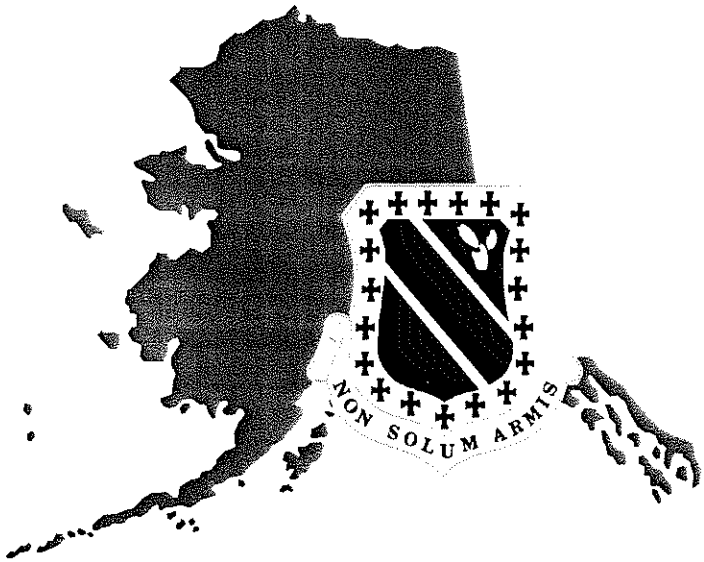


UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

ST409/7/9 REMOVAL ACTION REPORT

FEBRUARY 2003

TABLE OF CONTENTS

SECTION **PAGE**

TABLES

FIGURES

APPENDICES

(intentionally blank)

ACRONYMS AND 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, and xylenes
DQO	data quality objectives
DRO	diesel-range organics
EPA	U.S. Environmental Protection Agency
GRO	gasoline-range organics
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
PAH	polynuclear aromatic hydrocarbons
PID	photoionization detector
POL	petroleum, oil, and lubricants
ppm	parts per million
QA	quality assurance
QC	quality control
RRO	residual-range organics
SERA	State-Elmendorf Environmental Restoration Agreement
TERC	Total Environmental Restoration Contract
USAED	U.S. Army Engineer District, Alaska
USAF	U.S. Air Force
UST	underground storage tank

(intentionally blank)

1.0 INTRODUCTION

This report summarizes the removal of petroleum, oil, and lubricants (POL)-impacted soil and collection of soil confirmation samples at Site ST409/7/9 on Elmendorf Air Force Base (AFB), Alaska, during the summer of 2002. 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 ST409/7/9 was included in the State-Elmendorf Environmental Restoration Agreement (SERA) program. This cooperative agreement between the USAF and Alaska Department of Environmental Conservation (ADEC) addressed Elmendorf AFB's solid waste, underground storage tank (UST), and POL spill program areas. The SERA required that Elmendorf AFB perform necessary assessments, monitoring, remediation, and closure of these applicable sites.

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 ST409/7/9 was investigated under SERA Phase IV in 1996 and 1997, SERA Phase VII in 1998, and SERA Phase IX in 2001. A summary of these SERA investigation results is provided in Section 1.2, and complete results are in the SERA Phase IX ST409/7/9 *Release Investigation Report* (USAF 2002b).

The SERA investigation reports and site history were reviewed in spring 2002 to evaluate site conditions and develop corrective actions for the site if required. Site ST409/7/9 was recommended for excavation of shallow contamination, monitored natural attenuation of deep contamination, and groundwater monitoring of groundwater contamination. Shallow contamination is defined as contamination between 0 and 15 feet below ground surface (bgs). Depth to groundwater is approximately 30 feet bgs and contamination was detected in the

smear zone and in groundwater during the SERA investigations. Additional information on the evaluation and recommendation can be found in the *Corrective Action Plan, SERA IX Sites*, Final (USAF 2002a).

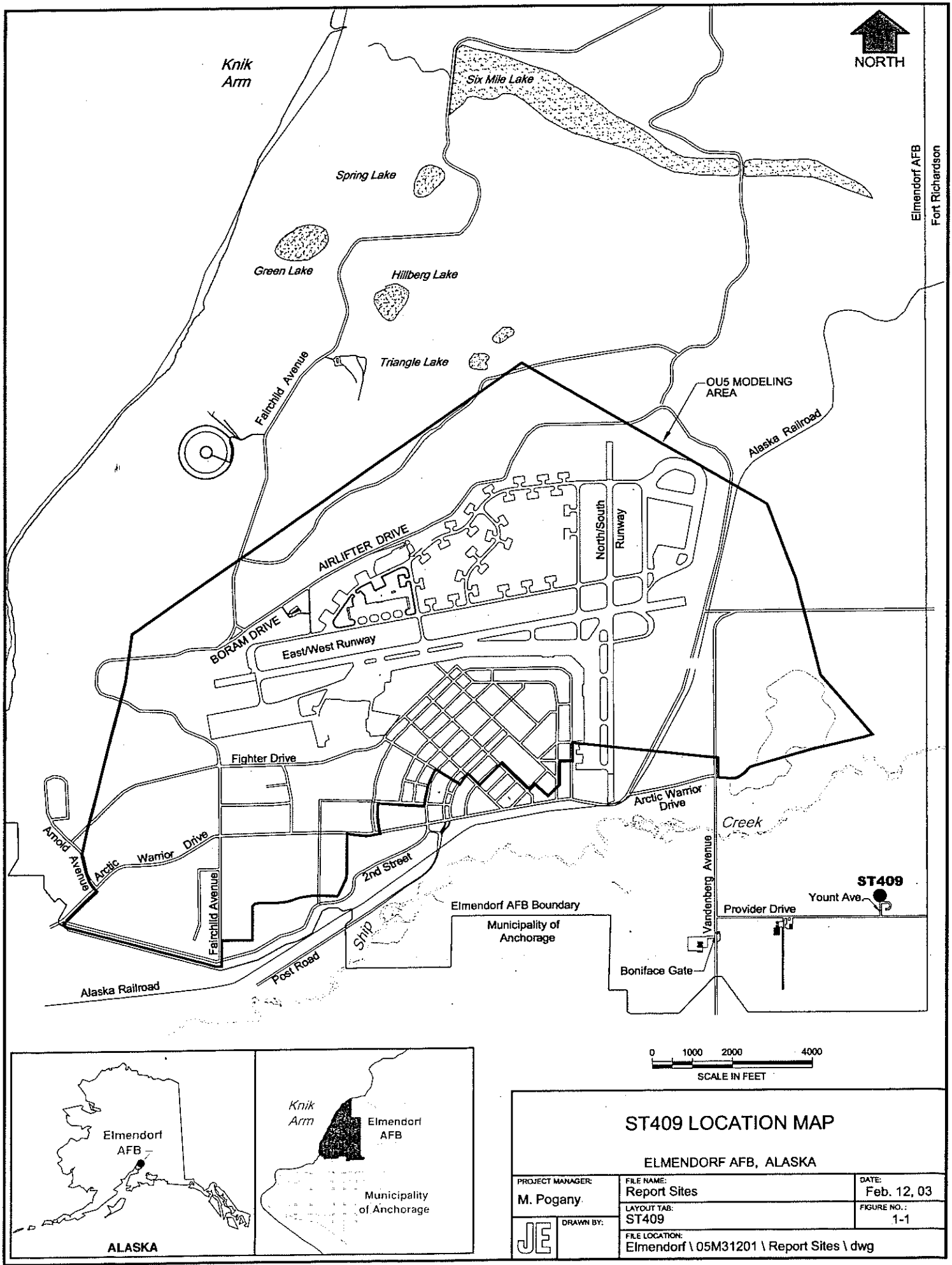
1.2 SITE BACKGROUND

ST409/7/9 is the site of a former 20,000-gallon UST (AFID 805) used to store heating oil for the former hospital's backup heating system (Building 4913, former Building 24-805). The site is located off of Yount Avenue. See Figure 1-1 for site location. The tank was installed in 1950 and removed in October 1994. Soil sampling conducted during the excavation revealed diesel-range organics (DRO) at a maximum of 12,000 milligrams per kilogram (mg/kg) at 9 feet bgs on the bottom of the excavation. Site soil is sand and gravel with fines (USAF 2002b).

A SERA investigation was conducted in 1996, during which one bioventing well and two soil gas monitoring arrays were installed. Only one soil sample, collected from 409PZ02 at 31 feet bgs, contained a DRO concentration exceeding ADEC 18 AAC 75 Category A cleanup criteria. The vertical migration pathway was not encountered since contamination was not detected at 11 feet bgs in 409PZ02. Groundwater was encountered at 34 feet bgs during drilling activities.

In 1997, three soil borings were advanced. Soil samples from these borings were analyzed for DRO, gasoline-range organics (GRO), benzene, toluene, ethylbenzene, and xylenes (BTEX), and polynuclear aromatic hydrocarbons (PAHs) (in select samples). Soil samples revealed DRO at a maximum of 2,600 mg/kg at 21 feet bgs at location 409WL02. Contamination was not detected at 45.5 feet bgs at this location. GRO, BTEX, and PAHs were below their respective cleanup levels. The method reporting limit for benzene was 0.05 mg/kg and the method detection limit was 0.01 mg/kg.

Also during this investigation, three groundwater monitoring wells (409WL02 through 409 WL04) were installed. DRO concentrations in the groundwater ranged from 0.179 milligrams



ST409 LOCATION MAP

ELMENDORF AFB, ALASKA

PROJECT MANAGER: M. Pogany	FILE NAME: Report Sites	DATE: Feb. 12, 03
	LAYOUT TAB: ST409	FIGURE NO.: 1-1
DRAWN BY: JE	FILE LOCATION: Elmendorf \ 05M31201 \ Report Sites \ dwg	

per liter (mg/L) to 1.3 mg/L. These results were all below the ADEC 18 AAC 75 groundwater cleanup criterion of 1.5 mg/L. Groundwater was encountered at 26 feet bgs.

In June 1998, during the SERA VII investigation, two monitoring wells were installed and one soil boring was drilled. Monitoring wells 409WL05 and 409WL06 were located hydraulically downgradient of the pre-existing wells on site. Soil boring 409BH01 was located east of well 409WL04, in order to assess if the piping associated with the former tank was a source of the contamination. This boring's location may actually be north of the former piping run because the actual location of the piping run was not known during this investigation.

Only one soil sample contained a DRO result (1,480 mg/kg) in excess of ADEC soil cleanup standards. This sample was collected from boring 409WL05 at a depth of 5 feet bgs. Photoionization detector (PID) readings and analytical results from this boring indicated that petroleum hydrocarbons are limited to the shallow soils. The extent of petroleum hydrocarbon contamination at ST409/7/9 has been shown to be present at depths ranging from 15 feet to 40 feet bgs. It is likely, due to the shallow nature of contamination in this boring, that the area of impacted soil in boring 409WL05 is not associated with the former UST at this site.

Two groundwater samples contained DRO results exceeding the cleanup criterion of 1.5 mg/L. In 409WL02, the DRO concentration was 2.55 mg/L, with the duplicate sample containing a DRO concentration of 3.84 mg/L. In 409WL03, the DRO concentration was 23.5 mg/L. Although GRO and BTEX constituents were detected in some of the groundwater samples, they were all below ADEC groundwater cleanup standards. Summary data from the SERA investigation is provided in Appendix A for reference.

In 2001, during the SERA IX investigation, seven borings were advanced with two of the borings completed as monitoring wells (409WL07 and 409WL08). The other five borings were subsequently abandoned. These borings were located near monitoring well 409WL05 in order to delineate the extent of contamination found during the SERA VII investigation.

Soil samples from these borings were analyzed for DRO, GRO, residual-range organics (RRO), BTEX, and PAHs (in select samples). Soil samples revealed DRO at a maximum concentration of 5,700 mg/kg (duplicate sample had 3,900 mg/kg DRO) at 2 feet bgs in soil boring 01409BH03, exceeding the ADEC 18 AAC 75, Method Two DRO cleanup standard of 250 mg/kg. All other constituents were below their respective cleanup levels. The method reporting limits for benzene ranged from 0.0173 mg/kg to 0.039 mg/kg.

Also during this investigation, all eight wells were sampled including the two newly installed groundwater wells. Groundwater samples were analyzed for DRO, GRO, RRO, BTEX and PAHs (in select samples). The maximum DRO concentration in the groundwater samples was 6.7 mg/L in well 409WL03 and 1.5 mg/L (duplicate sample had 2 mg/L DRO) in well 409WL02. These results exceeded the DRO cleanup standard of 1.5 mg/L. The remaining analytes were all below the ADEC groundwater cleanup criteria. Groundwater was encountered at approximately 25 feet bgs during this investigation.

1.3 REMOVAL SUMMARY

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

A total of 1,046 tons of soil was excavated and transported to Alaska Soil Recycling (ASR) in Anchorage, Alaska, for thermal treatment. A photoionization detector (PID) was used to determine the horizontal and vertical extent of the soil contamination. Three confirmation samples were collected from the excavation surrounding the former 409WL05, and six confirmation samples were collected from the excavation surrounding the former UST. The site was backfilled with clean fill material. A more detailed explanation of the work performed is provided in Section 2.0.

(intentionally blank)

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	19 September 2002
Field screening and soil excavation and transportation to the thermal treatment facility	19 and 20 September 2002
Confirmation soil sample collection for laboratory analysis	20 September and 10 October 2002
Excavation backfilling and site restoration	9, 10, and 11 October 2002

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, and a "Base Civil Engineer Work Clearance Request" form (Utility Clearance) was completed and approved for work at the site.

Soil excavation was initiated at the locations of the former UST and the former monitoring well 409WL05, where the highest contamination levels were detected during the previous SERA investigations. Excavation activities continued based on visible staining, PID screening, and PetroFLAG screening. As soil was removed from the excavation, the tip of the PID probe was placed 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 2002), 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 tip of the PID was then placed inside the bags to collect a headspace reading.

An adequate correlation could not always be achieved using the PID, possibly due to the wet weather. Therefore, the PetroFLAG was also used to field screen the soil samples. The PetroFLAG system is a field method for total petroleum hydrocarbon determination in soil.

The PetroFLAG quantifies all fuels, oils, and greases as total hydrocarbons. Analysis of a soil sample was performed using extraction, filtration, and analysis.

Soil near the surface with no visible staining and direct PID readings less than 5 parts per million (ppm) was stockpiled onsite as clean material for use as backfill. Approximately 410 cubic yards were stockpiled for use as backfill. All other material was transported to ASR for thermal treatment. In the 409WL05 excavation, one field screening sample collected from the center of the excavation, at approximately 17 feet bgs, had PID reading of 15 ppm and a PetroFLAG result of 8 ppm. A second field screening sample collected from this excavation along the south wall, at 13 feet bgs, had a PID reading of 10 ppm and a PetroFLAG result of 9 ppm. In the former UST excavation, the highest PetroFLAG result (9,270 ppm) was collected from the south wall at approximately 22 feet bgs. The second highest PetroFLAG result (621 ppm) was collected from the corner of the southwest wall at 22 feet bgs. The remaining PetroFLAG results from this excavation ranged from 11 ppm along the northeast corner (20 feet bgs) to 70 ppm along the southeast corner (22 feet bgs). Groundwater was encountered at 25 feet bgs at the time of this removal effort. Soil excavation was limited to the interface just above the smear zone at approximately 22 feet bgs.

Soil removal resulted in an excavation measuring approximately 23 feet long, 22 feet wide, and 19 feet deep in the 409WL05 excavation. The former UST excavation measured approximately 40 feet long, 35 feet wide, and 22 feet deep. A total of 1,046 tons of soil were excavated and transported to ASR for thermal treatment. All soil from the 2002 removal actions was consolidated at ASR. Treatment of all soil was completed in November 2002 and confirmation of treatment is provided in Appendix B.

2.2 CONFIRMATION SAMPLE COLLECTION

Upon completion of the excavation, three confirmation samples were collected from the floor of the 409WL05 excavation. Seven confirmation samples were collected from the floor of the former UST excavation. ADEC *Underground Storage Tanks* regulation 18 Alaska Administrative Code (AAC) 78 (ADEC 2003b) 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 of 409WL05 was approximately 500 square feet. Two samples were collected from the 409WL05 excavation on 20 September 2002. Upon further review, it was determined that an additional sample was required to meet the 18 AAC 78.090 requirement. The third sample was collected on 10 October 2002 when the excavator was mobilized to the site to backfill. The excavator bucket was used to expose freshly uncovered soil immediately before sample collection. The excavated pit area of the former UST was approximately 1,400 square feet. Sample locations are identified on Figure 2-1.

The samples were analyzed for the compounds and associated analytical methods listed in Table 2-2. Samples were not analyzed for GRO since GRO was not detected above ADEC 18 AAC 75, Method One, Category A cleanup criteria during previous SERA investigations. BTEX and PAH sample frequencies were reduced since the compounds were not detected above 18 AAC 75 cleanup criteria during previous SERA investigations. The samples collected from the areas with the highest field screening readings during this removal effort were analyzed for BTEX and PAHs as indicated in Section 3.0. Sample EL-A900105 was analyzed for DRO and PAHs, but was not analyzed for BTEX because the sidewall sloughed before the sample could be collected. Analytical results are presented in Section 3.0.

Sample analyses were selected based on the UST Procedures Manual (ADEC 2002), Table 2 for diesel, SERA investigation analytical results, and ADEC regulations.

2.3 EXCAVATION BACKFILLING AND SITE RESTORATION

After receipt of sample results, the excavation was backfilled. Backfill material was transported from a fill source location on Elmendorf AFB. The material was placed in 12-inch lifts and compacted with the excavator bucket and by passing equipment over the area. The area was regraded to match existing contours.

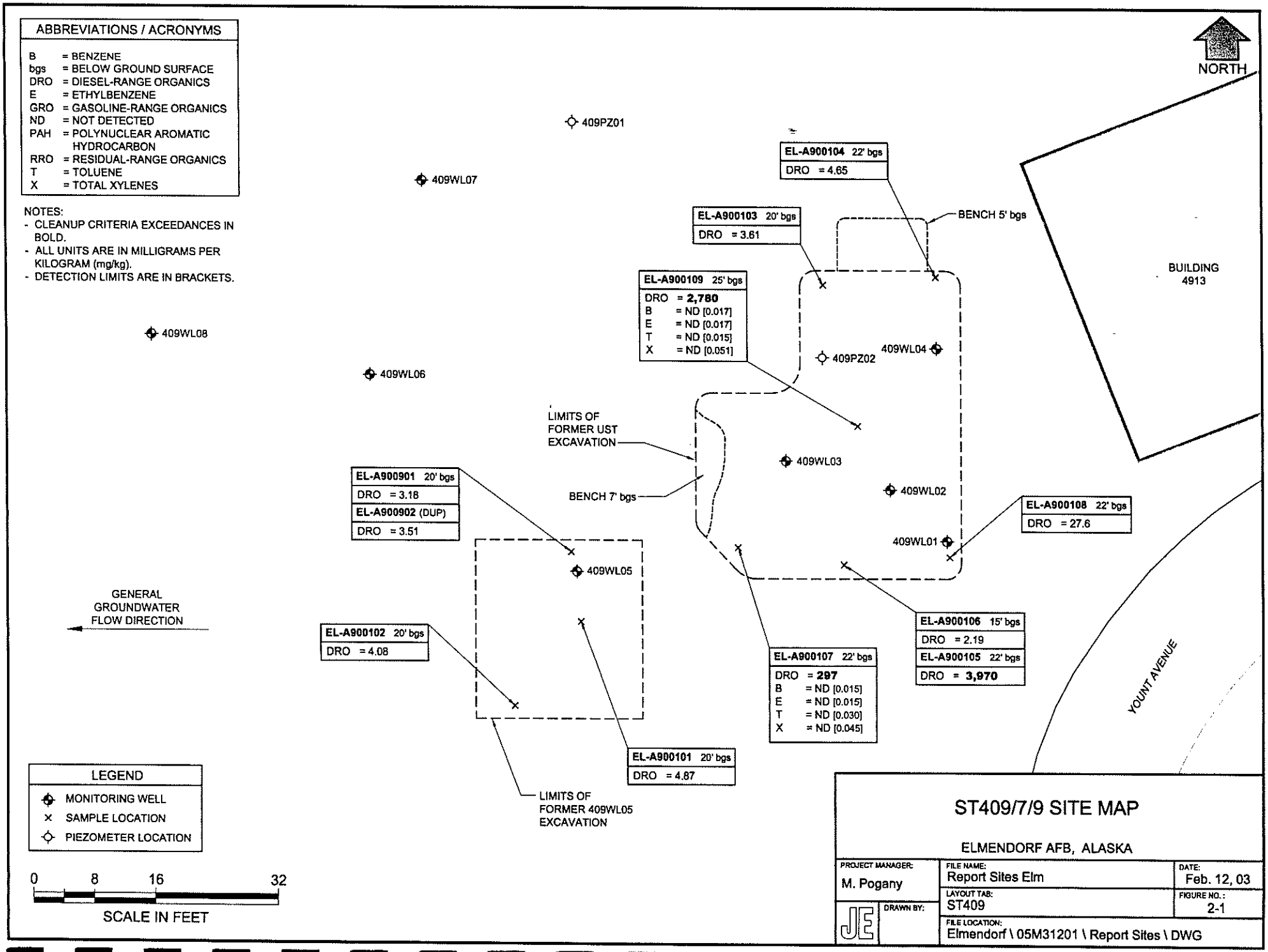

ABBREVIATIONS / ACRONYMS
B = BENZENE
bgs = BELOW GROUND SURFACE
DRO = DIESEL-RANGE ORGANICS
E = ETHYLBENZENE
GRO = GASOLINE-RANGE ORGANICS
ND = NOT DETECTED
PAH = POLYNUCLEAR AROMATIC HYDROCARBON
RRO = RESIDUAL-RANGE ORGANICS
T = TOLUENE
X = TOTAL XYLENES
NOTES:
- CLEANUP CRITERIA EXCEEDANCES IN BOLD.
- ALL UNITS ARE IN MILLIGRAMS PER KILOGRAM (mg/kg).
- DETECTION LIMITS ARE IN BRACKETS.
NORTH
409PZ01
409WL07
409WL08
409WL06
EL-A900104 22' bgs
DRO = 4.65
EL-A900103 20' bgs
DRO = 3.61
BENCH 5' bgs
EL-A900109 25' bgs
DRO = 2,780
B = ND [0.017]
E = ND [0.017]
T = ND [0.015]
X = ND [0.051]
BUILDING 4913
409PZ02
409WL04
LIMITS OF FORMER UST EXCAVATION
409WL03
BENCH 7' bgs
409WL02
EL-A900901 20' bgs
DRO = 3.18
EL-A900902 (DUP)
DRO = 3.51
EL-A900108 22' bgs
DRO = 27.6
409WL01
409WL05
GENERAL GROUNDWATER FLOW DIRECTION
EL-A900102 20' bgs
DRO = 4.08
EL-A900106 15' bgs
DRO = 2.19
EL-A900105 22' bgs
DRO = 3,970
EL-A900107 22' bgs
DRO = 297
B = ND [0.015]
E = ND [0.015]
T = ND [0.030]
X = ND [0.045]
YOUNT AVENUE
EL-A900101 20' bgs
DRO = 4.87
LIMITS OF FORMER 409WL05 EXCAVATION
LEGEND
MONITORING WELL
SAMPLE LOCATION
PIEZOMETER LOCATION
0 8 16 32
SCALE IN FEET
ST409/7/9 SITE MAP
ELMENDORF AFB, ALASKA
PROJECT MANAGER: M. Pogany
DRAWN BY: JE
FILE NAME: Report Sites Elm
LAYOUT TAB: ST409
FILE LOCATION: Elmendorf \ 05M31201 \ Report Sites \ DWG
DATE: Feb. 12, 03
FIGURE NO.: 2-1

Table 2-2
Confirmation Sample Analytical Methods

Compound	Method	Frequency
DRO	AK102	100% of samples
PAHs	SW8270C SIM	1 sample only
BTEX	SW8260B	2 samples only

Notes:
BTEX = benzene, toluene, ethylbenzene, and xylenes
DRO = diesel-range organics
PAHs = polynuclear aromatic hydrocarbons
SIM = selective ion monitoring
% = percent

2.4 HYDRAULIC FLUID SPILL

On 15 October 2002, a hydraulic line broke on the loader at site ST409 during removal of barricades and fencing. Less than 2 quarts of hydraulic fluid, only what was in the line, spilled onto the ground. This occurred in the grassy area north of Building 4911, located on Yount Avenue, to the south of the site. The hydraulic fluid was cleaned up with absorbent pads and the top layer of soil was removed with shovels and placed in two 55-gallon drums. Visual observation and a PID were used to confirm that all impacted soil was removed.

The impacted soil was transported to Alaska Soil Recycling for thermal treatment. Treatment confirmation is included in Appendix B.

(intentionally blank)

3.0 ANALYTICAL RESULTS

The analytical results for the confirmation samples and trip blank are presented in Table 3-1. Confirmation results also are shown in Figure 2-1. The maximum DRO concentration detected in seven samples was 3,970 mg/kg along the south wall at 22 feet bgs in the former UST excavation. The second highest DRO concentration (2,780 mg/kg) was collected in the center of this same excavation at 25 feet bgs. The third and final DRO concentration (297 mg/kg) that exceeded regulatory criteria (250 mg/kg DRO) was collected along the southwest corner at 22 feet bgs. Analytical results were compared to ADEC 18 AAC 75 (ADEC 2003a) Method Two regulatory criteria (18 AAC 75.341, Method Two, Tables B-1 and B-2, Under 40 Inch Zone, most stringent criteria). The sample results for BTEX and PAHs were below regulatory criteria. DRO results for four out of seven samples were below 18 AAC 75 Method Two cleanup criteria. No other contaminants exceeded the regulatory cleanup criteria. None of the contaminants exceeded regulatory criteria in the excavation around 409WL05. The data quality assessment and analytical data are included in Appendix C.

Table 3-1
Confirmation Sample Analytical Results
Site ST409/7/9

			Location	Former UST Excavation Northwest Corner		Former UST Excavation Northeast Corner		Former UST Excavation South Wall		Former UST Excavation South Wall		Former UST Excavation Southwest Corner		Former UST Excavation Southeast Corner		Former UST Excavation North of Center 6'		Trip Blank	
			Sample ID	EL-A900103		EL-A900104		EL-A900105		EL-A900106		EL-A900107		EL-A900108		EL-A900109		EL-A900110	
			Depth BGS	20 feet		22 feet		22 feet		15 feet		22 feet		22 feet		25 feet		NA	
Analyte	Method	Units	Cleanup Criteria[1]																
Diesel Range Organics	AK102	mg/kg	250	3.61	[10.4] J	4.65	[10.6] J	3970	[219]	2.19	[10.3] J	297	[10.6]	27.6	[10.6]	780	[213]	-	-
Benzene	SW8260B	mg/kg	0.02	-	-	-	-	-	-	-	-	ND	[0.015]	-	-	ND	[0.017]	ND	[0.018]
Ethylbenzene	SW8260B	mg/kg	5.5	-	-	-	-	-	-	-	-	ND	[0.015]	-	-	ND	[0.017]	ND	[0.018]
Toluene	SW8260B	mg/kg	5.4	-	-	-	-	-	-	-	-	ND	[0.03]	-	-	0.015	[0.034] J	ND	[0.035]
Total Xylenes	SW8260B	mg/kg	78	-	-	-	-	-	-	-	-	ND	[0.03]	-	-	ND	[0.034]	ND	[0.035]
Acenaphthene	SW8270CSIM	µg/kg	210000	-	-	-	-	ND	[53.8]	-	-	-	-	-	-	-	-	-	-
Acenaphthylene	SW8270CSIM	µg/kg	210000	-	-	-	-	ND	[53.8]	-	-	-	-	-	-	-	-	-	-
Anthracene	SW8270CSIM	µg/kg	4300000	-	-	-	-	5.91	[5.38]	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	SW8270CSIM	µg/kg	6000	-	-	-	-	ND	[5.38]	-	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	SW8270CSIM	µg/kg	1000	-	-	-	-	ND	[5.38]	-	-	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	SW8270CSIM	µg/kg	11000	-	-	-	-	ND	[5.38]	-	-	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	SW8270CSIM	µg/kg	1500000	-	-	-	-	ND	[5.38]	-	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	SW8270CSIM	µg/kg	110000	-	-	-	-	ND	[5.38]	-	-	-	-	-	-	-	-	-	-
Chrysene	SW8270CSIM	µg/kg	620000	-	-	-	-	ND	[5.38]	-	-	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	SW8270CSIM	µg/kg	1000	-	-	-	-	ND	[5.38]	-	-	-	-	-	-	-	-	-	-
Fluoranthene	SW8270CSIM	µg/kg	2100000	-	-	-	-	ND	[5.38]	-	-	-	-	-	-	-	-	-	-
Fluorene	SW8270CSIM	µg/kg	270000	-	-	-	-	43.7	[53.8] J	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	SW8270CSIM	µg/kg	11000	-	-	-	-	ND	[5.38]	-	-	-	-	-	-	-	-	-	-
Naphthalene	SW8270CSIM	µg/kg	43000	-	-	-	-	ND	[53.8]	-	-	-	-	-	-	-	-	-	-
Phenanthrene	SW8270CSIM	µg/kg	4300000	-	-	-	-	10.1	[5.38]	-	-	-	-	-	-	-	-	-	-
Pyrene	SW8270CSIM	µg/kg	1500000	-	-	-	-	1.86	[5.38] J	-	-	-	-	-	-	-	-	-	-

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
[ ] =laboratory reporting limit
- = Not Analyzed
bgs = below ground surface
J = Result is below laboratory reporting limit.
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ND = Analyte not detected

Table 3-1
Confirmation Sample Analytical Results
Site ST409/7/9
(continued)

			Location	409WL05 Excavation Center		409WL05 Excavation South Wall		409WL05 Excavation North Wall		409WL05 Excavation North Wall (duplicate)	
			Sample ID	EL-A900101		EL-A900102		EL-A900901		EL-A900902	
			Depth BGS	20 feet		20 feet		20 feet		20 feet	
Analyte	Method	Units	Cleanup Criteria[1]								
Diesel Range Organics	AK102	mg/kg	,250	4.87	[10.5] J	4.08	[10.5] J	3.18	[10.5] UBRL	3.51	[10.5] UBRL
Benzene	SW8260B	mg/kg	0.02	-	-	-	-	-	-	-	-
Ethylbenzene	SW8260B	mg/kg	5.5	-	-	-	-	-	-	-	-
Toluene	SW8260B	mg/kg	5.4	-	-	-	-	-	-	-	-
Total Xylenes	SW8260B	mg/kg	78	-	-	-	-	-	-	-	-
Acenaphthene	SW8270CSIM	µg/kg	210000	-	-	-	-	-	-	-	-
Acenaphthylene	SW8270CSIM	µg/kg	210000	-	-	-	-	-	-	-	-
Anthracene	SW8270CSIM	µg/kg	4300000	-	-	-	-	-	-	-	-
Benzo(a)anthracene	SW8270CSIM	µg/kg	6000	-	-	-	-	-	-	-	-
Benzo(a)pyrene	SW8270CSIM	µg/kg	1000	-	-	-	-	-	-	-	-
Benzo(b)fluoranthene	SW8270CSIM	µg/kg	11000	-	-	-	-	-	-	-	-
Benzo(g,h,i)perylene	SW8270CSIM	µg/kg	1500000	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	SW8270CSIM	µg/kg	110000	-	-	-	-	-	-	-	-
Chrysene	SW8270CSIM	µg/kg	620000	-	-	-	-	-	-	-	-
Dibenzo(a,h)anthracene	SW8270CSIM	µg/kg	1000	-	-	-	-	-	-	-	-
Fluoranthene	SW8270CSIM	µg/kg	2100000	-	-	-	-	-	-	-	-
Fluorene	SW8270CSIM	µg/kg	270000	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	SW8270CSIM	µg/kg	11000	-	-	-	-	-	-	-	-
Naphthalene	SW8270CSIM	µg/kg	43000	-	-	-	-	-	-	-	-
Phenanthrene	SW8270CSIM	µg/kg	4300000	-	-	-	-	-	-	-	-
Pyrene	SW8270CSIM	µg/kg	1500000	-	-	-	-	-	-	-	-

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).
[ ] =laboratory reporting limit
- = Not Analyzed
bgs = below ground surface
J = Result is below laboratory reporting limit.
mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram
ND = Analyte not detected
UBRL = Analyte was detected, but the result should be considered nondetect at the reporting limit or reported value (whichever is greater) due to potential laboratory contamination

(intentionally blank)

4.0 CONCLUSIONS

The objective of the removal action at Site ST409/7/9 was to reduce risk by excavating soil with contaminant concentrations above regulatory criteria, as outlined in 18 AAC 75. Contaminated soil was excavated to the smear zone and removed to the maximum extent possible. The samples with DRO concentrations exceeding 18 AAC 75 (ADEC 2003a) Method Two cleanup criteria were collected from the smear zone.

Groundwater contamination was detected at this site during the SERA IX sampling event in 2001. Groundwater samples were analyzed for DRO, GRO, RRO, BTEX, and PAHs (in select samples). The maximum DRO concentration in the groundwater samples was 6.7 mg/L in well 409WL03 and 1.5 mg/L (duplicate sample had 2 mg/L DRO) in well 409WL02. These results exceed the DRO cleanup standard of 1.5 mg/L. The remaining analytes were all below ADEC groundwater cleanup criteria. These wells were both located within the limits of the 2002 excavation. Contamination was not detected above cleanup criteria in downgradient wells 409WL06, 409WL07, and 409WL08 (USAF 2002b).

(intentionally blank)

5.0 REFERENCES

ADEC (Alaska Department of Environmental Conservation). 2003a (January). *Oil and Hazardous Substances Control Regulations*. 18 AAC 75.

ADEC. 2003b (January). *Underground Storage Tanks.* 18 AAC 78.

ADEC. 2002 (November). *Underground Storage Tanks Procedures Manual.*

EPA (U.S. Environmental Protection Agency). 1999 (October). *USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review.* OSWER 9240.1-05A-P. Washington, D.C.

USACE (U.S. Army Corps of Engineers). 1997 (October). *Environmental Quality – Chemical Quality Assurance for Hazardous, Toxic, and Radioactive Waste (HTRW) Projects*. EM200-1-6.

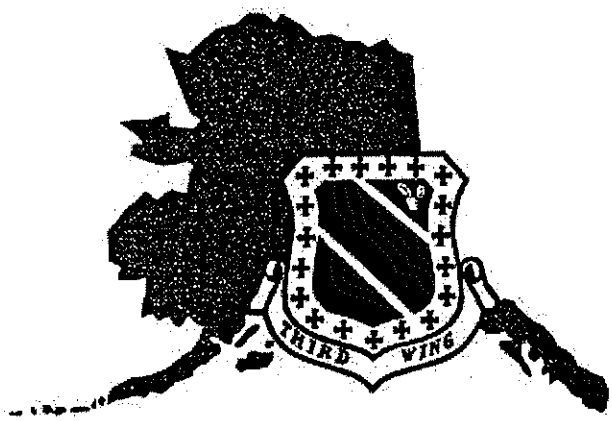
USAF (U.S. Air Force). 2002a (September). *Corrective Action Plan, SERA IX Sites (Final).* Environmental Restoration Program. Elmendorf Air Force Base, Alaska.

USAF. 2002b (January). *Release Investigation Report, SERA Phase IX ST409/7/9 (Draft Final).* Environmental Compliance Program. Elmendorf AFB, Alaska.

(intentionally blank)

APPENDIX A

SERA Investigation Results



UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

SERA PHASE IX RELEASE INVESTIGATION REPORT
ST409/7/9, FORMER HOSPITAL OUTBUILDING
UST AFID 805
FINAL

JANUARY 2002

CONTENTS

CONTENTS (Continued)

LIST OF TABLES

CONTENTS (Continued)

LIST OF FIGURES

EXECUTIVE SUMMARY

The accompanying report presents findings of the State-Elmendorf Environmental Restoration Agreement (SERA) Phase IX Release Investigation (RI) at ST409/7/9 on Elmendorf Air Force Base (EAFB). ST409/7/9 is the location of a former underground storage tank (UST) adjacent to Building 4913 (formerly Building 24-805), which is just south of the former EAFB hospital.

The 20,000-gallon UST, Air Force Identification Number (AFID) 805, held heating oil for the former hospital's backup heating system. After failing a tank tightness test in 1994, the UST and associated piping were removed under the EAFB UST management plan. Analytical results from soil samples collected from the UST excavation indicated the presence of contamination from petroleum, oil, and lubricants (POL) products.

RIs conducted at ST409 under SERA Phases IV and VII indicated the need for further investigation of both groundwater and soil because of the following findings:

- Groundwater at the former UST location had been contaminated with dissolved-phase POLs. Because ST409/7/9 is not within the Operable Unit 5 (OU5) Model Area, dissolved-phase contaminants must be addressed under SERA.
- Contaminated soil encountered during the installation of monitoring well 409WL05 during SERA VII exceeded Alaska Department of Environmental Conservation (ADEC) cleanup standards. This contaminated soil was believed to be unrelated to the UST release because of the relatively shallow depth of the contaminated soil and the distance from the former UST location.

The goal of the 2001 field program at ST409/7/9 has been to gather additional data that would address data gaps identified by ADEC, and EAFB and allow for evaluation of the potential for site closure. There were two major objectives of the SERA Phase IX investigation at this site:

- To monitor the leading edge of POLs contamination in groundwater, EAFB installed two additional wells downgradient from the UST release to act as sentinel wells. Sitewide sampling and analysis of groundwater was conducted.
- To further delineate contaminated soil near monitoring well 409WL05, five borings were advanced around the well. Soil samples were collected for field screening and off-site analysis.

Major findings of the SERA Phase IX investigation included the following:

- Groundwater monitoring indicated that POLs in the form of diesel range organics (DRO) were present at a concentration range of 1.5 to 6.7 milligrams/Liter (mg/L) at the UST release location. These concentrations exceed ADEC cleanup levels.

- DRO was detected approximately 75 feet downgradient of the UST release in one of the new sentinel wells (409WL08), but at a concentration below ADEC cleanup levels.
- Of the five borings advanced around well 409WL05, only at boring 01409BH03 were POLs detected, and these occurred at a depth range of 2 to 5 feet below ground surface (bgs). DRO concentrations detected at 01409BH03 ranged from 3,900 to 5,700 milligrams per kilogram (mg/kg), exceeding ADEC cleanup levels by a factor of 10. Total xylenes were also detected at this boring, but at concentrations well below ADEC cleanup levels.

Because the contaminant sources appear to have been fully identified, establishment of a passive remediation approach is warranted to minimize further impact to groundwater. Additionally, contaminated soil in the vicinity of monitoring well 409WL05 should be excavated and remediated.

3.0 RESULTS

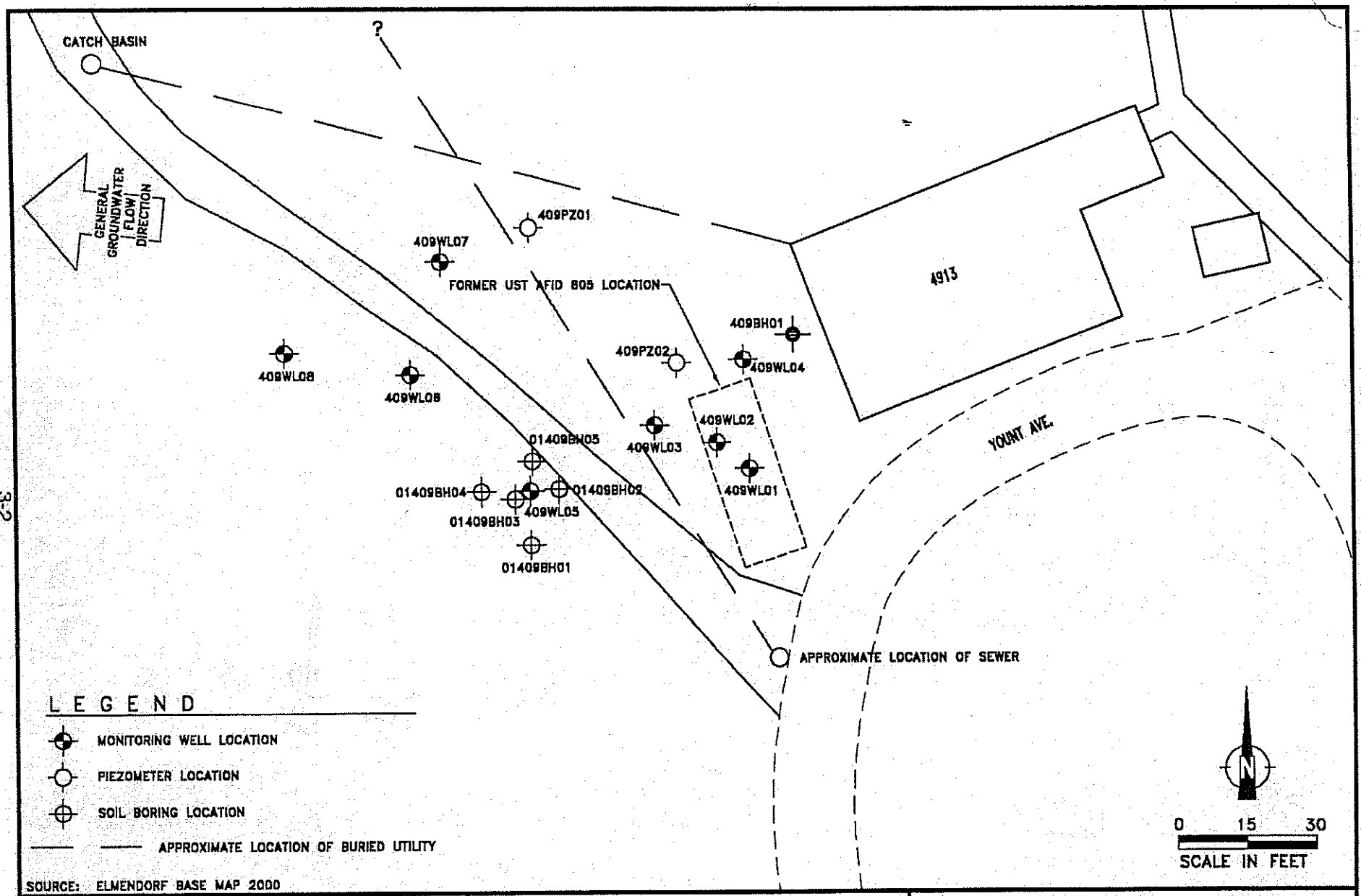
3.1 2001 SERA Phase IX Field Program

3.1.1 Soil Boring/Monitoring Well Installation

Monitoring well installation was performed in accordance with USACE guidelines (USACE 1998). Two monitoring wells (409WL07 and 409WL08) were installed on July 3, 2001. At the time of installation, these wells were designated 01409WL01 and 01409WL02, respectively. These wells were later renamed on August 2, 2001, to 409WL07 and 409WL08, respectively, to prevent confusion with existing wells 409WL01 and 409WL02, which were installed during previous phases of SERA. Five soil borings (01409BH01, 01409BH02, 01409BH03, 01409BH04, and 01409BH05) were installed on July 6, 2001. Soil samples were collected at a minimum of every 5 feet for lithologic logging and HHS screening. Select samples were also submitted for laboratory analyses of DRO/RRO, GRO/BTEX, PAHs, and TOC. Additionally, samples were submitted for physical characteristic analysis for use in assessing the site's potential for MNA. Figure 3-1 is a site layout map showing the location of the soil borings and monitoring wells. Soils encountered throughout the site were generally sands and gravels.

One round of water level measurements was conducted at existing monitoring wells prior to the commencement of drilling to assist in placement of downgradient wells. Monitoring well 409WL07 was installed downgradient and 409WL08 was installed downgradient and slightly cross-gradient of 409WL03 and 409WL04 to better define the groundwater contaminant plume. No fuel odor was observed in either soil borings, and the highest HHS reading was 1.1 ppm. Groundwater was encountered at approximately 25 feet in both wells.

Five soil borings (01409BH01, 01409BH02, 01409BH03, 01409BH04, and 01409BH05) were installed around 409WL05 to delineate the lateral extent of surface soil contamination observed in soil samples collected from this location. No fuel odor was observed in soil samples collected from soil borings 01409BH01, 01409BH02, 01409BH04, and 01409BH05. HHS readings from these four borings ranged from zero to 2.6 ppm. At boring location 01409BH03, an elevated HHS reading (92.4 ppm) and a strong fuel odor were observed at a depth of 2 feet bgs. The presence of petroleum hydrocarbons at 01409BH03 decreased to a slight fuel odor and a HHS reading of 20.0 ppm at 11 feet bgs. Boring 01409BH03 was terminated at 11 feet bgs because of its proximity to 01409WL05, and because the vertical extent of contamination had been characterized previously in samples from 01409WL05.



FILE: 409SL01	DRAWN: MNS	FIGURE 3-1
C/SC: 1:1PS	ZIP: 47/01	ST409/7/9 SITE LAYOUT
DATE: 10/25/01	CHECK: J.D.	3 CES/CEVR SERA PHASE IX ELMENDORF AFB, ALASKA PROJECT #9000-268

3.1.2 Well Development and Sampling

Monitoring wells 409WL07 and 409WL08 were developed on July 24, 2001. All eight wells were sampled between August 1 and August 3, 2001. No measurable thickness of free product was measured in any wells. A slight fuel odor was noted in 409WL04, and a sulfur odor was observed in 409WL03; no other wells sampled exhibited unusual odors.

3.2 Discussion of Findings

Tables and figures presenting the results discussed in this subsection are presented at the end of the subsection.

3.2.1 Soil Findings

Field screening and off-site analytical soil results indicate that petroleum hydrocarbon contaminated soil in the vicinity of 409WL05 is limited in lateral extent. All soil samples submitted for off-site analysis from 01409BH01, 01409BH04, 409WL07, and 409WL08 were found to be below the MRLs for DRO/RRO, GRO/BTEX, and PAH analyses. However, DRO was detected at the 2-to-4 foot bgs interval for 01409BH03 at a concentration of 5,700 mg/kg. A field duplicate of this sample was found to have a DRO concentration of 3,900 mg/kg. These concentrations exceed ADEC Method Two, Table B2, cleanup levels for DRO (migration to groundwater [250 mg/kg]). RRO and GRO were detected at concentrations of 78 mg/kg and 5.8 mg/kg, respectively, in this sample, results that are well below ADEC cleanup levels. Ethylbenzene and xylenes were also detected in this sample at concentrations below ADEC cleanup levels. Table 3-1 and Figure 3-2 show the SERA Phase IX soil analytical results.

3.2.2 Groundwater Findings

The purpose of installing 409WL07 and 409WL08 at the locations that were selected was to establish two downgradient wells that could act as sentinel wells to monitor for contamination previously observed in 409WL03 and 409WL04. Groundwater results were compared to groundwater cleanup levels, as discussed in Section 2.11.2. GRO, BTEX, and PAH analytes were not detected in any samples above MRLs. DRO was detected at levels exceeding the ADEC groundwater cleanup level for DRO (1.5 mg/L) at 409WL02 (1.5 mg/L, with field duplicate at 2 mg/L) and 409WL03 (6.7 mg/L). DRO was also detected in 409WL04, 409WL06, and 409WL08 at concentrations below the ADEC cleanup level. RRO was detected in all sampled wells at concentrations below the ADEC cleanup level. Table 3-2 and Figure 3-3 show the SERA Phase IX groundwater analytical results.

Table 3-1. Soil Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001.

Location:			01409BH01	01409BH03	
Sample Depth:		Soil	5 Feet	2 Feet	
Sample ID:		Cleanup	409BH01SO5.0N1	409BH03SO2.0N1	409BH03SO20.2N1
Sample Date:		Level*	7/6/2001	7/6/2001	7/6/2001
Sample QC Type:					Field Duplicate
Laboratory ID(s):			99383-22, 99383-23	99383-24, 99383-25, 99383L25	99383-26, 99383-27
Parameter	Unit				
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/kg	300	ND [2.3]	5.8 [2.2]	5.8 [2.2]
Diesel Range Organics	mg/kg	250	ND [36]	**5,700** [180]	**3,900** [36]
Residual Range Organics	mg/kg	11,000	ND [36]	88 [35]	78 [36]
BTEX [8021B]					
Benzene	mg/kg	0.02	ND [0.023]	ND [0.022]	ND [0.022]
Ethylbenzene	mg/kg	5.5	ND [0.047]	0.05 [0.045]	ND [0.045]
m,p-Xylene (Sum of Isomers)	mg/kg	NA	ND [0.093]	0.12 [0.09]	0.056 [0.089] J
o-Xylene	mg/kg	NA	ND [0.047]	ND [0.045]	ND [0.045]
Total Xylenes[1]	mg/kg	78	ND --	0.12 --	0.056 --
Toluene	mg/kg	5.4	ND [0.047]	ND [0.045]	ND [0.045]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
2-Methylnaphthalene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
Acenaphthene	µg/kg	210,000	ND [1.2]	ND [14]	ND [13]
Acenaphthylene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
Anthracene	µg/kg	4,300,000	ND [1.2]	ND [14]	ND [13]
Benzo(a)anthracene	µg/kg	6,000	ND [2.5]	ND [28]	ND [26]
Benzo(a)pyrene	µg/kg	1,000	ND [1.2]	ND [14]	ND [13]
Benzo(b)fluoranthene	µg/kg	11,000	ND [1.2]	ND [14]	ND [13]
Benzo(g,h,i)perylene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
Benzo(k)fluoranthene	µg/kg	110,000	ND [1.2]	ND [14]	ND [13]
Chrysene	µg/kg	620,000	ND [2.5]	ND [28]	ND [26]
Dibenzo(a,h)anthracene	µg/kg	1,000	ND [1.2]	ND [14]	ND [13]
Fluoranthene	µg/kg	2,100,000	ND [1.2]	ND [14]	ND [13]
Fluorene	µg/kg	270,000	ND [1.2]	ND [14]	ND [13]
Indeno(1,2,3-cd)pyrene	µg/kg	11,000	ND [1.2]	ND [14]	ND [13]
Naphthalene	µg/kg	43,000	ND [1.2]	ND [14]	ND [13]
Phenanthrene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
Pyrene	µg/kg	1,500,000	ND [1.2]	ND [14]	ND [13]
Total Organic Carbon [9060]					
Total Organic Carbon (TOC)	mg/kg	NA	--	--	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* The most stringent soil cleanup level listed in Method Two Tables B1 and B2 (Under 40-inch zone; ADEC 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-1. Soil Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001 (Cont.).

