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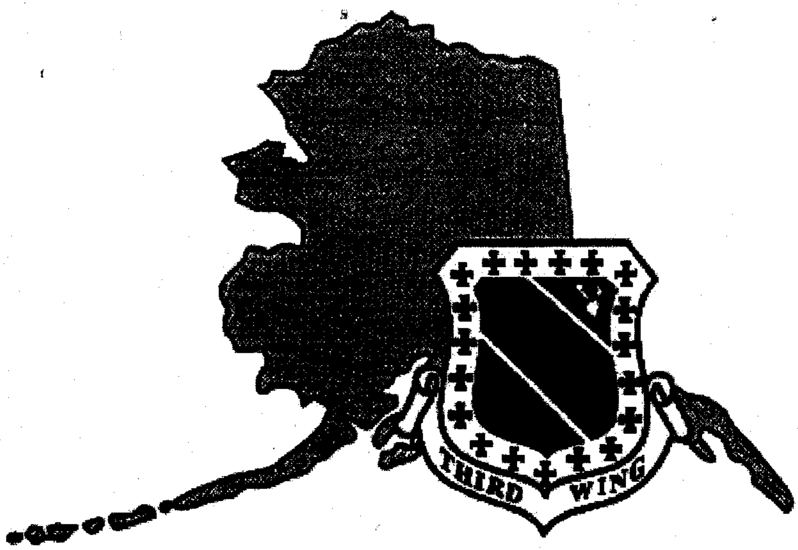

UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL QUALITY PROGRAM

AFID 755
SERA PHASE VII ST 423/7
RELEASE INVESTIGATION REPORT
FINAL DRAFT

FEBRUARY 1999

DP98000423

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LIST OF ACRONYMS

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

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EXECUTIVE SUMMARY

ST423/7 is the former location of an underground storage tank (UST) adjacent to Building 41-755 at the 381st Intelligence Squadron. The 3,000-gallon tank, AFID 755, held diesel fuel for the Squadron's backup generator. The UST was removed and replaced with a new tank in August 1995. 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 ST423/7 under SERA Phase IV in 1996 and 1997 (15 borings drilled, 11 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), with the goal of filling data gaps identified under SERA Phase IV.

Soil sample results from 1996, 1997, and 1998 indicate that petroleum hydrocarbons are present above the Alaska Department of Environmental Conservation (ADEC) Method Two soil cleanup standard for diesel range organics (DRO; 250 mg/Kg) and benzene (0.02 mg/Kg). Toluene, ethylbenzene, xylene, gasoline range organics (GRO), residual range organics (RRO), and polycyclic aromatic hydrocarbon (PAHs) have not been detected in soil in excess of their respective Method Two cleanup standards. Soil in the vicinity of the former UST was shown to contain DRO as high as 6,800 mg/Kg and benzene as high as 0.3 mg/Kg in 1996. The highest concentrations of DRO measured on site (up to 37,100 mg/Kg DRO) are present in a sand layer encountered approximately 150 feet downgradient of the former UST site and below the water table at approximately 25 to 30 feet below ground surface (bgs) (the water table is at approximately 10 feet bgs in that area). High levels of DRO have also been detected in borings outside the facility fenceline (up to 4,200 mg/Kg), but it is suspected that another contaminant source may have contributed to the contamination outside the fenceline (e.g., chlorinated solvents). With the exception of the sand unit, the extent of petroleum contamination has been delineated to the north-northwest, east, and south of the former UST site. The extent of the sand unit, the degree to which it is impacted, and the transport mechanisms by which petroleum hydrocarbons have reached the sand unit have not been fully investigated.

Groundwater level measurements collected in 1996, 1997, and 1998 show that free-phase petroleum hydrocarbons are present on the water table. Local groundwater flow is to the northwest at a gradient of 0.061 foot/foot. Wells downgradient of the former UST site were last sampled in 1996, and samples contained DRO of up to 30.6 mg/L, exceeding the ADEC groundwater cleanup standard of 1.5 mg/L. Because ST423/7 is not within the OU5 Model Area, free-phase product and dissolved-phase contaminants must be addressed as part of the SERA investigation.

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Probable sources of site contamination at ST423/7 have been identified. High concentrations of petroleum hydrocarbons remaining in the soil will likely continue to serve as a source of ongoing groundwater contamination.

1.0 INTRODUCTION

This report presents the findings of the State-Elmendorf Environmental Restoration Agreement (SERA) Phase VII release investigation at ST423/7, Building 41-755 381st IS Elephant Cage, 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

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

Because ST423/7 is not in the OU5 Model Area, the standard site investigation 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.

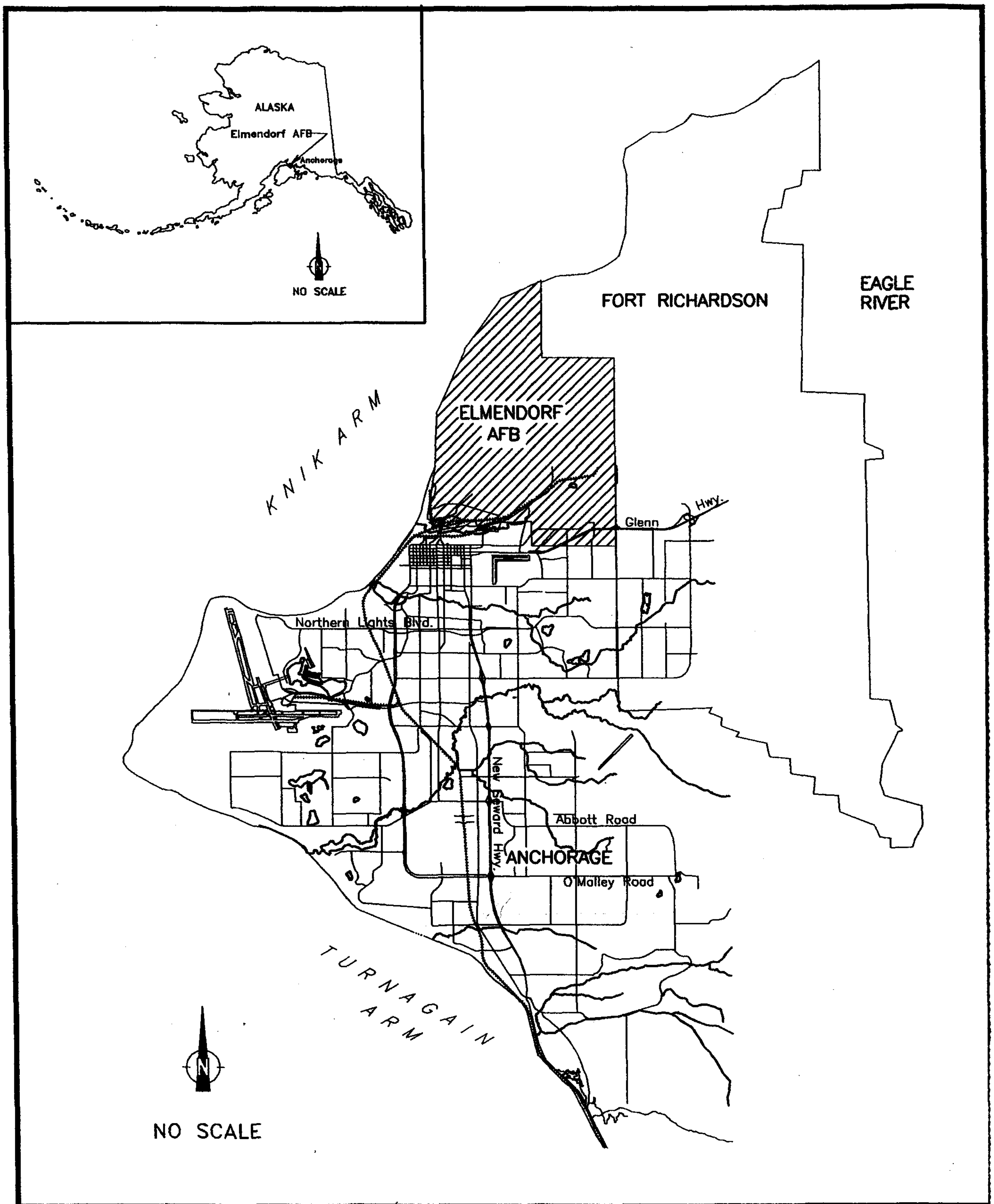
EAFB lies within the Cook Inlet-Susitna Lowlands, which is bordered on the west by the Alaska Range and on the east by the Kenai, Chugach, and Talkeetna mountain ranges. The Elmendorf terminal moraine traverses the Base northeast to southwest. The southern boundary of the Elmendorf Moraine is a ridge 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. ST423/7 is located on the north side of the Elmendorf Moraine and is not in the OU5 Model Area. The general groundwater flow direction from this site is northwest, towards Knik Arm. Information on localized groundwater flow is included in Section 3.2.2. Figure 1-2 shows the location of ST423/7 on EAFB, and Figure 1-3 shows the regional groundwater flow on EAFB.

