OU-D 33245

U.S. Army, Alaska

Prepared for
U.S. Army Engineer District - Alaska

Final RI/FS Operable Unit D
Fort Richardson, Alaska

Volume Ia
Remedial Investigation Report

November 1998

Prepared by

ENSR

ENSR
Consulting • Engineering • Remediation

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HTRW Contract No.: DACA85-94-D0010
Delivery Order: 0021
ENSR Project No.: 9000-107

November 19, 1998

Mr. Brian West
U.S. Army Engineer District, Alaska
CENPA-EN
P.O. Box 898
Anchorage, Alaska 99506-0898

Subject: Final Deliverable – Remedial Investigation/Feasibility Study, OUD, Fort Richardson, Alaska.

Dear Mr. West:

This letter is to transmit 17 copies plus one original of the Final Remedial Investigation/ Feasibility Study (RI/FS) Report for OUD. Included in the 17 copies is one unbound, 3-hole punched copy. We have also shipped two of the copies directly to Matt Wilkening (EPA Region 10 - Seattle, WA).

This deliverable consists of the final version of the OUD Remedial Investigation (Volume Ia) plus Appendices (Volume Ib) and the OUD Risk Assessment (Volume IIa) documents. The Postwide Risk Assessment (Volume IIb) and the draft final OUD Feasibility Study (Volume III) will be submitted under separate cover. Please note that comments pertaining to these redline/strikeout documents will be included in the front of their respective binders.

We have enjoyed working with you on this project. If you have any questions, please don't hesitate to call me at 561-5700.

Sincerely,

Steve Wrenn
Delivery Order Manager

Chris L. Humphrey, P.E.
Program Manager

U.S. Army, Alaska

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APPENDICES

ACRONYMS

ADC	Alaskan Defense Command
ADEC	Alaska Department of Environmental Conservation
ADF	Alaskan Defense Force
AEHA	U.S. Army Environmental Hygiene Agency
AFB	Air Force Base
ATH	Ambient Temperature Headspace
AVO	Aromatic Volatile Organics
BAF	Bioaccumulation factors
BCF	Bioconcentration factor
BHHRA	Baseline Human Health Risk Assessment
BTEX	Benzene, toluene, ethylbenzene, and xylene
CAS	Columbia Analytical Services
CDQRR	Chemical Data Quality Review Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Chemicals of Potential Concern
CRREL	U.S. Army Cold Regions Research and Engineering Laboratory
CVAA	Cold vapor atomic absorption
DAR	Data Assessment Report
DCA	Dichloroethane
DCE	Dichloroethene
DEH	Directorate of Engineering and Housing
DEHP	Bis(2-ethylhexyl)phthalate
DNAPL	Dense Non-aqueous Phase Liquid
DO	Dissolved Oxygen
DOD	Department of Defense
DQO	Data quality objectives
DRMO	Defense Reutilization and Marketing Office
DRO	Diesel Range Organics
ECD	Electron capture detection
ELCR	Excess lifetime cancer risk
ENSR	ENSR Corporation
EPH	Extractable petroleum hydrocarbons
ERA	Ecological Risk Assessment
FFA	Federal Facility Agreement
FID	Flame Ionization Detector
FSP	Field Sampling Plan
GC	Gas chromatography

ACRONYMS (Continued)

GFAA	Graphite furnace atomic absorption
gpm	Gallons per minute
GRO	Gasoline Range Organics
HDPE	High-density polyethylene
HLA	Harding Lawson Associates
HOCs	Hydrophobic organic compounds
HVOs	Halogenated Volatile Organics
ICP	Inductively coupled plasma
ID	Inner Diameter
K	coefficient of hydraulic conductivity
MCLs	Maximum Contaminant Levels
MDLs	Method detection limits
MRLs	Method reporting limits
MSL	Mean sea level
NAPL	Non-aqueous Phase Liquids
NCP	National Oil and Hazardous Substances Contingency Plan
NON	Notice of noncompliance
NPL	National Priorities List
OUD	Operable Unit D
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCE	Tetrachloroethene or Perchloroethene
PID	Photoionization Detector
ppm	Parts per million
PSE	Preliminary Source Evaluation
PVC	Polyvinyl Chloride
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
RBCs	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
SOW	Statement of Work
SVOC	Semivolatile organic compound
TAS	Target analyte summary
TCA	1,1,1-trichloroethane
TCE	Trichloroethene
TOC	Total organic carbon
TPH	Total petroleum hydrocarbons

ACRONYMS (Continued)

USACE	U.S. Army Corps of Engineers
UST	Underground storage tank
UTL	Upper tolerance limit
VOC	Volatile Organic Compounds
VP	vapor pressure
VSI	Visual Site Inspection

1.0 INTRODUCTION

This report has been developed for the U.S. Department of the Army (Army) under contract to the U.S. Army Corps of Engineers (USACE) by ENSR Corporation (ENSR). The report presents the findings of the Remedial Investigation (RI) for Operable Unit D (OUD) at Fort Richardson, Alaska. Preparation of the RI report has been conducted as Delivery Order No. 0021 under Contract No. DACA85-94-D-0010.

1.1 Federal Facility Agreement

The Department of Defense (DOD), the U.S. Environmental Protection Agency (EPA), and the Alaska Department of Environmental Conservation (ADEC) entered into a joint agreement, referred to as the Federal Facility Agreement (FFA), in the Spring of 1994. The FFA was formed in response to the placement of Fort Richardson on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 National Priorities List (NPL), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the National Oil and Hazardous Substances Contingency Plan (NCP) of 1985. The FFA identifies the authorities and responsibilities of these parties and integrates CERCLA requirements with relevant aspects of other federal and state programs, such as Resource Conservation and Recovery Act (RCRA) and Alaska underground storage tank (UST) regulations.

Section III of the FFA describes that its general purposes are to:

- Ensure that environmental impacts associated with past and present activities at the site are thoroughly investigated, and appropriate removal and/or remedial action(s) are taken as necessary to protect the public health, welfare, and the environment;
- Establish a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions at the site in accordance with CERCLA, the NCP, National Superfund guidance and policy, national RCRA guidance and policy, and appropriate state law; and
- Facilitate cooperation, exchange of information, and participation of the parties in such actions.

1.2 Remedial Investigation Report Purpose and Overview

The RI Report for OUD is based on information gathered from review of all identified pertinent information relevant to the specific sites included in the OU and the general site area. The information includes current and previous site investigation data and reports, historical reports, reconnaissance site visits, aerial photographs, and other data from files held by ADEC, EPA,

and the Army. Other information was obtained by interviewing persons having knowledge of the sites or practices at the sites. The RI Report for OUD has been prepared following the guidance set forth in *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1989) and *Data Quality Objectives Process for Superfund* (EPA 1993).

In order to focus the scope of the RI, Chemicals of Potential Concern (COPCs) and data gaps were identified by comparing available site data to various screening criteria. Screening criteria for soils included the following:

1. ADEC Underground Storage Tank (UST) Soil Cleanup Levels,
2. One-tenth of the EPA Region 3 Risk-Based Concentrations (RBCs) using residential soil levels,
3. Toxicological Benchmarks (sediments in Cooling Pond at 35-752), and
4. Statistical analysis of metals to determine background concentrations of target analytes.

Screening criteria for waters include the following:

1. Alaska Water Quality Criteria (18 AAC 70),
2. Maximum Contaminant Levels (MCLs; EPA),
3. Region 3 RBCs for Tap Water, and
4. Toxicological Benchmarks (surface water in Cooling Pond at 35-752).

In addition to those compounds exceeding screening criteria, data gaps were identified where the extent of contamination at a site was not known or if additional data was needed for the risk assessment.

Historical data and data generated during RI activities were then used to conduct a Baseline Human Health Risk Assessment (BHHRA) and Ecological Risk Assessment (ERA), presented in the Risk Assessment (Volume IIa).

Screening levels to be used for a general comparison are included in the data tables. However, sediment benchmark criteria established in the risk assessment replace the more generalized sediment screening criteria originally established in the management plan for Building 35-752.

1.3 Fort Richardson Background

Fort Richardson is located on 62,000 acres of land northeast of the Municipality of Anchorage and Elmendorf Air Force Base (AFB) in south central Alaska. Fort Richardson was established in 1940 under the command of the Alaskan Defense Force (ADF) to protect Alaska against foreign attack. The installation included an air field, which was called Elmendorf Field. In 1941,

the ADF was renamed the Alaskan Defense Command (ADC). At that time, Fort Richardson had approximately 7,800 personnel. During World War II, Fort Richardson was used as a staging and supply area for operations occurring on the Aleutian Islands. The troop complement varied in size from 7,800 to over 15,000. In 1943, the ADC was renamed the Alaskan Department, and in 1947 it was again reorganized as the U.S. Army, Alaska.

In 1950, Fort Richardson was divided between the Army and Air Force. On the northern part of the installation, the Army established a new cantonment area. The original base was released to the Air Force and renamed Elmendorf AFB. Fort Richardson has undergone a number of reorganizations and command and control changes since that time, including expansion of the cantonment area. Fort Richardson is currently the home of the 6th Infantry Division (Light) and has approximately 2,175 military and 3,820 dependent personnel stationed at the Post. In addition, approximately 1,500 civilian employees work on the Post. The overall mission of Fort Richardson has not changed over time; it is still tasked with protecting Alaska from foreign invasion.

Geographically, the Post is bordered by Eagle Bay and the Knik Arm of Cook Inlet to the north, and the Chugach Mountain Range and State Park to the south and east. The elevation of most of Fort Richardson lies between 45 and 225 feet above mean sea level (MSL).

1.4 OUD Source Areas

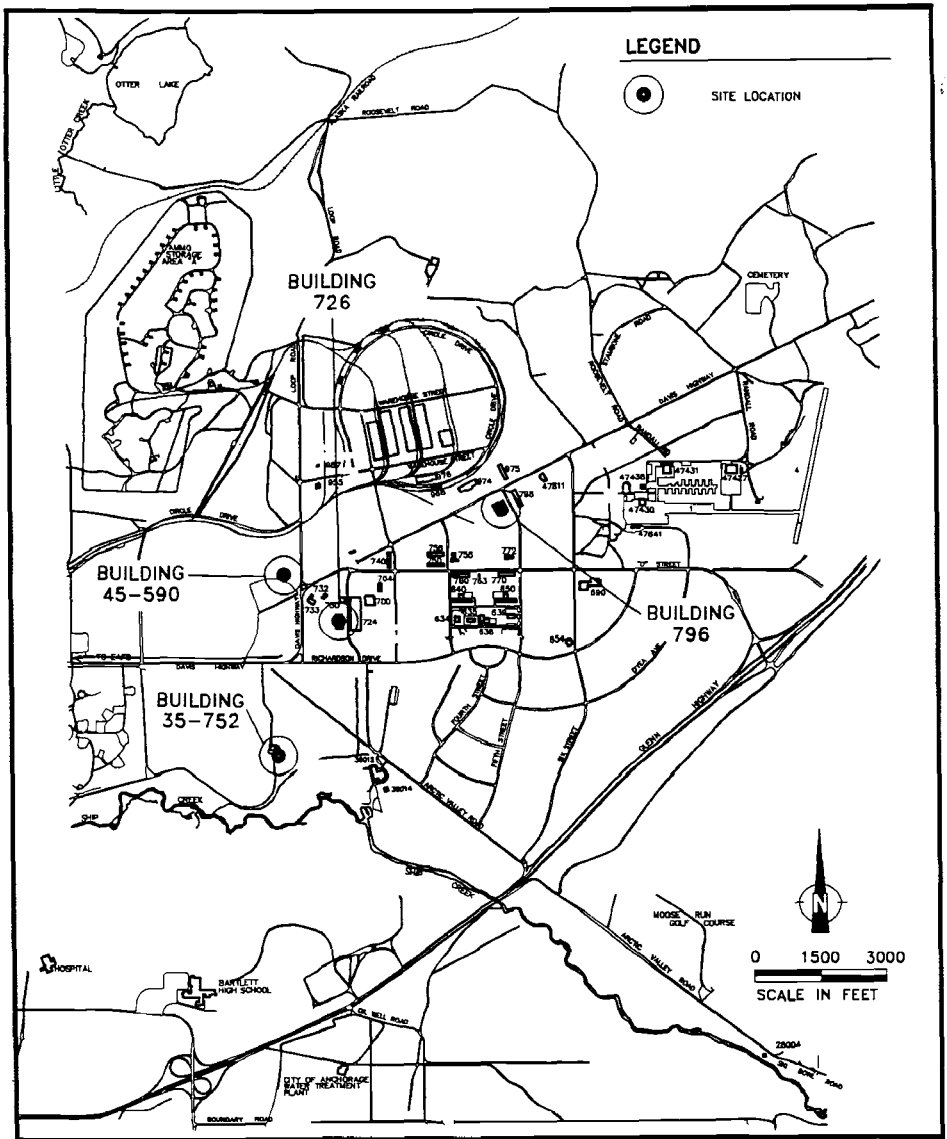
Four sites under investigation for OUD have known or suspected contamination as indicated by results of previous investigations. The purpose of the RI was to confirm the presence and evaluate the extent of contamination, and to provide enough information so that risk assessments and feasibility studies could be performed for each site. The four sites are:

- Building 35-752 -- High Frequency Transmitter Site;
- Building 45-590 -- Auto Hobby Shop;
- Building 726 -- Laundry Facility; and
- Building 796 -- Battery Shop.

The locations for these sites are shown on Figure 1-1 (page 1-4).

1.5 Document Presentation

This document is Volume I of the three-volume RI/FS. Volume IIa is the Risk Assessment for OUD. Volume IIb presents the Postwide Risk Assessment (PRA), which evaluates exposures to media regardless of OU boundaries. In addition, the PRA includes some sites that were not part of any OU based on contaminant type or were unknown prior to implementation of the FFA. Volume III presents the FS for OUD.



DRAWING: 196D-1 DRAWN: DPM C/SC: 1:3000 DISK: Z 11/97 DATE: 8/14/97 CHECK: J.W.	FIGURE 1-1 SITE LOCATIONS	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-002

2.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

The following sections provide a description of the general environmental setting of the Anchorage and Fort Richardson area. For ease of use and quick reference, tables and figures are presented at the end of Section 2.0 in Attachment 2.1.

2.1 Demography

Military, State of Alaska, and residential land holdings dominate the land use surrounding Fort Richardson. The Post is bordered by Elmendorf AFB to the west, the city of Anchorage to the southwest, and the city of Eagle River to the northeast (Figure 2-1, Attachment 2.1). Chugach State Park borders the remaining southern and eastern boundaries of Fort Richardson.

Anchorage and Eagle River are the two major population centers within 10 miles of Fort Richardson. The combined population of the Eagle River-Anchorage area is approximately 225,000 (WCC 1994). The Eagle River area serves as a suburban community for Fort Richardson personnel and also for Anchorage.

Future land use considerations include the potential for closure of Fort Richardson. If the Post is closed, the land may be taken over by Elmendorf AFB or deeded to the Municipality of Anchorage. Although three water supply wells are located on Fort Richardson property south of Ship Creek, it is unlikely that groundwater from any of the OUD sites would be used for a drinking water supply. A pipeline carrying drinking water from Eklutna Lake (over 15 miles from the site) runs through the area. The area is not suitable for agricultural purposes (WCC 1994). The potential for future residential use of the area is remote, but will be considered for screening purposes during the RI.

2.2 Ecology

2.2.1 Flora

Regional vegetation includes tundra, coniferous forests, deciduous forests, tall shrub, low shrub, sedge grass, aquatic and coastal wetlands. Alpine tundra consists of low-growing shrubs and lichen. Coniferous forests are dominated by black and white spruce. Deciduous forests are a mix of balsam poplar, birch, aspen, and alder. Tall shrub assemblage is dominated by alder. The types of low shrubs and grasses change with different moisture regimes. Zones of low shrub vegetation surrounding bogs and ponds include dwarf black spruce, ericaceous shrubs, and other low scrub. Wet meadows occupy small kettles (glacial ice pit depressions) and are dominated by bluejoint grass. Slightly wetter areas support the growth of sedges. Lake and stream vegetation consists of submerged, rooted aquatic plants.

Dominant vegetation types include pond lily, water lily, pond weeds, and marestails. Sedges and cattails line the banks of most lakes and streams. Boggy areas support mosses, cotton grass, cranberry, rosemary, and sedges (Black and Veatch 1989). Coastal wetlands consist of intertidal estuarine areas dominated by narrow-leafed persistent emergent vegetation (WCC 1994).

2.2.2 Fauna

All five species of Pacific salmon inhabit Cook Inlet and Knik Arm. Salmon species are chinook (king), sockeye (red), coho (silver), pink, and chum. Eagle River and Ship Creek maintain spawning runs of chinook, coho, and pink salmon. Beluga whales are common in both Turnagain Arm and Knik Arm, and are often observed off the mouth of the Eagle River.

Freshwater and estuarine aquatic habitats of Upper Cook Inlet, including Eagle River, contain Arctic grayling and Dolly Varden. Stickleback inhabit salt marshes along Knik Arm and are common within shallow ponds and backwaters of the Eagle River (WCC 1994).

Large and small mammals, raptors, waterfowl, shorebirds, and one amphibian (the wood frog) occur in the region. Mammals include large ungulates, such as moose and dall sheep, and small mammals, such as beaver, muskrat, red squirrel, snowshoe hare, arctic ground squirrel, and red-backed vole. Carnivores of the region include grizzly bear, black bear, coyote, timberwolf, wolverine, river otter, and mink (WCC 1994).

Bird life is abundant in Upper Cook Inlet. Breeding species are attracted to the extensive wetland and forest habitats and abundance of summer insect and plant life available as food. Migrating species are also attracted to the vast inland and coastal wetlands available as resting and staging areas. Common bird species in the vicinity of Fort Richardson, especially near the Eagle River, include raptors such as the bald eagle, red-tailed hawk, and northern harrier. Other common species observed in the vicinity of Fort Richardson include sandpipers, greater and lesser yellowlegs, red-necked phalarope, sandhill crane, mew gull, glaucous gull, Arctic tern, boreal chickadee, and varied thrush. Waterfowl observed in the summer months include trumpeter swan, northern shoveler, tundra swan, green-winged teal, Canada goose, greater scaup, Pacific white-fronted goose, common goldeneye, mallard, Barrow's goldeneye, northern pintail, bufflehead, American widgeon, and gadwall.

2.3 Climatology

The temperature and precipitation data for Anchorage from 1983 through 1992 is shown in Table 2-1 (Attachment 2.1). Average summer temperatures range from 46°F to 66°F, and winter temperatures range between 4°F and 42°F. Extremes are from -43°F to 86°F. The yearly average precipitation is approximately 15 inches. Infiltration and runoff from precipitation are both predominant during breakup when the winter snowpack melts.

The principal factors affecting the climate of Fort Richardson include terrain, latitude, and geographic position relative to large land masses and oceans. Fort Richardson is in a transitional zone between the maritime climatic zone to the south and the interior or continental climatic zone to the north (Selkregg 1972). The St. Elias and Chugach mountains to the south act as a barrier to the maritime influence of the northern Pacific Ocean; the Alaska Range to the north protects the area from the extreme cold of the arctic air masses of the state's interior region. Cook Inlet creates additional, local temperatures that impact the Fort Richardson area.

This transitional zone experiences a moderate climate, generally lacking in extremes in precipitation and temperature. However, because of the latitudinal position, the reduction of mean annual solar radiation results in low mean annual temperatures (Black and Veatch 1989).

2.3.1 Temperature

Seasonal variations in temperature for the area are exaggerated as a result of the reduced number of daylight hours during winter and increased number of daylight hours in the summer. However, daily fluctuation in temperature is relatively slight. January exhibits the lowest monthly mean temperature at 12°F. The highest monthly mean temperature (58°F) is in July (Leslie 1989).

2.3.2 Wind

Above-surface airflow in the Fort Richardson area is generally toward the northeast and northwest onto the Post from Cook Inlet. In winter, these winds are more likely to blow south along Knik Arm. Surface wind velocities average 5.8 knots, although channeling of the winds near Ship Creek is common with velocities reaching up to 53 knots (Black and Veatch 1989).

2.4 Geology

The geology in the vicinity of Fort Richardson is a complex sequence of glacial and alluvial deposits. An investigation is currently being conducted by the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) to better understand the geology and hydrogeology of this area. The following descriptions of regional geology are extracted from CRREL (1997), Schmoll and Dobrovolny (1972), Kirschner and Lyon (1973), and Freethey (1976).

The vicinity in which Fort Richardson is located has three general geologic terrains: glacial deposits, alluvial deposits, and metamorphic rock. Glacial sediments deposited in the Cook Inlet basin during a series of five glacial periods in recent geologic history constitute the north and central portions of Fort Richardson. Metamorphic bedrock outcrops and mountains predominate in the south-central and southern portions of Fort Richardson.

The OUD sites are on a sequence of alluvium and buried ground moraine to depths on the order of 200 feet or more. Terminal moraine deposits (the Elmendorf moraine) are present directly northwest of the main cantonment area. The soils of the Elmendorf moraine are composed of fine-grained, poorly sorted glacial materials (clays, silts, very fine sands), with interbedded heterogeneous layers of boulders, cobbles, gravel, sand, silt, and clays.

The main cantonment lies within the Mountain View Fan formation. The formation consists of multiple flood and interflood deposits, resulting in a complex subsurface stratigraphy. The flood deposits were probably generated by a series of sudden releases of an ancient glacial lake located in the Eagle River Valley. The interflood deposits include alluvial fan and braided stream deposits emanating predominantly from the Eagle River Valley in the east and smaller local valley sources and along the edge of the Elmendorf Moraine. The Elmendorf Moraine is a terminal moraine, deposited at the toe of the glacier during the most recent glacial event, and located northwest of the main cantonment area. The soils of the Elmendorf Moraine are composed of fine-grained, poorly sorted glacial materials (clays, silts, very fine sands), with interbedded heterogeneous layers of boulders, cobbles, gravel, sand, silt, and clays. In addition to the alluvial fan deposits, deposits formed by debris flow may also be interfingered with the alluvial fan sequences near the margin of the Elmendorf Moraine. Braided stream deposits, characteristic of alluvial fans, probably lie buried at depth. This also adds to the complexity of the geology and hydrogeology.

Beneath the Mountain View Fan lie older glacial and glacio-marine deposits. Soils in the Mountain View Fan consist mostly of sand and gravel with significant fines (approximately 10 to 15 percent). Interbedded silty sand and gravel containing lenses and layers of silt and clay are common (CRREL 1997).

Alluvial sediments of the Anchorage Plain extend from northeast of the Fort Richardson main cantonment area southwest to the city of Anchorage. The alluvial sediments comprise both glacial outwash, alluvial fan, and fluvial deposits, grading from gravel in the eastern portion of the plain to sand in the southwestern portion. In the cantonment area, deposits are composed chiefly of well-bedded and well-sorted gravel.

This sequence of alluvium and till probably overlies the Bootlegger Cove Formation.

The Bootlegger Cove Formation, comprised of thinly bedded clayey silt and silty clay, is present throughout a large part of the Anchorage Lowland (at least 40 square miles; CRREL 1997). This unit may be non-existent in the north and east portions of the cantonment. Where present, the Bootlegger Cove Formation acts as an aquitard to groundwater flow; groundwater beneath the Bootlegger Cove Formation is under confined (artesian) conditions. As will be discussed further in the next section, it is important to note that this confined aquifer, encountered beneath the Bootlegger Cove Formation, is not the same as the confined to semiconfined aquifer encountered beneath the OUD sites.

2.5 Hydrology

The primary surface drainage features in the area are Eagle River, to the north of the main cantonment, and Ship Creek, located south of the main cantonment. Both originate in the Chugach Mountains and flow westerly across the installation into Knik Arm. Eagle River is fed by turbid glacial meltwaters, and Ship Creek is sustained by snowmelt and rainwater runoff. Surface drainage across the main cantonment is southwesterly

Surface water from Ship Creek is the primary source of drinking water for Fort Richardson. A diversion dam, where water is taken from the creek, is located approximately 10.5 miles upstream from the mouth. The Municipality of Anchorage, Elmendorf AFB, and Fort Richardson pump water from a deep aquifer for drinking water when there is low stream flow (Freethey 1976). Table 2-2 provides a list of supply wells that have been drilled on or near Fort Richardson. The locations for these wells are shown on Figure 2-2. Table 2-3 provides a list of monitoring wells used in the OUD RI. (See Attachment 2.1 for tables and figures.)

Two major groundwater systems have been identified in the area of Fort Richardson: a shallow system and deep system (Freethey 1976). The groundwater of the shallow system occurs under unconfined conditions in the Anchorage Plain deposits and in unconfined to semiconfined conditions in the till of the Elmendorf Moraine. Shallow perched groundwater of limited volume and extent exists in localized areas within the Elmendorf Moraine till deposits. The deep system occurs under artesian (confined) conditions beneath areas where the Bootlegger Cove Formation is present.

Groundwater in the Anchorage Plain deposits occurs between 10 and 20 feet below ground surface (bgs). Flow in this system is generally southerly towards Ship Creek, with a gradient between 0.05 and 0.01 feet per feet (ft/ft; USACE 1991). Groundwater in the deep system has been encountered at a minimum depth of 130 feet bgs in the northern area of Fort Richardson. The flow in the deep system is generally westerly to northwesterly towards Knik Arm, with a gradient between 0.02 and 0.0025 ft/ft (USACE 1991).

The complex geology at Fort Richardson leads to complex hydrogeology. Because the hydrogeology varies between the sites of OUD, more detailed discussions are included along with the site descriptions.

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ATTACHMENT 2.1
Tables and Figures

Table 2-1. Climatological Summary from January 1983 to December 1992 for the Anchorage Area.

Latitude: 61° 15' N
Longitude: 149° 48' W
Elevation: 213 feet/65 meters

	Temperature (Degrees F)										Precipitation (Inches)									
	Means			Extremes		Mean Days				Heat Degree Days	Rain						Snow			
						Max		Min			Means and Extremes				Day Exceeded		Max and Means			
Mth	Max	Min	Mth	Rec Hi	Rec Lo	70+	60+	0-	33-	Mth Mean	Max Precip	Min Precip	Mean Mth Tot	Max 24 Hr	0.5	0.01	Mean Mth Tot	Max Daily Dpth	Max 24 Hr Snfl	Mean Days < 1.5
Jan	20	6	13	49	-38	0	0	10	31	1,580	2.60	.03	.91	1.16	1	8	10.8	34	11.6	3
Feb	25	9	17	58	-43	0	0	7	28	1,329	2.93	Tr	.87	1.38	1	7	11.5	41	13.7	3
Mar	32	16	24	51	-24	0	0	4	29	1,237	3.03	Tr	.78	1.90	1	7	9.1	50	14.9	2
Apr	43	28	36	65	-20	0	1	1	22	863	2.96	.01	.59	.83	1	6	5.2	21	10.0	1
May	54	39	47	80	0	1	6	0	3	545	2.00	Tr	.56	.72	1	6	.3	7	6.9	1
Jun	62	47	55	86	33	3	18	0	0	296	3.72	.09	1.13	1.31	1	8	0	0	0	0
Jul	65	52	58	83	34	6	25	0	0	195	4.94	.35	2.02	1.61	1	12	0	0	0	0
Aug	63	50	57	82	29	4	23	0	1	253	8.62	.27	2.41	2.54	1	14	Tr	0	1	0
Sep	55	42	48	74	15	1	6	0	3	482	6.41	.15	2.58	1.52	1	14	0.2	Tr	1.8	1
Oct	40	28	35	63	-6	0	1	1	20	924	3.39	.20	1.73	1.40	1	11	7.8	13	10.8	2
Nov	27	14	21	57	-22	0	0	4	28	1,312	2.93	.05	1.12	1.58	1	8	11.8	19	14.6	3
Dec	20	8	14	53	-34	0	0	9	31	1,552	3.63	.14	1.32	1.36	1	10	15.7	30	15.0	4
Year	Avg 42	Avg 28	Avg 35	Rec 86	Rec -43	Tot 15	Tot 80	Tot 36	Tot 195		Tot 23.37	Tot 9.05	Tot 15.91	Tot 2.54	Tot 12	Tot 111		Rec 50	Rec 15.0	Tot 20

Key:

Tr = Trace amounts reported.
F = Fahrenheit

Table 2-2. Fort Richardson Supply Wells.

Well	Date Installed	Northing	Easting	Elevation TOC	Casing Stickup (feet)	Casing Diameter (inches)	Depth to Groundwater from TOC (feet)	Groundwater Elevation (feet)	Boring Depth Below Ground Surface (feet)	Remarks/ Description
Otter	No Info	128,750[a]	121,950[a]	NSTD	No Info	No Info	No Info	No Info	No Info	Drinking water for Otter Lake Lodge
W-B	No Info	129,470	130,781	249.25	No Info	12	96.3	153.0	No Info	Abandoned
TW-1	Mar 56	107,551	121,104	227.31	2.4	6	26.3	201.0	250	Installed by USGS, used as piezometer
Well-1 (60)	9 Sep 56	111,710[c]	125,200[c]	NSTD	1.3	16	No Info	No Info	162	Standby drinking water supply well
Well-2 (61)	25 Sep 56	111,000[a]	124,500[a]	NSTD	No Info	16	No Info	No Info	170	Standby drinking water supply well
Well-3 (62)	27 Sep 56	110,300[a]	123,800[a]	NSTD	1.3	18	No Info	No Info	145	Standby drinking water supply well
ADFG 2	25 Mar 71	111,812	127,841	283.53	1.1	12	14.1	269.4	41	ADFG supply well for hatchery
ADFG 5	No Info	112,290	127,558	280.83	1.4	12	13.8	267.0	No Info	ADFG supply well for hatchery
ADFG 9	14 Nov 83	SB01300206CABB1[b]		No Info	No Info	No Info	55.4[c]	No Info	143	ADFG supply well for hatchery
ADFG 10	1 Jun 83	112,426	127,833	284.8	2.6	12	42.4	242.4	89	ADFG supply well for hatchery
ADFG A	No Info	111,315	127,574	283.72	2.7	10	8.3	275.7	No Info	ADFG supply well for hatchery
ADFG C	1 Jan 76	SB01300206CBAD3[b]		No Info	No Info	No Info	8.8[c]	No Info	30	ADFG supply well for hatchery
ADFG D2	No Info	111,499	126,529	246.57	2.8	10	12.5	234.1	No Info	ADFG supply well for hatchery
ADFG E	13 Jan 82	SB01300206CCBC1[b]		No Info	No Info	No Info	7.2[c]	No Info	41	ADFG supply well for hatchery
ADFG G	14 Jan 82	111,446	126,163	269.10	2.5	10	10.3	258.8	25	ADFG supply well for hatchery
ADFG K	11 Feb 82	SB01300206CCDA1[b]		No Info	No Info	No Info	6.4[c]	No Info	No Info	ADFG supply well for hatchery
ADFG N	23 Feb 82	111,441	127,345	280.04	2.4	10	14.1	265.6	50	ADFG supply well for hatchery
A-1	2 Aug 82	110,746	123,965	249.84	2.0	6	30.9	218.9	78	Exploration well for hatchery, capped off
A-2	4 Aug 82	110,834	122,728	230.60	2.3	6	23.3	207.3	156	Exploration well for hatchery, capped off

Table 2-2. Fort Richardson Supply Wells (Cont'd).

Well	Date Installed	Northing	Easting	Elevation TOC	Casing Stickup (feet)	Casing Diameter (inches)	Depth to Groundwater from TOC (feet)	Groundwater Elevation (feet)	Boring Depth Below Ground Surface (feet)	Remarks/ Description
A-3	6 Aug 82	111,106	122,979	238.34	2.1	6	30.6	207.7	118	Exploration well for hatchery, capped off
A-4	10 Aug 82	110,920	123,509	244.04	2.6	6	28.1	215.9	99	Exploration well for hatchery, capped off
A-5	20 Jan 83	111,350	124,640	252.57	2.3	6	6.4	246.2	60	Exploration well for hatchery, capped off
A-6	25 Jan 83	111,069	124,402	249.14	2.3	6	5.5	243.6	60	Exploration well for hatchery, capped off
A-7	27 Jan 83	111,402	124,064	246.87	2.2	6	5.7	241.2	40	Exploration well for hatchery, capped off
A-8	27 Jan 83	111,357	123,410	242.17	2.8	6	15.9	226.3	38	Exploration well for hatchery, capped off
A-9	27 Jan 83	111,178	123,710	242.72	2.7	6	5.3	237.4	38	Exploration well for hatchery, capped off
A-10	28 Jan 83	111,555	123,499	242.58	2.8	6	16.1	226.5	39	Exploration well for hatchery, capped off
B-6	23 Mar 83	110,029	130,292	311.30	3.6	6	7.9	303.4	38	Open end casing, not in use
H-1	24 Aug 83	112,420	127,840	284.51	1.9	6	42.6	241.9	218	Not in use
Gallery B	29 Apr 85	111,594	127,906	292.59	2.9	6	18.7	273.9	39	Cluster well, not in use
Gallery C	29 Apr 85	111,596	127,823	289.87	2.9	6	20.1	269.8	39	Cluster well, not in use
Gallery D	2 May 85	111,212	127,928	290.44	2.0	6	11.9	278.5	39	Cluster well, not in use
Gallery E	3 May 85	111,263	127,944	288.49	2.5	6	10.3	278.2	39	Cluster well, not in use
Gallery F	4 May 85	111,239	127,885	289.20	2.1	6	11.5	277.7	39	Cluster well, not in use
Gallery G	5 May 85	111,261	127,900	289.73	2.0	6	12.2	277.5	38	Cluster well, not in use
AP-3364	10 Nov 92	108,050	122,200	No Info	No Info	6	No Info	No Info	267	Supply/pump test
AP-3365	9 Dec 93	107,850	122,150	No Info	No Info	24	No Info	No Info	280	Supply/pump test

Notes:

[a] Estimated.
[b] U.S. Geological Survey well identifier number.
[c] Water level (feet).
ADFG = Alaska Department of Fish and Game; NSTD = Not surveyed to date; TOC = Top of casing; USGS = United States Geological Survey.