Location:			01409BH04	409WL07	
Sample Depth:		Soil	5 Feet	15 Feet	20 Feet
Sample ID:		Cleanup	409BH04SO5.0N1	409WL01SO15.0N1	409WL01SO20.0N1
Sample Date:		Level*	7/6/2001	7/3/2001	7/3/2001
Sample QC Type:					
Laboratory ID(s):			99383-28, 99383-29	99341-01	99341-03
Parameter	Unit				
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/kg	300	ND [2]	ND [2.1]	ND [2.1]
Diesel Range Organics	mg/kg	250	ND [32]	ND [34]	ND [33]
Residual Range Organics	mg/kg	11,000	ND [32]	ND [34]	ND [33]
BTEX [8021B]					
Benzene	mg/kg	0.02	ND [0.02]	ND [0.021]	ND [0.021]
Ethylbenzene	mg/kg	5.5	ND [0.04]	ND [0.042]	ND [0.042]
m,p-Xylene (Sum of Isomers)	mg/kg	NA	ND [0.081]	ND [0.084]	ND [0.085]
o-Xylene	mg/kg	NA	ND [0.04]	ND [0.042]	ND [0.042]
Total Xylenes[1]	mg/kg	78	ND --	ND --	ND --
Toluene	mg/kg	5.4	ND [0.04]	ND [0.042]	ND [0.042]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/kg	NA	--	--	--
2-Methylnaphthalene	µg/kg	NA	--	--	--
Acenaphthene	µg/kg	210,000	--	--	--
Acenaphthylene	µg/kg	NA	--	--	--
Anthracene	µg/kg	4,300,000	--	--	--
Benzo(a)anthracene	µg/kg	6,000	--	--	--
Benzo(a)pyrene	µg/kg	1,000	--	--	--
Benzo(b)fluoranthene	µg/kg	11,000	--	--	--
Benzo(g,h,i)perylene	µg/kg	NA	--	--	--
Benzo(k)fluoranthene	µg/kg	110,000	--	--	--
Chrysene	µg/kg	620,000	--	--	--
Dibenzo(a,h)anthracene	µg/kg	1,000	--	--	--
Fluoranthene	µg/kg	2,100,000	--	--	--
Fluorene	µg/kg	270,000	--	--	--
Indeno(1,2,3-cd)pyrene	µg/kg	11,000	--	--	--
Naphthalene	µg/kg	43,000	--	--	--
Phenanthrene	µg/kg	NA	--	--	--
Pyrene	µg/kg	1,500,000	--	--	--
Total Organic Carbon [9060]					
Total Organic Carbon (TOC)	mg/kg	NA	--	--	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* The most stringent soil cleanup level listed in Method Two Tables B1 and B2 (Under 40-inch zone; ADEC 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-1. Soil Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001 (Cont.).

Location:			409WL07	409WL08	
Sample Depth:		Soil	25.6 Feet	15 Feet	20 Feet
Sample ID:		Cleanup	409WL01SO25.6N1	409WL02SO15.0N1	409WL02SO20.0N1
Sample Date:		Level*	7/3/2001	7/3/2001	7/3/2001
Sample QC Type:					
Laboratory ID(s):			99341-08	99341-11	99341-12
Parameter	**Unit**				
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/kg	300	ND [2.3]	ND [2]	ND [2.2]
Diesel Range Organics	mg/kg	250	ND [35]	ND [33]	ND [33]
Residual Range Organics	mg/kg	11,000	ND [35]	ND [33]	ND [33]
BTEX [8021B]					
Benzene	mg/kg	0.02	ND [0.023]	ND [0.02]	ND [0.022]
Ethylbenzene	mg/kg	5.5	ND [0.046]	ND [0.041]	ND [0.044]
m,p-Xylene (Sum of Isomers)	mg/kg	NA	ND [0.093]	ND [0.082]	ND [0.087]
o-Xylene	mg/kg	NA	ND [0.046]	ND [0.041]	ND [0.044]
Total Xylenes[1]	mg/kg	78	ND --	ND --	ND --
Toluene	mg/kg	5.4	ND [0.046]	ND [0.041]	ND [0.044]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/kg	NA	ND [1.1]	ND [1.2]	--
2-Methylnaphthalene	µg/kg	NA	ND [1.1]	ND [1.2]	--
Acenaphthene	µg/kg	210,000	ND [1.1]	ND [1.2]	--
Acenaphthylene	µg/kg	NA	ND [1.1]	ND [1.2]	--
Anthracene	µg/kg	4,300,000	ND [1.1]	ND [1.2]	--
Benzo(a)anthracene	µg/kg	6,000	ND [2.2]	ND [2.5]	--
Benzo(a)pyrene	µg/kg	1,000	ND [1.1]	ND [1.2]	--
Benzo(b)fluoranthene	µg/kg	11,000	ND [1.1]	ND [1.2]	--
Benzo(g,h,i)perylene	µg/kg	NA	ND [1.1]	ND [1.2]	--
Benzo(k)fluoranthene	µg/kg	110,000	ND [1.1]	ND [1.2]	--
Chrysene	µg/kg	620,000	ND [2.2]	ND [2.5]	--
Dibenzo(a,h)anthracene	µg/kg	1,000	ND [1.1]	ND [1.2]	--
Fluoranthene	µg/kg	2,100,000	ND [1.1]	ND [1.2]	--
Fluorene	µg/kg	270,000	ND [1.1]	ND [1.2]	--
Indeno(1,2,3-cd)pyrene	µg/kg	11,000	ND [1.1]	ND [1.2]	--
Naphthalene	µg/kg	43,000	ND [1.1]	ND [1.2]	--
Phenanthrene	µg/kg	NA	ND [1.1]	ND [1.2]	--
Pyrene	µg/kg	1,500,000	ND [1.1]	ND [1.2]	--
Total Organic Carbon [9060]					
Total Organic Carbon (TOC)	mg/kg	NA	1300 [100]	1400 [100]	--

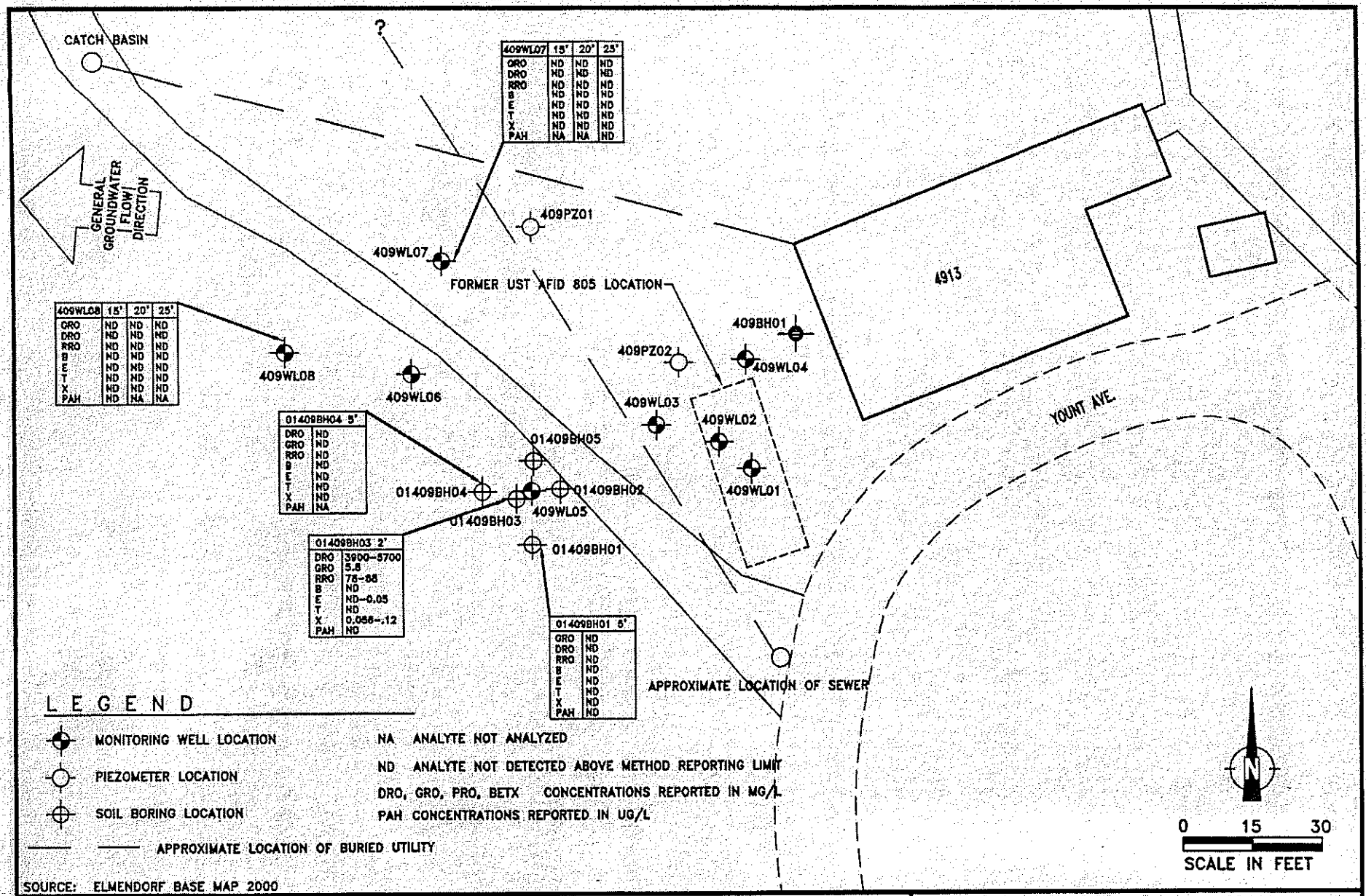
Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* The most stringent soil cleanup level listed in Method Two Tables B1 and B2 (Under 40-inch zone; ADEC 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-1. Soil Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001 (Cont.).

Parameter	Unit	Soil Cleanup Level*	409WL08 25 Feet 409WL02SO25.0N1 7/3/2001 99341-14
Petroleum Hydrocarbons [AK101, 102, 103]			
Gasoline Range Organics	mg/kg	300	ND [2.2]
Diesel Range Organics	mg/kg	250	ND [36]
Residual Range Organics	mg/kg	11,000	ND [36]
BTEX [8021B]			
Benzene	mg/kg	0.02	ND [0.022]
Ethylbenzene	mg/kg	5.5	ND [0.043]
m,p-Xylene (Sum of Isomers)	mg/kg	NA	ND [0.087]
o-Xylene	mg/kg	NA	ND [0.043]
Total Xylenes[1]	mg/kg	78	ND --
Toluene	mg/kg	5.4	ND [0.043]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]			
2-Chloronaphthalene	µg/kg	NA	--
2-Methylnaphthalene	µg/kg	NA	--
Acenaphthene	µg/kg	210,000	--
Acenaphthylene	µg/kg	NA	--
Anthracene	µg/kg	4,300,000	--
Benzo(a)anthracene	µg/kg	6,000	--
Benzo(a)pyrene	µg/kg	1,000	--
Benzo(b)fluoranthene	µg/kg	11,000	--
Benzo(g,h,i)perylene	µg/kg	NA	--
Benzo(k)fluoranthene	µg/kg	110,000	--
Chrysene	µg/kg	620,000	--
Dibenzo(a,h)anthracene	µg/kg	1,000	--
Fluoranthene	µg/kg	2,100,000	--
Fluorene	µg/kg	270,000	--
Indeno(1,2,3-cd)pyrene	µg/kg	11,000	--
Naphthalene	µg/kg	43,000	--
Phenanthrene	µg/kg	NA	--
Pyrene	µg/kg	1,500,000	--
Total Organic Carbon [9060]			
Total Organic Carbon (TOC)	mg/kg	NA	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* The most stringent soil cleanup level listed in Method Two Tables B1 and B2 (Under

Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).



SOURCE: ELMENDORF BASE MAP 2000

FILE: 409SL01-3	DRAWN: MNS	FIGURE 3-2 ST409/7/9 SOIL ANALYTICAL RESULTS
C/SC: 1:1PS	ZIP: 47/01	3 CES/CEVR SERA PHASE IX ELMENDORF AFB, ALASKA PROJECT #9000-268
DATE: 10/25/01	CHECK: J.D.	

Table 3-2. Groundwater Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001.

Location:			409WL01	409WL02	
Sample ID:		Groundwater	409WL01GW21N1	409WL02GW32N1	409WL02GW33N1
Sample Date:		Cleanup	8/1/2001	8/3/2001	8/3/2001
Sample QC Type:		Level*			Field Duplicate
Laboratory ID(s):			99949-01	100000-09	100000-10
Parameter	Unit				
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	ND [0.095]	**1.5** [0.1]	**2** [0.099]
Residual Range Organics	mg/L	1.1	0.1 [0.095]	0.63 [0.1]	0.89 [0.099]
BTEX [8021B]					
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10,000	ND --	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/L	NA	--	--	--
2-Methylnaphthalene	µg/L	NA	--	--	--
Acenaphthene	µg/L	2,200	--	--	--
Acenaphthylene	µg/L	NA	--	--	--
Anthracene	µg/L	11,000	--	--	--
Benzo(a)anthracene	µg/L	1	--	--	--
Benzo(a)pyrene	µg/L	0.2	--	--	--
Benzo(b)fluoranthene	µg/L	1	--	--	--
Benzo(g,h,i)perylene	µg/L	NA	--	--	--
Benzo(k)fluoranthene	µg/L	10	--	--	--
Chrysene	µg/L	100	--	--	--
Dibenzo(a,h)anthracene	µg/L	0.1	--	--	--
Fluoranthene	µg/L	1,460	--	--	--
Fluorene	µg/L	1,460	--	--	--
Indeno(1,2,3-cd)pyrene	µg/L	1	--	--	--
Naphthalene	µg/L	1,460	--	--	--
Phenanthrene	µg/L	NA	--	--	--
Pyrene	µg/L	1,100	--	--	--
Inorganic Anions by Ion Chromatography [E300]					
Nitrogen, Nitrate-Nitrite	mg/L	NA	--	1.7 [0.15]	--
Sulfate	mg/L	NA	--	34 [0.3]	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; ADEC 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-2. Groundwater Analytical Results: Site 409/7/9 SERA Phase IX Release Investigation, 2001 (Continued).

Parameter	Unit	Groundwater Cleanup Level*	409WL03	409WL04	409WL05
Location:			409WL03	409WL04	409WL05
Sample ID:			409WL03GW28N1	409WL04GW29N1	409WL05GW30N1
Sample Date:			8/3/2001	8/3/2001	8/3/2001
Sample QC Type:					
Laboratory ID(s):			100000-05, 100000L05	100000-06	100000-07
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	**6.7** [0.94]	0.1 [0.1] J	ND [0.096]
Residual Range Organics	mg/L	1.1	0.74 [0.094]	0.38 [0.1]	0.1 [0.096]
BTEX [8021B]					
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10,000	ND --	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/L	NA	ND [0.099]	ND [0.1]	--
2-Methylnaphthalene	µg/L	NA	ND [0.099]	ND [0.1]	--
Acenaphthene	µg/L	2,200	ND [0.099]	ND [0.1]	--
Acenaphthylene	µg/L	NA	ND [0.099]	ND [0.1]	--
Anthracene	µg/L	11,000	ND [0.099]	ND [0.1]	--
Benzo(a)anthracene	µg/L	1	ND [0.099]	ND [0.1]	--
Benzo(a)pyrene	µg/L	0.2	ND [0.099]	ND [0.1]	--
Benzo(b)fluoranthene	µg/L	1	ND [0.099]	ND [0.1]	--
Benzo(g,h,i)perylene	µg/L	NA	ND [0.099]	ND [0.1]	--
Benzo(k)fluoranthene	µg/L	10	ND [0.099]	ND [0.1]	--
Chrysene	µg/L	100	ND [0.099]	ND [0.1]	--
Dibenzo(a,h)anthracene	µg/L	0.1	ND [0.099]	ND [0.1]	--
Fluoranthene	µg/L	1,460	ND [0.099]	ND [0.1]	--
Fluorene	µg/L	1,460	ND [0.099]	ND [0.1]	--
Indeno(1,2,3-cd)pyrene	µg/L	1	ND [0.099]	ND [0.1]	--
Naphthalene	µg/L	1,460	ND [0.099]	ND [0.1]	--
Phenanthrene	µg/L	NA	ND [0.099]	ND [0.1]	--
Pyrene	µg/L	1,100	ND [0.099]	ND [0.1]	--
Inorganic Anions by Ion Chromatography [E300]					
Nitrogen, Nitrate-Nitrite	mg/L	NA	1.2 [0.15]	1.5 [0.15]	--
Sulfate	mg/L	NA	32 [0.3]	34 [0.3]	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-2. Groundwater Analytical Results: Site 409/7/9 SERA Phase IX Release Investigation, 2001 (Continued).

Location:			409WL06	409WL08
Sample ID:		Groundwater	409WL06GW31N1	409WL08GW26N1
Sample Date:		Cleanup	8/3/2001	8/2/2001
Sample QC Type:		Level*		
Laboratory ID(s):			100000-08	100000-03
Parameter	Unit			
Petroleum Hydrocarbons [AK101, 102, 103]				
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	0.29 [0.094]	0.48 [0.098]
Residual Range Organics	mg/L	1.1	0.71 [0.094]	0.14 [0.098]
BTEX [8021B]				
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10,000	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]				
2-Chloronaphthalene	µg/L	NA	--	--
2-Methylnaphthalene	µg/L	NA	--	--
Acenaphthene	µg/L	2,200	--	--
Acenaphthylene	µg/L	NA	--	--
Anthracene	µg/L	11,000	--	--
Benzo(a)anthracene	µg/L	1	--	--
Benzo(a)pyrene	µg/L	0.2	--	--
Benzo(b)fluoranthene	µg/L	1	--	--
Benzo(g,h,i)perylene	µg/L	NA	--	--
Benzo(k)fluoranthene	µg/L	10	--	--
Chrysene	µg/L	100	--	--
Dibenzo(a,h)anthracene	µg/L	0.1	--	--
Fluoranthene	µg/L	1,460	--	--
Fluorene	µg/L	1,460	--	--
Indeno(1,2,3-cd)pyrene	µg/L	1	--	--
Naphthalene	µg/L	1,460	--	--
Phenanthrene	µg/L	NA	--	--
Pyrene	µg/L	1,100	--	--
Inorganic Anions by Ion Chromatography [E300]				
Nitrogen, Nitrate-Nitrite	mg/L	NA	--	--
Sulfate	mg/L	NA	--	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-2. Groundwater Analytical Results: Site 409/7/9 SERA Phase IX Release Investigation, 2001 (Continued).

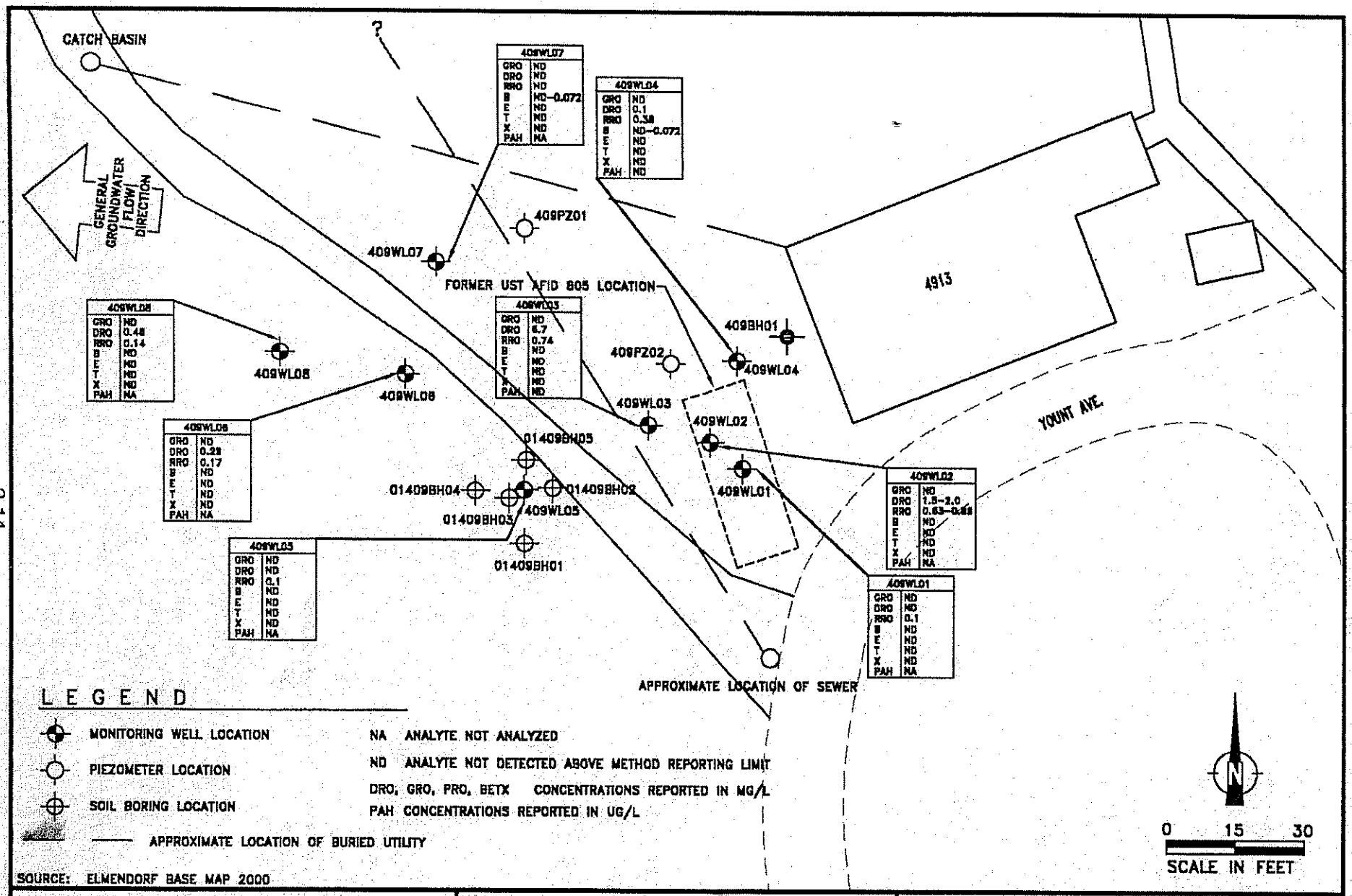
Parameter	Unit	Groundwater Cleanup Level*	409WL07	
Location:			409WL07GW24N1	409WL07GW25N1
Sample ID:			8/2/2001	8/2/2001
Sample Date:				Field Duplicate
Sample QC Type:			100000-01	100000-02
Laboratory ID(s):				
Petroleum Hydrocarbons [AK101, 102, 103]				
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	ND [0.1]	ND [0.1]
Residual Range Organics	mg/L	1.1	0.072 [0.1] J	ND [0.1]
BTEX [8021B]				
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10,000	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]				
2-Chloronaphthalene	µg/L	NA	--	--
2-Methylnaphthalene	µg/L	NA	--	--
Acenaphthene	µg/L	2,200	--	--
Acenaphthylene	µg/L	NA	--	--
Anthracene	µg/L	11,000	--	--
Benzo(a)anthracene	µg/L	1	--	--
Benzo(a)pyrene	µg/L	0.2	--	--
Benzo(b)fluoranthene	µg/L	1	--	--
Benzo(g,h,i)perylene	µg/L	NA	--	--
Benzo(k)fluoranthene	µg/L	10	--	--
Chrysene	µg/L	100	--	--
Dibenzo(a,h)anthracene	µg/L	0.1	--	--
Fluoranthene	µg/L	1,460	--	--
Fluorene	µg/L	1,460	--	--
Indeno(1,2,3-cd)pyrene	µg/L	1	--	--
Naphthalene	µg/L	1,460	--	--
Phenanthrene	µg/L	NA	--	--
Pyrene	µg/L	1,100	--	--
Inorganic Anions by Ion Chromatography [E300]				
Nitrogen, Nitrate-Nitrite	mg/L	NA	--	--
Sulfate	mg/L	NA	--	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-2. Groundwater Analytical Results: Site 409/7/9 SERA Phase IX Release Investigation, 2001 (Continued).

Parameter	Unit	Groundwater Cleanup Level*	Trip Blanks	
Location:				
Sample ID:			409WL04GW23N1	409WL08GW27N1
Sample Date:			8/1/2001	8/2/2001
Sample QC Type:			Trip Blank	Trip Blank
Laboratory ID(s):			99949-03	100000-04
Petroleum Hydrocarbons [AK101, 102, 103]				
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	--	--
Residual Range Organics	mg/L	1.1	--	--
BTEX [8021B]				
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10,000	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]				
2-Chloronaphthalene	µg/L	NA	--	--
2-Methylnaphthalene	µg/L	NA	--	--
Acenaphthene	µg/L	2,200	--	--
Acenaphthylene	µg/L	NA	--	--
Anthracene	µg/L	11,000	--	--
Benzo(a)anthracene	µg/L	1	--	--
Benzo(a)pyrene	µg/L	0.2	--	--
Benzo(b)fluoranthene	µg/L	1	--	--
Benzo(g,h,i)perylene	µg/L	NA	--	--
Benzo(k)fluoranthene	µg/L	10	--	--
Chrysene	µg/L	100	--	--
Dibenzo(a,h)anthracene	µg/L	0.1	--	--
Fluoranthene	µg/L	1,460	--	--
Fluorene	µg/L	1,460	--	--
Indeno(1,2,3-cd)pyrene	µg/L	1	--	--
Naphthalene	µg/L	1,460	--	--
Phenanthrene	µg/L	NA	--	--
Pyrene	µg/L	1,100	--	--
Inorganic Anions by Ion Chromatography [E300]				
Nitrogen, Nitrate-Nitrite	mg/L	NA	--	--
Sulfate	mg/L	NA	--	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; ADEC 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).



FILE: 409SL01-2	DRAWN: MNS	FIGURE 3-3 ST409/7/9 GROUNDWATER ANALYTICAL RESULTS
C/SC: 1:1PS	ZIP: 47/01	3 CES/CEVR SERA PHASE IX ELMENDORF AFB, ALASKA
DATE: 10/25/01	CHECK: J.D.	PROJECT #9000-268

4.0 CONCLUSIONS

4.1 Summary

Dissolved phase petroleum hydrocarbons are present in groundwater in what is likely a plume extending northwest from the original UST source location to the newly installed sentinel well 409WL08. Results of the SERA Phase IX investigation indicate that DRO contamination in groundwater in the immediate vicinity of the source area (wells 409WL02 and 409WL03) continues to exceed the ADEC cleanup level. However, DRO concentrations in groundwater at the source area have declined significantly from concentrations previously documented under SERA VII in 409WL02 and 409WL03.

DRO-contaminated soils detected in boring 01409BH03 near well 409WL05 exceed the ADEC cleanup level for DRO under Method Two, Table B2. However, based on results of this investigation, the DRO contamination appears to be very limited in lateral extent and to be present primarily at a depth range of 2 to 5 feet bgs. This depth range and the distance from the UST source area are indicative of what was likely a surface spill unrelated to the leaking UST.

This page intentionally left blank.

5.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2000a. *Alaska Administrative Code* (AAC), Title 18, Section 78. Underground Storage Tanks. As amended through August 27.

_____. 2000b. *Alaska Administrative Code* (AAC), Title 18, Section 75. Oil and Other Hazardous Substances Pollution Control. As amended through October 28.

_____. 2000c. Letter from Timothy Stevens to Colonel Scott Showers, 3CES/CE, re: Review of the SERA VII release investigation report for ST409/7, a non-regulated underground storage tank located near Building 24-805 on Elmendorf Air Force Base, Alaska; facility ID 0-001525, tank #247. March 21.

_____. 1992. State-Elmendorf Environmental Restoration Agreement (SERA). October 1.

U.S. Air Force (USAF). 2000. 1999. *Annual Report of Groundwater Sampling Activities, Basewide Monitoring and Well Maintenance Program.* March.

_____. 1993. *Basewide Environmental Staging Facility Operation and Maintenance Plan.* Environmental Restoration Program, Elmendorf Air Force Base, Alaska. March.

_____. 1997. *SERA Phase IV ST409 Release Investigation Report.* Elmendorf Air Force Base, Alaska. AFID 805. March.

_____. 1999. *SERA Phase VII ST409/7 Release Investigation Report.* AFID 805 Elmendorf Air Force Base, Alaska. February.

_____. 2001. *SERA Phase IX Release Investigations Work Plan.* June 2001.

_____. 1994b. *Final Closure and Site Assessment Report for Underground Storage Tank 805 (ST409/7/9).* Elmendorf Air Force Base, Alaska. December.

U.S. Army Corps of Engineers (USACE). 1998. *EM1110-1-4000 Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites.* November.

This page intentionally left blank.

APPENDIX A

ANALYTICAL RESULTS AND FIGURES

FOR PREVIOUS INVESTIGATIONS

APPENDIX A-1

UST SITE ASSESSMENT

TABLE 5-1

Soil Sample Analytical Results, UST 805, Elmendorf Air Force Base, Alaska

Laboratory Sample Number	Approximate Depth (feet)	Sample Collected from Limits of Excavation	DRO[1] (mg/kg)[2]	Comments
NA[3]	NA[3]	NA[3]	100	ADEC[4] Cleanup Level A
805-S9	13	Yes	12,000*	
805-S10	10	Yes	15	
805-S11	13	Yes	2,900*	
805-S12	13	Yes	3,200*	Duplicate of 805-S11
805-S13	9	Yes	12,000*	
805-S14	13	Yes	170*	Fill end
805-S15	10	Yes	110*	Fill end
805-S16	10	Yes	ND(11)[5]	Piping run
805-S17	1.5	No	2,400*	From stockpiled soil
805-S18	1.5	No	1,100*	From stockpiled soil
805-S19	1.5	No	5,200*	From stockpiled soil

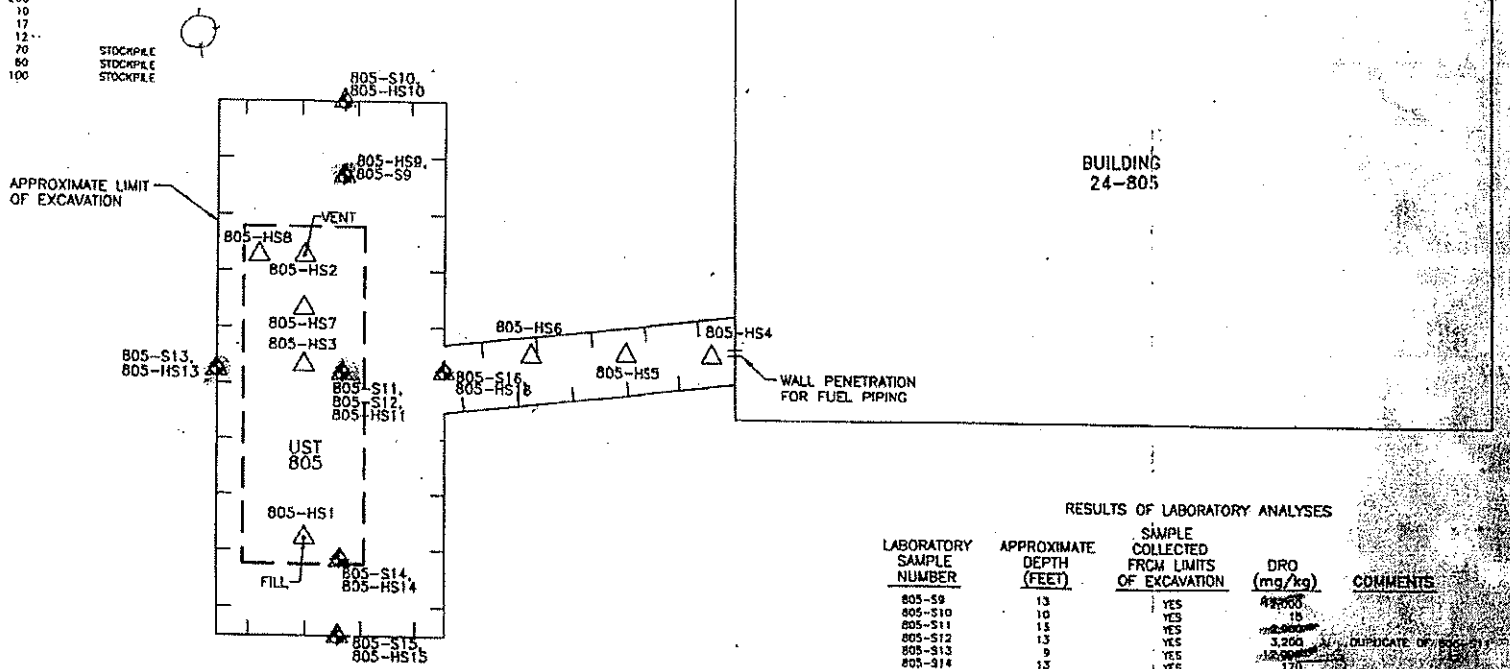
(1) Diesel range organics
(2) Milligrams per kilogram
(3) Not applicable
(4) Alaska Department of Environmental Conservation
(5) Not detected at or above method reporting limit in parentheses

* Denotes analytical results that exceed the Alaska Department of Environmental Conservation cleanup level.

FIELD SCREENING RESULTS

FIELD SCREENING SAMPLE NUMBER	APPROXIMATE DEPTH (FEET)	ORGANIC VAPORS (ppm)	COMMENTS
805-HS1	1	28	
805-HS2	1	467	
805-HS3	1	18	
805-HS4	3	1	
805-HS5	3	0	
805-HS6	3	0	
805-HS7	1	40	
805-HS8	1	180	
805-HS9	13	130	
805-HS10	10	15	
805-HS11	13	170	
805-HS13	9	200	
805-HS14	13	10	
805-HS15	10	17	
805-HS16	10	12	
805-HS17	1.5	70	STOCKPILE
805-HS18	1.5	80	STOCKPILE
805-HS19	1.5	100	STOCKPILE

ppm PARTS PER MILLION



RESULTS OF LABORATORY ANALYSES

LABORATORY SAMPLE NUMBER	APPROXIMATE DEPTH (FEET)	SAMPLE COLLECTED FROM LIMITS OF EXCAVATION	DRO (mg/kg)	COMMENTS
805-S9	13	YES	[illegible]	
805-S10	10	YES	[illegible]	
805-S11	13	YES	[illegible]	
805-S12	13	YES	3,200	DUPLICATE OF 805-S11
805-S13	9	YES	[illegible]	
805-S14	13	YES	170	
805-S15	10	YES	110	
805-S16	10	YES	ND(11)	
805-S17	1.5	NO	2,400	STOCKPILE
805-S18	1.5	NO	1,100	STOCKPILE
805-S19	1.5	NO	5,200	STOCKPILE

DRO DIESEL RANGE ORGANICS
mg/kg MILLIGRAMS PER KILOGRAM
ND NOT DETECTED AT OR ABOVE METHOD REPORT LIMIT IN PARENTHESES.

LEGEND

805-HS1 △ FIELD SCREENING SAMPLE LOCATION AND NUMBER

805-S15 COLLOCATED FIELD SCREENING AND LABORATORY SAMPLES LOCATION AND NUMBERS

FORMER LOCATION OF UNDERGROUND STORAGE TANK (UST)

0 5 10 20
SCALE IN FEET

Sample Locations and Results

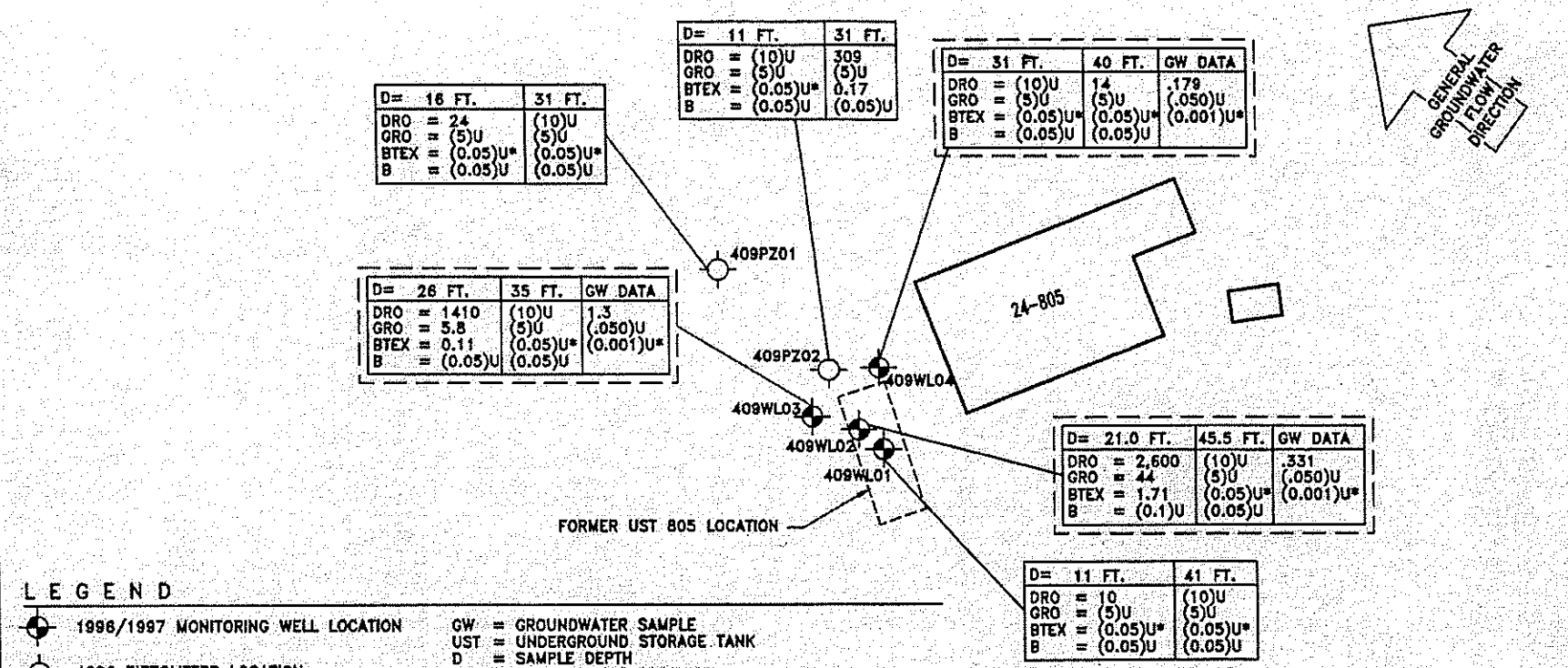
Elmendorf Air Force Base, Alaska

DRAWN	PROJECT NUMBER	APPROVED	DATE
BJ	29424	BCK	12/94

A-2

SERA PHASE IV

RELEASE INVESTIGATION



LEGEND

1996/1997 MONITORING WELL LOCATION

1996 PIEZOMETER LOCATION

1997 DATA

GW = GROUNDWATER SAMPLE
UST = UNDERGROUND STORAGE TANK
D = SAMPLE DEPTH
DRO = DIESEL RANGE ORGANICS
GRO = GASOLINE RANGE ORGANICS
BTEX = BENZENE, TOLUENE, ETHYLBENZENE AND XYLENES
B = BENZENE

QUALIFIERS
U = ANALYTE NOT DETECTED AT THE METHOD REPORTING LIMIT (MRL)
* = VALUE REPORTED IN PARENTHESES IS THE INDIVIDUAL MRL FOR BENZENE, TOLUENE, ETHYLBENZENE AND XYLENE (NOT THE SUM OF THE MRLs)

NOTE: ANALYTICAL SOIL RESULTS REPORTED AS mg/Kg

ANALYTICAL GROUNDWATER RESULTS REPORTED AS mg/L

SOURCE: 9010-035/NESEC/9/95

DRAWING: ST409SG DRAWN: SSR
C/SC: 1:50 DISK: 26/98
DATE: 02/01/02 CHECK: J.S.

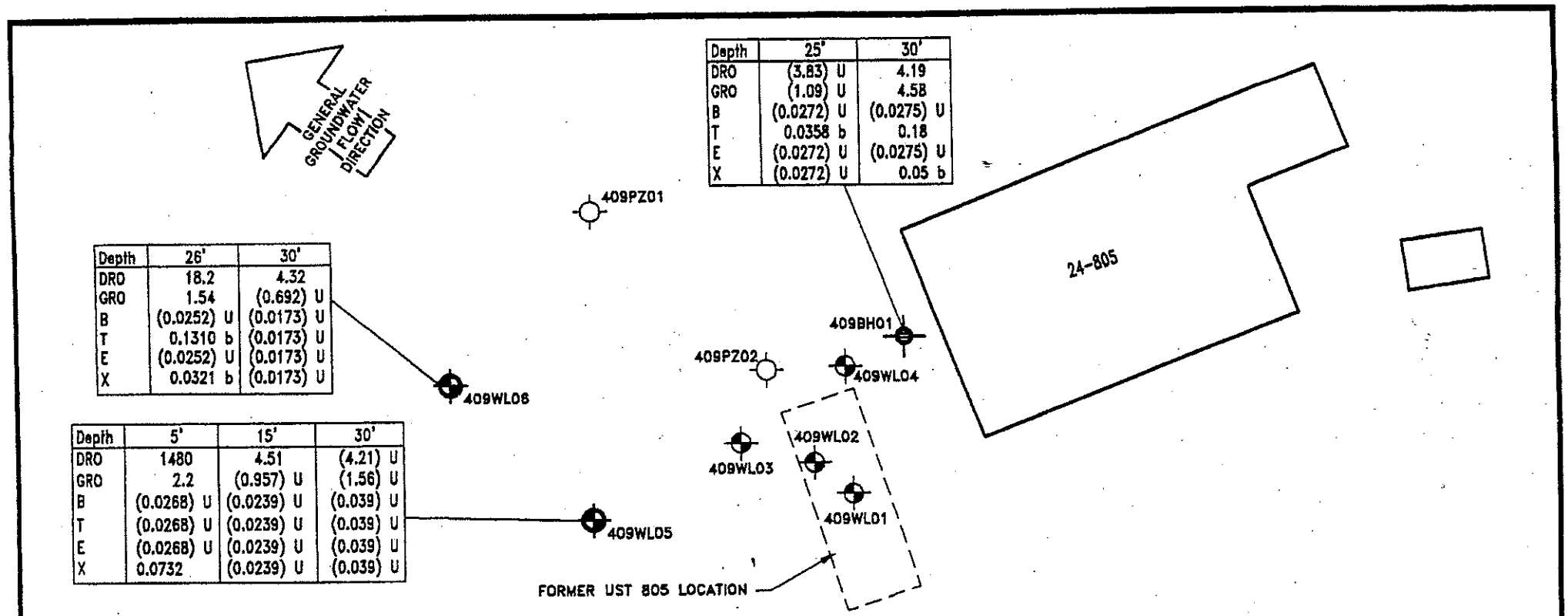
FIGURE A2-1
BLDG. 24-805
1996-1997 SERA IV RESULTS

3 CES/CEVQ
SERA IV
ELMENDORF AFB, ALASKA
PROJECT 9000-268

A-3

SERA PHASE VII

RELEASE INVESTIGATION



Depth	25'	30'
DRO	(3.83) U	4.19
GRO	(1.09) U	4.58
B	(0.0272) U	(0.0275) U
T	0.0358 b	0.18
E	(0.0272) U	(0.0275) U
X	(0.0272) U	0.05 b

Depth	26'	30'
DRO	18.2	4.32
GRO	1.54	(0.692) U
B	(0.0252) U	(0.0173) U
T	0.1310 b	(0.0173) U
E	(0.0252) U	(0.0173) U
X	0.0321 b	(0.0173) U

Depth	5'	15'	30'
DRO	1480	4.51	(4.21) U
GRO	2.2	(0.957) U	(1.56) U
B	(0.0268) U	(0.0239) U	(0.039) U
T	(0.0268) U	(0.0239) U	(0.039) U
E	(0.0268) U	(0.0239) U	(0.039) U
X	0.0732	(0.0239) U	(0.039) U

LEGEND

- 1996/1997 MONITORING WELL LOCATION
- 1996 PIEZOMETER LOCATION
- 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 (SUM OF RESULTS ABOVE MRL)
U = UNDETECTED AT LABORATORY MRL
b = ANALYTE DETECTED IN BLANK ASSOCIATED WITH SAMPLE

NOTE: ANALYTICAL SOIL RESULTS REPORTED AS mg/Kg

N

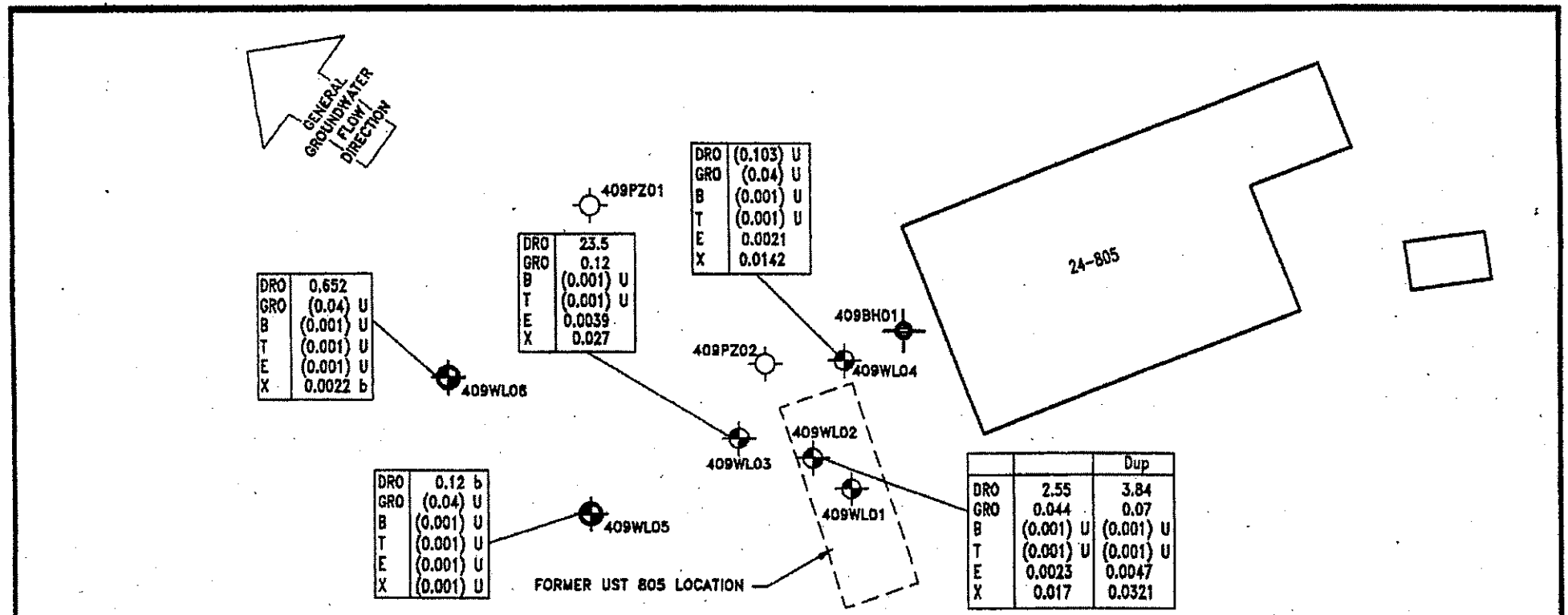
0 15 30
SCALE IN FEET

SOURCE: 9010-035/NESEC/9/95

DRAWING: 9000-168/409SB898
C/SC: 1:30
DATE: 1/14/99
DRAWN: SSR
DISK: 26/98
CHECK: J.S.

