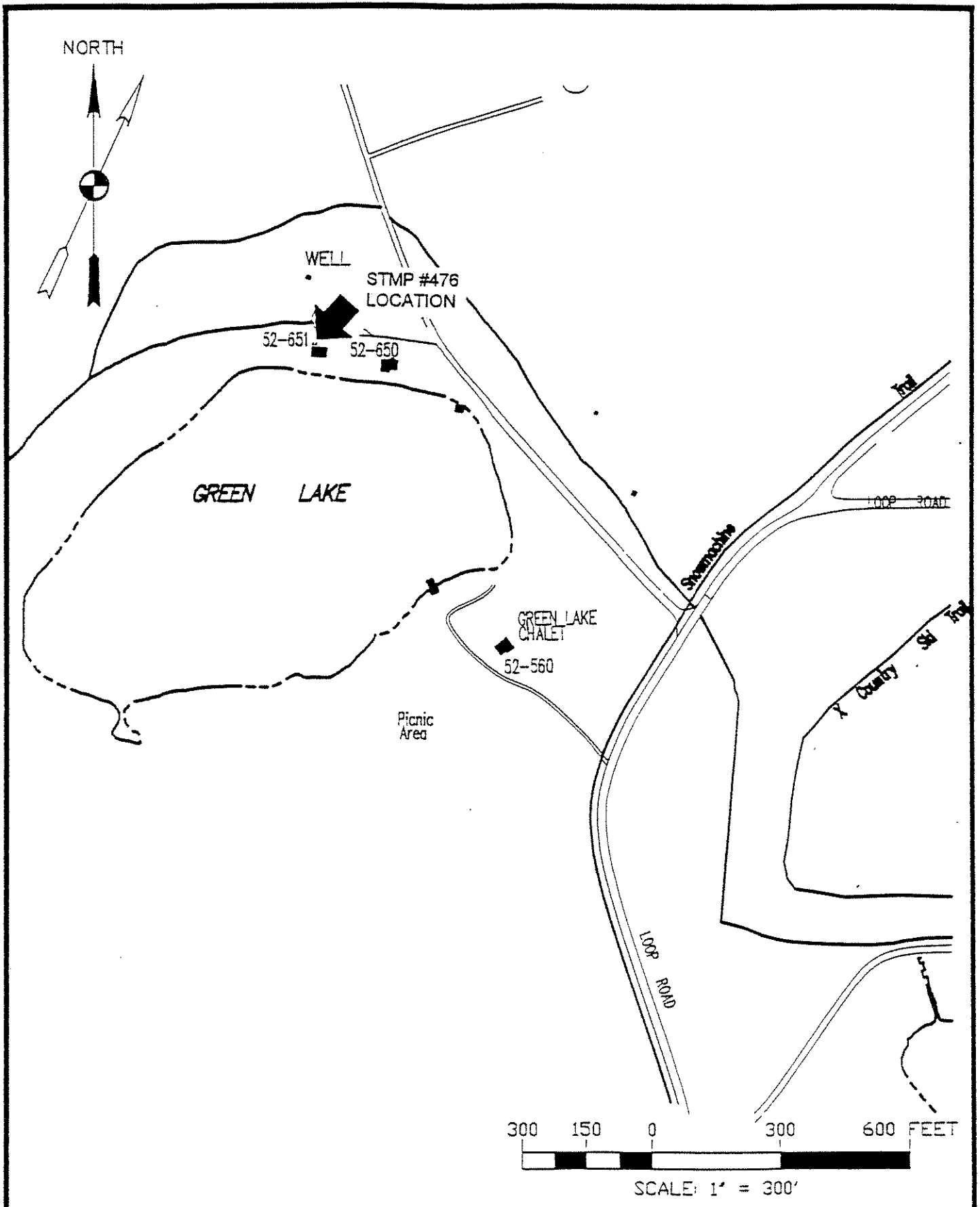


FIGURE 2

SITE VICINITY MAP
 STMP 476 - BUILDING 52-651
 ELMENDORF AIR FORCE BASE, ALASKA

UNITED STATES AIR FORCE

By	Date	Project No.
BTJ	8-6-97	BTJ
Checked	Date	File No.
TB	8-6-97	
Drawn		52-651
NA		

2.0 FIELD OPERATION

2.1 EXCAVATION

Prior to excavating UST STMP 476 utility locates were performed by Air Force personnel and a digging permit was acquired.