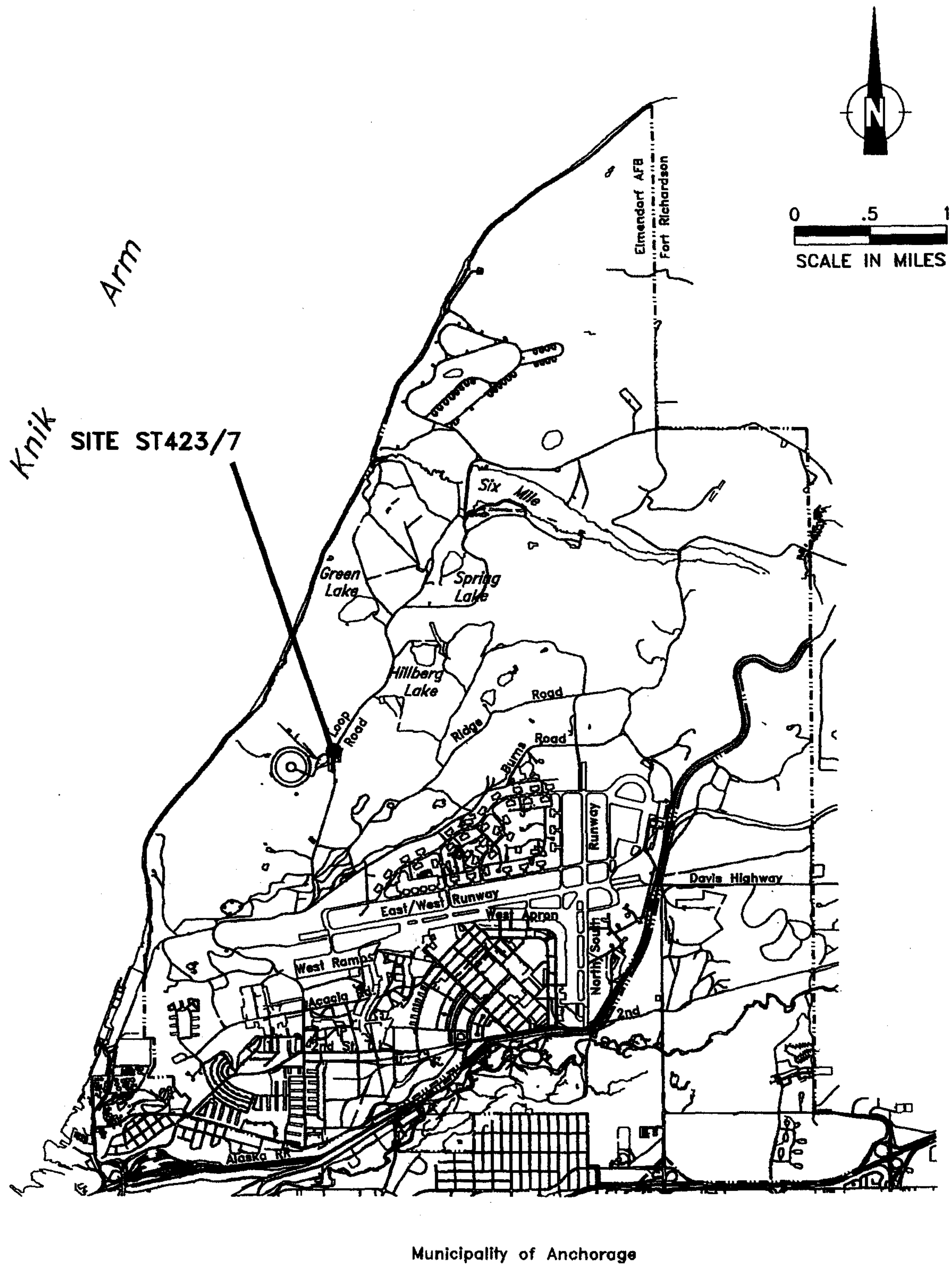
1.3 Site Background

ST423/7 is the location of a former UST south of Building 41-755 (Figure 1-2). The tank was identified as Air Force identification number (AFID) UST 755. The 3,000-gallon steel UST had been used to store diesel fuel for the emergency generator at Building 41-755. The UST was removed and replaced with a new 4,000-gallon UST in August 1995. Piping between the UST and Building 41-755 was abandoned in place by crimping and taping the ends (USAF 1995).