FIGURE 3-1
ST409/7, BLDG. 24-805
1998 SOIL BORING LOCATIONS
AND SAMPLE RESULTS

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



LEGEND

- 1996/1997 MONITORING WELL LOCATION
- 1996 PIEZOMETER LOCATION
- 1998 SOIL BORING LOCATION
- 1998 MONITORING WELL LOCATION

SOURCE: 9010-035/NESEC/9/95

UST = UNDERGROUND STORAGE TANK
DRO = DIESEL RANGE ORGANICS
GRO = GASOLINE RANGE ORGANICS
B = BENZENE
T = TOLUENE
E = ETHYLBENZENE
X = TOTAL XYLENES (SUM OF RESULTS ABOVE MRL)
U = UNDETECTED AT LABORATORY MRL
b = ANALYTE DETECTED IN BLANK ASSOCIATED WITH SAMPLE

NOTE: ANALYTICAL WATER RESULTS REPORTED AS mg/L

0 15 30
SCALE IN FEET

DRAWING: 9000-168/409GW898
C/SC: 1:30
DATE: 1/14/99
DRAWN: SSR
DISK: 26/98
CHECK: J.S.

FIGURE 3-2
ST409/7, BLDG. 24-805
1998 GROUNDWATER SAMPLE RESULTS

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

APPENDIX B

ADEC LETTER, MARCH 21, 2000

STATE OF ALASKA

Dan/Jackie

TONY KNOWLES, GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE
Storage Tank Program
Field Operations

555 Cordova Street
Anchorage, AK 99501
PHONE: (907) 269-7504
FAX: (907) 269-7507
http://www.state.ak.us/dec/home.htm

March 21, 2000

Colonel Scott Showers
U.S. Department of Defense
3 CES/CE
6326 Arctic Warrior Drive
Elmendorf AFB, AK 99506-3240

ST409

Re: Review of the SERA VII release investigation report for ST409/7, a non-regulated underground storage tank located near Building 24-805 on Elmendorf Air Force Base, Elmendorf AFB, Alaska; facility ID 0-001525, tank #247.

Dear Colonel Showers:

On October 15, 1999, the Department of Environmental Conservation (Department) received the SERA Phase VII final release investigation report for ST 409/7. The report summarizes information collected during a release investigation of a known petroleum release, associated with a 20,000-gallon underground heating oil tank, located near the Elmendorf AFB Hospital.

The Department has reviewed the release investigation report and is in general agreement with the following Air Force's conclusions:

- soil and groundwater have been impacted by a petroleum release from the former underground storage tank (UST),
- the level of soil and groundwater contamination found exceeds state cleanup standards,
- the former UST site is outside the OU5 groundwater modeling area, and
- additional groundwater investigation is needed to find the extent of the dissolved phase contamination.

The Department does not agree with the Air Force's statement that no data gaps exist in the information presented. The Department reviewed Figure 3-2 and believes the number and location of the existing monitoring wells is insufficient to monitor and define the contaminant plume. Additional monitoring wells are needed directly downgradient of monitoring well 409WL03.

Therefore, the Department is requesting the Air Force to submit a workplan for additional groundwater investigation to further define the extent of the groundwater contamination plume, and to provide data about the contaminant plume directly down gradient of monitoring well 409WL03. The Department is also requesting the Air Force to submit a corrective action plan to address the soil and groundwater contamination found during the UST closure and release investigation.

Under Section 3.2.1 of the report, the Air Force acknowledged finding contamination, exceeding soil cleanup standards (1,480 mg/Kg DRO), at the 5 foot sampling depth for monitor well 409WL05. Based on the apparent shallowness of the contamination found and the distance from the former UST, the contamination is thought to be from a separate release. The Department is requesting the Air Force to investigate this area of contamination to determine the extent of the contamination found.

If you have questions concerning this letter, please contact me at 269-7538.

Sincerely,

Timothy Stevens
Environmental Specialist

cc: Teresa Boston, ADEC/STP, Anchorage
Louis Howard, ADEC/CS, Anchorage
John Mahaffey, 3CES/CEVQ, Elmendorf AFB

APPENDIX C

Data Quality Assessment
Analytical Data Package

DATA QUALITY ASSESSMENT

Sample collection, handling, analysis and reporting procedures defined in the field sampling and quality assurance project plans were followed. Most data acceptance criteria were met with the few exceptions defined in this section.

The analytical data was provided by the laboratories in both hardcopy and electronic formats. The primary laboratory, SGS Environmental Services (formerly CTE Environmental Services) of Anchorage, Alaska supported the analytical requirements of the 2002 investigation.

A completeness check and detailed review of the hardcopy and electronic data was done by the Jacobs project chemist. 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, and a review to evaluate accuracy of electronic and hard copy data. The data were reviewed against the project specific quality assurance project plan, Appendix I of EM 200-1-3, and EPA *National Functional Guidelines* (EPA 1994, 1999). These documents were also referenced by the Jacobs project chemist to assess the data usability and apply validation qualifiers to the summary tables. 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 requirements as defined in the field sampling plan, quality assurance project plan, laboratory quality assurance project plan, and analytical methods. These DQO were evaluated by reviewing the following QA parameters and criteria:

- PRECISION
  - Matrix Spike Duplicates (MSD)
  - Field Duplicates
- ACCURACY
  - Calibrations - initial and continuing; acceptance and frequency

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

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

- COMPARABILITY
  - Standard Operating Procedures (SOPs)
  - Established analytical methods

- COMPLETENESS
  - Samples (field, QA, and QC)
  - Data Packages (forms, runlogs, extraction logs, etc.)
  - 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:

- "**J**" – The 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).

- "**R**" – The analyte was detected above the reporting limit, but the results are rejected (not usable) due to significant deficiencies in quality control(s) or inherent ability to analyze the sample (e.g. matrix effects).
- "**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 following qualifiers were also used in the text of this report to indicate which QA/QC protocols were not met:

- UBRL – although the analyte was detected, the result is considered nondetect at the 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 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-A900101). This sample appears on CoC number 9001, 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. 900101 would identify EL-A900101 found on CoC # 9001). The original CoC is on file in the Jacobs Anchorage office with the original data package.

The term "positive result(s)" is used to identify all analytes that are detected above the laboratory reporting limit. The term "nondetect" refers to results that are less than the laboratory reporting limit and are therefore not reported by the laboratory. "All results" refers to both nondetect and positive results.

There were no specific systematic problems to report; however one cooler was received at the primary laboratory at 0.6°C, which is below the EPA recommended temperature of 4 ± 2°C. The associated samples were analyzed for DRO, PAH, and BTEX. However, the data usability is not impacted and the results are not qualified based on this criterion.

Details of the evaluation are provided in the following section by method and include the associated samples and analytes.

Benzene, Toluene, Ethylbenzene, Xylenes by SW8260B. The quality of the data is acceptable.

- Holding Times and Sample Handling: All acceptance criteria were met except sample receipt temperatures were below allowable temperatures. Results are considered acceptable.
- Method Blanks: Target analytes were not detected in the method blanks; therefore, data were not qualified based on this criterion.
- Reporting Limits: All minimum reporting limit requirements are below project action limits.
- 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 Organics (DRO) AK 102. Overall, the quality of the data is acceptable with the following qualifications:

- Holding Times and Sample Handling: All acceptance criteria were met except sample receipt temperatures were below allowable temperatures. Results are considered acceptable.
- Method Blanks: DRO was detected in one method blank. The results for DRO in associated samples (900901 and 900902) are less than 5 times the method blank concentration are considered not detected and are qualified UBRL.
- Reporting Limits: All minimum reporting limit requirements are below project action limits.
- 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.

Polynuclear Aromatic Hydrocarbons (PAHs) by SW8270C-SIM. The quality of the data is acceptable.

- Holding Times and Sample Handling: All acceptance criteria were met except sample receipt temperatures were below allowable temperatures. Results are considered acceptable.
- Method Blanks: Target analytes were not detected in the method blanks; therefore, data were not qualified based on this criterion.
- 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 issues the data are considered usable, and the overall project completeness goal of 95 percent was met.

Elmendorf AFB, Site 409 (Hospital)
2002 Analytical Summary

GOC_ID	FIELD_ID	DESCRIPTION	METHOD	DATE_COLL	TIME_COLL	QC	DEPTH	MATRIX	LAB	TAT	COOLER_ID	SHIPPED	SAMPLER
EL-A900101	JE02ELM409MMID20-01SO	MW05 MIDDLE @ 20' BGS	AK102	20-Sep-02	1245		20	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900102	JE02ELM409MSW20-01SO	MW05 SOUTH WALL 20' BGS	AK102	20-Sep-02	1250		20	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900103	JE02ELM409UNWC20-01SO	UST NW CORNER @ 20' BGS	AK102	20-Sep-02	0945		20	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900104	JE02ELM409UNEC22-01SO	UST NE CORNER @ 22' BGS	AK102	20-Sep-02	1230		22	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900105	JE02ELM409USW22-01SO	UST STH WALL @ 22' BGS	AK102|SW8270CSIM	20-Sep-02	1130		22	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900106	JE02ELM409USW15-01SO	UST STH WALL @ 15' BGS	AK102	20-Sep-02	1445		15	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900107	JE02ELM409USWC22-01SO	UST SW CORNER @ 22' BGS	AK102	20-Sep-02	1450		22	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900107	JE02ELM409USWC22-01SO	UST SW CORNER @ 22' BGS	SW8021B	20-Sep-02	1450		22	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900108	JE02ELM409USEC22-01SO	UST SE CORNER @ 22' BGS	AK102	20-Sep-02	1453		22	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900109	JE02ELM409UCTR25-01SO	UST 6' NTH OF CTR @ 25BGS	AK102	20-Sep-02	1455		25	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900109	JE02ELM409UCTR25-01SO	UST 6' NTH OF CTR @ 25BGS	SW8021B	20-Sep-02	1455		25	SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900110	JE02ELM409TB_HC5	TRIP BLANK	SW8021B	20-Sep-02	1455			SO	CTE	7DAYS	HC5	21-Sep-02	MUTLEY
EL-A900901	JE02ELM409MNW20-01SO	MW05 NORTH WALL 20' BGS	AK102	10-Oct-02	1445	MS/D	20	SO	CTE	7DAYS	HC9	10-Oct-02	SCUNARD
EL-A900902	JE02ELM409MNW20-01SOD	MW05 NORTH WALL 20' BGS	AK102	10-Oct-02	1450	DUP	20	SO	CTE	7DAYS	HC9	10-Oct-02	SCUNARD

Elmendorf TO12
2002 Analytical Data
Site 409 (Hospital)

		Location	409MMID20-01SO	409MSW20-01SO	409UNWC20-01SO	409UNEC22-01SO	409USW22-01SO
		Sample ID	EL-A900101	EL-A900102	EL-A900103	EL-A900104	EL-A900105
		Laboratory	CTE	CTE	CTE	CTE	CTE
		Lab Sample ID	3024365001	3024365002	3024365003	3024365004	3024365005
		Collection Date	9/20/2002	9/20/2002	9/20/2002	9/20/2002	9/20/2002
		Matrix	SO	SO	SO	SO	SO
Analyte	**Method**	**Units**					
Total Solids	A2540G	PERCENT	95.4 [0.1]	94.9 [0.1]	96.2 [0.1]	94.3 [0.1]	91.4 [0.1]
Diesel Range Organics	AK102	mg/kg	4.87 [10.5] J	4.08 [10.5] J	3.61 [10.4] J	4.65 [10.6] J	3970 [219]
Benzene	SW8260B	mg/kg	- -	- -	- -	- -	- -
Ethylbenzene	SW8260B	mg/kg	- -	- -	- -	- -	- -
Toluene	SW8260B	mg/kg	- -	- -	- -	- -	- -
Xylene, Isomers m & p	SW8260B	mg/kg	- -	- -	- -	- -	- -
o-Xylene	SW8260B	mg/kg	- -	- -	- -	- -	- -
Acenaphthene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [53.8]
Acenaphthylene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [53.8]
Anthracene	SW8270CSIM	µg/kg	- -	- -	- -	- -	5.91 [5.38]
Benzo(a)anthracene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [5.38]
Benzo(a)pyrene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [5.38]
Benzo(b)fluoranthene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [5.38]
Benzo(g,h,i)perylene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [5.38]
Benzo(k)fluoranthene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [5.38]
Chrysene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [5.38]
Dibenzo(a,h)anthracene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [5.38]
Fluoranthene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [5.38]
Fluorene	SW8270CSIM	µg/kg	- -	- -	- -	- -	43.7 [53.8] J
Indeno(1,2,3-cd)pyrene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [5.38]
Naphthalene	SW8270CSIM	µg/kg	- -	- -	- -	- -	ND [53.8]
Phenanthrene	SW8270CSIM	µg/kg	- -	- -	- -	- -	10.1 [5.38]
Pyrene	SW8270CSIM	µg/kg	- -	- -	- -	- -	1.86 [5.38] J

See text for validation qualification information
ND - not detected
[ ] - laboratory reporting limit
"-" - sample not analyzed by this method

Elmendorf TO12
2002 Analytical Data
Site 409 (Hospital)

	Location	409USW15-01SO	409USWC22-01SO	409USEC22-01SO	409UCTR25-01SO	409TB_HC5
	Sample ID	EL-A900106	EL-A900107	EL-A900108	EL-A900109	EL-A900110
	Laboratory	CTE	CTE	CTE	CTE	CTE
	Lab Sample ID	3024365006	3024365007	3024365008	3024365009	3024365010
	Collection Date	9/20/2002	9/20/2002	9/20/2002	9/20/2002	9/20/2002
	Matrix	SO	SO	SO	SO	SO
Analyte	**Method**	**Units**				
Total Solids	A2540G	PERCENT	96.7 [0.1]	94.2 [0.1]	94 [0.1]	94.0 [0.1]	- -
Diesel Range Organics	AK102	mg/kg	2.19 [10.3] J	297 [10.6]	27.6 [10.6]	2780 [213]	- -
Benzene	SW8260B	mg/kg	- -	ND [0.015]	- -	ND [0.017]	ND [0.018]
Ethylbenzene	SW8260B	mg/kg	- -	ND [0.015]	- -	ND [0.017]	ND [0.018]
Toluene	SW8260B	mg/kg	- -	ND [0.03]	- -	0.015 [0.034] J	ND [0.035]
Xylene, Isomers m & p	SW8260B	mg/kg	- -	ND [0.03]	- -	ND [0.034]	ND [0.035]
o-Xylene	SW8260B	mg/kg	- -	ND [0.015]	- -	ND [0.017]	ND [0.018]
Acenaphthene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Acenaphthylene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Anthracene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Benzo(a)anthracene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Benzo(a)pyrene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Benzo(b)fluoranthene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Benzo(g,h,i)perylene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Benzo(k)fluoranthene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Chrysene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Dibenzo(a,h)anthracene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Fluoranthene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Fluorene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Indeno(1,2,3-cd)pyrene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Naphthalene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Phenanthrene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -
Pyrene	SW8270CSIM	µg/kg	- -	- -	- -	- -	- -

See text for validation qualification information
ND - not detected
[laborato rting
"-" - sample not analyzed by this method

Elmendorf TO12
2002 Analytical Data
Site 409 (Hospital)

			DUPLICATE
	Location	409MNW20-01SO	409MNW20-01SOD
	Sample ID	EL-A900901	EL-A900902
	Laboratory	CTE	CTE
	Lab Sample ID	3024758001	3024758002
	Collection Date	10/10/2002	10/10/2002
	Matrix	SO	SO
Analyte	**Method**	**Units**	
Total Solids	A2540G	PERCENT	95.2 [0.1]	95.5 [0.1]
Diesel Range Organics	AK102	mg/kg	3.18 [10.5] UBRL	3.51 [10.5] UBRL
Benzene	SW8260B	mg/kg	- -	- -
Ethylbenzene	SW8260B	mg/kg	- -	- -
Toluene	SW8260B	mg/kg	- -	- -
Xylene, Isomers m & p	SW8260B	mg/kg	- -	- -
o-Xylene	SW8260B	mg/kg	- -	- -
Acenaphthene	SW8270CSIM	µg/kg	- -	- -
Acenaphthylene	SW8270CSIM	µg/kg	- -	- -
Anthracene	SW8270CSIM	µg/kg	- -	- -
Benzo(a)anthracene	SW8270CSIM	µg/kg	- -	- -
Benzo(a)pyrene	SW8270CSIM	µg/kg	- -	- -
Benzo(b)fluoranthene	SW8270CSIM	µg/kg	- -	- -
Benzo(g,h,i)perylene	SW8270CSIM	µg/kg	- -	- -
Benzo(k)fluoranthene	SW8270CSIM	µg/kg	- -	- -
Chrysene	SW8270CSIM	µg/kg	- -	- -
Dibenzo(a,h)anthracene	SW8270CSIM	µg/kg	- -	- -
Fluoranthene	SW8270CSIM	µg/kg	- -	- -
Fluorene	SW8270CSIM	µg/kg	- -	- -
Indeno(1,2,3-cd)pyrene	SW8270CSIM	µg/kg	- -	- -
Naphthalene	SW8270CSIM	µg/kg	- -	- -
Phenanthrene	SW8270CSIM	µg/kg	- -	- -
Pyrene	SW8270CSIM	µg/kg	- -	- -

See text for validation qualification information
ND - not detected
[ ] - laboratory reporting limit
"-" - sample not analyzed by this method

Case Narrative

Customer: JACOBSE — **Jacobs Engineering Group**

Project: 1026253 — **Elmendorf TO12**

NPDL WO: NA

1026253005 PS

DRO by AK102 was analyzed by CTE ESI of Ludington, MI.

PAHSIMS - Naphthalene was found above the PQL in the method blank and did not meet RPD goals in the LCS/LCSD. Results are not affected as this analyte was not found in this sample.

455749 MB

PAHSIMS - Naphthalene was found above the PQL in the method blank due to contamination in the turbovap from samples with high concentration of naphthalene. Naphthalene may be biased high in the associated samples.

455751 LCSD

PAHSIMS - Naphthalene is biased high and does not meet QC recovery and RPD goals due to contamination from high concentration samples in the turbovap. Naphthalene will be estimated inthe associated samples.

456417 CCV

PAHSIMS - CCV - Surrogate, chrysene-d12 is biased low and does not meet QC recovery goals. Results are not significantly affected.

1026253

Chain-of-Custody Report

Collection Organization: JEGA **Chain-of-Custody:** EL-A5001 **Cooler ID:** HC5 **Admin Number:** NA

Project Number: Elmendorf TO12 **Laboratory:** CTE **Bill To:** JEGA **Report To:** JEGA

COC Sample ID	Collection Date	Time	Sampler	Containers Number	Type	Volume	Preservative	Matrix	Analyses Requested Group	QC	TAT	Contents Caution	Dispose or Return Samples	Level
EL-A900101 (1) A	09/20/2002	1245	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			-
EL-A900102 (2) A	09/20/2002	1250	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			-
EL-A900103 (3) A	09/20/2002	0945	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			-
EL-A900104 (4) A	09/20/2002	1230	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			-
EL-A900105 (5) A	09/20/2002	1130	MUTLEY	1	AMBER	8OZ	4C	SO	AK102|SW8270CSIM		7DAYS			-
EL-A900106 (6) A	09/20/2002	1445	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			-
EL-A900107 (7) A-B	09/20/2002	1450	MUTLEY	1	AMBER	4OZ	4C_METHANOL	SO	SW8021B		7DAYS			-
EL-A900107 (7) A-B	09/20/2002	1450	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			-
EL-A900108 (8) A	09/20/2002	1453	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			-
EL-A900109 (9) A-B	09/20/2002	1455	MUTLEY	1	AMBER	4OZ	4C_METHANOL	SO	SW8021B		7DAYS			-
EL-A900109 (9) A-B	09/20/2002	1455	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			-
EL-A900110 (10) A	09/20/2002	1455	MUTLEY	1	AMBER	4OZ	4C_METHANOL	SO	SW8021B		7DAYS			-

Comments:

Special Instructions:

Relinquish By: Mike Utley 9/20/02 2100

Received By: Janet Taylor 9/21/02 1000

CT&EAK Relinquished:

CT&EMI Received:

1026253

ATTACHMENT C
COOLER RECEIPT FORM

Fax this form and the CoC records to Jacobs Program/Project Chemist within 24 hours of receiving sample.

CoC Number EL-A5001 **(One receipt form per cooler)**
Cooler Number/Name on CoC HC 5
Laboratory and Location CT&E ANCHORAGE AK
Lab SDG 1026253

1.	Were custody seals on outside of cooler?	(YES) NO
	If yes, how many and where? 1 ON FRONT / 1 ON BACK	
	Were signatures and dates correct?	(YES) NO
2.	Were custody papers taped to lid inside of cooler?	(YES) NO
3.	Were custody papers properly filled out (ink, signed, etc.)?	(YES) NO
4.	Did you sign custody papers in the appropriate place?	(YES) NO
5.	Did you attach shipper's packing slip to this form?	~~YES~~ ~~NO~~ N/A
6.	What kind of packing material was used? BW / V	
7.	Was sufficient ice used (if appropriate)?	(YES) NO
8.	Were all bottles sealed in separate plastic bags?	(YES) NO
9.	Did all bottles arrive in good condition?	(YES) NO
10.	Were all bottle labels complete (number, date, signed, analysis, pres., etc.)?	(YES) NO
11.	Did all bottle labels and tags agree with custody papers?	(YES) NO
12.	Were correct bottles used for the tests?	(YES) NO
13.	Were VOA vials checked for absence of air bubbles, and if present noted?	~~YES~~ ~~NO~~ N/A
14.	Was sufficient amount of sample sent in each bottle?	(YES) NO
15.	Chain-of-custody identification number: EL-A5001	
	Temperature blank reading 3.7°C	
	Cooler temperature. 4.2°C	
	Identification number of thermometer CT&E #1	
16.	Is temperature within 4+/- 2°C?	(YES) NO
17.	Were labels correctly associated with pre-tared containers? (not placed directly on jars)?	(YES) NO
	CORRECTIVE ACTION FORM ATTACHED	***YES NO***

Jacobs Project Chemist contacted? Date/Time _____

Attach associated CoC record and Conversation Confirmer forms.

Explain any discrepancies: _____

Case Narrative

Customer: JAAM — Jacobs Engineering Group (AK)

Project: 3024365 — Elmendorf T012,COC EL-A5001

3024365005 PS

DRO: Unknown hydrocarbon pattern present.

3024365007 PS

DRO: Unknown hydrocarbon pattern present.

3024365008 PS

DRO: Unknown hydrocarbon pattern present.

3024365009 PS

DRO: Unknown hydrocarbon pattern present.

239007 LCS

Trichlorofluoromethane, acetone, MEK, 1,1,2,2-tetrachloroethane, 1,2-DCB, hexachlorobutadiene above QC acceptance criteria.

Diethyl ether below QC acceptance criteria.

1026253

Chain-of-Custody Report

CT&E Environmental Services Inc.

152001 COC Serial

Collection Organization:	JEGA	**Chain-of-Custody:**	EL-A5001	**Cooler ID:**	HC5	**Admin Number:**	NA
Project Number:	Elmendorf TO12	**Laboratory:**	CTE	**Bill To:**	JEGA	**Report To:**	JEGA

COC Sample ID	Collection Date	Collection Time	Sampler	Containers Number	Containers Type	Containers Volume	Preservative	Matrix	Analyses Requested Group	QC	TAT	Contents Caution	Dispose or Return Samples	Level
EL-A900101 (1) A	09/20/2002	1245	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			–
EL-A900102 (2) A	09/20/2002	1250	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			–
EL-A900103 (3) A	09/20/2002	0945	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			–
EL-A900104 (4) A	09/20/2002	1230	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			–
EL-A900105 (5) A	09/20/2002	1130	MUTLEY	1	AMBER	8OZ	4C	SO	AK102|SW8270CSIM		7DAYS			–
EL-A900106 (6) A	09/20/2002	1445	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			–
EL-A900107 } (7) A-B	09/20/2002	1450	MUTLEY	1	AMBER	4OZ	4C_METHANOL	SO	SW8021B		7DAYS			–
EL-A900107	09/20/2002	1450	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			–
EL-A900108 (8) A	09/20/2002	1453	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			–
EL-A900109 } (9) A-B	09/20/2002	1455	MUTLEY	1	AMBER	4OZ	4C_METHANOL	SO	SW8021B		7DAYS			–
EL-A900109	09/20/2002	1455	MUTLEY	1	AMBER	8OZ	4C	SO	AK102		7DAYS			–
EL-A900110 (10) A	09/20/2002	1455	MUTLEY	1	AMBER	4OZ	4C_METHANOL	SO	SW8021B		7DAYS			–

Comments:

Special Instructions:

Relinquish By: [signature] 9/2[illegible]02 2100

Received By: [signature] 9/21/02 1000

CT&E AK Relinquished: [signature] 9/23/02 1030

CT&E MI Received: [signature] 9-24-02 900

09/20[redacted]

1026253

ATTACHMENT C
COOLER RECEIPT FORM

Fax this form and the CoC records to Jacobs Program/Project Chemist within 24 hours of receiving sample.

CoC Number EL-A5001 **(One receipt form per cooler)**
Cooler Number/Name on CoC HC 5
Laboratory and Location CT&E ANCHORAGE AK
Lab SDG 1026253

1.	Were custody seals on outside of cooler?	(YES)	NO
	If yes, how many and where? 1 ON FRONT / 1 ON BACK		
	Were signatures and dates correct?	(YES)	NO
2.	Were custody papers taped to lid inside of cooler?	(YES)	NO
3.	Were custody papers properly filled out (ink, signed, etc.)?	(YES)	NO
4.	Did you sign custody papers in the appropriate place?	(YES)	NO
5.	Did you attach shipper's packing slip to this form?	~~YES~~	~~NO~~ N/A
6.	What kind of packing material was used? BW / V		
7.	Was sufficient ice used (if appropriate)?	(YES)	NO
8.	Were all bottles sealed in separate plastic bags?	(YES)	NO
9.	Did all bottles arrive in good condition?	(YES)	NO
10.	Were all bottle labels complete (number, date, signed, analysis, pres., etc.)?	(YES)	NO
11.	Did all bottle labels and tags agree with custody papers?	(YES)	NO
12.	Were correct bottles used for the tests?	~~YES~~	~~NO~~ N/A
13.	Were VOA vials checked for absence of air bubbles, and if present noted?	(YES)	NO
14.	Was sufficient amount of sample sent in each bottle?		
15.	Chain-of-custody identification number: EL-A5001		
	Temperature blank reading 3.7°C		
	Cooler temperature. 4.2°C		
	Identification number of thermometer CT&E #1		
16.	Is temperature within 4+/- 2°C?	(YES)	NO
17.	Were labels correctly associated with pre-tared containers? (not placed directly on jars)?	(YES)	NO

CORRECTIVE ACTION FORM ATTACHED ***YES NO***

Jacobs Project Chemist contacted? Date/Time _____

Attach associated CoC record and Conversation Confirmer forms.

Explain any discrepancies: _____

Case Narrative

Customer: JAAM
Project: 3024758

Jacobs Engineering Group (AK)
Elmendorf TO12 (1026875)

3024758001 PS
DRO detected in the Method Blank at 1.27 mg/Kg.

3024758002 PS
DRO detected in the Method Blank at 1.27 mg/Kg.

Samples analyzed at the Ludington, Michigan laboratory of CT&E Environmental Services Inc.

3024758

1026875

Chain-of-Custody Report

Collection Organization: JEGA | Chain-of-Custody: EL-A9009 | Cooler ID: HC9 | Admin Number: NA

Project Number: Elmendorf TO12 | Laboratory: CTE | Bill To: JEGA | Report To: JEGA

COC Sample ID	Collection Date	Time	Sampler	Containers Number	Type	Volume	Preservative	Matrix	Analyses Requested Group	QC	TAT	Contents Caution	Dispose or Return Samples	Level
EL-A900901	10/10/02	1445	MUTLEY	1	AMBER	8OZ	4C	SO	AK102	MS/D	7DAYS			-
EL-A900902	10/10/02	1450	MUTLEY	1	AMBER	8OZ	4C	SO	AK102	MSD	7DAYS			-

Comments:

Special Instructions:

Relinquish By: Mike Utley 10/10/02 1815

Received By: Trust Taylor 10/10/02 1815

Relinquished CTE AVC: Rhonda Smelcer 10/11/02 1102

Rec By: P. Applebee 10-12-02 14:00

10/02/2002

1026875

ATTACHMENT C
COOLER RECEIPT FORM

Fax this form and the CoC records to Jacobs Program/Project Chemist within 24 hours of receiving sample.

CoC Number EL-A9009 **(One receipt form per cooler)**
Cooler Number/Name on CoC HC9
Laboratory and Location CT&E ANCHORAGE
Lab SDG 1026875

1.	Were custody seals on outside of cooler?	YES (NO)
	If yes, how many and where? HAND CARRIES	
	Were signatures and dates correct?	~~YES NO N/A~~
2.	Were custody papers taped to lid inside of cooler?	(YES) NO
3.	Were custody papers properly filled out (ink, signed, etc.)?	(YES) NO
4.	Did you sign custody papers in the appropriate place?	(YES) NO
5.	Did you attach shipper's packing slip to this form?	~~YES NO N/A~~
6.	What kind of packing material was used? BW	
7.	Was sufficient ice used (if appropriate)?	(YES) NO
8.	Were all bottles sealed in separate plastic bags?	YES (NO)
9.	Did all bottles arrive in good condition?	(YES) NO
10.	Were all bottle labels complete (number, date, signed, analysis, pres., etc.)?	(YES) NO
11.	Did all bottle labels and tags agree with custody papers?	YES (NO) (1)
12.	Were correct bottles used for the tests?	(YES) NO
13.	Were VOA vials checked for absence of air bubbles, and if present noted?	~~YES NO N/A~~
14.	Was sufficient amount of sample sent in each bottle?	(YES) NO
15.	Chain-of-custody identification number: EL-A9009	
	Temperature blank reading 3.3°C	
	Cooler temperature. 3.0°C	
	Identification number of thermometer CT&E #1	
16.	Is temperature within 4+/- 2°C?	(YES) NO
17.	Were labels correctly associated with pre-tared containers? (not placed directly on jars)?	~~YES NO N/A~~
	CORRECTIVE ACTION FORM ATTACHED	***YES NO***

Jacobs Project Chemist contacted? Date/Time _____

Attach associated CoC record and Conversation Confirmer forms.

Explain any discrepancies: (1) SAMPLER ID IS DIFFERENT ON JARS THAN IS INDICATED ON COC

ATTACHMENT C
COOLER RECEIPT FORM

Fax this form and the CoC records to Jacobs Program/Project Chemist within 24 hours of receiving sample.

CoC Number EL-A9009 (One receipt form per cooler)
Cooler Number/Name on CoC 12186, 19W44, 4053 7003 HC9
Laboratory and Location CT+E Michigan
Lab SDG 30247S8

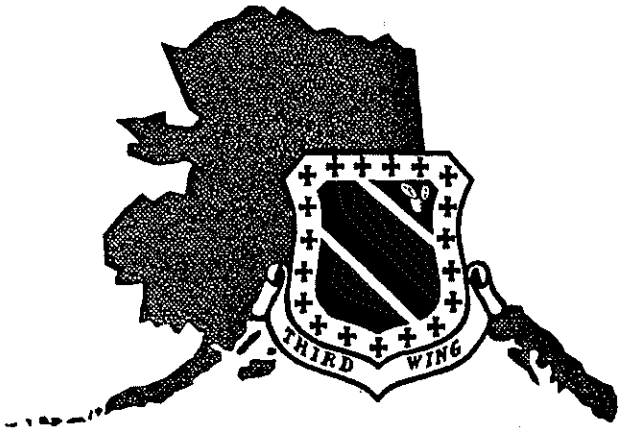
1.	Were custody seals on outside of cooler?	(YES) NO
	If yes, how many and where? Top Left + Right Sides	
	Were signatures and dates correct?	(YES) NO
2.	Were custody papers taped to lid inside of cooler?	(YES) NO
3.	Were custody papers properly filled out (ink, signed, etc.)?	(YES) NO
4.	Did you sign custody papers in the appropriate place?	(YES) NO
5.	Did you attach shipper's packing slip to this form?	(YES) NO
6.	What kind of packing material was used? BW, CB	
7.	Was sufficient ice used (if appropriate)?	(YES) NO
8.	Were all bottles sealed in separate plastic bags?	(YES) NO
9.	Did all bottles arrive in good condition?	(YES) NO
10.	Were all bottle labels complete (number, date, signed, analysis, pres., etc.)?	(YES) NO
11.	Did all bottle labels and tags agree with custody papers?	(YES) NO
12.	Were correct bottles used for the tests?	(YES) NO
13.	Were VOA vials checked for absence of air bubbles, and if present noted?	~~YES~~ NA NO
14.	Was sufficient amount of sample sent in each bottle?	(YES) NO
15.	Chain-of-custody identification number: EL-A9009	
	Temperature blank reading 5.0 C	
	Cooler temperature. 6.0 C	
	Identification number of thermometer 21352801	
16.	Is temperature within 4+/- 2°C?	(YES) NO
17.	Were labels correctly associated with pre-tared containers? (not placed directly on jars)?	~~YES~~ NA NO

CORRECTIVE ACTION FORM ATTACHED YES (NO)

Jacobs Project Chemist contacted? Date/Time _____

Attach associated CoC record and Conversation Confirmer forms.

Explain any discrepancies: _____



UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL RESTORATION PROGRAM

SERA PHASE IX RELEASE INVESTIGATION REPORT
ST409/7/9, FORMER HOSPITAL OUTBUILDING
UST AFID 805
FINAL

JANUARY 2002

CONTENTS

CONTENTS (Continued)

APPENDICES

LIST OF TABLES

CONTENTS (Continued)

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AFID	Air Force Identification Number
ASTM	American Society for Testing and Materials
AWACS	Airborne Warning and Control Squadron
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
C	Centigrade
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CSRP	Contaminated Sites Remediation Program
DRMO	Defense Reutilization and Marketing Organization
DRO	Diesel range organics
EAFB	Elmendorf Air Force Base
EPA	U.S. Environmental Protection Agency
ESF	Environmental Staging Facility
EV	Electron volt
F	Fahrenheit
FFA	Federal Facility Agreement
GRO	Gasoline range organics
HDPE	High-density polyethylene
HHS	Heated Headspace
IDW	Investigation-derived waste
LNAPL	Light nonaqueous-phase liquids
µg/kg	Micrograms per kilogram
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mL	Milliliter

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

MNA	Monitored natural attenuation
MRL	Method reporting limit
MS	Matrix spike
MSD	Matrix spike duplicate
MS/MSD	Matrix spike/matrix spike duplicate
ORC	Oxygen Release Compound
OU5	Operable Unit 5
PAHs	Polycyclic aromatic hydrocarbons
PID	Photoionization detector
POL	Petroleum, oil, and lubricants
ppm	Parts per million
PVC	Polyvinyl chloride
QA	Quality assurance
QC	Quality control
RI	Release Investigation
RRO	Residual range organics
SERA	State-Elmendorf Environmental Restoration Agreement
SSHP	Site-Specific Safety and Health Plan
TOC	Total organic carbon
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USCS	Unified Soil Classification System
UST	Underground storage tank
VOA	Volatile organic analysis
VOC	Volatile organic compound

EXECUTIVE SUMMARY

The accompanying report presents findings of the State-Elmendorf Environmental Restoration Agreement (SERA) Phase IX Release Investigation (RI) at ST409/7/9 on Elmendorf Air Force Base (EAFB). ST409/7/9 is the location of a former underground storage tank (UST) adjacent to Building 4913 (formerly Building 24-805), which is just south of the former EAFB hospital.

The 20,000-gallon UST, Air Force Identification Number (AFID) 805, held heating oil for the former hospital's backup heating system. After failing a tank tightness test in 1994, the UST and associated piping were removed under the EAFB UST management plan. Analytical results from soil samples collected from the UST excavation indicated the presence of contamination from petroleum, oil, and lubricants (POL) products.

RIs conducted at ST409 under SERA Phases IV and VII indicated the need for further investigation of both groundwater and soil because of the following findings:

- Groundwater at the former UST location had been contaminated with dissolved-phase POLs. Because ST409/7/9 is not within the Operable Unit 5 (OU5) Model Area, dissolved-phase contaminants must be addressed under SERA.
- Contaminated soil encountered during the installation of monitoring well 409WL05 during SERA VII exceeded Alaska Department of Environmental Conservation (ADEC) cleanup standards. This contaminated soil was believed to be unrelated to the UST release because of the relatively shallow depth of the contaminated soil and the distance from the former UST location.

The goal of the 2001 field program at ST409/7/9 has been to gather additional data that would address data gaps identified by ADEC, and EAFB and allow for evaluation of the potential for site closure. There were two major objectives of the SERA Phase IX investigation at this site:

- To monitor the leading edge of POLs contamination in groundwater, EAFB installed two additional wells downgradient from the UST release to act as sentinel wells. Sitewide sampling and analysis of groundwater was conducted.
- To further delineate contaminated soil near monitoring well 409WL05, five borings were advanced around the well. Soil samples were collected for field screening and off-site analysis.

Major findings of the SERA Phase IX investigation included the following:

- Groundwater monitoring indicated that POLs in the form of diesel range organics (DRO) were present at a concentration range of 1.5 to 6.7 milligrams/Liter (mg/L) at the UST release location. These concentrations exceed ADEC cleanup levels.

- DRO was detected approximately 75 feet downgradient of the UST release in one of the new sentinel wells (409WL08), but at a concentration below ADEC cleanup levels.
- Of the five borings advanced around well 409WL05, only at boring 01409BH03 were POLs detected, and these occurred at a depth range of 2 to 5 feet below ground surface (bgs). DRO concentrations detected at 01409BH03 ranged from 3,900 to 5,700 milligrams per kilogram (mg/kg), exceeding ADEC cleanup levels by a factor of 10. Total xylenes were also detected at this boring, but at concentrations well below ADEC cleanup levels.

Because the contaminant sources appear to have been fully identified, establishment of a passive remediation approach is warranted to minimize further impact to groundwater. Additionally, contaminated soil in the vicinity of monitoring well 409WL05 should be excavated and remediated.

1.0 INTRODUCTION

This report presents the findings of the State-Elmendorf Environmental Restoration Agreement (SERA) Phase IX Release Investigation (RI) at ST409/7/9 Former Hospital Outbuilding, on Elmendorf Air Force Base (EAFB: see Figure 1-1). SERA is a cooperative agreement signed in October 1992 between the U.S. Air Force (USAF) and Alaska Department of Environmental Conservation (ADEC).

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 (FFA). FFA sites are subject to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

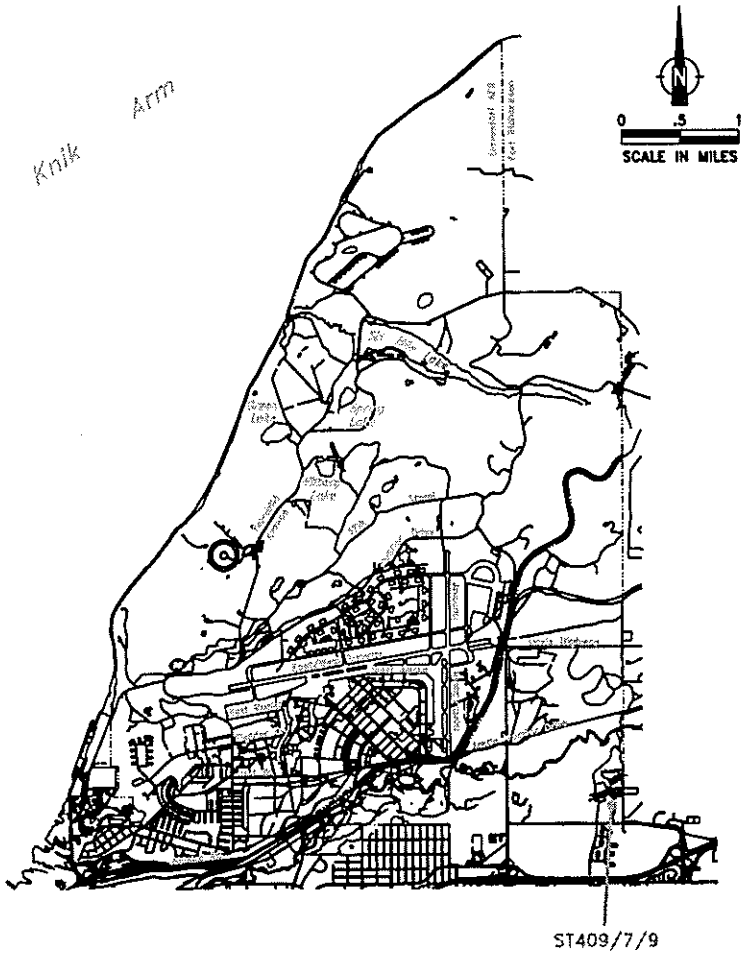
SERA requires EAFB to perform any necessary assessment, monitoring, remediation, and closure of solid waste, UST, and POL spill sites identified under SERA, as well as new sites identified subsequent to the issuance of SERA. For all sites in SERA Phase IX, it has been established through previous environmental investigations that a discharge or release has occurred from a known source of contamination (e.g., leaking UST or surface spill).

The goal of the 2001 field program at ST409/7/9, which has been investigated during previous SERA phases, is to gather additional data that will address data gaps identified by ADEC and EAFB and allow for evaluation of the potential for site closure.

1.1 Report Outline

This report is divided into the following sections:

- Section 1.0 introduces the report and describes the SERA program, the regional setting, applicable ADEC regulatory requirements, site background, previous investigations, and site objectives.
- Section 2.0 summarizes field methods employed in the RI. This section also discusses methods and standards used in data interpretation.
- Section 3.0 describes 2001 fieldwork and discusses all findings to date for the site.
- Section 4.0 provides conclusions of the RI, identifies any remaining data gaps, and provides disposition recommendations for the site.
- Section 5.0 is a list of documents cited in this report.



FILE: F3605/A-D	DRAWN: SSR	FIGURE 1-1 ST409/7/9 SITE LOCATION MAP	3 CES/CEVR SERA PHASE IX ELMENDORF AFB, ALASKA PROJECT #9000-268
C/SC: 1:5500	ZIP: 47/01		
DATE: 10/23/01	CHECK: J.D.		

Analytical results, and figures for previous investigations are presented in Appendix A. Appendix B contains a letter from ADEC dated March 21, 2000, requesting that additional investigation be conducted at ST409/7/9. Boring exploration and monitoring well logs are presented in Appendix C. Monitoring well development, purge and sample collection records for SERA Phase IX are presented in Appendix D. Photographs taken during SERA Phase IX fieldwork are provided in Appendix E. Appendix F contains completed ADEC forms for the UST investigation and the Preliminary Risk Evaluation. The SERA Phase IX data assessment report for ST409/7/9 includes a discussion of data quality and chromatogram interpretations, and is provided in Appendix G. Geotehnical data for three samples collected at ST409/7/9 is included as Appendix H.

1.2 SERA Phase IX

The approach to SERA fieldwork was based on whether or not a site is located within the groundwater modeled area (Operable Unit 5 [OU5] Model Area) of the EAFB outwash plain (Figure 1-2). Because groundwater quality in the model area is being monitored actively under the terms used to establish OU5, SERA sites within the model area typically do not address dissolved-phase contamination. ST409 is not in the model area, and therefore the investigation must focus on the presence of dissolved-phase contaminants in both groundwater and soil.

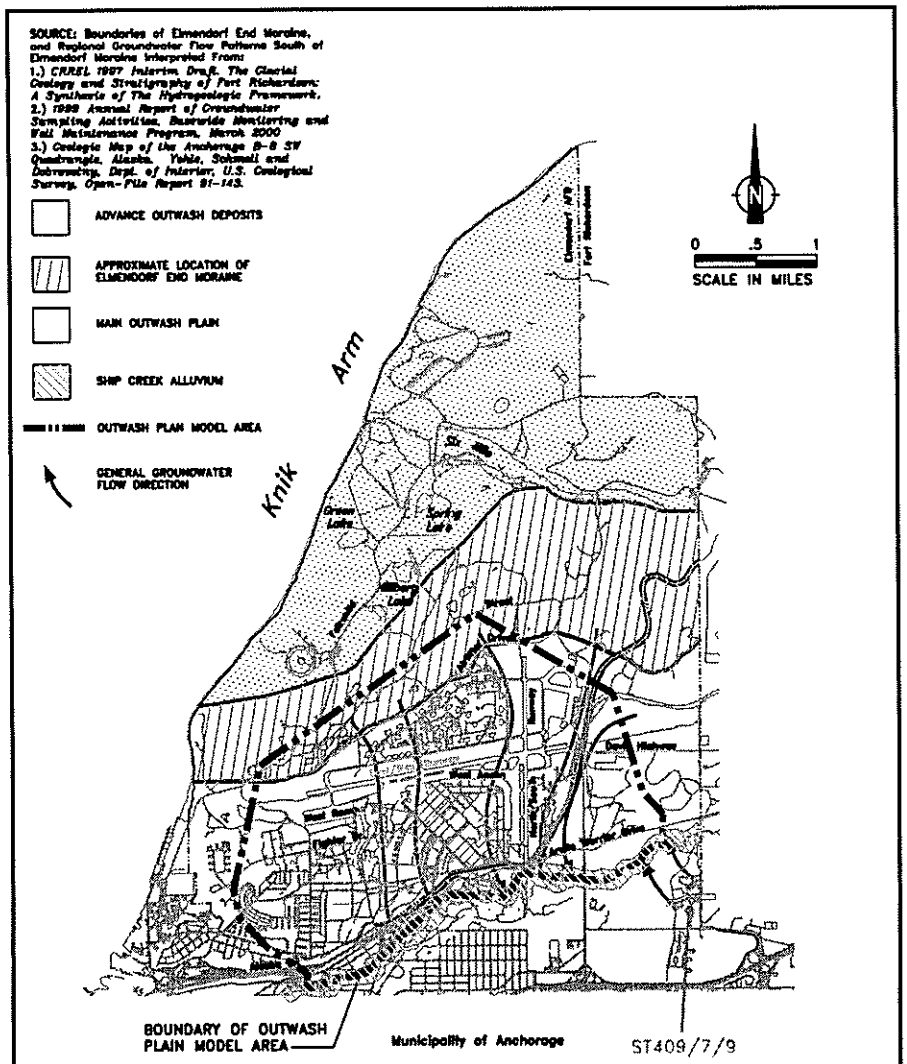
1.3 ADEC Regulatory Requirements

The State of Alaska regulations pertinent to the SERA Phase IX RI for ST409/7/9 include the site characterization/RI and corrective action requirements of Title 18 of the *Alaska Administrative Code* (AAC), Sections 75 and 78.

1.4 ADEC Underground Storage Tank Regulations

For UST sites with a confirmed release of petroleum product, an RI must be performed in accordance with 18 AAC 78.234. ST409/7/9 is subject to the RI requirements of 18 AAC 78 (UST Regulations), including the soil and groundwater cleanup levels published in 18 AAC 75 and commonly known as the Contaminated Sites Remediation Program (CSRP).

The RI regulations require that after initial release abatement is complete, an RI is conducted to characterize the release and the actual or potential threat to human health and safety, and to the environment. If applicable to the site, the RI must include the following (with the applicability to the SERA program also noted):



FILE: RGFP/A-D	DRAWN: SSR	FIGURE 1-2 REGIONAL GROUNDWATER FLOW PATTERNS	3 CES/CEVR SERA PHASE IX ELMENDORF AFB, ALASKA ENSR PROJECT #9000-268
C/SC: 1:5500	ZIP: 47/01		
DATE: 10/23/01	CHECK: J.D.		

- *Soil samples must be taken to adequately characterize the horizontal and vertical distribution of the release in the soil and to identify soil properties that are likely to influence the type and rate of migration.* Multiple investigations have been conducted at the site to satisfy this requirement.
- *Investigation of the site geology and hydrogeology must be conducted to adequately characterize the horizontal and vertical distribution of the release in groundwater and to identify the features that affect the fate and transport of the release.* Multiple investigations have been conducted at the site to satisfy this requirement.
- *Investigation of any surface waters must be conducted to adequately characterize significant hydrologic features such as surface drainage patterns and quantities, surface waters, floodplains, and actual or potential contaminant migration routes toward or within these features.* The release site is not located near any significant hydrologic feature.
- *A hazard ranking evaluation must be conducted to measure the potential risk to human health and safety and to the environment.* The completed ADEC form "Underground Storage Tank Program Preliminary Risk Evaluation Form" is provided in Appendix F. This form was prepared during the SERA PHASE IV RI.

1.5 Regional Geology

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 Moraine traverses the base from northeast to southwest and consists of discontinuous, unconsolidated glacial till comprising gravel, sand, and silt deposits. The southern boundary of the Elmendorf Moraine is a ridgeline running along the north side of the east-west runway. Underlying the glacial deposits of the Elmendorf Moraine are the shallow marine deposits of the Bootlegger Cove Formation. The shallow aquifer within the Elmendorf Moraine occurs from 1 to 60 feet below ground surface (bgs). The greatest depth to groundwater is along the moraine crest, which also acts as a groundwater divide with groundwater becoming shallower along the limbs of the moraine (USAF 2000a). Groundwater flow is divided by the Elmendorf Moraine. Groundwater flow direction in the Elmendorf Moraine closely matches the slope of the surface topography, with flow to the northwest along the north edge and to the southeast along the south edge of the moraine (USAF 2000a).