Modified from Table 1, Groundwater Monitoring Network, Fort Richardson, Alaska (USACE 1991b).

Table 2-3. Fort Richardson Monitor Wells.

Well	Date Installed	Northing	Easting	Elevation TOC	Casing Stickup (feet)	Casing Diameter (inches)	Depth to Groundwater from TOC* (feet)	Groundwater Elevation (feet)	Boring Depth Below Ground Surface (feet)	Screened Interval Depth Below Ground Surface (feet)
Building 35-752										
AP-2982	21 Aug 90	113158	125665	263.61	1.1	2	13.36	250.25	24	14.28 - 24.28
AP-2983	21 Aug 90	113158	125767	264.24	1.5	2	15.99	248.58	24	13.67 - 23.67
AP-2984	22 Aug 90	113118	125767	261.80	1.5	2	13.18	248.62	19	8.63 - 18.63
AP-2985	23 Aug 90	113086	125718	259.54	2.4	2	10.93	248.61	14	3.89 - 13.89
AP-2986	23 Aug 90	113113	125715	260.98	1.5	2	12.53	248.45	19	8.57 - 18.57
AP-2987	24 Aug 90	113123	125664	261.75	1.3	2	13.44	248.31	19	8.75 - 18.75
AP-3231	26 Aug 93	113231	125746	265.62	2.8	2	17.21	248.41	21	10.65 - 20.65
AP-3232	25 Aug 93	113060	125662	259.75	2.3	2	11.44	248.35	16	4.97 - 14.97
AP-3458	25 Aug 94	113562	125451	264.65	2	2	26.99	237.66	36	25 - 34.7
AP-3502	07 Nov 94	113150.70	125618.86	261.05	-0.26	2	13.16	247.89	22	11.96 - 21.96
AP-3503	8 Nov 94	113127.27	125594.38	263.66	-0.26	2	15.69	247.97	19	8.96 - 18.96
AP-3504	4 Nov 94	113208.25	125603.48	261.54	-0.26	2	13.96	247.58	24	14.03 - 24.03
AP-3917	19 May 98	113261.05	125735.99	261.92	-0.38	2	8.36	253.56	19	8.67 – 18.67
AP-3918	19 May 98	113228.05	125703.51	265.78	2.58	2	12.79	252.99	19	8.67 – 18.67
AP-3920	20 May 98	113260.09	125705.39	262.43	-0.47	2	9.20	253.23	22	10 – 20
Building 45-590										
AP-3387	30 Mar 94	117240	125872	279.89	Flush Mount	2	105.34	174.55	111	91 - 110.5
AP-3439	13 Jun 94	117137	125981	279.91	Flush Mount	2	104.67	175.24	110	90.0 - 110.0
AP-3440	17 Jun 94	117175	125824	279.5	Flush Mount	2	105.25	174.25	109	90.0 - 109.0
AP-3441	15 Jul 94	117489	125850	285.4	Flush Mount	2	110.92	174.48	113	93.0 - 113.0
AP-3468	28 Dec 94	117281	126635	289.26	2.4	2	110.5	203.03	115.5	101.26 - 111.86
AP-3483	10 Jan 95	116394	125369	277.09	2.4	2	99.2	177.89	114.6	104.7 - 114.4
AP-3534	11 May 95	117271	126617	288.89	2.8	2	113.82	175.07	136.1	116.1 - 145.9
AP-3772	07Sept 96	116837.01	125870.98	281.75	3.15	2	106.43	175.32	117.2	106.5-116.5

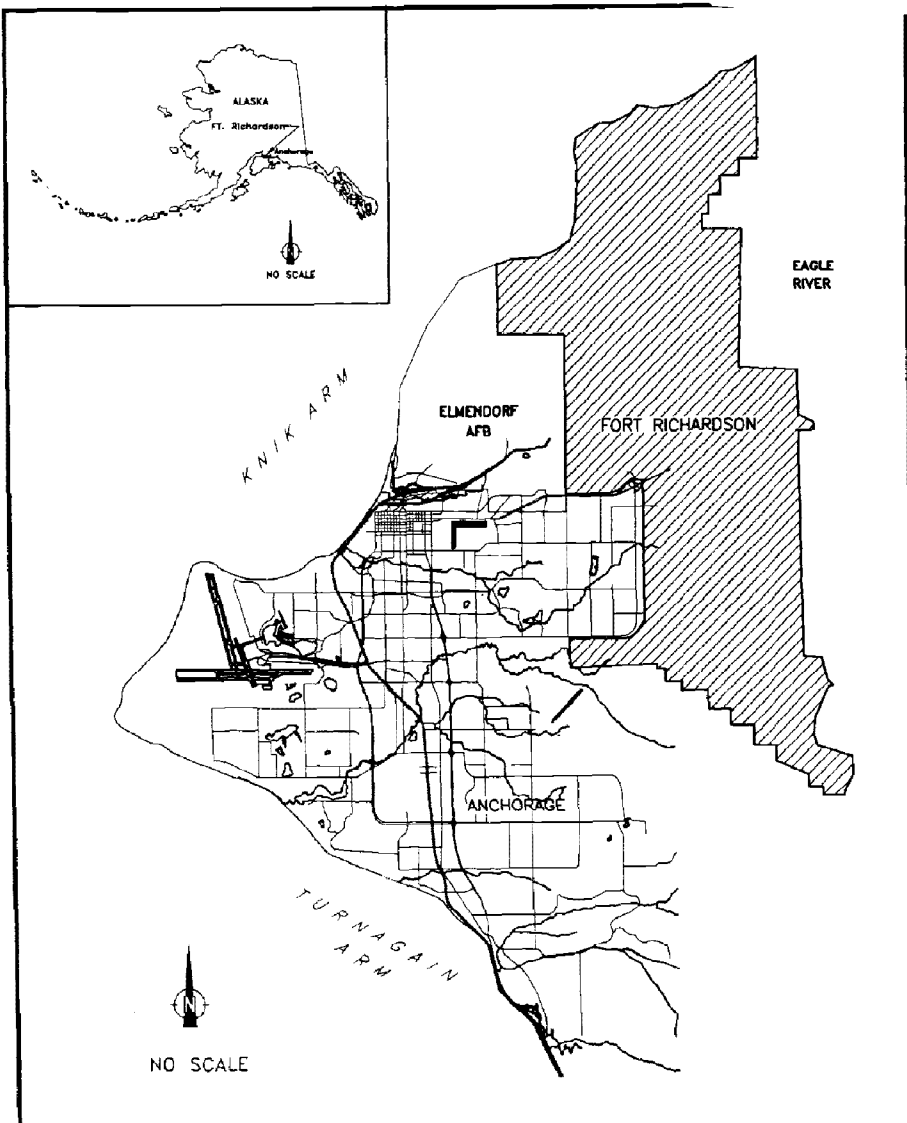
Table 2-3. Fort Richardson Monitor Wells (Cont'd).

Well	Date Installed	Northing	Easting	Elevation TOC	Casing Stickup (feet)	Casing Diameter (inches)	Depth to Groundwater from TOC* (feet)	Groundwater Elevation (feet)	Boring Depth Below Ground Surface (feet)	Screened Interval Depth Below Ground Surface (feet)
AP-3773	10 Sept 96	116979.34	126157.60	285.20	3.5	2	110.2	175.00	118	108-118
AP-3774	19 Sept 96	117363.01	125605.42	285.24	3.54	2	110.56	174.68	113	102-112
AP-3775	20 Sept 96	117078.32	126233.41	285.07	3.47	2	110.08	174.99	112	101-111
AP-3776	21 Sept 96	117207.21	125482.62	282.00	2.4	2	107.3	174.70	111	98.5-108.5
AP-3789	3 Feb 97	116939.27	126732.86	288.65	3.25	2	113.16	175.49	80.5	69-79
AP-3790	31 Jan 97	117076.33	127493.77	294.98	2.78	2	74.27	220.71	117.5	107-117
AP-3870	12 Jan 98	117395.23	124922.88	277.98	3.5	2	102.08	NA	120	97-107
AP-3871	14 Jan 98	117798.10	126198.99	289.46	3.5	2	113.12	NA	122	108-118
AP-3872	16 Jan 98	117891.76	126705.84	292.77	3.5	2	116.3	NA	125	110-120
AP-3873	20 Jan 98	117655.63	124729.14	279.38	3.5	2	103.56	NA	112.5	97-107
Building 726										
AP-3467	18 Dec 94	115990	127202	289.16	1.7	2	2	203.03	99.2	88.86 - 99.46
AP-3469	20 Jan 95	116529	126973	289.93	2.5	2	2	201.12	125	114.03 - 124.63
Building 796										
AP-3513	12 Dec 95	118899	130876	321.89	Flush Mount	2	87.87	234.02	91	81.0 - 91.0
AP-3532	07 May 95	117990	128220	304.9	2.8	2	113.37	191.53	133.7	113.5 - 133.3
AP-3533	10 May 95	119053	130585	323.12	2.5	2	116.62	206.50	131.4	111.32 - 141.12
AP-3777	12 Sept 96	118614.09	131203.35	324.91	3.5	2	85.02	239.89	96	82-92
AP-3778	13 Sept 96	118389.54	131039.86	323.61	3	2	82.10	241.51	98	83-93

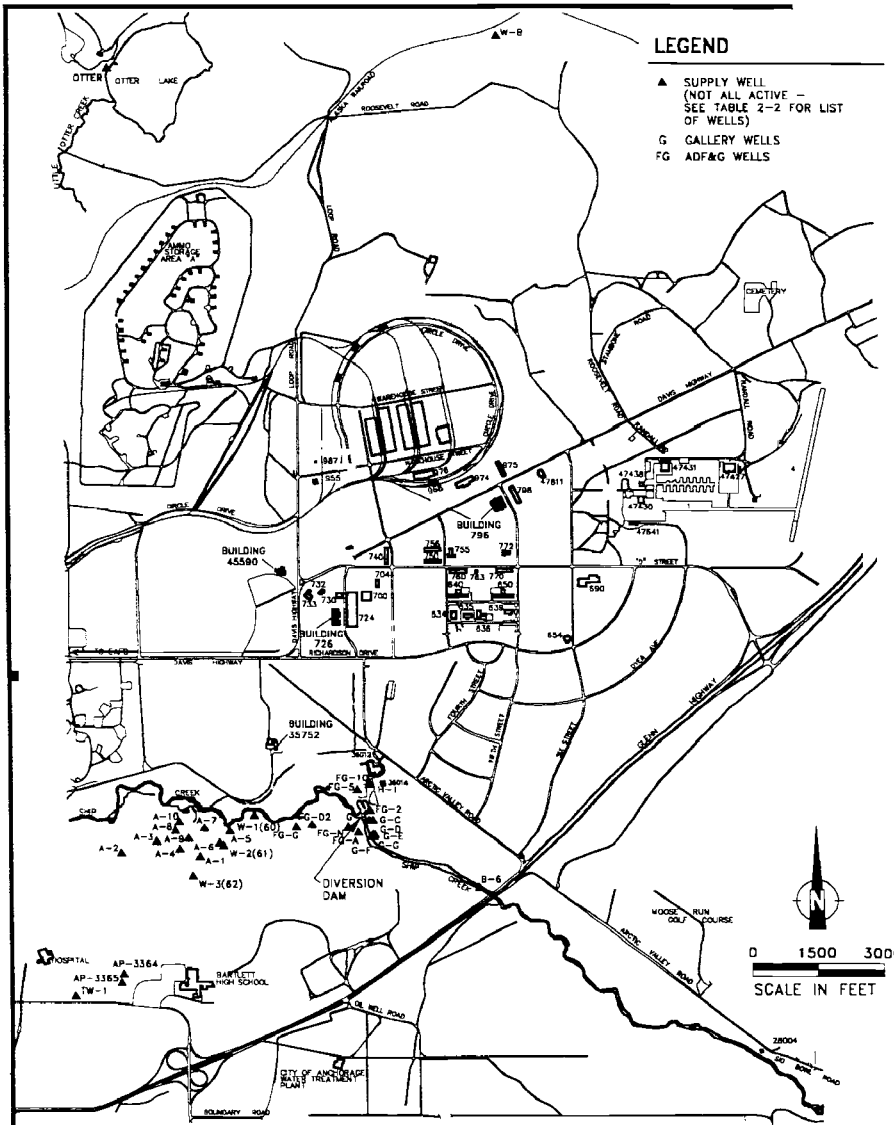
* Water levels for all wells except those installed in 1998 (AP-3870, AP-3871, AP-3872 and AP-3873) were collected on the same day in August 1997. Water levels for AP-3870 through AP-3873 and AP-3917, AP-3918 and AP-3920 were collected during well sampling.

TOC = Top of casing.

Modified from Table 1, Groundwater Monitoring Network, Fort Richardson, Alaska (USACE 1991).



DRAWING: FTFDLOC DRAWN: DPM C/SC: 1:2 DISK: Z 11/97 DATE: 8/14/97 CHECK: J.S.	FIGURE 2-1 FORT RICHARDSON LOCATION MAP	RI/FS REPORT OPERABLE UNIT D FORT RICHARDSON, ALASKA PROJECT 9000-066



DRAWING: 1960-2 DRAWN: DPM C/SC: 1:3000 DISK: Z 11/97 DATE: 9/28/98 CHECK: J.W.	FIGURE 2-2 WATER SUPPLY WELL LOCATIONS	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120

3.0 STUDY AREA INVESTIGATION

This section describes the study area investigated for the RI at OUD. Tables are presented at the end of Section 3.0 in Attachment 3.1. General objectives of the RI were as follows:

- Assess the nature and extent of surface and subsurface soil contamination at the source areas, where applicable;
- Evaluate groundwater flow direction and hydraulic characteristics;
- Assess the nature and extent of groundwater contamination;
- Assess the nature and extent of sediment and surface-water contamination, where applicable;
- Collect sufficient data to asses human health and ecological risks; and
- Collect sufficient data to evaluate remedial action alternatives.

To attain these general objectives, field and analytical programs were developed in the OUD Management Plan (ENSR 1996a). Results of ENSR's quality assurance (QA) review of the field and analytical program are provided in the Data Assessment Report (DAR; Appendix F). Each program is described in detail in Appendix F, and is summarized in the following sections.

3.1 Field Investigation Methods

Fieldwork for the RI began on September 4, 1996. Fieldwork associated with modifications to the RI task order has been completed. The chronology of each field task and a summary of the number of sampling points at each source area are provided in Table 3-1 (Attachment 3.1).

The following subsections provide a brief description of each task. Detailed descriptions of the field activities are included in the OUD Management Plan (ENSR 1996a).

3.1.1 Surface Soil Sampling Procedures

Surface and near surface soils were collected at Building 35-752 and Building 726. Soil samples were collected from 0.0 to 0.5 feet bgs, 1 to 1.5 feet bgs (at Building 726 only), and 2 to 2.5 feet bgs using a decontaminated hand trowel. Sample jars were filled and tightly packed, keeping the void spaces to a minimum and the appropriate sample labels attached. The sample containers were then wrapped in resealable, plastic storage bags and immediately placed in a pre-cooled ice chest for transport to the analytical laboratory. Observations, such as soil description, sample location, staining or odor, were recorded in the field activities logbook.

Samples for volatiles analysis were collected first. The remaining soils were mixed in a stainless steel bowl with a stainless steel trowel. The bowl and trowel were decontaminated between each sample location and sample depth.

3.1.2 Surface Water and Sediment Sampling Procedures

Surface water samples were collected from the Cooling Pond at Building 35-752. Water samples were obtained from the deeper portion of the water column using a Beta Bottle sampler, being careful to minimize any disturbance of the bottom sediments.

Sediment samples from the bottom of the Cooling Pond and the discharge ditch were collected by coring the top of the sediment with a 6-inch by 2.5-inch outer diameter (OD), decontaminated, stainless steel sleeve. The cores retrieved were placed in a stainless steel bowl. Organic matter (e.g., leaves and twigs) was removed from the sample prior to placement in sample jars. Aliquots for volatile-related analyses (i.e., VOC and GRO) were collected first and placed directly into jars minimizing aeration of the samples. Samples collected for Volatile Organic Compound (VOC) analysis were filled to minimize headspace. Samples collected for Gasoline Range Organic (GRO) analysis were field-preserved with methanol in accordance with Method AK101.0 protocol. The remaining soil was homogenized in the stainless steel bowl and then placed in appropriate sample jars for nonvolatile-related analyses.

Field observations were noted in the field logbook and sample jars were labeled and placed immediately in an ice filled cooler.

3.1.3 Soil Boring and Logging Procedures

Soil borings were advanced at Building 45-590, Building 35-752, Building 726, and Building 796. Soil borings were used for logging soil conditions and collecting subsurface soil samples. A complete log of conditions encountered during drilling was maintained by the geologist supervising the operation. Soil boring logs and associated laboratory geotechnical data generated during the OUD RI are presented in Appendix A.

Borings were drilled with a truck-mounted drilling rig using either hollow-stem auger or air rotary drilling methods. Borings not converted to monitoring wells were backfilled with volclay grout. A description of the standard monitoring well construction used is presented in Section 3.1.4.

In general, subsurface soil samples were collected from borings for soil description or chemical analyses at 5-foot intervals. Soil lithology in most of the borings completed as monitoring wells was based on discharge cuttings from the drill rig. In the case of wells AP-3871 and AP-3872, split-spoon samples were collected every 10 feet to a depth of 50 feet below grade and then every 20 feet to the bottom of the boring. Up to two soil samples from each well at which lithology was based on cuttings alone were collected with a split-spoon sampler and submitted for geotechnical analyses (grain size, Atterberg Limits, and percent moisture). With the

exception of AP-3871 and AP-3872, soil samples were not submitted for chemical analyses. Samples for soil description were collected by advancing a 3-inch split-spoon sampler with a 300-pound hammer, from cuttings on the auger, or from the discharge of the air rotary rig depending on the type of sample needed.

Soil samples submitted for chemical analyses were collected with a split-spoon sampler driven into undisturbed soil. Samples were collected from a 2.5-inch inner diameter (ID) split-spoon sampler. Soil samples were field-screened using ambient temperature headspace (ATH) analysis with a photoionization detector (PID) equipped with a 10.2 eV lamp. The PID was maintained in accordance with the manufacturer's specifications and was calibrated with 100 parts per million (ppm) isobutylene once daily at a minimum.

Aliquots collected for the volatile-related analyses were collected first. The remaining soil was then homogenized and placed into appropriate sample jars for nonvolatile-related analyses. If there was insufficient recovery, the soils used for ATH analysis were used as the aliquots for nonvolatile-related analyses. In both cases, sample containers were placed immediately into an ice filled cooler until field-screening results were obtained.

3.1.4 Monitoring Well Installation, Development, and Sampling

Monitoring wells were installed in the vicinity of Building 45-590 and Building 796 with a truck-mounted drilling rig using air rotary drilling methods. Casing size was at least 6 inches nominal ID. A geologist supervised the drilling and well installation, and prepared logs of the borings. Soil samples were collected as described in Section 3.1.3. Monitoring wells were screened in the unconfined aquifer when encountered; otherwise they were screened in the confined aquifer.

Standard Monitoring Well Construction

Monitoring wells were constructed of 10-foot-long, machine slotted, prepacked, Schedule 40 polyvinyl chloride (PVC) screen with Schedule 40 PVC riser pipe. The screen and riser pipe are coupled with threaded joints. No PVC glue or solvent was used in the well installations. The screened sections consist of an inner screen (2-inch ID, 0.008-slot) and an outer screen (3.5-inch ID, 0.008-slot) packed with a No. 40 to 60 silica sand. The annulus between the outer screen and the borehole was backfilled with No. 10 to 20 clean silica sand, which was selected based on knowledge of the formation material. In most cases, the sand pack extends to a minimum of 2 feet above the top of the screen, with a minimum 2-foot-thick bentonite pellet seal placed on top of the sand pack. The annulus above the bentonite seal was filled with neat bentonite grout.

Monitoring wells were completed with an above-grade 6 5/8-inch-diameter tubular steel protective casing with a locking cover. The above-grade casings were completed with a gravel

drainage pad. The locks were set to a USACE-defined combination. The protective casing was embedded approximately 1.5 feet into the ground. The PVC casing inside the steel casing was capped with a locking, watertight well plug (expandable plug).

Well Development

New monitoring wells were developed no sooner than 24 hours after the final completion of the well to allow the concrete and grout sufficient time to set. The purpose of well development is to remove any fine sand or silt particles that may have settled around the well screen during installation. Development also enhances the hydrologic connection between the well and the aquifer.

The equipment used to develop the wells was constructed of materials that would not adversely affect the quality of the water. In general, the development procedure involved surging and pumping of the wells until the discharged water was relatively sediment-free. During development, the purged water was measured for pH, specific conductivity, temperature, turbidity, and dissolved oxygen (DO). Measurements were taken after each well volume was removed. These measurements, as well as water clarity, were recorded in the field logbook. The well was considered developed after the above-mentioned parameters met with the criteria established in the OUD Management Plan Field Sampling Plan (FSP) Exhibit 3-12. Field parameters measured during well development are provided in Appendix B. Water from well development was transported daily to the water treatment tanks at the Environmental Staging Facility (ESF).

Monitoring Well Sampling Methodology

Immediately before purging, the static water level below the top of the well's PVC casing and the total depth of the well were measured and recorded on the field parameter form. Wells were sampled when a minimum of three well-borehole volumes had been purged and field measurements consisting of specific conductance, water temperature, pH, DO, oxygen reduction (redox) potential and turbidity met the criteria established in the OUD Management Plan FSP, Exhibit 1-13. The wells were purged and sampled by hand bailing or using a submersible pump.

Samples were collected using either a disposable high-density polyethylene (HDPE) bailer or submersible pump. Any observations made during sampling, such as odor or sheen, were recorded in the field logbook. Water sampling forms are included in Appendix B. Water purged during well sampling was transported daily to the water treatment tanks at the ESF.

3.1.5 Water Level Survey

Water levels were measured from wells associated with buildings 35-752, 45-590, 726, and 796 on a monthly basis from September 1996 through September 1997. Measurements were

collected using an electronic sounder and documented in field logbooks. The following protocols were employed while collecting water-level measurements:

- An electronic sounder was used to monitor well water-level measurements.
- The portion of the cable submerged below fluid levels in wells was decontaminated by Alconox and water with a methanol rinse on the probe.
- Sounders were maintained in a clean and functional condition.
- Measurements were taken from a permanent, marked location on the well casing.

Appendix C provides a summary of the monthly water level measurements along with graphical presentations of how the water levels varied with time.

Hydraulic conductivity tests were conducted at Building 35-752 in wells AP-2984, AP-2987, and AP-3504. Measurements were recorded using a downhole pressure transducer and a datalogger. Two sets of falling head tests (slug injection) and rising head tests (slug withdrawal) were performed on each well. Results were modeled using AQTESOLV. Discussion of the results is included in Section 4.1. Data sheets are included in Appendix E.

3.1.6 Surveying

Site surveying was conducted by the USACE to provide ground elevations and horizontal locations for soil borings and monitoring wells (Appendix A). The elevation of the tops of the PVC monitoring well casings was also provided. Elevations were measured to an accuracy of 0.01 foot, and horizontal locations were measured to an accuracy of 0.1 foot.

3.2 Analytical Program

The OUD analytical program consisted of submitting project field and quality assurance/quality control (QA/QC) samples to the laboratories for analysis as described in the OUD Management Plan (ENSR 1996a) and in the DAR (Appendix F). The number of field and QA/QC samples shipped to the laboratories are presented in Tables 3-2 and 3-3 (Attachment 3.1).

3.2.1 Analytical Laboratories

Project field samples were analyzed by Columbia Analytical Services (CAS) with a laboratory facility in Kelso, Washington. Samples for geotechnical analyses were subcontracted to Soil Technology in Bainbridge Island, Washington. QA samples were analyzed by Lockheed Analytical Services located in Las Vegas, Nevada, through January 19, 1998. CT&E Alaska was designated as the QA laboratory on January 21, 1998.

Groundwater samples collected from the five monitoring wells at Building 45-590 (installed in 1996) were submitted for tetrachloroethene (PCE) analysis on a 14-day turnaround time. Soil samples and groundwater samples collected during the January 1998 sampling event were submitted to the laboratory on a 7-day turnaround time.

QA/QC samples were collected during all sampling events.

3.2.2 Project and QA/QC Samples and Analytical Methods

Analytical methods are defined by State of Alaska (ADEC 1995) and EPA (1992, 1994, 1995) methodology. The following brief narrative describes the analytical techniques and instrument detection method.

Analysis of samples for petroleum hydrocarbons was performed by gas chromatography (GC) technique with flame ionization detector (FID). Methodology is defined by ADEC guidance (1995) as "Method for the Determination of Diesel Range Organics" (DRO; AK102.0), and "Method for the Determination of Gasoline Range Organics" (GRO; AK101.0).

Volatile organic compounds (VOCs) were analyzed by SW-846 Method 8260A, a gas chromatograph/mass spectrometer (GC/MS) technique. Semivolatile organic compounds (SVOCs) were analyzed by SW-846 Method 8270B, a GC/MS technique. Organochlorine pesticides and polychlorinated biphenyls (pest/PCB) were analyzed by EPA Method 8080A, a GC technique with electron capture detection (ECD).

Target analyte total metals were assessed in project samples. Analysis by inductively coupled plasma (ICP) spectroscopy, EPA Method 6010A, was employed to assess the target analytes of barium, cadmium, chromium, iron, lead, and nickel. Analysis by graphite furnace atomic absorption (GFAA) technique was employed to assess the target analyte arsenic by EPA Method 7060. Analysis by cold vapor atomic absorption (CVAA) technique was employed to assess the target analyte mercury by EPA Method 7470.

3.2.3 Data Verification/Validation Procedures

Data verification procedures were performed to ensure the competency of the reported results. A complete cross-checking of laboratory identification numbers with ENSR field identification numbers was performed to ensure that analysis had been performed as specified by the chain-of-custody documentation. Missing information regarding samples or any quality control procedures was noted and resolved with laboratory personnel. The verified database was used for generation of target analyte summary (TAS) tables provided in Appendix H.

The *Final Chemical Data Quality Review Report* (CDQRR; HLA 1997; see Appendix F) evaluation addresses primary investigative samples, quality assurance (QA) referee samples, field quality control (QC) samples, and laboratory QC sample analysis. The DAR (Appendix F)

additionally addresses specific data limitations and validation recommendations identified in the CDQRR.

Harding Lawson Associates (HLA) performed data assessment procedures on the primary investigative and QA referee analytical results from the Fall 1996 data collection activities (September 1996 through November 1996). The validation effort is identified in the CDQRR (HLA 1997), which is included with the DAR (Appendix F).

ENSR performed data assessment procedures on the Spring 1997 (February through April 1997) data collection activities for a systematic and independent verification to determine method compliance and assess data quality. Data assessment was performed from the laboratory-provided sample result sheets, summary quality control sheets, and available raw data packages.

As a result of the ENSR and HLA validation efforts and assessment, data were further annotated with qualifier flags, where appropriate, on the TAS tables in Appendix H.

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ATTACHMENT 3.1
Tables

Table 3-1. Summary of Remedial Investigation Field Tasks.

Site	Task	Dates of Activity
Building 35-752	Sediment samples collected in cooling pond.	September 1996
	Surface soil samples collected at former waste accumulation area.	September 1996
	Soil borings (AP3785-AP3788) advanced in former waste accumulation area, former UST locations, and cooling pond; soil samples submitted for laboratory analyses.	October 1996
	Groundwater sampling of on-site wells [second round of sampling conducted on a number of wells].	October and November 1996 [April 1997]
	Water levels measured in on-site wells.	Monthly, September 1996 through September 1997
	Surface water samples collected.	October 1996
	Six sediment samples collected in cooling pond and Ship Creek (as part of a separate sampling event).	October 1997
	Installation of three monitoring wells and one soil boring to evaluate conditions in the vicinity of former UST 1109. Groundwater samples collected from three newly installed wells and one previously existing well.	May 1998
Building 45-590	Installation of five monitoring wells (AP3772-AP3776) .	September 1996
	Groundwater samples collected from five newly installed wells and analyzed for PCE at an expedited turnaround time.	September 1996
	Soil borings advanced (AP3779 - AP3784).	September and October 1996
	Groundwater samples collected from existing wells and submitted for analyses specified in Management Plan.	October through November 1996
	Sediment sample collected from existing sump at wash pad.	September 26 and October 25, 1996

Table 3-1. Summary of Remedial Investigation Field Tasks (Cont'd).

Site	Task	Dates of Activity
Building 45-590 (Cont'd)	Two additional monitoring wells installed hydraulically upgradient of site (AP3789-AP3790); groundwater samples were collected.	February 1997
	Water levels measured in on-site wells.	Monthly, September 1996 through September 1997
	Advanced one soil boring at Building 704 and submitted soils for laboratory analyses (AP3864).	September 1997
	Four additional groundwater monitoring wells (AP3870 – AP3873) installed in an effort to delineate the extent of contamination. Soil samples collected from two of the wells and submitted for laboratory analyses.	January 1998
	Groundwater samples collected from the four additional wells and ten previously existing wells.	January 1998
Building 726	Surface soil samples collected from edge of paved area.	September 1996
	Groundwater sampling (as part of investigation at Building 45-590).	October 1996
	Soil borings (AP3860 - AP3863).	September 1997
Building 796	Installation of two monitoring wells hydraulically upgradient of the site (AP3777 and AP3778).	September 1996
	Groundwater sampling of on-site wells.	September and October 1996
	Water levels measured in on-site wells.	Monthly, September 1996 through September 1997
	Groundwater sampling of wells associated with Building 796.	August 1997

Key:
PCE = Tetrachloroethene
UST = Underground storage tank

Table 3-2. Project and Quality Assurance/Quality Control Sample Summary for Groundwater and Surface Water.

Analysis	Number of Analyses for Groundwater and Surface Water							
	Building 35-752	Building 45-590	Building 726	Building 796	Total Field Replicates	Total QA Replicates	Total Rinsate Blanks	Total Trip Blanks
Gasoline Range Organics (Method AK 101.0)	27	29	0	5	14	10	33	0
Diesel Range Organics (Method AK 102.0)	27	29	0	9	14	10	31	0
Residual Range Organics (Method AK 103.0)	4	0	0	0	1	1	0	0
VOCs (EPA 8260A)	27	29	0	9	14	11	31	44
SVOCs (EPA 8270B)	27	29	0	5	13	9	35	0
PCBs/Pesticides (EPA 8080A)	26	29	0	5	6	4	22	0
Dissolved Metals (EPA 6010/7060/7470)	25	29	0	9	14	10	32	0
Total Metals EPA 6010/7060/7470)	25	29	0	9	14	10	32	0
Total Hardness (SM 2340B)	25	29	0	9	5	3	19	0
Total suspended Solids (160.2)	25	29	0	7	4	3	18	0
Nitrogen – Ammonia (350.3)	21	29	0	7	4	3	18	0
Nitrate + Nitrite (353.2)	25	29	0	9	4	3	18	0
Sulfate (300.0)	24	29	0	8	4	3	18	0

Key:

EPA = U.S. Environmental Protection Agency.
PCBs = Polychlorinated biphenyls.
SVOCs = Semivolatile organic compounds.
VOCs = Volatile organic compounds.
QA = Quality Assurance.

Table 3-3. Project and Quality Assurance/Quality Control Sample Summary for Soil and Sediment.