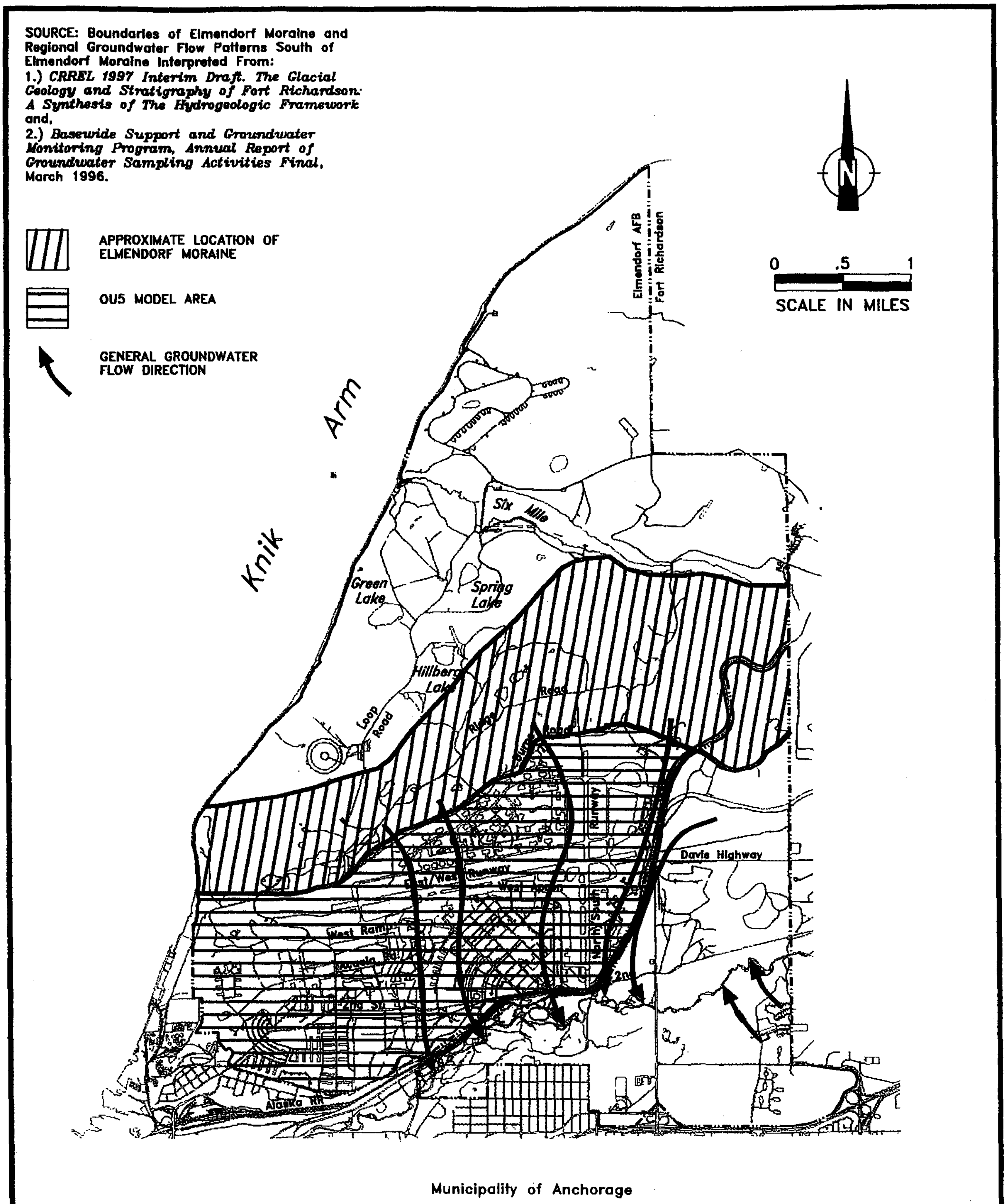
Soil samples were collected from the excavation at the time of UST removal. An ADEC matrix score of 39 was calculated for the site. As a result of this score, the following Level B cleanup values were applied to this site: 100 mg/Kg gasoline range organics (GRO), 200 mg/Kg diesel range organics (DRO), 0.5 mg/Kg benzene, and 15 mg/Kg total benzene, toluene, ethylbenzene, and xylenes (BTEX). Three of the four soil samples collected from the excavation exceeded ADEC Level B cleanup standards for DRO. The highest concentration of DRO was 9,700 mg/Kg. A 25,000-gallon diesel fuel UST (referred to as AFID 756 and/or STMP458) is located immediately to the northeast of the former 3,000-gallon UST site and is



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 957011Z3



DRAWING: 9000-168/ F360523/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



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

still in place, but all fuel has been removed from this tank. A 10,000-gallon heating oil UST (STMP456) is located to the northwest of Building 41-760. This tank is empty and is to be removed from the ground at a future data not yet scheduled.

A review of as-built drawings of Building 41-755 shows that a drainage tile ("french drain") system was installed around the perimeter of the building and discharges via two drain tiles. The drain pipes discharge to the north/northwest of Building 41-755, outside the facility fence line, as shown in Figure 1-4. Drain tiles were set approximately 3 feet below ground surface (bgs) in gravel backfill around the entire building. A second, deeper drain tile (11 feet bgs) is located at the southwest corner of the building, corresponding to the portion of the building that has a basement. These drain tiles/pipes and their gravel backfill may have acted as a contaminant migration pathway.

As-built drawings reveal that the floor drainage network inside the former garage area of Building 41-755 connected to the drainage tile/pipe system. As-built drawings show catch basins in 4 floor drains, a wash rack, and a "grease pit" leading to a grease and oil interceptor (a wier-type oil/water separator). Drawings further show that underflow from the interceptor discharged to the building's drainage tile/pipe system. POL and other contaminants could have exited the interceptor if it was not operating properly or if waste streams not suitable for the interceptor (e.g., streams denser than water) entered the interceptor. Based upon this review of as-built drawings and knowledge of past vehicle maintenance activities inside Building 41-755, it is possible that contaminants from these activities have impacted the subsurface at ST423/7.

1.4 Previous Investigations

In 1996, the SERA IV release investigation at ST423/7 consisted of drilling 13 borings, including installation of 9 groundwater monitoring/air injection wells (41-755WL01 through -09) and 3 soil gas monitoring arrays (41-755PZ01 through -03). One boring was grouted following sampling. Free product was found to be present on the water table at this site, extending from monitoring well 41-755WL01 to 41-755WL03. The extent of free product was relatively well defined with the exception of the north side of Building 41-755. Soil and groundwater contamination at this location was found to be in excess of Level B standards and was not fully delineated. A Petropore® passive product recovery system was installed in WL01 as part of a product recovery evaluation. The evaluation concluded that product recovery is sustainable and a larger diameter, higher capacity recovery system would likely increase product recovery rates. Use of the passive product recovery system in place at WL01 was discontinued during spring break-up in 1997 to prevent incidental migration of surface runoff to the well. Figure 1-4 shows analytical results associated with the 1996 fieldwork, and Appendix C contains tabulated data.

In 1997, two 4-inch diameter monitoring wells (41-755WL10 and 41-755WL11) were installed primarily to better evaluate the potential for free product recovery using an active skimmer system. A Petropore® passive recovery system was installed in 41-755WL11. An active