South of the moraine are sediments associated with the glaciofluvial deposits of an outwash plain (herein called "Main Outwash Plain"), consisting of mainly unconsolidated, poorly sorted sand and gravel with a thin overlying layer of loess present locally. Underlying the glacial outwash deposits are fine-grained silt and clay deposits of the Bootlegger Cove Formation. The Bootlegger Cove Formation beneath the Elmendorf Moraine is encountered between 50 and 100 feet bgs. Depth to the shallow aquifer in the Main Outwash Plain is between 5 and 50 feet

bgs. The general flow direction of the shallow aquifer in the Main Outwash Plain is to the south and southwest, toward Ship Creek.

South of the Main Outwash Plain is the Ship Creek Alluvium. The Ship Creek Alluvium is comprised of unconsolidated, fine- to medium-grained sands, with lesser amounts of fine-grained gravel. The Bootlegger Cove Formation is believed to underlie the Ship Creek Alluvium, although the Bootlegger Cove Formation is exposed only in downstream locations (USAF 2000). Depth to the shallow aquifer in the Ship Creek Alluvium varies from zero to 10 feet bgs. The general flow direction of the shallow aquifer in the Ship Creek Alluvium closely matches that of Ship Creek. ST409/7/9 is within the Ship Creek Alluvium.

North of the Elmendorf Moraine are advance outwash deposits consisting of stratified sand and pebble-and-cobble gravel. The Bootlegger Cove Formation underlies the advance outwash deposits and is exposed along the Knik Arm bluff. The thickness of the advance outwash deposit ranges from 5 to 42 feet along Knik Arm. Groundwater occurs in the advance outwash deposits above the Bootlegger Cove Formation.

Overall, the regional groundwater flow direction north of the moraine is to the northwest toward Knik Arm of Cook Inlet, while the regional groundwater flow direction south of the moraine is to the south and west toward Ship Creek (Figure 1-2). The local groundwater flow direction at the site is to the northwest toward Ship Creek.

1.6 Site Background

Site ST409/7/9 is the former location of a 20,000-gallon UST near Building 4913 (formerly Building 24-805), which is located south of the former EAFB Hospital. The UST, AFID 805, was installed in 1950 and contained heating oil for the former hospital's backup heating system. The tank failed a tank tightness test in July 1994. The UST and associated piping were removed from the ground in October 1994 under the EAFB UST management program. The UST excavation was about 13 feet deep, and groundwater was not encountered (USAF 1994). Previous investigation analytical results and figures are presented in Appendix A.

The depth to groundwater is approximately 30 feet bgs, with a presumably westerly gradient (USAF 1999, 2000). Excluding the six monitoring wells and two piezometers installed during the 1996 and 1998 investigations, no monitoring wells are present in the vicinity to assist in assessing groundwater quality upgradient and downgradient of the site. The nearest well to ST409/7/9 that was included in the 1999 Basewide Groundwater Sampling Event is OU6-MW-01, located 4,000 feet west of the site. Because of the great distance from the site, OU6-MW-01 is not useful in assessing groundwater impacts from the site. Base Well 43 (BW-43) is approximately 800 feet north-northeast of the site. The site is outside the EAFB Outwash Plain Groundwater Model Area.

1.6.1 Previous Investigations

UST Site Assessment. Soil samples were collected from the excavation at the time of the UST removal. An ADEC Level A cleanup standard was determined for the site. Five of the seven soil samples collected from the limits of the excavation contained concentrations of diesel range organics (DRO) exceeding the Level A cleanup standard. The maximum concentration of DRO was 12,000 milligrams per kilogram (mg/kg). The samples were not analyzed for BTEX compounds (benzene, toluene, ethylbenzene, and total xylenes) or residual range organics (RRO). In addition, the three samples collected from the stockpile generated during the UST removal contained concentrations of DRO (1,100 to 5,200 mg/kg) exceeding the Level A cleanup standard (100 mg/kg). With the approval of ADEC, this soil was used to backfill the excavation. In addition, 100 cubic yards of imported, clean fill was used to backfill the excavation. Based on the elevated DRO concentrations, the UST removal report concluded that an RI was required at the site (USAF 1994).

SERA Release Investigations. An RI was conducted at ST409/7/9 under SERA Phase IV in 1996 and 1997. Six borings were advanced in the vicinity of the former UST, and three of the borings were completed as groundwater monitoring wells, two as soil gas monitoring arrays, and one as a bioventing well. The site was also investigated under SERA Phase VII in 1998. Three additional borings were advanced, with two of the borings completed as groundwater monitoring wells. The two RIs are discussed below.

SERA Phase IV. In 1996, three soil borings were advanced in the vicinity of the former excavation. One boring was placed in the center of the former tank excavation and the other two borings were placed north of the former tank. Two soil samples were collected from each boring and analyzed for gasoline range organics (GRO), DRO, and BTEX. One sample collected from 31 feet bgs from boring 409PZ02, placed directly north of the former excavation, contained DRO exceeding the Level A cleanup criteria.

In 1997, three additional soil borings were advanced to further define the extent of soil contamination associated with the former UST. The three borings were completed as monitoring wells. The samples were analyzed for GRO, DRO, and BTEX and selectively analyzed for polycyclic aromatic hydrocarbons (PAHs). Two of the three borings contained concentrations of DRO (1,410 and 2,600 mg/kg), exceeding the Level A cleanup standards. GRO, BTEX, and PAHs were also detected in the samples, but at concentrations below the Level A cleanup standards and Method Two cleanup criteria.

Groundwater samples were collected from monitoring wells 409WL02, 409WL03, and 409WL04. The samples contained concentrations from 0.179 to 1.3 mg/L DRO, none of which exceeded the ADEC cleanup criteria of 1.5 milligrams per liter (mg/L) (USAF 1997).

SERA Phase VII. In 1998, as part of SERA Phase VII, three additional borings, two completed as groundwater monitoring wells, were advanced at the site. The locations of the wells and

borings were based on the groundwater flow direction at the site, contaminant plume profiles identified during the SERA IV investigation, and site infrastructure constraints. A total of seven soil samples were collected from the three borings. One sample collected from 5 feet bgs in 409WL05 contained DRO exceeding the ADEC Level A cleanup level. This contamination was assumed unrelated to the former UST because of the sample's shallow location relative to the other samples that showed impacts. Groundwater samples were collected from five monitoring wells at the site. Two groundwater samples exceeded the ADEC cleanup criteria for DRO: 409WL02 contained 2.55 mg/L, and 409WL03 contained 23.5 mg/L (USAF 1999).

1.6.2 Exceedances of Cleanup Levels

Soil. Data from the UST closure and the SERA IV and VII investigations were compared to the ADEC Method Two cleanup criteria (18 AAC 75.342, Tables B1 and B2, under-40-inch zone). The exposure pathway (inhalation, ingestion, or migration to groundwater) with the most stringent value was chosen for comparison with the analytical results. Soil and groundwater contaminated by heating oil need to be analyzed for DRO, RRO, BTEX, and PAHs to satisfy the Method Two cleanup criteria.

Soil samples from 1994, 1996, 1997, and 1998 indicate that DRO exceeding the ADEC Method Two soil cleanup level of 250 mg/kg are present in the vicinity of the former UST. Elevated levels of DRO were found to have migrated vertically at the location of the tank and horizontally along the smear zone downgradient of the tank. GRO, BTEX, and PAHs have not been detected in the soil in excess of their respective Method Two cleanup criteria.

During the UST closure in 1994, up to 12,000 mg/kg DRO was documented in the sidewalls and base of the UST excavation. During subsequent investigation efforts, the highest concentration of DRO detected was from 21 feet bgs at the location of the former UST excavation. Elevated DRO concentrations also have been detected downgradient of the former tank.

In addition, a soil sample collected from 409WL05, approximately 40 feet east of the former UST, exceeded the Method Two cleanup criteria for DRO. The sample was collected from 5 feet bgs and contained 1,480 mg/kg DRO. A sample collected from 15 feet bgs contained 4.51 mg/kg DRO. The contaminated soil encountered at the former tank location has been shown to be present from 9 to 40 feet bgs. The contaminated soil encountered in 409WL05 was found at a shallow depth and does not extend vertically. Therefore, it appears that this soil is not related to the contaminated soil in the vicinity of the former tank.

Soil sampling conducted at the site prior to SERA Phase IX did not include analysis for RRO, as required by ADEC.

Groundwater. Data from the SERA Phase IV and VII investigations were compared to the ADEC groundwater cleanup levels (18 AAC 75.345, Table C). In 1997, groundwater samples collected from monitoring wells 409WL02, 409WL03, and 409WL04 contained DRO ranging

from 0.179 to 1.3 mg/L. These levels are below the ADEC cleanup standard of 1.5 mg/L. GRO and BTEX constituents were not detected in the groundwater samples.

In 1998, groundwater samples were collected from monitoring wells 409WL02 through 409WL06. DRO was not detected above the method reporting limit (MRL) of 0.103 mg/L in 409WL04 in 1998, although in 1997 DRO had been detected at 0.179 mg/L. The concentration of DRO in samples from 409WL02 and 409WL03 increased by more than one order of magnitude from 1997 to 1998. The DRO concentration increased from 0.331 to 2.55 mg/L at 409WL02, and from 1.3 to 23.5 mg/L at 409WL03. Samples from 409WL05 and 409WL06 contained 0.12 mg/L DRO and 0.652 mg/L DRO, respectively. Ethylbenzene and xylenes were detected in four of the five wells sampled in 1998, but none of the results exceeded the ADEC cleanup levels. Benzene and toluene were not detected in any of the five wells. Samples from 409WL02 and 409WL03 contained 0.044 and 0.12 mg/L GRO, respectively, both below the ADEC cleanup level of 1.3 mg/L.

1.7 Objectives of SERA Phase IX Investigation

In a letter to EAFB (Appendix B), ADEC requested that additional investigation activities be conducted at the site (ADEC 2000c). ADEC requested that two additional wells be placed downgradient of 409WL03 to further define the groundwater contaminant plume. Additionally, ADEC requested that the shallow contamination encountered at 409WL05 be further investigated. Based on a review of the results of previous investigations and this input from ADEC, the objectives of the SERA Phase IX field investigation at ST409/7/9 were to:

- Better define the groundwater contaminant plume downgradient of the former UST, specifically to the northwest of 409WL03 and 409WL04.
- Obtain a current snapshot of the extent and concentration of groundwater contaminants on site by sampling all wells at the site. Groundwater samples had last been collected in July 1998.
- Investigate shallow soil contamination near 409WL05. One sample collected at 5 feet bgs in this location in 1998 exceeded the Method Two DRO cleanup level, while a deeper sample exhibited a decrease in contaminant concentration. This finding suggests that the contamination in soil at 409WL05 was due to a surface spill and is not associated with a release from the nearby UST, which resulted in contaminants at depths ranging from 15 to 40 feet bgs.
- Collect data to support assessment of monitored natural attenuation (MNA) as a remedial option at this site.

This page intentionally left blank.

3.0 RESULTS

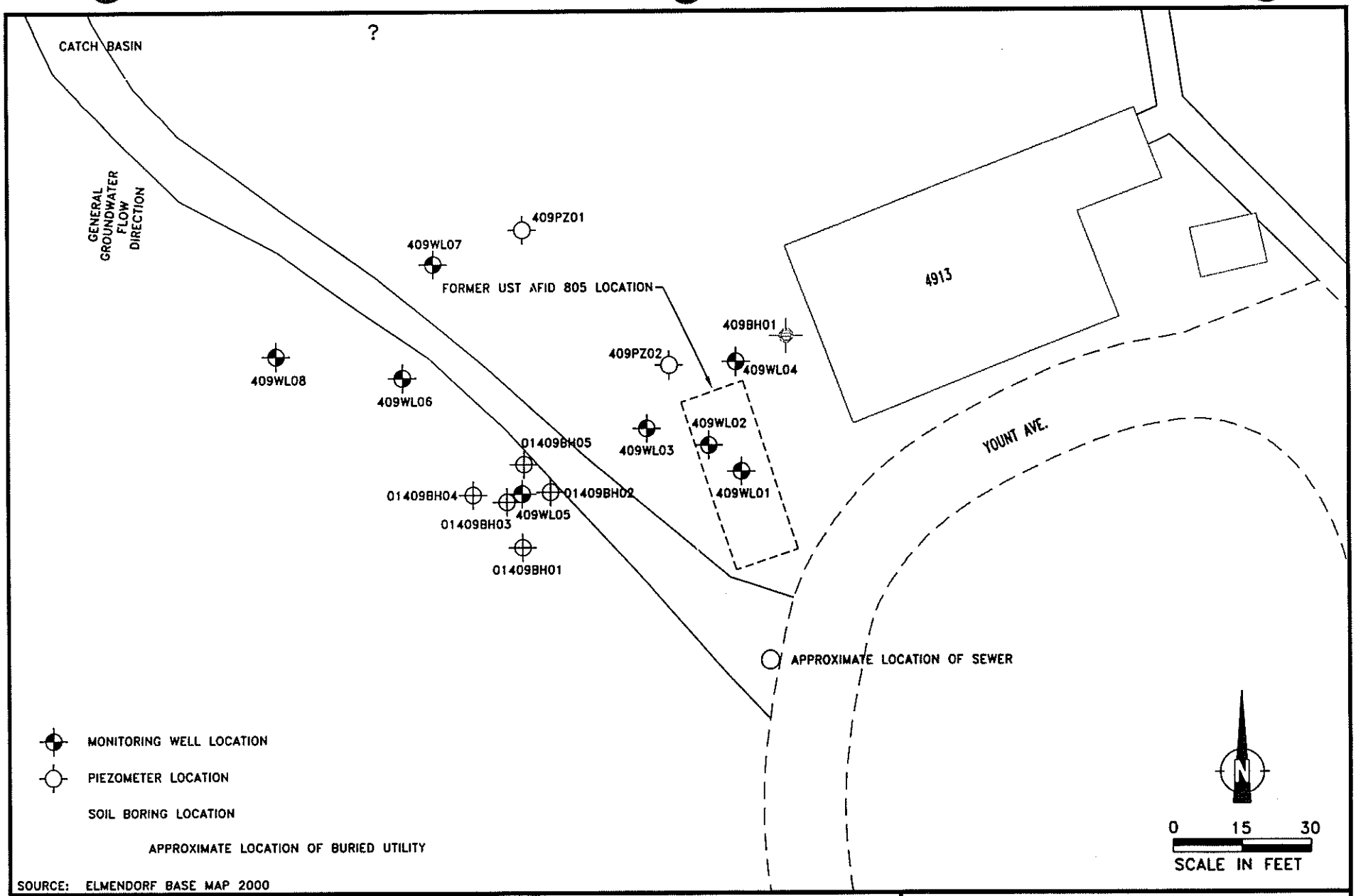
3.1 2001 SERA Phase IX Field Program

3.1.1 Soil Boring/Monitoring Well Installation

Monitoring well installation was performed in accordance with USACE guidelines (USACE 1998). Two monitoring wells (409WL07 and 409WL08) were installed on July 3, 2001. At the time of installation, these wells were designated 01409WL01 and 01409WL02, respectively. These wells were later renamed on August 2, 2001, to 409WL07 and 409WL08, respectively, to prevent confusion with existing wells 409WL01 and 409WL02, which were installed during previous phases of SERA. Five soil borings (01409BH01, 01409BH02, 01409BH03, 01409BH04, and 01409BH05) were installed on July 6, 2001. Soil samples were collected at a minimum of every 5 feet for lithologic logging and HHS screening. Select samples were also submitted for laboratory analyses of DRO/RRO, GRO/BTEX, PAHs, and TOC. Additionally, samples were submitted for physical characteristic analysis for use in assessing the site's potential for MNA. Figure 3-1 is a site layout map showing the location of the soil borings and monitoring wells. Soils encountered throughout the site were generally sands and gravels.

One round of water level measurements was conducted at existing monitoring wells prior to the commencement of drilling to assist in placement of downgradient wells. Monitoring well 409WL07 was installed downgradient and 409WL08 was installed downgradient and slightly cross-gradient of 409WL03 and 409WL04 to better define the groundwater contaminant plume. No fuel odor was observed in either soil borings, and the highest HHS reading was 1.1 ppm. Groundwater was encountered at approximately 25 feet in both wells.

Five soil borings (01409BH01, 01409BH02, 01409BH03, 01409BH04, and 01409BH05) were installed around 409WL05 to delineate the lateral extent of surface soil contamination observed in soil samples collected from this location. No fuel odor was observed in soil samples collected from soil borings 01409BH01, 01409BH02, 01409BH04, and 01409BH05. HHS readings from these four borings ranged from zero to 2.6 ppm. At boring location 01409BH03, an elevated HHS reading (92.4 ppm) and a strong fuel odor were observed at a depth of 2 feet bgs. The presence of petroleum hydrocarbons at 01409BH03 decreased to a slight fuel odor and a HHS reading of 20.0 ppm at 11 feet bgs. Boring 01409BH03 was terminated at 11 feet bgs because of its proximity to 01409WL05, and because the vertical extent of contamination had been characterized previously in samples from 01409WL05.



SOURCE: ELMENDORF BASE MAP 2000

FILE: 409SL01	DRAWN: MNS	FIGURE 3-1 ST409/7/9 SITE LAYOUT
C/SC: 1:1PS	ZIP: 47/01	3 CES/CEVR SERA PHASE IX ELMENDORF AFB, ALASKA
DATE: 10/25/01	CHECK: J.D.	PROJECT #9000-268

3.1.2 Well Development and Sampling

Monitoring wells 409WL07 and 409WL08 were developed on July 24, 2001. All eight wells were sampled between August 1 and August 3, 2001. No measurable thickness of free product was measured in any wells. A slight fuel odor was noted in 409WL04, and a sulfur odor was observed in 409WL03; no other wells sampled exhibited unusual odors.

3.2 Discussion of Findings

Tables and figures presenting the results discussed in this subsection are presented at the end of the subsection.

3.2.1 Soil Findings

Field screening and off-site analytical soil results indicate that petroleum hydrocarbon contaminated soil in the vicinity of 409WL05 is limited in lateral extent. All soil samples submitted for off-site analysis from 01409BH01, 01409BH04, 409WL07, and 409WL08 were found to be below the MRLs for DRO/RRO, GRO/BTEX, and PAH analyses. However, DRO was detected at the 2-to-4 foot bgs interval for 01409BH03 at a concentration of 5,700 mg/kg. A field duplicate of this sample was found to have a DRO concentration of 3,900 mg/kg. These concentrations exceed ADEC Method Two, Table B2, cleanup levels for DRO (migration to groundwater [250 mg/kg]). RRO and GRO were detected at concentrations of 78 mg/kg and 5.8 mg/kg, respectively, in this sample, results that are well below ADEC cleanup levels. Ethylbenzene and xylenes were also detected in this sample at concentrations below ADEC cleanup levels. Table 3-1 and Figure 3-2 show the SERA Phase IX soil analytical results.

3.2.2 Groundwater Findings

The purpose of installing 409WL07 and 409WL08 at the locations that were selected was to establish two downgradient wells that could act as sentinel wells to monitor for contamination previously observed in 409WL03 and 409WL04. Groundwater results were compared to groundwater cleanup levels, as discussed in Section 2.11.2. GRO, BTEX, and PAH analytes were not detected in any samples above MRLs. DRO was detected at levels exceeding the ADEC groundwater cleanup level for DRO (1.5 mg/L) at 409WL02 (1.5 mg/L, with field duplicate at 2 mg/L) and 409WL03 (6.7 mg/L). DRO was also detected in 409WL04, 409WL06, and 409WL08 at concentrations below the ADEC cleanup level. RRO was detected in all sampled wells at concentrations below the ADEC cleanup level. Table 3-2 and Figure 3-3 show the SERA Phase IX groundwater analytical results.

Table 3-1. Soil Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001.

Location:			01409BH01	01409BH03	
Sample Depth:		Soil	5 Feet	2 Feet	
Sample ID:		Cleanup	409BH01SO5.0N1	409BH03SO2.0N1	409BH03SO20.2N1
Sample Date:		Level*	7/6/2001	7/6/2001	7/6/2001
Sample QC Type:					Field Duplicate
Laboratory ID(s):			99383-22, 99383-23	99383-24, 99383-25, 99383L25	99383-26, 99383-27
Parameter	**Unit**				
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/kg	300	ND [2.3]	5.8 [2.2]	5.8 [2.2]
Diesel Range Organics	mg/kg	250	ND [36]	**5,700** [180]	**3,900** [36]
Residual Range Organics	mg/kg	11,000	ND [36]	88 [35]	78 [36]
BTEX [8021B]					
Benzene	mg/kg	0.02	ND [0.023]	ND [0.022]	ND [0.022]
Ethylbenzene	mg/kg	5.5	ND [0.047]	0.05 [0.045]	ND [0.045]
m,p-Xylene (Sum of Isomers)	mg/kg	NA	ND [0.093]	0.12 [0.09]	0.056 [0.089] J
o-Xylene	mg/kg	NA	ND [0.047]	ND [0.045]	ND [0.045]
Total Xylenes[1]	mg/kg	78	ND --	0.12 --	0.056 --
Toluene	mg/kg	5.4	ND [0.047]	ND [0.045]	ND [0.045]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
2-Methylnaphthalene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
Acenaphthene	µg/kg	210,000	ND [1.2]	ND [14]	ND [13]
Acenaphthylene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
Anthracene	µg/kg	4,300,000	ND [1.2]	ND [14]	ND [13]
Benzo(a)anthracene	µg/kg	6,000	ND [2.5]	ND [28]	ND [26]
Benzo(a)pyrene	µg/kg	1,000	ND [1.2]	ND [14]	ND [13]
Benzo(b)fluoranthene	µg/kg	11,000	ND [1.2]	ND [14]	ND [13]
Benzo(g,h,i)perylene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
Benzo(k)fluoranthene	µg/kg	110,000	ND [1.2]	ND [14]	ND [13]
Chrysene	µg/kg	620,000	ND [2.5]	ND [28]	ND [26]
Dibenzo(a,h)anthracene	µg/kg	1,000	ND [1.2]	ND [14]	ND [13]
Fluoranthene	µg/kg	2,100,000	ND [1.2]	ND [14]	ND [13]
Fluorene	µg/kg	270,000	ND [1.2]	ND [14]	ND [13]
Indeno(1,2,3-cd)pyrene	µg/kg	11,000	ND [1.2]	ND [14]	ND [13]
Naphthalene	µg/kg	~~43,000~~ 2,100	ND [1.2]	ND [14]	ND [13]
Phenanthrene	µg/kg	NA	ND [1.2]	ND [14]	ND [13]
Pyrene	µg/kg	1,500,000	ND [1.2]	ND [14]	ND [13]
Total Organic Carbon [9060]					
Total Organic Carbon (TOC)	mg/kg	NA	--	--	--

~~Notes:~~
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* The most stringent soil cleanup level listed in Method Two Tables B1 and B2 (Under 40-inch zone; ADEC 2000b)
~~Key:~~
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-1. Soil Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001 (Cont.).

Location:			01409BH04	409WL07	
Sample Depth:		Soil	5 Feet	15 Feet	20 Feet
Sample ID:		Cleanup	409BH04SO5.0N1	409WL01SO15.0N1	409WL01SO20.0N1
Sample Date:		Level*	7/6/2001	7/3/2001	7/3/2001
Sample QC Type:					
Laboratory ID(s):			99383-28, 99383-29	99341-01	99341-03
Parameter	**Unit**				
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/kg	300	ND [2]	ND [2.1]	ND [2.1]
Diesel Range Organics	mg/kg	250	ND [32]	ND [34]	ND [33]
Residual Range Organics	mg/kg	11,000	ND [32]	ND [34]	ND [33]
BTEX [8021B]					
Benzene	mg/kg	0.02	ND [0.02]	ND [0.021]	ND [0.021]
Ethylbenzene	mg/kg	5.5	ND [0.04]	ND [0.042]	ND [0.042]
m,p-Xylene (Sum of Isomers)	mg/kg	NA	ND [0.081]	ND [0.084]	ND [0.085]
o-Xylene	mg/kg	NA	ND [0.04]	ND [0.042]	ND [0.042]
Total Xylenes[1]	mg/kg	78	ND --	ND --	ND --
Toluene	mg/kg	5.4	ND [0.04]	ND [0.042]	ND [0.042]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/kg	NA	--	--	--
2-Methylnaphthalene	µg/kg	NA	--	--	--
Acenaphthene	µg/kg	210,000	--	--	--
Acenaphthylene	µg/kg	NA	--	--	--
Anthracene	µg/kg	4,300,000	--	--	--
Benzo(a)anthracene	µg/kg	6,000	--	--	--
Benzo(a)pyrene	µg/kg	1,000	--	--	--
Benzo(b)fluoranthene	µg/kg	11,000	--	--	--
Benzo(g,h,i)perylene	µg/kg	NA	--	--	--
Benzo(k)fluoranthene	µg/kg	110,000	--	--	--
Chrysene	µg/kg	620,000	--	--	--
Dibenzo(a,h)anthracene	µg/kg	1,000	--	--	--
Fluoranthene	µg/kg	2,100,000	--	--	--
Fluorene	µg/kg	270,000	--	--	--
Indeno(1,2,3-cd)pyrene	µg/kg	11,000	--	--	--
Naphthalene	µg/kg	43,000	--	--	--
Phenanthrene	µg/kg	NA	--	--	--
Pyrene	µg/kg	1,500,000	--	--	--
Total Organic Carbon [9060]					
Total Organic Carbon (TOC)	mg/kg	NA	--	--	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* The most stringent soil cleanup level listed in Method Two Tables B1 and B2 (Under 40-inch zone; ADEC 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-1. Soil Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001 (Cont.).

Location:			409WL07	409WL08	
Sample Depth:		Soil	25.6 Feet	15 Feet	20 Feet
Sample ID:		Cleanup	409WL01SO25.6N1	409WL02SO15.0N1	409WL02SO20.0N1
Sample Date:		Level*	7/3/2001	7/3/2001	7/3/2001
Sample QC Type:					
Laboratory ID(s):			99341-08	99341-11	99341-12
Parameter	**Unit**				
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/kg	300	ND [2.3]	ND [2]	ND [2.2]
Diesel Range Organics	mg/kg	250	ND [35]	ND [33]	ND [33]
Residual Range Organics	mg/kg	11,000	ND [35]	ND [33]	ND [33]
BTEX [8021B]					
Benzene	mg/kg	0.02	ND [0.023]	ND [0.02]	ND [0.022]
Ethylbenzene	mg/kg	5.5	ND [0.046]	ND [0.041]	ND [0.044]
m,p-Xylene (Sum of Isomers)	mg/kg	NA	ND [0.093]	ND [0.082]	ND [0.087]
o-Xylene	mg/kg	NA	ND [0.046]	ND [0.041]	ND [0.044]
Total Xylenes[1]	mg/kg	78	ND --	ND --	ND --
Toluene	mg/kg	5.4	ND [0.046]	ND [0.041]	ND [0.044]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/kg	NA	ND [1.1]	ND [1.2]	--
2-Methylnaphthalene	µg/kg	NA	ND [1.1]	ND [1.2]	--
Acenaphthene	µg/kg	210,000	ND [1.1]	ND [1.2]	--
Acenaphthylene	µg/kg	NA	ND [1.1]	ND [1.2]	--
Anthracene	µg/kg	4,300,000	ND [1.1]	ND [1.2]	--
Benzo(a)anthracene	µg/kg	6,000	ND [2.2]	ND [2.5]	--
Benzo(a)pyrene	µg/kg	1,000	ND [1.1]	ND [1.2]	--
Benzo(b)fluoranthene	µg/kg	11,000	ND [1.1]	ND [1.2]	--
Benzo(g,h,i)perylene	µg/kg	NA	ND [1.1]	ND [1.2]	--
Benzo(k)fluoranthene	µg/kg	110,000	ND [1.1]	ND [1.2]	--
Chrysene	µg/kg	620,000	ND [2.2]	ND [2.5]	--
Dibenzo(a,h)anthracene	µg/kg	1,000	ND [1.1]	ND [1.2]	--
Fluoranthene	µg/kg	2,100,000	ND [1.1]	ND [1.2]	--
Fluorene	µg/kg	270,000	ND [1.1]	ND [1.2]	--
Indeno(1,2,3-cd)pyrene	µg/kg	11,000	ND [1.1]	ND [1.2]	--
Naphthalene	µg/kg	248,000	ND [1.1]	ND [1.2]	--
Phenanthrene	µg/kg	NA	ND [1.1]	ND [1.2]	--
Pyrene	µg/kg	1,500,000	ND [1.1]	ND [1.2]	--
Total Organic Carbon [9060]					
Total Organic Carbon (TOC)	mg/kg	NA	1300 [100]	1400 [100]	--

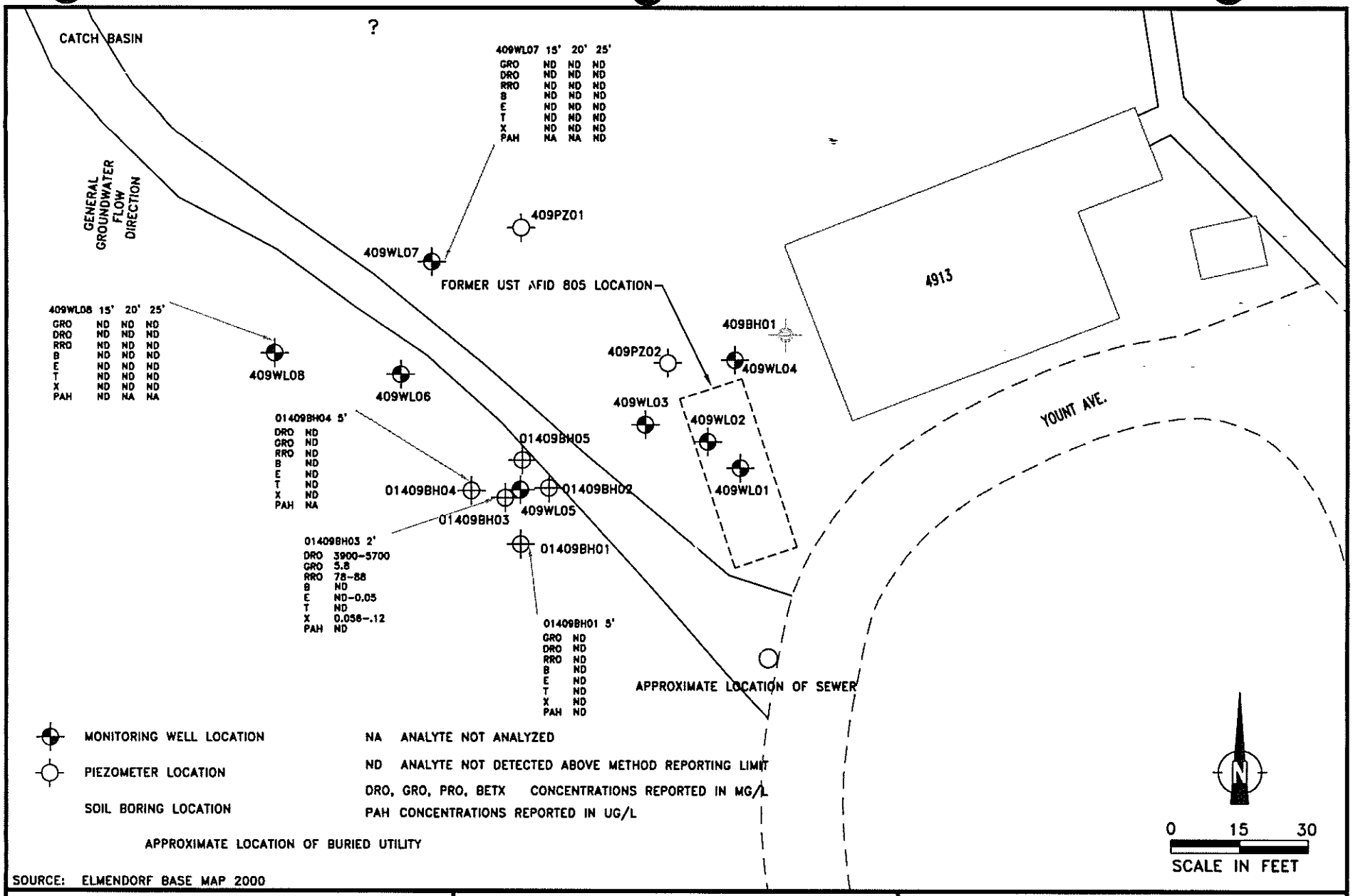
Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* The most stringent soil cleanup level listed in Method Two Tables B1 and B2 (Under 40-inch zone; ADEC 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-1. Soil Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001 (Cont.).

Location:			409WL08
Sample Depth:		Soil	25 Feet
Sample ID:		Cleanup	409WL02SO25.0N1
Sample Date:		Level*	7/3/2001
Sample QC Type:			
Laboratory ID(s):			99341-14
Parameter	**Unit**		
Petroleum Hydrocarbons [AK101, 102, 103]			
Gasoline Range Organics	mg/kg	300	ND [2.2]
Diesel Range Organics	mg/kg	250	ND [36]
Residual Range Organics	mg/kg	11,000	ND [36]
BTEX [8021B]			
Benzene	mg/kg	0.02	ND [0.022]
Ethylbenzene	mg/kg	5.5	ND [0.043]
m,p-Xylene (Sum of Isomers)	mg/kg	NA	ND [0.087]
o-Xylene	mg/kg	NA	ND [0.043]
Total Xylenes[1]	mg/kg	78	ND --
Toluene	mg/kg	5.4	ND [0.043]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]			
2-Chloronaphthalene	µg/kg	NA	--
2-Methylnaphthalene	µg/kg	NA	--
Acenaphthene	µg/kg	210,000	--
Acenaphthylene	µg/kg	NA	--
Anthracene	µg/kg	4,300,000	--
Benzo(a)anthracene	µg/kg	6,000	--
Benzo(a)pyrene	µg/kg	1,000	--
Benzo(b)fluoranthene	µg/kg	11,000	--
Benzo(g,h,i)perylene	µg/kg	NA	--
Benzo(k)fluoranthene	µg/kg	110,000	--
Chrysene	µg/kg	620,000	--
Dibenzo(a,h)anthracene	µg/kg	1,000	--
Fluoranthene	µg/kg	2,100,000	--
Fluorene	µg/kg	270,000	--
Indeno(1,2,3-cd)pyrene	µg/kg	11,000	--
Naphthalene	µg/kg	43,000	--
Phenanthrene	µg/kg	NA	--
Pyrene	µg/kg	1,500,000	--
Total Organic Carbon [9060]			
Total Organic Carbon (TOC)	mg/kg	NA	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* The most stringent soil cleanup level listed in Method Two Tables B1 and B2 (Under

Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).



SOURCE: ELMENDORF BASE MAP 2000

FILE: 409SL01-3	DRAWN: MNS	FIGURE 3-2 ST409/7/9 SOIL ANALYTICAL RESULTS
C/SC: 1:1PS	ZIP: 47/01	3 CES/CEVR SERA PHASE IX ELMENDORF AFB, ALASKA PROJECT #9000-268
DATE: 10/25/01	CHECK: J.D.	

Table 3-2. Groundwater Analytical Results: Site 409/7/9, SERA Phase IX Release Investigation, 2001.

Location:			409WL01	409WL02	
Sample ID:		Groundwater	409WL01GW21N1	409WL02GW32N1	409WL02GW33N1
Sample Date:		Cleanup	8/1/2001	8/3/2001	8/3/2001
Sample QC Type:		Level*			Field Duplicate
Laboratory ID(s):			99949-01	100000-09	100000-10
Parameter	**Unit**				
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	ND [0.095]	**1.5** [0.1]	**2** [0.099]
Residual Range Organics	mg/L	1.1	0.1 [0.095]	0.63 [0.1]	0.89 [0.099]
BTEX [8021B]					
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10	ND --	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/L	NA	--	--	--
2-Methylnaphthalene	µg/L	NA	--	--	--
Acenaphthene	µg/L	2,200	--	--	--
Acenaphthylene	µg/L	NA	--	--	--
Anthracene	µg/L	11,000	--	--	--
Benzo(a)anthracene	µg/L	1	--	--	--
Benzo(a)pyrene	µg/L	0.2	--	--	--
Benzo(b)fluoranthene	µg/L	1	--	--	--
Benzo(g,h,i)perylene	µg/L	NA	--	--	--
Benzo(k)fluoranthene	µg/L	10	--	--	--
Chrysene	µg/L	100	--	--	--
Dibenzo(a,h)anthracene	µg/L	0.1	--	--	--
Fluoranthene	µg/L	1,460	--	--	--
Fluorene	µg/L	1,460	--	--	--
Indeno(1,2,3-cd)pyrene	µg/L	1	--	--	--
Naphthalene	µg/L	1,460	--	--	--
Phenanthrene	µg/L	NA	--	--	--
Pyrene	µg/L	1,100	--	--	--
Inorganic Anions by Ion Chromatography [E300]					
Nitrogen, Nitrate-Nitrite	mg/L	NA	--	1.7 [0.15]	--
Sulfate	mg/L	NA	--	34 [0.3]	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; ADEC 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-2. Groundwater Analytical Results: Site 409/7/9 SERA Phase IX Release Investigation, 2001 (Continued).

Parameter	Unit	Groundwater Cleanup Level*	409WL03	409WL04	409WL05
Location:			409WL03	409WL04	409WL05
Sample ID:			409WL03GW28N1	409WL04GW29N1	409WL05GW30N1
Sample Date:			8/3/2001	8/3/2001	8/3/2001
Sample QC Type:					
Laboratory ID(s):			100000-05, 100000L05	100000-06	100000-07
Petroleum Hydrocarbons [AK101, 102, 103]					
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	**6.7** [0.94]	0.1 [0.1] J	ND [0.096]
Residual Range Organics	mg/L	1.1	0.74 [0.094]	0.38 [0.1]	0.1 [0.096]
BTEX [8021B]					
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10,000	ND --	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]					
2-Chloronaphthalene	µg/L	NA	ND [0.099]	ND [0.1]	--
2-Methylnaphthalene	µg/L	NA	ND [0.099]	ND [0.1]	--
Acenaphthene	µg/L	2,200	ND [0.099]	ND [0.1]	--
Acenaphthylene	µg/L	NA	ND [0.099]	ND [0.1]	--
Anthracene	µg/L	11,000	ND [0.099]	ND [0.1]	--
Benzo(a)anthracene	µg/L	1	ND [0.099]	ND [0.1]	--
Benzo(a)pyrene	µg/L	0.2	ND [0.099]	ND [0.1]	--
Benzo(b)fluoranthene	µg/L	1	ND [0.099]	ND [0.1]	--
Benzo(g,h,i)perylene	µg/L	NA	ND [0.099]	ND [0.1]	--
Benzo(k)fluoranthene	µg/L	10	ND [0.099]	ND [0.1]	--
Chrysene	µg/L	100	ND [0.099]	ND [0.1]	--
Dibenzo(a,h)anthracene	µg/L	0.1	ND [0.099]	ND [0.1]	--
Fluoranthene	µg/L	1,460	ND [0.099]	ND [0.1]	--
Fluorene	µg/L	1,460	ND [0.099]	ND [0.1]	--
Indeno(1,2,3-cd)pyrene	µg/L	1	ND [0.099]	ND [0.1]	--
Naphthalene	µg/L	1,460	ND [0.099]	ND [0.1]	--
Phenanthrene	µg/L	NA	ND [0.099]	ND [0.1]	--
Pyrene	µg/L	1,100	ND [0.099]	ND [0.1]	--
Inorganic Anions by Ion Chromatography [E300]					
Nitrogen, Nitrate-Nitrite	mg/L	NA	1.2 [0.15]	1.5 [0.15]	--
Sulfate	mg/L	NA	32 [0.3]	34 [0.3]	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-2. Groundwater Analytical Results: Site 409/7/9 SERA Phase IX Release Investigation, 2001 (Continued).

Parameter	Unit	Groundwater Cleanup Level*	409WL06	409WL08
Location:			409WL06	409WL08
Sample ID:			409WL06GW31N1	409WL08GW26N1
Sample Date:			8/3/2001	8/2/2001
Sample QC Type:				
Laboratory ID(s):			100000-08	100000-03
Petroleum Hydrocarbons [AK101, 102, 103]				
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	0.29 [0.094]	0.48 [0.098]
Residual Range Organics	mg/L	1.1	0.71 [0.094]	0.14 [0.098]
BTEX [8021B]				
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10,000	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]				
2-Chloronaphthalene	µg/L	NA	--	--
2-Methylnaphthalene	µg/L	NA	--	--
Acenaphthene	µg/L	2,200	--	--
Acenaphthylene	µg/L	NA	--	--
Anthracene	µg/L	11,000	--	--
Benzo(a)anthracene	µg/L	1	--	--
Benzo(a)pyrene	µg/L	0.2	--	--
Benzo(b)fluoranthene	µg/L	1	--	--
Benzo(g,h,i)perylene	µg/L	NA	--	--
Benzo(k)fluoranthene	µg/L	10	--	--
Chrysene	µg/L	100	--	--
Dibenzo(a,h)anthracene	µg/L	0.1	--	--
Fluoranthene	µg/L	1,460	--	--
Fluorene	µg/L	1,460	--	--
Indeno(1,2,3-cd)pyrene	µg/L	1	--	--
Naphthalene	µg/L	1,460	--	--
Phenanthrene	µg/L	NA	--	--
Pyrene	µg/L	1,100	--	--
Inorganic Anions by Ion Chromatography [E300]				
Nitrogen, Nitrate-Nitrite	mg/L	NA	--	--
Sulfate	mg/L	NA	--	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-2. Groundwater Analytical Results: Site 409/7/9 SERA Phase IX Release Investigation, 2001 (Continued).

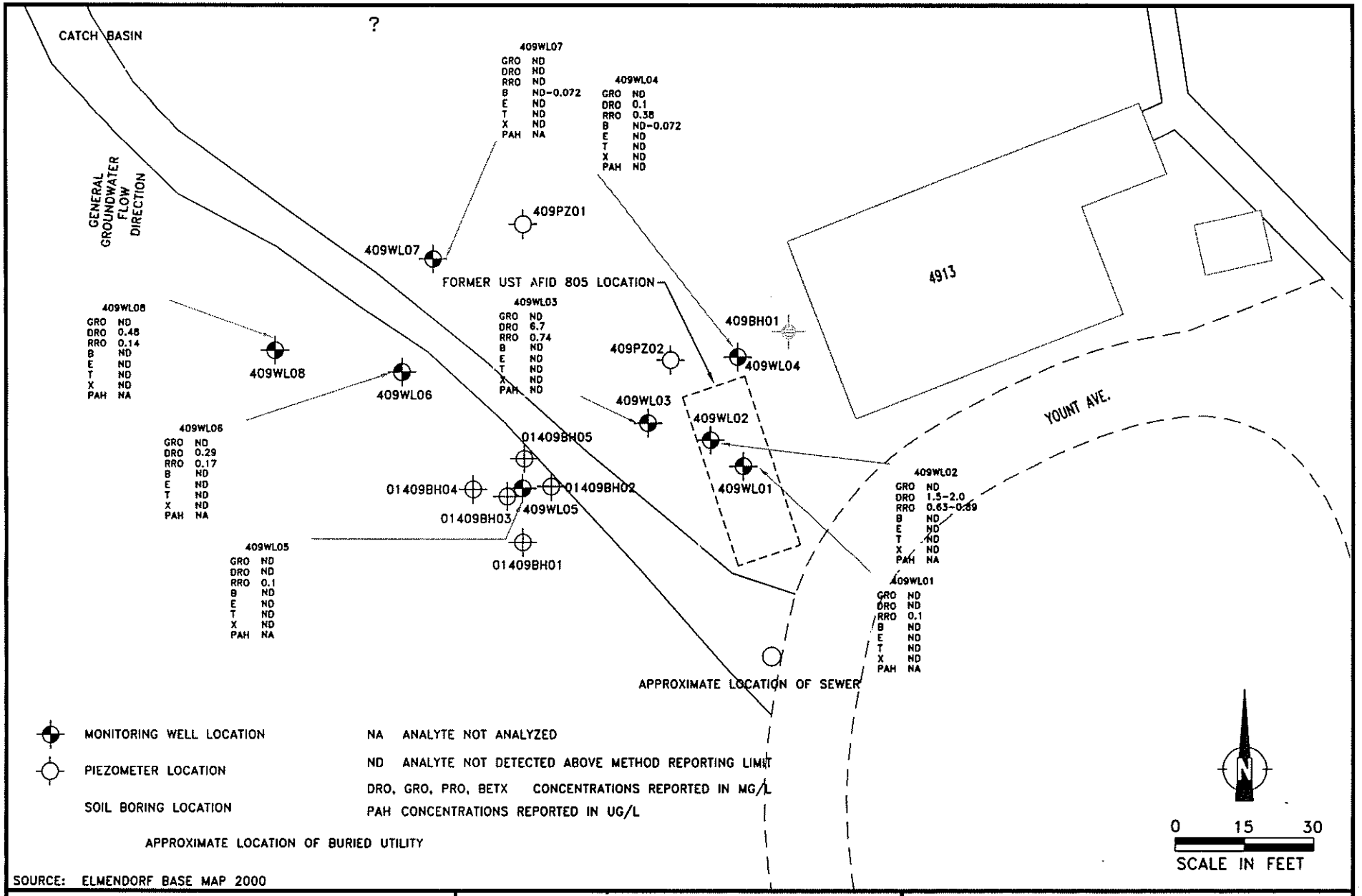
Location:		Groundwater	409WL07	
Sample ID:		Cleanup	409WL07GW24N1	409WL07GW25N1
Sample Date:		Level*	8/2/2001	8/2/2001
Sample QC Type:				Field Duplicate
Laboratory ID(s):			100000-01	100000-02
Parameter	**Unit**			
Petroleum Hydrocarbons [AK101, 102, 103]				
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	ND [0.1]	ND [0.1]
Residual Range Organics	mg/L	1.1	0.072 [0.1] J	ND [0.1]
BTEX [8021B]				
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10,000	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]				
2-Chloronaphthalene	µg/L	NA	--	--
2-Methylnaphthalene	µg/L	NA	--	--
Acenaphthene	µg/L	2,200	--	--
Acenaphthylene	µg/L	NA	--	--
Anthracene	µg/L	11,000	--	--
Benzo(a)anthracene	µg/L	1	--	--
Benzo(a)pyrene	µg/L	0.2	--	--
Benzo(b)fluoranthene	µg/L	1	--	--
Benzo(g,h,i)perylene	µg/L	NA	--	--
Benzo(k)fluoranthene	µg/L	10	--	--
Chrysene	µg/L	100	--	--
Dibenzo(a,h)anthracene	µg/L	0.1	--	--
Fluoranthene	µg/L	1,460	--	--
Fluorene	µg/L	1,460	--	--
Indeno(1,2,3-cd)pyrene	µg/L	1	--	--
Naphthalene	µg/L	1,460	--	--
Phenanthrene	µg/L	NA	--	--
Pyrene	µg/L	1,100	--	--
Inorganic Anions by Ion Chromatography [E300]				
Nitrogen, Nitrate-Nitrite	mg/L	NA	--	--
Sulfate	mg/L	NA	--	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).

Table 3-2. Groundwater Analytical Results: Site 409/7/9 SERA Phase IX Release Investigation, 2001 (Continued).

Parameter	Unit	Groundwater Cleanup Level*	Trip Blanks	
Location:				
Sample ID:			409WL04GW23N1	409WL08GW27N1
Sample Date:			8/1/2001	8/2/2001
Sample QC Type:			Trip Blank	Trip Blank
Laboratory ID(s):			99949-03	100000-04
Petroleum Hydrocarbons [AK101, 102, 103]				
Gasoline Range Organics	mg/L	1.3	ND [0.05]	ND [0.05]
Diesel Range Organics	mg/L	1.5	--	--
Residual Range Organics	mg/L	1.1	--	--
BTEX [8021B]				
Benzene	mg/L	0.005	ND [0.0005]	ND [0.0005]
Ethylbenzene	mg/L	0.7	ND [0.001]	ND [0.001]
m,p-Xylene (Sum of Isomers)	mg/L	NA	ND [0.002]	ND [0.002]
o-Xylene	mg/L	NA	ND [0.001]	ND [0.001]
Total Xylenes [1]	mg/L	10,000	ND --	ND --
Toluene	mg/L	1	ND [0.001]	ND [0.001]
Polycyclic Aromatic Hydrocarbons (PAHs) [8270C]				
2-Chloronaphthalene	µg/L	NA	--	--
2-Methylnaphthalene	µg/L	NA	--	--
Acenaphthene	µg/L	2,200	--	--
Acenaphthylene	µg/L	NA	--	--
Anthracene	µg/L	11,000	--	--
Benzo(a)anthracene	µg/L	1	--	--
Benzo(a)pyrene	µg/L	0.2	--	--
Benzo(b)fluoranthene	µg/L	1	--	--
Benzo(g,h,i)perylene	µg/L	NA	--	--
Benzo(k)fluoranthene	µg/L	10	--	--
Chrysene	µg/L	100	--	--
Dibenzo(a,h)anthracene	µg/L	0.1	--	--
Fluoranthene	µg/L	1,460	--	--
Fluorene	µg/L	1,460	--	--
Indeno(1,2,3-cd)pyrene	µg/L	1	--	--
Naphthalene	µg/L	1,460	--	--
Phenanthrene	µg/L	NA	--	--
Pyrene	µg/L	1,100	--	--
Inorganic Anions by Ion Chromatography [E300]				
Nitrogen, Nitrate-Nitrite	mg/L	NA	--	--
Sulfate	mg/L	NA	--	--

Notes:
Values in boldface exceed ADEC cleanup levels.
Values in brackets ([xxx.xx]) are MQLs.
[1] Total xylenes represent the sum of m, p, and o-Xylenes.
* Table C Groundwater Cleanup Levels (18 AAC 75; ADEC 2000b)
Key:
-- = Analysis not performed on this sample.
BTEX = Benzene, toluene, ethylbenzene, and xylenes
J = Result is considered an estimate.
NA = Not available.
ND = Parameter not detected above the method quantitation limit (MQL).