Analysis	Number of Analyses for Soil and Sediment					
	Building 35-752*	Building 45-590	Building 726	Building 796	Total Field Replicates	Total QA Replicates
Gasoline Range Organics						
Diesel Range Organics (Method AK 102.0)	46	29	27	0	16	18
Residual Range Organics (Method AK 103.0)	12	0	0	0	1	1
VOCs (EPA 8260)	45	57	27	0	15	17
SVOCs (EPA 8080)	45	54	18	0	15	17
PCBs/Pesticides (EPA 8080)	47	2	0	0	6	8
Total Organic Carbon (EPA 9060)	34	0	8	0	4	3
Metals (EPA 6010/7060/7471)	29	24	0	0	8	10
Geotechnical Analysis	6	8	7	3	0	0

* Does not include soil stockpile samples associated with UST 1109 Investigation.

KEY:
EPA = U.S. Environmental Protection Agency.
PCBs = Polychlorinated biphenyls.
QA = Quality assurance.
SVOCs = Semivolatile organic compounds.
VOCs = Volatile organic compounds.

4.0 STUDY AREA DESCRIPTIONS AND NATURE AND EXTENT OF CONTAMINATION

The physical locations, environmental setting, historical events leading to the current occurrence of contamination, and results from the Remedial Investigation (RI) for each of the sites investigated under OUD are described and discussed in this section. Site discussions are presented in the following order:

Subsection 4.1	Building 35-752 Source Area
Subsection 4.2	Building 45-590 Source Area
Subsection 4.3	Building 726 Source Area
Subsection 4.4	Building 796 Source Area

Site-specific tables and figures are presented in attachments at the end of Section 4.0 and correspond with their respective subsection numbers. For example, Section 4.1, Building 35-752, tables and figures are included in Attachment 4.1.

Results from several investigations were included in this section to provide historical knowledge of each source area (Table 4-1 on page 4-2). The previous investigations consist of preliminary source evaluations, groundwater monitoring studies, and chemical data acquisition studies. Each section also contains the list of Chemicals of Potential Concern (COPCs) and data gaps identified prior to conducting the RI and findings of the RI.

Table 4-1. Summary of Previous Investigations Performed at OUD Source Areas.

Investigation	Source Area				
	Author	Building 35-752	Building 45-590	Building 726	Building 796
Sampling Report for Groundwater Monitoring Network at Ft. Richardson, AK, 1994	ENSR	Yes	No	No	No
Chemical Data Report, Groundwater Study (Spring 1994) Ft. Richardson, AK, 1994	USACE	Yes	No	No	No
Chemical Data Report Groundwater Study Fall 1994 and Spring 1995 at Ft. Richardson, AK, 1994 and 1995	USACE	Yes	No	No	Yes
Report for Groundwater Monitoring Network, Ft. Richardson, AK, Feb. 1996	USACE	Yes	Yes	Yes	Yes
Management Plan, Operable Unit D, 1996	ENSR	Yes	Yes	Yes	Yes
Draft Site Assessment/Remedial Investigation and Corrective Action Plan, Site 4, Building 35-752 High-Frequency Transmitter Site, Ft. Richardson, AK, 1994	HLA	Yes	No	No	No
Preliminary Source Evaluation 2, Operable Unit D, Ft. Richardson, AK, 1996	ENSR	Yes	No	No	Yes
Release Investigation Report, Underground Storage Tank Sites, Ft. Richardson, AK, 1994	HLA	No	Yes	No	Yes
Release Investigation Report and Corrective Action Plan, Building 45-590, Ft. Richardson, AK, 1994	EMCON	No	Yes	No	No
Final Preliminary Source Evaluation 2, Building 45-590, Ft. Richardson, AK, 1995	EMCON	No	Yes	No	No
Draft Release Investigation Report Former UST 27, Building 796, Ft. Richardson, AK, 1994	EMCON	No	No	No	Yes
Preliminary Source Evaluation, Ft. Richardson Laundry Facility, Building 726, Final Report, 1995	USACE	No	Yes	Yes	No
Final Closure Report, Building 45-590, Ft. Richardson, AK, 1994	EMCON	No	Yes	No	No
1996-1998 Data Collection Activities, 1996-1998	ENSR	Yes	Yes	Yes	Yes

Key:
ENSR = ENSR Corporation
USACE = U.S. Army Corps of Engineers
HLA = Harding Lawson Associates
EMCON = EMCON Alaska, Inc.

4.1 Building 35-752 Source Area

Building 35-752 is the former generator building for the adjacent high frequency transmitter site building (Building 35-750) and is currently being used to store fire extinguishers. The site is just off of the Davis Highway, approximately 1 mile from the main cantonment of Fort Richardson. Four distinct areas are under investigation at this site:

- Concrete floor in Building 35-752,
- Former underground storage tanks (USTs) south of Building 35-752,
- Drum accumulation area east of Building 35-752, and
- Cooling pond southwest of Building 35-752.

Results of a Release Investigation associated with former UST 1109, located on the north side of Building 35-752, are also included in this document (Section 4.1.6).

The location for each area is shown on Figure 4.1-1 (Attachment 4.1).

4.1.1 Environmental Setting

Building 35-752 is located in an undeveloped portion of Fort Richardson within the area of the high frequency transmitter antennas. Warning signs have been installed at the entrance to the area to limit access to facility personnel. Entry to the interior of the building is restricted to fire department personnel. The building is a single-story structure with a concrete floor. The site is surrounded by mixed spruce and birch forest, with grassy clearings. Surface soils are exposed in the gravel parking area around the building. Topographical relief in the area is relatively low, except for a gradual depression south and east of the building. This depression appears to be man-made based on review of 1974 and 1983 aerial photographs. The area had been recently excavated and graded in the 1983 aerial photograph.

Surface water drains away from Building 35-752 to the south and towards the Cooling Pond to the southwest. The Cooling Pond discharges to an unlined ditch that transports moving water for several hundred feet to the south, where it intersects another ditch that drains into Ship Creek. The flow rate is estimated at 5 to 10 gallons per minute (gpm), but probably increases during rainfall or snowmelt events (ENSR 1996a) and has been observed to be dry. Ship Creek is approximately 0.25 mile south of the site.

Subsurface soil at the site consists of a glacial alluvium with cobbles and erratics interbedded with sands and silty, sandy gravels. Depth to groundwater ranges from 10 to 20 feet below ground surface (bgs). The general groundwater flow direction is northwest, with local variations around the Cooling Pond and well AP-2987. Cross sections showing subsurface stratigraphy

are presented in Figures 4.1-2 (A - A'), 4.1-3 (B – B'), and 4.1-4 (C – C'). Cross-sections B - B' and C – C' also include some of the analytical results presented in the sections to follow.

4.1.2 Past Practices

4.1.2.1 Concrete Floor

During active operations from 1953 to 1987, four generators were in operation within Building 35-752. The generators were situated in a 4-inch-deep concrete pit located in the middle of the floor. When the generators were removed in 1987, the pit was filled with concrete to bring this area to grade.

In 1987, the Fort Richardson Directorate of Engineering and Housing (DEH) Environmental Resources Branch began operating the building as an emergency hazardous waste storage area. Wastes were stored inside the building for an average of 30 to 45 days until they could be transported to the Post's hazardous waste storage area. Building 35-752 was also used for storage of unknown waste and spill cleanup debris.

In 1989, the building was used as a temporary storage location for 125 bags of polychlorinated biphenyl (PCB)-contaminated soil. Each bag reportedly weighed approximately 2,000 pounds. The bags of soil were removed by 1990, but dust from the bags may remain on the floor. In 1991, samples of the dust on the floor were collected and composited. Aroclor 1254, a PCB, was the only compound detected above method reporting limits (MRLs). The Aroclor 1254 concentration in the composited sample was 411 parts per million (ppm; ENSR 1994b). The presence of Aroclor 1254 inside the building was not expected, because the soil in the bags had contained only Aroclor 1260 (ENSR 1994b). However, this observance can be explained by recent guidance (EPA 1996a), which states that the characterization of environmental mixtures of PCBs as Aroclors can be incorrect. Aroclors are commercial mixtures of PCBs that vary with degree of chlorination. Errors can arise from interpretations of GC/MS data for environmentally altered mixtures. Differences have been observed in analytical results reported by laboratories for the same samples (Alford-Stevens et al. 1985, Alford-Stevens 1986). Therefore, the PCBs in the dust may have originated from the bags.

At the time of the RCRA Facility Assessment visual site inspection (VSI) in 1990, the building contained drums of PCB-containing wastes, dry cleaning solvent, paint waste, and denatured alcohol (SAIC 1990). The drums were stored on pallets. No drip pans or berms were observed around the waste drums (SAIC 1990). No evidence of releases from the unit was observed during the VSI.

4.1.3 Underground Storage Tanks

Seven 5,000-gallon USTs were excavated from the south side of Building 35-752 in 1990. The tanks were operational from 1958 to 1989 and presumably contained diesel fuel for the

generators. Some of the USTs may have also contained waste oil. A review of aerial photographs in 1974 and 1983 showed a stained area around the western-most UST (UST 51). It appeared that this tank had been moved or excavated in the 1983 aerial photograph. During closure activities in 1990, petroleum hydrocarbon contamination was found in the excavation, which was reportedly 19 feet deep and measured 98 feet by 43 feet at the surface (HLA 1994b). The excavated soil was stockpiled off site; during routine characterization analyses of the stockpiles, Aroclor 1260 was detected at concentrations ranging from 5.5 to 322 milligrams/kilogram (mg/Kg; E&E 1992). The excavation was filled with soil from another location on Post.

UST 1109, located on the north side of Building 35-752 (Figure 4.1-1, Attachment 4.1), was removed during the summer of 1996 by Oil Spill Consultants Inc. (OSC). UST 1109 contained waste oil and was located near a former dry well. The contents of UST 1109 were sampled in May 1996 and analyzed for metals, PCBs, and total halogens. Lead, cadmium, and chromium concentrations were 1,760, 1.97, and 3.37 mg/Kg, respectively. No PCBs were detected in the sample, and total halogen concentrations were 724 mg/Kg (OSC 1996). PCBs were detected in stockpiled soils associated with the tank excavation. A Release Investigation was conducted in the vicinity of the former UST 1109 location in May 1998. Section 4.1.6 (page 4-19) of this document presents a brief summary of the work conducted as well as soil and groundwater analytical results.

Two USTs remain in the area: USTs 55A and 85A at Building 35-750. UST 55A is a 5,000-gallon heating oil tank, and UST 85A is a 1,000-gallon waste oil tank. Both are located along the southeast side of Building 35-750 (Figure 4.1-1, inset).

4.1.3.1 Drum Accumulation Area

The south end of the east side of the building was the site of an approximately 20 foot by 30 foot unlined drum storage area in the 1960s and 1970s. The drums reportedly came from vehicle maintenance shops and contained various fuel products and solvents. The drums were reportedly not stacked, and the area was never completely covered with drums (ENSR 1994b). Drum storage in this area apparently ceased by 1974 because no drums were visible in the 1974 aerial photograph of the site. Soil near the drum storage area appeared stained in a 1983 aerial photograph.

4.1.3.2 Cooling Pond

Insulating oils associated with the generators housed inside Building 35-752 likely contained PCBs. Cooling water from the generators was discharged into a man-made Cooling Pond located southwest of the building via a culvert pipe extending from the building. Discharged water may have carried insulating oils into the Cooling Pond.

The Cooling Pond currently receives discharge water from Building 35-750. A well adjacent to Building 35-750 pumps water to the building cooling system, used to maintain cool temperatures for the electronic gear inside. Water is discharged from the cooling system to the Cooling Pond.

A review of Building 35-750 and 35-752 as-built drawings revealed the presence of a septic system and leach field south of Building 35-750 and west of Building 35-752. This septic system apparently serviced Building 35-750. The building was connected to the Post sewer system by 1972, but the water from the cooling system was not hooked up to the sewer system and continues to discharge to the Cooling Pond. As-built drawings also indicate the presence of a drywell connected to Building 35-752 north of the structure (Figure 4.1-1) although excavation activities associated with the removal of the waste oil tank (1109) in the same area did not encounter it.

4.1.4 Previous Investigations

Three previous investigations have been conducted at Building 35-752. In 1990, the USACE conducted a UST remediation sampling program at the location of the former USTs south of Building 35-752 to assess the presence and extent of fuel contamination in the soil and groundwater (USACE 1990). In 1993, HLA conducted an additional site assessment/corrective action plan at the former UST site to more completely assess the presence and extent of PCBs in the backfill, and fuel in the soil and groundwater (HLA 1994b).

In 1994, ENSR conducted a limited field investigation of the entire site. Complete results of the PSE2 investigation are presented in *Preliminary Source Evaluation 2, Operable Unit D, Fort Richardson, Alaska* (ENSR 1996b). The objectives of the PSE2 were to evaluate the presence of contamination in soil and sediment, the possible downward migration of contaminants, and to assess potential source areas for groundwater contamination.

Analytical results from these previous investigations are included in Appendix D. A summary of the previous investigations and associated results is provided in the following subsections.

4.1.4.1 Concrete Floor

Concrete wipe samples were collected during the PSE2 in order to assess the presence of PCBs in residual dust and oil on the concrete floor. Sampling locations were selected to obtain representative coverage of the entire floor area and included areas obviously impacted by dust and oil. Samples were collected from 27 different locations throughout the building; however, samples could not be obtained from the northwest corner of the building due to ice on the floor. Total PCB concentrations ranged from 6 to 649 micrograms per 100 cm^2 ($\mu g/100\ cm^2$). Of the 32 samples collected (including duplicates), Aroclor 1254 was detected in every sample, and Aroclor 1260 was detected in 19 samples.

4.1.4.2 Former UST Locations (South of Building 35-752)

After the seven USTs were removed and the excavation backfilled, the USACE drilled and installed six monitoring wells (AP-2982 through AP-2987) to obtain data for closure of the UST site. Soil samples were collected from each boring at approximate 5-foot intervals and analyzed for VOCs and petroleum hydrocarbons. Analytes detected in the soil samples are included in Appendix D. One boring, AP-2986, contained VOCs and petroleum hydrocarbons at significant levels. The analytes were detected in the 10-foot-depth sample from this boring. In addition, toluene was detected in the 5-foot soil samples from borings AP-2982 and AP-2985 at concentrations of 23 µg/Kg each.

Groundwater samples were collected from each of the monitoring wells and analyzed for VOCs and petroleum hydrocarbons. Analytes detected in the groundwater samples are included in Appendix D. Benzene, toluene, m-dichlorobenzene, o,p-dichlorobenzene, and K-1 kerosene were detected in the groundwater in wells AP-2982, AP-2983, AP-2984, AP-2986, and AP-2987 at concentrations exceeding either MCLs, RBCs, or Alaska Water Quality Criteria.

Site Assessment/Corrective Action Plan

In 1993, HLA drilled six borings (AP-3227 through AP-3232) and installed two monitoring wells (AP-3231 and AP-3232) to further assess the extent of fuel in the soil and groundwater and to assess the presence of PCBs in the soil. Soil samples were collected from each boring at approximate 5-foot intervals and analyzed for aromatic VOCs, PCBs, metals, gasoline range organics (GRO), diesel range organics (DRO), total petroleum hydrocarbons (TPH), and total organic carbon (TOC).

DRO were detected in borings AP-3227, AP-3228, and AP-3230 at concentrations exceeding ADEC cleanup criteria. GRO was detected near the water table in borings AP-3227 and AP-3228 at concentrations exceeding ADEC cleanup criteria. The presence of GRO and DRO at this depth may be due to the presence of fuel in the groundwater.

Aroclor 1260 (a PCB) was detected in two of the borings (AP-3227 and AP-3228) at 5, 10, and 15 feet bgs. PCB concentrations in the soil samples ranged from 0.054 to 84 mg/Kg. The highest concentration of 84 mg/Kg was detected in the 15-foot bgs sample from boring AP-3228. GRO and DRO were also detected in this sample at concentrations exceeding ADEC cleanup criteria. Both of these borings were drilled within the footprint of the former excavation. HLA's boring logs noted a change in soil at around 15 feet, suggesting that the excavation was not as deep in all locations as the 19 feet originally reported. The presence of PCBs at depths less than 15 feet suggests that the backfill may have been contaminated with PCBs.

Arsenic was detected at 11 mg/Kg in soil collected from the 20-foot interval at AP-3231, exceeding the screening criteria (based on background concentrations) of 8.4 mg/Kg. Lead

was detected at 25 mg/Kg and 85 mg/Kg in soils collected from the 5-foot intervals in AP-3227 and AP-3228, not exceeding the screening criteria of 400 mg/Kg (EPA cleanup standard). Cadmium was detected in soil samples at concentrations ranging from 4 to 5.8 mg/Kg, exceeding the screening criteria of 2.2 mg/Kg (based on 1/10th the Region 3 RBC).

Groundwater samples were obtained from the two new wells and from the six existing wells, and analyzed for lead, TOC, VOCs, and PCBs. Analytes detected in the groundwater samples are included in Appendix D. Benzene was detected in one well (AP-2982) at concentrations exceeding either the MCLs or RBCs.

Preliminary Source Evaluation 2

During the PSE2, four borings (AP-3497 through AP-3500) were advanced and sampled within the footprint of the former USTs excavation south of Building 35-752 to assess the possible downward migration of contaminants from the backfill soils. Soil borings AP-3497 and AP-3499 were advanced to assess contaminant concentrations at depth. These two borings were located adjacent to existing monitoring wells AP-2982 and AP-2987, where hydrocarbon contamination had been detected. Soil borings AP-3498 and AP-3500 were located to evaluate the extent of contamination in the area of the backfill soils.

Soil samples were collected from each boring at approximate 5-foot intervals and analyzed for GRO, DRO, TPH, organochlorine pesticides, PCBs, VOCs, SVOCs, and metals.

DRO were detected in all four soil borings at concentrations ranging from 352 to 8,150 mg/Kg. The highest concentrations were detected in the 10-foot sample from boring AP-3498 and in the 14-foot sample from boring AP-3500. Groundwater was encountered in these borings at approximately 16 to 17 feet bgs.

Aroclor 1260 was detected in the surface samples from borings AP-3497 through AP-3499 at concentrations ranging from 0.7 to 4.1 mg/Kg. The highest Aroclor 1260 concentration was detected in the surface sample at boring AP-3497.

Barium and lead were detected in several of the soil samples at concentrations exceeding background levels. The lead concentrations, however, were below the EPA cleanup standard for residential soil, and the barium concentrations were less than one-tenth the RBC.

Groundwater samples were collected from existing wells AP-2983 and AP-2986 to evaluate the former tank area as a potential source of groundwater contamination. Analytes detected in the groundwater samples are included in Appendix D. DRO, TPH, and Aroclor 1260 were detected in the sample from well AP-2986 at concentrations exceeding either the Alaska Water Quality Criteria, MCLs, or RBCs. Arsenic, chromium, lead, and nickel were detected in the water samples at concentrations exceeding either MCLs or RBCs.

4.1.4.3 Drum Accumulation Area

During the PSE2, eight locations in the former drum accumulation area were sampled within the 20-by-30 foot area. Samples were collected at 6 inches and 2 feet bgs at each location. The sample locations were based on a grid pattern to assess if a release had occurred and to assess potentially impacted soils. Two soil borings (AP-3505 and AP-3506) were located in two of the more contaminated areas to evaluate the migration of the contamination through the vadose zone. The borings were drilled and sampled to 16 feet bgs, where groundwater was encountered. Results of organic analytes exceeding screening criteria at the Drum Accumulation Area are shown on Figure 4.1-5 (Attachment 4.1).

All soil samples were analyzed for DRO, TPH, organochlorine pesticides, PCBs, VOCs, SVOCs, and metals. DRO, Aroclor 1260, and several polycyclic aromatic hydrocarbons (PAHs) were detected at concentrations that exceeded either one-tenth the RBCs or the ADEC cleanup levels. Aroclor 1260 was detected in 7 of the 10 sampling locations at concentrations ranging from 0.3 to 15.6 mg/Kg. The highest concentrations were found in samples from boring AP-3505 and nearby surface location SS-8. The PAHs were also detected in samples from these two locations.

DRO was detected above the ADEC cleanup level only in the samples from SS-5. The DRO concentrations at this location increased with depth from 192 mg/Kg at 0.5 feet to 778 mg/Kg at 2 feet.

In 1993, HLA collected two surface water and sediment samples from the Cooling Pond (Figure 4.1-6, Attachment 4.1). The surface water samples were analyzed for lead, VOCs, and PCBs. No analytes were detected in the surface water samples. The sediment samples were analyzed for aromatic VOCs, PCBs, metals, GRO, DRO, and TPH. Aroclor 1260 was detected in two of the sediment samples at concentrations ranging from 0.055 to 1.15 mg/Kg. The highest concentration was found in the sample collected from where the culvert/pipe outfalls into the Cooling Pond (HLA 1994b).

During the PSE2, eight sediment samples were collected from the Cooling Pond. Four representative locations from the Cooling Pond were chosen for sampling. The sediment samples were analyzed for GRO, DRO, TPH, organochlorine pesticides, PCBs, VOCs, SVOCs, and metals. TPH, pesticides, Aroclor 1260, 1,1,1-trichloroethane (TCA), several PAHs, and several metals were detected in the sediment samples. Aroclor 1260 was detected in every sediment sample collected from the Cooling Pond at concentrations ranging from 0.1 to 4.5 mg/Kg (Figure 4.1-6, Attachment 4.1). As found during the 1990 site assessment, the highest Aroclor 1260 concentrations were detected in the Cooling Pond nearest the culvert/pipe outfall.

Four borings (AP-3501 through AP-3504) near the Cooling Pond were advanced and sampled as part of the investigation. Borehole AP-3501, a slant boring, was located on the east side of

the Cooling Pond and drilled at a 45-degree angle underneath the pond. The boring was sampled at a depth of approximately 10 feet below the bottom of the Cooling Pond to assess the potential migration of contaminants from the pond sediment. The boring was angled to prevent the transport of Cooling Pond sediment contaminants during drilling.

Monitoring well AP-3502, northeast of the Cooling Pond, was located to assess local groundwater elevations and to determine whether contaminants from either the Cooling Pond or monitoring well AP-2982 were present in groundwater at this location. Monitoring well AP-3503, west of the Cooling Pond, was located to determine if contaminants from the pond sludges have impacted adjacent soils or groundwater. Monitoring well AP-3504 to the north of the Cooling Pond was placed to aid in the delineation of the local groundwater flow direction.

Soil samples were collected at approximate 5-foot intervals from each of the borings. The samples were analyzed for GRO, DRO, TPH, organochlorine pesticides, PCBs, VOCs, and metals. Analytes detected in the samples are included in Appendix D. Aroclor 1260 was detected in every boring at concentrations exceeding RBCs (Figure 4.1-6, Attachment 4.1). In boring AP-3504, Aroclor 1260 was only detected at the ground surface. However, at borings AP-3501 through AP-3503, near the Cooling Pond, Aroclor 1260 was detected as deep as 6 to 10 feet bgs. The highest concentration of 18.6 mg/Kg was detected in boring AP-3501 underneath the Cooling Pond.

Barium and lead were detected at concentrations exceeding background levels. The lead concentrations, however, were below the EPA cleanup criteria for residential soil, and the barium concentrations were less than one-tenth the RBC.

The three new monitoring wells (AP-3502, AP-3503, and AP-3504) and existing wells AP-2982 and AP-2987 were sampled to evaluate the Cooling Pond as a potential source of groundwater contamination. Analytical results of the groundwater samples are presented in Appendix D. GRO, DRO, benzene, and 1,2,4-trimethylbenzene were detected in the sample from well AP-2982 at concentrations exceeding either the Alaska Water Quality Criteria, MCLs, or RBCs. DRO were also detected in the samples from wells AP-3502, AP-3503, and AP-2987. Benzene was detected above the RBC in well AP-2987. Arsenic, chromium, lead, and nickel were detected in all of the water samples at concentrations exceeding either MCLs or RBCs.

4.1.4.4 Groundwater

As noted in previous sections, groundwater samples were collected during each of the three earlier investigations (USACE 1990; HLA 1994b; ENSR 1996b). Analytes detected in groundwater during previous investigations are presented in Appendix D. Some on-site wells have also been sampled periodically as part of Fort Richardson's Monitoring Well Network Sampling (ENSR 1994a). Analytes detected in these wells during this sampling program are

also included in Appendix D. Results of organic compounds exceeding criteria in groundwater are shown on Figure 4.1-7 (Attachment 4.1).

In 1990, fuel-related compounds were detected in the groundwater samples from wells AP-2987 and AP-2982 at concentrations exceeding MCLs. Successive sampling in 1992 through 1993 showed that the concentrations of benzene, toluene, and o,p-dichlorobenzene had decreased significantly. However, the concentrations in well AP-2982 increased significantly in 1994 and 1995. Well AP-2982 is downgradient of the former USTs and very near the area that had been stained in the 1974 and 1983 aerial photographs. The source of petroleum compounds at this location is likely leaks from the USTs and spills around former UST 51. The reason for the dramatic increase in benzene, GRO, and DRO concentrations is unknown. It may be the smear zone contaminants leaching into the groundwater due to the rise in the water level. Since the source of contamination (the USTs) has been removed, it is unlikely that a new underground source has appeared.

PCBs have been detected in two wells (AP-2986 [December 1994] and AP-2982 [April 1995]) at concentrations of 0.7 and 0.8 µg/L, respectively. These concentrations exceed the MCL of 0.5 µg/L. At the time that the borings were drilled in 1990, PCBs were not a Chemical of Potential Concern (COPC); therefore, soil samples from the borings were not analyzed for PCBs, and no soil PCB data at these locations are available.

Several halogenated VOCs [1,1-dichloroethane (DCA), 1,2-DCA, 1,1,1-trichloroethane (TCA), and trichloroethene (TCE)] were detected in water samples near the former UST locations and near the former dry well. TCE was detected at concentrations exceeding the residential RBC of 1.6 µg/L but below the MCL of 5 µg/L in well AP-2987 in 1992 and 1993, but not in 1994. TCE was detected at a concentration of 11 µg/L in well AP-3231 in April 1995. This value exceeds the MCL of 5 µg/L. 1,2-DCA was detected in wells AP-2982 and AP-3231 during one sampling event in March 1994, at concentrations exceeding the RBC of 0.12 µg/L, but below the MCL of 5 µg/L.

Aluminum, arsenic, chromium, iron, lead, manganese, and nickel have been detected at concentrations exceeding RBCs and/or MCLs. Cadmium was detected in one well during the PSE2 (AP-3503) at a concentration exceeding the MCL of 5 µg/L. The metal concentrations are especially dependent on the turbidity of the samples collected. Depth to water at this site is typically less than 15 feet bgs, and at times the wells can be bailed dry with a hand bailer. Therefore, it is difficult to get a clear, sediment-free sample. Most of the MCL or RBC exceedances for metals may be due to the presence of sediment in the samples.

4.1.5 Remedial Investigation

Results from the previous investigations were used to identify data gaps and COPCs. Data gaps identified in the Management Plan and findings of the RI are presented in Table 4.1-1 (see

Attachment 4.1), and COPCs identified in the Management Plan are presented in Table 4.1-2 (see Attachment 4.1). The following subsections summarize the work conducted as part of the RI and a discussion of the data collected.

4.1.5.1 Concrete Floor

PCBs have been detected in floor wipe samples collected from inside Building 35-752 at concentrations ranging from 6 to 750 µg/wipe (µg/100 cm^2). According to Title 40 of the Code of Federal Regulations (CFR), Part 761.125, the cleanup level for PCBs on a low contact industrial surface is 10 µg/100 cm^2. Therefore, the concrete floor will require remediation; however, no additional sample data was required during the RI to assess remedial alternatives.

4.1.5.2 Soil at the Former UST Locations

The lateral and vertical extent of fuel-related compounds in the former USTs location south of Building 35-752 has been adequately evaluated. In order to evaluate the extent of PCBs in the soil along the eastern side of the former UST excavation, one soil boring (AP-3786) was advanced to the top of the water table, encountered at approximately 12.5 feet bgs. Samples from the 0 to 2 feet and 5 to 7 feet intervals were submitted for DRO, VOC, pesticides/PCB, SVOC, and TOC analyses.

DRO was detected in the 0- to 2-foot [upper] interval at 4 mg/Kg and 49 mg/Kg in the 5- to 7-foot [lower] interval. TCE was the only VOC detected, at a concentration of 2 J µg/Kg in the lower interval. Low concentrations of pesticides (i.e., 4,4'-DDD, 4,4'-DDE, 4,4'-DDT and dieldrin) were detected in both intervals, at total estimated concentrations of 8 J µg/Kg in each interval. Aroclor 1260 was detected at an estimated concentration of 30 J µg/Kg in the upper interval and 1900 µg/Kg in the lower interval. Bis(2-ethylhexyl)phthalate (DEHP) was detected at the estimated concentration of 0.1 J mg/Kg in both intervals. Results are presented on Figure 4.1-8 (Attachment 4.1).

4.1.5.3 Soil at the Drum Accumulation Area

The lateral and vertical extent of contaminated soil at the drum accumulation area had not been identified. During the RI, surface (0.5 feet bgs) and near-surface (2.5 feet bgs) soil samples were collected at six locations in the vicinity of the waste accumulation area (96-SS01 through 96-SS06) and submitted for DRO, VOC, pesticides/PCBs, and SVOCs analyses. Additionally, the vertical extent of DRO in sampling location SS5 from the PSE2 (located approximately at the middle of the waste accumulation area), was evaluated by advancing a soil boring to groundwater and analyzing soils for DRO, VOC, pesticides/PCBs, SVOCs and TOC.

Analytical results for soil samples are included in Table 4.1-3 (surface soil samples) and Table 4.1-4 (soil borings). Organic compounds detected in soils during the RI are shown on Figure 4.1-9 and discussed below. See Attachment 4.1 for tables and figures.

Surface Soils

DRO concentrations ranged from 4 J mg/Kg to 44 mg/Kg in five of six surface (0.5 feet bgs) soil samples collected, and was not detected above method reporting limits (MRLs) in the sixth sample. DRO concentrations were 6 mg/Kg, 13 mg/Kg, and 29 mg/Kg in samples collected at the 2.5 feet interval at locations 96-SS03, 96-SS04, and 96-SS06, and were not detected above MRLs in this interval at the other locations.

An estimated concentration of 2 J µg/Kg 1,1,1-TCA was detected in 96-SS05. TCE was detected at 2 J and 53 µg/Kg in the 2.5-foot intervals at 96-SS05 and 96-SS06, respectively. VOCs detected in the 2.5-foot interval of 96-SS06 included 1,1,1-TCA (5 J µg/Kg), tetrachloroethene (PCE) (5 J µg/Kg), toluene (7 µg/Kg), and xylenes (total, 3 J µg/Kg). Methylene chloride was detected at the 2.5-foot intervals at each of the sampling locations and ranged in concentration from 8 µg/Kg to an estimated value of 40 J µg/Kg.

Surface soil samples at 96-SS04 and the duplicate collected at 96-SS05 had low concentrations of SVOCs detected, each at total estimated concentrations of 5 mg/Kg or less. No SVOCs were detected in the near-surface soil samples.

4,4'-DDE was detected in all surface soil samples at concentrations ranging from 2 J to 40 µg/Kg. Dieldrin was also detected in all surface soil samples at concentrations ranging from 2 J to 53 µg/Kg. 4,4'-DDE and dieldrin were detected in the near-surface soils collected at 96-SS01, 96-SS02, 96-SS03 and 96-SS06, and ranged in concentrations from 0.4 J to 2 J µg/Kg (4,4'-DDE) and 0.6 J to 3 J µg/Kg (dieldrin).

Aroclor 1260 was detected in all surface soil samples and ranged in concentrations from 420 µg/Kg at 96-SS03 to 9200 µg/Kg in 96-SS06. Aroclor 1260 was not detected in the near-surface soils at 96-SS01, 96-SS02, and 96-SS05; however, it was detected in 96-SS03 at 130 µg/Kg, 96-SS04 at 27,000 µg/Kg, and 96-SS06 at 270 µg/Kg.

Soil Boring

Aroclor 1260 was detected at 1400 µg/Kg in the sample collected from 5 feet bgs in AP-3785, but was not detected in the soil at 10 feet bgs. The DRO concentration in the 5-foot interval was 8 mg/Kg. No VOCs or SVOCs were detected in the 5-foot interval, and only DEHP was detected in the sample collected at 10 feet bgs (0.1 mg/Kg). Less than 5 µg/Kg each of 4,4'-DDE and dieldrin were detected in the sample collected from the 5-foot interval.

4.1.5.4 Cooling Pond

Contamination had been confirmed as deep as 10 feet bgs in the Cooling Pond sediments; however, the lateral and vertical extent of the contamination had not been adequately addressed.