Excavation related activities consisted of:

- Excavating the tank using a backhoe
- Field screening and stockpiling excavated soils.

Excavated soil was stockpiled on a 10-mil Visqueen® liner placed on the ground away from the excavation. Stockpiled soil was field screened for possible contamination. Prior to removal, the atmosphere within the tank was tested using a Scientific Instruments LTX-310 Multigas Monitoring instrument to measure O₂ and LEL in the UST. The UST did not require inertion prior to removal.

2.2 TANK REMOVAL

The UST STMP 476 was removed from the excavation using a backhoe. The excavation measured approximately 15 ft. long by nine ft. wide by six ft. deep. The tank was in good condition, with slight rust but no obvious holes observed. Associated tank piping was unearthed to the foundation of building 52-651. Once to the building, the tank piping was cut, capped, removed, and grouted. Vent lines were also removed. After removal, UST STMP 476 was transferred to the project storage yard located on the intersection of Elm and Plum Streets on Elmendorf AFB where it was cleaned with degreaser, scrubbed, and rinsed. The tank was cut into pieces and delivered to Alaska Metals Recycling for disposal. Delivery of the tank pieces was documented using Department of Defense (DOD) form 1348-1.

2.3 SITE ASSESSMENT

The soil removed from the excavation was field screened for the presence of contaminants. Field screening involved headspace analysis using a Photovac MicroTIP HL 2000 PID with a 10.6 eV lamp, in accordance with Section 4.4 of the approved QAPP. Collection of samples for headspace analysis were based on potentially contaminated soils. The PID was calibrated in the field using isobutylene at 100 parts per million (ppm).

The soil surrounding the UST consisted of fine grained sand with gravel. Intermittent clay was encountered at a depth of 6 feet below ground surface (bgs). Field screening indicated that petroleum hydrocarbon contamination was present at the bottom of the excavation and along the east wall. The field technician used professional judgment and based sample locations on these field observations. Approximately 20 cubic yards of soil were excavated in an attempt to remove contaminated soil to acceptable limits. Table 1 below provides field screening results.

TABLE 1
RESULTS OF HEADSPACE ANALYSES

Sample Depth (ft bgs)	Location	Headspace Results (ppm)	Laboratory Sample ID
½ - 1	Near fill pipe	350	
3	North side of tank - east end	205	
6.0	Bottom Center		97ELMGL001SS
6.5	Fill End		97ELMGL002SS
4	North side of tank - east end	1.5	
5.5	East end - bottom of tank	552	
4	Piping Run		97ELMGL003SS
4	Piping Run		97ELMGL004SS*
4	East wall	324	
5-6	South wall - east end	97	
5	East wall	49	
5	South wall - west end	457	97ELMGL005SS
6	Bottom of tank - west end	44	
6	Bottom of tank - east end	215	
6.5	Bottom of tank - east end	16	97ELMGL6SS
NA	Stockpile		97ELMGL007SS

* Duplicate of 97ELMGL003SS.