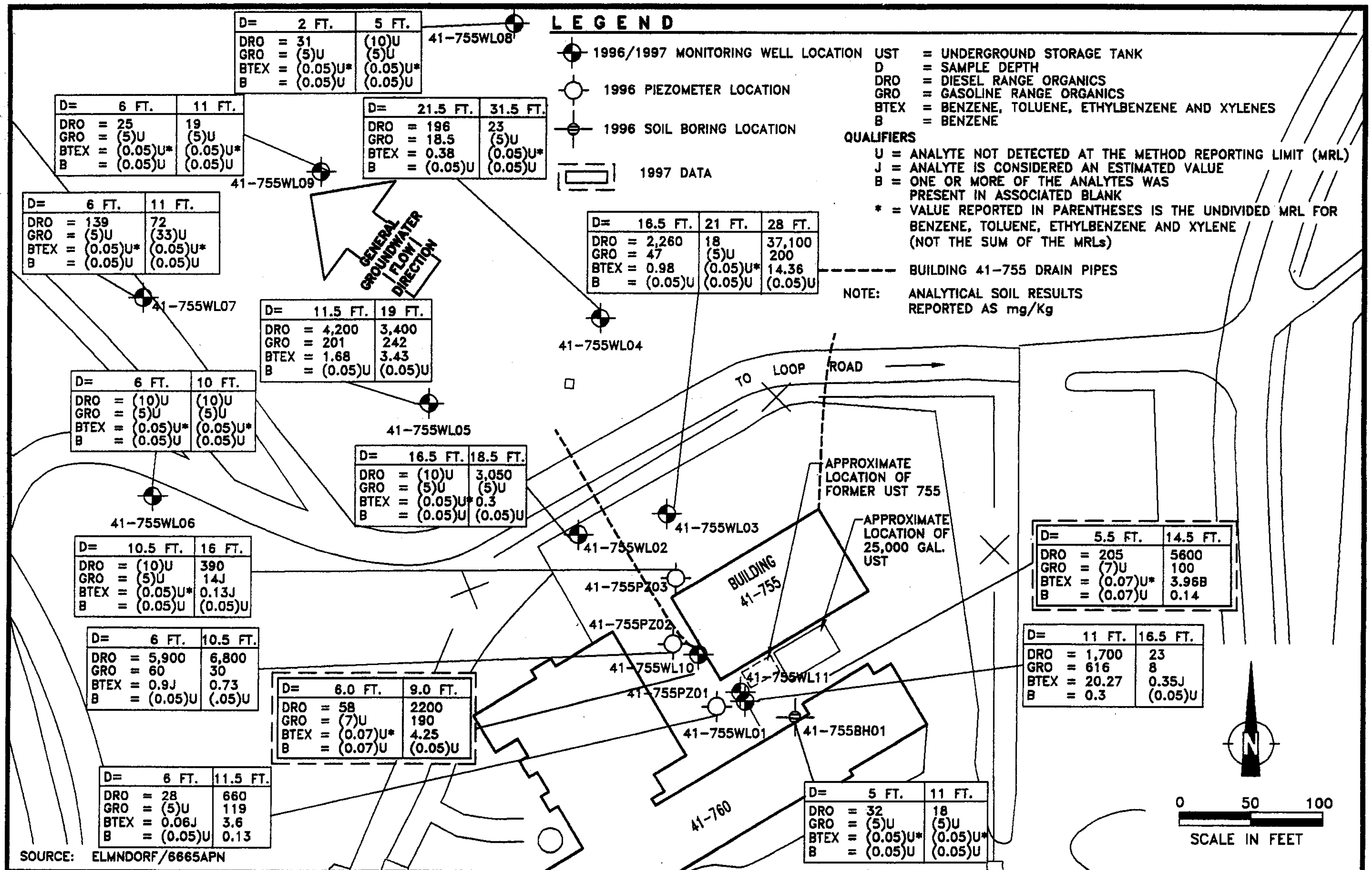


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FIGURE 1-4
ST423/7, 381st IS
SITE LAYOUT AND 1996-1997 RESULTS

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

recovery system (Spillbuster® skimmer) was installed in summer 1997 in one of the 4-inch wells. This system was operated until September 1997 but recovered little product. The active system was replaced with the Petropore® system in October 1997 due to snow removal/freezing concerns. Figure 1-4 shows analytical results associated with the 1997 fieldwork, and Appendix C contains tabulated data.

Based upon water level data collected during the 1997 SERA IV investigation, groundwater was estimated to be at 4 to 10 feet bgs at 41-755WL01, 41-755WL10, and 41-755WL11 in the immediate vicinity of the former 3,000-gallon UST location. Groundwater was estimated to be at 6 to 16 feet bgs at 41-755WL02 and 41-755WL03 northwest of Building 41-755.

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 investigation results.

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

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

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

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

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

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 the 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,*" 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 release investigation, 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 detected [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. Asphalt and concrete damaged by drilling activities were patched after borings are completed.

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 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 field screening analysis.

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 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 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) polycyclic aromatic hydrocarbons (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 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 ST423/7.

Analyte	Method	Number of Samples
DRO	AK102	Up to 3 per boring
GRO	AK101	Up to 3 per boring
RRO	AK103	Up to 3 per boring
BTEX	AK101/EPA 8021B	Up to 3 per boring
PAH	EPA 8270B/SIM	Up to 3 per site
SIM = Selective ion monitoring.		

2.3.2 Groundwater Development and Sampling

No groundwater sampling was conducted at ST423/7 as part of the SERA VII release investigation. Downgradient monitoring is being conducted at this site under a separate Air Force contract. However, the 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.

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

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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 U.S. Army Corps of Engineers (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. 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 Borehole 04 at site ST423/7, from 5 to 7.5 feet bgs, would be numbered:

423BH04SO5.0N1

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

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Specific decontamination procedures for various types of field equipment used 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

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.

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 ST423/7. The completed matrix score sheet, provided in Appendix D, indicates a total matrix score of 39 (Level B cleanup standards). However, per 18 AAC 78.610(c), because groundwater at this site has been impacted by petroleum leachate, the site defaults to 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 and 1998, elevated concentrations of petroleum hydrocarbons were detected as deep as 28 feet bgs. Water levels measured in 1998 in the vicinity of the impacted soil show the water table to be at approximately 5 to 10 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 ST423/7 is coarse-grained soils with fines (ML, SM, SP-SM, SC, Unified Soil Classification).

- Potential Receptors: The nearest public/private water system is approximately 2,800 feet southeast (and presumed upgradient) of ST423/7: Well 29 at Building 42-500 (EAFB Master Plan G-Tab drawing, Water Supply System). The number of people served by this well is not known, but is conservatively estimated to be over 25. The 381st IS facility receives potable water from the EAFB 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 150 feet by 150 feet, with elevated PID readings and laboratory results indicating contaminants in a 5 to 10 foot zone. This equals 4,170 to 8,300 cubic yards of soil.

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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.

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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.

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3.0 RESULTS

3.1 1998 SERA VII Field Program

3.1.1 Drilling and Soil Sampling

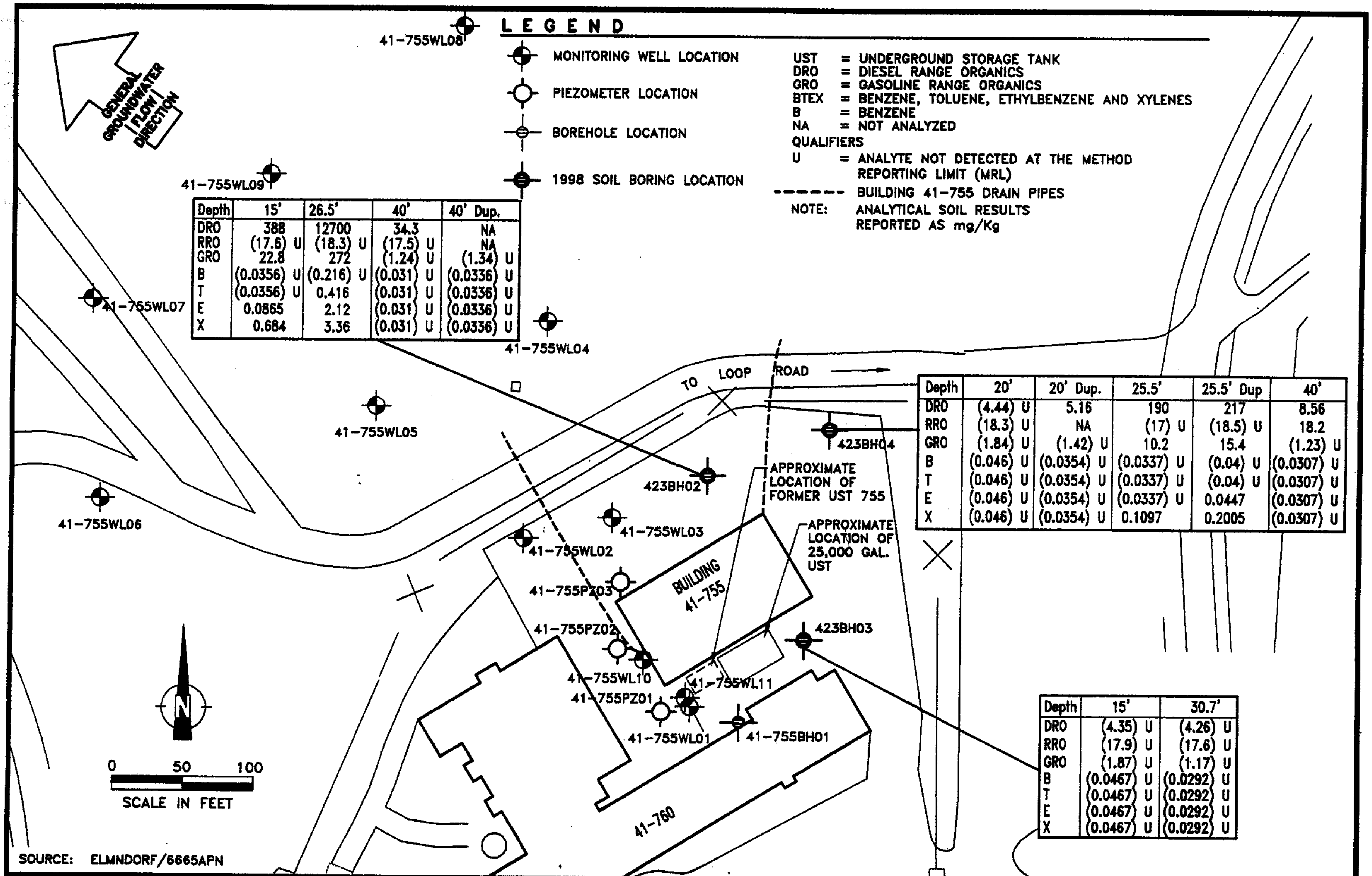
On June 25, 1998, two soil borings (423BH02 and 423BH03) were advanced in the vicinity of Building 41-755 (Figure 3-1). Boring 423BH02 was located on the north side of the building between 423WL03 and the drainage tile identified on facility blueprints. This soil boring was advanced to further characterize the (eastern) extent of petroleum-impacted soil and water and to assess if the floor tile was a source of contaminants. Boring 423BH03 was located on the south side of the building, adjacent to the formerly used 25,000-gallon UST. The tank is no longer in use but is still in place. This boring was located as close to the tank as possible, although electrical transformers and buried electric lines prevented the boring from being placed any closer to the tank. The boring was used to determine the eastern extent of petroleum-contaminated soil in the vicinity of two USTs located on that side of the building. A third soil boring (423BH04) was added east of 423BH02 after field observations indicated petroleum contamination in 423BH02. Boring 423BH04 was drilled on July 20, 1998.