Sediment samples were collected along the length of the Cooling Pond and to the south of former PSE2 sample SD-A to assess the lateral extent of PCBs, pesticides, VOCs, PAHs, and metals in the Cooling Pond sediments. Sediment samples were also obtained near and downstream of the point where the Cooling Pond discharges into the drainage ditch. In addition to the sediment samples collected during the RI, one additional sample was collected as part of a separate sampling program. This sample and its associated blind duplicate (97-SD007 and 97-SD008) were located slightly upstream of the RI sample 96-SD06.

DRO concentrations ranged from a minimum of 32 mg/Kg in a sample collected approximately 173 feet downstream of the discharge pipe in the Cooling Pond, to a maximum of 2300 mg/Kg in sediments collected approximately 200 feet downstream of the outfall to the drainage ditch. The concentration of DRO in soils near the discharge pipe entering the Cooling Pond was 55 mg/Kg. The chromatograms of DRO detected in the Cooling Pond exhibit the characteristics of a heavy residual product such as mineral oil, lubricating turbine, or motor oil. A more detailed explanation is included in the DAR.

A number of VOCs were detected in sediment samples. Acetone was detected at concentrations ranging from 51 to 350 J µg/Kg. 2-Butanone ranged in concentration from not detected to an estimated concentration of 75 J µg/Kg. n-Propylbenzene and 2-Chlorotoluene were detected in samples collected 100 feet (30 J µg and 10 J µg/Kg) and 200 feet (180 µg/Kg and 7 J µg/Kg) downstream of the outfall to the drainage ditch. Carbon disulfide was detected in the duplicate sample only, not the primary sample collected approximately 79 feet downstream of the discharge pipe to the Cooling Pond at a concentration of 6 J µg/Kg. Naphthalene was detected at 2 J µg/Kg and 0.7 J µg/Kg in samples collected from 40 feet and 147 feet downstream of the discharge pipe to the Cooling Pond. Naphthalene was also detected at 11 µg/Kg and 50 µg/Kg in 97-SD007 and 97-SD008. 4-Isopropyltoluene was detected only in the sample collected 147 feet downstream of the discharge pipe at a concentration of 130 µg/Kg. n-Propylbenzene was detected in the samples collected 100 feet and 200 feet downstream from the outfall to the drainage ditch at the estimated concentrations of 30 J µg/Kg and 180 J µg/Kg. 2-Chlorotoluene was also detected at these two locations only at the estimated concentrations of 10 J µg/Kg and 7 J µg/Kg.

A number of PAHs were detected. Estimated total concentrations of PAHs detected at each location ranged from 0.4 J mg /Kg in the sample collected 100 feet downstream of the outfall to the drainage ditch to a maximum of 21 mg /Kg near the discharge pipe to the Cooling Pond.

4,4'-DDD and 4,4'-DDE were detected in all sample locations and ranged in concentrations from 0.1 J µg/Kg and 0.5 J µg/Kg near the discharge pipe to the Cooling Pond to 740 µg/Kg and 30 µg/Kg in the sample collected approximately 100 feet downstream of the outfall to the drainage ditch. 4,4'-DDT was detected in all samples except those collected at approximately 40.5 feet and 147 feet downstream of the discharge pipe to the Cooling Pond.

Concentrations of 4,4'-DDT ranged from 9 J µg/Kg near the discharge pipe to the Cooling Pond to 309 µg/Kg near the outfall into the drainage ditch. Aldrin was detected at concentrations ranging from 0.7 J to 3 J µg/Kg in all samples collected from the drainage ditch, and at 0.8 J µg/Kg at the discharge pipe to the Cooling Pond. Dieldrin was detected in all samples but the outfall to the drainage ditch and 100 feet downstream of this. Concentrations ranged from 2 J µg/Kg to 11 J µg/Kg. Endrin aldehyde was detected at the discharge pipe to the Cooling Pond at 3 J µg/Kg. Endrin was detected at 34 µg/Kg in both the normal and blind duplicate samples.

Aroclor 1260 was detected in all sediment samples. Concentrations ranged from 110 µg/Kg at the discharge pipe into the Cooling Pond to a maximum of 3100 µg/Kg approximately 40.5 feet downstream of the discharge pipe. The farthest downstream sample collected, approximately 200 feet from the outfall to the drainage ditch, had a concentration of 690 µg/Kg detected.

Arsenic was detected in all sediment samples ranging in concentrations from 3 mg/Kg to 5 mg/Kg. Barium concentrations ranged from 38 mg/Kg near the discharge pipe to a maximum of 136 mg/Kg 200 feet downstream of the outfall to the drainage ditch. Cadmium was detected in only three of the samples and ranged in concentrations from 0.5 J mg/Kg to 2 mg/Kg. Concentrations of chromium ranged from 29 mg/Kg to 64 mg/Kg. Lead was detected in all but one sample and ranged in concentrations from an estimated value of 10 J mg/Kg at the outfall pipe to 200 mg/Kg 200 feet downstream of the outfall to the drainage ditch. Silver was detected in the same location at 0.6 J mg/Kg. Mercury was detected at all but one sample location (the discharge pipe). Most of the concentrations were estimates ranging from 0.05 J mg/Kg to 0.2 J mg/Kg. Mercury was detected in the sample collected 200 feet downstream of the outfall to the drainage ditch at a concentration of 0.3 mg/Kg.

Results of sediment analyses are included in Table 4.1-5 and shown on Figure 4.1-10 (see Attachment 4.1).

Surface Water

To confirm that sediment contaminants have not impacted surface water, two surface water samples were collected in the Cooling Pond from the bottom one-half of the water column. Analytical results are shown on Table 4.1-6 (Attachment 4.1).

The only two analytes detected in the samples were 0.01J µg/L toluene and 8 J µg/L DEHP.

Soil Borings

To determine the vertical extent of contamination, two soil borings were advanced in the Cooling Pond. The first boring (AP-3787) was advanced near the drainage pipe coming into the Cooling Pond. The second boring (AP-3788) was located approximately three-quarters of the length of the Cooling Pond downstream from the initial boring, just east of the water level mark

in the pond. The borings were advanced to the top of groundwater. Soil samples were collected every 2.5 feet and were submitted for VOC, DRO, SVOC, pesticides/PCB, and metals analyses. Analytical results are included in Table 4.1-4 (Attachment 4.1).

Aroclor 1260 was detected at 330 µg/Kg and 500 µg/Kg in the sample and its duplicate collected at 2.5 feet bgs, and 70 J µg/Kg in the sample collected at 5 feet bgs from AP-3787. 4,4'-DDD was detected in the 2.5 feet, 5 feet, 7.5 feet and 10 feet bgs samples at the same boring at concentrations ranging from 2 J µg/Kg to 180 µg/Kg (240 µg/Kg duplicate), with the maximum at the 2.5-foot interval. 4,4'-DDE was detected at 6 J µg/Kg (8 J µg/Kg duplicate) in the 2.5-foot interval and 0.9 J µg/Kg in the 5-foot interval. 4,4'-DDT was detected in the 7.5-foot interval at 0.9 J µg/Kg. Results are presented in Figure 4.1-10 (Attachment 4.1).

DRO concentrations ranged from 502 mg/Kg (342 mg/Kg duplicate) in the 2.5-foot interval down to a minimum concentration of 4 mg/Kg in the 7.5-foot interval; the DRO concentration in the 10-foot interval was 6 mg/Kg.

Low concentrations of VOCs and SVOCs were detected in the sample collected at 2.5 feet and 7.5 feet bgs.

Arsenic was detected in all intervals and ranged in concentration from 4 mg/Kg to 7 mg/Kg. Although these exceed the screening criteria of 2.3 mg/Kg (1/10th Region 3 RBCs), they do not exceed background levels. Arsenic is further discussed in the Risk Assessment (Volume IIa). Barium, chromium, and lead were detected in all intervals; none exceed the screening criteria. Estimated concentrations of mercury (0.05 J mg/Kg to 0.1 mg/Kg) were detected in all sample intervals except at the surface. These do not exceed a screening criterion of 2.3 mg/Kg.

Concentrations of metals detected in subsurface soils are further discussed in the Risk Assessment (Volume IIa).

In AP-3788, located approximately three-quarters of the length of the Cooling Pond downstream from the discharge pipe, most analytes detected were from the 0- to 2-foot interval. A DRO concentration of 116 mg/Kg was detected in the same interval, with none detected in the 2.5 feet and 5 feet bgs samples.

Acetone and 2-butanone were detected at 63 µg/Kg and 4 J µg/Kg, respectively, in the 0- to 2-foot interval and not in the deeper intervals. DEHP was detected at 0.1 J µg/Kg in the same interval. 4,4'-DDD was detected in the 0 feet, 2.5 feet, and 5 feet intervals at 330 µg/Kg, 0.6 J µg/Kg, and 0.5 J µg/Kg (1 J µg/Kg duplicate), respectively. 4,4'-DDT was also detected in the three intervals sampled, with increasing depth, at 124 µg/Kg, 2 J µg/Kg and 1 J µg/Kg (duplicate; not detected above MRLs for actual sample). Beta-BHC was detected in the 0 to 2-foot sample at 6 J µg/Kg. Dieldrin was detected in the deepest interval sampled, 5 feet bgs, in the duplicate sample only, at 0.6 J µg/Kg.

Aroclor 1260 was detected only in the sample collected at 0 to 2 feet bgs, at a concentration of 310 µg/Kg.

Arsenic was detected at 6 mg/Kg and 5 mg/Kg in the 0- and 2.5-foot intervals. Barium, chromium, and lead were detected in both intervals, although none exceed a screening criteria ($1/10^{th}$ Region 3 RBCs). Mercury was detected at the estimated concentrations of 0.09 J mg/Kg from the 0-foot and 2.5-foot intervals (0.1 J mg/Kg for the associated blind duplicate from 0 feet). These do not exceed a screening criterion of 2.3 mg/Kg.

Concentrations of metals detected in subsurface soils are discussed in the Risk Assessment (Volume IIa).

4.1.5.5 Groundwater

Groundwater at the site is contaminated with petroleum hydrocarbons, solvents, PCBs, and metals. Two rounds of groundwater sampling were conducted at the site to determine if contaminant levels fluctuate with changes in water levels or if changes over time were occurring. In addition, sampling of AP-3458 was conducted to confirm if contaminants have reached this downgradient location as had been indicated in unvalidated data reviewed during the writing of the management plan.

Analytical results from groundwater sampling conducted during the RI are included in Table 4.1-7 and shown on Figures 4.1-11 through 4.1-13 (Attachment 4.1). Groundwater samples collected as part of the Release Investigation for UST 1109 are discussed in Section 4.1.6.

VOCs, including solvents and benzene, toluene, ethylbenzene, and xylene (BTEX), as well as PAHs were detected in various concentrations in all wells during one or both sampling events. AP-2982, AP-2987, AP-3502, and AP-3504 appear to have the most significant presence of contaminants. Halogenated VOCs were detected in AP-3458, confirming previous data indicating that contaminants in groundwater have reached this location.

GRO was detected in only three of the wells sampled (AP-2982, AP-2987 and AP-3502). Concentrations of GRO detected in AP-2982 increased from 1910 µg/L (1930 µg/L, duplicate) to 4400 µg/L between the two sampling events. Concentrations in AP-2987 and AP-3502 decreased between the two events from 850 and 81 µg/L to 510 µg/L and not detected, respectively. DRO were detected in all wells during one or both sampling rounds except AP-3504 (only sampled during October sampling event). Concentrations ranged from 45 J to 1310 µg/L, with the highest concentration detected in AP-2982 during the Spring sampling event. DRO Chromatograms are interpreted as exhibiting the characteristics of a light distillate product such as gasoline. A more detailed explanation is included in the DAR.

Aroclor 1260 had been detected in two monitoring wells (AP-2982 and AP-2986) at concentrations of 0.8 and 0.7 µg/L, respectively. PCBs were not detected in groundwater during

the RI. Low concentrations (< 0.02 µg/L) of pesticides were detected in nine of 12 wells sampled.

High concentrations of several metals had been previously detected in groundwater at the site; however, the metals appeared to be associated with sediment in the water samples. During the RI sampling events, both filtered and unfiltered samples were submitted for metals analysis to determine the relationship between total and dissolved metals. Arsenic, chromium, and lead were the only metals detected that exceeded screening criteria (Maximum Contaminant Level [MCL] or Region III Risk-Based Concentrations [RBC]), and only for total metals; dissolved metals were below screening criteria. It appears that sediment in the samples may be the cause of the elevated metal detections. Further discussion of detected metals is included in the Risk Assessment (Volume IIa).

As part of the investigation, wells AP-2982, AP-2983, AP-2985, AP-2986, AP-2987, AP-3231, AP-3232, AP-3502, AP-3503, and AP-3458 were sampled during October 1996 and April 1997 to determine if contaminant concentrations fluctuated with seasons.

Concentrations of contaminants did appear to fluctuate, although they did not all have the same trend. Concentrations of contaminants did increase during the Spring sampling event in wells AP-2982 and AP-2986. DRO concentrations in AP-3502, AP-3503, and AP-3458 increased during the Spring sampling event; however. BTEX and halogenated VOCs either remained fairly similar or decreased. Wells AP-2983, AP-2985, AP-3231, and AP-3232 contaminant concentrations did not fluctuate significantly. Contaminant concentrations in AP-2987 decreased during the Spring sampling event.

Groundwater Levels

Monthly water level readings at on-site wells were collected for a 1-year period starting in September 1996. Over the 1-year period of water level monitoring, water levels were at a maximum elevation in September 1997 and a minimum in March 1996. There was a difference of approximately 8 to 10 feet between the highest and lowest recorded elevations, although well AP-3458 only had a fluctuation of approximately 4.5 feet. Water levels measured in September 1996 were, in general, approximately 5 feet lower than those collected in September 1997.

Starting with the September 1996 readings, water levels were on the rise through October, were declining in November through March, and then were on the rise again through September 1997. AP-3458 was slightly different than the on-site wells. Water levels were decreasing from September through April 1997 and then were on the rise from May 1997 through September 1997. The fluctuation in elevations from month to month was generally no more than a 1-foot gain or loss, except for the March-to-April fluctuation for the on-site wells and the April-to-May fluctuation in AP-3458, which was approximately 3.5 feet.

Contouring of groundwater levels as observed in wells in the immediate vicinity of 35-752 (i.e., not including AP-3458) indicates a west/northwest direction of gradient. A groundwater gradient more representative of regional flow was calculated by three-point analysis using wells AP-3232, AP-2983, and AP-3458. These calculations indicated a gradient of 0.02 ft/ft in a more northwesterly direction than the contouring of site wells. Monthly groundwater gradients are presented in Figure 4.1-14 (Attachment 4.1). In addition to three-point analysis, hydraulic conductivity (K) testing was performed by means of a slug test. Results of the slug test and the program used for modeling the data are including as Appendix E. The average K was calculated to be 0.0075 feet per minute (ft/min) for AP-2984, 0.007104 ft/min for AP-2987, and 0.009991 ft/min for AP-3504. These numbers were based on the rising head tests. The rising head tests did not exhibit as much data scatter as the falling head tests.

Using an estimated site-wide K at 0.008198 ft/min and an average gradient of 0.02 ft/ft, a velocity of 86.2 feet per year (ft/yr) is estimated for groundwater at the site.

Although the Cooling Pond may contribute locally to groundwater (i.e., it is a losing stream), it probably does not significantly affect the groundwater gradient in a more regional manner. The Cooling Pond has, in the past, been significantly bigger than it currently is and therefore may have previously affected on-site groundwater gradient more significantly.

The groundwater in the area is probably most influenced by Ship Creek located approximately 1200 to 1600 feet to the southeast and south, respectively, of Building 35-752. This is confirmed by the rise in groundwater elevation during the spring of over 3 feet, which would be due to melting of the snowpack and the resulting substantial increase in streamflow.

Water level readings and a graph showing fluctuations in water levels are included in Appendix C.

4.1.6 UST 1109 Investigation

One soil boring (AP-3919) and three monitoring wells (AP-3917, AP-3918, and AP-3920) were installed in the vicinity of former UST 1109 in May 1998 (Figure 4.1-15). Figures 4.1-16 and 4.1-17 show subsurface conditions of the former tank area. Analytical results are presented in Tables 4.1-8 (soil), 4.1-9 (groundwater), and 4.1-10 (stockpile). See Attachment 4.1 for tables and figures.

Soil boring AP-3919 was located between the former drywell and UST 1109. The boring was terminated in a clay unit encountered at approximately 21.5 feet bgs. Three monitoring wells were installed in a radial fashion around this boring. The borings completed as monitoring wells were advanced deep enough to set the well screen and did not encounter the clay unit.

Water was encountered at approximately 12 to 13 feet bgs during drilling. The highest ATH results in all locations were for those samples collected from the 15 to 17 foot interval.

Soil Borings

VOCs were detected primarily in the samples collected from the 15 to 17 foot intervals in the four borings. However, TCE was detected in the 5 to 7 foot and 10 to 12 foot intervals from AP-3918 as well as the 10 to 12 foot interval from AP-3920 at estimated concentrations (below the MRL). 4-Isopropyltoluene (110 µg/Kg) and 1,3,5-trimethylbenzene (110 µg/Kg) were detected in the duplicate but not the primary sample from the 10 to 12 foot interval in AP-3919 and TCE (2 J µg/Kg) was detected in the sample from the 22 to 24 foot interval in AP-3919. The 15-to-17 foot sample collected from AP-3919 (the boring between the drywell and the former UST) had the most VOCs detected, including benzene (50 µg/Kg), PCE (45 µg/Kg), TCE (20 µg/Kg), and cis-1,2-dichloroethene (1,2-DCE) (14 µg/Kg). A summary of detected analytes is included as Table 4.1-8 (Attachment 4.1).

4,4'-DDT was detected in a number of samples and ranged in concentration from 2 J to 7 J µg/Kg. Endosulfan II was detected at 3 J µg/Kg in the 10 to 12 foot sample at AP-3918. PCB 1254 was detected at concentrations ranging from 0.05 J µg/Kg to 0.1 µg/Kg.

The highest GRO, DRO, and RRO concentrations were detected in the samples collected from the 15 to 17 foot intervals in all of the borings and the 10 to 12 foot interval in AP-3919.

Groundwater

TCE was detected in all samples and ranged in concentration from 5 µg/L (AP-3231) to 11 µg/L (AP-3918). Benzene was detected in AP-3917 (4.7 µg/L) and AP-3918 (0.2 J µg/L). Other VOCs detected are included in summary tables in Attachment 4.1.

Pesticides were detected in AP-3920 and AP-3918; all concentrations were estimated values (0.006 J µg/L to 0.02 J µg/L).

GRO, DRO, and RRO were detected in water samples collected from AP-3917, AP-3918, and AP-3920. RRO was detected at 34 J µg/L in the duplicate sample collected from AP-3231 but not the primary sample.

A complete summary of detected analytes is presented in Table 4.1-9 (Attachment 4.1).

Stockpile Samples

Five samples (four primary, one duplicate) were collected from the stockpiled soils associated with the tank removal. No VOCs, SVOCs, or GRO were detected. DRO concentrations ranged from 66 mg/Kg to 76 mg/Kg. RRO concentrations ranged from 325 mg/Kg to 2370 mg/Kg.

PCB (Aroclor 1260) was detected in all samples submitted for PCB analysis. Concentrations were 0.2 mg/Kg and 0.3 mg/Kg. 4,4'-DDD and 4,4'-DDT were detected in all samples submitted for pesticides analysis. 4,4'-DDD concentrations ranged from 6 J µg/Kg to 11 µg/Kg. 4,4'-DDT concentrations ranged from 8 J µg/Kg to 42 µg/Kg.

A summary of detected analytes is included as Table 4.1-10 (Attachment 4-1).

4.2 Building 45-590 Source Area

Building 45-590 is located in the western portion of Fort Richardson near the corner of the Davis Highway and Loop Road (see Figure 4.2-1, Attachment 4.2). It was initially constructed as an auto craft shop. Portions of it have also been used for auto repair. The building was demolished and removed during the summer of 1995.

4.2.1 Environmental Setting

Building 45-590 is on the outskirts of the developed portion of Fort Richardson, and is surrounded primarily by wooded areas consisting of birch, alder, and spruce. A fenced military police impound lot is south of the site, and a Post camping area is just north and west of the site. Topographical relief in the area is relatively low with land surface elevation being approximately 280 feet above mean sea level (MSL; EMCON 1995d).

Building 45-590 is approximately 1 mile north of Ship Creek. The closest potable supply well (Supply Well 1) is located approximately 1.25 miles south of the site and on the opposite side of Ship Creek. Supply Well-1 is completed in the confined aquifer to a depth of 162 feet with 20 feet of screen. Another nearby supply well is the Otter Lake well, which is approximately 2.5 to 3 miles north-northwest of the site.

Subsurface soil at the site consists of a glacial alluvium with cobbles and erratics interbedded with sands and silty, sandy gravels. Depth to groundwater is approximately 100 feet bgs and represents the potentiometric surface of the principal unconfined aquifer (EMCON 1995d). General groundwater flow direction at the site in the unconfined aquifer is to the northwest with a gradient ranging from 0.0009 feet/feet (ft/ft) to 0.003 ft/ft.

Regionally, the occurrence of unconfined and perched groundwater in the area is sporadic due to heterogeneous geologic conditions throughout the Post (USACE 1995). Several borings drilled at Building 732, approximately 800 feet southeast of the site, encountered small quantities of perched water at between 15 and 26 feet bgs. However, none of the borings at Building 732 were drilled deeper than 52 feet bgs. Therefore, the actual depth of the unconfined potentiometric surface at that site is unknown. Wells AP-3468 and AP-3534 were installed just north of Building 732, approximately 800 feet east of Building 45-590. Groundwater in well AP-3468 was encountered at 107 feet bgs, approximately 3 feet above the confining layer. Two wells at Building 726 (AP-3467 and AP-3469, approximately 1,500 feet southwest) were completed in the confined aquifer, which was encountered at around 115 feet bgs. Figure 4.2-2 (Attachment 4.2) shows the general regional subsurface geology between Building 45-590 and Building 726.

4.2.2 Past Practices

Building 45-590 was originally constructed in 1943. A northern annex (quonset hut) was added in 1956; a center annex, immediately west of the original building, was added in 1966; and a west annex was added in 1972. The building and its annexes were wood-framed with metal sheathing on a concrete slab. The concrete floor was 6 inches thick with wire mesh reinforcing. Concrete aprons on the south side of the original building and the west and center annexes were constructed similar to the floor.

According to the as-built drawings, the original building was constructed as an auto hobby shop. The center and west annexes were added to provide additional bays for auto repair work. The northern annex was used as a tool and parts sales office.

A review of building as-built drawings indicates that a waste oil UST was present on the south side of the building between the center and west annexes. Floor drains were installed in the west annex, with the drains discharging to an oil/water separator. Liquid from the oil/water separator drained to the sanitary sewer. Oil from the unit drained to the waste oil UST.

A portion of the concrete apron outside of the west annex was used as an accumulation point for containers that were filled with wastes from auto maintenance activities. An aboveground tank, located at the east end of the west annex, was also used to store waste oil. According to facility personnel, there was no piping associated with this tank. Waste oil was carried to the tank by buckets and removed by a vacuum-pump truck. There was no secondary containment around the containers or tank (ENSR 1994c).

In 1989, the EPA issued a notice of noncompliance (NON) requiring that the wastes be sampled and, if hazardous, applicable regulations complied with (EMCON 1995d). In October of 1990, the U.S. Army Environmental Hygiene Agency (AEHA) conducted drum sampling at this building (ENSR 1994c). There were a total of nine 55-gallon drums, two 5-gallon cans, and the aboveground tank at the site during AEHA's sampling event. The aboveground tank contained only used oil and was not sampled. The remaining containers contained a mixture of motor oil and ethylene glycol. No chlorinated compounds, methyl cellosolve, or PCBs were found above the method detection limits (MDLs) in the samples from the containers. The drums and tank were taken to the Defense Reutilization and Marketing Office (DRMO) at Elmendorf Air Force Base in April 1991 for reuse, resale, or disposal (ENSR 1994c).

Aerial photographs in 1974 and 1983 were reviewed to provide a better idea of past practices at the site and in the surrounding area. Only a small portion of the eastern end of the site is visible in the 1974 photographs. The soil in the parking lot and the road near the building were heavily stained. It appears that used oil may have been poured onto the road surface, which was a common practice at the time.

In 1983, the entire site and surrounding area were visible. The area around the building, especially to the north and east of the building, had been cleared. Facility personnel used the

cleared area east of the building as a parking lot. Several lightly stained areas were visible around the perimeter of the building, with the most staining being in the parking lot. It appears that the practice of pouring used oil onto the road surface had stopped by this time. The fenced impound lot was present across the street, south of Building 45-590.

A concrete pad with a wash rack and sump was visible outside of the fence along the northeast corner of the impound lot. A review of old site drawings indicates that this pad was a concrete grease rack. The concrete pad was either heavily stained or contained standing water in the aerial photograph. Liquids appeared to collect in the northeast corner of the pad, which was on the opposite side of the pad from the sump. Currently, this grease rack/concrete pad is abandoned.

Approximately 400 feet northeast of the building was a cleared area containing about five of what appeared to be abandoned vehicles. This area is where a portion of the camping area north of the site has been constructed.

In 1993, only the newest annex of the building was being used for vehicle maintenance activities. The other three sections of the building were being used for storage of military cold weather clothing and equipment (ENSR 1994c). In the summer of 1994, the building was being used as a construction office.

During the summer of 1995, the building was demolished and removed from the site. During the demolition process, a sump was discovered beneath the concrete slab on the eastern end of the original building. As-built drawings for the original construction could not be obtained; however, this sump is not shown on subsequent modified as-built drawings. Samples collected from this sump contained fuel-related VOCs. A fuel fingerprint of the samples indicated the presence of Jet A and Bunker Oil. Soil surrounding the sump also contained fuel-related VOCs, DRO, and GRO.

4.2.3 Previous Investigations

Several investigations have been conducted that reviewed historical activities at the site and evaluated the potential presence of soil and groundwater contamination at the site. Analytical results from these previous investigations are included in Appendix D.

In 1993, USACE conducted a Release Investigation at a former waste oil UST location to assess the possible presence of soil contamination near the former excavation (HLA 1994a). In 1994, USACE conducted an additional Release Investigation and prepared a corrective action plan for contaminated soil at the site (EMCON 1994b). USACE also conducted closure sampling for the waste accumulation area in 1994 (EMCON 1994c). USACE conducted subsequent groundwater sampling at the site (EMCON 1995b and 1995c), and summarized results of their previous investigations at this site in one PSE2 report (EMCON 1995d). Results from these investigations are presented in the following subsections.

4.2.3.1 Former Waste Accumulation Area

Near-surface soil sampling was conducted near the former waste accumulation area at the west end of Building 45-590. Samples were analyzed for VOCs, SVOCs, metals, GRO, DRO, and TPH. Results of the investigation determined that petroleum hydrocarbon and VOC concentrations were below ADEC soil target cleanup levels (Appendix D). With the exception of chromium at a maximum concentration of 53 mg/Kg, metals, VOCs, and SVOCs were not detected above background and/or RBCs. The RBC for chromium is 39 mg/Kg, and the background concentration is 43.8 mg/Kg.

4.2.3.2 Former Waste Oil UST

In 1991, a 300-gallon waste oil UST that serviced Building 45-590 was removed. A new UST was installed at a different location at the site. The maximum reported excavation depth was 6 feet bgs. TPH concentrations in soil samples collected from the excavation limits during tank decommissioning were as high as 4,600 mg/Kg (HLA 1994a).

In 1993, investigators drilled seven borings at the site to assess the presence of soil contamination (HLA 1994a). Boring AP-3238 was drilled through the location of the former UST (Figure 4.2-3, Attachment 4.2). The extent of contamination from the former UST is limited to a depth of 10 feet bgs and no more than 10 to 15 feet from the center of the excavation. GRO, DRO, TPH, trichlorofluoromethane, chlorobenzene, Aroclor 1254, 4,4'-DDT, and metals were detected in the 5- to 8-foot sample interval of boring AP-3238; however, none of the compounds detected at the former UST location exceeded either ADEC cleanup levels or RBCs. Chromium and lead exceeded background values; however, the lead values are below EPA's cleanup level of 400 mg/Kg (Wilkening 1995).

4.2.3.3 Former Dry Well/Sewer Line

During the Release Investigation, petroleum hydrocarbon-impacted soil was found in an area unrelated to use of the former UST (HLA, 1994a). Through a records search and interviews with facility personnel, the USACE determined that the impacted area was close to the reported location of an abandoned sewer line and tentatively identified the source of this impacted area as a dry well located immediately south of Building 45-590 (EMCON 1995d).

In 1994, USACE conducted an additional Release Investigation in this area to assess the extent of soil contamination and to assess the presence of contaminants in the groundwater (EMCON 1994b). They drilled 13 soil borings and converted 4 of the borings to monitoring wells. Boring and well locations are shown on Figure 4.2-3 (Attachment 4.2). USACE encountered wood fragments with wire wrap at approximately 10 feet bgs in boring AP-3387. The wood fragments are assumed to be associated with the sewer line/dry well.

Soil and groundwater samples were collected from the site and analyzed for VOCs, GRO, DRO, TOC, metals, and biofeasibility parameters. Results of the soil sampling are summarized in Appendix D. Approximately 18,000 cubic yards of soil containing DRO above ADEC soil target cleanup levels were identified as a result of the Release Investigation (EMCON 1995d). USACE is currently conducting a bioventing feasibility test on DRO-impacted soils from 40 feet to 100 feet bgs.

An additional isolated area of petroleum hydrocarbon-impacted soil was encountered at a depth of 12 feet bgs in boring MP-C, which is approximately 55 feet southeast of the former dry well (Figure 4.2-3, Attachment 4.2). GRO was detected in this sample at a concentration of 488 mg/Kg. It was assumed that this GRO impact may be associated with the abandoned sewer line that was reportedly approximately 20 feet south of Building 45-590 (EMCON 1995d).

Monitoring wells at the site were sampled in April and December 1994 and in March 1995. Analytes detected in the groundwater samples during these sampling events are summarized in Appendix D. DRO were consistently detected in the groundwater from two of the wells (AP-3387 and AP-3341), and sporadically detected in the groundwater from wells AP-3439 and AP-3440. PCE was consistently detected at concentrations slightly above the MCL of 5 µg/L in wells AP-3387, AP-3439, and AP-3440. Chloroform was detected above the RBC of 0.15 µg/L in wells AP-3387 and AP-3441 (Figure 4.2-1).

Two of the wells containing PCE (AP-3439 and AP-3440) are either upgradient or crossgradient of the former drywell/sewer line location. Additionally, no PCE or its breakdown products (TCE or dichloroethene [DCE]) were detected in the soil beneath the dry well/sewer line. However, the presence of solvents in soil beneath the dry well/sewer line may have been masked by the presence of high levels of petroleum hydrocarbons, which caused PCE detection limits to be as high as 1,300 µg/Kg. This detection limit exceeds one-tenth of PCE's RBC in soil (1,200 µg/Kg). Therefore, although the presence of PCE in upgradient and crossgradient groundwater indicates that the dry well/sewer line may not be the only source of PCE in groundwater, it cannot be ruled out as a potential source. Other potential on-site sources include the sump discovered during building demolition and the grease rack/sump near the corner of the impound lot.

4.2.3.4 Potential Off-Site Sources of PCE in Groundwater

A review of site maps indicates the presence of two facilities upgradient of Building 45-590 that could potentially be sources of PCE in the groundwater. Building 726, the laundry and dry cleaning facility, is approximately 1,500 feet southeast of Building 45-590, and Building 732, the Army Reserve Motor Repair Shop, is approximately 800 feet southeast of Building 45-590.

In 1994, USACE conducted a Preliminary Source Evaluation (PSE) at Building 726 to determine if it may be the source of PCE at Building 45-590. Three borings were drilled inside the

excavation footprint of three former solvent USTs, two monitoring wells were installed north and south of the building (AP-3469 and AP-3467), and one monitoring well was installed approximately 800 feet north of the building (AP-3468). AP-3468 was installed in the unconfined aquifer, just at the top of the confining layer, and the other two wells were installed within the confined aquifer. No PCE or its breakdown products were detected in soil or groundwater samples at this site during the PSE (USACE 1995). Only Stoddard solvent was detected in soil within the former tank excavation limits. However, because groundwater from two of the wells was obtained from the confined aquifer, this data is not directly comparable to the PCE detected in the unconfined aquifer at Building 45-590. More complete details of this investigation are presented in Section 4.3.