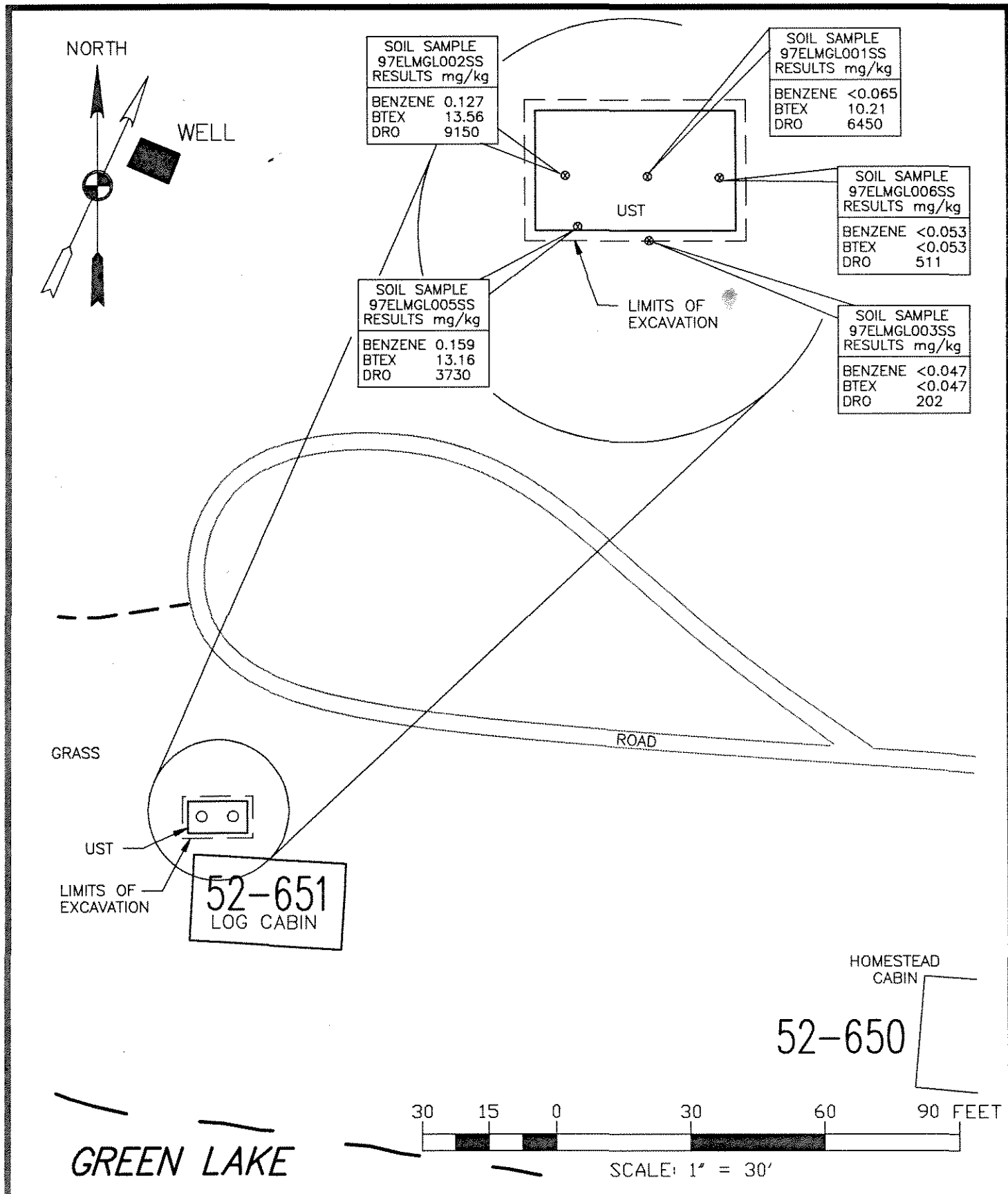


FIGURE 3

Project:	SAMPLE LOCATION MAP		By:	Date:	Project No.
	STMP 476 - BUILDING 52-651		BTJ	8-6-97	
	ELMENDORF AIR FORCE BASE, ALASKA		Check:	Date:	File Path
Client:	UNITED STATES AIR FORCE		TB	8-6-97	
			Scale:		52-651a
			NA		

3.0 LABORATORY ANALYSIS AND RESULT

Soil samples collected during this site assessment were analyzed for DRO, using ADEC Method AK102 and BTEX using EPA Method 8020. Seven soil samples were collected, including two soil samples from below the tank bottom, two confirmation samples from the limits of the excavation, one soil sample and one duplicate sample from the piping trench and one soil sample from the contaminated soil stockpile. A trip blank was also analyzed. Figure 3 provides the locations of the soil samples. Analytical results of the soil samples are presented in Table 2.

**TABLE 2
 RESULTS OF LABORATORY ANALYSES**

Sample ID	Location	Depth (ft)	DRO (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Total Xylenes (mg/kg)	Total BTEX (mg/kg)
97ELMGL001SS	Bottom Center	6.0	6450	ND (<0.065)	0.176	1.16	8.87	10.21
97ELMGL002SS	Fill End	6.5	9150	0.127	0.422	2.00	11.01	13.60
97ELMGL003SS	Piping Run	4.0	202	ND (<0.047)	ND (<0.047)	ND (<0.047)	ND (<0.047)	ND (<0.047)
97ELMGL004SS	Piping Run (duplicate)	4.0	193	ND (<0.047)	ND (<0.047)	ND (<0.047)	ND (<0.047)	ND (<0.047)
97ELMGL005SS	South Wall, West (Confirmation)	5.0	3730	0.159	0.421	2.75	9.83	13.16
97ELMGL006SS	Bottom, East (Confirmation)	6.5	511	ND (<0.053)	ND (<0.053)	ND (<0.053)	ND (<0.053)	ND (<0.053)
97ELMGL007SS	Stockpile	NA	6730	0.0863	0.266	1.15	6.37	7.87
Trip Blank	NA	NA	NA	ND (<0.0010)	ND (<0.0010)	ND (<0.0010)	ND (<0.0010)	ND (<0.0010)