Water was measured while drilling in 423BH02 at approximately 19.6 feet bgs. A thin layer (<0.01 feet) of product was detected with an interface probe. The soil boring was advanced to a total depth of 40 feet bgs; soils were identified as silts and silty sands with gravel. Field observations, including ATH screening, indicated potentially contaminated soils throughout the entire soil boring. The boring was terminated to prevent the possibility of breaking through the silty soils into a more permeable unit and, because petroleum contamination was evident, the goal of defining the eastern extent of contamination could not be met.

Boring 423BH03 was advanced to a depth of approximately 30 feet bgs. There was no evidence (based on visual observations and ATH screening results) of petroleum-contaminated soil. Although the depth to the bottom of the tank is not known, sampling to 30 feet bgs was expected to be deep enough to extend to at least 10 to 15 feet below the bottom of the tank.

Soil boring 423BH04 was advanced to a depth of 40 feet bgs. Soils encountered were gravelly sands with significant (up to 40%) fines. The sample collected from the 25 to 27 foot interval was noted as having a slight odor, possible dark gray staining and an ATH result of 200.6 PID units. The samples collected below this (30 to 32 foot, 35 to 37 foot, and 40 to 42 foot) did not appear to be impacted nor did soils above the 25 foot sample.

Soil samples from all borings were submitted to the laboratory for DRO, GRO, RRO, and BTEX analysis. Select samples were also analyzed for PAHs.



Depth	15'	26.5'	40'	40' Dup.
DRO	388	12700	34.3	NA
RRO	(17.6) U	(18.3) U	(17.5) U	NA
GRO	22.8	272	(1.24) U	(1.34) U
B	(0.0356) U	(0.216) U	(0.031) U	(0.0336) U
T	(0.0356) U	0.416	(0.031) U	(0.0336) U
E	0.0865	2.12	(0.031) U	(0.0336) U
X	0.684	3.36	(0.031) U	(0.0336) U

Depth	20'	20' Dup.	25.5'	25.5' Dup	40'
DRO	(4.44) U	5.16	190	217	8.56
RRO	(18.3) U	NA	(17) U	(18.5) U	18.2
GRO	(1.84) U	(1.42) U	10.2	15.4	(1.23) U
B	(0.046) U	(0.0354) U	(0.0337) U	(0.04) U	(0.0307) U
T	(0.046) U	(0.0354) U	(0.0337) U	(0.04) U	(0.0307) U
E	(0.046) U	(0.0354) U	(0.0337) U	0.0447	(0.0307) U
X	(0.046) U	(0.0354) U	0.1097	0.2005	(0.0307) U

Depth	15'	30.7'
DRO	(4.35) U	(4.26) U
RRO	(17.9) U	(17.6) U
GRO	(1.87) U	(1.17) U
B	(0.0467) U	(0.0292) U
T	(0.0467) U	(0.0292) U
E	(0.0467) U	(0.0292) U
X	(0.0467) U	(0.0292) U

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FIGURE 3-1

ST423/7, 1998 SOIL SAMPLE RESULTS

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

3.1.2 Water Level Measurement

On September 16, 1998, water levels were measured in monitoring wells at ST423/7. Several of the wells contained what appears to be a passive product recovery system (WL01, WL03, WL10, and WL11). The field team could not locate WL02; this flush-mounted well may have been covered over by soil or otherwise obscured.

3.2 Discussion of Findings

3.2.1 Soil Findings

Soil samples collected in 1998 provide for better characterization of the vertical and lateral extent of soil contamination in the vicinity of Building 41-755. Boring 41-755WL03, sampled in 1996, contained 37,100 mg/Kg DRO at a depth of 28 feet bgs (Figure 1-4). The lack of any samples from below the 28-foot level prevented the vertical extent of contamination from being defined at the time. In addition, the lack of any soil boring to the east of 41-755WL03 or the former UST location prevented lateral definition of the eastern extent of the contaminated zone. To fill these data gaps, borings 423BH02, 423BH03, and 423BH04 were sampled in 1998. Figure 3-1 presents the results of soil sampling.

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

Boring 423BH02 was shown to contain DRO above the Method Two cleanup standard (250 mg/Kg DRO) at 15 feet and 26.5 feet bgs. In 423BH02, the DRO concentration dropped from 12,700 mg/Kg at 26.5 feet bgs to 34.3 mg/Kg at 40 feet bgs, below DRO cleanup standards. Boring 423BH02 also confirms the presence of petroleum hydrocarbons in a sand layer at a depth below the water table (as first indicated in 1997 by the sample from 41-755WL03 at 28 feet bgs). Concentrations of DRO in soil samples collected from 423BH04 were below the Method Two DRO cleanup standard, and were significantly lower than those collected from similar intervals in 423BH02, aiding in better definition of the eastern extent of the soil contamination. Appendix B contains boring logs for ST423/7, and Appendix C contains all 1996, 1997, and 1998 laboratory results.

Similarly, boring 423BH03, placed in close proximity to the abandoned-in-place 25,000-gallon UST, had no detectable concentrations of petroleum hydrocarbons in soil, indicating that the lateral extent of soil contamination to the east of the former 3,000-gallon UST has been defined.

In reviewing all soil data collected to date (1996, 1997, and 1998), the extent of impacted soil appears to have been delineated on the south and east sides of the former 3,000-gallon UST. Soil samples collected in 1996 from downgradient borings WL06, WL07, WL08, and WL09 were within the Method Two cleanup standard, indicating that the extent of soil contamination downgradient of the source (former UST) has also been delineated. Soil boring 41-755WL01, sampled in 1996, provides some information on the vertical extent of impacted soil in the vicinity of the USTs, showing that DRO concentrations dropped from 1,700 mg/Kg at 11 feet bgs to 23 mg/Kg at 16.5 feet bgs.

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 1998a), 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 3-2, 3-3, and 3-4 provide cross-section diagrams for ST423/7. The dominant soil type at this site is silty sands and gravels. There is a fine sand unit that may underlie part or all of this site, and which is apparent at a depth of 20 feet bgs in 41-755WL02, 28 feet bgs in 41-755WL03, 26.5 feet bgs in 423BH02, and 30 feet bgs in 423BH04. The extent of this sand unit is not known. The upper limit of the water table begins within the silty soil. The underlying sand unit may exist under semi-confined or confined conditions. This unit is likely to have a higher hydraulic conductivity than the overlying silty unit. Soil samples from the sand unit had DRO concentrations reported at 37,100 mg/Kg (41-755WL03 at 28 feet bgs – sampled in 1996) and 12,700 mg/Kg (423BH02 at 26.5 feet bgs – sampled in 1998).