Several investigations have been conducted at Building 732. In 1992, the USACE drilled 17 soil borings to depths ranging from 11 to 26 feet bgs to determine chemical concentrations in soil at the site in support of design of an addition to the building. Twelve of the borings were drilled in areas where historical review and field observations indicated that contamination was most probable (USACE 1993). Groundwater was not encountered in any of the borings; therefore, no monitoring wells were installed. Petroleum hydrocarbons were detected in several samples, with the most significant concentrations being at a depth of 5 feet in boring AP-3124. Unidentified hydrocarbons were detected at 18,000 mg/Kg, and diesel fuel was detected at 4,400 mg/Kg in the sample at this depth. No PCBs, pesticides, or chlorinated solvents were detected in the soil samples (USACE 1993).

In 1994, USACE conducted a UST closure site assessment for a former 1,000-gallon used oil UST at Building 732 (DOWL 1994). Extractable petroleum hydrocarbons (EPH) up to 2,050 mg/Kg, TPH up to 3,500 mg/Kg, BTEX up to 0.049 mg/Kg, metals, 1,2-dichlorobenzene at 0.029 mg/Kg, 1,4-dichlorobenzene at 0.026 mg/Kg, and 1,1,2,2-tetrachloroethane at 0.026 mg/Kg were detected in soil samples from the tank excavation (DOWL 1994).

In 1994, USACE conducted a Release Investigation at the former UST site and near a former materials storage area at Building 732 (EMCON 1995a). The material storage area consisted of a wooden shed constructed over a lined and bermed containment area for the storage of in-use, drummed materials. Adjacent to the wooden shed was a drum rack for the storage of drummed materials not currently in use (EMCON 1995a). Four soil borings were drilled at each area to a maximum depth of 52 feet bgs. Groundwater was not encountered during drilling. GRO, DRO, fuel-related VOCs, TCE, and metals were detected in soil samples from the borings at concentrations below site cleanup levels or RBCs. The maximum TCE concentration was 0.01 mg/Kg, and this was noted to be an overestimated value (EMCON 1995a).

4.2.4 Remedial Investigation

Results from the previous investigations were used to identify data gaps at the site so that COPCs could be established and incorporated into the RI sampling plan. Data gaps identified in

the Management Plan and findings of the RI are presented in Table 4.2-1, and COPCs identified in the Management Plan are presented in Table 4.2-2 (see Attachment 4.2). The following subsections summarize the work conducted as part of the RI and discuss the data collected.

4.2.4.1 Subsurface Soil

The four areas investigated during the RI included an area adjacent to the dry well/abandoned sewer line, the area near abandoned boring MP-C, and areas near the sumps at Building 45-590 and the concrete wash pad located south of the building. Analytical results are presented in Table 4.2-3 and on Figures 4.2-3 and 4.2-4 in Attachment 4.2.

Drywell/Abandoned Sewer Line

One soil boring (AP-3779) was advanced to 50 feet bgs to determine if soils had been impacted by the drywell/abandoned sewer line at Building 45-590. DRO were detected in samples collected from 15 feet (176 mg/Kg; 218 mg/Kg duplicate), 25 feet (492 mg/Kg) and 30 feet (1630 mg/Kg) bgs. Aromatic volatile organics (AVOs) were detected in all samples collected between 15 feet and 30 feet bgs in concentrations ranging from 13.7 µg/Kg (total estimated AVOs) in the 30-foot interval to 330 µg/Kg (total estimated AVOs) in the duplicate sample collected at 15 feet; the normal sample collected at 15 feet had an estimated total concentration of 157 J µg/Kg AVOs detected. Low concentrations of AVOs (less than 11 µg/Kg estimated total) were detected in the sample collected at 5 feet. PAHs were detected only in the sample collected at 15 feet at insignificant concentrations.

MP-C

Three borings were advanced in the vicinity of abandoned boring MP-C (AP-3780, AP-3781, and AP-3782). DRO concentrations ranged from non-detect (above MRLs) to 205 mg/Kg. GRO concentrations ranged from non-detect (above MRLs) to 270 mg/Kg. The maximum concentrations of DRO and GRO were at the 15-foot sample collected in AP-3780 (205 mg/Kg and 270 mg/Kg). Toluene was detected in only three samples: AP-3781 at 0 and 5 feet (2 J µg/Kg and 6 µg/Kg) and AP-3780 at 30 feet (2 J µg/Kg). Other estimated total AVOs were only present in four samples, although total estimated concentrations were less than 15 µg/Kg except at the 15-foot interval in AP-3780 (total AVOs 837 µg/Kg).

Trichloroethene (TCE) was detected in only one sample at 1 J µg/Kg, the duplicate collected from the 15-foot interval in AP-3781. Acetone was detected in samples to a maximum concentration of 200 µg. Arsenic ranged from 3 mg/Kg to 8 mg/Kg and was detected in all intervals. These concentrations do not statistically exceed site background levels. Barium, chromium, and lead concentrations did not exceed screening criteria (1/10th Region 3 RBCs). Mercury ranged in estimated concentrations from 0.06 J mg/Kg to 0.1 J mg/Kg, none of which

exceed screening criteria. Discussion of significance of metals concentration is included in the Risk Assessment (Volume IIa).

Sump at Building 45-590

At the time of the RI, the building and the sump had been demolished. The boring (AP-3783) was placed in close proximity to where the sump had been located. DRO and GRO were detected in samples collected at 10 feet and 15 feet bgs in concentrations ranging from 4 to 308 mg/Kg. PCE and 1,2-dichloroethane (1,2-DCA) were detected at 20 J µg/Kg and 10 J µg/Kg in the sample collected at 10 feet. The total estimated AVO concentration detected at this location was 190 J µg/Kg. VOCs were not detected in any other samples. Arsenic was detected at 6 mg/Kg to 7 mg/Kg in the three samples collected. Although these concentrations exceed the screening criteria of 2.3 mg/Kg (one-tenth the Region III RBC), they do not exceed Post background levels.

Sump at Concrete Wash Pad

Sediment samples were collected from the bottom of the sump; results are shown on Table 4.2-4 (Attachment 4.2). Substantial concentrations of DRO and VOCs were detected, including concentrations of PCE ranging from 87 µg/Kg to 600 µg/Kg. However, a soil boring advanced adjacent to the sump (AP-3784), to a total depth of 35 feet bgs, indicated that the materials in the sump have not impacted adjacent soils. Low concentrations (less than 25 mg/Kg) of DRO were detected in the subsurface soils adjacent to the sump. Arsenic was detected at concentrations of 6 mg/Kg in the 15- and 35-foot samples, and 18 mg/Kg in the 10-foot sample. The detection of 18 mg/Kg exceeds Post background levels for this metal (9.2 mg/Kg).

Drywell at Building 704

A soil boring (AP-3864) was advanced to a depth of 40 feet bgs near a former drywell southeast of Building 704. The drywell was identified during replacement of an oil/water separator and had been used to direct disposal of effluent to the subsurface soils. Building 704 is located hydraulically upgradient of the Building 45-590 site area. The soil boring location is included on the sample location map for Building 726 (Figure 4.3-1, Attachment 4.3). The soil samples were collected in order to assess the impact of the drywell on the subsurface soils and to determine if there was any connection between it and the contaminants seen in groundwater in the vicinity of Building 45-590.

Methylene chloride was the only VOC detected. It was detected at 5 µg/Kg in the samples collected at 15 feet, 25 feet, and 30 feet as well as the associated blind duplicate from 30 feet. However, methylene chloride was also detected in the associated laboratory method blank at the estimated concentration of 3 J µg/Kg.

DRO concentrations ranged from the estimated concentration of 3 J mg/Kg to a maximum of 49 mg/Kg detected in the 5-foot interval.

Semivolatiles were detected in the 5-foot interval only and included pyrene (0.07 J mg/Kg), indeno (1,2,3-cd) pyrene (0.04 J mg/Kg), and benzo (g,h,i) perylene (0.04 J mg/Kg). 4,4'-DDD was detected in the 5-foot and 10-foot intervals, and the duplicate sample from the 30-foot interval (2 J µg/Kg, 1 J µg/Kg, and 0.4 J µg/Kg respectively). Delta-BHC was detected in the 15-foot, 25-foot, and 30-foot intervals, including the duplicate sample at the 30-foot interval, at the estimated concentrations of 1 J µg/Kg, 0.8 J µg/Kg, 1 J µg/Kg, and 0.7 µg/Kg, respectively. In the 5-foot interval, 4,4'-DDE, endosulfan sulfate, 4,4'-DDT, and methoxychlor were detected at 1 J µg/Kg, 2 J µg/Kg, 14 µg/Kg, and 4 J µg/Kg, respectively.

Arsenic was detected in concentrations ranging from 4 to 7 mg/Kg. As is similar throughout the investigation, these exceed the screening criteria (1/10th Region 3 RBCs) but do not exceed background levels. Levels of barium, chromium, and lead do not exceed screening criteria. Mercury ranged in (estimated) concentrations from 0.06 J mg/Kg to 0.1 mg/Kg, none of which exceed the screening criteria. Iron ranged in concentrations from 24,300 mg/Kg to 35,500 mg/Kg. Significance of metals concentrations is addressed in the Risk Assessment (Volume IIa).

4.2.4.2 Groundwater

In September 1996, five monitoring wells were installed in the vicinity of Building 45-590. Soil samples were not collected for contaminant analysis; lithologic logging was based, in general, on discharge cuttings from the air rotary drill rig. Three of the wells were located potentially hydraulically upgradient of the site. Two wells, AP-3772 and AP-3773, were screened below a confining unit as no water was encountered above this unit. The three other wells (AP-3774, AP-3775, and AP-3776) were completed in the unconfined aquifer. The wells were sampled for VOCs on a quick turnaround basis to determine if additional upgradient wells needed to be installed to further evaluate the upgradient source of PCE contamination. PCE was detected in the newly installed upgradient well (AP-3775). During the site-wide groundwater sampling event, PCE was also detected in upgradient wells AP-3468 and AP-3534.

In February 1997, two additional wells were installed hydraulically upgradient from this site in an attempt to further delineate the extent of PCE in groundwater and possibly identify the source. One well (AP-3789) located adjacent to Building 732 was screened below a confining unit as no water was encountered above this unit. AP-3790, located downgradient of Building 704, was screened above a confining unit in what is presumed to be a perched aquifer.

Four additional wells (AP-3870 through AP-3873) were installed in January 1998 to further delineate the extent of groundwater contamination. In general, the boreholes were terminated at approximately 120 feet bgs. The confining silt unit was not encountered at any of the four

locations. In conjunction with collecting groundwater samples at the four new wells, samples were also collected at 10 existing wells (AP-3468, AP-3534, AP-3387, AP-3773, AP-3774, AP-3775, AP-3776, AP-3441, AP-3789, and AP-3790).

Groundwater results collected during the RI are included in Table 4.2-5 and Figure 4.2-1 (Attachment 4.2). The concentrations of PCE detected were highest in wells AP-3468 (unconfined) and AP-3534 (confined). Concentrations detected in these wells were 100 µg/L and 34 µg/L, respectively. PCE had not previously been detected in either of these wells. PCE was detected in on-site wells AP-3439 and AP-3440, as it had been previously. Carbon tetrachloride was also detected in both wells, although it had not been detected in previous investigations. PCE had been detected in AP-3387 during previous investigations; this well was not sampled during the September 1996 sampling event as it was believed to be inaccessible due to ongoing remedial activities. PCE was not detected in AP-3441, although it is unclear if this well is screened in the unconfined aquifer or not. Of the five new wells installed in September 1996, PCE was detected in the three installed in the unconfined aquifer. PCE was not detected in the two wells screened below the confining unit (south of Building 45-590). PCE was detected in both wells installed in February 1997, upgradient of the site.

Results of the 1998 groundwater sampling event did not indicate any significant changes in concentrations. PCE was detected at its highest concentration of 91 µg/L in AP-3468, which corresponds well to the 1996 sampling in which the result was 100 µg/L. PCE was not detected in any of the newly installed wells (AP-3870, AP-3871, AP-3872, and AP-3873). Carbon tetrachloride was detected at 1 µg/L in AP-3871 and the estimated concentration of 0.4 J µg/L in the duplicate sample collected at AP-3873 but not the primary sample. The DRO concentration in AP-3387 was detected at 5900 µg/L (5270 µg/L in the duplicate). None of the other wells had a DRO concentration detected above the MRL of 100 µg/L.

Groundwater Levels

Groundwater levels have been collected in all accessible on-site wells on a monthly basis. Water level readings were collected through September 1997. A review of well installation logs of existing wells and those installed during the RI indicates that in many wells water was not encountered until after drilling through a silt unit. These wells have been referred to as wells screened in a "confined" aquifer. Although on a well-specific basis this may be true, this groundwater system as a whole is believed to be semiconfined, meaning in some areas the water acts like a confined system, and in some areas it appears to be unconfined with no silt unit encountered. It is believed that these are interconnected and not two distinct groundwater systems. The most predominant area of mixing may be in close proximity to 45-590 where some of the wells (e.g., AP-3468, AP-3534, AP-3772, and AP-3773) were installed beneath the silt unit and some did not encounter the silt unit (e.g., AP-3774, AP-3775, and AP-3776). A review of the water level survey indicates no more than approximately 5-foot water level difference in the wells near 45-590 with almost identical patterns of fluctuation. This would lend to the theory of a mixing zone in this area. Water level readings and graphs depicting groundwater fluctuations are included in Appendix C.

4.3 Building 726 Source Area

Building 726 is located in the western portion of Fort Richardson between the Davis Highway and Richardson Drive. Building operations include dry cleaning, clothing washing, and mattress washing. Chemicals likely used at the site include dry cleaning solvents: PCE, a typical dry cleaning agent, and Stoddard solvent, a dry cleaning agent and degreaser/cleaner. Small amounts of PCE are still presently used.

4.3.1 Environmental Setting

Building 726 is near the outskirts of the developed portion of Fort Richardson in a well-maintained, low topographical relief area. The site is surrounded by buildings to the north and east, and by black spruce and birch trees to the south and west. Asphalt paving extends from the building out to approximately 64 feet on all four sides. Along the back side (west) of the facility, the asphalt slopes away from the building toward the wooded area.

Building 726 is approximately 0.25 mile north of Ship Creek. The closest potable supply well (Supply Well 1) is located approximately 0.3 miles southwest of the site and on the opposite side of Ship Creek. Supply Well 1 is completed in the confined aquifer to a depth of 162 feet with 20 feet of screen.

Subsurface soil at the site consists of a glacial alluvium with cobbles and erratics interbedded with sands and silty, sandy gravels. In general, the gravels extend to depths of around 50 to 107 feet bgs. Below the gravels is a tight confining silt layer that varies in thickness. The surface of the confining layer dips downward toward the north and west (USACE 1995). Soils directly above the confining layer are typically wet, with some perched water. Underlying the silt is the confined aquifer in a gravel layer. Perched, unconfined groundwater in the area generally flows to the northwest, and confined aquifer groundwater in the area generally flows to the west/northwest (USACE 1995).

4.3.2 Past Practices

Building 726 was constructed in the 1950s as the Post laundry and dry cleaning facility. The building is a two-story, concrete block structure with concrete floors. The building has always been served by the Post's sanitary and stormwater sewer system. No dry wells or independent septic systems were found on as-built drawings.

According to 1951 as-built drawings, three 2,000-gallon USTs containing clean, dirty, and new dry cleaning solvents serviced the building. The type of solvent used was not indicated in the plans and personal interviews conducted by the USACE resulted in conflicting reports of tank contents using PCE or Stoddard solvent (USACE 1995). The plans did indicate that it was a closed system. New solvent was added through a 2-inch fill pipe outside the building into the

new solvent tank. Used solvent from each dry cleaning station was returned to the dirty solvent tank via drain lines. The dirty solvent was pumped through a solvent still to remove impurities and returned to the clean solvent tank. A combination of new and used solvent was drawn from the respective tanks and used in the dry cleaning operations. New makeup solvent was added to replace solvent that evaporated during dry cleaning operations (USACE 1995).

Before 1990, the solvent still bottoms were placed in a dumpster outside the laundry building and disposed of in the landfill. Solvent-contaminated diatomaceous earth and activated carbon used during processing of the used solvent were placed in an aeration box inside the building. Upon extended aeration, this material was also taken to a landfill for disposal (SAIC 1990).

Due to a change in laundry practices, the facility stopped using the tanks in 1972, and they were removed in 1987. Currently, only small amounts of PCE are used in the dry cleaning area. Approximately one 55-gallon drum per month is used to replace PCE that has evaporated and as makeup solvent in the dry cleaning operation. Empty PCE solvent drums are stored on a concrete dock behind the building. A review of aerial photographs in 1974 and 1983 indicated the presence of drums on this concrete dock during these periods as well.

4.3.3 Previous Investigations

In 1994, the USACE conducted a PSE at Building 726 to determine if the USTs may have released solvent to the environment and to evaluate the potential that this site may be the source of PCE in downgradient groundwater at Building 45-590. Three borings were drilled inside the excavation footprint of the three former solvent USTs and two monitoring wells were installed north and south of the building (AP-3469 and AP-3467; Figure 4.3-1, Attachment 4.3). One monitoring well was installed approximately 800 feet north of the building (AP-3468; refer to Figure 4.2-1, Attachment 4.2). AP-3468 was installed in the unconfined aquifer, just at the top of the confining layer. Wells AP-3467 and AP-3469 were both installed within the confined aquifer due to lack of water above the confining unit.

Soil samples from the borings were analyzed for GRO, DRO, VOCs, and metals. Groundwater samples were analyzed for GRO, DRO, VOCs, and TPH. Results of the soil and groundwater analyses are included in Appendix D.

PCE was detected in soil samples collected in soil boring AP-3465 at the 15- to 17- and 17- to 19-foot intervals at 2 J and 5 J µg/Kg, respectively. Soil samples collected from AP-3469 at the 52- to 54-foot interval had concentrations of PCE detected at 1.5 µg/Kg and 3.5 µg/Kg for the sample and its duplicate, and 50 µg/Kg for a quality assurance sample sent to a secondary laboratory. PCE was not detected in groundwater samples, and only low levels of DRO were detected in groundwater samples from the site. The primary contamination found at the site was in the soil borings within the excavation limits, where petroleum compounds (GRO and DRO) were detected. However, the laboratory indicated that the chromatograms from these

samples did not exhibit a typical gasoline or diesel response. The characteristic "hump" on the GRO chromatogram was on the far right side rather than in the middle, and the "hump" on the DRO chromatogram was on the far left side rather than in the middle. Therefore, it was concluded that the contaminant was most likely Stoddard solvent, which contains hydrocarbons in both the gasoline and diesel range (USACE 1995). The vertical extent of contaminated soil beneath the former UST locations is 15 to 40 feet bgs. The horizontal extent of the soil contamination has not been defined.

4.3.4 Remedial Investigation

Results from the previous investigations were used to identify data gaps at the site so that data quality objectives (DQOs) could be established and incorporated into the RI. Data gaps identified in the Management Plan and findings of the RI are presented in Table 4.3-1, and COPCs identified in the Management Plan are presented in Table 4.3-2 (see Attachment 4.3). The following subsections summarize the work conducted as part of the RI and discuss the data collected.

4.3.4.1 Surface Soil

In order to determine if surface soil at the edge of the asphalt near the PCE drum storage area had been impacted, surface and near-surface soil samples were collected from this area (see Figure 4.3-1, Attachment 4.3) and submitted for VOC, DRO, and GRO analyses. Soil samples were collected at depths of 0.5, 1.0 and 2.0 feet bgs, respectively, at three locations adjacent to the paved area south of Building 726. Analytical results are included in Table 4.3-3.

PCE was detected in all samples in concentrations ranging from 5 µg/Kg to 100 µg/Kg (Figure 4.3-2, Attachment 4.3). The highest concentrations of PCE were detected in samples collected from the 1-foot interval, the next highest were from the 2-foot interval, and the lowest concentrations were from the 0.5-foot interval. Methylene chloride was detected in six samples at concentrations ranging from 3 J µg/Kg to 6 J µg/Kg. It was detected in the sample collected at 0.5 feet in 96-SS02, but not in the associated blind duplicate.

DRO was detected at all locations in concentrations ranging from 29 mg/Kg to 98 mg/Kg (Figure 4.3-2). Concentrations of DRO in 96-SS01 and 96-SS02 were highest at the 0.5-foot interval, and decreased in concentration with depth. At 96-SS03, the highest concentration of DRO was detected at the 1-foot interval, followed by the 0.5-foot and 2.0-foot intervals. GRO was detected in all samples except for the 0.5-foot interval at 96-SS01; concentrations of GRO ranged from 4 J mg/Kg to 71 mg/Kg. Concentrations of GRO increased with depth.

Interpretation of DRO chromatograms characterizes the DRO pattern as exhibiting the characteristics of a light distillate product such as mineral spirits or Stoddard solvent. A more complete discussion is included in the DAR.

4.3.4.2 Subsurface Soil

Although Stoddard solvent had been detected in subsurface soil at the former UST excavation footprint, and the lateral extent of contamination was not known, further investigation was determined to be unnecessary during the writing of the Management Plan as the area is covered with asphalt. Also, because no measurable unconfined groundwater exists, the potential for the contamination to migrate to groundwater was also considered low. However, surface soil results collected during the RI indicated the presence of both PCE and Stoddard solvent in the surface soils behind the laundry facility.

Four soil borings were advanced behind the laundry facility in an effort to determine the lateral and vertical extent of PCE and Stoddard solvent contamination. One soil boring (AP-3860) was advanced in the location of the surface soil collected with the highest PCE result. Two borings (AP-3862 and AP-3863) were advanced along the edge of the asphalt, straddling AP-3860. The fourth boring was located approximately 30 feet west of AP-3860 in the wooded area behind the laundry facility. Analytical results are presented in Table 4.3-3. Cross-sections A - A' and B - B' are presented on Figures 4.3-3 and 4.3-4. See Attachment 4.3 for tables and figures.

Analytical results indicate low concentrations of PCE, DRO, and GRO in soils collected to a depth of 6 feet in AP-3862 and a depth of 10 feet in AP-3860. In AP-3861, a GRO concentration of 72 mg/Kg and a DRO concentration of 19 mg/Kg were detected in the 0- to 2-foot interval. ATH results and field observations did not identify obviously impacted soils below these shallower intervals until encountering a sand and gravel unit just above the silt unit (at approximately 57 to 63 feet bgs). The soils were field-identified as being moderately silty to a depth of approximately 45 or 50 feet and then encountering a saturated, loose sand and gravel zone with apparently little fines. A strong solvent odor, presumed to be Stoddard, was detected in this unit at borings AP-3860, AP-3861, and AP-3862. ATH readings in this zone confirmed the presence of contamination with readings exceeding 1,000 PID units. This sand and gravel zone did not appear to be more than a few feet thick and was underlain by a dense silt unit.

Analytical results indicate the presence of PCE in this sand and gravel zone from an estimated concentration of 4 J µg/Kg (AP-3861) to a maximum of 880 µg/Kg (AP-3860). DRO and GRO concentrations ranged from 27 and 5 mg/Kg to 2,200 and 2,890 mg/Kg in AP-3861 and AP-3860, respectively. The DRO chromatograms exhibit the characteristics of a light distillate product and match the laboratory's fingerprint of Stoddard solvent. Samples were submitted from the silt unit, which was presumed to be acting as a confining unit inhibiting vertical migration of the contaminants. Samples submitted from this silt unit at each of the borings indicated low concentrations of DRO (less than 10 mg/Kg). Low concentrations of PCE were detected in AP-3861 and AP-3862 (1J µg/Kg) and not detected in the silt at AP-3860 and AP-3863.

Other compounds detected in soil samples include toluene, acetone, and methylene chloride. Toluene was detected in only two samples at the estimated concentration of 2 J µg/Kg. Acetone was detected in one sample (AP-3862, 55 to 57 feet) at the estimated concentration of 40 J µg/Kg. It was not detected in its associated blind duplicate. Methylene chloride was detected in 10 samples ranging in concentration from an estimated value of 3 J µg/Kg to 8 J µg/Kg. Methylene chloride associated with 5 of the 10 samples was also detected in the laboratory method blanks.

Because the Risk Assessment (Volume IIa) has determined that there is no risk to human health or the environment, no corrective action is needed.

4.3.4.3 Groundwater

Due to the lack of sufficient quantities of unconfined groundwater, no monitoring wells are screened above the silt confining unit. It is assumed that any water present above this unit will flow in the direction of the unconfined water present elsewhere, approximately northwest (USACE 1995).

Only low levels of DRO were detected previously in the confined groundwater at this site. The confined aquifer did not appear to be impacted and therefore further investigation of the confined aquifer was not considered necessary at this site. Groundwater samples were collected from AP-3467 and AP-3469 during the RI but are included in Section 4.2, Building 45-590 Source Area. Discussion of hydrogeology is also incorporated into Section 4.2 as the confined groundwater at Building 726 is believed to be part of the confined groundwater system at Building 45-590.

Groundwater Levels

Monthly water levels were recorded from on-site groundwater monitoring wells. The groundwater data was collected to determine monthly elevation fluctuations and variations in flow direction. The monthly water level data are tabulated in Appendix C. The water levels were used in conjunction with readings collected as part of the Building 45-590 Source Area investigation.

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4.4 Building 796 Source Area

Building 796, the Maintenance/Vehicle and Weapons Repair Section, is used for vehicle and equipment maintenance. Activities conducted at this facility include battery rework, engine rebuilding, radiator cleaning, brake repair, parts cleaning, painting (including the use of chemical agent-resistant coating [CARC] paint), steam cleaning, and the lubrication and maintenance of vehicles.

4.4.1 Environmental Setting

Building 796 is located near the intersection of Fifth Street and the Davis Highway, in the developed portion of Fort Richardson (Figure 4.4-1, Attachment 4.4). The building is a single-story, cinder-blocked structure with a concrete floor. A gravel driveway/loading area runs along the east side of the building. Topographical relief in the area is relatively low. Surface water drains to a shallow ditch along the western side of Fifth Street. Water in this ditch enters the stormwater drainage system at the intersection of Fifth Street and "D" Street. There are no surface-water bodies within 0.5 mile of the site. Access to the site is unrestricted to persons on Post.

Subsurface soil at the site consists of a glacial alluvium with cobbles and erratics interbedded with silty sands and silty, sandy gravels to approximately 20 feet bgs; gravels with small amounts of sand, silt, and clay to approximately 91 feet bgs; and clay beneath the gravels. The thickness of the clay layer is unknown. During the PSE2 one well was installed at the site; groundwater in this well was encountered at approximately 88 feet bgs. A silt layer (less than five feet thick) was encountered at approximately 80 feet bgs in wells installed during the RI (AP-3777 and AP-3778). Perched water has been reported at 20 feet bgs in borings drilled within a 1,000-foot radius of the site. The general regional groundwater flow direction in the unconfined aquifer is toward the west with an approximate hydraulic gradient of 0.005 ft/ft (interpreted from Freethey 1976).

4.4.2 Past Practices

4.4.2.1 Battery Shop

A Battery Shop is located within the building. In the past, batteries were reportedly drained onto a stainless steel table and into a small aboveground tank. The acids were neutralized with sodium bicarbonate, and resulting fluids were tested for pH with litmus paper. When the fluids were adequately neutralized, they were reportedly discharged via a floor drain to a UST (SAIC 1990).

However, Mr. Donald Spooner, who has worked at the building for over 15 years, indicated that the acid originally drained from the floor drain to a log crib (Pers. com. 1995). The crib was

removed approximately 12 years ago (1985), and the floor drain was connected to the storm drain. However, at that time, the acid was no longer being drained from the batteries. They were being given to the Defense Reutilization and Marketing Office (DRMO) as a complete unit with the acid remaining in the battery. In approximately 1993, the floor drain was connected to an oil/water separator. Currently, a brass plug prevents fluids from being poured into the drain line. Mr. Spooner provided the location of the former log crib.

According to the USACE Statement of Work (SOW) for this project, the old acid disposal lines and surrounding soils were reportedly removed after July 1981. Mr. Spooner indicated that the log crib was also removed at this time (Pers. com. 1995). When removed, the pipe was reportedly structurally unsound. The depth of the excavation immediately adjacent to the building was 8 feet.

The oil/water separator is located on the east side of the facility, approximately 20 feet from the Battery Shop. The oil/water separator appears to be in good condition and has apparently been added to the facility within the last several years. The oil/water separator reportedly backs up on occasion, overflowing various parts of the system.

4.4.2.2 Underground Storage Tanks (USTs)

Several USTs are or were in use at Building 796. Locations of the USTs are identified in Figure 4.4-1 (Attachment 4.4).

UST 27, a 1,500-gallon used oil UST was removed in 1990. Approximately 500 cubic yards of impacted soil from adjacent to and beneath the UST were removed. Maximum TPH concentrations in soil samples collected during tank removal were 17,700 mg/Kg (EMCON 1994a). A replacement 1,000-gallon used oil UST (27A) was installed on the northern side of the building.

USTs 28 and 29 (1,000-gallon diesel and gasoline USTs) were removed in 1991. During UST removal, TPH up to 5,810 mg/Kg, DRO up to 2,091 mg/Kg, GRO up to 458 mg/Kg, and benzene up to 16.1 mg/Kg were detected at the excavation limits (HLA 1994a). Replacement USTs 28A and 29A (1,000-gallon diesel and unleaded gasoline USTs) were installed in the UST 28 and 29 excavation.

4.4.2.3 Waste Accumulation Area

A waste accumulation area was reportedly located on the east side of Building 796 (SAIC 1990); however, according to Mr. Spooner, the waste accumulation area was approximately 150 feet south of the building. A review of 1974 and 1983 aerial photographs confirms Mr. Spooner's location. In 1974, only a few drums (approximately 10) and two white aboveground storage tanks were present in the area. An approximate area of 50 feet by 30 feet around the drums was stained. In 1983, the waste accumulation area had grown to approximately 100 feet

by 100 feet and contained several drums along with what looks like general refuse of unused equipment and materials from the building.

During the 1989 Visual Site Inspection (VSI) for the RCRA Facility Assessment, 13 drums and 5 boxes were observed in this waste accumulation area. The drums were stored on pallets, and the area was roped off on one side with signs posted indicating the presence of hazardous waste. Notes from the VSI indicated that the drums were in poor condition, and staining on the ground surface was observed (SAIC 1990).

4.4.3 Previous Investigations

Several investigations have been conducted that reviewed historical activities at the site and evaluated the potential presence of soil and groundwater contamination at the site. Analytical results from these previous investigations are included in Appendix D. A summary of the previous investigations and associated results is provided in the following subsections.

4.4.3.1 UST Release Investigations

After USTs 27, 28, and 29 were removed, UST release investigations were performed. EMCON, Alaska, Inc. (EMCON) conducted the Release Investigation for UST 27 in December 1993. The investigation consisted of drilling five soil borings to maximum depths of 33 feet bgs in the vicinity of the former UST and collecting soil samples from the borings. The soil samples were analyzed for VOCs, metals, GRO, DRO, PCBs, and biofeasibility parameters. Results of the Release Investigation indicated that petroleum impacted soil was present to depths of around 24 feet bgs. The highest GRO and DRO concentrations were 143 and 2,550 mg/Kg, respectively (EMCON 1994a).

HLA conducted the Release Investigation for USTs 28 and 29 in 1993. The Release Investigation consisted of drilling three soil borings within and at the perimeter of the former excavation. Soil samples collected from the borings were analyzed for TPH, DRO, GRO, VOCs, SVOCs and TOC. No analytes were detected in the samples, except for lead and three tentatively identified SVOCs with a total concentration of 1.1 mg/Kg. Therefore, the extent of impacted soil does not appear to be widespread (HLA 1994a).

4.4.3.2 Battery Shop Investigation

In 1994, a limited field investigation of the Battery Shop site at Building 796 was conducted as part of a PSE2 investigation at OUD. Complete results of the PSE2 investigation are presented in *Preliminary Source Evaluation 2, Operable Unit D, Fort Richardson, Alaska* (ENSR 1996b). The objectives of the PSE2 were to evaluate the potential presence of contaminants in subsurface soils near the former storm sewer line, to evaluate the potential presence of contaminants below the former floor drain and sewer line in the Battery Shop, and to assess the potential release of contaminants to groundwater.

The investigation included drilling four soil borings and installing one monitoring well. The soil borings were located based on the previously reported locations for the storm sewer drainage line and the former log crib. The first two borings (SS1 and SS2) were located inside the Battery Shop. The next two borings were located immediately outside the Battery Shop; one in the location of the former log crib (AP-3511), and the other over the former storm sewer drain line (AP-3512). The soil boring locations are presented on Figure 4.4-1 (Attachment 4.4).

The borings inside the Battery Shop (SS1 and SS2) were advanced to a maximum practical depth of 48 inches bgs (shop height restrictions precluded drilling with available equipment). An electric jackhammer was used to break through the 12-inch deep concrete floor. The remaining depth was achieved by a combination of hand-held shovels and an auger attachment on a bobcat. Large cobbles, rebar, and cast iron piping were encountered during the sampling of these two borings.