FILE: 409SL01-2	DRAWN: MNS	FIGURE 3-3
C/SC: 1:1PS	ZIP: 47/01	ST409/7/9 GROUNDWATER ANALYTICAL RESULTS
DATE: 10/25/01	CHECK: J.D.	3 CES/CEVR SERA PHASE IX ELMENDORF AFB, ALASKA ENSR PROJECT #9000-268

4.0 CONCLUSIONS

4.1 Summary

Dissolved phase petroleum hydrocarbons are present in groundwater in what is likely a plume extending northwest from the original UST source location to the newly installed sentinel well 409WL08. Results of the SERA Phase IX investigation indicate that DRO contamination in groundwater in the immediate vicinity of the source area (wells 409WL02 and 409WL03) continues to exceed the ADEC cleanup level. However, DRO concentrations in groundwater at the source area have declined significantly from concentrations previously documented under SERA VII in 409WL02 and 409WL03.

DRO-contaminated soils detected in boring 01409BH03 near well 409WL05 exceed the ADEC cleanup level for DRO under Method Two, Table B2. However, based on results of this investigation, the DRO contamination appears to be very limited in lateral extent and to be present primarily at a depth range of 2 to 5 feet bgs. This depth range and the distance from the UST source area are indicative of what was likely a surface spill unrelated to the leaking UST.

This page intentionally left blank.

5.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2000a. *Alaska Administrative Code* (AAC), Title 18, Section 78. Underground Storage Tanks. As amended through August 27.

_____. 2000b. *Alaska Administrative Code* (AAC), Title 18, Section 75. Oil and Other Hazardous Substances Pollution Control. As amended through October 28.

_____. 2000c. Letter from Timothy Stevens to Colonel Scott Showers, 3CES/CE, re: Review of the SERA VII release investigation report for ST409/7, a non-regulated underground storage tank located near Building 24-805 on Elmendorf Air Force Base, Alaska; facility ID 0-001525, tank #247. March 21.

_____. 1992. State-Elmendorf Environmental Restoration Agreement (SERA). October 1.

U.S. Air Force (USAF). 2000. 1999. *Annual Report of Groundwater Sampling Activities, Basewide Monitoring and Well Maintenance Program.* March.

_____. 1993. *Basewide Environmental Staging Facility Operation and Maintenance Plan.* Environmental Restoration Program, Elmendorf Air Force Base, Alaska. March.

_____. 1997. *SERA Phase IV ST409 Release Investigation Report.* Elmendorf Air Force Base, Alaska. AFID 805. March.

_____. 1999. *SERA Phase VII ST409/7 Release Investigation Report.* AFID 805 Elmendorf Air Force Base, Alaska. February.

_____. 2001. *SERA Phase IX Release Investigations Work Plan.* June 2001.

_____. 1994b. *Final Closure and Site Assessment Report for Underground Storage Tank 805 (ST409/7/9).* Elmendorf Air Force Base, Alaska. December.

U.S. Army Corps of Engineers (USACE). 1998. *EM1110-1-4000 Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites.* November.

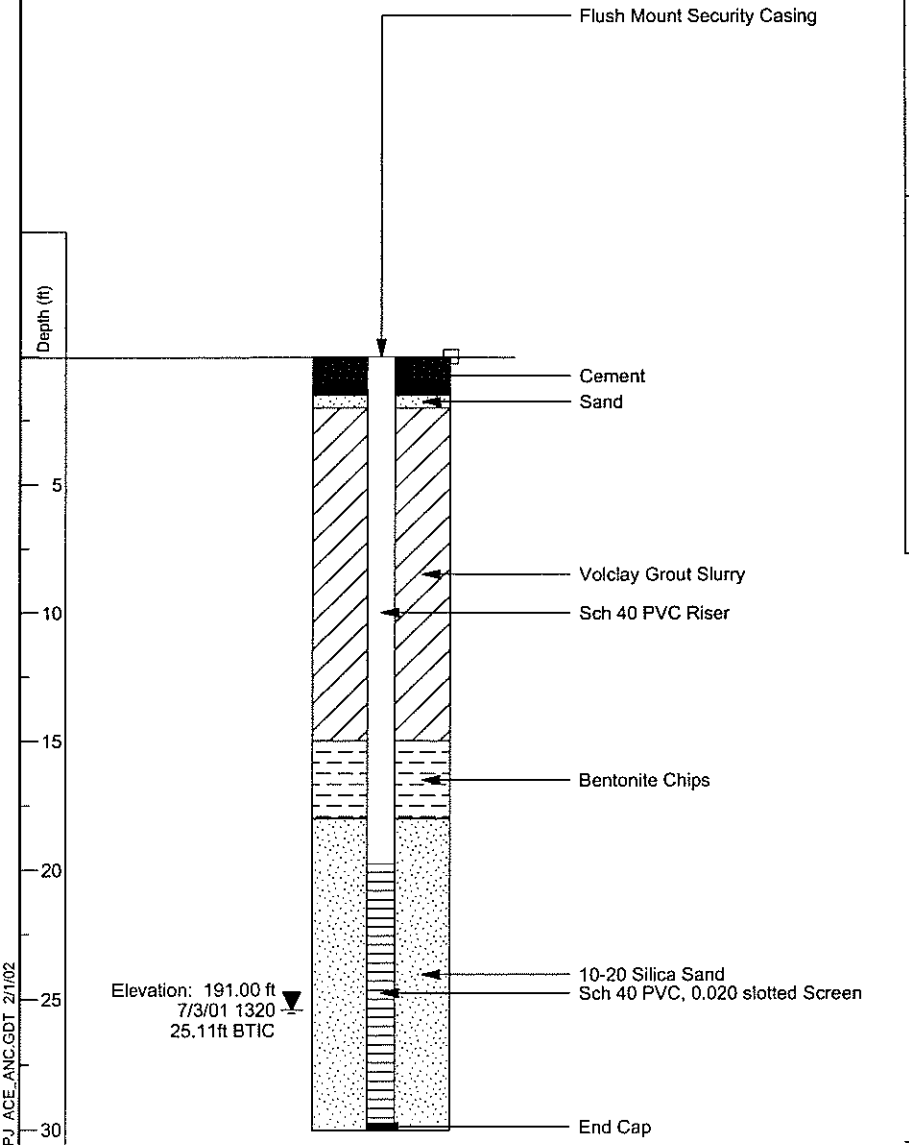
APPENDIX C

SERA PHASE IX BORING EXPLORATION

AND MONITORING WELL LOGS

MONITORING WELL LOG

Project: *SERA IX* *Elmendorf AFB*		Page 1 of 1 Date: *3 Jul 2001*
Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*		Elevation Datum: ☒ MSL ☐ other
Location: Northing: *2,642,801 ft* Easting: *1,684,119 ft*		Top of Hole Elevation: *216.4 ft*
Hole Number, Field: *ST409 WL07* Permanent: *409WL07*	Driller: *Gary Wilson*	Inspector: *Jackie Donley*
Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☒ Monitoring Well ☐ Piezometer	Depth to Groundwater: *26.00 ft WD*	Depth Drilled: *30.5 ft* / Total Depth: *30.5 ft*
Hammer Weight: *340 lbs*	Split Spoon I.D: *2.0 in*	Size and Type of Bit: *6.0 in*
Type of Equipment: *Truck Mounted CME-75*		Type of Samples: *Split Spoon*



NOTE:

1) Top of PVC Casing Elevation: 216.11'

BTIC - Below Top of Inner Casing

SUMMARY OF MATERIALS USED

1) Flush Mount Security Casing
2) Locking Expandable Cap
3) 2", Sch. 40 PVC Riser
4) 2", Sch. 40 PVC, 0.020 Slotted Screen
5) PVC End Cap

Bottom of Exploration 30.5 ft
Groundwater Encountered While Drilling: at depth 26.00 ft

	Project: *SERA IX*	Hole Number: *409WL07*

AIRFORCE-WELL SERAIX.GPJ ACE_ANC.GDT 2/1/02

EXPLORATION LOG

Project: *SERA IX* — *Elmendorf AFB*

Date: *3 Jul 2001*

Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*

Elevation Datum: ☒ MSL ☐ other

Location: Northing: *2,642,801* Easting: *1,684,119*

Top of Hole Elevation: *216.4 ft*

Hole Number, Field: *ST409 WL07* Permanent: *409WL07*

Driller: *Gary Wilson*

Inspector: *Jackie Donley*

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☒ Monitoring Well ☐ Piezometer

Depth to Groundwater: *26.0 ft WD*

Depth Drilled: *30.5 ft*

Total Depth: *30.5 ft*

Hammer Weight: *340 lbs*

Split Spoon I.D.: *2.0 in*

Size and Type of Bit: *6.0 in*

Type of Equipment: *Truck Mounted CME-75*

Type of Samples: *Split Spoon*

Depth (ft)	Lithology	Sample	Recovery (in)	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	%Sand	%Fines	Max Size (in)	PID (ppm)	% Water	Description and Remarks
0			24		4 3 2 2	ML	**SILT**	0	20	80		0.0		**0'-2' Tan, fine sandy SILT, very well sorted, tight, dry, no fuel odor. 1.2' Black organic layer.**
6			15		6 10 13 13	SW	**Well-graded Gravelly SAND**	20	70	10	1.0	0.0		**5'-7' Gray, gravelly SAND, max=4 cm, rounded, loose, poorly sorted, dry, no fuel odor.**
10			22		5 11 19 20	SW	**Well-graded Gravelly SAND**	30	60	10	2.0	0.0		**10'-12' Grayish brown, gravelly SAND, max.>2", subrounded, loose, poorly sorted, moist, no fuel odor.**
16		409WL07SO15.0	22		9 16 18 21	SW	**Well-graded Gravelly SAND**	30	60	10	2.0	0.8		**15'-17' Grayish brown, gravelly SAND, max.>2", subrounded, loose, poorly sorted, moist, no fuel odor.**

EXPLORATION LOG

Project: *SERA IX* — *Elmendorf AFB*

Date: *3 Jul 2001*

Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*

Elevation Datum: ☒ MSL ☐ other

Location: Northing: *2,642,801* Easting: *1,684,119*

Top of Hole Elevation: *216.4 ft*

Hole Number, Field: *ST409 WL07* Permanent: *409WL07*

Driller: *Gary Wilson*

Inspector: *Jackie Donley*

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☒ Monitoring Well ☐ Piezometer

Depth to Groundwater: *26.0 ft WD*

Depth Drilled: *30.5 ft*

Total Depth: *30.5 ft*

Hammer Weight: *340 lbs*

Split Spoon I.D.: *2.0 in*

Size and Type of Bit: *6.0 in*

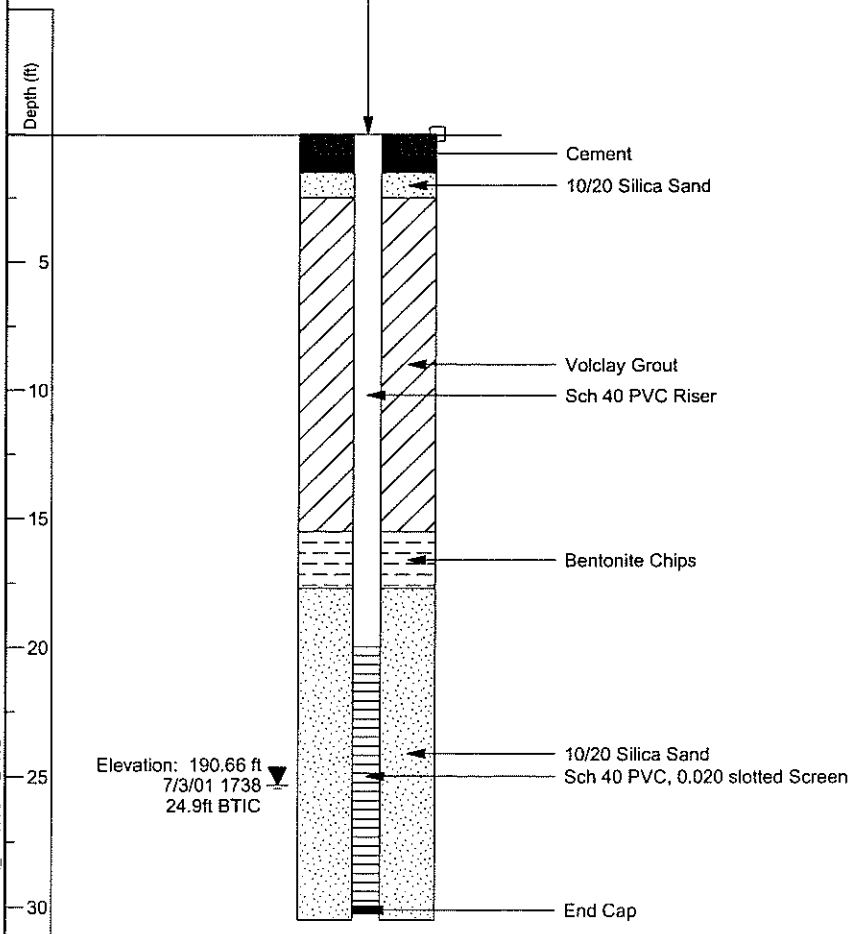
Type of Equipment: *Truck Mounted CME-75*

Type of Samples: *Split Spoon*

Depth (ft)	Lithology	Sample	Recovery (in)	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	Grain Size %Sand	Grain Size %Fines	Max Size (in)	PID (ppm)	% Water	Description and Remarks
22		409WL07SO2	24		11 22 55 43	SW	Well-graded Gravelly SAND	30	40	20	2.0	1.2		20'-22' Brown, gravelly coarse SAND, pea gravel, subrounded, max.>2", loose, very poorly sorted, moist, no fuel odor.
24					17 19 21 17	SP	Poorly graded SAND	20	80	0	0.3	1.0		23'-25' Brown, coarse SAND, pea gravel, subrounded, loose, well sorted, moist, no fuel odor.
26		409WL07SO2206			7 14 15 15	SW GW-GM	Well-graded Gravelly SAND Well-graded Sandy GRAVEL with Silt	20 60	80 30	 10		1.1 0.1	▼	25.6'-26' Coarse SAND, gravel, max.>2", average 4 cm, minor silt, loose, poorly sorted, moist, no fuel odor 26'-27' Sandy, silty pea GRAVEL, subangular pea gravel, coarse sand, loose poorly sorted, wet, no fuel odor. Sandy, silty pea gravel, subangular pea gravel, coarse sand, loose, poorly sorted, wet, no fuel odor.
28														
30														
32														Bottom of Exploration 30.5 ft Groundwater Encountered While Drilling: at depth 26.00 ft PID = Photo Ionization Detector
34														
36														
38														

MONITORING WELL LOG

Project: *SERA IX* *Elmendorf AFB*		Page 1 of 1 Date: *3 Jul 2001*
Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*		Elevation Datum: ☒ MSL ☐ other
Location: Northing: *2,642,772 ft* Easting: *1,684,088 ft*		Top of Hole Elevation: *216.0 ft*
Hole Number, Field: *ST409 WL08* Permanent: *409WL08*	Driller: *Gary Wilson*	Inspector: *Jackie Donley*
Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☒ Monitoring Well ☐ Piezometer	Depth to Groundwater: *25.20 ft WD*	Depth Drilled: *30.5 ft* / Total Depth: *30.5 ft*
Hammer Weight: *340 lbs*	Split Spoon I.D.: *2.0 in*	Size and Type of Bit: *6.0 in*
Type of Equipment: *Truck Mounted CME-75*		Type of Samples: *Split Spoon*



NOTE:

1) Top of PVC Casing Elevation: 215.56'

BTIC - Below Top of Inner Casing

SUMMARY OF MATERIALS USED

1) Flush Mount Security Casing
2) Locking Expandable Cap
3) 2", Sch. 40 PVC Riser
4) 2", Sch. 40 PVC, 0.020 Slotted Screen
5) PVC End Cap

Bottom of Exploration 30.5 ft
Groundwater Encountered While Drilling: at depth 25.20 ft

AIRFORCE-WELL SERAIX.GPJ ACE_ANC.GDT 2/1/02

	Project: *SERA IX*	Hole Number: *409WL08*

EXPLORATION LOG

Project: *SERA IX* — *Elmendorf AFB*

Date: *3 Jul 2001*

Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*

Elevation Datum: ☒ MSL ☐ other

Location: Northing: *2,642,772* Easting: *1,684,088*

Top of Hole Elevation: *216.0 ft*

Hole Number, Field: *ST409 WL08* Permanent: *409WL08*

Driller: *Gary Wilson*

Inspector: *Jackie Donley*

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☒ Monitoring Well ☐ Piezometer

Depth to Groundwater: *25.2 ft WD*

Depth Drilled: *30.5 ft*

Total Depth: *30.5 ft*

Hammer Weight: *340 lbs*

Split Spoon I.D.: *2.0 in*

Size and Type of Bit: *6.0 in*

Type of Equipment: *Truck Mounted CME-75*

Type of Samples: *Split Spoon*

Depth (ft)	Lithology	Sample	Recovery (in)	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	%Sand	%Fines	Max Size (in)	PID (ppm)	% Water	Description and Remarks
0			12		2 2 3 3	ML	SILT		20	80	2.0	0.0		0'-2' Tan fine sandy SILT, one>2" cobble, very well sorted, dry, no fuel odor.
4			12		8 18 40	SW	Well-graded SAND with Gravel	20	70	10	1.5	0.0		5'-7' Gray, gravelly SAND, max.=1.5", rounded, loose, poorly sorted, slightly moist, no fuel odor.
10		409WL08SO10.5, 11.0	20		7 17 21 25									10'-12' Sample collected for grain size. No description collected.
14			24		6 12 13 15	SW	Well-graded SAND with Gravel	30	60	10	2.0	0.4		15'-17' Grayish, gravelly SAND, max>2", subrounded, loose, poorly sorted, moist, no fuel odor.
16		409WL08SO15.0												
18														

EXPLORATION LOG

Project: *SERA IX* — *Elmendorf AFB*

Date: *3 Jul 2001*

Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*

Elevation Datum: ☒ MSL ☐ other

Location: Northing: *2,642,772* Easting: *1,684,088*

Top of Hole Elevation: *216.0 ft*

Hole Number, Field: *ST409 WL08* Permanent: *409WL08*

Driller: *Gary Wilson*

Inspector: *Jackie Donley*

Type of Hole: ☐ other ☐ Test Pit ☐ Auger Hole ☒ Monitoring Well ☐ Piezometer

Depth to Groundwater: *25.2 ft WD*

Depth Drilled: *30.5 ft*

Total Depth: *30.5 ft*

Hammer Weight: *340 lbs*

Split Spoon I.D.: *2.0 in*

Size and Type of Bit: *6.0 in*

Type of Equipment: *Truck Mounted CME-75*

Type of Samples: *Split Spoon*

Depth (ft)	Lithology	Sample	Recovery (in)	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	%Sand	%Fines	Max Size (in)	PID (ppm)	% Water	Description and Remarks
22		409WL08SO20.0	24		14 39 41 43	SW	**Well-graded SAND with Gravel**	30	60	10	2.0	0.2		**20'-22' Gray, soil as above, loose, moist, poorly sorted, no fuel odor.**
24														
26		409WL08SO25.0	24		11 23 22 29	GW-GM	**Well-graded GRAVEL with Silt**	80	0	20	2.0	0.2	▼	**25'-27' Gray, silty pea GRAVEL, sub angular, 10% cobbles >2", loose, wet @ 25.5', no fuel odor.**
28		409WL08SO27.0, 28.5	24		5 7 13 27									**27'-29' Sample collected for grain size. Not submitted for analysis, enough samples already collected for G.S.**
30														
32														**Bottom of Exploration 30.5 ft** **Groundwater Encountered While Drilling: at depth 25.20 ft** **PID = Photo Ionization Detector**
34														
36														
38														

EXPLORATION LOG

Project: *SERA IX* — *Elmendorf AFB*

Date: *6 Jul 2001*

Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*

Elevation Datum: ☒ MSL ☐ other

Location: Northing: *2,642,740* Easting: *1,684,139*

Top of Hole Elevation: *219.0 ft*

Hole Number, Field: *ST409 BH01* Permanent: *01409BH01*

Driller: *Gary Wilson*

Inspector: *Jackie Donley*

Type of Hole: ☐ other ☐ Test Pit ☒ Auger Hole ☐ Monitoring Well ☐ Piezometer

Depth to Groundwater: *NE*

Depth Drilled: *4.0 ft*

Total Depth: *6.0 ft*

Hammer Weight: *340 lbs*

Split Spoon I.D.: *2.0 in*

Size and Type of Bit: *6.0 in*

Type of Equipment: *Truck Mounted CME-75*

Type of Samples: *Split Spoon*

Depth (ft)	Lithology	Sample	Recovery (in)	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	Grain Size %Sand	Grain Size %Fines	Max Size (in)	PID (ppm)	% Water	Description and Remarks
0			24		2 3 2 2	ML	Sandy SILT	20	40	40	1.0	2.1		0'-.2' Organic matt. 0.2'-0.5' Medium SAND, dry 0.5'-1.5' Silty SAND, wet, max.=4 cm, poorly sorted. 1.5'-2.0' Brown, fine sandy SILT, well sorted, tight, laminated, dry, no fuel odor.
4			24		5 8 13 15	SW	Well-graded Gravelly SAND	30	60	10	2.0	2.6		4'-6' Gray, gravelly SAND, max>2", subrounded, average=4 cm, poorly sorted, loose, dry, no fuel odor.
6			409BH01SO5.0											6' No fuel odor. Abandon 409BH01 with volclay grout slurry. Bottom of Exploration 6.0 ft Groundwater Not Encounted PID = Photo Ionization Detector

EXPLORATION LOG

Project: *SERA IX* — *Elmendorf AFB*

Date: *6 Jul 2001*

Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*

Elevation Datum: ☒ MSL ☐ other

Location: Northing: *2,642,744* Easting: *1,684,144*

Top of Hole Elevation: *219.0 ft*

Hole Number, Field: *ST409 BH02* Permanent: *01409BH02*

Driller: *Gary Wilson*

Inspector: *Jackie Donley*

Type of Hole: ☐ other ☐ Test Pit ☒ Auger Hole ☐ Monitoring Well ☐ Piezometer

Depth to Groundwater: *NE*

Depth Drilled: *6.0 ft*

Total Depth: *6.0 ft*

Hammer Weight: *340 lbs*

Split Spoon I.D: *2.0 in*

Size and Type of Bit: *6.0 in*

Type of Equipment: *Truck Mounted CME-75*

Type of Samples: *Split Spoon*

Depth (ft)	Lithology	Sample	Recovery (in)	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	Grain Size %Sand	Grain Size %Fines	Max Size (in)	PID (ppm)	% Water	Description and Remarks
0			24		4	ML	**Sandy SILT with Gravel**	20	30	50		6.6		**0'-2' FILL, sandy silt, tight, very moist, poorly sorted, no fuel odor.**
					4									
					3									
2					2									
4			18		3	ML	**Sandy SILT with Gravel**	20	30	50		5.1		**4.5'-5.5' Sandy SILT, poorly sorted, slightly moist, no fuel odor.**
					3									
					6	SW	**Well-graded Gravelly SAND**	30	60	10				**5.5'-6' Gravelly SAND, loose, moist, no fuel odor.**
6					10									**6' No fuel odor. Abandon 409BH02 with volclay grout slurry.** **Bottom of Exploration 6.0 ft** **Groundwater Not Encounted** **PID = Photo Ionization Detector**
8														
10														
12														
14														
16														
18														

EXPLORATION LOG

Project: *SERA IX* — *Elmendorf AFB*

Page 1 of 1

Date: *6 Jul 2001*

Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*

Elevation Datum: ☒ MSL ☐ other

Location: Northing: *2,642,745* Easting: *1,684,138*

Top of Hole Elevation: *219.5 ft*

Hole Number, Field: *ST409 BH03* Permanent: *01409BH03*

Driller: *Gary Wilson*

Inspector: *Jackie Donley*

Type of Hole: ☐ other ☐ Test Pit ☒ Auger Hole ☐ Monitoring Well ☐ Piezometer

Depth to Groundwater: *NE*

Depth Drilled: *11.0 ft*

Total Depth: *11.0 ft*

Hammer Weight: *340 lbs*

Split Spoon I.D.: *2.0 in*

Size and Type of Bit: *6.0 in*

Type of Equipment: *Truck Mounted CME-75*

Type of Samples: *Split Spoon*

Depth (ft)	Lithology	Sample	Recovery (in)	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	Grain Size %Sand	Grain Size %Fines	Max Size (in)	PID (ppm)	% Water	Description and Remarks
2		409BH03SO2.0, 20.2, 3.0, 3.5	24		5 5 10 9	SW-SM	**Well-graded Gravelly SAND with Silt**	40	40	20	2.0	92.4		**2'-4' Tan, gravelly SAND, max.=2", average=4 cm, rounded, tight, dry, strong fuel odor.**
4			24		5 6 11 12	SP-SM	**Poorly graded SAND with Silt and Gravel**	80	10	10		62.9		**4'-6' Brown, SAND, loose, slightly blackish possible fuel stain, moist, strong fuel odor.**
8			20		3 4 7 8	SW	**Well-graded Gravelly SAND**	40	50	10	2.0	20.0		**9'-11' Gray, gravelly SAND, max=2", average=2 cm, subangular, loose, poorly sorted, moist, slight fuel odor.**
12														**11' Because of proximity to 409WL05, abandon 409BH03 at 11' BGS with bentonite chips. Bottom of Exploration 11.0 ft Groundwater Not Encounted PID = Photo Ionization Detector**
14														
16														
18														

AIRFORCE-BORING SERAIX.GPJ ENSR_ANC.GDT 2/1/02

EXPLORATION LOG

Project: *SERA IX* — *Elmendorf AFB*

Page 1 of 1

Date: *6 Jul 2001*

Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*

Elevation Datum: ☒ MSL ☐ other

Location: Northing: *2,642,745* Easting: *1,684,133*

Top of Hole Elevation: *219.4 ft*

Hole Number, Field: *ST409 BH04* Permanent: *01409BH04*

Driller: *Gary Wilson*

Inspector: *Jackie Donley*

Type of Hole: ☐ other ☐ Test Pit ☒ Auger Hole ☐ Monitoring Well ☐ Piezometer

Depth to Groundwater: *NE*

Depth Drilled: *12.0 ft*

Total Depth: *12.0 ft*

Hammer Weight: *340 lbs*

Split Spoon I.D.: *2.0 in*

Size and Type of Bit: *6.0 in*

Type of Equipment: *Truck Mounted CME-75*

Type of Samples: *Split Spoon*

Depth (ft)	Lithology	Sample	Recovery (in)	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	%Sand	%Fines	Max Size (in)	PID (ppm)	% Water	Description and Remarks
2			20		5 9	ML	SILT with Sand and Gravel	20	20	40				2.4'-3' Brown, FILL, tight, poorly sorted, very moist, no fuel odor.
					8 9	SW	Well-graded Gravelly SAND	30	60	10		0.0		3'-4' Gray, gravelly SAND, loose, slightly moist, very slight fuel odor.
4			24		4 8	SP	Poorly graded Gravelly SAND	20	80	0	0.3	0.0		4'-6' Gray, gravelly SAND, max.=2 cm, rounded, loose, moist, very slight fuel odor.
		409BH04SO5.0			12 15									
6														
8														
10			24		5 22 23 21	SP	Poorly graded Gravelly SAND	20	80	0	2.0	0.0		10'-12' Gray, gravelly SAND, max.>2", subrounded, loose, dry, poorly sorted, no fuel odor.
12														12' No fuel odor. Abandon 409BH04 with volclay grout slurry. Bottom of Exploration 12.0 ft Groundwater Not Encounted PID = Photo Ionization Detector
14														
16														
18														

EXPLORATION LOG

Project: *SERA IX* — *Elmendorf AFB*

Date: *6 Jul 2001*

Drilling Agency: ☐ Alaska District ☒ Other *Hughes Drilling*

Elevation Datum: ☒ MSL ☐ other

Location: Northing: *2,642,749* Easting: *1,684,140*

Top of Hole Elevation: *219.2 ft*

Hole Number, Field: *ST409 BH05* Permanent: *01409BH05*

Driller: *Gary Wilson*

Inspector: *Jackie Donley*

Type of Hole: ☐ other _____
☐ Test Pit ☒ Auger Hole ☐ Monitoring Well ☐ Piezometer

Depth to Groundwater: *NE*

Depth Drilled: *5.0 ft*

Total Depth: *7.0 ft*

Hammer Weight: *340 lbs*

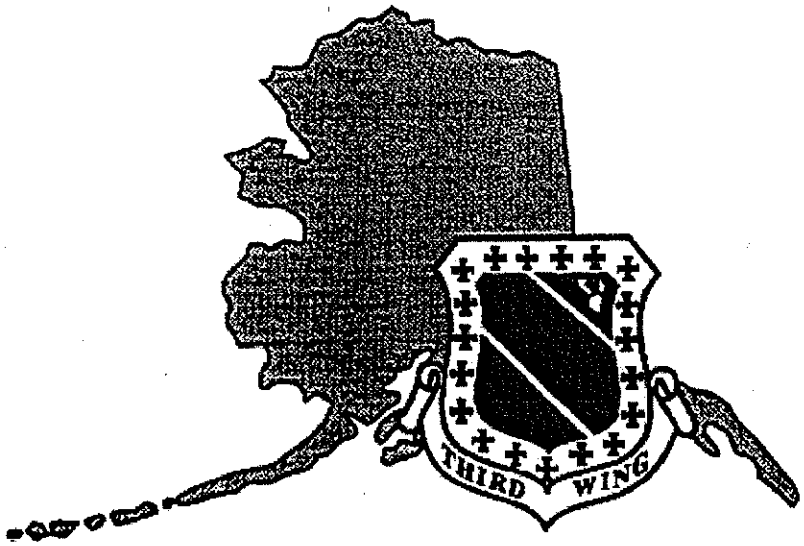
Split Spoon I.D.: *2.0 in*

Size and Type of Bit: *6.0 in*

Type of Equipment: *Truck Mounted CME-75*

Type of Samples: *Split Spoon*

Depth (ft)	Lithology	Sample	Recovery (in)	Frost Class. TM 5-822-5	Blow Count	Symbol	Classification ASTM: D 2487 or D 2488	Grain Size %Gravel	Grain Size %Sand	Grain Size %Fines	Max Size (in)	PID (ppm)	% Water	Description and Remarks
2														
4			12		3 4 6 7	ML	Sandy SILT	1	29	60	1.0	0.5		3'-5' Tan-brown, laminated, fine sandy SILT, max.=4cm, rounded, tight, hard, very well sorted, no fuel odor.
6			12		3 4 6 7	ML	Sandy SILT	1	29	60	1.0	0.3		5'-7' Tan-brown, soil as above, tight, dry, no fuel odor.
8														7' Abandon 409BH05 with volclay grout slurry. Bottom of Exploration 7.0 ft Groundwater Not Encounted PID = Photo Ionization Detector
10														
12														
14														
16														
18														



UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL QUALITY PROGRAM

AFID 805
SERA PHASE VII ST 409/7
RELEASE INVESTIGATION REPORT
FINAL DRAFT

FEBRUARY 1999

CONTENTS

APPENDICES

A DATA ASSESSMENT REPORT
B BORING LOGS
C ANALYTICAL DATA
D ADEC FORMS
E SITE PHOTOGRAPHS

LIST OF TABLES

LIST OF FIGURES

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

This page intentionally left blank.

EXECUTIVE SUMMARY

ST409/7 is the former location of an underground storage tank (UST) near Building 24-805, Hospital Outbuilding. The 20,000-gallon tank, AFID 805, held diesel fuel for the hospital's backup heating system. The UST was removed from the ground in October 1994 under the Elmendorf Air Force Base UST management program. 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 ST409/7 under SERA Phase IV in 1996 and 1997 (6 borings drilled, 4 completed as groundwater monitoring wells), further indicating that the site was contaminated with petroleum hydrocarbons. The site was further investigated under SERA Phase VII in 1998 (3 additional borings, 2 completed as wells), with the goal of filling data gaps identified under SERA Phase IV.

Soil and groundwater results from 1996, 1997, and 1998 indicate that petroleum hydrocarbons have impacted soil at the former UST site and have migrated vertically to groundwater, affecting the smear zone downgradient of the tank. However, the petroleum hydrocarbon plume in soil appears to have migrated no farther than 50 feet from the former UST location. Soil and groundwater results suggest that the contaminant plume has been delineated.

Over the 3 years of sampling, only four soil samples exceeded the Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Program soil cleanup standard for diesel range organics (DRO; 250 mg/Kg); no other chemicals of concern exceeded cleanup standards. Three of the exceedences (1996 and 1997) were at a depth of 21 to 31 feet below ground surface (bgs), with DRO concentrations of up to 2,600 mg/Kg. The fourth exceedence (1998) contained 1,480 mg/Kg DRO at a depth of 5 feet bgs and is believed to be unrelated to the former UST because of the sample's location relative to other impacted samples. Groundwater is present at approximately 26 to 27 feet bgs.

Groundwater samples from two of the five wells sampled in 1998 contained DRO in excess of the ADEC groundwater cleanup standard (1.5 mg/L DRO), with concentrations of 2.55 and 23.5 mg/L. No other petroleum hydrocarbon chemicals of concern exceeded the ADEC groundwater cleanup standards. Because ST409/7 is not within the Operable Unit (OU) 5 Model Area, dissolved-phase contaminants must be addressed as part of the SERA investigation.

This page intentionally left blank.

1.0 INTRODUCTION

This report presents the findings of the State-Elmendorf Environmental Restoration Agreement (SERA) Phase VII release investigation at ST409/7, Building 24-805 Hospital Outbuilding, 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 ST409/7 is not in the OU5 Model Area, the standard site investigation approach was conducted.

1.2 Regional Setting

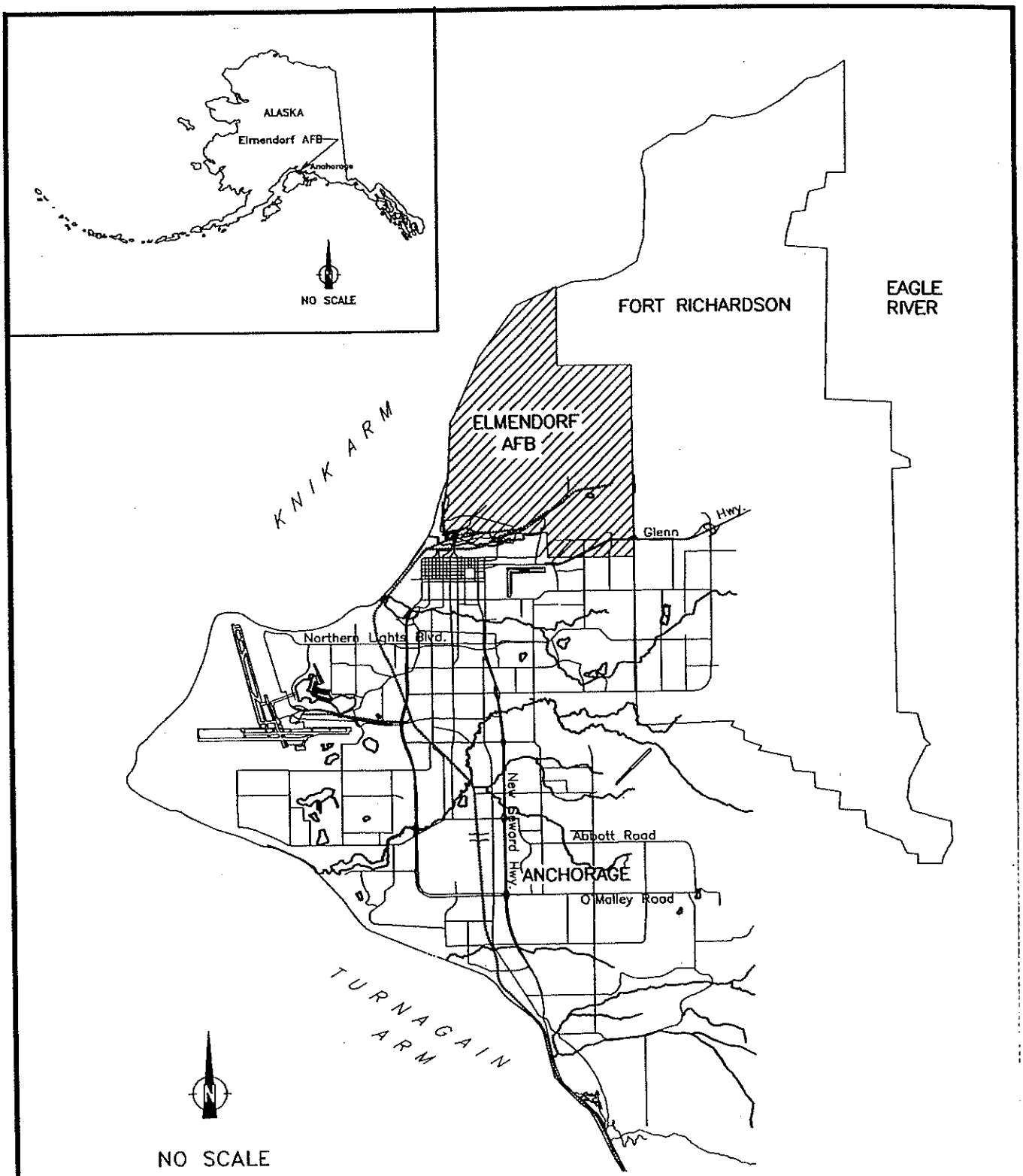
EAFB is located in Southcentral Alaska, along the head of Cook Inlet and adjacent to the City of Anchorage (Figure 1-1). EAFB comprises 13,130 acres, bordered to the north and west by Cook Inlet, to the east by Fort Richardson, and to the south by the City of Anchorage. Land use at EAFB is varied. Nearly 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.

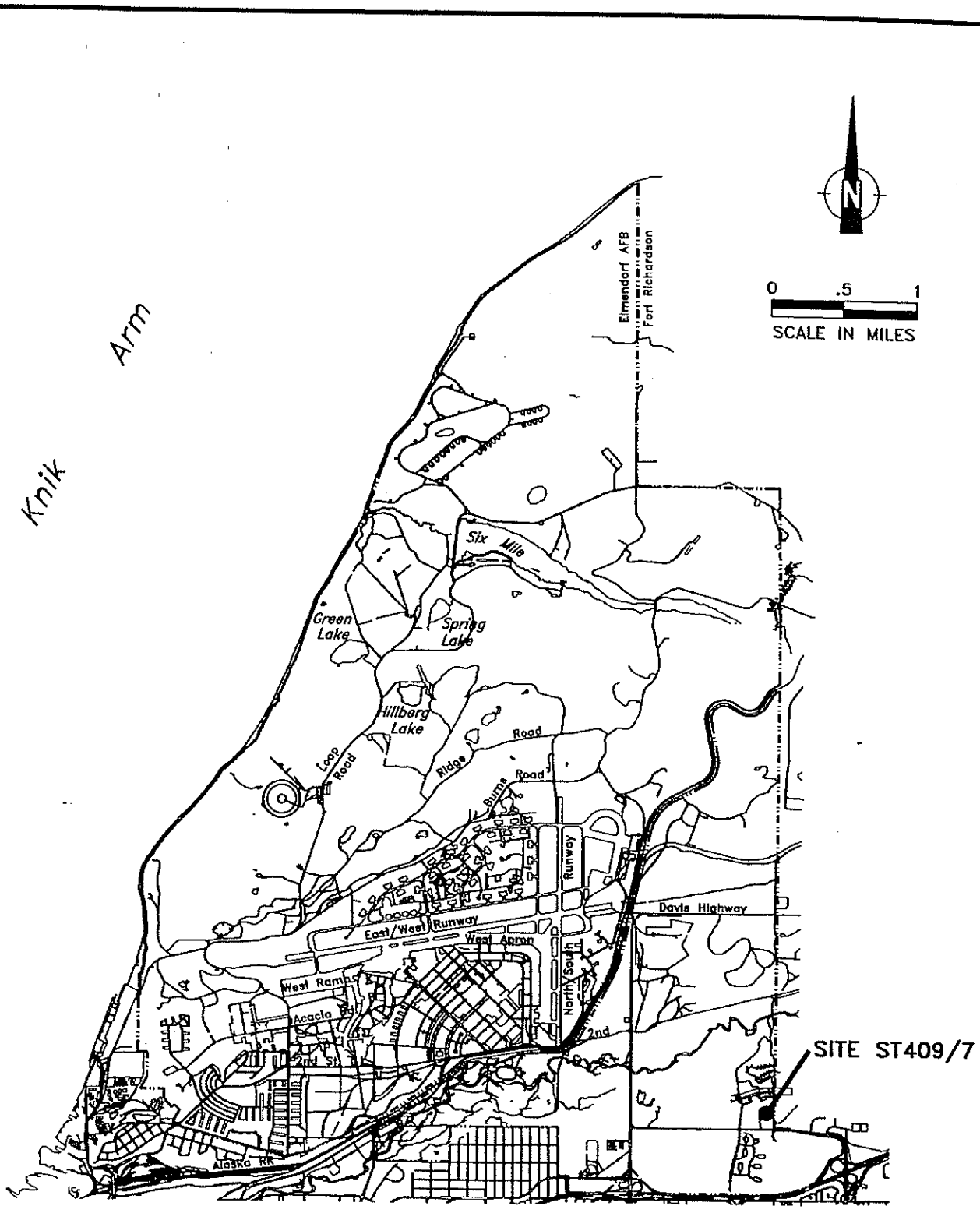
Groundwater flow is divided by the Elmendorf Moraine. Regional groundwater flow north of the moraine is to the northwest towards Knik Arm of Cook Inlet. Regional groundwater flow south of the moraine is south and west toward Ship Creek. ST409/7 is located on the south side of the Elmendorf Moraine and is not in the OU5 Model Area. Figure 1-2 shows the location of ST409/7 on EAFB, and Figure 1-3 shows the regional groundwater flow direction on EAFB.

1.3 Site Background

ST409/7 is the location of a former underground storage tank (UST) near Building 24-805 on Moose Drive south of the EAFB hospital (Figure 1-2). The tank was identified as Air Force identification number (AFID) UST 805 and had a 20,000-gallon capacity. The UST was installed in 1950, was constructed of steel, and stored heating oil for the hospital's backup heating system. The UST was removed in October 1994, and soil samples were collected from the excavation. At the time of UST removal, an ADEC Level A cleanup standard was determined for this site: 50 mg/Kg gasoline range organics (GRO); 100 mg/Kg diesel range organics (DRO); 0.1 mg/Kg benzene; and 10 mg/Kg total benzene, toluene, ethylbenzene, and xylenes (BTEX). Five of the seven soil samples collected from the limits of the excavation contained DRO above the Level A DRO cleanup standard, with maximum soil concentrations of 12,000 mg/Kg DRO. Based on these elevated DRO concentrations, the UST removal report concluded that a release investigation was required at this site.



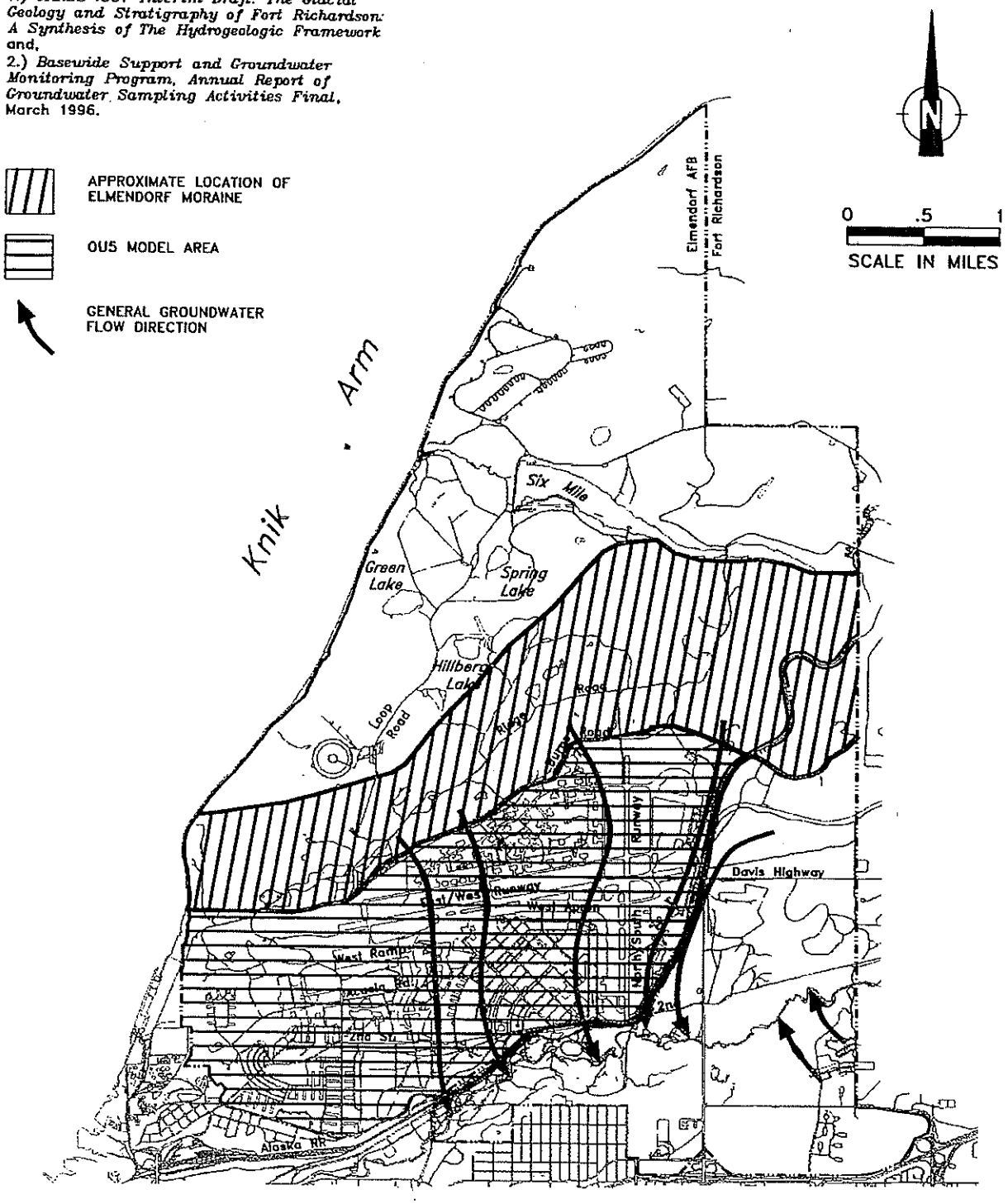
DRAWING: 9000-168/ SITELOCA DRAWN: ABB/SR C/SC: 1:2 DISK: 26/98 DATE: 5/14/98 CHECK: J.S.	FIGURE 1-1 ELMENDORF AFB LOCATION MAP	3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 95701123



DRAWING: 9000-168/ F36059/A-D DRAWN: SSR C/SC: 1:5500 ZIP: 26/98 DATE: 8/29/98 CHECK: J.S.	FIGURE 1-2 SITE LOCATION MAP	3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 957011Z3

Figure 1-3. Generalized Groundwater Flow Direction.

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.



Municipality of Anchorage

DRAWING: 9000-168/ RGFP/A-D C/SC: 1:5500 DATE: 1/13/99	FIGURE 1-3 REGIONAL GROUNDWATER FLOW PATTERNS	3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 957011Z3
DRAWN: SSR ZIP: 26/98 CHECK: J.S.		

1.4 Previous Investigations

In 1996, fieldwork at ST409/7 consisted of installing one bioventing well and two soil gas monitoring arrays. Figure 1-4 shows the location of and results for soil samples collected during 1996, and Appendix C contains tabulated results. Soil contamination exceeding ADEC Level A cleanup standards was detected in one sample, from 409PZ02 at 31.0 feet below ground surface (bgs). The vertical migration pathway was not encountered. Groundwater was not encountered in 409WL01, located within the footprint of the former UST; however, groundwater was encountered at approximately 34 feet bgs during drilling of 409PZ01 and 409PZ02. Groundwater appeared to be limited to a thin zone above the silt layer north of the 409WL01 location. During the 1996 field season, soil data were collected to support bioventing treatability testing; however, no treatability test was conducted due to the low concentrations of vadose zone petroleum hydrocarbons.