Notes: ND (xx) = not detected above method detection limits shown in parentheses.
 NA = not applicable

Laboratory analyses indicated that total BTEX compounds were detected in three of the four soil samples collected from the tank excavation, in one sample collected from the piping run, and in one sample collected from the stockpile. Total BTEX values for samples from the tank excavation range from not detected to 13.60 mg/kg. Benzene was detected in soil samples at a maximum concentration of 0.159 mg/kg. DRO was detected in all soil samples collected from the tank excavation, with laboratory analytical results ranging from 511 to 9,150 mg/kg. The soil sample with the highest DRO concentration was collected from the fill end of the tank excavation. Laboratory analytical results indicate that the sample collected from the piping run contained no BTEX compounds and 202 mg/kg DRO

Analytical results of the stockpile sample are also shown in Table 2.

The laboratory data received a thorough quality assurance review. All laboratory results met the established quality control criteria. An ADEC matrix score sheet for petroleum cleanup levels at the site was determined and is described in the following section.

3.1 ADEC MATRIX SCORE

An ADEC matrix score was completed for UST STMP 476 to determine the required cleanup levels for petroleum contamination at the site. The matrix cleanup levels are determined based on depth to groundwater, mean annual precipitation, soil type, potential receptors, and estimated volume of contaminated soil.

An ADEC matrix score range of 29 to 37 was computed for UST STMP 476 (Appendix D).

The score is based on the following information:

- Depth to subsurface water is estimated to be between 16 and 50 feet bgs
- Mean annual precipitation data prepared by the National Weather Service report the mean annual precipitation for Anchorage to be 15.1 inches
- Soil type was identified from the excavation as fine grained sand, with gravel from 0-6 ft. bgs. In addition, intermittent clay was encountered at six ft. bgs.

- The closest water well is located approximately 125 feet (ft) from the UST location
- Volume of contaminated soil is estimated to be 20 cubic yards.

Based on an ADEC soil matrix score ranging from 29 to 37, a soil cleanup at Level B is anticipated for this site.

Under Level B, soil contamination cleanup levels are:

- GRO - 100 mg/kg
- DRO - 200 mg/kg
- RRO - 2,000 mg/kg
- Benzene - 0.5 mg/kg
- Total BTEX - 15 mg/kg.

The concentrations of DRO detected in confirmation sample 97ELMDT006SS, collected from the limit of the excavation, and pipeline sample 97ELMDT004SS, exceeded the Level B cleanup concentrations.

4.0 CONCLUSIONS AND RECOMMENDATION

On July 21, 1997, UST STMP 476, adjacent to Building 52-651 on Elmendorf AFB, was decommissioned, removed, and transported to the project storage yard on Elmendorf AFB for temporary storage in a bermed and lined area. Following cleaning and tank destruction the UST was delivered to Alaska Metals Recycling. The excavation was backfilled using excavated soils that were shown to be clean during field screening tests and other clean borrow material from off-site. The contaminated soil excavated during UST removal activities was transferred to a fully permitted thermal treatment facility in Anchorage. Headspace analysis performed in the field using a PID indicated that elevated hydrocarbon concentrations were likely present in excavation samples and the contaminated soil stockpile. Laboratory results from the analyses of seven soil samples collected from the excavation and soil stockpile indicate that BTEX compound are present in the subsurface soils. Based on site parameters a soil cleanup level of Level B was calculated for the site using the ADEC soil cleanup matrix. DRO was detected in the soil samples above the allowable concentration of 200 mg/kg. Based on the assessment results, additional assessment and remediation are required to attain ADEC Level B cleanup goals.

UST STMP 476
BUILDING 52-651

**APPENDIX A
LABORATORY REPORT
WITH ADEC DELIVERABLES**



CT&E Environmental Services Inc.