Boring AP-3511 was advanced to 18 feet bgs outside the Battery Shop, over the former log crib site, and 15 feet northeast of the center of the bay door (Bay Door No. 5). Boring AP-3512 was advanced to 19 feet bgs outside the building and 150 feet east from the center of the bay door. The boring was located over the probable location of the former storm sewer drainage line. Monitoring well AP-3513 was located adjacent to Boring AP-3511.

Soil samples from the borings were analyzed for TPH, GRO, DRO, VOCs, PCBs, SVOCs, metals, ethylene glycol, sulfate, and soil pH. Selected samples were also analyzed for grain size distribution, Atterberg limits and oxygen reduction (redox) potential. The water sample from the monitoring well was analyzed for TPH, GRO, DRO, VOCs, PCBs, SVOCs, metals, ethylene glycol, sulfate, and redox potential. Analytes detected in the soil and groundwater samples are in Appendix D.

DRO was detected in the sample from SS1, inside the building, at concentrations exceeding the ADEC soil cleanup level of 100 to 200 mg/Kg. The soil in this boring was acidic with pH values of 4.7 to 5.2. Sulfate concentrations in this boring, which ranged from 2,100 to 3,500 mg/Kg, were relatively high compared to sulfate concentrations in samples from the other borings.

Arsenic, chromium, lead, and nickel were detected in the borings at concentrations exceeding the 95 percent upper tolerance limit (UTL) of the mean background values. The lead concentration, however, was below EPA's cleanup standard for residential soil of 400 mg/Kg, and the nickel concentrations were less than one-tenth the RBC.

DRO was detected in the groundwater samples from AP-3513 at concentrations ranging from 132 to 238 µg/L. The source for the petroleum hydrocarbons in groundwater at this site may be due to past leaks from USTs 27, 28, and 29. However, the UST Release Investigations found no contamination in the areas of the USTs deeper than approximately 30 feet bgs, the groundwater is around 88 feet bgs, and the DRO concentrations were relatively low (less than 1

milligram/liter [mg/L]). Therefore, it does not appear that the soil continues to be a high contributor of petroleum hydrocarbons in the water. What was detected in the water is likely residual contamination from the past spills and is expected to decrease with time.

Chloroform and carbon tetrachloride were detected in groundwater samples from well AP-3513 at concentrations exceeding EPA Region 3 RBCs but below the MCLs. These compounds were only detected in one soil sample at the site. This sample was collected from boring AP-3513 at a depth of 80 feet bgs, just above the water table. The presence of chloroform and carbon tetrachloride at depth in the soil indicates that these compounds may have migrated in the groundwater to this area of the site from some other area near Building 796 or from some other off-site source.

Arsenic concentrations in the groundwater sample exceeded the RBC of 11 µg/L, but were below the MCL of 50 µg/L. Chromium and nickel concentrations exceeded their MCLs of 100 µg/L; however, their concentrations did not exceed RBCs. The lead concentration exceeded the MCL of 15 µg/L.

4.4.4 Remedial Investigation

Results from the previous investigations were used to identify data gaps at the site so that DQOs could be established and incorporated into the sampling plan. Data gaps identified in the Management Plan and findings of the RI are presented in Table 4.4-1, and COPCs identified in the Management Plan are presented in Table 4.4-2 (see Attachment 4.4). The only data gap identified was the source of the chloroform and carbon tetrachloride detected in the groundwater.

4.4.4.1 Groundwater

During the RI, two wells (AP-3777 and AP-3778) were installed upgradient of the site to evaluate the source and extent of the chloroform and carbon tetrachloride. Both wells were screened in a confined aquifer as no unconfined water was encountered during drilling. Two rounds of groundwater sampling were conducted in the vicinity of Building 796. During the first round in October 1996, wells AP-3777, AP-3778, AP-3533, and AP-3532 were sampled. AP-3513, the well located on site, could not be sampled due to insufficient water present.

DRO, several VOCs, and metals were detected in the groundwater in the vicinity of the site. Carbon tetrachloride was detected in samples collected from the four monitoring wells. Concentrations ranged from 1.1 µg/L in AP-3533 to a maximum concentration of 3.9 µg/L in AP-3778. The EPA Region 3 RBC for carbon tetrachloride is 0.16 µg/L and the MCL is 5 µg/L.

None of the metals detected in groundwater exceed screening criteria. Significance of metals concentrations is addressed in the Risk Assessment (Volume IIa).

The second round of sampling was conducted in August 1997. In addition to the wells previously sampled, AP-3513 was also sampled at this time. The sample at AP-3513 was collected over a 2-day period due to slow recharge.

Carbon tetrachloride was detected during both rounds of sampling in all wells except AP-3513, the well adjacent to Building 796 (only sampled during the second round). The highest concentration of carbon tetrachloride detected for both rounds of sampling was in AP-3778 (3.9 µg/L and 3.6 µg/L, respectively). It was detected in wells AP-3777 and AP-3532 during both rounds and in AP-3533 during the first round of sampling only. Chloroform results for the four wells sampled during the first round were qualified as not detected at the MRL ("U") because it (chloroform) was also detected in associated method and/or field blanks. Chloroform was detected in all five wells sampled during the second round as well as laboratory method blanks associated with samples from AP-3532 and AP-3777. Data from the second round of sampling has not been validated. 1,1,1-Trichloroethane (1,1,1-TCA) was detected in wells AP-3777 and AP-3778 only. Concentrations ranged from 1 µg/L to 1.2 µg/L (1.3 µg/L for the duplicate) in AP-3778 and estimated values of 0.3 J µg/L (0.2 J µg/L for the duplicate) to 0.2 J µg/L in AP-3777. Other VOCs detected (below the MRL) include toluene, acetone, and methylene chloride. Results of all analytes detected are presented in the data tables in Attachment 4.4.

DRO was detected at 173 µg/L in AP-3513 and at concentrations below the MRL of 100 µg/L in wells AP-3533, AP-3532, AP-3777, and AP-3778.

SVOCs were detected in AP-3533, AP-3778, and AP-3513 at concentrations below the MRL of 10 µg/L. Analytes detected in groundwater samples from the new and existing wells are presented in Table 4.4-3 and Figure 4.4-1 (see Attachment 4.4).

Groundwater Levels

Monthly groundwater water levels were recorded in monitoring wells associated with Building 796. The groundwater data was collected to determine monthly elevation fluctuations and variations in flow direction. The monthly water level data and a graph depicting fluctuations in water levels are included in Appendix C (included with Building 45-590).

ATTACHMENT 4.1
Tables and Figures

Table 4.1-1. Summary of Data Gaps as Identified in the Management Plan and Findings of the Remedial Investigation/Baseline Risk Assessments - Building 35-752.

Area of Concern as Identified in the Management Plan	Available Data (Prior to the Remedial Investigation)	Data Gaps Established in the Management Plan	Action Taken During the Remedial Investigation	Findings of the Remedial Investigation/Baseline Risk Assessment
Former UST Locations – Soil				
Surface and subsurface soil contamination at the former UST locations.	Limited analytical data from three previous investigations.	Lateral and vertical extent of PCBs in surface and subsurface soil along eastern side of former excavation.	Collected and analyzed soil samples from borings along eastern side of former excavation.	A number of Chemicals of Potential Concern (COPCs) have been identified in both the human health and ecological risk assessments. Extent of these COPCs has not been defined. Additional information is needed.
Drum Accumulation Area – Soil				
Surface and subsurface soil contamination at the drum accumulation area.	Limited analytical data are available for soil contamination.	Lateral and vertical extent of soil contamination throughout the Drum Accumulation Area.	Collected and analyzed soil samples from borings and surface soil samples.	A number of Chemicals of Potential Concern (COPCs) have been identified in both the human health and ecological risk assessments. Extent of these COPCs has not been defined. Additional information is needed.
Cooling Ponds				
Sediment contamination in the Cooling Ponds.	Limited analytical data in the first pond and along the eastern edge of the second pond.	Lateral and vertical extent of sediment contamination in the cooling ponds and downstream of the cooling ponds.	Collected and analyzed sediment samples at transects along the ponds and downstream of the pond.	A number of Chemicals of Potential Concern (COPCs) have been identified in both the human health and ecological risk assessments. Extent of these COPCs has not been defined. Additional information is needed.

Table 4.1-1. Summary of Data Gaps as Identified in the Management Plan and Findings of the Remedial Investigation/Baseline Risk Assessments - Building 35-752 (Cont'd).

Area of Concern as Identified in the Management Plan	Available Data (Prior to the Remedial Investigation)	Data Gaps Established in the Management Plan	Action Taken During the Remedial Investigation	Findings of the Remedial Investigation/Baseline Risk Assessment
Cooling Ponds (Cont'd)				
Surface water in the cooling ponds.	Limited analytical data for concentrations of chemicals in the surface water.	Concentrations of sediment Chemicals in the surface water.	Collected and analyzed surface water samples from the bottom one-half of the water column.	A number of Chemicals of Potential Concern (COPCs) have been identified in both the human health and ecological risk assessments. Extent of these COPCs has not been defined. Additional information is needed.
Groundwater				
Groundwater contamination throughout the site.	Analytical data for samples collected from 1990 through 1995.	Confirm that the plume has migrated to downgradient wells. Confirm that increase in contaminant concentrations is due to smear zone flushing.	Collected and analyzed groundwater samples from all existing wells. Collect an additional round of groundwater samples from wells AP-2982, AP-2985, AP-2986, AP-2987, AP3231, AP-3232, AP-3502, AP-3503, and AP-3504.	A number of Chemicals of Potential Concern (COPCs) have been identified in both the human health and ecological risk assessments. Extent of these COPCs has not been defined. Additional information is needed.

Key: PCBs = Polychlorinated biphenyls.
UST = Underground storage tank
COPCs = Chemicals of Potential Concern

Table 4.1-2. Chemicals of Potential Concern by Area and Media Identified in the Management Plan - Building 35-752.

Area	Media	Type	Compound
Concrete floor	Surface dust	Polychlorinated biphenyls	Aroclor-1254 Aroclor-1260
Former UST location	Soil and groundwater	Petroleum hydrocarbons	Diesel Range Organics (DRO) Gasoline Range Organics (GRO)
		Monoaromatics	Benzene, Toluene, Ethylbenzene, Xylenes, m-Dichlorobenzene, and o,p-Dichlorobenzene
		Chlorinated aliphatics	Trichloroethene (TCE), 1,2-Dichloroethane, 1,1-Dichloroethane, and 1,1,1-Trichloroethane (TCA)
		Polychlorinated biphenyls	Aroclor-1260
		Metals	Arsenic and Cadmium
	Groundwater (in addition to above)	Phthalates	Bis(2-ethylhexyl)Phthalate
		Metals	Arsenic, Cadmium, Nickel, Chromium, and Lead
Drum accumulation area	Soil	Petroleum hydrocarbons	DRO Benzene, Toluene, Ethylbenzene, and Xylenes
		Polycyclic aromatic hydrocarbons	Benzo(b)fluoranthene, Benzo(a)pyrene, and Indeno(1,2,3-cd)pyrene
		Polychlorinated biphenyls	Aroclor-1260
Cooling ponds	Soil	Petroleum hydrocarbons	DRO
		Monoaromatics	Xylenes and 4-Isopropyltoluene
		Polychlorinated biphenyls	Aroclor-1260
	Groundwater	Petroleum hydrocarbons	DRO
		Chlorinated aliphatics	1,1,1-TCA
		Metals	Arsenic, Cadmium, Chromium, Lead, and Nickel
	Sediment and surface water	Chlorinated aliphatics	1,1,1-TCA
		Polycyclic aromatic hydrocarbons	Phenanthrene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, and Benzo(a)pyrene
		Polychlorinated biphenyls	Aroclor-1260
		Polychlorinated diphenyl alkanes (Organochlorine pesticides)	4,4'-DDD and 4,4'-DDT
		Metals	Chromium, Lead, and Nickel

TABLE 4.1-3 ANALYTES DETECTED IN SURFACE SOIL COLLECTED AT BUILDING 35-752
DURING THE REMDIAL INVESTIGATION

Location-ID		96-SS01		96-SS02		96-SS03	
Depth (ft.)		0.5	2.5	0.5	2.5	0.5	2.5
Field-ID		96575212SL	96575219SL	96575213SL	96575220SL	96575214SL	96575221SL
Lab-ID	Screening	K96613002	K96614901	K96613003	K96614902	K96613004	K96614903
Sample Date	Criteria	9/26/96	9/27/96	9/26/96	9/27/96	9/26/96	9/27/96
Petroleum Hydrocarbons (mg/Kg)							
Diesel Range Organics	50-100[a]	25	4 U	4 J	4 U	4 U	6
Gasoline Range Organics	100-200[a]	5 U	5 U	5 U	5 U	5 U	5 U
Volatile Organic Compounds (µg/Kg)							
Aromatic Volatile Organics (AVOs)							
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes	1.6E7[b]	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	20 U
Halogenated Volatile Organics (HVOs)							
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	5 U	5 U	5 U
1,1,1-Trichloroethane	1.6E5[b]	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	50 U	50 U	50 U
2-Butanone	4.7E6[b]	20 U	20 U	20 U	20 U	20 U	20 U
Methylene chloride	8500[b]	3 U J,B	8	10 U	8	10 U	8
Pesticides/PCBs (µg/Kg)							
PCB-1260 (Aroclor 1260)	32[b]	2460	100 U	1520	100 U	420	130
Dieldrin	4[b]	12 B	0.6 J	8 J,B	3 J	2 J,B	1 J
4,4'-DDD	270[b]	10 U	10 U	10 U	10 U	10 U	10 U
4,4'-DDE	190[b]	10	0.4 J	6 J	0.6 J	2 J	0.6 J
4,4'-DDT	190[b]	40 U	3 J	20 U	4 J	10 U	8 J
beta-BHC	UA	10 U	10 U	10 U	10 U	10 U	10 U
Semi-Volatile Organic Compounds (mg/Kg)							
Benzo(b)fluoranthene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chrysene	8.8[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Fluoranthene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Pyrene	230[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Other Analyses (mg/Kg)							
Total Organic Carbon	UA	0.75	0.5	0.63	0.5	0.54	0.67

Notes:
DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
R = Value reponed is considered rejected from data validation recommendations.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
- - = Analysis not performed on sample
[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]Screening criteria one-tenth of the EPA Region III RBCs (EPA 1996).

TABLE 4.1-3 ANALYTES DETECTED IN SURFACE SOIL COLLECTED AT BUILDING 35-752
DURING THE REMDIAL INVESTIGATION

Location-ID		96-SS04		96-SS05			96-SS06	
Depth (ft.)		0.5	2.5	0.5	0.5	2.5	0.5	2.5
Field-ID		96575215SL	96575222SL	96575216SL	96575218SL	96575223SL	96575217SL	96575224SL
Lab-ID	Screening	K96613005	K96614904	K96613006	K96613008	K96614905	K96613007	K96614906
Sample Date	Criteria	9/26/96	9/27/96	9/26/96	9/26/96 DUP	9/27/96	9/26/96	9/27/96
Petroleum Hydrocarbons (mg/Kg)								
Diesel Range Organics	50-100[a]	13	13	31	44	4 U	34	29
Gasoline Range Organics	100-200[a]	5 U	5 U	5 U	5 U	5 U	5 U	10 U
Volatile Organic Compounds (µg/Kg)								
Aromatic Volatile Organics (AVOs)								
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	5 U	5 U	7 J
Xylenes	1.6E7[b]	5 U	5 U	5 U	5 U	5 U	5 U	3 J
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Halogenated Volatile Organics (HVOs)								
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 J
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	5 U	2 J	5 U	53 J
1,1,1-Trichloroethane	1.6E5[b]	5 U	5 U	5 U	2 J	5 U	5 U	5 J
Acetone	7.8E5[b]	50 U	50 U	50 U	50 U	50 U	50 U	50 U
2-Butanone	4.7E6[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Methylene chloride	8500[b]	10 U	11	10 U	10 U	15	10 U	40 J
Pesticides/PCBs (µg/Kg)								
PCB-1260 (Aroclor 1260)	32[b]	1830	27000	1620	2010	100 U	9200	270
Dieldrin	4[b]	10 J,B	200 U R	10 B	12 B	10 U J	53 B	3 J
4,4'-DDD	270[b]	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4,4'-DDE	190[b]	5 J	200 U	6 J	8 J	10 U	40	2 J
4,4'-DDT	190[b]	30 U	300 U R	30 U	30 U	10 U J	100 U	10 U R
beta-BHC	UA	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Semi-Volatile Organic Compounds (mg/Kg)								
Benzo(b)fluoranthene	0.088[b]	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.1 U J,B	0.3 U	0.1 U J,B	0.2 U J,B	0.3 U	0.3 U	0.3 U
Chrysene	8.8[b]	0.1 J	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U	0.3 U
Fluoranthene	310[b]	0.1 J	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Pyrene	230[b]	0.1 J	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U	0.3 U
Other Analyses (mg/Kg)								
Total Organic Carbon	UA	1.03	0.82	1.17	0.99	0.48	0.72	3

Notes:
DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
R = Value reported is considered rejected from data validation recommendations.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
- - = Analysis not performed on sample
[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]Screening criteria one-tenth of the EPA Region III RBCs (EPA 1996).

TABLE 4.1-4 ANALYTES DETECTED IN SOIL BORINGS AT BULDING 35-752
DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3785		AP3786	
Depth (ft.)		5	10	0	5
Field-ID		96575225SL	96575226SL	96575227SL	96575228SL
Lab-ID	Screening	K96628905	K96628906	K96628916	K96628917
Sample Date	Criteria	10/2/96	10/2/96	10/3/96	10/3/96
Petroleum Hydrocarbons (mg/Kg)					
Diesel Range Organics	50-100[a]	8	4 U	4	49
Gasoline Range Organics	100-200[a]	5 U J	5 U J	5 U J	5 U J
Volatile Organic Compounds (µg/Kg)					
Aromatic Volatile Organics (AVOs)					
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U
Xylenes	1.6E7[b]	5 U	5 U	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U
Halogenated Volatile Organics (HVOs)					
Tetrachloroethene	1.2E3[c]	5 U	5 U	5 U	5 U
Trichloroethene	5.8E3[c]	5 U	2 J	5 U	2 J
1,1,1-Trichloroethane	1.6E5[b]	5 U	5 U	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	50 U
2-Butanone	4.7E6[b]	20 U	20 U	20 U	20 U
Methylene chloride	8500[b]	10 U	10 U	10 U	10 U
Pesticides/PCBs (ug/Kg)					
PCB-1260 (Aroclor 1260)	32[b]	1400	100 U	30 J	1900
Dieldrin	4[b]	5 J	10 U	0.6 J	20 U
4,4'-DDD	270[c]	10 U	10 U	10 U	10 U
4,4'-DDE	190[b]	3 J	10 U	0.4 J	8 J
4,4'-DDT	190[b]	20 U	10 U	7 J	50 U R
beta-BHC	UA	10 U	10 U	10 U	10 U
Semi-Volatile Organic Compounds (mg/Kg)					
Benzo(b)fluoranthene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	0.3 U	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.3 U	0.1	0.1 J	0.1 J
Chrysene	8.8[b]	0.3 U	0.3 U	0.3 U	0.3 U
Fluoranthene	310[c]	0.3 U	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	0.3 U	0.3 U	0.3 U
Pyrene	230[b]	0.3 U	0.3 U	0.3 U	0.3 U
Metals (mg/Kg)					
Arsenic	2.3[b]	--	--	--	--
Barium	550[b]	--	--	--	--
Chromium	39/7800[b]	--	--	--	--
Lead	400[c]	--	--	--	--
Mercury	2.3[b]	--	--	--	--
Other Analyses (mg/Kg)					
Total Organic Carbon	UA	0.28	0.21	0.43	0.69

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
R = Value reported is considered rejected from data validation recommendations.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
-- = Analysis not performed on sample

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

TABLE 4.1-4 ANALYTES DETECTED IN SOIL BORINGS AT BULDING 35-752 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3787					
Depth (ft.)		0	2.5	2.5	5	7.5	10
Field-ID Lab-ID Sample Date	Screening Criteria	96575230SL K96629905 10/3/96	96575231SL K96629906 10/3/96	96575232SL K96629907 10/3/96 DUP	96575233SL K96629908 10/3/96	96575234SL K96629909 10/3/96	96575235SL K96629910 10/3/96
Petroleum Hydrocarbons (mg/Kg)							
Diesel Range Organics	50-100[a]	70	502	342	11	4	6
Gasoline Range Organics	100-200[a]	5 U	5 U	--	--	5 U	5 U
Volatile Organic Compounds (µg/Kg)							
Aromatic Volatile Organics (AVOs)							
Toluene	1.6E6[b]	5 U	5 U	--	--	5 U	5 U
Xylenes	1.6E7[b]	5 U	5 U	--	--	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	0.8 J	20 U	--	--	20 U	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	4 J	1 J	--	--	0.8 J	20 U
Halogenated Volatile Organics (HVOs)							
Tetrachloroethene	1.2E3[b]	5 U	5 U	--	--	5 U	5 U
Trichloroethene	5.8E3[b]	5 U	5 U	--	--	1 J	5 U
1,1,1-Trichloroethane	1.6E5[b]	5 U	5 U	--	--	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	--	--	50 U	50 U
2-Butanone	4.7E6[b]	4 J	3 J	--	--	20 U	20 U
Methylene chloride	8500[b]	10 U	10 U	--	--	10 U	10 U
Pesticides/PCBs (µg/Kg)							
PCB-1260 (Aroclor 1260)	32[b]	890	330	500	70 J	100 U	100 U
Dieldrin	4[b]	4 J	10 U	10 U	10 U	10 U	10 U
4,4'-DDD	270[b]	7 J	180	240	23	2 J	3 J
4,4'-DDE	190[b]	2 J	6 J	8 J	0.9 J	10 U	10 U
4,4'-DDT	190[b]	40 U R	20 U R	20 U R	10 U R	0.9 J	10 U J
beta-BHC	UA	10 U	10 U	10 U	10 U	10 U	10 U
Semi-Volatile Organic Compounds (mg/Kg)							
Benzo(b)fluoranthene	0.088[b]	0.1 J	0.6 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.1 J	0.6 U	0.3 U	0.3 U	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.1 J	0.2 J	0.1 J	0.3 U	0.1 J	0.3 U
Chrysene	8.8[b]	0.2 J	0.1 J	0.3 U	0.3 U	0.3 U	0.3 U
Fluoranthene	310[b]	0.4	0.6 U	0.3 U	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	0.1 J	0.6 U	0.3 U	0.3 U	0.3 U	0.3 U
Pyrene	230[b]	0.3	0.1 J	0.1 J	0.3 U	0.3 U	0.3 U
Metals (mg/Kg)							
Arsenic	2.3[b]	5	7	--	6	6	4
Barium	550[b]	61	92	--	54	68	48
Chromium	39/7800[b]	27	32	--	31	30	31
Lead	400[c]	16	14	--	6	6	5
Mercury	2.3[b]	0.2 U	0.06 J	--	0.07 J	0.05 J	0.05 J
Other Analyses (mg/Kg)							
Total Organic Carbon	UA	0.87	0.99	--	0.4	0.25	0.16

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
R = Value reported is considered rejected from data validation recommendations.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
- - = Analysis not performed on sample

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

TABLE 4.1-4 ANALYTES DETECTED IN SOIL BORINGS AT BULDING 35-752 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3788				
Depth (ft.)		0	0	2.5	5	5
Field-ID		96575236SL	96575237SL	96575238SL	96575239SL	96575240SL
Lab-ID	Screening	K96629911	K96629912	K96629913	K96629914	K96629915
Sample Date	Criteria	10/3/96	10/3/96 DUP	10/3/96	10/3/96	10/3/96 DUP
Petroleum Hydrocarbons (mg/Kg)						
Diesel Range Organics	50-100[a]	116	--	4 U	4 U	4 U
Gasoline Range Organics	100-200[a]	5 U J	5 U	5 U	5 U J	--
Volatile Organic Compounds (µg/Kg)						
Aromatic Volatile Organics (AVOs)						
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	--
Xylenes	1.6E7[b]	5 U	5 U	5 U	5 U	--
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	--
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	--
Halogenated Volatile Organics (HVOs)						
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	5 U	--
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	5 U	--
1,1,1-Trichloroethane	1.6E5[b]	5 U	5 U	5 U	5 U	--
Acetone	7.8E5[b]	63	78	50 U	50 U	--
2-Butanone	4.7E6[b]	4 J	20 J	20 U	20 U	--
Methylene chloride	8500[b]	10 U	10 U	10 U	10 U	--
Pesticides/PCBs (µg/Kg)						
PCB-1260 (Aroclor 1260)	32[b]	310	--	100 U	100 U	100 U
Dieldrin	4[b]	10 U	--	10 U	10 U	0.6 J
4,4'-DDD	270[b]	330	--	0.6 J	0.5 J	1 J
4,4'-DDE	190[b]	8 J	--	10 U	10 U	10 U
4,4'-DDT	190[b]	124 J	--	2 J	10 U J	1 J
beta-BHC	UA	6 J	--	10 U	10 U	10 U
Semi-Volatile Organic Compounds (mg/Kg)						
Benzo(b)fluoranthene	0.088[b]	0.3 U	--	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	--	0.3 U	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.1 J	--	0.3 U	0.1 J	0.3 U
Chrysene	8.8[b]	0.3 U	--	0.3 U	0.3 U	0.3 U
Fluoranthene	310[b]	0.3 U	--	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	--	0.3 U	0.3 U	0.3 U
Pyrene	230[b]	0.3 U	--	0.3 U	0.3 U	0.3 U
Metals (mg/Kg)						
Arsenic	2.3[b]	6	6	5	--	--
Barium	550[b]	147	102	45	--	--
Chromium	39/7800[b]	39	32	29	--	--
Lead	400[c]	28	20	7	--	--
Mercury	2.3[b]	0.09 J	0.1 J	0.09 J	--	--
Other Analyses (mg/Kg)						
Total Organic Carbon	UA	1.73	--	0.2	--	--

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
R = Value reported is considered rejected from data validation recommendations.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
- - = Analysis not performed on sample

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).

[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

TABLE 4.1-5 ANALYTES DETECTED IN COOLING POND SEDIMENT SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION

Location-ID		96-SD1	96-SD2	96-SD3	96-SD4	96-SD5
Field-ID		96575201SD	96575202SD	96575203SD	96575204SD	96575205SD
Lab-ID		K96607201	K96607202	K96607203	K96607204	K96607208
Sample Date	Screening	9/25/96	9/25/96	9/25/96	9/25/96	9/25/96
Location	Criteria	Discharge Pipe (DP)	40 feet from DP	79 feet from DP	Dup of 96-SD3	119 feet from DP
Petroleum Hydrocarbons (mg/Kg)						
Diesel Range Organics	UA	55	156	142	164	412
Volatile Organic Compounds (µg/Kg)						
Aromatic Volatile Organics (AVOs)						
Naphthalene	35[a]	20 U	2 J	40 U	40 U	40 U
n-Propylbenzene	UA	20 U	40 U	40 U	40 U	40 U
2-Chlorotoluene	UA	20 U	40 U	40 U	40 U	40 U
4-Isopropyltoluene	UA	20 U	40 U	40 U	40 U	40 U
Acetone	25[b]	50 U	140	130	130	240
2-Butanone	750[b]	20 U	40 U	30 J	40 U	58
Carbon disulfide	UA	5 U	10 U	10 U	6 J	10 U
Semi-Volatile Organic Compounds (mg/Kg)						
2-Methylnaphthalene	0.020[a]	0.3 U	0.7 U	0.7 U	0.7 U	0.7 U
Acenaphthene	0.007[a]	0.3 U	0.7 U	0.7 U	0.7 U	0.7 U
Acenaphthylene	0.006[a]	0.3 U	0.7 U	0.7 U	0.7 U	0.7 U
Anthracene	0.047[a]	0.3 U	0.3 J	0.7 U	0.7 U	0.7 U
Benzo(a)anthracene	0.075[a]	0.3 U	1	0.1 J	0.1 J	0.1 J
Benzo(a)pyrene	0.089[a]	0.3 U	0.7	0.1 J	0.1 J	0.1 J
Benzo(b)fluoranthene	0.3892[b]	0.3 U	1.4	0.2 J	0.2 J	0.2 J
Benzo(g,h,i)perylene	0.072[d]	0.3 U	0.2 J	0.7 U	0.7 U	0.7 U
Benzo(k)fluoranthene	3.6[d]	0.3 U	1.2	0.2 J	0.2 J	0.2 J
Bis(2-ethylhexyl) phthalate	1.3[d]	0.3 U	0.7 U	0.3 J	0.7 U	0.2 J
Chrysene	0.108[a]	0.3 U	2.4	0.3 J	0.3 J	0.3 J
Dibenzo(a,h)anthracene	0.006[a]	0.3 U	0.7 U	0.7 U	0.7 U	0.7 U
Dibenzofuran	0.540[d]	0.3 U	0.7 U	0.7 U	0.7 U	0.7 U
Fluoranthene	0.600[c]	0.3 U	5.7	0.8	0.7	0.7 U
Fluorene	0.019[c]	0.3 U	0.7 U	0.7 U	0.7 U	0.7 U
Indeno(1,2,3-cd)pyrene	0.69[d]	0.3 U	0.3 J	0.7 U	0.7 U	0.7 U
Phenanthrene	0.087[a]	0.3 U	3.5	0.4 J	0.3 J	0.3 J
Pyrene	0.153[a]	0.3 U	4.3	0.6 J	0.6 J	0.5 J
Pesticides/PCBs (µg/Kg)						
PCB-1260 (Aroclor 1260)	22[a]	110	3100	1300	1400	1600
Dieldrin	0.72[a]	8 J B	11 J B	6 J B	5 J B	7 J B
4,4'-DDD	1.2[a]	1 J	49	55	61	88
4,4'-DDE	2.1[a]	0.5 J	6 J	5 J	5 J	6 J
4,4'-DDT	1.6[c]	9 J	40 U	110	60	270
Aldrin	UA	0.8 J	20 U	20 U	20 U	20 U
Endrin	120[b]	10 U	20 U	20 U	20 U	20 U
Endrin aldehyde	UA	3 J	90 U	40 U	50 U	50 U

TABLE 4.1-5 ANALYTES DETECTED IN COOLING POND SEDIMENT SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION

Location-ID Field-ID Lab-ID Sample Date Location	Screening Criteria	96-SD1 96575201SD K96607201 9/25/96 Discharge Pipe (DP)	96-SD2 96575202SD K96607202 9/25/96 40 feet from DP	96-SD3 96575203SD K96607203 9/25/96 79 feet from DP	96-SD4 96575204SD K96607204 9/25/96 Dup of 96-SD3	96-SD5 96575205SD K96607208 9/25/96 119 feet from DP
Metals (mg/Kg)						
Arsenic	7.24[a]	3	5	4	4	4
Barium	UA	38	77	77	67	79
Cadmium	0.676[a]	1 U	1 U	1 U	1 U	1 U
Chromium	52.3[a]	30	37	34	29	34
Lead	30.2[a]	10 J	39	29	25	33
Silver	0.733[a]	2 U	2 U	2 U	2 U	2 U
Mercury	0.13[a]	0.2 U	0.1 J	0.08 J	0.07 J	0.09 J
Other Analyses (mg/Kg)						
Total Organic Carbon	UA	0.48	3.05	3.43	2.96	3.02

Notes:

UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
* = Analytes detected using selective ion microscopy (SIMs) method; laboratory reported results in µg/Kg.
** = Naphthalene reported in SVOCs results by laboratory.
[a]Threshold effects levels (TELs) calculated in the ecological risk assessment.
[b]Screening benchmark calculated in the ecological risk assessment.
[c]Effects range-low (ER-L) calculated in the ecological risk assessment.
[d]Apparent effects thresholds (AETs) calculated in the ecological risk assessment.