In 1997, three soil borings were drilled to further define the extent of soil contamination. Figure 1-4 shows locations and results of samples collected in 1997, and Appendix C contains tabulated results. Soil DRO concentrations ranged from non-detect to 2,600 mg/Kg, in excess of Level A standards. Selected soil samples were also analyzed for polycyclic aromatic hydrocarbons (PAHs). Although PAHs were detected in soil samples, none of these PAHs exceeded the conservative risk-based concentrations listed in Table B1 of the ADEC Contaminated Sites Regulations (18 AAC 75.340 soil cleanup standards). Based on analytical results, the petroleum hydrocarbon contamination in soil did not appear to extend below 31 feet bgs; however, the lateral extent of soil contamination was not fully delineated.

In 1997, monitoring wells were installed (409WL02 through 409WL04) to assess groundwater characteristics (i.e., flow direction and gradient). Groundwater was estimated to flow in a northwesterly direction at this site with a gradient of 0.01 to 0.1 feet per feet (ft/ft). DRO was detected in groundwater at 0.179 mg/L (409WL04), 0.331 mg/L (409WL02), and 1.3 mg/L (409WL03) but was not in excess of the ADEC groundwater standard for DRO (1.5 mg/L DRO) under the Contaminated Sites Program. The lateral extent of impacted soil and groundwater to the west/northwest side of 409WL03 was not adequately characterized.

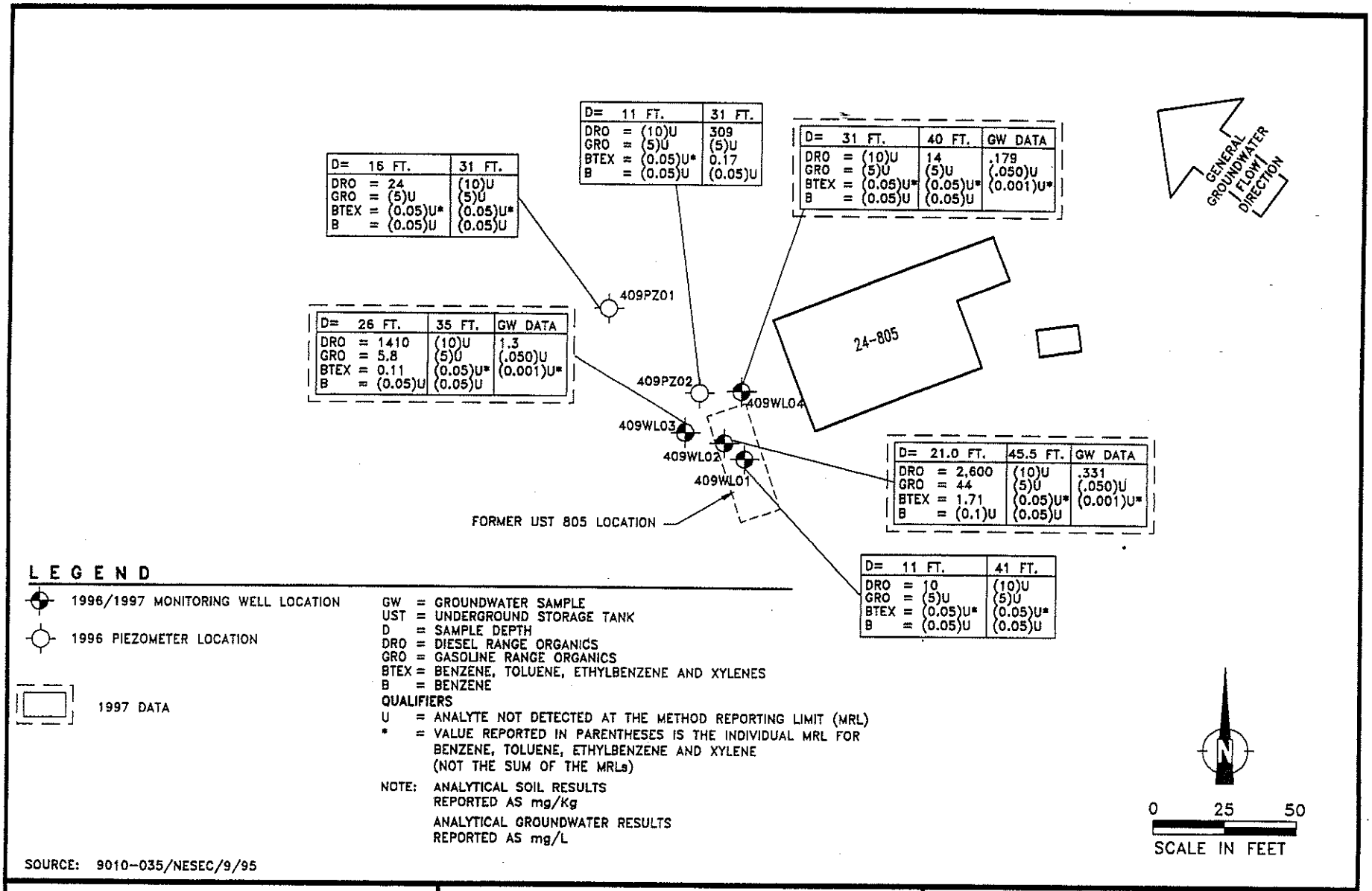
Based upon water level data taken during the 1997 SERA IV investigation, groundwater was estimated to be at 30 to 35 feet bgs at this site.

1.5 Report Outline

This report is divided into the following sections:

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

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



DRAWING: 9000-168/ ST409SG	DRAWN: SSR	FIGURE 1-4 ST409/7, BLDG. 24-805 SITE LAYOUT AND 1996-1997 RESULTS
C/SC: 1:50	DISK: 26/98	3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 957011Z3
DATE: 10/09/98	CHECK: J.S.	

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 field work are presented in Appendix E.

2.0 FIELD METHODS

This section summarizes the field methods that were used in the 1998 SERA VII Release Investigation. The work was completed as a continuation of SERA Phase IV. The Work Plan was prepared following the guidelines of SERA, as well as Basewide policies and procedures for fieldwork at EAFB presented in the Management Action Plan (MAP) Revision 3, December 1996, as applicable to environmental compliance projects.

This project was conducted in accordance with Title 18 of the Alaska Administrative Code (AAC), Part 75 and Part 78, as well as the guidelines established under:

- *Guidance Manual for Underground Storage Tank Regulations*, 18 AAC 78.
- ADEC proposed revisions to 18 AAC 75, "Oil and Hazardous Substance Pollution Control Regulations," Cleanup Standards, Adoption Draft Incorporating Public Comments, May 1998.

2.1 Initial Activities

The field program was based on information obtained from previous site assessments, historical aerial photographs, facility drawings, Basewide monitoring reports, and correspondence between the Air Force and ADEC. Critical information included the contaminant type and source, presumed or known groundwater flow direction; potential contaminant receptors, and infrastructure constraints. Utility clearances and dig permits were obtained for the site prior to drilling or excavation. The site was visually inspected for surface features and conditions to assist in locating borings.

2.2 Borings

Soil borings were drilled under SERA VII to supplement borings installed under SERA IV. Boring locations were based on the assumed or known groundwater flow direction, contaminant plume profiles identified during the SERA IV investigation at this site, and known infrastructure constraints. Specific boring locations were adjusted as necessary based on locations of subsurface utilities or the field screening results from the first borings at the site.

Borings were advanced to a minimum of 10 feet below the bottom of the former UST (if applicable to a specific site), or until three successive field screening readings indicated "clean" soils (less than 3 photoionization detector [PID] units above background/ambient air readings), or to groundwater, based on field observations. Field screening measurements are further described in Section 2.3.1. The soil borings were advanced using a truck-mounted, hollow-stem auger drilling rig. The cuttings from the soil borings were placed in 55-gallon drums. Cuttings were disposed of as outlined in Section 2.5.

Borings were completed as groundwater monitoring wells, as shown in Figure 2-1. Appendix B contains boring logs that also show the details of the well installation. Groundwater monitoring wells were installed based on preliminary investigation results and coordination with the Air Force, U.S. Army Corps of Engineers (USACE), and ADEC project managers.

2.3 Sampling

2.3.1 Soil Sampling

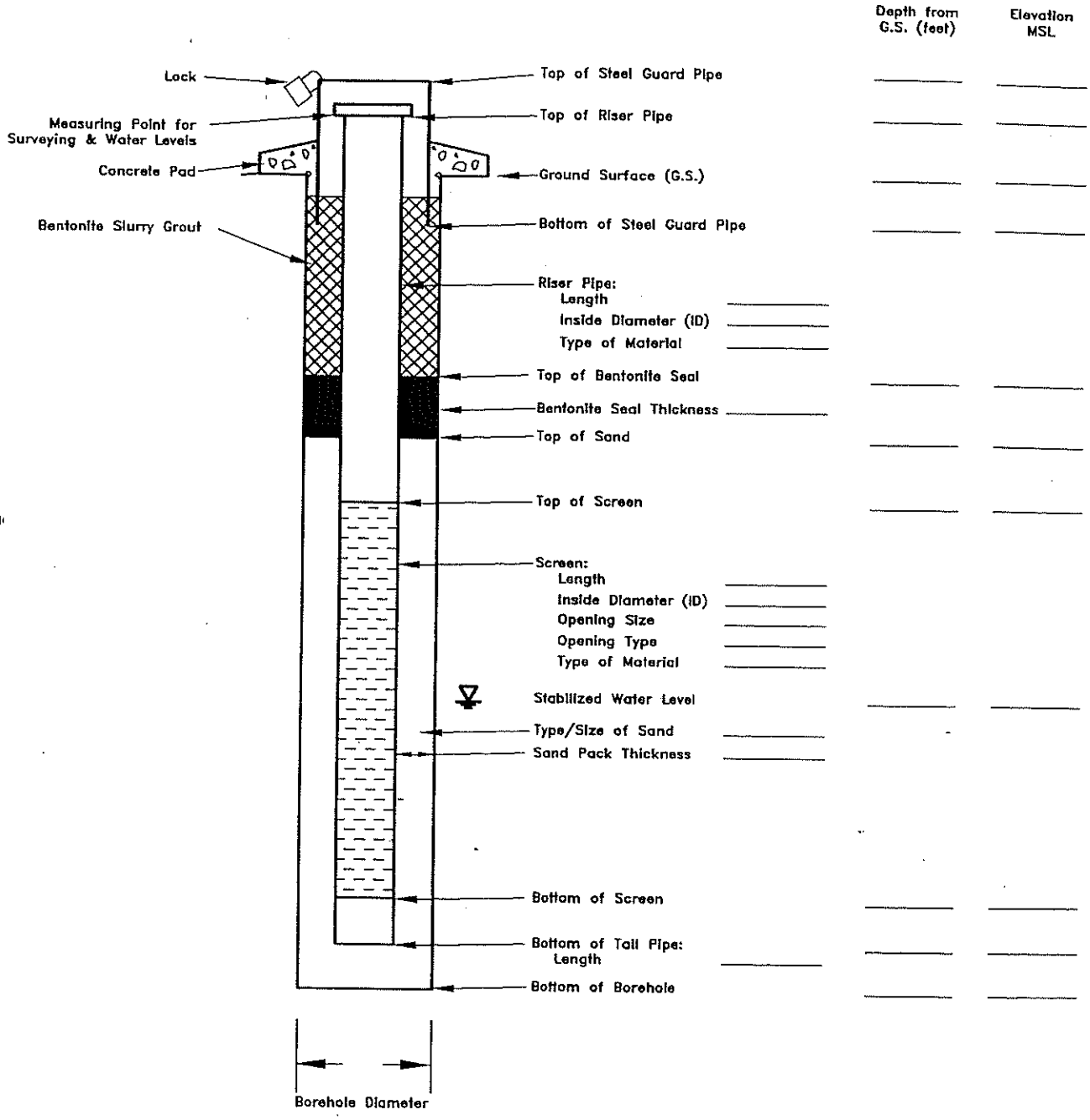
Soil samples were collected from a 2.5-inch-diameter split-spoon sampler advanced ahead of the auger flights. In general, samples were collected at 5-foot intervals to groundwater between the ground surface and the water table. At sites where groundwater was suspect to contamination, a soil sample was collected as close to the saturated zone as possible. Samples were immediately placed in a cooler with freeze packs and maintained at approximately 4°C while awaiting results of the field screening.

All soil samples were field screened using the ambient temperature headspace (ATH) method, as follows. A clean glass jar was partially filled (one-third to one-half) with the sample to be analyzed. Aluminum foil was placed over the top prior to screwing the lid on. The sample was transferred immediately after opening the split-spoon.

Headspace vapors were allowed to develop in the container for at least 10 minutes but less than 1 hour. The container was agitated for 15 seconds at the beginning and end of the headspace development period to assist volatilization. The container was maintained at a minimum temperature of approximately 40°F. The field screening instrument, a PID, was then side-punched through the aluminum foil, to a point about one-half the headspace depth. Care was taken to avoid uptake of water or soil. The highest meter reading (2 to 5 seconds following insertion) was recorded on the soil boring logs at the appropriate depth. Erratic meter response was noted in the field logbook.

Up to three samples from each boring were sent to the laboratory for analysis. Typically the sample at or just above the water table and the sample with the highest ATH screening results were selected from each boring for laboratory analysis. Samples not chosen for laboratory analysis were placed with the soil cuttings awaiting final disposition. Table 2-1 summarizes soil sample analyses and laboratory methods.

Soil samples were placed in containers in the following order: 1) GRO/BTEX, 2) DRO, 3) residual range organics (RRO), 4) PAHs, 5) total organic carbon (TOC) and soil classification. Soil samples to be analyzed for GRO/BTEX were collected by transferring approximately 25 grams of soil into a 4-ounce, wide-mouth jar and immediately adding 25 mL of methanol. An additional 25 mL of methanol was added if the soil sample was not completely submerged in the methanol, and the extra methanol was noted on the sample log. No additional labels were



APPROVED:

SIGNATURE _____ DATE: _____

DRAWING: 9000-168/ MWDET DRAWN: SSR C/SC: 1:1 DISK: 26/98 DATE: 8/24/98 CHECK: J.S.	FIGURE 2-1 MONITORING WELL CONSTRUCTION DETAIL	3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 957011Z3

added to the pre-tared GRO/BTEX jars. Percent solids determinations for DRO samples were used for the corresponding GRO/BTEX samples.

Table 2-1. Sample Analytical Summary for ST409/7.

Analyte	Method	Number of Samples
Soil		
DRO	AK102	Up to 3 per boring
GRO	AK101	Up to 3 per boring
BTEX	AK101/EPA 8021B	Up to 3 per boring
Groundwater		
DRO	AK102	One per well
GRO	AK101	One per well
BTEX	EPA 8021B	One per well
PAH	EPA 8270B/SIM	Up to 3 per site

SIM = Selective ion monitoring.

2.3.2 Groundwater Development and Sampling

New monitoring wells were developed by removing a minimum of five casing volumes of water (or until the well bore is evacuated for low yield wells) and measurements of development water temperature, pH, dissolved oxygen, and conductivity were within 10 percent variability between measurements. Depth to groundwater and, if present, light nonaqueous-phase liquid (LNAPL) was measured with an interface water level indicator to an accuracy of 0.02 feet.

All groundwater monitoring wells at the site were sampled. New wells were sampled a minimum of 48 hours after development. The wells were purged prior to sampling in a similar manner as development, except that a minimum of three casing volumes were removed. Groundwater samples were collected after the well was allowed to equilibrate and fines had settled. The water level was re-measured after purging occurred and water level returned to stasis. Groundwater samples were collected using disposable high-density polyethylene (HDPE) bailers fitted with new nylon line for each well sampled or a foot valve or peristaltic pump fitted with new clean tubing. All sampling apparatus were handled by personnel wearing disposable gloves. Samples were collected from as close as possible to the water/air interface, minimizing agitation of the water.

Water was transferred directly from the sampling device into appropriate containers in the order of the analyte volatility. Containers for analysis of BTEX or GRO were filled to a positive (convex)

meniscus, inverted, and lightly tapped after capping to ensure no bubbles were present. Table 2-1 summarizes groundwater sample analyses and laboratory methods.

Purge water and development water were disposed of as described in Section 2.5.

2.3.3 Field Quality Control Samples

The following field quality control (QC) samples were collected:

- Field duplicates were collected at a 10 percent rate from the same sample interval and placed into separate containers. Field duplicates were submitted "blind" to the laboratory.
- Rinsate blanks (generally analyzed for BTEX only; one per site) were collected by rinsing the split spoon or groundwater sampling apparatus with deionized/distilled water following decontamination and collecting the rinsate.
- One field blank sample of deionized/distilled water was collected by pouring directly from the original deionized/distilled water container.
- Laboratory-prepared trip blanks of analyte-free media accompanied each batch of aqueous samples submitted for BTEX.
- Two methanol trip blanks were submitted for GRO analysis over the course of the fieldwork.
- Matrix spike/matrix spike duplicate (MS/MSD) samples were collected at a rate of 5 percent for the primary laboratory only. No additional soils were collected for MS/MSD samples; two additional sets of bottles were required for aqueous MS/MSD if groundwater samples were collected (i.e., a total of three sets for primary and MS/MSD samples).

Quality assurance (QA) referee (field duplicate) samples were also collected at a rate of 10 percent and were sent to a USACE-designated referee laboratory.

2.3.4 Sample Packaging and Shipping

Plastic bubble wrap or vermiculite was used to line the bottom of shipping coolers. The samples were wrapped in plastic bubble wrap prior to placement in the coolers. Completed chain-of-custody forms were placed inside a resealable plastic bag and secured to the inside of coolers. Space between samples in the coolers was filled with packing material so that samples were protected and movement was limited. Cold packs were placed around and on top of the samples to maintain the temperature at approximately 4°C.

When a transfer of samples occurred, the chain-of-custody form was completed with the name of the person relinquishing the samples; the person receiving the sample signed and dated it. Copies of any shipping documentation were also retained for the project files. Sample shipments were delivered by the field team to the Anchorage-based analytical laboratory (CT&E).

2.3.5 Sampling Control

Samples collected during this field investigation were each assigned a unique field sample tracking number using an alphanumeric system. This system was developed to allow for sample control of the large number of samples that were collected during this and any following investigations. Each sample tracking number consisted of a three-segment alphanumeric code that identifies the sampling location, the sample identifier, the type of sample, and the QC identifier. The sample numbers were defined as follows:

1) Site Designation. The first segment of the sample identification number is the site number (3 digits).

2) Location Designation. The next four characters represent the location within the sites where the samples were obtained, namely: AANN, where A = alpha code designating the type of sample, and N = the sequential number assigned. The following codes were used during this investigation:

   BH = Borehole

   WL = Well (groundwater monitoring or bioventing)

3) Matrix Code. The next two characters indicate the sample matrix. The following are some of the codes that were used during this investigation:

   SO = Soil

   WG = Groundwater

   SQ = Soil/Solid Quality Control Matrix

   WQ = Water Quality Control Matrix

4) Sample Depth. For soil samples only, the next set of numerals indicate the depth below the surface to the top of the soil sample collection interval in feet and tenths of feet (e.g., 2.5 or 17.5).

5) Sample Type. The next set of characters represents the field sample type. The following are some of the codes that were used during this investigation:

   N# = Normal Environmental Sample

   EB# = Equipment Blank

   FD# = Field Duplicate

TB# = Trip Blank

MS# = Lab Matrix Spike

SD# = Lab Matrix Spike Duplicate

The # symbol represents a numeral that was sequentially assigned by additional sample types collected from one location. Lab matrix spike and matrix spike duplicates on a single sample were identified together as an MS/MSD sample type. For example, a soil sample collected from Monitoring Well 05 at site ST409/7, from 5 to 7.5 feet bgs, would be numbered:

409WL05SO5.0N1

Each sample container was labeled with project number, site name, sample number, date and time of sample collection, any preservatives used, and sampler name.

2.4 Decontamination

All field equipment coming in contact with potentially contaminated soil or used for sampling was decontaminated before and after use. Clean, solvent-resistant gloves were worn by persons decontaminating tools and equipment. Soil sampling tools, including split spoons, were cleaned by the following process:

1) scrub with a brush in a solution of Alconox and water
2) rinse twice in clean water
3) rinse with methanol
4) rinse with deionized or distilled water

Specific decontamination procedures for various types of field equipment are as follows:

- Auger flights and rods and bits were decontaminated between boreholes by cleaning with high pressure hot water.

- Polyvinyl chloride (PVC) casings, screen caps, couplings, and covers were steam cleaned prior to installation. If the material was still in the factory packaging, the material was considered sufficiently clean and was used without steam cleaning.

- Well sounders, steel tapes, and water quality probes were scrubbed and rinsed with methanol, then rinsed with deionized water, and allowed to air dry. If visible contamination was not removed using this technique, the equipment was cleaned by rinsing with potable water and Alconox solution, rinsing with potable water, rinsing with methanol, rinsing with deionized or distilled water, and air drying.

2.5 Disposition of Investigation-Derived Waste

Water produced during development and sampling of monitoring wells and decontamination water was containerized in 55-gallon drums. The drums were transported to the decontamination pad area at the Environmental Staging Facility for processing through the on-site conditioning system. The conditioning system discharges the water to the sanitary sewer system for treatment in the Anchorage wastewater treatment system. If the water could not be conditioned upon arrival at the conditioning system, the drummed water was stored adjacent to the conditioning area until it was possible to process it through the conditioning system. Refer to the *Basewide Environmental Staging Facility Operation and Maintenance Plan* (USAF 1993) for details on how the conditioning system works.

If a layer of free-phase product was present in a drum of water, the water was processed through an EAFB oil/water separator at the direction of EAFB.

Soil cuttings generated during this investigation were containerized in drums at the time of drilling. The containers of soil were transported to the Environmental Staging Facility for storage until analytical data for the soil from the borings or wells was received. If the soil contaminant concentrations are below ADEC Level A cleanup standards, the soil will be considered clean and will be spread onto the ground in an area approved by the 3CES/CEVR. If the soil is above ADEC Level A cleanup standards, soil will be transported to an approved thermal treatment facility for remediation following receipt of written approval from ADEC.

Drums and containers of soil were labeled with permanent marker. The containers listed the date and time of sampling, soil boring or monitoring well location, contents, and EAFB point of contact.

Disposable protective clothing, disposable bailers, and other similar supplies were presumed to be nonhazardous. The waste was disposed of at the Municipality of Anchorage landfill.

2.6 Field Equipment Calibration

A PID with a minimum 10.2 eV lamp (e.g., Microtip 2000, OVM 580B, or Minirae) was used to field screen soil for hydrocarbons. A flame ionization detector (FID) was available in the event problems occurred with the operation or response of the PID. The PID was calibrated each day prior to use and recalibrated during the day, as needed (e.g., if PID drift is noted). The PID was calibrated in accordance with the owner's manual using a 100 parts per million (ppm) isobutylene reference gas and clean ambient air as the zero reference gas. The time, date, and result of each PID reading were recorded in the field logbook. Field instruments were maintained according to the manufacturer's recommended procedures. The date, time, and results of all calibrations and repairs to field instruments were recorded in the instrument calibration log.

2.7 Survey

All borings and monitoring wells installed during these investigations were surveyed by an Alaska-registered surveyor. All survey data established was relative to the Municipality of Anchorage datum and the USAF identified benchmark (TTAN7) located on EAFB. The vertical datum for this survey was based on the Alaska State Plan coordinates. This control was the same datum used for the 1986 Elmendorf Master Plan and for the SERA Phase I, II, and IV investigations.

2.8 Data Interpretation

2.8.1 Field Screening Data

ATH/PID results were interpreted as qualitative data for field sample screening and extrapolating the extent of vadose petroleum hydrocarbon contamination. ATH/PID values above 10 ppm in combination with odor and elevated analytical results from associated samples were generally interpreted as positive indicators of petroleum hydrocarbons. Elevated ATH/PID values not accompanied by petroleum odor or petroleum hydrocarbons detected in laboratory analyses were attributed to interference from condensing humidity.

2.8.2 Comparison to ADEC Soil Cleanup Standards – Method One

Soil petroleum hydrocarbon concentrations were compared to cleanup standards provided in 18 AAC 75.340, Table A1 – Method One (ADEC 1999). This method relies upon use of a Matrix Score Sheet to determine appropriate cleanup levels, as summarized in Table 2-2 below.

Table 2-2. Matrix Score Sheet Cleanup Standards.

Matrix Score	Cleanup Level in mg/Kg			
	GRO	DRO	RRO	BTEX Compounds
Level A	50	100	2,000	See Table 2-3
Level B	100	200	2,000	See Table 2-3
Level C	500	1,000	2,000	See Table 2-3
Level D	1,000	2,000	2,000	See Table 2-3

The matrix score sheet was used to estimate the cleanup level for soil at ST409/7. The completed matrix score sheet, provided in Appendix D, indicates a total matrix score of 44 (Level A cleanup standards). The assumptions used to develop the matrix score are discussed below:

- Depth to Subsurface Water: The depth to subsurface water is measured from the lowest point of the zone of soil contamination to the seasonal high groundwater table. In samples collected in 1997, elevated concentrations of petroleum

hydrocarbons were detected as deep as 26 feet bgs. Water levels measured in 1998 show the water table to be at approximately 26 to 28 feet bgs. Therefore the depth to subsurface water from the zone of contamination is estimated at less than 5 feet.

- Mean Annual Precipitation: Mean annual precipitation for Anchorage, Alaska, is 15.57 inches (Western Regional Climate Center data for 4/1/52 through 4/30/98).

- Soil Type: Based upon lithologic logging of soil borings drilled under SERA VII, the soil type encountered at ST409/7 is coarse-grained soils with fines (SP-SM, GP-GM, SW-SM, Unified Soil Classification).

- Potential Receptors: The nearest public/private water system is approximately 500 feet north of ST409/7: a co-gradient well used as a backup well for the hospital. The well is periodically pumped and purged (EAFB Master Plan G-Tab drawing, Water Supply System).

- Volume of Contaminated Soil: The surface dimensions of the area containing soil with petroleum hydrocarbon levels above the estimated soil cleanup level are approximately 45 feet by 15 feet, with elevated PID readings and laboratory results indicating contaminants in a 10 to 20 foot zone. This equals 250 to 500 cubic yards of soil.

2.8.3 Comparison to ADEC Soil Cleanup Standards – Method Two

Soil analytical results were also compared to chemical-specific soil cleanup standards under 18 AAC 75.340 (ADEC 1999). Using Method Two of these regulations, bulk petroleum hydrocarbon (GRO and DRO) and chemical-specific cleanup standards are specified for various potential contaminant exposure pathways and as a function of the amount of precipitation the site receives. Table 2-3 summarizes the pertinent Method Two cleanup standards for SERA investigations on EAFB (less than 40 inches of precipitation per year).

2.8.4 Comparison to ADEC Groundwater Cleanup Standards

Groundwater petroleum hydrocarbon concentrations were compared to groundwater cleanup standards in 18 AAC 75.345, under the ADEC's Contaminated Sites Program. Table 2-4 summarizes the cleanup standards pertinent to the SERA investigation.

Table 2-3. ADEC Soil Cleanup Standards

Compound	ADEC Cleanup Standard (<40" Zone[1])		
	Ingestion	Inhalation	Migration to GW
Petroleum Hydrocarbons			
GRO	1,400	1,400	300
DRO	10,250	12,500	250
RRO	10,000	22,000	11,000
BTEX Compounds			
Benzene	290	9	0.02
Toluene	20,300	180	5.4
Ethylbenzene	10,000	89	5.5
Xylenes (total)	203,000	81	78
PAHs			
Acenaphthene	6,100	none	210
Acenaphthylene	none	none	none
Anthracene	30,000	none	4,300
Benzo(a)anthracene	11	none	6
Benzo(b)fluoranthene	11	none	20
Benzo(k)fluoranthene	110	none	200
Benzo(g,h,i)perylene	none	none	none
Benzo(a)pyrene	1	none	3
Chrysene	1,100	none	620
Dibenz(a,h)anthracene	1	none	6
Dibenzofuran	none	none	none
Fluoranthene	4,100	none	2,100
Fluorene	4,100	none	270
Indeno(1,2,3-cd)pyrene	11	none	54
2-Methylnaphthalene	none	none	none
Naphthalene	4,100	none	43
Phenanthrene	none	none	none
Pyrene	3,000	none	1,500

Notes:

[1] ADEC soil cleanup standards in mg/Kg, 18 AAC 75.340.

Shaded boxes represent the most stringent cleanup level for each chemical.

Table 2-4. ADEC Groundwater Cleanup Standards

Compound	Groundwater Cleanup Standard (mg/L)
Petroleum Hydrocarbons	
GRO	1.3
DRO	1.5
RRO	1.1
BTEX Compounds	
Benzene	0.005
Toluene	1.0
Ethylbenzene	0.7
Xylenes (total)	10.0
PAHs	
Acenaphthene	2.2
Acenaphthylene	none
Anthracene	11.0
Benzo(a)anthracene	0.001
Benzo(b)fluoranthene	0.001
Benzo(k)fluoranthene	0.01
Benzo(g,h,I)perylene	none
Benzo(a)pyrene	0.0002
Chrysene	0.1
Dibenz(a,h)anthracene	0.0001
Dibenzofuran	none
Fluoranthene	1.46
Fluorene	1.46
Indeno(1,2,3-cd)pyrene	0.001
2-Methylnaphthalene	none
Naphthalene	1.46
Phenanthrene	none
Pyrene	1.1

Notes:

[1] ADEC groundwater cleanup standards in mg/L, 18 AAC 75.345.

3.0 RESULTS

3.1 1998 SERA VII Field Program

3.1.1 Drilling and Soil Sampling

Two monitoring wells (409WL05 and 409WL06) and one soil boring (409BH01) were drilled on June 24 and 26, 1998. Soil samples were collected every 5 feet for lithologic logging and ATH screening. A select number of samples were also submitted for laboratory analyses of DRO, GRO, and BTEX. During the work planning stage, ADEC and EAFB agreed that analysis for RRO would not be required at ST409/7 because the former UST was known to have held diesel fuel. Figure 3-1 shows the location of soil borings.

Monitoring well 409WL05 was located as a hydraulically downgradient well. Soils were logged as sand and gravel with up to 15 percent fines. The sample collected from the 5 to 7 foot interval was noted as having an odor and had an ATH result of 26.3 PID units. The ATH result for the 10 to 12 foot interval was 10.5 PID units; all other sample intervals had ATH results of 2.9 PID units or less. The sample collected at 30 feet bgs was saturated; water was measured while drilling at approximately 26 feet bgs. The well was screened from 22.5 to 32.5 feet bgs. Samples from 5, 15, and 30 feet bgs were sent to the laboratory for analysis.

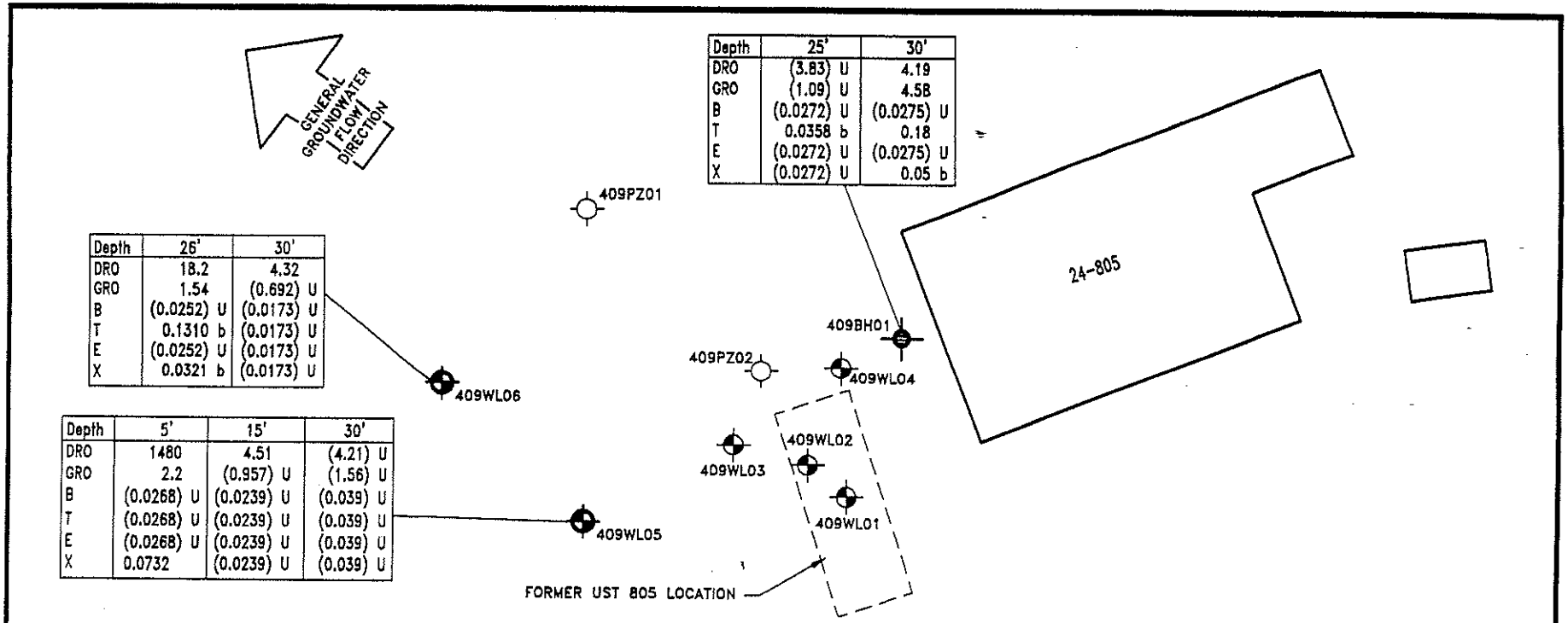
Monitoring well 409WL06 was also placed hydraulically downgradient of existing wells with known groundwater contamination. Soils were similar to those logged in 409WL05. Field observations did not indicate the presence of petroleum contaminants in samples collected from this location. The sample collected at 25 feet was saturated; the water level was measured at 25.8 feet bgs during drilling. The well was screened from 22 to 32 feet bgs. Samples from 26 and 30 feet bgs were sent to the laboratory for analysis.

Soil boring 409BH01 was placed east of 409WL04, between the building and the former tank. The purpose of the boring was to assess if the piping associated with the former tank was acting as a source of contamination. The actual location of the piping run was not known during the field investigation. The boring location may actually be north of the former piping run. Soils were similar to those seen in 409WL04 and 409WL05. Field observations did not indicate the presence of petroleum contaminants in samples collected from this location. Samples from 25 and 30 feet bgs were sent to the laboratory for analysis.

3.1.2 Well Development and Groundwater Sampling

The two new wells were developed on July 23, 1998. The wells were surged and purged using a submersible pump until parameters stabilized as specified in the Work Plan.

Figure 3-1. ST409/7 1998 Soil Sample Results.



Depth	25'	30'
DRO	(3.83) U	4.19
GRO	(1.09) U	4.58
B	(0.0272) U	(0.0275) U
T	0.0358 b	0.18
E	(0.0272) U	(0.0275) U
X	(0.0272) U	0.05 b

Depth	26'	30'
DRO	18.2	4.32
GRO	1.54	(0.692) U
B	(0.0252) U	(0.0173) U
T	0.1310 b	(0.0173) U
E	(0.0252) U	(0.0173) U
X	0.0321 b	(0.0173) U

Depth	5'	15'	30'
DRO	1480	4.51	(4.21) U
GRO	2.2	(0.957) U	(1.56) U
B	(0.0268) U	(0.0239) U	(0.039) U
T	(0.0268) U	(0.0239) U	(0.039) U
E	(0.0268) U	(0.0239) U	(0.039) U
X	0.0732	(0.0239) U	(0.039) U

LEGEND

- 1996/1997 MONITORING WELL LOCATION
- 1996 PIEZOMETER LOCATION
- 1998 SOIL BORING LOCATION
- 1998 MONITORING WELL LOCATION

SOURCE: 9010-035/NESEC/9/95

UST = UNDERGROUND STORAGE TANK
DRO = DIESEL RANGE ORGANICS
GRO = GASOLINE RANGE ORGANICS
B = BENZENE
T = TOLUENE
E = ETHYLBENZENE
X = TOTAL XYLENES (SUM OF RESULTS ABOVE MRL)
U = UNDETECTED AT LABORATORY MRL
b = ANALYTE DETECTED IN BLANK ASSOCIATED WITH SAMPLE

NOTE: ANALYTICAL SOIL RESULTS REPORTED AS mg/Kg

N

0 15 30
SCALE IN FEET

DRAWING: 9000-168/409SB898
C/SC: 1:30
DATE: 1/14/99
DRAWN: SSR
DISK: 26/98
CHECK: J.S.

FIGURE 3-1
ST409/7, BLDG. 24-805
1998 SOIL BORING LOCATIONS
AND SAMPLE RESULTS

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

Samples were collected from the two new wells and from existing wells 409WL02, 409WL03, and 409WL04. Samples were submitted for DRO, GRO, and BTEX analyses. Samples collected from 409WL02, 409WL03, and 409WL04 were also submitted for PAH analysis.

3.2 Discussion of Findings

3.2.1 Soil Findings

Soil sample results from 1996, 1997, and 1998 indicate that petroleum hydrocarbons have impacted soils in the vicinity of the tank, migrated vertically, and affected the smear zone downgradient of the tank. Soil from four borings (PZ02, WL02, WL03, and WL05) contained petroleum hydrocarbons in excess of Method One Level A and Method Two chemical-specific cleanup standards. Figure 3-1 shows soil sample locations and results.

Following the Method Two soil cleanup standards (outlined in Section 2.8.3), the exposure pathway with the most stringent value 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.

Diesel range petroleum hydrocarbons were detected in the soil at ST409/7 above the ADEC Method Two DRO cleanup standard of 250 mg/Kg DRO. The highest DRO concentration (2,600 mg/Kg) was detected in 1997 at 21 feet bgs in 409WL02. Petroleum hydrocarbon contamination does not appear to extend below 40 feet bgs. The highest DRO concentration from UST excavation sampling in 1994 was approximately 12,000 mg/Kg; it is possible that the current DRO concentration at this area has decreased from its 1994 measured concentrations due to natural attenuation of petroleum hydrocarbons. Although carcinogenic PAHs were detected in soil samples in 1997, none of these PAHs exceeded Method Two cleanup standards. Figure 1-4 shows the soil sample results from 1996 and 1997.

The only soil result from 1998 that exceeded ADEC soil cleanup standards was at 5 feet bgs in boring 409WL05 (1,480 mg/Kg DRO). PID readings for this boring drop off significantly below 10 feet bgs, indicating that the petroleum hydrocarbons detected in this boring are limited to shallow soils. Because the extent of petroleum-impacted soil at ST409/7 has been shown to be present at a depth of 15 to 40 feet bgs, it is likely that the area of impacted soil in 409WL05 is not associated with the former UST at ST409/7. Figure 3-1 shows the soil sample results from 1998.

Data collected since the tank removal (October 1994), indicate that the petroleum hydrocarbon plume in the soil has not migrated farther than 50 feet from the former UST excavation area.

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 1998), 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.

Figures 3-3, 3-4 and 3-5 are cross section diagrams for ST409/7. Appendix B contains boring logs for ST409/7, and Appendix C contains all 1998 laboratory results.

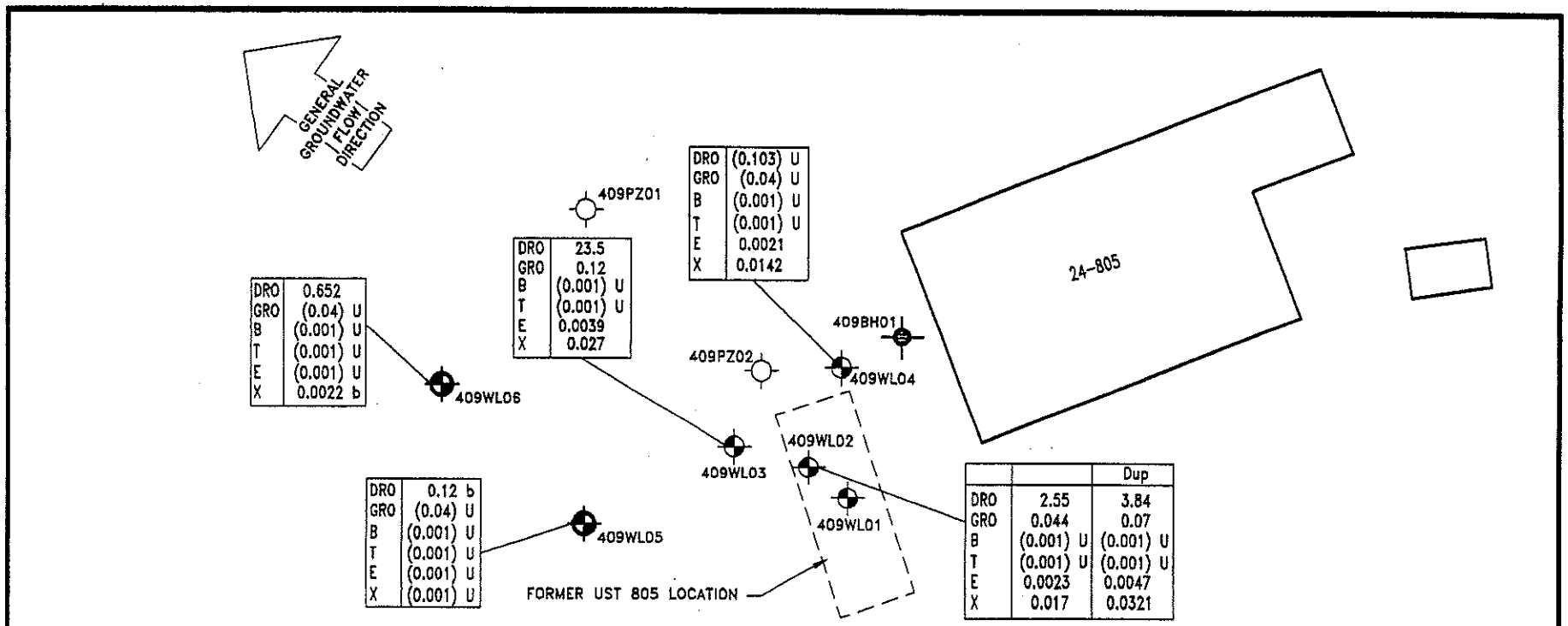
3.2.2 Groundwater Findings

An unconfined aquifer is present at depths of less than 40 feet bgs and consists of glacial outwash material having highly variable fines content both laterally and vertically. This probably results in local variability in soil permeability.

In 1997, groundwater samples collected from monitoring wells 409WL02, 409WL03, and 409WL04 contained DRO ranging from 0.179 to 1.3 mg/L, which was below the DRO groundwater cleanup standard of 1.5 mg/L. DRO chromatograms reviewed for these samples were either indeterminate or appeared to exhibit an elevated baseline. No GRO or BTEX compounds were detected in the groundwater samples. Figure 1-4 shows the groundwater results for 1997.

In 1998, DRO concentrations in groundwater ranged from 0.12 to 23.5 mg/L, exceeding the DRO cleanup standard of 1.5 mg/L in 409WL02 and 409WL03. Figure 3-2 shows the results for 1998. DRO in 409WL04 was not detected above the MRL of 0.103 mg/L in 1998, although in 1997 it was detected at 0.179 mg/L. As previously stated, review of the 1997 DRO chromatograms were inconclusive. DRO concentrations in samples collected from 409WL02 and 409WL03 increased by more than one order of magnitude from 1997 to 1998: from 0.331 to 2.55 mg/L in 409WL02, and from 1.3 to 23.5 mg/L in 409WL03. GRO was detected in two of the five wells sampled in 1998, and ethylbenzene and xylenes were detected in four of the five wells, although none exceeded the ADEC groundwater cleanup standards. Benzene was not detected in any of the groundwater samples collected. Appendix C provides all 1998 laboratory results.

The increase in DRO concentrations in groundwater may be attributable to the significant increase in water table elevation between the 1997 and 1998 sampling events. The water table was approximately 5 feet higher during the 1998 sampling event. In both 409WL02 and



LEGEND

- 1996/1997 MONITORING WELL LOCATION
- 1996 PIEZOMETER LOCATION
- 1998 SOIL BORING LOCATION
- 1998 MONITORING WELL LOCATION

SOURCE: 9010-035/NESEC/9/95

UST = UNDERGROUND STORAGE TANK
DRO = DIESEL RANGE ORGANICS
GRO = GASOLINE RANGE ORGANICS
B = BENZENE
T = TOLUENE
E = ETHYLBENZENE
X = TOTAL XYLENES (SUM OF RESULTS ABOVE MRL)
U = UNDETECTED AT LABORATORY MRL
b = ANALYTE DETECTED IN BLANK ASSOCIATED WITH SAMPLE

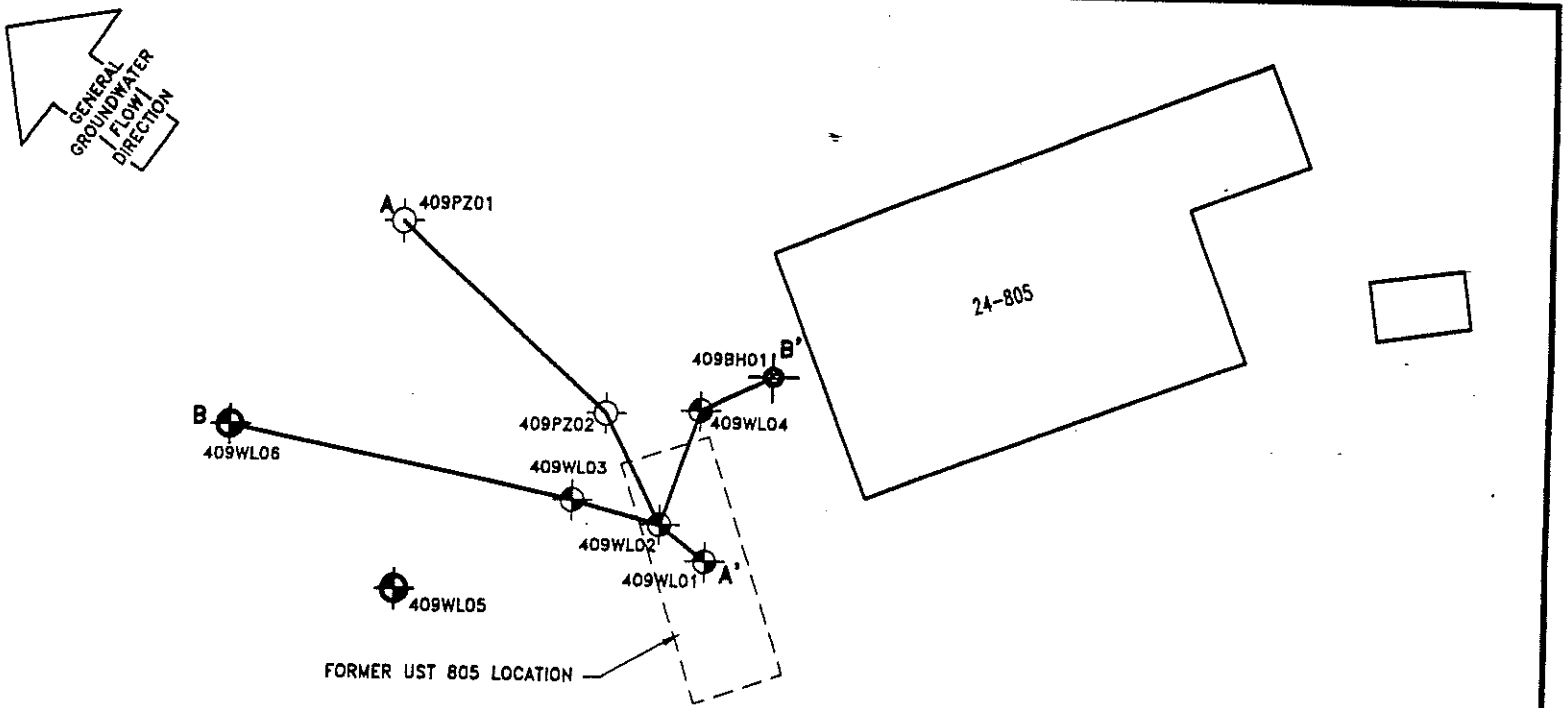
NOTE: ANALYTICAL WATER RESULTS REPORTED AS mg/L

0 15 30
SCALE IN FEET

DRAWING: 9000-168/409GW898
C/SC: 1:30
DATE: 1/14/99
DRAWN: SSR
DISK: 26/98
CHECK: J.S.