In review of all soil data, it is evident that the highest concentrations of petroleum hydrocarbons measured on-site are present in the sand unit. Soil samples may indicate that contamination at this depth is vertically segregated from contamination at higher elevations (i.e., there appears to be a thin zone of less contaminated soil between the sand unit and the overlying soils). This suggests migration of contaminants to this deeper sand unit may not have occurred simply through vertical migration from above. There is currently not enough information to determine the extent of the sand unit or the transport mechanism for the petroleum contamination to reach it.

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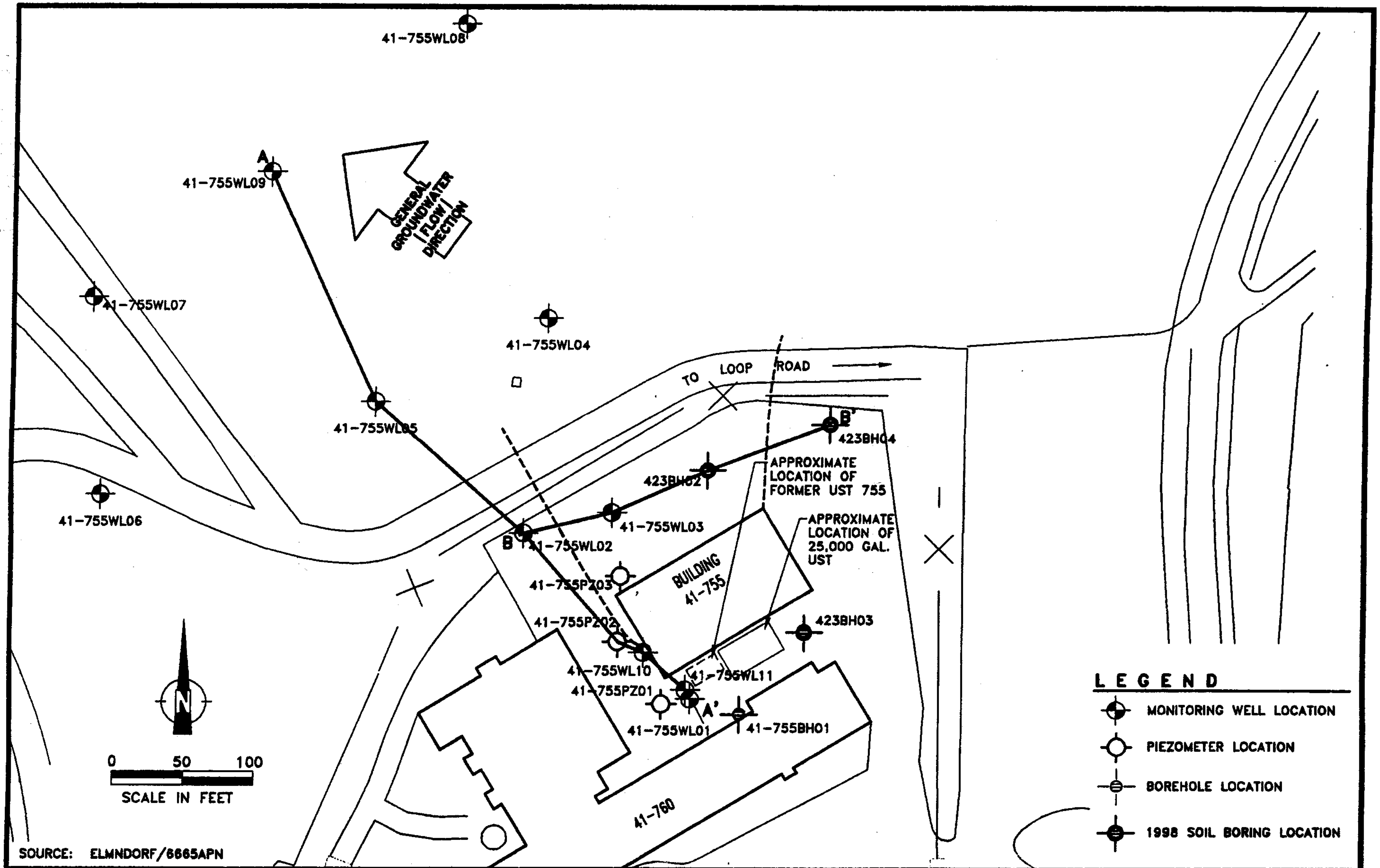


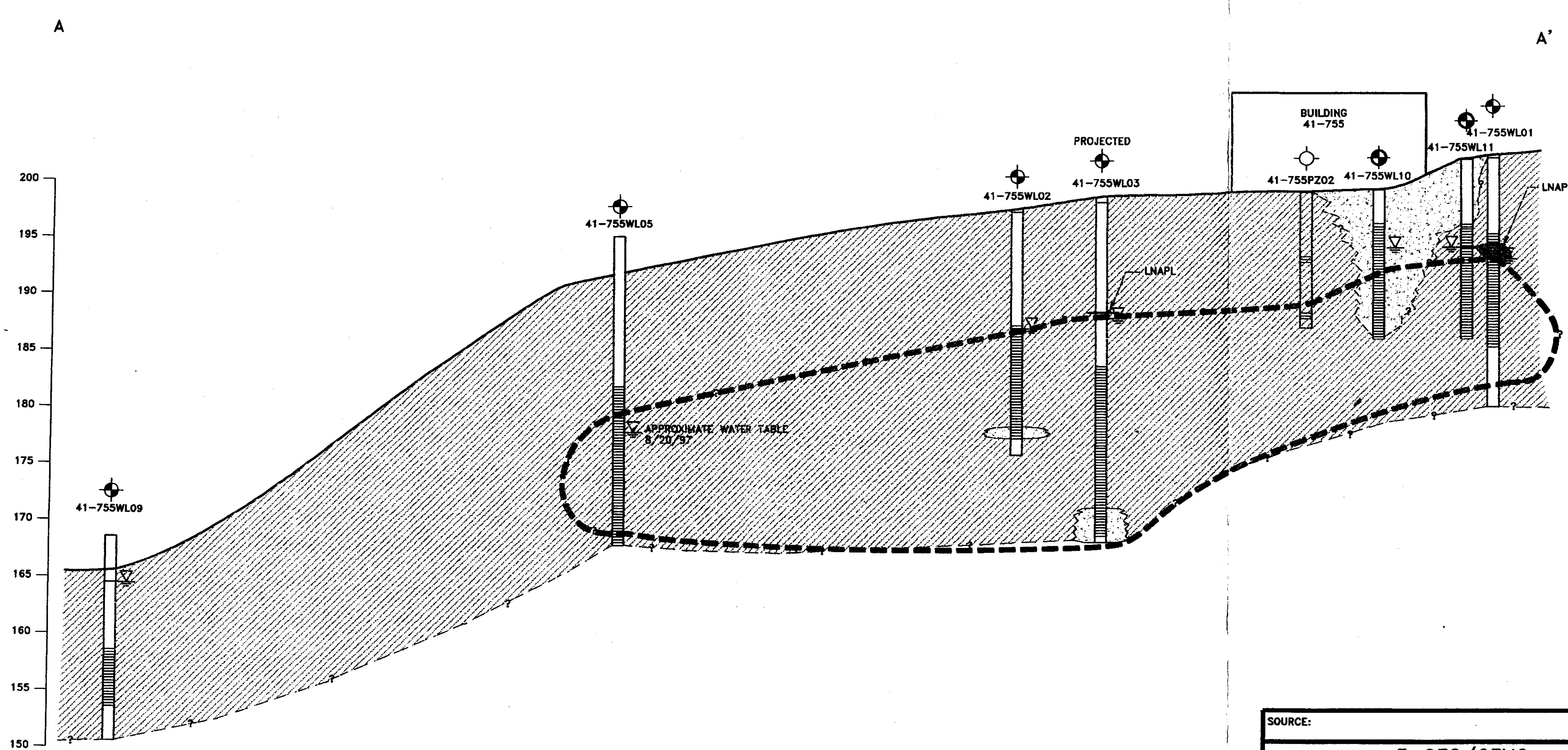
DRAWING: 9000-168/42398 C/SC: 1:100 DATE: 1/13/99	DRAWN: SSR DISK: 26/98 CHECK: J.S.	FIGURE 3-2 ST423/7, 381st IS SITE MAP SHOWING CROSS SECTIONS	3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA PROJECT FXSB 957011Z3