TABLE 4.1-5 ANALYTES DETECTED IN COOLING POND SEDIMENT SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION

Location-ID Field-ID Lab-ID Sample Date Location	Screening Criteria	96-SD6 96575206SD K96607209 9/25/96 147 feet from DP	97-SD007 975752007SD K97791945 10/21/97 just upstream of 96-SD6	97-SD008 975752008SD K97791945 10/21/97 Dup of 97-SD007	96-SD8 96575208SD K96607211 9/25/96 165 feet from DP
Petroleum Hydrocarbons (mg/Kg)					
Diesel Range Organics	UA	32	--	--	694 J
Volatile Organic Compounds (µg/Kg)					
Aromatic Volatile Organics (AVOs)					
Naphthalene	35[a]	0.7 J	11**	50**	20 U
n-Propylbenzene	UA	20 U	--	--	20 U
2-Chlorotoluene	UA	20 U	--	--	20 U
4-Isopropyltoluene	UA	130	--	--	20 U
Acetone	25[b]	51	--	--	100
2-Butanone	750[b]	20 U	--	--	22
Carbon disulfide	UA	5 U	--	--	5 U
Semi-Volatile Organic Compounds (mg/Kg)					
2-Methylnaphthalene	0.020[a]	0.3 U	0.016*	0.036*	0.3 U
Acenaphthene	0.007[a]	0.3 U	0.014*	0.031*	0.3 U
Acenaphthylene	0.006[a]	0.3 U	0.014*	0.009*	0.3 U
Anthracene	0.047[a]	0.3 U	0.033*	0.024*	1.2
Benzo(a)anthracene	0.075[a]	0.1 J	0.136*	0.095*	0.6
Benzo(a)pyrene	0.089[a]	0.1 J	0.097*	0.071*	0.2 J
Benzo(b)fluoranthene	0.3892[b]	0.1 J	0.220*	0.142*	0.4
Benzo(g,h,i)perylene	0.072[c]	0.3 U	0.060*	0.037*	0.3 U
Benzo(k)fluoranthene	3.6[d]	0.1 J	0.174*	0.112*	0.4
Bis(2-ethylhexyl) phthalate	1.3[c]	0.2 J	--	--	0.1 J
Chrysene	0.108[a]	0.2 J	0.374*	0.250*	0.9
Dibenzo(a,h)anthracene	0.006[a]	0.3 U	0.018*	0.013*	0.3 U
Dibenzofuran	0.540[d]	0.3 U	0.023*	0.031*	0.3 U
Fluoranthene	0.600[c]	0.5	0.820*	0.571*	1.9
Fluorene	0.019[c]	0.3 U	0.032*	0.042*	0.1 J
Indeno(1,2,3-cd)pyrene	0.69[d]	0.3 U	0.067*	0.045*	0.1 J
Phenanthrene	0.087[a]	0.3	0.332*	0.279*	0.9
Pyrene	0.153[a]	0.4	0.771*	0.479*	1.3
Pesticides/PCBs (µg/Kg)					
PCB-1260 (Aroclor 1260)	22[a]	900	3000	3600	550
Dieldrin	0.72[a]	5 J B	20 U	20 U	10 U
4,4'-DDD	1.2[a]	20	130	130	458
4,4'-DDE	2.1[a]	3 J	15 J	22	16
4,4'-DDT	1.6[c]	20 U	70	100 U	309
Aldrin	UA	10 U	20 U	20 U	0.7 J
Endrin	120[b]	10 U	34	34	10 U
Endrin aldehyde	UA	40 U	60 U	60 U	10 U

TABLE 4.1-5 ANALYTES DETECTED IN COOLING POND SEDIMENT SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION

Location-ID Field-ID Lab-ID Sample Date Location	Screening Criteria	96-SD6 96575206SD K96607209 9/25/96 147 feet from DP	97-SD007 975752007SD K97791945 10/21/97 just upstream of 96-SD6	97-SD008 975752008SD K97791945 10/21/97 Dup of 97-SD007	96-SD8 96575208SD K96607211 9/25/96 165 feet from DP
Metals (mg/Kg)					
Arsenic	7.24[a]	4	--	--	5
Barium	UA	48	--	--	85
Cadmium	0.676[a]	1 U	--	--	1 U
Chromium	52.3[a]	31	--	--	36
Lead	30.2[a]	20 U	--	--	43
Silver	0.733[a]	2 U	--	--	2 U
Mercury	0.13[a]	0.05 J	--	--	0.09 J
Other Analyses (mg/Kg)					
Total Organic Carbon	UA	0.82	--	--	1.95

Notes:

UA = Unassigned or unavailable.

U = Analyte is not detected. Value reported is the method reporting limit (MRL).

J = Value reported is considered an estimate value.

B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.

* = Analytes detected using selective ion microscopy (SIMs) method; laboratory reported results in µg/Kg.

** = Naphthalene reported in SVOCs results by laboratory.

[a]Threshold effects levels (TELs) calculated in the ecological risk assessment.

[b]Screening benchmark calculated in the ecological risk assessment.

[c]Effects range-low (ER-L) calculated in the ecological risk assessment.

[d]Apparent effects thresholds (AETs) calculated in the ecological risk assessment.

TABLE 4.1-5 ANALYTES DETECTED IN COOLING POND SEDIMENT SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION

Location-ID Field-ID Lab-ID Sample Date Location	Screening Criteria	96-SD7 96575207SD K96607210 9/25/96 171 feet from DP (west side)	96-SD9 96575209SD K96607212 9/25/96 171 feet from DP (east side)	96-SD10 96575210SD K96607213 9/25/96 100' from outfall to drainage ditch	96-SD11 96575211SD K96613001 9/26/96 200' from outfall to drainage ditch
Petroleum Hydrocarbons (mg/Kg)					
Diesel Range Organics	UA	624	235	1570	2300
Volatile Organic Compounds (µg/Kg)					
Aromatic Volatile Organics (AVOs)					
Naphthalene	35[a]	60 U	20 U	40 U	40 U
n-Propylbenzene	UA	60 U	20 U	30 J	180 J
2-Chlorotoluene	UA	60 U	20 U	10 J	7 J
4-Isopropyltoluene	UA	60 U	20 U	40 U	40 U
Acetone	25[b]	150 U	86	150 J	350 J
2-Butanone	750[b]	60 U	20 J	30 J	75 J
Carbon disulfide	UA	15 U	5 U	10 U	10 U
Semi-Volatile Organic Compounds (mg/Kg)					
2-Methylnaphthalene	0.020[a]	0.7 U	0.3 U	3 U	1.2 U
Acenaphthene	0.007[a]	0.7 U	0.3 U	3 U	1.2 U
Acenaphthylene	0.006[a]	0.7 U	0.3 U	3 U	1.2 U
Anthracene	0.047[a]	0.7 U	0.3 U	3 U	1.2 U
Benzo(a)anthracene	0.075[a]	0.1 J	0.1 J	3 U	0.3 J
Benzo(a)pyrene	0.089[a]	0.1 J	0.1 J	3 U	0.2 J
Benzo(b)fluoranthene	0.3892[b]	0.1 J	0.2 J	3 U	0.4 J
Benzo(g,h,i)perylene	0.072[d]	0.7 U	0.3 U	3 U	0.3 J
Benzo(k)fluoranthene	3.6[d]	0.1 J	0.1 J	3 U	0.2 J
Bis(2-ethylhexyl) phthalate	1.3[d]	0.2 J	0.3	2 J	7 B
Chrysene	0.108[a]	0.2 J	0.2 J	3 U	0.6 J
Dibenzo(a,h)anthracene	0.006[a]	0.7 U	0.3 U	3 U	1.2 U
Dibenzofuran	0.540[d]	0.7 U	0.3 U	3 U	1.2 U
Fluoranthene	0.600[c]	0.3 J	0.4	3 U	0.7 J
Fluorene	0.019[c]	0.7 U	0.3 U	3 U	1.2 U
Indeno(1,2,3-cd)pyrene	0.69[d]	0.7 U	0.3 U	3 U	1.2 U
Phenanthrene	0.087[a]	0.1 J	0.2 J	3 U	0.4 J
Pyrene	0.153[a]	0.3 J	0.4	0.4 J	0.8 J
Pesticides/PCBs (µg/Kg)					
PCB-1260 (Aroclor 1260)	22[a]	940	340	770	690
Dieldrin	0.72[a]	4 J B	2 J B	20 U	4 J B
4,4'-DDD	1.2[a]	345	131	740	268
4,4'-DDE	2.1[a]	14 J	3 J	30	28
4,4'-DDT	1.6[c]	122	37	117	31
Aldrin	UA	2 J	1 J	3 J	3 J
Endrin	120[b]	20 U	10 U	20 U	20 U
Endrin aldehyde	UA	40 U	20 U	30 U	30 U

TABLE 4.1-5 ANALYTES DETECTED IN COOLING POND SEDIMENT SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION

Location-ID Field-ID Lab-ID Sample Date Location	Screening Criteria	96-SD7 96575207SD K96607210 9/25/96 171 feet from DP (west side)	96-SD9 96575209SD K96607212 9/25/96 171 feet from DP (east side)	96-SD10 96575210SD K96607213 9/25/96 100' from outfall to drainage ditch	96-SD11 96575211SD K96613001 9/26/96 200' from outfall to drainage ditch
Metals (mg/Kg)					
Arsenic	7.24[a]	3	3	4	5
Barium	UA	90	59	105	136
Cadmium	0.676[a]	0.5 J	1 U	1	2
Chromium	52.3[a]	46	35	50	64
Lead	30.2[a]	74	34	129	200
Silver	0.733[a]	2 U	2 U	2 U	0.6 J
Mercury	0.13[a]	0.1 J	0.07 J	0.2 J	0.3
Other Analyses (mg/Kg)					
Total Organic Carbon	UA	4.35	1.82	1.78	7.33

Notes:

UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
* = Analytes detected using selective ion microscopy (SIMs) method; laboratory reported results in µg/Kg.
** = Naphthalene reported in SVOCs results by laboratory.
[a]Threshold effects levels (TELs) calculated in the ecological risk assessment.
[b]Screening benchmark calculated in the ecological risk assessment.
[c]Effects range-low (ER-L) calculated in the ecological risk assessment.
[d]Apparent effects thresholds (AETs) calculated in the ecological risk assessment.

TABLE 4.1-6 ANALYTES DETECTED IN COOLING POND SURFACE WATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION

Location-ID	Screening Criteria		Pond 1	Pond 2
Field-ID			96575242WA	96575243WA
Lab-ID	Acute	Chronic	K96629901	K96629902
Sample Date	Benchmark[a]	Benchmark[a]	10/3/96	10/3/96
Semi-Volatile Organic Compounds (µg/L)				
Bis(2-ethylhexyl) phthalate	27	3	10 U	8 J
Volatile Organic Compounds (µg/L)				
Toluene	120	9.8	0.5 U	0.04 J
Metals (µg/L)				
Barium (dissolved)	110	4	--	--
Barium	110	4	15	5
Lead (dissolved)	82[b]	3.2[b]	--	--
Lead	82[b]	3.2[b]	5	2 U

Notes:

U = Analyte is not detected. Value reported is the method reporting limit (MRL).

J = Value reported is considered an estimate value.

- - = Analysis not performed on sample

[a] Tier II (secondary acute and chronic) values from ORNL (Oak Ridge National Laboratory) 1996. Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision. G.W. Suter and C.L. Tsao, eds. Prepared for the U.S. Department of Energy, Office of Environmental Management. ES/ER/TM-96/R2.

[b] NAQW criteria based on a hardness of 100 mg/L CaCO3. In: EPA 1991. Water Quality Criteria Summary. USEPA, Office of Science and Technology.

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID		AP29B2			AP29B3	
Field-ID		96575245GW	96575246GW	97575269GW	96575252GW	96575254GW
Lab-ID	Screening	K96646005	K96646003	K97261003	K96653301	K96653304
Sample Date	Criteria	10/9/96	10/9/96 DUP	4/17/97	10/11/96	10/11/96 DUP
Petroleum Hydrocarbons (µg/L)						
Gasoline Range Organics	15[a]	1910 B	1930 J B	4400	50 U	50 U
Diesel Range Organics	15[a]	399 B	401 B	1310	50 J	53 J
Volatile Organic Compounds (µg/L)						
Aromatic Volatile Organics (AVOs)						
Benzene	15[a], 5[b], 0.36[c]	42 B	39 B	100	0.5 U	0.5 U
Ethylbenzene	700[b], 1300[c]	160 B	140 B	280	0.4 U J,B	0.4 U J,B
Toluene	1000[b], 750[c]	240 B	220 B	630	0.3 U J,B	0.2 U J,B
Xylenes	10,000[b], 12,000[c]	560 B	520 B	1100	1.4 U B	1.1 U B
Naphthalene	1500[c]	37 B	36 B	40 J B	0.2 U J,B	0.2 U J,B
Isopropylbenzene	UA	10 B	10 B	10 J	2 U	2 U
n-Propylbenzene	UA	16 B	16 B	20 J	2 U	2 U
1,2,4-Trimethylbenzene	12[c]	100 B	100 B	150	0.4 U J,B	0.2 U J,B
1,3,5-Trimethylbenzene	12[c]	8 B	8 B	50 J	0.09 U J,B	2 U
4-Isopropyltoluene	UA	1 J	1 J	50 U	2 U	2 U
n-Butylbenzene	61[c]	2 J	2 J	50 U	2 U	2 U
sec-Butylbenzene	61[c]	2 U	2 U	50 U	2 U	2 U
tert-Butylbenzene	61[c]	2 U	2 U	50 U	2 U	2 U
Halogenated Volatile Organics (HVOs)						
1,1,1-Trichloroethane	200[b], 540[c]	12 B	12 B	30	0.5 U	0.5 U
Trichloroethene	5[b], 1.6[c]	1.6 B	1.7 B	12 U	0.7	0.6
Tetrachloroethene	5[b], 1.10[c]	0.7	0.8	12 U	0.5 U	0.5 U
1,1-Dichloroethane	810[c]	0.3 J	0.3 J	12 U	0.5 U	0.5 U
1,2-Dichloroethane	5[b], 0.12[c]	1	1	12 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70[b], 61[c]	0.5 U	0.5 U	12 U	0.5 U	0.5 U
Chloroform	0.15[c]	0.1 U J,B	0.1 U J,B	12 U	0.2 U J,B	0.2 U J,B
Bromodichloromethane	0.17[c]	0.5 U	0.5 U	12 U	0.5 U	0.5 U
Chlorobenzene	100[b], 39[c]	0.5 U	0.5 U	12 U	0.5 U	0.5 U
Chloromethane	1.40[c]	0.5 U	0.5 U	12 U	0.5 U	0.5 U
Vinyl chloride	2[b], 0.019[c]	0.5 U	0.5 U	12 U	0.5 U	0.5 U
Acetone	3700[c]	20 U	20 U	500 U	20 U	20 U
2-Butanone	1900[c]	20 U	20 U	500 U	20 U	20 U
Methylene chloride	5[b], 4.10[c]	1 U	1 U	8 J	1 U	1 U
Semi-Volatile Organic Compounds (µg/L)						
Naphthalene	1500[c]	29	25	40 B	10 U	10 U
2-Methylnaphthalene	UA	13	10	12	10 U	10 U
Phenol	1500[c]	10 U	10 U	10 U	10 U	10 U
2-Methylphenol (o-cresol)	1800[c]	3 J	10 U	6 J	10 U	10 U
4-Methylphenol (p-cresol)	180[c]	2 J	10 U	2 J	10 U	10 U
2,4-Dimethylphenol	730[c]	10 U	10 U	4 J	10 U	10 U
Bis(2-ethylhexyl) phthalate	6[b], 4.8[c]	10 U	10 U	10 U	10 U	10 U
Benzyl alcohol	11000[c]	10 U	10 U	10 U	10 U	10 U
Pesticides/PCBs (µg/L)						
Dieldrin	4.2E-3[c]	7E-04 J	0.001 J	0.04 U	8E-04 J	0.04 U
alpha-BHC	1.1E-2[c]	0.04 U	0.04 U	0.01 J	0.04 U	0.04 U
Endrin aldehyde	UA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aldrin	11[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Heptachlor epoxide	0.2[b],1.2E-3[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
delta-BHC	UA	0.04 U	0.04 U	0.003 J	0.04 U	0.04 U
gamma-BHC (Lindane)	0.2[b], 0.052[c]	0.04 U	0.04 U	0.005 J	0.04 U	0.04 U
Heptachlor	0.4[b], 2.3E-3[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID		AP2982			AP2983	
Field-ID		96575245GW	96575246GW	97575269GW	96575252GW	96575254GW
Lab-ID	Screening	K96646005	K96646003	K97261003	K96653301	K96653304
Sample Date	Criteria	10/9/96	10/9/96 DUP	4/17/97	10/11/96	10/11/96 DUP
Metals (µg/L)						
Arsenic (dissolved)	50[b], 11[c]	3 J	3 J	5 U	5 U	--
Arsenic	50[b], 11[c]	3 J	3 J	1 J	1 J	--
Barium (dissolved)	2000[b], 2600[c]	5 U	5 U	8	5 U	--
Barium	2000[b], 2600[c]	5 U	5 U	8	5 U	--
Chromium (dissolved)	100[b], 180/3.7E3[c,e]	5 U	5 U	5 U	5 U	--
Chromium	100[b], 180/3.7E3[c,e]	5 U	5 U	5 U	5 U	--
Lead (dissolved)	15[b,**]	2 U	2 U	2 U	2 U	--
Lead	15[b,**]	2 U	2 U	2 U	2 U	--
Mercury	2[b], 11[c]	0.5 U	0.5 U	0.2 J	0.5 U	--
Other Analyses (mg/L)						
Hardness (As CaCO3)		55.4	--	106	31.5	--
Suspended Solids		5 U	--	5 U	5 U	--
Sulfate		6.4	--	5.9	8.8	--
Nitrogen, Ammonia (as N)		0.05 U	--	0.05 U	0.05 U	--
Nitrogen, Nitrate-Nitrite		0.2	--	0.3	0.3	--

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
-- = Analysis not performed on sample

[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria Primary Maximum Contaminant levels (MCLs) EPA. **Action level for lead.
[c]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996) for tap water. [e]Chromium VI/Chromium III.

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID		AP2984	AP2985		AP2986		
Field-ID		97575280GW	96575250GW	97575276GW	96575249GW	97575286GW	97575287GW
Lab-ID	Screening	K97276601	K96649103	K97269103	K96649102	K97289203	K97289201
Sample Date	Criteria	4/23/97	10/10/96	4/21/97	10/10/96	4/29/97	4/29/97 DUP
Petroleum Hydrocarbons (µg/L)							
Gasoline Range Organics	15[a]	50 U	50 U	50 U	50 U	50 U	50 U
Diesel Range Organics	15[a]	60 J	63 J	100 U	55 U J,B	205 B	203
Volatile Organic Compounds (µg/L)							
Aromatic Volatile Organics (AVOs)							
Benzene	15[a], 5[b], 0.36[c]	0.5 U	0.5 U	0.5 U	0.2 U J,B	0.5 U	0.5 U
Ethylbenzene	700[b], 1300[c]	0.5 U	0.8 U B	0.5 U	1.6 U B	0.3 J	0.3 J
Toluene	1000[b], 750[c]	0.04 U J,B	0.4 U J,B	0.5 U	0.8 U B	0.5 U	0.5 U
Xylenes	10,000[b], 12,000[c]	0.5 U	2.6 U B	0.5 U	5.2 U B	0.9 U B	1
Naphthalene	1500[c]	2 U	0.2 U J,B	2 U	0.6 U J,B	2 U	2 U
Isopropylbenzene	UA	2 U	2 U	2 U	0.2 U J,B	2 U	2 U
n-Propylbenzene	UA	2 U	0.1 U J,B	2 U	0.2 U J,B	2 U	2 U
1,2,4-Trimethylbenzene	12[c]	2 U	0.7 U J,B	2 U	1 U J,B	1 J	1 J
1,3,5-Trimethylbenzene	12[c]	2 U	0.2 U J,B	2 U	0.3 U J,B	2 U	0.7 J
4-Isopropyltoluene	UA	2 U	2 U	2 U	2 U	2 U	2 U
n-Butylbenzene	61[c]	2 U	2 U	2 U	2 U	2 U	2 U
sec-Butylbenzene	61[c]	2 U	2 U	2 U	2 U	2 U	2 U
tert-Butylbenzene	61[c]	2 U	2 U	2 U	2 U	2 U	2 U
Halogenated Volatile Organics (HVOs)							
1,1,1-Trichloroethane	200[b], 540[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5[b], 1.6[c]	0.4 J	0.5 U B	0.2 J	0.5 U J,B	0.2 J	0.3 J
Tetrachloroethene	5[b], 1.10[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	810[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	5[b], 0.12[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70[b], 61[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	0.15[c]	0.1 J	0.2 U J,B	0.09 J	0.1 U J,B	0.5 U	0.5 U
Bromodichloromethane	0.17[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	100[b], 39[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	1.40[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	2[b], 0.019[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	3700[c]	1 U J,B	4 U J,B	1 U J,B	20 U	20 U	20 U
2-Butanone	1900[c]	20 U	20 U	20 U	20 U	20 U	20 U
Methylene chloride	5[b], 4.10[c]	1 U	1 U	1 U	1 U	1 U	1 U
Semi-Volatile Organic Compounds (µg/L)							
Naphthalene	1500[c]	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	UA	10 U	10 U	10 U	10 U	10 U	10 U
Phenol	1500[c]	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylphenol (o-cresol)	1800[c]	10 U	10 U	10 U	10 U	10 U	10 U
4-Methylphenol (p-cresol)	180[c]	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	730[c]	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-ethylhexyl) phthalate	6[b], 4.8[c]	10 U	10 U	10 U	10 U	10 U	10 U
Benzyl alcohol	11000[c]	10 U	10 U	10 U	10 U	10 U	10 U
Pesticides/PCBs (µg/L)							
Dieldrin	4.2E-3[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
alpha-BHC	1.1E-2[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Endrin aldehyde	UA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aldrin	11[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Heptachlor epoxide	0.2[b], 1.2E-3[c]	0.001 J	0.04 U	0.04 U	0.001 J	0.04 U	0.04 U
delta-BHC	UA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
gamma-BHC (Lindane)	0.2[b], 0.052[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Heptachlor	0.4[b], 2.3E-3[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID		AP2984	AP2985		AP2986		
Field-ID		97575280GW	96575250GW	97575276GW	96575249GW	97575286GW	97575287GW
Lab-ID	Screening	K97276601	K96649103	K97269103	K96649102	K97289203	K97289201
Sample Date	Criteria	4/23/97	10/10/96	4/21/97	10/10/96	4/29/97	4/29/97 DUP
Metals (µg/L)							
Arsenic (dissolved)	50[b], 11[c]	5 U	5 U	5 U	5 U	5 U	5 U
Arsenic	50[b], 11[c]	5 U	5 U	5 U	5 U	5 U	5 U
Barium (dissolved)	2000[b], 2600[c]	4 J	5 U	3 J	5 U	4 J	4 J
Barium	2000[b], 2600[c]	4 J	5 U	2 J	5 U	4 J	4 J
Chromium (dissolved)	100[b], 180/3.7E3[c]*	5 U	5 U	5 U	5 U	5 U	5 U
Chromium	100[b], 180/3.7E3[c]*	5 U	5 U	5 U	5 U	5 U	5 U
Lead (dissolved)	15[b]**	2 U		2 U		2 U	2 U
Lead	15[b]**	2 U		2 U		2 U	2 U
Mercury	2[b], 11[c]	0.3 J	0.5 U	0.4 J	0.5 U	0.2 J	0.2 J
Other Analyses (mg/L)							
Hardness (As CaCO3)		49.9	33.2	35.5	46.6	53	--
Suspended Solids		5 U	5 U	5 U	5 U	5 U	--
Sulfate		4.2	7.8	3	9.1	4.6	--
Nitrogen, Ammonia (as N)		0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	--
Nitrogen, Nitrate-Nitrite		0.5	0.4	0.3	0.3	0.2 J	--

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
- - = Analysis not performed on sample
[b]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria Primary Maximum Contaminant levels (MCLs) EPA. **Action level for lead.
[c]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996) for tap water. *Chromium VI/Chromium III.

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID		AP3231				
Field-ID		96575263GW	96575263GW	96575264GW	97575284GW	97575285GW
Lab-ID	Screening	K96674401	K96674401R	K96674402	K97289202	K97289204
Sample Date	Criteria	10/21/96	10/21/96	10/21/96 DUP	4/29/97	4/29/97 DUP
Petroleum Hydrocarbons (µg/L)						
Gasoline Range Organics	15[a]	50 U	--	50 U	50 U	50 U
Diesel Range Organics	15[a]	68 J	--	--	67 J	66 J
Volatile Organic Compounds (µg/L)						
Aromatic Volatile Organics (AVOs)						
Benzene	15[a], 5[b], 0.36[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
Ethylbenzene	700[b], 1300[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
Toluene	1000[b], 750[c]	0.07 U J,B	--	0.06 U J,B	0.5 U	0.5 U
Xylenes	10,000[b], 12,000[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
Naphthalene	1500[c]	2 U	--	2 U	2 U	2 U
Isopropylbenzene	UA	2 U	--	2 U	2 U	2 U
n-Propylbenzene	UA	2 U	--	2 U	2 U	2 U
1,2,4-Trimethylbenzene	12[c]	2 U	--	2 U	2 U	2 U
1,3,5-Trimethylbenzene	12[c]	2 U	--	2 U	2 U	2 U
4-Isopropyltoluene	UA	2 U	--	2 U	2 U	2 U
n-Butylbenzene	61[c]	2 U	--	2 U	2 U	2 U
sec-Butylbenzene	61[c]	2 U	--	2 U	2 U	2 U
tert-Butylbenzene	61[c]	2 U	--	2 U	2 U	2 U
Halogenated Volatile Organics (HVOs)						
1,1,1-Trichloroethane	200[b], 540[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
Trichloroethene	5[b], 1.6[c]	1.6 J	--	1.7	3.5	3.4
Tetrachloroethene	5[b], 1.10[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	810[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	5[b], 0.12[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70[b], 61[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
Chloroform	0.15[c]	0.3 J	--	0.2 U J,B	0.1 U J,B	0.1 U J,B
Bromodichloromethane	0.17[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
Chlorobenzene	100[b], 39[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
Chloromethane	1.40[c]	0.3 J	--	0.2 J	0.5 U	0.5 U
Vinyl chloride	2[b], 0.019[c]	0.5 U	--	0.5 U	0.5 U	0.5 U
Acetone	3700[c]	3 U J,B	--	2 U J,B	20 U	20 U
2-Butanone	1900[c]	20 U	--	20 U	20 U	20 U
Methylene chloride	5[b], 4.10[c]	0.1 U J,B	--	0.1 U J,B	1 U	1 U
Semi-Volatile Organic Compounds (µg/L)						
Naphthalene	1500[c]	10 U	10 U J	--	10 U	10 U
2-Methylnaphthalene	UA	10 U R	10 U J	--	10 U	10 U
Phenol	1500[c]	10 U R	10 U J	--	10 U	10 U
2-Methylphenol (o-cresol)	1800[c]	10 U R	10 U J	--	10 U	10 U
4-Methylphenol (p-cresol)	180[c]	10 U R	10 U J	--	10 U	10 U
2,4-Dimethylphenol	730[c]	10 U R	10 U J	--	10 U	10 U
Bis(2-ethylhexyl) phthalate	6[b], 4.8[c]	10 U	10 U J	--	10 U	10 U
Benzyl alcohol	11000[c]	10 U	10 U J	--	10 U	10 U
Pesticides/PCBs (µg/L)						
Dieldrin	4.2E-3[c]	9E-04 J	--	--	--	0.04 U
alpha-BHC	1.1E-2[c]	0.04 U	--	--	--	0.04 U
Endrin aldehyde	UA	0.04 U	--	--	--	0.04 U
Aldrin	11[c]	0.04 U	--	--	--	0.04 U
Heptachlor epoxide	0.2[b],1.2E-3[c]	0.04 U	--	--	--	0.04 U
delta-BHC	UA	0.04 U	--	--	--	0.04 U
gamma-BHC (Lindane)	0.2[b], 0.052[c]	0.04 U	--	--	--	0.04 U
Heptachlor	0.4[b], 2.3E-3[c]	0.04 U	--	--	--	0.04 U

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID Field-ID Lab-ID Sample Date	Screening Criteria	AP3231				
		96575263GW K96674401 10/21/96	96575263GW K96674401R 10/21/96	96575264GW K96674402 10/21/96 DUP	97575284GW K97289202 4/29/97	97575285GW K97289204 4/29/97 DUP
Metals (µg/L)						
Arsenic (dissolved)	50[b], 11[c]	2 J	--	2 J	5 U	5 U
Arsenic	50[b], 11[c]	39	--	29	5 U	5 U
Barium (dissolved)	2000[b], 2600[c]	42	--	46	7	7
Barium	2000[b], 2600[c]	533	--	345	7	7
Chromium (dissolved)	100[b], 180/3.7E3[c]*	8	--	9	5 U	5 U
Chromium	100[b], 180/3.7E3[c]*	102	--	69	5 U	5 U
Lead (dissolved)	15[b]**	2 J	--	2 J	2 U	2 U
Lead	15[b]**	43	--	27	2 U	2 U
Mercury	2[b], 11[c]	0.4 J	--	0.6	0.3 J	0.2 J
Other Analyses (mg/L)						
Hardness (As CaCO3)		41.4	--	44.3	64.2	--
Suspended Solids		672 J	--	--	5 U	--
Sulfate		10	--	--	5.8	--
Nitrogen, Ammonia (as N)		0.05 U	--	--	0.05 U	--
Nitrogen, Nitrate-Nitrite		0.3	--	--	0.4	--

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
-- = Analysis not performed on sample.
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria Primary Maximum Contaminant levels (MCLs) EPA. **Action level for lead.
[c]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996) for tap water. *Chromium VI/Chromium III.

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID		AP2987		AP3232		AP3458	
Field-ID		96575247GW	97575271GW	96575259GW	97575275GW	96575266GW	97575273GW
Lab-ID	Screening	K96646001	K97261004	K96666803	K97269102	K96730001	K97266703
Sample Date	Criteria	10/9/96	4/17/97	10/16/96	4/21/97	11/11/96	4/18/97
Petroleum Hydrocarbons (µg/L)							
Gasoline Range Organics	15[a]	850	510	50 U	50 U	50 U	50 U
Diesel Range Organics	15[a]	1260	771	45 J	100 U	275	426
Volatile Organic Compounds (µg/L)							
Aromatic Volatile Organics (AVOs)							
Benzene	15[a], 5[b], 0.36[c]	50 B	8	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	700[b], 1300[c]	64 B	21	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	1000[b], 750[c]	61 B	75	0.5	0.5 U	0.5 U	0.04 U J,B
Xylenes	10,000[b], 12,000[c]	220 B	130	0.5 U	0.5 U	0.5 U	0.5 U
Naphthalene	1500[c]	29 B	3 J B	2 U	2 U	2 U	2 U
Isopropylbenzene	UA	6 B	10 U	2 U	2 U	2 U	2 U
n-Propylbenzene	UA	7 B	1 J	2 U	2 U	2 U	2 U
1,2,4-Trimethylbenzene	12[c]	33 B	10 J	2 U	2 U	2 U	2 U
1,3,5-Trimethylbenzene	12[c]	6 B	4 J	2 U	2 U	2 U	2 U
4-Isopropyltoluene	UA	0.5 J	10 U	2 U	2 U	2 U	2 U
n-Butylbenzene	61[c]	0.4 J	10 U	2 U	2 U	2 U	2 U
sec-Butylbenzene	61[c]	2 U	10 U	2 U	2 U	2 U	0.1 J
tert-Butylbenzene	61[c]	2 U	10 U	2 U	2 U	2 U	2 U
Halogenated Volatile Organics (HVOs)							
1,1,1-Trichloroethane	200[b], 540[c]	5.6 B	0.8 J	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5[b], 1.6[c]	1.9 B	1 J	0.4 J	0.3 J	0.5	0.6
Tetrachloroethene	5[b], 1.10[c]	1.3	2 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	810[c]	1.8	2 U	0.5 U	0.5 U	0.7	0.8
1,2-Dichloroethane	5[b], 0.12[c]	1.3	2 U	0.5 U	0.5 U	0.5 U	0.06 J
cis-1,2-Dichloroethene	70[b], 61[c]	0.9	2 U	0.5 U	0.5 U	9.6	9.1
Chloroform	0.15[c]	0.07 U J,B	2 U	0.2 U J,B	0.09 J	0.5 U	0.5 U
Bromodichloromethane	0.17[c]	0.5 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	100[b], 39[c]	0.5 U	2 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	1.40[c]	0.3 J	2 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	2[b], 0.019[c]	0.5 U	2 U	0.5 U	0.5 U	0.5 U	0.1 J
Acetone	3700[c]	6 U J,B	100 U	20 U	1 U J,B	20 U	1 U J,B
2-Butanone	1900[c]	20 U	100 U	20 U	20 U	20 U	20 U
Methylene chloride	5[b], 4.10[c]	1 U	5 U	1 U	1 U	1 U	1 U
Semi-Volatile Organic Compounds (µg/L)							
Naphthalene	1500[c]	17	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	UA	10 U	10 U	10 U	10 U	10 U	10 U
Phenol	1500[c]	10 U	10 U	10 U	10 U	10 U	10 U R
2-Methylphenol (o-cresol)	1800[c]	10 U	3 J	10 U	10 U	10 U	10 U R
4-Methylphenol (p-cresol)	180[c]	10 U	2 J	10 U	10 U	10 U	10 U R
2,4-Dimethylphenol	730[c]	10 U	10 U	10 U	10 U	10 U	10 U R
Bis(2-ethylhexyl) phthalate	6[b], 4.8[c]	10 U	10 U	10 U	10 U	10 U	10 U
Benzyl alcohol	11000[c]	10 U	1 J	10 U	10 U	10 U	10 U
Pesticides/PCBs (µg/L)							
Dieldrin	4.2E-3[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U J	0.04 U
alpha-BHC	1.1E-2[c]	0.02 J	0.01 J	0.04 U	0.04 U	0.04 U J	0.006 J
Endrin aldehyde	UA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U J	0.04 U
Aldrin	11[c]	0.04 U	0.008 J	0.04 U	0.04 U	0.04 U J	0.011 J
Heptachlor epoxide	0.2[b], 1.2E-3[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U J	0.04 U
delta-BHC	UA	0.04 U	0.004 J	0.04 U	0.04 U	0.04 U J	0.04 U
gamma-BHC (Lindane)	0.2[b], 0.052[c]	0.04 U	0.005 J	0.04 U	0.04 U	0.04 U J	0.004 J
Heptachlor	0.4[b], 2.3E-3[c]	0.04 U	0.005	0.04 U	0.04 U	0.04 U J	0.04 U

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID		AP2987		AP3232		AP3458	
Field-ID		96575247GW	97575271GW	96575259GW	97575275GW	96575266GW	97575273GW
Lab-ID	Screening	K96646001	K97261004	K96666803	K97269102	K96730001	K97266703
Sample Date	Criteria	10/9/96	4/17/97	10/16/96	4/21/97	11/11/96	4/18/97
Metals (µg/L)							
Arsenic (dissolved)	50[b], 11[c]	3 J	5 U	5 U	5 U	1 J	5 U
Arsenic	50[b], 11[c]	5	5 U	5 U	5 U	6	4 J
Barium (dissolved)	2000[b], 2600[c]	9	7	5 U	4 J	18	15
Barium	2000[b], 2600[c]	10	6	4 J	4 J	88	49
Chromium (dissolved)	100[b], 180/3.7E3[c,e]	5 U	5 U	5 U	5 U	5 U	5 U
Chromium	100[b], 180/3.7E3[c,e]	5 U	5 U	5 U	5 U	22	10
Lead (dissolved)	15[b,**]	2 U	2 U	2 U	2 U	2 U	2 U
Lead	15[b,**]	2 U	2 U	2 U	2 U	4	2 J
Mercury	2[b], 11[c]	0.5 U	0.4 J	0.5 U	0.4 J	0.5 U	0.5 J
Other Analyses (mg/L)							
Hardness (As CaCO3)		96.2	55.4	40.9	51.4	0.2 J	246
Suspended Solids		7	5 U	5 U	5 U	486	359
Sulfate		2.7	4.8	8.5	3.9	6.6	18
Nitrogen, Ammonia (as N)		0.05 U	0.05 U	0.05 U	0.05 U	0.04 J	0.05 U
Nitrogen, Nitrate-Nitrite		0.2 U	0.6	0.4	0.5	0.2 U	0.07 J

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
- - = Analysis not performed on sample
*Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria Primary Maximum Contaminant levels (MCLs) EPA. **Action level for lead.
[c]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996) for tap water. [e]Chromium VI/Chromium III.