Laboratory Division

Laboratory Analysis Report

July 29, 1997

Cindy Hale
ACCI
912 E. 15th Suite 200
Anchorage, AK 99501

Client Name	ACCI
Project ID	Elmendorf UST Removal(DO 12) [973977]
Printed	July 29, 1997

Enclosed are the analytical results associated with the above project.

As required by the state of Alaska and the USEPA, a formal Quality Assurance/Quality Control Program is maintained by CT&E. A copy of our Quality Control Manual that outlines this program is available at your request.

Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth in our Quality Assurance Program Plan.

If you have any questions regarding this report or if we can be of any other assistance, please call your CT&E Project Manager at (907) 562-2343.

The following descriptors may be found on your report which will serve to further qualify the data.

- U - Indicates the compound was analyzed for but not detected.
- J - Indicates an estimated value that falls below PQL, but is greater than the MDL.
- B - Indicates the analyte is found in the blank associated with the sample.
- * - The analyte has exceeded allowable limits.
- GT - Greater Than
- D - Secondary Dilution
- LT - Less Than
- ! - Surrogate out of range



CT&E Ref.# 973977001
 Client Name ACCI
 Project Name/# Elmendorf UST Removal(DO 12)
 Client Sample ID 97ELMGL001SS
 Matrix Soil
 Ordered By
 PWSID

Client PO#
 Printed Date/Time 07/29/97 13:17
 Collected Date/Time 07/21/97 16:28
 Received Date/Time 07/22/97 13:50
 Technical Director: Stephen C. Ede

Released By *Sharon Patten*

Sample Remarks:
 DRO - Pattern consistent with weathered middle distillate.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Total Solids	74.3		%	SM18 2540G			07/28/97	DAV
BTEX 8020								
Benzene	0.065 U	0.065	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Toluene	0.176	0.065	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Ethylbenzene	1.16	0.065	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
P & M -Xylene	4.66	0.065	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
o-Xylene	4.21	0.065	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Surrogates								
1,4-Difluorobenzene <Surr>	99.4		%	BTEX SW846-8020 (50-150)		07/23/97	07/23/97	
AK102								
Diesel Range Organics	6450	52.9	mg/Kg	AK102 DRO		07/26/97	07/28/97	WAA
Surrogates								
5a Androstane <surr>	91.9		%	AK102 DRO (50-150)		07/26/97	07/28/97	



CT&E Ref.# 973977002
Client Name ACCI
Project Name/# Elmendorf UST Removal(DO 12)
Client Sample ID 97ELMGL002SS
Matrix Soil
Ordered By PWSID

Client PO#
Printed Date/Time 07/29/97 13:17
Collected Date/Time 07/21/97 16:36
Received Date/Time 07/22/97 13:50
Technical Director: Stephen C. Ede

Released By [Signature]

Sample Remarks:
DRO - Pattern consistent with weathered middle distillate.

Table with columns: Parameter, Results, PQL, Units, Method, Allowable Limits, Prep Date, Analysis Date, Init. Rows include Total Solids, BTEX 8020 (Benzene, Toluene, Ethylbenzene, P & M -Xylene, o-Xylene), Surrogates (1,4-Difluorobenzene), AK102 (Diesel Range Organics), and Surrogates (5a Androstane).



CT&E Ref.# 973977003
 Client Name ACCI
 Project Name/# Elmendorf UST Removal(DO 12)
 Client Sample ID 97ELMGL003SS
 Matrix Soil
 Ordered By
 PWSID

Client PO#
 Printed Date/Time 07/29/97 10:45
 Collected Date/Time 07/21/97 16:53
 Received Date/Time 07/22/97 13:50
 Technical Director: Stephen C. Ede

Released By *Sharon Patton*

Sample Remarks:
 DRO - Pattern consistent with weathered middle distillate.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Total Solids	98.7		%	SM18 2540G			07/28/97	DAV
BTEX 8020								
Benzene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Toluene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Ethylbenzene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
P & M -Xylene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
o-Xylene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Surrogates								
1,4-Difluorobenzene <Surr>	96.6		%	BTEX SW846-8020 (50-150)		07/23/97	07/23/97	
AK102								
Diesel Range Organics	202	3.98	mg/Kg	AK102 DRO		07/26/97	07/27/97	WAA
Surrogates								
5a Androstane <surr>	94.1		%	AK102 DRO (50-150)		07/26/97	07/27/97	