During 1997, a soil gas survey and additional soil sampling were conducted under SERA VI within the area of contaminated soils to the northwest of Building 41-755. Data from the SERA VI soil gas survey suggests that a plume of petroleum hydrocarbons and chlorinated solvents is present in two separate areas: 1) in the field to the northwest of the building and outside the facility fenceline, in the area encompassed by WL04, WL05, WL06, WL07, WL08, and WL09; and 2) to the immediate north of Building 41-755 (USAF 1998b). As described in Section 1.3, a review of as-built drawings for Building 41-755 shows that the floor drainage system for the building appears to have discharged in this area outside the facility fenceline. This drainage system is a likely source of contamination in the field northwest of the facility fenceline. The other area of contamination indicated by the soil gas survey is more immediate to Building 41-755, and the petroleum hydrocarbons detected in this area are likely partially due to migration of diesel fuel from the former 3,000-gallon UST on the water table. SERA VI soil samples collected in Fall 1997 show that DRO concentrations in the area outside the fenceline were 7,500 and 42,000 mg/Kg DRO in two samples. Within the fenceline, SERA VI soil samples indicated DRO concentrations of 710 to 4,500 mg/Kg at depths of up to 10 to 12 feet bgs (USAF 1998b).

3.2.2 Groundwater Findings

Water level measurements taken in September 1998 show that local groundwater flow is to the northwest at a gradient of 0.061 foot/foot (Figure 3-5), consistent with the flow direction determined in August 1997. Table 3-1 contains water level data for September 1998. Two wells contained measurable product in the well casing: WL01 near the former UST location and WL03 downslope from Building 41-755. Monitoring well WL01 contained 3.26 feet of product, and WL03 contained 0.21 foot of product. Although WL10 and WL11 are in close proximity to WL01, they did not contain any free product, and it is likely that the passive recovery systems present in WL10 and WL11 (both 4 inch wells) are operating satisfactorily. The thickness of the product in WL01 (a 2 inch well) may indicate that the passive recovery system in that well is not operating correctly.

Groundwater samples were collected in November 1996 from ST423/7 wells WL02, WL04, WL05, WL06, WL07, WL08, and WL09. DRO results for groundwater samples from wells WL02, WL04, WL05, and WL07 exceeded the groundwater cleanup standard of 1.5 mg/L. The groundwater cleanup standard for GRO of 1.3 mg/L was exceeded only in WL02, and the BTEX compounds' standards were not exceeded. At the downgradient wells (WL06, WL08, and WL09), any DRO or GRO detected was below groundwater standards, and benzene was not detected at laboratory MRLs. Appendix C contains the 1996 groundwater results.



0 20 40

HORIZONTAL SCALE IN FEET
4 X VERTICAL EXAGGERATION

LEGEND

- SAND AND GRAVEL, LITTLE TO NO FINES
- SILT/CLAY, SILTY SANDS AND GRAVELS
- PETROLEUM HYDROCARBON CONTAMINATION

LNAPL = LIGHT NON-AQUEOUS PHASE LIQUID

SOURCE:			
3 CES/CEVQ SERA VII ELMENDORF AFB, ALASKA			
FIGURE 3-3 ST423/7, 381st IS CONCEPTUAL SITE MODEL CROSS SECTION A-A'			
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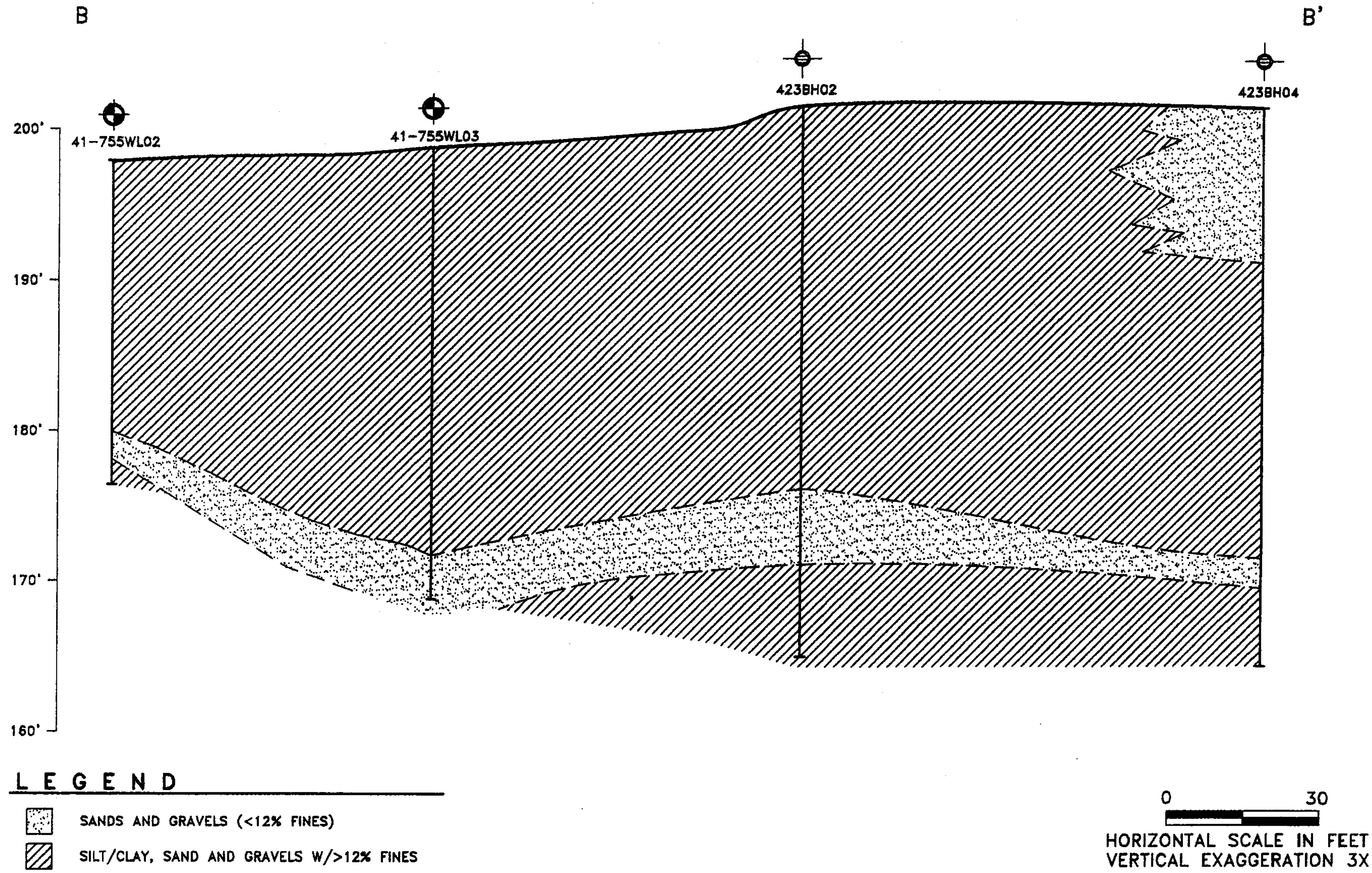