FIGURE 3-2
ST409/7, BLDG. 24-805
1998 GROUNDWATER SAMPLE RESULTS

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



LEGEND

- 1996/1997 MONITORING WELL LOCATION
- 1996 PIEZOMETER LOCATION
- 1998 SOIL BORING LOCATION
- 1998 MONITORING WELL LOCATION

SOURCE: 9010-035/NESEC/9/95

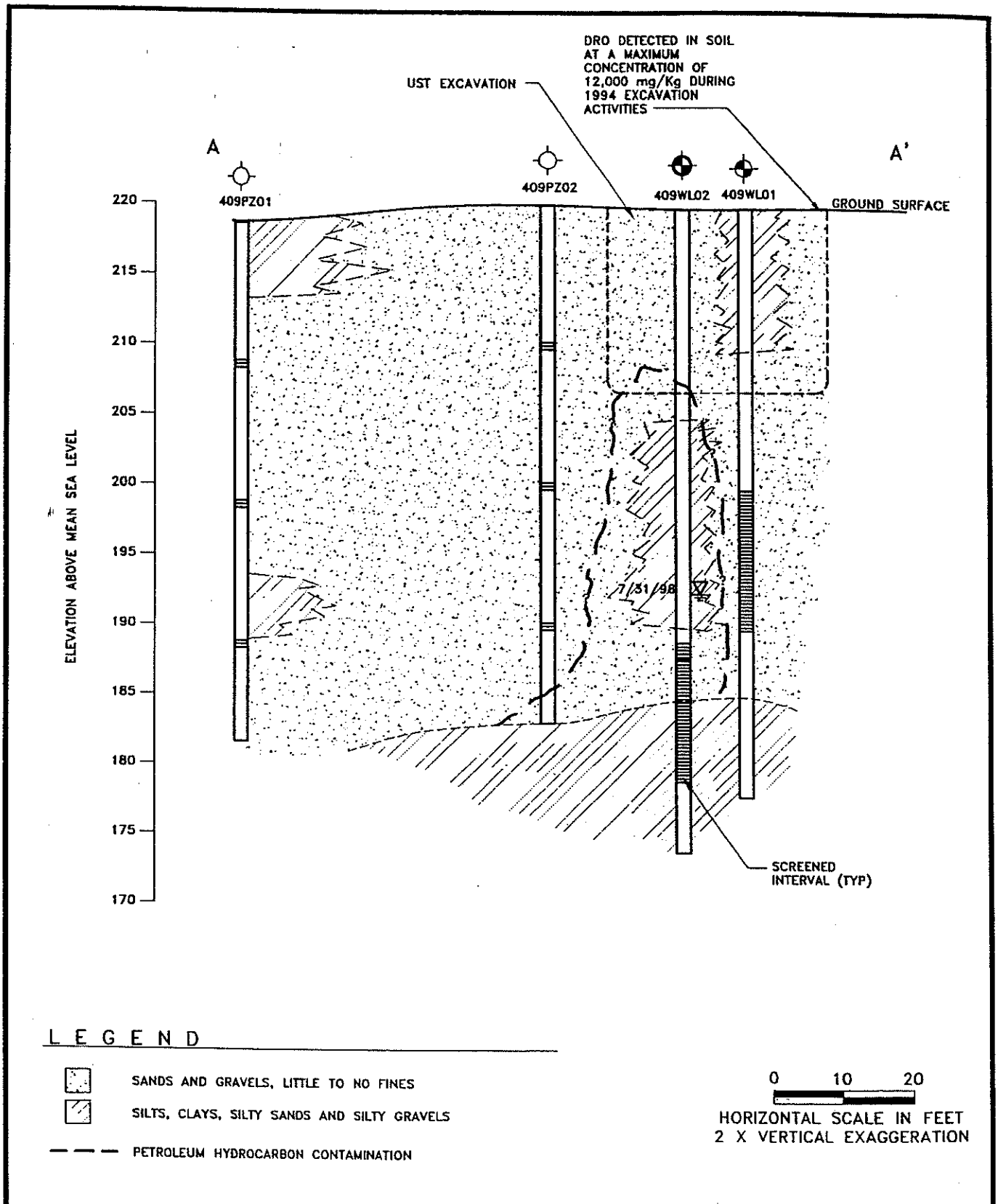
N

0 15 30

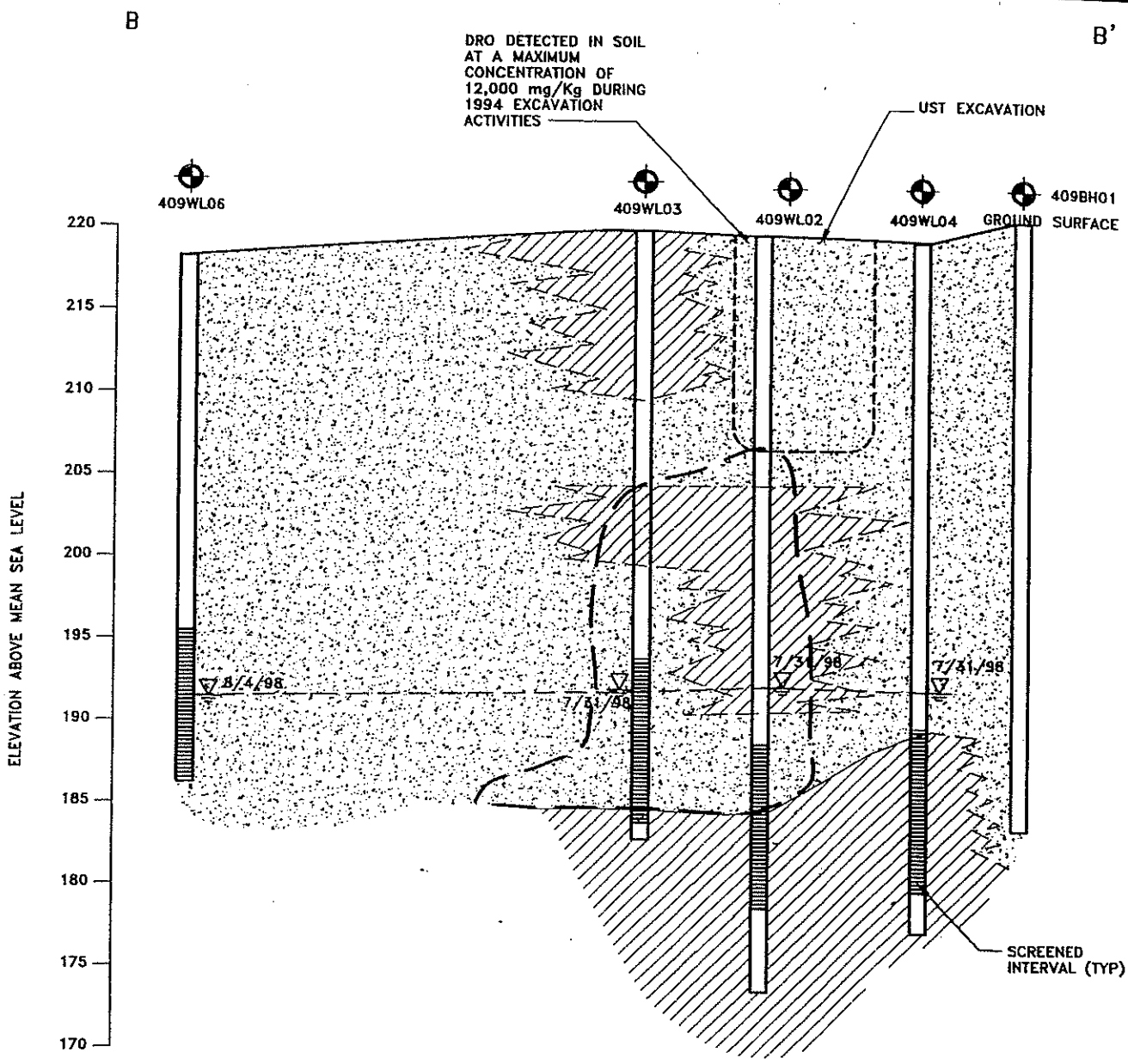
SCALE IN FEET

DRAWING: 9000-168/ 40998	DRAWN: SSR	FIGURE 3-3
C/SC: 1:30	DISK: 26/98	ST409/7, BLDG. 24-805
DATE: 1/13/99	CHECK: J.S.	SITE MAP SHOWING CROSS SECTION

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



DRAWING: 9000-168/ ST409CS DRAWN: SR C/SC: 1:20 DISK: Z 6/96 DATE: 1/13/99 CHECK: J.S.	FIGURE 3-4 ST409/7 CONCEPTUAL SITE MODEL CROSS SECTION A-A'	3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 957011Z3



DRAWING: 9000-168/ ST409CS3 DRAWN: SSR C/SC: 1:20 DISK: 26/98 DATE: 10/16/98 CHECK: J.S.	FIGURE 3-5 ST409/7, BLDG. 24-805 CONCEPTUAL SITE MODEL CROSS SECTION B-B'	3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 95701123

4.0 CONCLUSIONS

4.1 Summary

Soil and groundwater results from 1996, 1997, and 1998 indicate that petroleum hydrocarbons have impacted soil at the former UST site and have migrated to groundwater. The 3 years' soil sample results indicate that petroleum hydrocarbons have impacted soils in the vicinity of the former UST, migrated vertically, and affected the smear zone downgradient of the tank. However, the petroleum hydrocarbon plume in soil appears to have migrated no farther than 50 feet from the former UST location. Over the 3 years of sampling, only four soil samples exceeded the ADEC soil cleanup standard for DRO (250 mg/Kg); no other COCs exceeded cleanup standards. Three of the samples (1996 and 1997) were at a depth of 21 to 31 feet bgs, with DRO concentrations of up to 2,600 mg/Kg. The fourth sample (1998) contained 1,480 mg/Kg DRO at a depth of 5 feet bgs and is believed to not be related to the former UST because of the sample's location relative to other impacted samples.

Groundwater samples from two of the five wells sampled in 1998 contained DRO in excess of the ADEC groundwater cleanup standard (1.5 mg/L DRO), with concentrations of 2.55 and 23.5 mg/L. None of the other petroleum hydrocarbon COCs exceeded the ADEC groundwater cleanup standards. Because ST702 is not within the OU5 Model Area, dissolved-phase contaminants must be addressed as part of the SERA investigation.

4.2 Data Gaps

No data gaps remain in evaluating the nature and extent of contamination for ST409/7. Additional data collection may be necessary to support the chosen method of remediation.

This page intentionally left blank.

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.

U.S. Air Force (USAF). 1993. *Basewide Environmental Staging Facility Operation and Maintenance Plan*.

_____. 1994. *Final Closure and Site Assessment Report for Underground Storage Tank 805*. Prepared for Elmendorf Air Force Base by Harding Lawson Associates. December.

_____. 1996. *Management Action Plan*. Environmental Restoration Program. Revision 3, December.

_____. 1998. SERA Phase VII Release Investigations Work Plan. Elmendorf Air Force Base, Alaska. Final. June.

This page intentionally left blank.

Appendix B

Boring Logs

BORING LOG

BORING NUMBER: 409BH01

CLIENT: US Air Force

PROJECT NAME: SERA VII

SITE: ST 409/7

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 DEPTH (ft): 37

BORING DIAMETER (in): 8

GROUND ELEVATION (ft): 220.7

FIELD PARTY: R. LAFATA, V. FISHER

DATE STARTED: 6/25/98

DATE COMPLETED: 6/25/98

NORTHING: 2642780.3689

EASTING: 1684196.0465

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
5				SS	8 10 12 14	0		SP-SM	Light brown POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), medium to coarse sand, and gravel, 1/4 in. to 2 in. diameter, subrounded, well graded, little silt, moist.
10				SS	8 10 14 16	0			Lithology similar to above, gravel subangular to subrounded, moist.
15				SS	9 14 15 19	0		GP	Light brown POORLY GRADED GRAVEL WITH SAND (GP), gravel 1 in. and 1/4 in. diameter, subangular, poorly graded, and medium to coarse sand, trace silt, moist.
20									

BORING LOG

BORING NUMBER: 409BH01

CLIENT: US Air Force
PROJECT NAME: SERA VII
SITE: ST 409/7
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 DEPTH (ft): 37
BORING DIAMETER (in): 8
GROUND ELEVATION (ft): 220.7
FIELD PARTY: R. LAFATA, V. FISHER

DATE STARTED: 6/25/98
DATE COMPLETED: 6/25/98
NORTHING: 2642780.3689
EASTING: 1684196.0465

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				SS	11 20 25 27	0		GP	Lithology similar to above, olive gray to yellowish-orange, wet
								SP-SM	Olive gray to yellowish-orange **POORLY GRADED SAND WITH SILT (SP-SM)**, coarse sand grading to medium sand at 21.2 ft., little silt, gravel to 1" diameter, subrounded, and large cobble in shoe, moist.
25			409 BH01S0 25.0N1	SS	11 22 33 35	0		SW	Olive gray to yellowish-orange **WELL GRADED SAND WITH GRAVEL (SW)**, grades from fine to medium to coarse sand, gravels mostly 1/2 in. and 1 in. diameter, subrounded, poorly graded, moist, dense. Three inch band of fine gravel (subangular) at top of sample.
30			409 BH01S0 30.0N1	SS	15 20 20 20	0		GP-GM	Yellowish-orange **POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM)**, gravel, 1/4 in. and 1.5 in. diameter, subrounded, and coarse to medium sand, little silt, saturated, loose.
35				SS	9 15 32 16	0		SP-SM	**POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM)**, coarse to medium sand, and gravel, 1/4 in. to 2 in. diameter, angular to rounded, poorly graded, little silt, saturated. Plug of clay at bottom of sampler.
									End of boring at 37 ft. Water level measured while drilling at 29 ft bgs.
40									

BORING LOG

BORING NUMBER: 409PZ01

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST409
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 37
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
REFERENCE ELEVATION (ft): 218.61
CASING STICKUP (in): 0
FIELD PARTY: D. McGee

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 7/17/96
DATE COMPLETED: 7/17/96
NORTHING: 2642803.5
EASTING: 1684137.7

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								ML	Grass surface.	
5				SS	25	2.1			Tan SILTY TOPSOIL (ML), in top 6 inches then.....	
								GW	Medium brown GRAVEL (GW), with 20% fine sand, 15% silt, gravel diameter from 25 to 70 mm, medium dense, damp, no odor.	
10				SS	28	2.7			Medium brown GRAVEL (GW), 20% fine to medium sand, gravel diameter from 50 to 70+ mm, some lignite, moderately to well graded, medium dense, damp, no odor.	
15			409PZ0 1S016. 0N	SS	30	4.6		SP	Medium brown SAND (SP), medium grained, 10% gravel, poorly graded, medium dense to dense.	
20								GW		

BORING LOG

BORING NUMBER: 409PZ01

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST409
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 37
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
REFERENCE ELEVATION (ft): 218.61
CASING STICKUP (in): 0
FIELD PARTY: D. McGee

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 7/17/96
DATE COMPLETED: 7/17/96
NORTHING: 2642803.5
EASTING: 1684137.7

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
				SS	89	1.0		GW	Medium brown GRAVEL (GW), iameter 5 to > 70 mm, 25% fine to medium grained sand, very dense, dry, no hydrocarbon odor. Soil Classsification at 21.0 feet: Gravel 33.7% Sand 53.2% Silt 13.1%	
25				SS	27	0.0		GM	Tan-light brown SILTY GRAVEL (GM), with 15-20% silt, 10% fine sand, gravel diameter from 5 to > 70 mm, moderately dense, dry, no odor.	
30			409PZ0 1S031. ON	SS	52	1.5		GW	Medium brown GRAVEL (GW), with 20% fine to medium grained sand, 10% silt, weli graded, very dense, damp, no odor.	
35				SS	33	0.9			Lithology same as above, saturated.	
									End of boring at 37 feet. Boring completed as a piezometer.	
40										

PIEZOMETER DIAGRAM

BORING NUMBER: 409PZ01

CLIENT: U.S. AIR FORCE

PROJECT NAME: SERA IV

SITE: ST409

JOB NUMBER: 9000-068

LOGGED BY: T. BARRETT APPROVED BY: P. RIBBENS

DRILLED BY: HUGHES DRILLING

METHOD: 4.25 IN. HOLLOW STEM AUGER

BORING DEPTH (ft): 37'

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

REFERENCE ELEVATION (ft):218.61

CASING STICKUP (in): 0

FIELD PARTY: D. McGEE

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

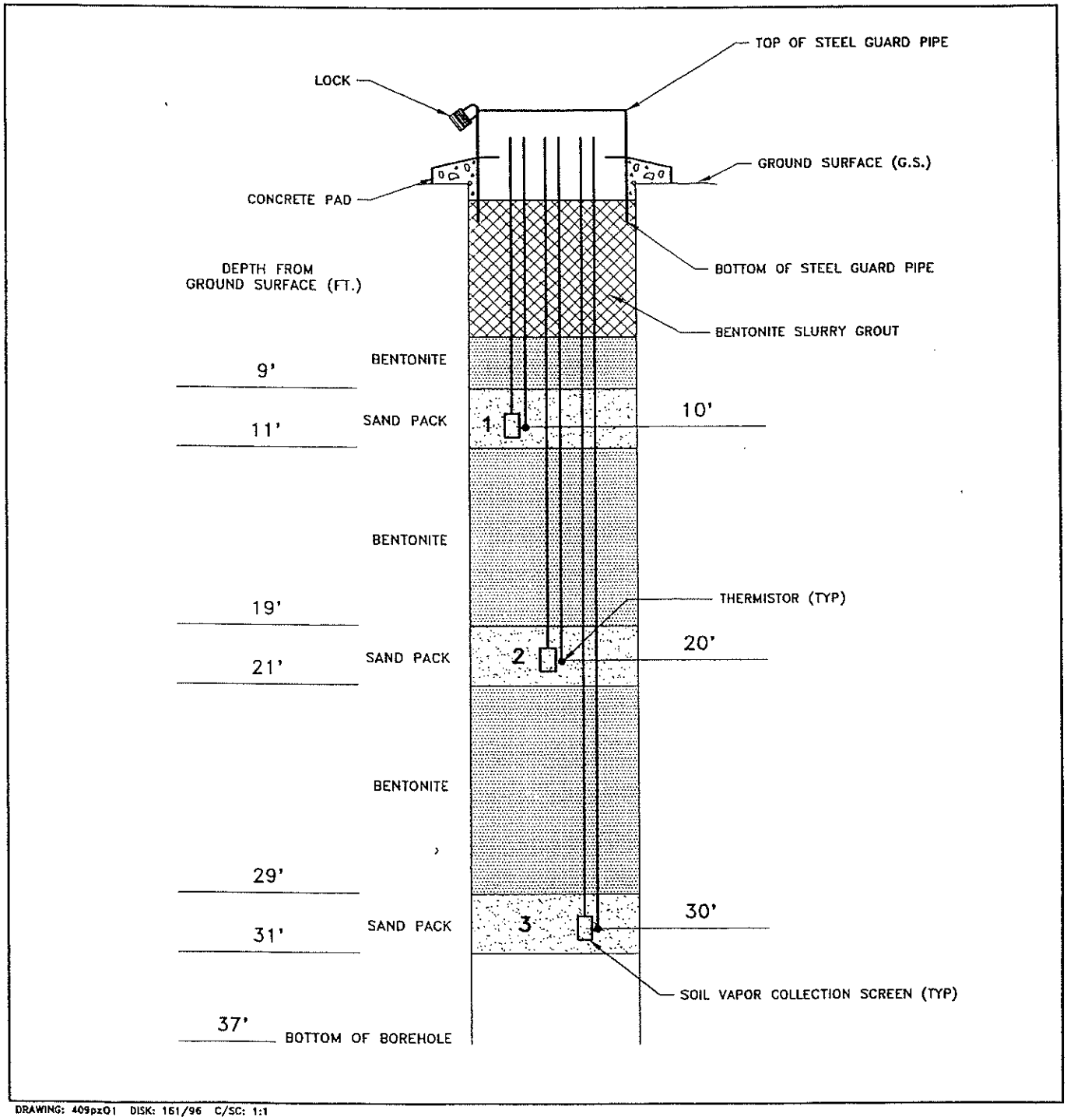
FILTER PACK:

DATE STARTED: 7/17/96

DATE COMPLETED: 7/17/96

NORTHING: 2642803.5

EASTING: 1684137.7



DRAWING: 409pz01 DISK: 161/96 C/SC: 1:1

BORING LOG

BORING NUMBER: 409PZ02

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST409
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 37
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
REFERENCE ELEVATION (ft): 220.02
CASING STICKUP (in): 0
FIELD PARTY: D. McGee

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 7/17/96
DATE COMPLETED: 7/17/96
NORTHING: 2642774.2
EASTING: 1684170.1

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GW	Grass surface.	
5				SS	27	2.0			Medium brown **GRAVEL (GW)**, diameter from 5 to 50 mm, 25% fine to medium grained sand, very well graded, medium dense, subangular gravel, dry, no odor.	
10			409PZ02S011.0N	SS	31	4.8			Medium brown **GRAVEL (GW)**, lithology same as above, dense, damp, no odor.	
15				SS	29	3.4			Lithology same as above.	
20										

BORING LOG

BORING NUMBER: 409PZ02

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST409
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 37
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
REFERENCE ELEVATION (ft): 220.02
CASING STICKUP (in): 0
FIELD PARTY: D. McGee

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 7/17/96
DATE COMPLETED: 7/17/96
NORTHING: 2642774.2
EASTING: 1684170.1

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
				SS	40	2.7		GW	Medium brown GRAVEL (GW), diameter from 5 to > 70 mm, subrounded, 25% fine to medium sand, well graded, dense, damp, no odor.	
25				SS	40	3.4			Lithology same as above, with 5-10% fines, dense, damp.	
30			409PZ02S031.0N	SS	38	26.8		SW	Medium brown SAND (SW), fine to coarse grained, 15% gravel, 10% fines from 30 to 31 feet, well graded, dense, moist, diesel odor from 30 to 31.5 feet. Soil Classification at 31.0 feet: Gravel 26.8% Sand 60.5% Silt 12.7%	
▼ 35				SS	52	21.8			Lithology same as above.	
								ML	End of boring at 37 feet. Boring completed as a piezometer.	
40										

PIEZOMETER DIAGRAM

BORING NUMBER: 409PZ02

CLIENT: U.S. AIR FORCE

PROJECT NAME: SERA IV

SITE: ST409

JOB NUMBER: 9000-068

LOGGED BY: T. BARRETT APPROVED BY: P. RIBBENS

DRILLED BY: HUGHES DRILLING

METHOD: 4.25 IN. HOLLOW STEM AUGER

BORING DEPTH (ft): 37'

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

REFERENCE ELEVATION (ft):220.02

CASING STICKUP (in): 0

FIELD PARTY: D. McGEE

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

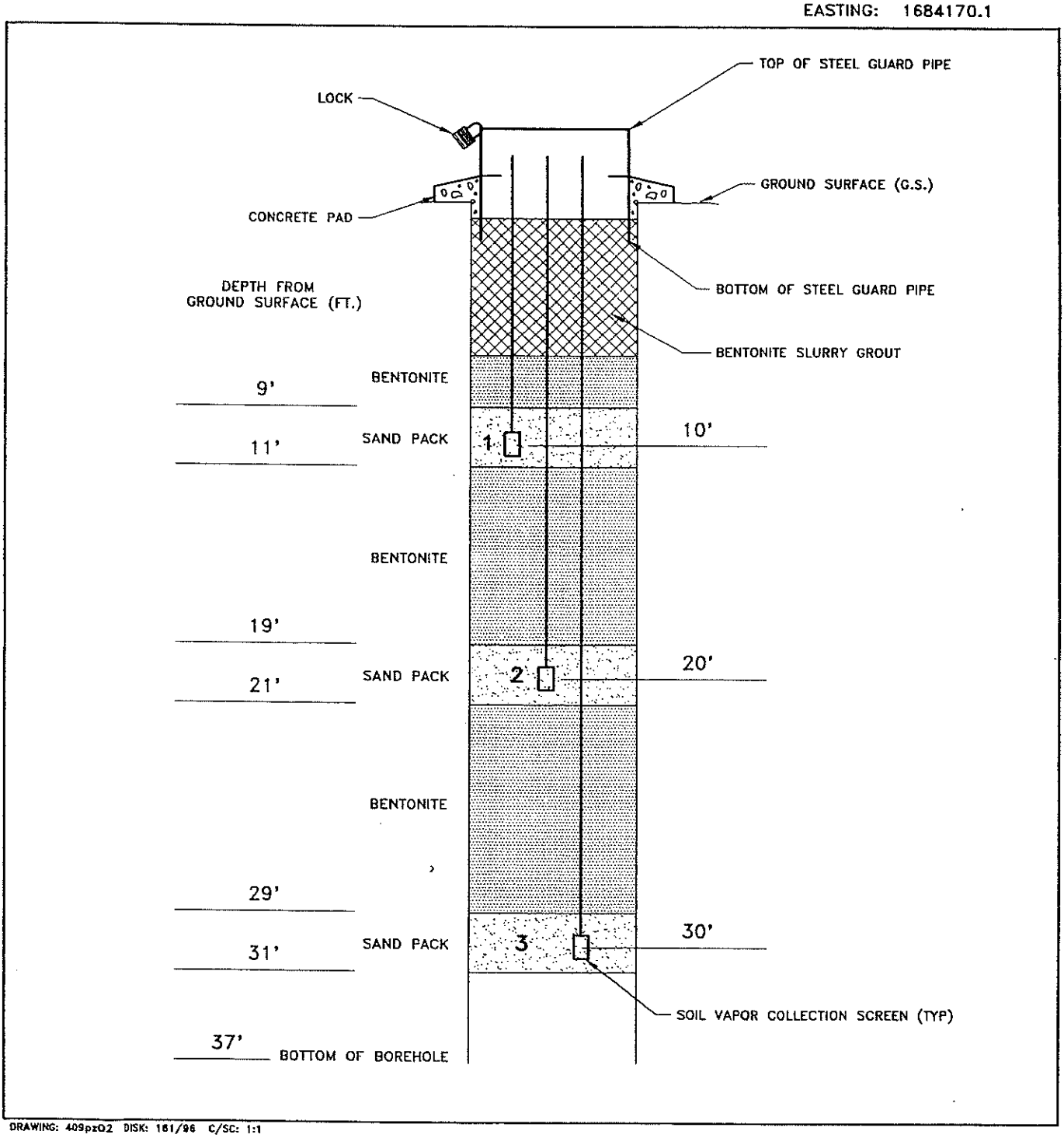
FILTER PACK:

DATE STARTED: 7/17/96

DATE COMPLETED: 7/17/96

NORTHING: 2642774.2

EASTING: 1684170.1



DRAWING: 409pz02 DISK: 161/96 C/SC: 1:1

BORING LOG

BORING NUMBER: 409WL01

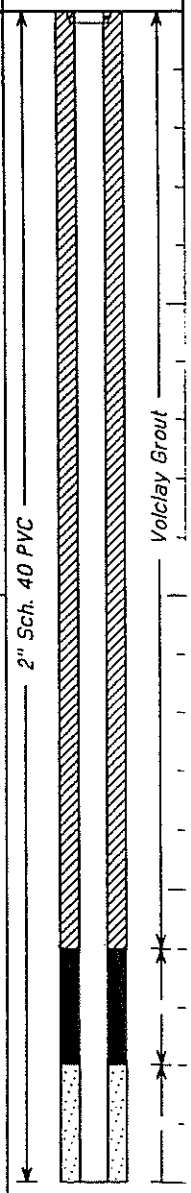
CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST409
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft): 30.25
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.64
CASING STICKUP (in): 0
FIELD PARTY: D. McGee

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 Colorado Sand
DATE STARTED: 7/12/96
DATE COMPLETED: 7/12/96
NORTHING: 2642751.2
EASTING: 1684186.1

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SM	Grass surface.
5				SS	4	83.3			Tan **SILTY SAND (SM)**, with 10% gravel, fine grained sand, gravel diameter from 5 to 25 mm, poor recovery, loose, dry, no odor.
									Likely bottom of excavation.
10			409WL01 SOIL ON	SS	35	91.1		GW	Tan **GRAVEL (GW)**, diameter from 5 to > 70 mm, subrounded, 15 to 20% fine to medium sand, 10% fines, well graded, dense, dry, no hydrocarbon odor.
15				SS	42	97.7			Tan **GRAVEL (GW)**, diameter from 5 to > 70 mm, rounded to subrounded, 20% fine to coarse sand, 5-10% fines, well graded, dense, damp, no hydrocarbon odor.
20									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 409WL01

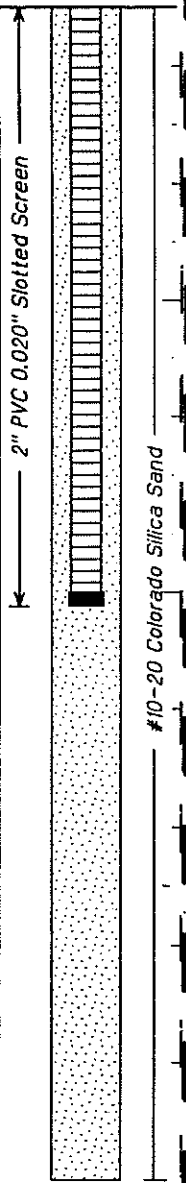
CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST409
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft): 30.25
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.64
CASING STICKUP (in): 0
FIELD PARTY: D. McGee

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 Colorado Sand
DATE STARTED: 7/12/96
DATE COMPLETED: 7/12/96
NORTHING: 2642751.2
EASTING: 1684186.1

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				SS	46	28.8		GW	Light-medium brown GRAVEL (GW), 25% fine to coarse sand, < 5% fines, well graded, dense, damp to moist, no hydrocarbon odor.
25				SS	34	59.7		SW	Medium brown SAND (SW), fine to medium grained, mode approximately 1 mm, 20% gravel diameter from 25 to 70+ mm, matix supported, moderately to well graded, dense, damp, no odor.
30				SS	117	20.2		GP	GRAVEL (GP), fractured gravel, with sand, cutting in top 12 inches of the sampler.
35				SS	52	11.1		ML	Gray CLAYEY SILT (ML), trace fine sand in thin laminae, massive, no features, hard, dry, no odor.
40									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 409WL01

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST409
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft): 30.25
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.64
CASING STICKUP (in): 0
FIELD PARTY: D. McGee

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 Colorado Sand
DATE STARTED: 7/12/96
DATE COMPLETED: 7/12/96
NORTHING: 2642751.2
EASTING: 1684186.1

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			409WL01S041ON	SS	81	11.8		ML	Gray CLAYEY SILT (ML), with fine sand, 15% gravel diametr from 10 to 50 mm, rounded, low plasticity silt, non-cohesive.	
									End of boring at 42 feet. Boring completed as a bioventing well.	
45										
50										
55										
60										

BORING LOG

BORING NUMBER: 409WL02

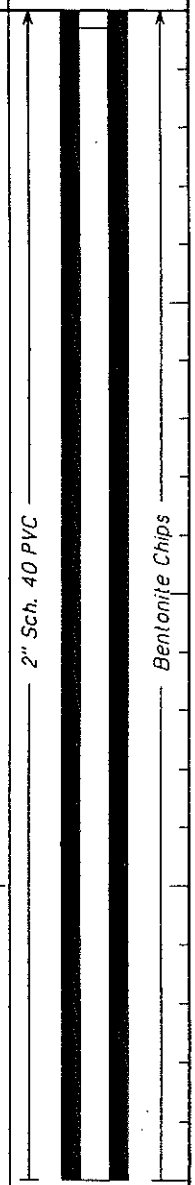
CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST-409
JOB NUMBER: 9000-080
LOGGED BY: J. Shapiro APPROVED BY: J. Noffke
DRILLED BY: Discovery Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 46
BORING DIAMETER (in): 8
WELL DEPTH (ft): 40.9
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.67
CASING STICKUP (in): 0
FIELD PARTY: M. Field

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 Colorado sand
DATE STARTED: 6/26/97
DATE COMPLETED: 6/27/97
NORTHING: 2642756.9
EASTING: 1684178.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SP	Grass surface.
5				SS	13	0.7			Light brown Gravelly SAND (SP), fine to medium sand, little gravel to 1/2" diameter, subangular, dry to moist.
10				SS	5	169.9			As above, little clay, wet, petroleum odor.
15				SS	130	576.5		SM	Olive gray Silty Gravelly SAND (SM), medium sand, some coarse sand to gravel, up to 1" diameter , subangular and subrounded, strong petroleum odor, dark gray staining, wet.
20									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 409WL02

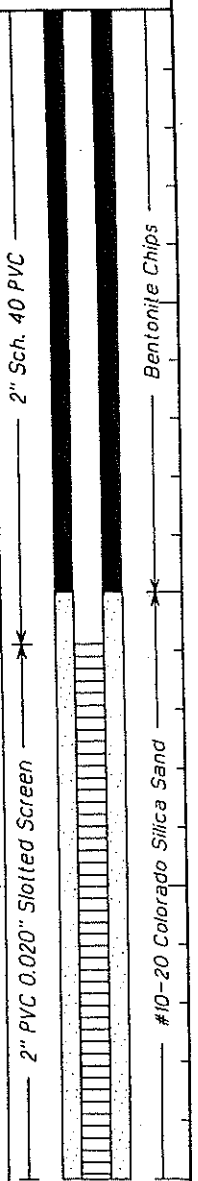
CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST-409
JOB NUMBER: 9000-080
LOGGED BY: J. Shapiro APPROVED BY: J. Noffke
DRILLED BY: Discovery Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 46
BORING DIAMETER (in): 8
WELL DEPTH (ft): 40.9
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.67
CASING STICKUP (in): 0
FIELD PARTY: M. Field

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 Colorado sand
DATE STARTED: 6/26/97
DATE COMPLETED: 6/27/97
NORTHING: 2642756.9
EASTING: 1684178.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
			409 WL02 S021.0 N AND SOFD	SS	73	768.3		SM	Olive gray Silty SAND (SM), fine to coarse sand, little gravel to 1" diameter , subrounded, wood fibers, wet, strong petroleum odor, staining.
25				SS	27	397.1			Lithology same as above, light brown, wet, strong petroleum odor.
30				SS	33	236.4			Lithology same as above.
								SP	Grades to Gravelly SAND (SP), medium sand, gravel to 1/2" diameter, subrounded, wet, strong petroleum odor.
35				SS	46	277.5		SM GM	Olive gray Silty Gravelly SAND (SM), fine to medium sand, some coarse sand and gravel to 1" diameter , subrounded and fractured, cohesive, moist.
40									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 409WL02

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST-409
JOB NUMBER: 9000-080
LOGGED BY: J. Shapiro APPROVED BY: J. Noffke
DRILLED BY: Discovery Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 46
BORING DIAMETER (in): 8
WELL DEPTH (ft): 40.9
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.67
CASING STICKUP (in): 0
FIELD PARTY: M. Field

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 Colorado sand
DATE STARTED: 6/26/97
DATE COMPLETED: 6/27/97
NORTHING: 2642756.9
EASTING: 1684178.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
				SS	100	367.5		SM GM	Light brown to olive gray Clayey/silty Gravelly SAND (SM-GM), fine to medium sand, some coarse sand and gravel to 1" diameter, subangular, dry to moist, petroleum odor.	
45			409 WL02 S045.5 N	SS	122	2.4		ML	Olive gray Sandy Clay/SILT (ML), very fine sand, dry.	
									End of boring at 46 feet. Boring completed as monitoring well.	
50										
55										
60										

BORING LOG

BORING NUMBER: 409WL03

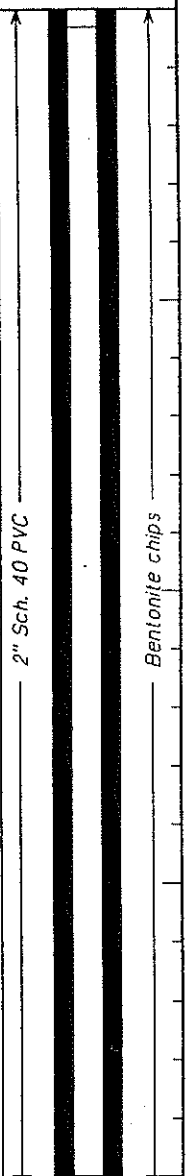
CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST-409
JOB NUMBER: 9000-080
LOGGED BY: J. Shapiro APPROVED BY: J. Noffke
DRILLED BY: Discovery Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 37
BORING DIAMETER (in): 8
WELL DEPTH (ft): 36
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.95
CASING STICKUP (in): 0
FIELD PARTY: M. Field

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): .020
FILTER PACK: 10-20 Colorado sand
DATE STARTED: 6/27/97
DATE COMPLETED: 6/27/97
NORTHING: 2642774.86
EASTING: 1684184.89

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
5				SS	8	0.2		SM	Light brown Silty SAND (SM), fine sand, some gravel to 1" diameter, subangular and subrounded, well graded, dry.
10				SS	11	0.0		SP	Light brown SAND (SP), fine to medium sand, little coarse sand and pea-sized gravel, one large piece of 2" diameter gravel, blocky, moist to wet.
15				SS	84	85.4		SM GM	Olive gray Silty SAND and GRAVEL (SM-GM), fine to medium sand and gravel at 1/4" and 2" diameters, moist to wet.
20								SW	

WELL DIAGRAM



BORING LOG

BORING NUMBER: 409WL03

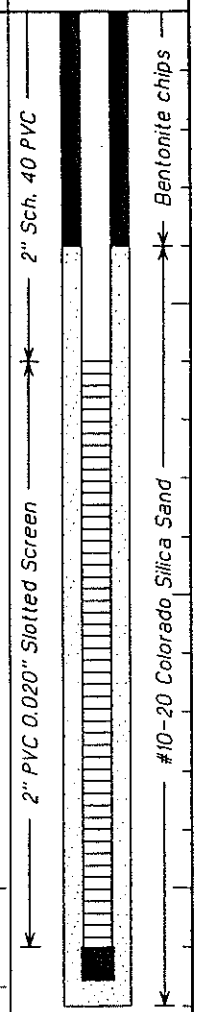
CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST-409
JOB NUMBER: 9000-080
LOGGED BY: J. Shapiro APPROVED BY: J. Noffke
DRILLED BY: Discovery Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 37
BORING DIAMETER (in): 8
WELL DEPTH (ft): 36
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.95
CASING STICKUP (in): 0
FIELD PARTY: M. Field

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): .020
FILTER PACK: 10-20 Colorado sand
DATE STARTED: 6/27/97
DATE COMPLETED: 6/27/97
NORTHING: 2642774.86
EASTING: 1684184.89

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				SS	59	146.8		SW	Olive gray Gravelly SAND (SW), fine to coarse sand and gravel to 1/2", subrounded, wet.
25			409 WL03SO 26.0N	SS	64	268			Lithology same as above. Moist to wet. Petroleum odor.
30				SS	32	NR			No recovery.
35			409 WL03SO 35.0N	SS	45	522.6		SM GM	Dark gray Gravelly Silty SAND (SM-GM), fine to medium sand, some gravel at 1/2" and 1" diameters, subrounded (poorly graded), moist to wet.
								CL	Light brown Clay (CL) in shoe.
40									End of boring at 37 feet. Boring completed as monitoring well.

WELL DIAGRAM



BORING LOG

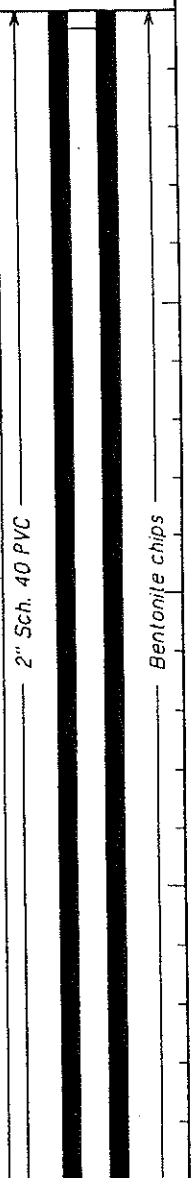
BORING NUMBER: 409WL04

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST-409
JOB NUMBER: 9000-080
LOGGED BY: J. Shapiro APPROVED BY: J. Noffke
DRILLED BY: Discovery Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft): 38.5
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.3
CASING STICKUP (in): 0
FIELD PARTY: M. Field

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): .020
FILTER PACK: 10-20 Colorado sand
DATE STARTED: 6/28/97
DATE COMPLETED: 6/28/97
NORTHING: 2642760.59
EASTING: 1684165.11

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SP	Grass surface.
5				SS	42	0.0			Light brown Gravelly SAND (SP), fine to medium sand, some gravel to 2" diameter , blocky, angular, little silt, dry to moist at 6 feet.
10				SS	45	0.0			Lithology same as above, dry to moist.
15				SS	61	0.1			Lithology same as above, dry.
20									



BORING LOG

BORING NUMBER: 409WL04

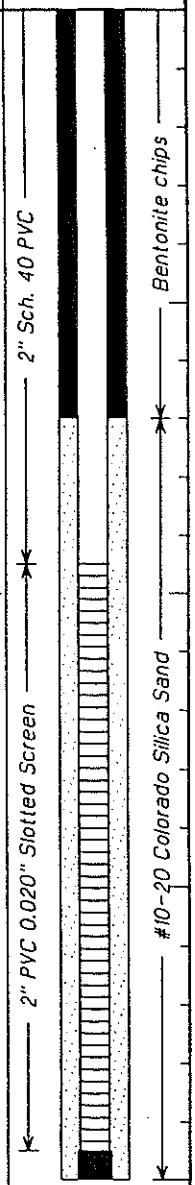
CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST-409
JOB NUMBER: 9000-080
LOGGED BY: J. Shapiro APPROVED BY: J. Noffke
DRILLED BY: Discovery Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft): 38.5
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.3
CASING STICKUP (in): 0
FIELD PARTY: M. Field

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): .020
FILTER PACK: 10-20 Colorado sand
DATE STARTED: 6/28/97
DATE COMPLETED: 6/28/97
NORTHING: 2642760.59
EASTING: 1684165.11

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				SS	92	1.0		SP	As above, wet at top of spoon, remainder moist to dry. On rock - no recovery.
25				SS	50	NR			
30			409 WL04S0 31.0N	SS	67	0.0		SM	Olive gray Silty gravelly SAND (SM), fine to coarse sand, gravel at 3/4" and 1" diameters, subrounded, some silt, moist to wet.
35				SS	193	0.4			No recovery on first attempt. Redrove sample. Olive gray Silty SAND (SM), fine to medium sand, little gravel to 1" diameter, subrounded, few clumps of clay, loose, saturated.
				SS	200	NR			Olive gray Clayey SILT (ML), trace coarse sand, wet.
40									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 409WL04

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST-409
JOB NUMBER: 9000-080
LOGGED BY: J. Shapiro APPROVED BY: J. Noffke
DRILLED BY: Discovery Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft): 38.5
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 219.3
CASING STICKUP (in): 0
FIELD PARTY: M. Field

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): .020
FILTER PACK: 10-20 Colorado sand
DATE STARTED: 6/28/97
DATE COMPLETED: 6/28/97
NORTHING: 2642760.59
EASTING: 1684165.11

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			409 WL04SO 40.0N	SS	156	NR		SM	Olive gray Silt and Fine SAND (SM), little medium sand, trace coarse sand and gravel to 1" diameter , rounded, dense, tight, appears moist.	
									End of boring at 42 feet. Boring completed as monitoring well.	
45										
50										
55										
60										

BORING LOG

BORING NUMBER: 409WL05

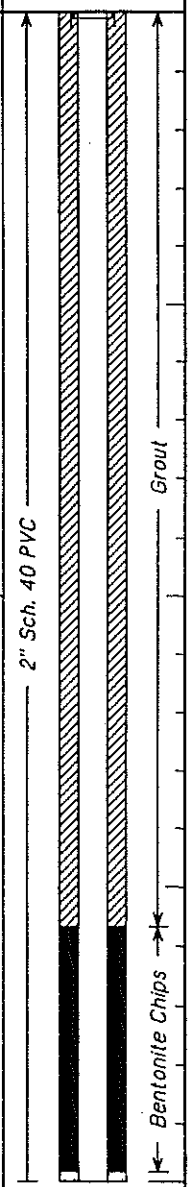
CLIENT: US Air Force
PROJECT NAME: SERA VII
SITE: ST 409/7
ENSR JOB NUMBER: 9000-168
LOGGED BY: J. SHAPIRO REVIEWED BY: S. WRENN
DRILLED BY: HUGHES DRILLING
RIG: CME 75, 4.25" ID HSA w/ 340# hammer, 3" OD SS

BORING DEPTH (ft): 30
BORING DIAMETER (in): 8.25
WELL DEPTH (ft): 32.5
WELL DIAMETER (in): 2
GROUND ELEVATION (ft): 218.5
TOP OF CASING ELEV (ft): 217.96
FIELD PARTY: V. FISHER, R. LAFATA

SCREEN LENGTH (ft): 10
SCREEN TYPE: SLOTTED PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 COLORADO SAND
DATE STARTED: 06/24/98
DATE COMPLETED: 06/24/98
NORTHING: 2642746.3540
EASTING: 1684137.5089

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
5			409 WL05SO 5.0N1	SS	3 4 11 18	26.3		SP	Light brown/olive gray POORLY GRADED SAND WITH GRAVEL (SP), medium sand, little coarse sand, little gravel, 1/4 in. diameter, subrounded to angular, trace fines, moist. Zone of fractured gravel at 12 in. in sample, fractured, angular, to 3 in. diameter (possibly broken by split-spoon), dry. Odor noted - petroleum? Slight "pine" scent.
10				SS	6 12 20 24	10.5		SP-SM	Dark brown POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), medium to coarse sand with little silt, and gravel, 1/4 in. to 2 in. diameter, subrounded to subangular, moist.
15			409 WL05SO 15.0N1	SS	7 5 13 12	2.9			Light brown POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), medium to coarse sand, and gravel, 3/4 in. diameter, subrounded, some silt in top 9 in. of sample, trace in bottom 9 in., moist.
20									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 409WL05

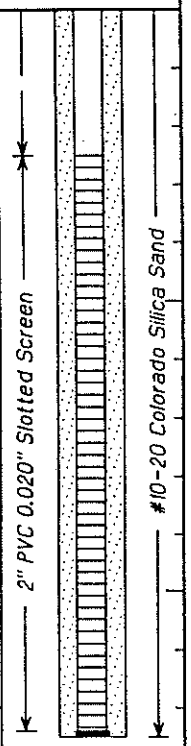
CLIENT: US Air Force
PROJECT NAME: SERA VII
SITE: ST 409/7
ENSR JOB NUMBER: 9000-168
LOGGED BY: J. SHAPIRO REVIEWED BY: S. WRENN
DRILLED BY: HUGHES DRILLING
RIG: CME 75, 4.25" ID HSA w/ 340# hammer, 3" OD SS

BORING DEPTH (ft): 30
BORING DIAMETER (in): 8.25
WELL DEPTH (ft): 32.5
WELL DIAMETER (in): 2
GROUND ELEVATION (ft): 218.5
TOP OF CASING ELEV (ft): 217.96
FIELD PARTY: V. FISHER, R. LAFATA

SCREEN LENGTH (ft): 10
SCREEN TYPE: SLOTTED PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 COLORADO SAND
DATE STARTED: 06/24/98
DATE COMPLETED: 06/24/98
NORTHING: 2642746.3540
EASTING: 1684137.5089

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				SS	6 17 29 33	2.2		SP-SM	Light brown POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), medium to coarse sand, and gravel to 2 in. diameter, subrounded to subangular, blocky, poorly graded, little fines, wet.
25				SS	60 7 10 16	1.7		SP	Olive gray POORLY GRADED SAND WITH GRAVEL (SP), medium to coarse sand, some gravel, mostly 1/2 in. diameter (little to 2 in. diameter), subrounded, poorly graded, trace fines, wet.
30			409 WL05SO 30.0N1	SS	7 74 63 74	0.8		GP-GM	Olive gray POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), gravel to 3 in. diameter, blocky, subangular to angular, and medium to coarse sand, little fines, loose, saturated.
									Boring advanced to 32.5 ft bgs. Water level measured while drilling at 26.2 ft bgs. Boring completed as monitoring well.
35									
40									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 409WL06

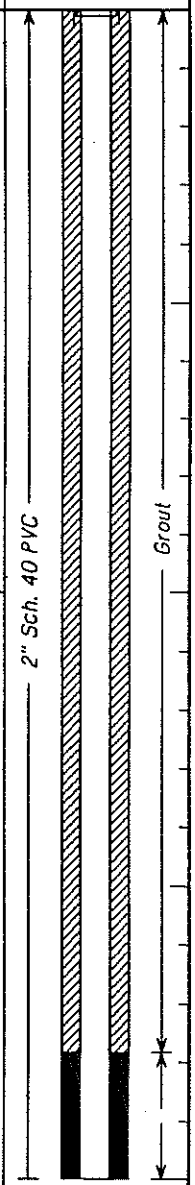
CLIENT: US Air Force
PROJECT NAME: SERA VII
SITE: ST 409/7
ENSR JOB NUMBER: 9000-168
LOGGED BY: J. SHAPIRO REVIEWED BY: S. WRENN
DRILLED BY: HUGHES DRILLING
RIG: CME 75, 4.25" ID HSA w/ 340# hammer, 3" OD SS

BORING DEPTH (ft): 30
BORING DIAMETER (in): 8.25
WELL DEPTH (ft): 33
WELL DIAMETER (in): 2
GROUND ELEVATION (ft): 218.1
TOP OF CASING ELEV (ft): 217.56
FIELD PARTY: V. FISHER, R. LAFATA

SCREEN LENGTH (ft): 10
SCREEN TYPE: SLOTTED PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 COLORADO SAND
DATE STARTED: 06/25/98
DATE COMPLETED: 06/25/98
NORTHING: 2642771.5997
EASTING: 1684111.2112

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
5				SS	2 3 5 6	0		SW	Light brown WELL GRADED SAND WITH GRAVEL (SW), fine to coarse sand, some gravel, 1/4 in. to 1 in. diameter, subrounded, poorly graded, moist. Band of clean, medium sand at top 4 in. of sample, moist.
10				SS	7 18 20 21	0		SW-SM	WELL GRADED SAND WITH SILT AND GRAVEL (SW-SM), lithology similar to above, little fines, wet at 6 in. in sample.
15				SS	11 17 32 25	0			Lithology similar to above, wet. Apparently cored through large rock from 10 to 16 in. in sample, dry, fractured.
20									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 409WL06