CT&E Ref.# 973977004
 Client Name ACCI
 Project Name/# Elmendorf UST Removal(DO 12)
 Client Sample ID 97ELMGL004SS
 Matrix Soil
 Ordered By
 PWSID

Client PO#
 Printed Date/Time 07/29/97 10:45
 Collected Date/Time 07/21/97 16:53
 Received Date/Time 07/22/97 13:50
 Technical Director: Stephen C. Ede

Released By *Sharon Proton*

Sample Remarks:
 DRO - Pattern consistent with weathered middle distillate.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Total Solids	98.4		%	SM18 2540G			07/28/97	DAV
BTEX 8020								
Benzene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Toluene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Ethylbenzene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
P & M -Xylene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
o-Xylene	0.047 U	0.047	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Surrogates								
1,4-Difluorobenzene <Surr>	90.2		%	BTEX SW846-8020 (50-150)		07/23/97	07/23/97	
AK102								
Diesel Range Organics	193	4.03	mg/Kg	AK102 DRO		07/26/97	07/27/97	WAA
Surrogates								
5a Androstane <surr>	104		%	AK102 DRO (50-150)		07/26/97	07/27/97	



CT&E Ref.# 973977005
Client Name ACCI
Project Name/# Elmendorf UST Removal(DO 12)
Client Sample ID 97ELMGL005SS
Matrix Soil
Ordered By
PWSID

Client PO#
Printed Date/Time 07/29/97 13:17
Collected Date/Time 07/21/97 17:38
Received Date/Time 07/22/97 13:50
Technical Director: Stephen C. Ede

Released By [Signature]

Sample Remarks:
DRO - Pattern consistent with weathered middle distillate.

Table with 9 columns: Parameter, Results, PQL, Units, Method, Allowable Limits, Prep Date, Analysis Date, Init. Rows include Total Solids, BTEX 8020 (Benzene, Toluene, Ethylbenzene, P & M -Xylene, o-Xylene), Surrogates (1,4-Difluorobenzene), AK102 (Diesel Range Organics), and 5a Androstane.



CT&E Ref.# 973977006
 Client Name ACCI
 Project Name/# Elmendorf UST Removal(DO 12)
 Client Sample ID 97ELMGL006SS
 Matrix Soil
 Ordered By
 PWSID

Client PO#
 Printed Date/Time 07/29/97 10:45
 Collected Date/Time 07/21/97 17:54
 Received Date/Time 07/22/97 13:50
 Technical Director: Stephen C. Ede

Released By *Sharon Paton*

Sample Remarks:
 DRO - Pattern consistent with weathered middle distillate.

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
Total Solids	89.2		%	SM18 2540G			07/28/97	DAV
BTEX 8020								
Benzene	0.053 U	0.053	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Toluene	0.053 U	0.053	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Ethylbenzene	0.053 U	0.053	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
P & M -Xylene	0.053 U	0.053	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
o-Xylene	0.053 U	0.053	mg/Kg	BTEX SW846-8020		07/23/97	07/23/97	GSM
Surrogates								
1,4-Difluorobenzene <Surr>	83		%	BTEX SW846-8020 (50-150)		07/23/97	07/23/97	
AK102								
Diesel Range Organics	511	4.45	mg/Kg	AK102 DRO		07/26/97	07/28/97	WAA
Surrogates								
5a Androstane <surr>	88.1		%	AK102 DRO (50-150)		07/26/97	07/28/97	



CT&E Ref.# 973977007
Client Name ACCI
Project Name/# Elmendorf UST Removal(DO 12)
Client Sample ID 97ELMGL007SS
Matrix Soil
Ordered By
PWSID

Client PO#
Printed Date/Time 07/29/97 13:18
Collected Date/Time 07/21/97 18:05
Received Date/Time 07/22/97 13:50
Technical Director: Stephen C. Ede

Released By [Signature]

Sample Remarks:
DRO - Pattern consistent with weathered middle distillate.

Table with columns: Parameter, Results, PQL, Units, Method, Allowable Limits, Prep Date, Analysis Date, Init. Rows include Total Solids, BTEX 8020 (Benzene, Toluene, Ethylbenzene, P & M -Xylene, o-Xylene), Surrogates (1,4-Difluorobenzene), AK102 (Diesel Range Organics), and Surrogates (5a Androstane).