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DATE: 10/16/98
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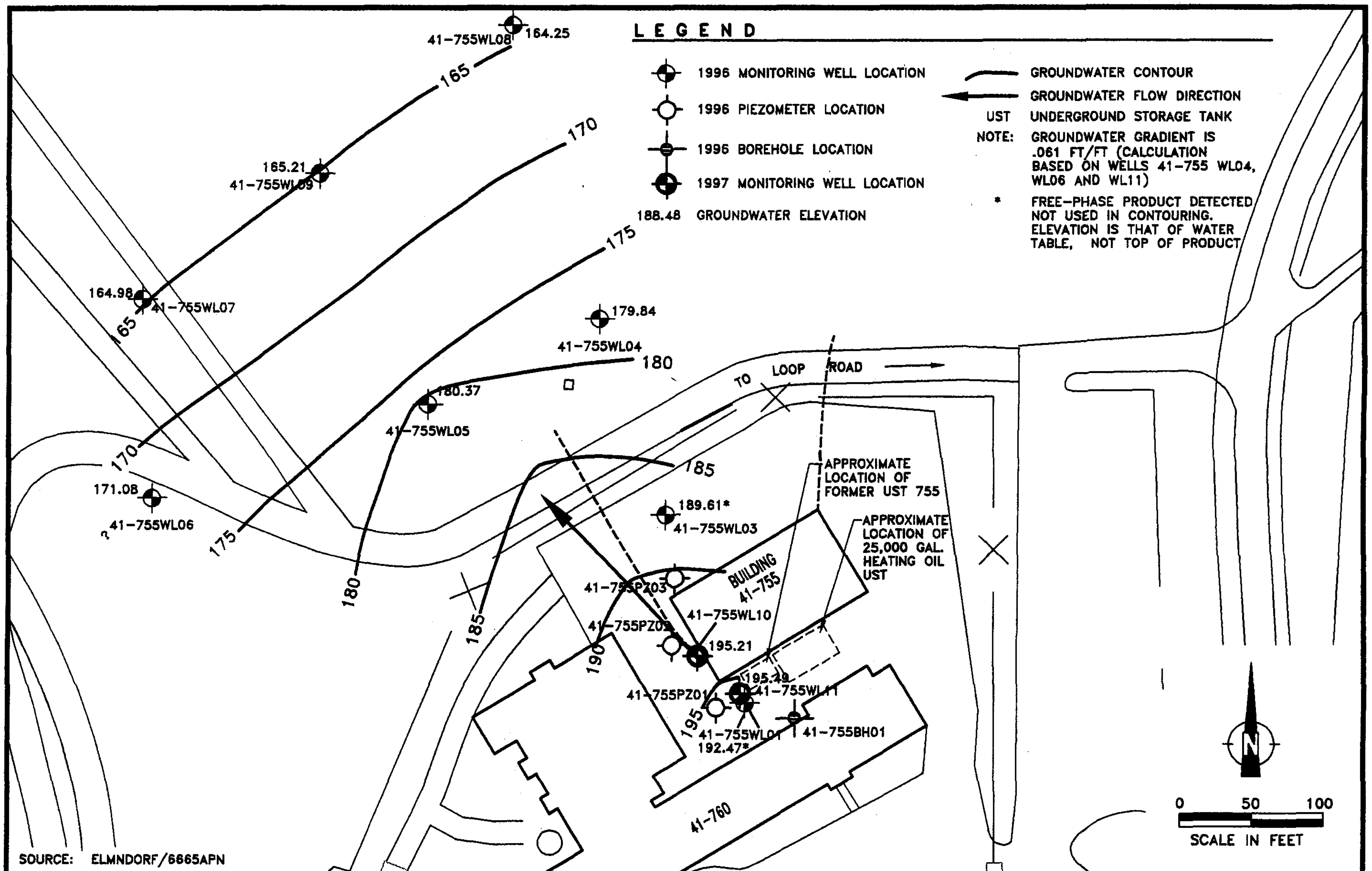
FIGURE 3-4
ST423/7, 381st IS
SITE MAP SHOWING
CROSS SECTION B-B'

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



DRAWING: 9000-168/423WT998	DRAWN: SSR	FIGURE 3-5 ST423/7 WATER TABLE CONTOUR MAP FOR SEPTEMBER 16, 1998	3 CES/CEVQ SERA VII ELEMENDORF AFB, ALASKA PROJECT FXSB 957011Z3
C/SC: 1:100	DISK: 26/98		
DATE: 1/22/99	CHECK: JS		

Product thickness measurements from September 1998 show that a measurable layer of free-phase product continues to be present in WL01 (3.26 feet product) and WL03 (0.21 foot product).

Table 3-1. Water Levels - September 16, 1998

Well No.	Top of Well Elevation	Top of PVC Elevation	Depth to Water	Water Table Elevation	Ground Elevation	Notes
41-755WL01	n/a	202.78	10.31	192.47	n/a	7.05 ft to top of product.
41-755WL02	n/a	197.88	not measured	n/a	n/a	
41-755WL03	n/a	198.73	9.12	189.61	n/a	8.91 ft to top of product.
41-755WL04	n/a	196.79	16.95	179.84	n/a	No free-phase product.
41-755WL05	n/a	195.52	15.15	180.37	n/a	No free-phase product.
41-755WL06	n/a	179.97	8.89	171.08	n/a	No free-phase product.
41-755WL07	n/a	172.80	7.82	164.98	n/a	No free-phase product.
41-755WL08	n/a	166.92	2.67	164.25	n/a	No free-phase product.
41-755WL09	n/a	168.59	3.38	165.21	n/a	No free-phase product.
41-755WL10	n/a	199.97	4.76	195.21	n/a	No free-phase product.
41-755WL11	n/a	202.69	7.20	195.49	n/a	No free-phase product.

Notes: Passive skimmers in WL01, WL03, WL10 and WL11.

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4.0 CONCLUSIONS

4.1 Summary

Probable sources of site contamination at ST423/7 have been identified, and the extent of soil contamination due to the former UST has been well characterized to the north-northwest, east, and south of Building 41-755. However, the extent of an underlying sand unit and the degree to which it is impacted by petroleum hydrocarbons is not yet known. High concentrations of petroleum hydrocarbons remaining in the soil will likely continue to serve as a source of ongoing groundwater contamination.

Soil sample results from 1996, 1997,and 1998 indicate that petroleum hydrocarbons are present above the ADEC Method Two soil cleanup standard for DRO (250 mg/Kg) and benzene (0.02 mg/Kg). Toluene, ethylbenzene, xylene, GRO, and RRO have not been measured in soil in excess of their respective Method Two cleanup standards. Soil in the vicinity of the former 3,000-gallon UST (AFID 755) was shown to contain DRO as high as 6,800 mg/Kg and benzene as high as 0.3 mg/Kg in 1996. High levels of DRO have also been detected in borings outside the facility fenceline, but it is suspected that another contaminant source may have contributed to the contamination outside the fenceline (e.g., chlorinated solvents).

The highest concentrations of DRO measured on site (up to 37,100 mg/Kg DRO) are present in the sand layer, encountered below the water table at approximately 25 to 30 feet bgs (the water table is at approximately 10 feet bgs). The sand unit and the transport mechanisms by which petroleum hydrocarbons have reached the sand unit need to be further investigated.

Groundwater level measurements collected in 1998 show that free-phase petroleum hydrocarbons are present on the water table. Local groundwater flow is to the northwest. Water samples collected from wells downgradient from the former UST site were last collected in 1996 and contained DRO in excess of the ADEC groundwater cleanup standard. Because ST423/7 is not within the OU5 Model Area, free-phase product and dissolved-phase contaminants must be addressed as part of the SERA investigation.

4.2 Data Gaps

- The extent of the sand unit and degree to which it has been impacted by contaminants is not known.
- The condition of the floor drain system associated with Building 41-755 is unknown.

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