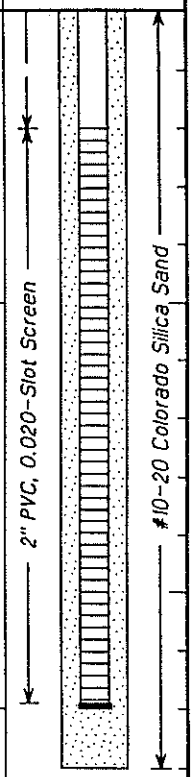
CLIENT: US Air Force
PROJECT NAME: SERA VII
SITE: ST 409/7
ENSR JOB NUMBER: 9000-168
LOGGED BY: J. SHAPIRO REVIEWED BY: S. WRENN
DRILLED BY: HUGHES DRILLING
RIG: CME 75, 4.25" ID HSA w/ 340# hammer, 3" OD SS

BORING DEPTH (ft): 30
BORING DIAMETER (in): 8.25
WELL DEPTH (ft): 33
WELL DIAMETER (in): 2
GROUND ELEVATION (ft): 218.1
TOP OF CASING ELEV (ft): 217.56
FIELD PARTY: V. FISHER, R. LAFATA

SCREEN LENGTH (ft): 10
SCREEN TYPE: SLOTTED PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 COLORADO SAND
DATE STARTED: 06/25/98
DATE COMPLETED: 06/25/98
NORTHING: 2642771.5997
EASTING: 1684111.2112

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	ATH (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
				SS	18 36 41 34	0		SW-SM	Lithology similar to above, cored through some cobbles, increased gravel content, wet in sandy matrix.
25 ▼			409 WL06SO 26.0N1	SS	10 13 17 23	0		GP-GM	POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), gravel 1/4 in. to 2 in. diameter, subangular, in matrix of silty (little) coarse to medium sand, saturated. Zone of clean medium sand, wet, at top 7 in. of sample.
30			409 WL06SO 30.0N1	SS	13 41 52 14/ 1"	0			POORLY GRADED GRAVEL WITH SILT AND SAND (GP-GM), fine gravel, some coarse to medium sand, little silt, saturated.
									Bottom of boring at 32 ft. Boring completed as monitoring well.
35									
40									

WELL DIAGRAM



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 409/7
Building 24-805, Hospital Outbuilding
SERA VII 1998 Analytical Results Summary

FIELD_ID	LAB_ID	DATE	MATRIX	ANALYSIS		PARAMETER	RESULT		UNITS	MRL	Dilfac	V_Rcd
409BH01SO25.0N1	983257004	06/26/98	SO	AK102	SW3550	Diesel Range Organics	3.83	U	MG/KG	3.83	0.915	
409BH01SO25.0N1	983257004	06/26/98	SO	A2540G	NONE	Total Solids	95.5		PERCENT		1	
409BH01SO25.0N1	983257004	06/26/98	SO	AK101	AK101PR	Gasoline Range Organics	1.09	U	MG/KG	1.09	0.519	
409BH01SO25.0N1	983257004	06/26/98	SO	AK101	AK101PR	Benzene	0.0272	U	MG/KG	0.0272	0.519	
409BH01SO25.0N1	983257004	06/26/98	SO	AK101	AK101PR	Toluene	0.0358	B	MG/KG	0.0272	0.519	B
409BH01SO25.0N1	983257004	06/26/98	SO	AK101	AK101PR	Ethylbenzene	0.0272	U	MG/KG	0.0272	0.519	
409BH01SO25.0N1	983257004	06/26/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.0272	U	MG/KG	0.0272	0.519	
409BH01SO25.0N1	983257004	06/26/98	SO	AK101	AK101PR	o-Xylene	0.0272	U	MG/KG	0.0272	0.519	
409BH01SO30.0N1	983257003	06/26/98	SO	AK102	SW3550	Diesel Range Organics	4.19		MG/KG	3.8	0.864	
409BH01SO30.0N1	983257003	06/26/98	SO	A2540G	NONE	Total Solids	90.9		PERCENT		1	
409BH01SO30.0N1	983257003	06/26/98	SO	AK101	AK101PR	Gasoline Range Organics	4.58		MG/KG	1.1	0.501	
409BH01SO30.0N1	983257003	06/26/98	SO	AK101	AK101PR	Benzene	0.0275	U	MG/KG	0.0275	0.501	
409BH01SO30.0N1	983257003	06/26/98	SO	AK101	AK101PR	Toluene	0.18		MG/KG	0.0275	0.501	B
409BH01SO30.0N1	983257003	06/26/98	SO	AK101	AK101PR	Ethylbenzene	0.0275	U	MG/KG	0.0275	0.501	
409BH01SO30.0N1	983257003	06/26/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.05	B	MG/KG	0.0275	0.501	B
409BH01SO30.0N1	983257003	06/26/98	SO	AK101	AK101PR	o-Xylene	0.0275	U	MG/KG	0.0275	0.501	
409WL05SO5.0N1	983197001	06/24/98	SO	AK102	SW3550	Diesel Range Organics	1480		MG/KG	20.7	4.938	J
409WL05SO5.0N1	983197001	06/24/98	SO	E160.3	NONE	Total Solids	95.5		PERCENT		1	
409WL05SO5.0N1	983197001	06/24/98	SO	AK101	AK101PR	Gasoline Range Organics	2.2		MG/KG	1.07	0.513	
409WL05SO5.0N1	983197001	06/24/98	SO	AK101	AK101PR	Benzene	0.0268	U	MG/KG	0.0268	0.513	
409WL05SO5.0N1	983197001	06/24/98	SO	AK101	AK101PR	Toluene	0.0268	U	MG/KG	0.0268	0.513	
409WL05SO5.0N1	983197001	06/24/98	SO	AK101	AK101PR	Ethylbenzene	0.0268	U	MG/KG	0.0268	0.513	
409WL05SO5.0N1	983197001	06/24/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.0391		MG/KG	0.0268	0.513	
409WL05SO5.0N1	983197001	06/24/98	SO	AK101	AK101PR	o-Xylene	0.0341		MG/KG	0.0268	0.513	
409WL05SO15.0N1	983197002	06/24/98	SO	AK102	SW3550	Diesel Range Organics	4.51		MG/KG	4.16	0.986	
409WL05SO15.0N1	983197002	06/24/98	SO	E160.3	NONE	Total Solids	94.9		PERCENT		1	
409WL05SO15.0N1	983197002	06/24/98	SO	AK101	AK101PR	Gasoline Range Organics	0.957	U	MG/KG	0.957	0.454	
409WL05SO15.0N1	983197002	06/24/98	SO	AK101	AK101PR	Benzene	0.0239	U	MG/KG	0.0239	0.454	
409WL05SO15.0N1	983197002	06/24/98	SO	AK101	AK101PR	Toluene	0.0239	U	MG/KG	0.0239	0.454	
409WL05SO15.0N1	983197002	06/24/98	SO	AK101	AK101PR	Ethylbenzene	0.0239	U	MG/KG	0.0239	0.454	
409WL05SO15.0N1	983197002	06/24/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.0239	U	MG/KG	0.0239	0.454	
409WL05SO15.0N1	983197002	06/24/98	SO	AK101	AK101PR	o-Xylene	0.0239	U	MG/KG	0.0239	0.454	
409WL05SO30.0N1	983197003	06/24/98	SO	AK102	SW3550	Diesel Range Organics	4.21	U	MG/KG	4.21	0.99	
409WL05SO30.0N1	983197003	06/24/98	SO	E160.3	NONE	Total Solids	94		PERCENT		1	
409WL05SO30.0N1	983197003	06/24/98	SO	AK101	AK101PR	Gasoline Range Organics	1.56	U	MG/KG	1.56	0.733	
409WL05SO30.0N1	983197003	06/24/98	SO	AK101	AK101PR	Benzene	0.039	U	MG/KG	0.039	0.733	
409WL05SO30.0N1	983197003	06/24/98	SO	AK101	AK101PR	Toluene	0.039	U	MG/KG	0.039	0.733	
409WL05SO30.0N1	983197003	06/24/98	SO	AK101	AK101PR	Ethylbenzene	0.039	U	MG/KG	0.039	0.733	
409WL05SO30.0N1	983197003	06/24/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.039	U	MG/KG	0.039	0.733	
409WL05SO30.0N1	983197003	06/24/98	SO	AK101	AK101PR	o-Xylene	0.039	U	MG/KG	0.039	0.733	
409WL06SO26.0N1	983257002	06/26/98	SO	AK102	SW3550	Diesel Range Organics	18.2		MG/KG	4.14	0.975	
409WL06SO26.0N1	983257002	06/26/98	SO	A2540G	NONE	Total Solids	94.2		PERCENT		1	
409WL06SO26.0N1	983257002	06/26/98	SO	AK101	AK101PR	Gasoline Range Organics	1.54		MG/KG	1.01	0.475	
409WL06SO26.0N1	983257002	06/26/98	SO	AK101	AK101PR	Benzene	0.0252	U	MG/KG	0.0252	0.475	
409WL06SO26.0N1	983257002	06/26/98	SO	AK101	AK101PR	Toluene	0.131	B	MG/KG	0.0252	0.475	B
409WL06SO26.0N1	983257002	06/26/98	SO	AK101	AK101PR	Ethylbenzene	0.0252	U	MG/KG	0.0252	0.475	
409WL06SO26.0N1	983257002	06/26/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.0321	B	MG/KG	0.0252	0.475	B
409WL06SO26.0N1	983257002	06/26/98	SO	AK101	AK101PR	o-Xylene	0.0252	U	MG/KG	0.0252	0.475	
409WL06SO30N1	983257001	06/26/98	SO	AK102	SW3550	Diesel Range Organics	4.32		MG/KG	4.21	0.951	
409WL06SO30N1	983257001	06/26/98	SO	A2540G	NONE	Total Solids	90.4		PERCENT		1	
409WL06SO30N1	983257001	06/26/98	SO	AK101	AK101PR	Gasoline Range Organics	0.692	U	MG/KG	0.692	0.313	
409WL06SO30N1	983257001	06/26/98	SO	AK101	AK101PR	Benzene	0.0173	U	MG/KG	0.0173	0.313	
409WL06SO30N1	983257001	06/26/98	SO	AK101	AK101PR	Toluene	0.0173	U	MG/KG	0.0173	0.313	
409WL06SO30N1	983257001	06/26/98	SO	AK101	AK101PR	Ethylbenzene	0.0173	U	MG/KG	0.0173	0.313	
409WL06SO30N1	983257001	06/26/98	SO	AK101	AK101PR	m,p-Xylene (Sum of Isomers)	0.0173	U	MG/KG	0.0173	0.313	
409WL06SO30N1	983257001	06/26/98	SO	AK101	AK101PR	o-Xylene	0.0173	U	MG/KG	0.0173	0.313	

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 409/7
Building 24-805, Hospital Outbuilding
SERA VII 1998 Analytical Results Summary

FIELD_ID	LAB_ID	DATE	MATRIX	ANALYSIS		PARAMETER	RESULT		UNITS	MRL	Dilfac	V_Rcd
409WL02WGN1	984113001	07/31/98	WS	AK102	SW3510	Diesel Range Organics	2.55		MG/L	0.105	1.053	
409WL02WGN1	984113001	07/31/98	WS	AK101	SW5030A	Gasoline Range Organics	0.044		MG/L	0.04	1	
409WL02WGN1	984113001	07/31/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1	
409WL02WGN1	984113001	07/31/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1	
409WL02WGN1	984113001	07/31/98	WS	AK101	SW5030A	Ethylbenzene	0.0023		MG/L	0.001	1	
409WL02WGN1	984113001	07/31/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.0091		MG/L	0.001	1	
409WL02WGN1	984113001	07/31/98	WS	AK101	SW5030A	o-Xylene	0.0079		MG/L	0.001	1	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Acenaphthene	0.052	U	UG/L	0.052	1.031	UJ
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Acenaphthylene	0.052	U	UG/L	0.052	1.031	UJ
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Anthracene	0.052	U	UG/L	0.052	1.031	UR
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Benzo(a)anthracene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Benzo(a)pyrene	0.052	U	UG/L	0.052	1.031	UR
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Benzo(b)fluoranthene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Benzo(g,h,i)perylene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Benzo(k)fluoranthene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Chrysene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Dibenzo(a,h)anthracene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Fluoranthene	0.052	U	UG/L	0.052	1.031	UJ
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Fluorene	0.052	U	UG/L	0.052	1.031	UJ
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Indeno(1,2,3-cd)pyrene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Naphthalene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Phenanthrene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1	984113001	07/31/98	WS	PAHSIM	SW3510	Pyrene	0.052	U	UG/L	0.052	1.031	
409WL02WGN1 DUP	984113002	07/31/98	WS	AK102	SW3510	Diesel Range Organics	3.84		MG/L	0.104	1.042	
409WL02WGN1 DUP	984113002	07/31/98	WS	AK101	SW5030A	Gasoline Range Organics	0.07		MG/L	0.04	1	
409WL02WGN1 DUP	984113002	07/31/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1	
409WL02WGN1 DUP	984113002	07/31/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1	
409WL02WGN1 DUP	984113002	07/31/98	WS	AK101	SW5030A	Ethylbenzene	0.0047		MG/L	0.001	1	B
409WL02WGN1 DUP	984113002	07/31/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.0179		MG/L	0.001	1	B
409WL02WGN1 DUP	984113002	07/31/98	WS	AK101	SW5030A	o-Xylene	0.0142		MG/L	0.001	1	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Acenaphthene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Acenaphthylene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Anthracene	0.053	U	UG/L	0.053	1.053	UR
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Benzo(a)anthracene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Benzo(a)pyrene	0.053	U	UG/L	0.053	1.053	UR
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Benzo(b)fluoranthene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Benzo(g,h,i)perylene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Benzo(k)fluoranthene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Chrysene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Dibenzo(a,h)anthracene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Fluoranthene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Fluorene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Indeno(1,2,3-cd)pyrene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Naphthalene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Phenanthrene	0.053	U	UG/L	0.053	1.053	
409WL02WGN1 DUP	984113002	07/31/98	WS	PAHSIM	SW3510	Pyrene	0.053	U	UG/L	0.053	1.053	
409WL03WGN1	984113003	07/31/98	WS	AK102	SW3510	Diesel Range Organics	23.5		MG/L	0.206	2.062	
409WL03WGN1	984113003	07/31/98	WS	AK101	SW5030A	Gasoline Range Organics	0.12		MG/L	0.04	1	
409WL03WGN1	984113003	07/31/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1	
409WL03WGN1	984113003	07/31/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1	
409WL03WGN1	984113003	07/31/98	WS	AK101	SW5030A	Ethylbenzene	0.0039		MG/L	0.001	1	
409WL03WGN1	984113003	07/31/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.0144		MG/L	0.001	1	
409WL03WGN1	984113003	07/31/98	WS	AK101	SW5030A	o-Xylene	0.0126		MG/L	0.001	1	
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Acenaphthene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Acenaphthylene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Anthracene	0.053	U	UG/L	0.053	1.064	UR
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Benzo(a)anthracene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Benzo(a)pyrene	0.053	U	UG/L	0.053	1.064	UR
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Benzo(b)fluoranthene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Benzo(g,h,i)perylene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Benzo(k)fluoranthene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Chrysene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Dibenzo(a,h)anthracene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Fluoranthene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Fluorene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Indeno(1,2,3-cd)pyrene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Naphthalene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Phenanthrene	0.053	U	UG/L	0.053	1.064	UJ
409WL03WGN1	984113003	07/31/98	WS	PAHSIM	SW3510	Pyrene	0.053	U	UG/L	0.053	1.064	UJ

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 409/7
Building 24-805, Hospital Outbuilding
SERA VII 1998 Analytical Results Summary

FIELD_ID	LAB_ID	DATE	MATRIX	ANALYSIS		PARAMETER	RESULT		UNITS	MRL	Dilfac	V_Rcd
409WL04WGN1	984113004	07/31/98	WS	AK102	SW3510	Diesel Range Organics	0.103	U	MG/L	0.103	1.031	
409WL04WGN1	984113004	07/31/98	WS	AK101	SW5030A	Gasoline Range Organics	0.04	U	MG/L	0.04	1	
409WL04WGN1	984113004	07/31/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1	
409WL04WGN1	984113004	07/31/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1	
409WL04WGN1	984113004	07/31/98	WS	AK101	SW5030A	Ethylbenzene	0.0021		MG/L	0.001	1	
409WL04WGN1	984113004	07/31/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.0078		MG/L	0.001	1	
409WL04WGN1	984113004	07/31/98	WS	AK101	SW5030A	o-Xylene	0.0064		MG/L	0.001	1	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Acenaphthene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Acenaphthylene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Anthracene	0.052	U	UG/L	0.052	1.042	UR
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Benzo(a)anthracene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Benzo(a)pyrene	0.052	U	UG/L	0.052	1.042	UR
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Benzo(b)fluoranthene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Benzo(g,h,i)perylene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Benzo(k)fluoranthene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Chrysene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Dibenzo(a,h)anthracene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Fluoranthene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Fluorene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Indeno(1,2,3-cd)pyrene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Naphthalene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Phenanthrene	0.052	U	UG/L	0.052	1.042	
409WL04WGN1	984113004	07/31/98	WS	PAHSIM	SW3510	Pyrene	0.052	U	UG/L	0.052	1.042	
409WL05WGN1	984153001	08/04/98	WS	AK102	SW3510	Diesel Range Organics	0.12	B	MG/L	0.109	1.087	B
409WL05WGN1	984153001	08/04/98	WS	AK101	SW5030A	Gasoline Range Organics	0.04	U	MG/L	0.04	1	
409WL05WGN1	984153001	08/04/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1	
409WL05WGN1	984153001	08/04/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1	
409WL05WGN1	984153001	08/04/98	WS	AK101	SW5030A	Ethylbenzene	0.001	U	MG/L	0.001	1	
409WL05WGN1	984153001	08/04/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.001	U	MG/L	0.001	1	
409WL05WGN1	984153001	08/04/98	WS	AK101	SW5030A	o-Xylene	0.001	U	MG/L	0.001	1	
409WL06WGN1	984153002	08/04/98	WS	AK102	SW3510	Diesel Range Organics	0.652		MG/L	0.111	1.111	
409WL06WGN1	984153002	08/04/98	WS	AK101	SW5030A	Gasoline Range Organics	0.04	U	MG/L	0.04	1	
409WL06WGN1	984153002	08/04/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1	
409WL06WGN1	984153002	08/04/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1	
409WL06WGN1	984153002	08/04/98	WS	AK101	SW5030A	Ethylbenzene	0.001	U	MG/L	0.001	1	
409WL06WGN1	984153002	08/04/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.0022	B	MG/L	0.001	1	
409WL06WGN1	984153002	08/04/98	WS	AK101	SW5030A	o-Xylene	0.001	U	MG/L	0.001	1	
409WL06WQEB1	984153003	08/04/98	WS	AK101	SW5030A	Gasoline Range Organics	0.04	U	MG/L	0.04	1	
409WL06WQEB1	984153003	08/04/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1	
409WL06WQEB1	984153003	08/04/98	WS	AK101	SW5030A	Toluene	0.0033		MG/L	0.001	1	
409WL06WQEB1	984153003	08/04/98	WS	AK101	SW5030A	Ethylbenzene	0.0016		MG/L	0.001	1	
409WL06WQEB1	984153003	08/04/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.0068		MG/L	0.001	1	
409WL06WQEB1	984153003	08/04/98	WS	AK101	SW5030A	o-Xylene	0.0018		MG/L	0.001	1	
Trip Blank	984113005	07/31/98	WS	SW8021B	SW5030A	Benzene	0.001	U	MG/L	0.001	1	
Trip Blank	984113005	07/31/98	WS	SW8021B	SW5030A	Toluene	0.001	U	MG/L	0.001	1	
Trip Blank	984113005	07/31/98	WS	SW8021B	SW5030A	Ethylbenzene	0.001	U	MG/L	0.001	1	
Trip Blank	984113005	07/31/98	WS	SW8021B	SW5030A	m,p-Xylene (Sum of Isomers)	0.001	U	MG/L	0.001	1	
Trip Blank	984113005	07/31/98	WS	SW8021B	SW5030A	o-Xylene	0.001	U	MG/L	0.001	1	
Trip Blank	984153004	08/04/98	WS	AK101	SW5030A	Benzene	0.001	U	MG/L	0.001	1	
Trip Blank	984153004	08/04/98	WS	AK101	SW5030A	Toluene	0.001	U	MG/L	0.001	1	
Trip Blank	984153004	08/04/98	WS	AK101	SW5030A	Ethylbenzene	0.001	U	MG/L	0.001	1	
Trip Blank	984153004	08/04/98	WS	AK101	SW5030A	m,p-Xylene (Sum of Isomers)	0.001	U	MG/L	0.001	1	
Trip Blank	984153004	08/04/98	WS	AK101	SW5030A	o-Xylene	0.001	U	MG/L	0.001	1	

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.

SITE 409
SERA IV 1997 Analytical Results Summary

FIELD_ID	LAB_ID	DATE	MATRIX	ANALYSIS	EXT	PARAMETER	RESULT		UNITS	MRL	MDL	Dilfac	Lnote
409WL02SO21.0N	A97044601	06/26/97	SO	AK101	AK101PR	Gasoline Range Organics	44		MG/KG	10	0.6	2	AW, DG,EG
409WL02SO21.0N	A97044601	06/26/97	SO	AK102	SW3540	Diesel Range Organics	2600		MG/KG	50	25	5	DG, AW
409WL02SO21.0N	A97044601	06/26/97	SO	SW8020A	AK101PR	Benzene	0.1	U	MG/KG	0.1	0.02	2	
409WL02SO21.0N	A97044601	06/26/97	SO	SW8020A	AK101PR	Ethylbenzene	0.36		MG/KG	0.1	0.02	2	
409WL02SO21.0N	A97044601	06/26/97	SO	SW8020A	AK101PR	Toluene	0.05	J	MG/KG	0.1	0.02	2	J
409WL02SO21.0N	A97044601	06/26/97	SO	SW8020A	AK101PR	Xylenes	1.3		MG/KG	0.1	0.06	2	
409WL02SO21.0N	K97457104	06/26/97	SO	E160.3M	NONE	Total Solids	94.5		PERCENT	0	0	1	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	2-Methylnaphthalene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Acenaphthene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Acenaphthylene	250	U	UG/KG	250	0.2	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Anthracene	250	U	UG/KG	250	0.6	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Benzo(a)anthracene	10	J	UG/KG	250	0.7	50	J
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Benzo(a)pyrene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Benzo(b)fluoranthene	250	U	UG/KG	250	0.8	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Benzo(g,h,i)perylene	250	U	UG/KG	250	0.4	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Benzo(k)fluoranthene	250	U	UG/KG	250	0.6	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Chrysene	8	J	UG/KG	250	0.6	50	J
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Dibenzo(a,h)anthracene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Dibenzofuran	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Fluoranthene	250	U	UG/KG	250	0.6	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Fluorene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Indeno(1,2,3-cd)pyrene	250	U	UG/KG	250	0.7	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Naphthalene	470		UG/KG	250	0.4	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Phenanthrene	250	U	UG/KG	250	0.8	50	
409WL02SO21.0N	K97457104	06/26/97	SO	SIM	SW3545	Pyrene	20	J	UG/KG	250	0.8	50	J
409WL02SO21.0N DUP	A97044603	06/26/97	SO	AK101	AK101PR	Gasoline Range Organics	46		MG/KG	10	0.6	2	AW,DG,EG
409WL02SO21.0N DUP	A97044603	06/26/97	SO	AK102	SW3540	Diesel Range Organics	2500		MG/KG	50	25	5	DG, AW
409WL02SO21.0N DUP	A97044603	06/26/97	SO	SW8020A	AK101PR	Benzene	0.1	U	MG/KG	0.1	0.02	2	
409WL02SO21.0N DUP	A97044603	06/26/97	SO	SW8020A	AK101PR	Ethylbenzene	0.37		MG/KG	0.1	0.02	2	
409WL02SO21.0N DUP	A97044603	06/26/97	SO	SW8020A	AK101PR	Toluene	0.05	J	MG/KG	0.1	0.02	2	J
409WL02SO21.0N DUP	A97044603	06/26/97	SO	SW8020A	AK101PR	Xylenes	1.3		MG/KG	0.1	0.06	2	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	E160.3M	NONE	Total Solids	95		PERCENT	0	0	1	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	2-Methylnaphthalene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Acenaphthene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Acenaphthylene	250	U	UG/KG	250	0.2	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Anthracene	250	U	UG/KG	250	0.6	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Benzo(a)anthracene	250	U	UG/KG	250	0.7	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Benzo(a)pyrene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Benzo(b)fluoranthene	250	U	UG/KG	250	0.8	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Benzo(g,h,i)perylene	250	U	UG/KG	250	0.4	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Benzo(k)fluoranthene	250	U	UG/KG	250	0.6	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Chrysene	250	U	UG/KG	250	0.6	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Dibenzo(a,h)anthracene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Dibenzofuran	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Fluoranthene	250	U	UG/KG	250	0.6	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Fluorene	250	U	UG/KG	250	0.5	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Indeno(1,2,3-cd)pyrene	250	U	UG/KG	250	0.7	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Naphthalene	340		UG/KG	250	0.4	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Phenanthrene	250	U	UG/KG	250	0.8	50	
409WL02SO21.0N DUP	K97457105	06/26/97	SO	SIM	SW3545	Pyrene	250	U	UG/KG	250	0.8	50	

U = Compound analyzed but not detected at the method reporting limit (MRL).
J = Estimated value reported between the method detection limit (MDL) and MRL.
Dilfac = Dilution factor.
Ext = Extraction method.
Lnote = USACE COELT footnote.

SITE 409
SERA IV 1997 Analytical Results Summary

FIELD_ID	LAB_ID	DATE	MATRIX	ANALYSIS	EXT	PARAMETER	RESULT		UNITS	MRL	MDL	Dilfac	Lnote
409WL02SO45.5N	A97044602	06/26/97	SO	AK101	AK101PR	Gasoline Range Organics	5	U	MG/KG	5	0.3	1	
409WL02SO45.5N	A97044602	06/26/97	SO	AK102	SW3540	Diesel Range Organics	10	U	MG/KG	10	5	1	
409WL02SO45.5N	A97044602	06/26/97	SO	SW8020A	AK101PR	Benzene	0.05	U	MG/KG	0.05	0.01	1	
409WL02SO45.5N	A97044602	06/26/97	SO	SW8020A	AK101PR	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	
409WL02SO45.5N	A97044602	06/26/97	SO	SW8020A	AK101PR	Toluene	0.05	U	MG/KG	0.05	0.01	1	
409WL02SO45.5N	A97044602	06/26/97	SO	SW8020A	AK101PR	Xylenes	0.05	U	MG/KG	0.05	0.03	1	
409WL02SO45.5N	A97044602	06/26/97	SO	E160.3M	NONE	Total Solids	89.2		PERCENT	0	0	1	
409WL03SO26.0N	A97045701	06/27/97	SO	AK101	AK101PR	Gasoline Range Organics	5.8		MG/KG	5	0.3	1	
409WL03SO26.0N	A97045701	06/27/97	SO	AK102	SW3540	Diesel Range Organics	1410		MG/KG	10	5	1	
409WL03SO26.0N	A97045701	06/27/97	SO	SW8020A	SW5030A	Benzene	0.05	U	MG/KG	0.05	0.01	1	
409WL03SO26.0N	A97045701	06/27/97	SO	SW8020A	SW5030A	Ethylbenzene	0.02	J	MG/KG	0.05	0.01	1	J
409WL03SO26.0N	A97045701	06/27/97	SO	SW8020A	SW5030A	Toluene	0.03	J	MG/KG	0.05	0.01	1	J
409WL03SO26.0N	A97045701	06/27/97	SO	SW8020A	SW5030A	Xylenes	0.06		MG/KG	0.05	0.03	1	
409WL03S026.ON DUP	A97045702	06/27/97	SO	AK101	AK101PR	Gasoline Range Organics	8.5		MG/KG	5	0.3	1	
409WL03S026.ON DUP	A97045702	06/27/97	SO	AK102	SW3540	Diesel Range Organics	620		MG/KG	10	5	1	
409WL03S026.ON DUP	A97045702	06/27/97	SO	SW8020A	SW5030A	Benzene	0.05	U	MG/KG	0.05	0.01	1	
409WL03S026.ON DUP	A97045702	06/27/97	SO	SW8020A	SW5030A	Ethylbenzene	0.03	J	MG/KG	0.05	0.01	1	J
409WL03S026.ON DUP	A97045702	06/27/97	SO	SW8020A	SW5030A	Toluene	0.04	J	MG/KG	0.05	0.01	1	J
409WL03S026.ON DUP	A97045702	06/27/97	SO	SW8020A	SW5030A	Xylenes	0.1		MG/KG	0.05	0.03	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	2-Methylnaphthalene	250	U	UG/KG	250	0.5	1	DG
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Acenaphthene	5	U	UG/KG	5	0.5	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Acenaphthylene	39		UG/KG	5	0.2	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Anthracene	5	U	UG/KG	5	0.6	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Benzo(a)anthracene	5	U	UG/KG	5	0.7	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Benzo(a)pyrene	5	U	UG/KG	5	0.5	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Benzo(b)fluoranthene	5	U	UG/KG	5	0.8	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Benzo(g,h,i)perylene	1	J	UG/KG	5	0.4	1	J
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Benzo(k)fluoranthene	5	U	UG/KG	5	0.6	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Chrysene	2	J	UG/KG	5	0.6	1	J
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Dibenzo(a,h)anthracene	5	U	UG/KG	5	0.5	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Dibenzofuran	5	U	UG/KG	5	0.5	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Fluoranthene	5	U	UG/KG	5	0.6	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Fluorene	5	U	UG/KG	5	0.5	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Indeno(1,2,3-cd)pyrene	5	U	UG/KG	5	0.7	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Naphthalene	250	U	UG/KG	250	0.4	1	DG
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Phenanthrene	5	U	UG/KG	5	0.8	1	
409WL03SO26.0N	K97457106	06/27/97	SO	SIM	SW3545	Pyrene	10		UG/KG	5	0.8	1	
				E160.3M	NONE	Total Solids	96		PERCENT	0	0	1	
409WL03SO35.0N	A97045703	06/27/97	SO	AK101	AK101PR	Gasoline Range Organics	5	U	MG/KG	5	0.3	1	
409WL03SO35.0N	A97045703	06/27/97	SO	AK102	SW3540	Diesel Range Organics	10	U	MG/KG	10	5	1	
409WL03SO35.0N	A97045703	06/27/97	SO	SW8020A	SW5030A	Benzene	0.05	U	MG/KG	0.05	0.01	1	
409WL03SO35.0N	A97045703	06/27/97	SO	SW8020A	SW5030A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	
409WL03SO35.0N	A97045703	06/27/97	SO	SW8020A	SW5030A	Toluene	0.05	U	MG/KG	0.05	0.01	1	
409WL03SO35.0N	A97045703	06/27/97	SO	SW8020A	SW5030A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	
409WL03SO35.0N	K97457107	06/27/97	SO	E160.3M	NONE	Total Solids	92.6		PERCENT	0	0	1	

U = Compound analyzed but not detected at the method reporting limit (MRL).
J = Estimated value reported between the method detection limit (MDL) and MRL.
Dilfac = Dilution factor.
Ext = Extraction method.
Lnote = USACE COELT footnote.

SITE 409
SERA IV 1997 Analytical Results Summary

FIELD_ID	LAB_ID	DATE	MATRIX	ANALYSIS	EXT	PARAMETER	RESULT		UNITS	MRL	MDL	Dilfac	Lnote
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	2-Methylnaphthalene	10		UG/KG	5	0.5	1	B
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Acenaphthene	5	J	UG/KG	5	0.5	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Acenaphthylene	6		UG/KG	5	0.2	1	
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Anthracene	5	U	UG/KG	5	0.6	1	
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Benzo(a)anthracene	0.8	J	UG/KG	5	0.7	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Benzo(a)pyrene	5	U	UG/KG	5	0.5	1	
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Benzo(b)fluoranthene	2	J	UG/KG	5	0.8	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Benzo(g,h,i)perylene	2	J	UG/KG	5	0.4	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Benzo(k)fluoranthene	2	J	UG/KG	5	0.6	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Chrysene	1	J	UG/KG	5	0.6	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Dibenzo(a,h)anthracene	0.9	J	UG/KG	5	0.5	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Dibenzofuran	5	U	UG/KG	5	0.5	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Fluoranthene	2	J	UG/KG	5	0.6	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Fluorene	3	J	UG/KG	5	0.5	1	
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Indeno(1,2,3-cd)pyrene	1	J	UG/KG	5	0.7	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Naphthalene	17		UG/KG	5	0.4	1	
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Phenanthrene	2	J	UG/KG	5	0.8	1	J
409WL03SO35.0N	K97457107	06/27/97	SO	SIM	SW3545	Pyrene	2	J	UG/KG	5	0.8	1	J
409WL04SO31.0N	A97045704	06/28/97	SO	AK101	AK101PR	Gasoline Range Organics	5	U	MG/KG	5	0.3	1	
409WL04SO31.0N	A97045704	06/28/97	SO	AK102	SW3540	Diesel Range Organics	10	U	MG/KG	10	5	1	
409WL04SO31.0N	A97045704	06/28/97	SO	SW8020A	SW5030A	Benzene	0.05	U	MG/KG	0.05	0.01	1	
409WL04SO31.0N	A97045704	06/28/97	SO	SW8020A	SW5030A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	
409WL04SO31.0N	A97045704	06/28/97	SO	SW8020A	SW5030A	Toluene	0.05	U	MG/KG	0.05	0.01	1	
409WL04SO31.0N	A97045704	06/28/97	SO	SW8020A	SW5030A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	
409WL04SO31.0N	K97457108	06/28/97	SO	E160.3M	NONE	Total Solids	95.7		PERCENT	0	0	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	2-Methylnaphthalene	5		UG/KG	5	0.5	1	B
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Acenaphthene	5	U	UG/KG	5	0.5	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Acenaphthylene	5	U	UG/KG	5	0.2	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Anthracene	5	U	UG/KG	5	0.6	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Benzo(a)anthracene	5	U	UG/KG	5	0.7	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Benzo(a)pyrene	5	U	UG/KG	5	0.5	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Benzo(b)fluoranthene	5	U	UG/KG	5	0.8	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Benzo(g,h,i)perylene	0.7	J	UG/KG	5	0.4	1	J
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Benzo(k)fluoranthene	5	U	UG/KG	5	0.6	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Chrysene	5	U	UG/KG	5	0.6	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Dibenzo(a,h)anthracene	5	U	UG/KG	5	0.5	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Dibenzofuran	5	U	UG/KG	5	0.5	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Fluoranthene	5	U	UG/KG	5	0.6	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Fluorene	5	U	UG/KG	5	0.5	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Indeno(1,2,3-cd)pyrene	5	U	UG/KG	5	0.7	1	
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Naphthalene	2	J	UG/KG	5	0.4	1	J
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Phenanthrene	0.9	J	UG/KG	5	0.8	1	J
409WL04SO31.0N	K97457108	06/28/97	SO	SIM	SW3545	Pyrene	5	U	UG/KG	5	0.8	1	

U = Compound analyzed but not detected at the method reporting limit (MRL).
J = Estimated value reported between the method detection limit (MDL) and MRL.
Dilfac = Dilution factor.
Ext = Extraction method.
Lnote = USACE COELT footnote.

SITE 409
SERA IV 1997 Analytical Results Summary

FIELD_ID	LAB_ID	DATE	MATRIX	ANALYSIS	EXT	PARAMETER	RESULT		UNITS	MRL	MDL	Dilfac	Lnote
409WL04SO40.0N	A97045705	06/28/97	SO	AK101	AK101PR	Gasoline Range Organics	5	U	MG/KG	5	0.3	1	
409WL04SO40.0N	A97045705	06/28/97	SO	AK102	SW3540	Diesel Range Organics	14		MG/KG	10	5	1	
409WL04SO40.0N	A97045705	06/28/97	SO	SW8020A	SW5030A	Benzene	0.05	U	MG/KG	0.05	0.01	1	
409WL04SO40.0N	A97045705	06/28/97	SO	SW8020A	SW5030A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	
409WL04SO40.0N	A97045705	06/28/97	SO	SW8020A	SW5030A	Toluene	0.05	U	MG/KG	0.05	0.01	1	
409WL04SO40.0N	A97045705	06/28/97	SO	SW8020A	SW5030A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	
409WL04SO40.0N	K97457109	06/28/97	SO	E160.3M	NONE	Total Solids	89.2		PERCENT	0	0	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	2-Methylnaphthalene	22		UG/KG	6	0.5	1	B
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Acenaphthene	6	U	UG/KG	6	0.5	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Acenaphthylene	6	U	UG/KG	6	0.2	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Anthracene	6	U	UG/KG	6	0.6	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Benzo(a)anthracene	0.8	J	UG/KG	6	0.7	1	J
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Benzo(a)pyrene	6	U	UG/KG	6	0.5	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Benzo(b)fluoranthene	1	J	UG/KG	6	0.8	1	J
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Benzo(g,h,i)perylene	2	J	UG/KG	6	0.4	1	J
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Benzo(k)fluoranthene	6	U	UG/KG	6	0.6	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Chrysene	2	J	UG/KG	6	0.6	1	J
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Dibenzo(a,h)anthracene	6	U	UG/KG	6	0.5	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Dibenzofuran	3	J	UG/KG	6	0.5	1	J
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Fluoranthene	6	U	UG/KG	6	0.6	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Fluorene	6	U	UG/KG	6	0.5	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Indeno(1,2,3-cd)pyrene	6	U	UG/KG	6	0.7	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Naphthalene	8		UG/KG	6	0.4	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Phenanthrene	7		UG/KG	6	0.8	1	
409WL04SO40.0N	K97457109	06/28/97	SO	SIM	SW3545	Pyrene	3	J	UG/KG	6	0.8	1	J
409WL02WQN	A97050001	07/10/97	W	AK101	SW5030A	Gasoline Range Organics	50	U	UG/L	50	5	1	
409WL02WQN	A97050001	07/10/97	W	AK102	SW3510	Diesel Range Organics	331		UG/L	100	50	1	
409WL02WQN	A97050001	07/10/97	W	SW8020A	SW5030A	Benzene	1	U	UG/L	1	0.2	1	
409WL02WQN	A97050001	07/10/97	W	SW8020A	SW5030A	Ethylbenzene	1	U	UG/L	1	0.2	1	
409WL02WQN	A97050001	07/10/97	W	SW8020A	SW5030A	Toluene	1	U	UG/L	1	0.2	1	
409WL02WQN	A97050001	07/10/97	W	SW8020A	SW5030A	Xylenes	1	U	UG/L	1	0.2	1	
409WL03WQN	A97050002	07/10/97	W	AK101	SW5030A	Gasoline Range Organics	50	U	UG/L	50	5	1	
409WL03WQN	A97050002	07/10/97	W	AK102	SW3510	Diesel Range Organics	1310		UG/L	100	50	1	
409WL03WQN	A97050002	07/10/97	W	SW8020A	SW5030A	Benzene	1	U	UG/L	1	0.2	1	
409WL03WQN	A97050002	07/10/97	W	SW8020A	SW5030A	Ethylbenzene	1	U	UG/L	1	0.2	1	
409WL03WQN	A97050002	07/10/97	W	SW8020A	SW5030A	Toluene	1	U	UG/L	1	0.2	1	
409WL03WQN	A97050002	07/10/97	W	SW8020A	SW5030A	Xylenes	1	U	UG/L	1	0.2	1	
409WL03WQN DUP	A97050004	07/10/97	W	AK101	SW5030A	Gasoline Range Organics	50	U	UG/L	50	5	1	
409WL03WQN DUP	A97050004	07/10/97	W	AK102	SW3510	Diesel Range Organics	100	U	UG/L	100	50	1	
409WL03WQN DUP	A97050004	07/10/97	W	SW8020A	SW5030A	Benzene	1	U	UG/L	1	0.2	1	
409WL03WQN DUP	A97050004	07/10/97	W	SW8020A	SW5030A	Ethylbenzene	1	U	UG/L	1	0.2	1	
409WL03WQN DUP	A97050004	07/10/97	W	SW8020A	SW5030A	Toluene	1	U	UG/L	1	0.2	1	
409WL03WQN DUP	A97050004	07/10/97	W	SW8020A	SW5030A	Xylenes	1	U	UG/L	1	0.2	1	
409WL04WQN	A97050003	07/10/97	W	AK101	SW5030A	Gasoline Range Organics	50	U	UG/L	50	5	1	
409WL04WQN	A97050003	07/10/97	W	AK102	SW3510	Diesel Range Organics	179		UG/L	100	50	1	
409WL04WQN	A97050003	07/10/97	W	SW8020A	SW5030A	Benzene	1	U	UG/L	1	0.2	1	
409WL04WQN	A97050003	07/10/97	W	SW8020A	SW5030A	Ethylbenzene	1	U	UG/L	1	0.2	1	
409WL04WQN	A97050003	07/10/97	W	SW8020A	SW5030A	Toluene	1	U	UG/L	1	0.2	1	
409WL04WQN	A97050003	07/10/97	W	SW8020A	SW5030A	Xylenes	1	U	UG/L	1	0.2	1	

U = Compound analyzed but not detected at the method reporting limit (MRL).
J = Estimated value reported between the method detection limit (MDL) and MRL.
Dilfac = Dilution factor.
Ext = Extraction method.
Lnote = USACE COELT footnote.

SITE ST409
SOIL CONTAMINANT ANALYTICAL RESULTS

SAMPLE ID	LAB ID	MATRIX	ANALYSIS	EXTRACTION	NAME	RESULT	QC	UNITS	LNOTE	RDL	LDL	DIL	LOG DATE	EXTR. DATE	ANAL. DATE	ANAL-HT
409PZ01SO16.0N	A96042801	SO	AK101	METHOD	GRO	5	U	MG/KG		5	0.3	1	19960717	19960718	19960720	3
409PZ01SO16.0N	A96042801	SO	AK102	SW3540	DRO	24		MG/KG		10	5	1	19960717	19960719	19960722	5
409PZ01SO16.0N	A96042801	SO	E160.3M	NONE	Solids, Percent	95		PERCENT		0	0	1	19960717	19960720	19960720	3
409PZ01SO16.0N	A96042801	SO	SW8020A	AK101PR	Benzene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960720	3
409PZ01SO16.0N	A96042801	SO	SW8020A	AK101PR	Ethylbenzene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960720	3
409PZ01SO16.0N	A96042801	SO	SW8020A	AK101PR	Toluene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960720	3
409PZ01SO16.0N	A96042801	SO	SW8020A	AK101PR	Xylenes	0.05	U	MG/KG		0.05	0.03	1	19960717	19960717	19960720	3
409PZ01SO31.0N	A96042802	SO	AK101	METHOD	GRO	5	U	MG/KG		5	0.3	1	19960717	19960718	19960720	3
409PZ01SO31.0N	A96042802	SO	AK102	SW3540	DRO	10	U	MG/KG		10	5	1	19960717	19960719	19960722	5
409PZ01SO31.0N	A96042802	SO	E160.3M	NONE	Solids, Percent	95.3		PERCENT		0	0	1	19960717	19960720	19960720	3
409PZ01SO31.0N	A96042802	SO	SW8020A	AK101PR	Benzene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960720	3
409PZ01SO31.0N	A96042802	SO	SW8020A	AK101PR	Ethylbenzene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960720	3
409PZ01SO31.0N	A96042802	SO	SW8020A	AK101PR	Toluene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960720	3
409PZ01SO31.0N	A96042802	SO	SW8020A	AK101PR	Xylenes	0.05	U	MG/KG		0.05	0.03	1	19960717	19960717	19960720	3
409PZ01WQEB	A96042807	W	AK101	SW5030A	GRO	50	U	UG/L		50	5	1	19960717	19960721	19960721	4
409PZ01WQEB	A96042807	W	SW8020A	SW5030A	Benzene	0.5	U	UG/L		0.5	0.2	1	19960717	19960721	19960721	4
409PZ01WQEB	A96042807	W	SW8020A	SW5030A	Ethylbenzene	1	U	UG/L		1	0.2	1	19960717	19960721	19960721	4
409PZ01WQEB	A96042807	W	SW8020A	SW5030A	Toluene	1	U	UG/L		1	0.2	1	19960717	19960721	19960721	4
409PZ01WQEB	A96042807	W	SW8020A	SW5030A	Xylenes	1	U	UG/L		1	0.4	1	19960717	19960721	19960721	4
409PZ02SO11.0N	A96042803	SO	AK101	METHOD	GRO	5	U	MG/KG		5	0.3	1	19960717	19960718	19960721	4
409PZ02SO11.0N	A96042803	SO	AK102	SW3540	DRO	10	U	MG/KG		10	5	1	19960717	19960719	19960722	5
409PZ02SO11.0N	A96042803	SO	E160.3M	NONE	Solids, Percent	95.4		PERCENT		0	0	1	19960717	19960720	19960720	3
409PZ02SO11.0N	A96042803	SO	SW8020A	AK101PR	Benzene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960721	4
409PZ02SO11.0N	A96042803	SO	SW8020A	AK101PR	Ethylbenzene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960721	4
409PZ02SO11.0N	A96042803	SO	SW8020A	AK101PR	Toluene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960721	4
409PZ02SO11.0N	A96042803	SO	SW8020A	AK101PR	Xylenes	0.05	U	MG/KG		0.05	0.03	1	19960717	19960717	19960721	4
409PZ02SO31.0N	A96042804	SO	AK101	METHOD	GRO	5	U	MG/KG		5	0.3	1	19960717	19960718	19960721	4
409PZ02SO31.0N	A96042804	SO	AK102	SW3540	DRO	309		MG/KG		10	5	1	19960717	19960719	19960722	5
409PZ02SO31.0N	A96042804	SO	E160.3M	NONE	Solids, Percent	93.7		PERCENT		0	0	1	19960717	19960720	19960720	3
409PZ02SO31.0N	A96042804	SO	E160.3M	NONE	Solids, Percent	94.5		PERCENT		0	0	1	19960717	19960720	19960720	3
409PZ02SO31.0N	A96042804	SO	SW8020A	AK101PR	Benzene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960721	4
409PZ02SO31.0N	A96042804	SO	SW8020A	AK101PR	Ethylbenzene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960721	4
409PZ02SO31.0N	A96042804	SO	SW8020A	AK101PR	Toluene	0.05	U	MG/KG		0.05	0.01	1	19960717	19960717	19960721	4
409PZ02SO31.0N	A96042804	SO	SW8020A	AK101PR	Xylenes	0.17		MG/KG		0.05	0.03	1	19960717	19960717	19960721	4
409WL01SO11.0N	A96041101	SO	AK101	METHOD	GRO	5	U	MG/KG		5	0.3	1	19960712	19960712	19960715	3
409WL01SO11.0N	A96041101	SO	AK102	SW3540	DRO	10		MG/KG		10	5	1	19960712	19960715	19960716	4
409WL01SO11.0N	A96041101	SO	E160.3M	NONE	Solids, Percent	95.3		PERCENT		0	0	1	19960712	19960716	19960716	4
409WL01SO11.0N	A96041101	SO	SW8020A	AK101PR	Benzene	0.05	U	MG/KG		0.05	0.01	1	19960712	19960712	19960715	3
409WL01SO11.0N	A96041101	SO	SW8020A	AK101PR	Ethylbenzene	0.05	U	MG/KG		0.05	0.01	1	19960712	19960712	19960715	3
409WL01SO11.0N	A96041101	SO	SW8020A	AK101PR	Toluene	0.05	U	MG/KG		0.05	0.01	1	19960712	19960712	19960715	3
409WL01SO11.0N	A96041101	SO	SW8020A	AK101PR	Xylenes	0.05	U	MG/KG		0.05	0.03	1	19960712	19960712	19960715	3
409WL01SO41.0N	A96041103	SO	AK101	METHOD	GRO	5	U	MG/KG		5	0.3	1	19960712	19960712	19960715	3
409WL01SO41.0N	A96041103	SO	AK102	SW3540	DRO	10	U	MG/KG		10	5	1	19960712	19960715	19960716	4
409WL01SO41.0N	A96041103	SO	E160.3M	NONE	Solids, Percent	93.3		PERCENT		0	0	1	19960712	19960716	19960716	4
409WL01SO41.0N	A96041103	SO	SW8020A	AK101PR	Benzene	0.05	U	MG/KG		0.05	0.01	1	19960712	19960712	19960715	3
409WL01SO41.0N	A96041103	SO	SW8020A	AK101PR	Ethylbenzene	0.05	U	MG/KG		0.05	0.01	1	19960712	19960712	19960715	3
409WL01SO41.0N	A96041103	SO	SW8020A	AK101PR	Toluene	0.05	U	MG/KG		0.05	0.01	1	19960712	19960712	19960715	3
409WL01SO41.0N	A96041103	SO	SW8020A	AK101PR	Xylenes	0.05	U	MG/KG		0.05	0.03	1	19960712	19960712	19960715	3