CT&E Ref.# 973977008
 Client Name ACCI
 Project Name/# Elmendorf UST Removal(DO 12)
 Client Sample ID Trip Blank
 Matrix Water (Surface, Eff., Ground)
 Ordered By
 PWSID

Client PO#
 Printed Date/Time 07/29/97 10:45
 Collected Date/Time
 Received Date/Time 07/22/97 13:50
 Technical Director: Stephen C. Ede

Released By *Shane Patton*

Sample Remarks:

Parameter	Results	PQL	Units	Method	Allowable Limits	Prep Date	Analysis Date	Init
BTEX 8020								
Benzene	0.0010 U	0.0010	mg/L	BTEX SW846-8020		07/24/97	07/24/97	GSM
Toluene	0.0010 U	0.0010	mg/L	BTEX SW846-8020		07/24/97	07/24/97	GSM
Ethylbenzene	0.0010 U	0.0010	mg/L	BTEX SW846-8020		07/24/97	07/24/97	GSM
P & M -Xylene	0.0010 U	0.0010	mg/L	BTEX SW846-8020		07/24/97	07/24/97	GSM
o-Xylene	0.0010 U	0.0010	mg/L	BTEX SW846-8020		07/24/97	07/24/97	GSM
Surrogates								
1,4-Difluorobenzene <Surr>	93.5		%	BTEX SW846-8020 (50-150)		07/24/97	07/24/97	

APPENDIX B
CHAIN-OF-CUSTODY DOCUMENTATION



CT&E Environmental Services Inc.

Laboratory Division

CHAIN OF CUSTODY

97.3977

POH: _____

Reports to:

BRET BERGLUND
ACCI
912 E. 15th AVENUE
ANCHORAGE AK 99501
Phone: (907) 278-7818 Fax: (907) 278-7815

Invoice to:

SAME

QUOTE # 3038

Laboratory:

Page 1 of 1
CT&E Environmental Services Inc.
200 W Potter Dr.
Anchorage, AK 99518-1605
Phone (907) 562-2343 Fax: (907) 561-5301

Contact person for questions concerning these samples: CINDY HALE / BRET BERGLUND Phone: 278-7818 Fax: 278-7815

Special Instructions: AFCEE PROJECT

Lab #	Sample #	Date/Time Sampled	# of Containers	Sample Matrix	DRO ALIQUOT EPA 8020 BULK								Comments
①	97ELMGL001SS	7/21/97 ¹⁶³⁸	2	SOIL	X	X							
②	97ELMGL002SS	7/21/97 ¹⁶³⁶	2	SOIL	X	X							
③	97ELMGL003SS	7-21-97 ¹⁶⁵³	2	SOIL	X	X							
④	97ELMGL004SS	7-21-97 ¹⁶⁵³	2	SOIL	X	X							
⑤	97ELMGL005SS	7-21-97 ¹⁷³⁸	2	SOIL	X	X							
⑥	97ELMGL006SS	7-21-97 ¹⁷⁵⁴	2	SOIL	X	X							
⑦	97ELMGL007SS	7-21-97 ¹⁸⁰⁵	2	SOIL	X	X							
⑧	TRIP BLANK			WATER		X							

Sample Receipt:		Relinquished By:		Relinquished By:		Relinquished By:	
Number of Containers	Signature: <u>Lucinda L. Hale</u>	Time: <u>1:50</u>	Signature: _____	Time: _____	Signature: _____	Time: _____	Signature: _____
COC Seals/Intact Y/N/NA	Printed Name: <u>LUCINDA L. HALE</u>	Date: <u>7/22/97</u>	Printed Name: _____	Date: _____	Printed Name: _____	Date: _____	Printed Name: _____
Temperature <u>3.6 C</u>	Received By:		Received By:		Received at Laboratory By:		
Turnaround Required	Signature: _____	Time: _____	Signature: _____	Time: _____	Signature: <u>Weather Hall</u>		Time: <u>3:50</u>
Data Deliverables Required Level I Level II Level III	Printed Name: _____	Date: _____	Printed Name: _____	Date: _____	Printed Name: <u>Weather Hall</u>		Date: <u>7/22/97</u>