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID		AP3502		AP3503		AP3504
Field-ID		96575255GW	97575278GW	96575258GW	97575277GW	96575261GW
Lab-ID	Screening	K96659801	K97273303	K96666802	K97273302	K96670601
Sample Date	Criteria	10/15/96	4/22/97	10/16/96	4/22/97	10/18/96
Petroleum Hydrocarbons (µg/L)						
Gasoline Range Organics	15[a]	81	50 U	50 U	50 U	50 U
Diesel Range Organics	15[a]	210	342	76 J B	277	63 U J,B
Volatile Organic Compounds (µg/L)						
Aromatic Volatile Organics (AVOs)						
Benzene	15[a], 5[b], 0.36[c]	24 B	0.5 U	0.5 U	0.5 U	0.3 U J,B
Ethylbenzene	700[b], 1300[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	1000[b], 750[c]	0.1 U J,B	0.5 U	0.04 U J,B	0.5 U	0.3 U J,B
Xylenes	10,000[b], 12,000[c]	11 B	0.5 U	0.5 U	0.5 U	0.7 U J,B
Naphthalene	1500[c]	5 B	2 U	2 U	2 U	1 U J,B
Isopropylbenzene	UA	2 U	2 U	2 U	2 U	0.2 J
n-Propylbenzene	UA	2 U	2 U	2 U	2 U	0.3 J
1,2,4-Trimethylbenzene	12[c]	2 U	2 U	2 U	2 U	0.2 U J,B
1,3,5-Trimethylbenzene	12[c]	2 U	2 U	2 U	2 U	0.2 J
4-Isopropyltoluene	UA	2 U	2 U	2 U	2 U	0.2 J
n-Butylbenzene	61[c]	0.1 U J,B	2 U	2 U	2 U	0.3 J
sec-Butylbenzene	61[c]	0.4 J	2 U	2 U	2 U	0.3 J
tert-Butylbenzene	61[c]	0.08 J	2 U	2 U	2 U	0.2 J
Halogenated Volatile Organics (HVOs)						
1,1,1-Trichloroethane	200[b], 540[c]	27	4.2	3	1.1	0.2 J
Trichloroethene	5[b], 1.6[c]	3	2.4	1.9	0.8	1.3
Tetrachloroethene	5[b], 1.10[c]	0.9	0.2 J	0.5 U	0.5 U	0.2 J
1,1-Dichloroethane	810[c]	1	0.5 U	0.2 J	0.5 U	0.5 U
1,2-Dichloroethane	5[b], 0.12[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70[b], 61[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	0.15[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.2 U J,B
Bromodichloromethane	0.17[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.2 U J,B
Chlorobenzene	100[b], 39[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J,B
Chloromethane	1.40[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	2[b], 0.019[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	3700[c]	6 U J,B	20 U	20 U	20 U	20 U
2-Butanone	1900[c]	20 U	20 U	20 U	20 U	20 U
Methylene chloride	5[b], 4.10[c]	0.1 U J,B	1 U	1 U	1 U	1 U
Semi-Volatile Organic Compounds (µg/L)						
Naphthalene	1500[c]	3 J	10 U	10 U	10 U	10 U
2-Methylnaphthalene	UA	10 U	10 U	10 U	10 U	10 U
Phenol	1500[c]	1 J	10 U	10 U	10 U	10 U
2-Methylphenol (o-cresol)	1800[c]	10 U	10 U	10 U	10 U	10 U
4-Methylphenol (p-cresol)	180[c]	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	730[c]	10 U	10 U	10 U	10 U	10 U
Bis(2-ethylhexyl) phthalate	6[b], 4.8[c]	10 U	10 U	10 U	10 U	10 U
Benzyl alcohol	11000[c]	10 U	10 U	10 U	10 U	10 U
Pesticides/PCBs (µg/L)						
Dieldrin	4.2E-3[c]	0.002 J	0.04 U	0.04 U	0.04 U	0.04 U
alpha-BHC	1.1E-2[c]	0.001 U J,B	0.01 J	0.04 U	0.04 U	0.04 U
Endrin aldehyde	UA	0.002 J	0.04 U	0.04 U	0.04 U	0.04 U
Aldrin	11[c]	0.04 U	0.04 U	0.04 U	0.01 J	0.04 U
Heptachlor epoxide	0.2[b],1.2E-3[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
delta-BHC	UA	0.04 U	0.01 J	0.04 U	0.04 U	0.04 U
gamma-BHC (Lindane)	0.2[b], 0.052[c]	0.04 U	0.009 J	0.04 U	0.002 J	0.04 U
Heptachlor	0.4[b], 2.3E-3[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U

TABLE 4.1-7 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 35-752 DURING THE REMEDIAL INVESTIGATION (FALL 1996/SPRING 1997)

Location-ID		AP3502		AP3503		AP3504
Field-ID		96575255GW	97575278GW	96575256GW	97575277GW	96575261GW
Lab-ID	Screening	K96659801	K97273303	K96666802	K97273302	K96670601
Sample Date	Criteria	10/15/96	4/22/97	10/16/96	4/22/97	10/18/96
Metals (µg/L)						
Arsenic (dissolved)	50[b], 11[c]	5 U	5 U	5 U	5 U	5 U
Arsenic	50[b], 11[c]	6	3 J	83	6	5 U
Barium (dissolved)	2000[b], 2600[c]	7	7	6	7	5 U
Barium	2000[b], 2600[c]	57	39	812	54	5 U
Chromium (dissolved)	100[b], 180/3.7E3[c]*	5 U	5 U	5 U	5 U	5 U
Chromium	100[b], 180/3.7E3[c]*	10	8	235	12	5 U
Lead (dissolved)	15[b]**	2 U	2 U	2 U	2 U	2 U
Lead	15[b]**	4	1 J	64	3	2 U
Mercury	2[b], 11[c]	0.5 U	0.4 J	0.6	0.6	0.5 U
Other Analyses (mg/L)						
Hardness (As CaCO3)		83	73	94.5	85.4	43.1
Suspended Solids		82	100	1770	132	5 U
Sulfate		4.1	5.3	7.8	4.7	10
Nitrogen, Ammonia (as N)		0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Nitrogen, Nitrate-Nitrite		0.3	0.7	0.5	0.6	0.3

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
- - = Analysis not performed on sample
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria Primary Maximum Contaminant levels (MCLs) EPA. **Action level for lead.
[c]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996) for tap water. *Chromium VI/Chromium III.

TABLE 4.1-8 ANALYTES DETECTED IN SOIL SAMPLES AT BUILDING 35-752 DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3917		
Depth (feet)		5-7	10-12	15-17
Field-ID		985752004SL	985752005SL	985752006SL
Lab ID	Screening	K98325203	K98325204	K98325205
Date	Criteria	19-May-98	19-May-98	19-May-98
Petroleum Hydrocarbons (mg/Kg)				
Gasoline Range Organics	50-100[a]	- -	5 U	210
Diesel Range Organics	100-200[a]	7	157	7120
Residual Range Organics	UA	100 U	92 J	2980
Volatile Organic Compounds (µg/Kg)				
Benzene	100-500[a], 2.2E3[b]	5 U	5 U	15 U
Toluene	1.6E6[b]	5 U	5 U	7 J
Ethylbenzene	7.8E5[b]	5 U	5 U	90
Xylenes	1.6E7[b]	5 U	5 U	230
n-Butylbenzene	7.8E4[b]	20 U	20 U	11000
sec-Butylbenzene	7.8E4[b]	20 U	20 U	450
Carbon disulfide	7.8E5[b]	5 U	5 U	6 J
Chloroethane	2.2E4[b]	5 U	5 U	15 U
1,2-Dichlorobenzene	7.0E5[b]	5 U	5 U	15 U
1,3-Dichlorobenzene	7.0E5[b]	5 U	5 U	15 U
1,4-Dichlorobenzene	2.7E3[b]	5 U	5 U	15 U
cis-1,2-Dichloroethene	7.8E4[b]	5 U	5 U	15 U
Isopropylbenzene	UA	20 U	20 U	230
4-Isopropyltoluene	UA	20 U	20 U	7700
Naphthalene	3.1E5[b]	20 U	20 U	9500
n-Propylbenzene	7.8E4[b]	20 U	20 U	2000 J
Tetrachloroethene	1.2E3[b]	5 U	5 U	15 U
Trichloroethene	5.8E3[b]	5 U	5 U	7 J
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	11000
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	170
Acetone	7.8E5[b]	50 U	50 U	150 U
Pesticides (µg/Kg)				
4,4'-DDT	190[b]	10 U	10 U	7 J
Endosulfan II	4.7E4[b]	10 U	10 U	10 U
Polychlorinated Biphenyls (PCBs) (mg/Kg)				
PCB-1254 (Arocior 1254)	160[b]	0.1 U	0.1 U	0.1
Total Solids (%)				
Total Solids	UA	94.1	94.0	92.6

TABLE 4.1-8 ANALYTES DETECTED IN SOIL SAMPLES AT BUILDING 35-752 DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3917		
Depth (feet)		5-7	10-12	15-17
Field-ID		985752004SL	985752005SL	985752006SL
Lab ID	Screening	K98325203	K98325204	K98325205
Date	Criteria	19-May-98	19-May-98	19-May-98
Semi-Volatile Organic Compounds (mg/Kg)				
1,2-Dichlorobenzene	7.5E5[b]	0.3 U	0.3 U	7.5 U
1,4-Dichlorobenzene	7.5E5[b]	0.3 U	0.3 U	7.5 U
2-Methylnaphthalene	310[b]	0.3 U	0.3 U	19
Acenaphthene	470[b]	0.3 U	0.3 U	7.5 U
Anthracene	2300[b]	0.3 U	0.3 U	7.5 U
Benzo(a)anthracene	0.088[b]	0.3 U	0.3 U	7.5 U
Benzo(g,h,i)perylene	UA	0.3 U	0.3 U	7.5 U
Benzoic acid	3.1E4[b]	0.5 J	2 U	50 U
Benzyl butyl phthalate	1600[b]	0.08 J	0.3 U	7.5 U
bis-(2-ethylhexyl)phthalate	4.6[b]	0.3 U	0.3 U	7.5 U
Chrysene	8.8[b]	0.3 U	0.3 U	7.5 U
Dibenzofuran	31[b]	0.3 U	0.3 U	7.5 U
Di-n-butyl phthalate	780[b]	0.3 U	0.3 U	0.6 J
Fluoranthene	310[b]	0.3 U	0.3 U	7.5 U
Fluorene	310[b]	0.3 U	0.3 U	1 J
Naphthalene	310[b]	0.3 U	0.3 U	4 J
Phenanthrene	UA	0.3 U	0.3 U	0.7 J
Pyrene	230[b]	0.3 U	0.3 U	7.5 U
Metals (mg/Kg)				
Barium	550[b]	60	57	59
Cadmium	3.9[b]	0.7 J	1 U	1 U
Chromium	39/7800[b]	29	29	32
Iron	2300[b]	27500	25600	30900
Nickel	160[b]	32	27	33
Arsenic	2.3[b]	6	6	6
Lead	400[c]	5	6	7
Mercury	2.3[b]	0.1 J	0.09 J	0.1 J

Notes:

U: Compound not detected; value reported is the method reporting limit (MRL).

J: Compound detected between the MRL and the method detection limit (MDL); value reported is considered an estimate.

–: Analysis not performed.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800)

[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

TABLE 4.1-8 ANALYTES DETECTED IN SOIL SAMPLES AT BUILDING 35-752 DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3918		
Depth (feet)		5-7	10-12	15-17
Field-ID		985752008SL	985752009SL	985752010SL
Lab ID	Screening	K98325206	K98325207	K98325208
Date	Criteria	19-May-98	19-May-98	19-May-98
Petroleum Hydrocarbons (mg/Kg)				
Gasoline Range Organics	50-100[a]	5 U	5 U	150
Diesel Range Organics	100-200[a]	4 J	5	5360
Residual Range Organics	UA	100 U	100 U	1390
Volatile Organic Compounds (µg/Kg)				
Benzene	100-500[a], 2.2E3[c]	5 U	5 U	15 U
Toluene	1.6E6[b]	5 U	5 U	22
Ethylbenzene	7.8E5[c]	5 U	5 U	170
Xylenes	1.6E7[c]	5 U	5 U	460
n-Butylbenzene	7.8E4[b]	20 U	20 U	60 U
sec-Butylbenzene	7.8E4[c]	20 U	20 U	450
Carbon disulfide	7.8E5[b]	5 U	5 U	6 J
Chloroethane	2.2E4[b]	5 U	5 U	15 U
1,2-Dichlorobenzene	7.0E5[b]	5 U	5 U	15 U
1,3-Dichlorobenzene	7.0E5[b]	5 U	5 U	15 U
1,4-Dichlorobenzene	2.7E3[b]	5 U	5 U	15 U
cis-1,2-Dichloroethene	7.8E4[c]	5 U	5 U	6 J
Isopropylbenzene	UA	20 U	20 U	300
4-Isopropyltoluene	UA	20 U	20 U	2300
Naphthalene	3.1E5[b]	20 U	20 U	3700
n-Propylbenzene	7.8E4[b]	20 U	20 U	690
Tetrachloroethene	1.2E3[b]	5 U	5 U	15 U
Trichloroethene	5.8E3[b]	1 J	4 J	9 J
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	3900
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	380
Acetone	7.8E5[b]	50 U	50 U	150 U
Pesticides (µg/Kg)				
4,4'-DDT	190[b]	2 J	10 U	7 J
Endosulfan II	4.7E4[b]	10 U	3 J	10 U
Polychlorinated Biphenyls (PCBs) (mg/Kg)				
PCB-1254 (Aroclor 1254)	160[b]	0.1 U	0.1 U	0.06 J
Total Solids (%)				
Total Solids	UA	92.4	94.1	91.1

TABLE 4.1-8 ANALYTES DETECTED IN SOIL SAMPLES AT BUILDING 35-752 DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3918		
Depth (feet)		5-7	10-12	15-17
Field-ID		985752008SL	98575200 9SL	985752010SL
Lab ID	Screening	K98325206	K98325207	K98325208
Date	Criteria	19-May-98	19-May-98	19-May-98
Semi-Volatile Organic Compounds (mg/Kg)				
1,2-Dichlorobenzene	7.5E5[b]	0.3 U	0.3 U	7.5 U
1,4-Dichlorobenzene	7.5E5[b]	0.3 U	0.3 U	7.5 U
2-Methylnaphthalene	310[b]	0.3 U	0.3 U	18
Acenaphthene	470[b]	0.3 U	0.3 U	7.5 U
Anthracene	2300[b]	0.3 U	0.3 U	7.5 U
Benzo(a)anthracene	0.088[b]	0.3 U	0.3 U	7.5 U
Benzo(g,h,i)perylene	UA	0.3 U	0.3 U	7.5 U
Benzoic acid	3.1E4[b]	2 U	2 U	50 U
Benzyl butyl phthalate	1600[b]	0.3 U	0.3 U	7.5 U
bis-(2-ethylhexyl)phthalate	4.6[b]	0.3 U	0.3 U	7.5 U
Chrysene	8.8[b]	0.3 U	0.3 U	7.5 U
Dibenzofuran	31[b]	0.3 U	0.3 U	7.5 U
Di-n-butyl phthalate	780[b]	0.3 U	0.3 U	0.3 J
Fluoranthene	310[b]	0.3 U	0.3 U	7.5 U
Fluorene	310[b]	0.3 U	0.3 U	1 J
Naphthalene	310[b]	0.3 U	0.3 U	6 J
Phenanthrene	UA	0.3 U	0.3 U	0.5 J
Pyrene	230[b]	0.3 U	0.3 U	7.5 U
Metals (mg/Kg)				
Barium	550[b]	71	71	57
Cadmium	3.9[b]	0.6 J	0.6 J	0.8 J
Chromium	39/7800[b]	40	44	47
Iron	2300[b]	30900	28500	31800
Nickel	160[b]	41	28	46
Arsenic	2.3[b]	5	6	7
Lead	400[c]	5	6	7
Mercury	2.3[b]	0.07 J	0.09 J	0.1 J

Notes:

U: Compound not detected, value reported is the method reporting limit (MRL).

J: Compound detected between the MRL and the method detection limit (MDL); value reponed is considered an estimate.

--: Analysis not performed.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening critena one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800)

[c]Screening critena EPA's cleanup standard for lead in soil (Wilkening 1995).

TABLE 4.1-8 ANALYTES DETECTED IN SOIL SAMPLES AT BUILDING 35-752 DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3919				
Depth (feet)		10-12	10-12	15-17	15-17	22-24
Field-ID		985752013SL	985752025SL	985752014SL	985752026SL	985752017SL
Lab ID	Screening	K98325209	K98325216	K98325210	K98325217	K98325211
Date	Criteria	20-May-98	20-May-98 DUP	20-May-98	20-May-98 DUP	20-May-98
Petroleum Hydrocarbons (mg/Kg)						
Gasoline Range Organics	50-100[a]	140	- -	260	240	5 U
Diesel Range Organics	100-200[a]	6210	- -	6220	5760	4 U
Residual Range Organics	UA	3500	- -	11000	13000	100 U
Volatile Organic Compounds (µg/Kg)						
Benzene	100-500[a], 2.2E3[b]	5 U	25 U	50	- -	5 U
Toluene	1.6E6[b]	5 U	25 U	1100	- -	5 U
Ethylbenzene	7.8E5[c]	5 U	25 U	1400	- -	5 U
Xylenes	1.6E7[b]	5 U	25 U	8900	- -	5 U
n-Butylbenzene	7.8E4[b]	20 U	100 U	3900	- -	20 U
sec-Butylbenzene	7.8E4[b]	20 U	100 U	1000 J	- -	20 U
Carbon disulfide	7.8E5[b]	5 U	25 U	10 U	- -	5 U
Chloroethane	2.2E4[b]	5 U	25 U	2 J	- -	5 U
1,2-Dichlorobenzene	7.0E5[b]	5 U	25 U	1100	- -	5 U
1,3-Dichlorobenzene	7.0E5[b]	5 U	25 U	78	- -	5 U
1,4-Dichlorobenzene	2.7E3[b]	5 U	25 U	360	- -	5 U
cis-1,2-Dichloroethene	7.8E4[b]	5 U	25 U	14	- -	5 U
Isopropylbenzene	UA	20 U	100 U	800 J	- -	20 U
4-Isopropyltoluene	UA	20 U	110	6300	- -	20 U
Naphthalene	3.1E5[b]	20 U	100 U	6100	- -	20 U
n-Propylbenzene	7.8E4[b]	20 U	100 U	2000 J	- -	20 U
Tetrachloroethene	1.2E3[b]	5 U	25 U	45	- -	5 U
Trichloroethene	5.8E3[b]	5 U	25 U	20	- -	2 J
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	100 U	11000	- -	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	110	3500	- -	20 U
Acetone	7.8E5[b]	50 U	250 U	80 J	- -	50 U
Pesticides (µg/Kg)						
4,4'-DDT	190[b]	10 U	- -	10 U	- -	10 U
Endosulfan II	4.7E4[b]	10 U	- -	10 U	- -	10 U
Polychlorinated Biphenyls (PCBs) (mg/Kg)						
PCB-1254 (Aroclor 1254)	160[b]	0.05 J	- -	0.1 U	- -	0.1 U
Total Solids (%)						
Total Solids	UA	92.4	94.3	88.6	88.7	88.5

TABLE 4.1-8 ANALYTES DETECTED IN SOIL SAMPLES AT BUILDING 35-752 DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3919				
Depth (feet)		10-12	10-12	15-17	15-17	22-24
Field-ID		985752013SL	985752025SL	985752014SL	985752026SL	985752017SL
Lab ID	Screening	K98325209	K98325216	K98325210	K98325217	K98325211
Date	Criteria	20-May-98	20-May-98 DUP	20-May-98	20-May-98 DUP	20-May-98
Semi-Volatile Organic Compounds (mg/Kg)						
1,2-Dichlorobenzene	7.5E5[b]	7.5 U	- -	1 J	1 J	0.3 U
1,4-Dichlorobenzene	7.5E5[b]	7.5 U	- -	0.5 J	0.6 J	0.3 U
2-Methylnaphthalene	310[b]	7.5 U	- -	17	19	0.3 U
Acenaphthene	470[b]	7.5 U	- -	0.3 J	0.3 J	0.3 U
Anthracene	2300[b]	7.5 U	- -	0.2 J	0.2 J	0.3 U
Benzo(a)anthracene	0.088[b]	7.5 U	- -	0.3 J	0.3 J	0.3 U
Benzo(g,h,i)perylene	UA	7.5 U	- -	0.2 J	0.2 J	0.3 U
Benzoic acid	3.1E4[b]	50 U	- -	20 U	20 U	2 U
Benzyl butyl phthalate	1600[b]	7.5 U	- -	3 U	3 U	0.3 U
bis-(2-ethylhexyl)phthalate	4.6[b]	7.5 U	- -	1 J	1 J	0.3 U
Chrysene	8.8[b]	7.5 U	- -	0.2 J	0.3 J	0.3 U
Dibenzofuran	31[b]	7.5 U	- -	0.3 J	3 U	0.3 U
Di-n-butyl phthalate	780[b]	0.3 J	- -	0.2 J	0.3 J	0.3 U
Fluoranthene	310[b]	7.5 U	- -	0.3 J	0.3 J	0.3 U
Fluorene	310[b]	7.5 U	- -	0.9 J	1 J	0.3 U
Naphthalene	310[b]	7.5 U	- -	9.7	11	0.3 U
Phenanthrene	UA	7.5 U	- -	1 J	1 J	0.3 U
Pyrene	230[b]	7.5 U	- -	0.5 J	0.6 J	0.3 U
Metals (mg/Kg)						
Barium	550[b]	45	- -	57	- -	52
Cadmium	3.9[b]	0.6 J	- -	0.8 J	- -	1 U
Chromium	39/7800[b]	29	- -	32	- -	25
Iron	2300[b]	24000	- -	25500	- -	23200
Nickel	160[b]	- -	- -	- -	- -	- -
Arsenic	2.3[b]	4	- -	5	- -	6
Lead	400[c]	9	- -	16	- -	4
Mercury	2.3[b]	0.1 J	- -	0.1 J	- -	0.07 J

Notes:

U: Compound not detected; value reported is the method reporting limit (MRL).

J: Compound detected between the MRL and the method detection limit (MDL); value reported is considered an estimate.

--: Analysis not performed.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).

[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

TABLE 4.1-8 ANALYTES DETECTED IN SOIL SAMPLES AT BUILDING 35-752
DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3920			
Depth (feet)		1-3	10-12	15-17	15-17
Field-ID		985752019SL	985752021SL	985752022SL	985752027SL
Lab ID	Screening	K98325213	K98325214	K98325215	K98325218
Date	Criteria	20-May-98	20-May-98	20-May-98	20-May-98 DUP
Petroleum Hydrocarbons (mg/Kg)					
Gasoline Range Organics	50-100[a]	5 U	4 J	140	- -
Diesel Range Organics	100-200[a]	14	168	3710	- -
Residual Range Organics	UA	88 J	155	706	- -
Volatile Organic Compounds (µg/Kg)					
Benzene	100-500[a], 2.2E3[b]	5 U	5 U	25 U	- -
Toluene	1.6E6[b]	5 U	5 U	24	- -
Ethylbenzene	7.8E5[b]	5 U	5 U	210	- -
Xylenes	1.6E7[b]	5 U	5 U	460	- -
n-Butylbenzene	7.8E4[b]	20 U	20 U	4800	- -
sec-Butylbenzene	7.8E4[b]	20 U	20 U	620	- -
Carbon disulfide	7.8E5[b]	5 U	5 U	25 U	- -
Chloroethane	2.2E4[b]	5 U	5 U	25 U	- -
1,2-Dichlorobenzene	7.0E5[b]	5 U	5 U	25 U	- -
1,3-Dichlorobenzene	7.0E5[b]	5 U	5 U	25 U	- -
1,4-Dichlorobenzene	2.7E3[b]	5 U	5 U	25 U	- -
cis-1,2-Dichloroethene	7.8E4[b]	5 U	5 U	25 U	- -
Isopropylbenzene	UA	20 U	20 U	360	- -
4-Isopropyltoluene	UA	20 U	20 U	4000	- -
Naphthalene	3.1E5[b]	20 U	20 U	4400	- -
n-Propylbenzene	7.8E4[b]	20 U	20 U	830	- -
Tetrachloroethene	1.2E3[b]	5 U	5 U	25 U	- -
Trichloroethene	5.8E3[b]	5 U	1 J	6 J	- -
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	5700	- -
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	200	- -
Acetone	7.8E5[b]	50 U	50 U	250 U	- -
Pesticides (µg/Kg)					
4,4'-DDT	190[b]	6 J	10 U	10 U	10 U
Endosulfan II	4.7E4[b]	2 J	10 U	10 U	10 U
Polychlorinated Biphenyls (PCBs) (mg/Kg)					
PCB-1254 (Aroclor 1254)	160[b]	0.1 U	0.05 J	0.06 J	0.08 J
Total Solids (%)					
Total Solids	UA	94.8	91.5	92.4	91.7

TABLE 4.1-8 ANALYTES DETECTED IN SOIL SAMPLES AT BUILDING 35-752 DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3920			
Depth (feet)		1-3	10-12	15-17	15-17
Field-ID		985752019SL	985752021SL	985752022SL	985752027SL
Lab ID	Screening	K98325213	K98325214	K98325215	K98325218
Date	Criteria	20-May-98	20-May-98	20-May-98	20-May-98 DUP
Semi-Volatile Organic Compounds (mg/Kg)					
1,2-Dichlorobenzene	7.5E5[b]	0.3 U	0.3 U	7.5 U	- -
1,4-Dichlorobenzene	7.5E5[b]	0.3 U	0.3 U	7.5 U	- -
2-Methylnaphthalene	310[b]	0.3 U	0.3 U	9.5	- -
Acenaphthene	470[b]	0.3 U	0.3 U	7.5 U	- -
Anthracene	2300[b]	0.3 U	0.3 U	7.5 U	- -
Benzo(a)anthracene	0.088[b]	0.3 U	0.3 U	7.5 U	- -
Benzo(g,h,i)perylene	UA	0.3 U	0.3 U	7.5 U	- -
Benzoic acid	3.1E4[b]	2 U	2 U	50 U	- -
Benzyl butyl phthalate	1600[b]	0.3 U	0.3 U	7.5 U	- -
bis-(2-ethylhexyl)phthalate	4.6[b]	0.3 U	0.3 U	7.5 U	- -
Chrysene	8.8[b]	0.3 U	0.3 U	7.5 U	- -
Dibenzofuran	31[b]	0.3 U	0.3 U	7.5 U	- -
Di-n-butyl phthalate	780[b]	0.3 U	0.3 U	0.2 J	- -
Fluoranthene	310[b]	0.3 U	0.3 U	7.5 U	- -
Fluorene	310[b]	0.3 U	0.3 U	0.6 J	- -
Naphthalene	310[b]	0.3 U	0.3 U	3 J	- -
Phenanthrene	UA	0.3 U	0.3 U	0.4 J	- -
Pyrene	230[b]	0.3 U	0.3 U	7.5 U	- -
Metals (mg/Kg)					
Barium	550[b]	69	50	40	57
Cadmium	3.9[b]	1 U	0.6 J	0.9 J	0.8 J
Chromium	39/7800[b]	36	30	26	32
Iron	2300[b]	31100	25700	22000	27600
Nickel	160[b]	- -	- -	- -	- -
Arsenic	2.3[b]	6	6	6	6
Lead	400[c]	6	6	5	6
Mercury	2.3[b]	0.08 J	0.1 J	0.1 J	0.1 J

Notes:

U: Compound not detected; value reported is the method reporting limit (MRL).

J: Compound detected between the MRL and the method detection limit (MDL); value reported is considered an estimate.

--: Analysis not performed.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).

[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

TABLE 4.1-9 ANALYTES DETECTED IN GROUNDWATER AT BUILDING 35-752
DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3917	AP3920	AP3231		AP3918
Field-ID		985752033GW	985752035GW	985752036GW	985752037GW	985752039GW
Lab ID	Screening	K98376703	K98376701	K98382503	K98382504	K98382501
Date	Criteria	09-Jun-98	09-Jun-98	11-Jun-98	11-Jun-98 DUP	11-Jun-98
Petroleum Hydrocarbons (µg/L)						
Gasoline Range Organics	15[a]	58	210	50 U	50 U	69
Diesel Range Organics	15[a]	752	1770	100 U	100 U	596
Residual Range Organics	UA	100 J	262	200 U	34 J	105 J
Volatile Organic Compounds (µg/L)						
Aromatic Volatile Organics (AVOs)						
Benzene	15[a], 5[b], 0.36[c]	0.5 U	4.7	0.5 U	0.5 U	0.2 J
Toluene	700[b], 1300[c]	0.4 J	18	0.5 U	0.5 U	1.9
Ethylbenzene	1000[b], 750[c]	1	11	0.5 U	0.5 U	2.0
Xylenes	10000[b], 12000[c]	3.3	31	0.5 U	0.5 U	3.5
Naphthalene	1500[c]	9	32	0.7 J	2 U	16
Isopropylbenzene	UA	0.9 J	5	2 U	2 U	2 J
n-Propylbenzene	UA	2 U	8	2 U	2 U	2
1,2,4-Trimethylbenzene	12[c]	10	24	2 U	2 U	11
1,3,5-Trimethylbenzene	12[c]	2 U	6	2 U	2 U	1 J
4-Isopropyltoluene	UA	3	9	2 U	2 U	3
n-Butylbenzene	61[c]	2 U	3	2 U	2 U	2
sec-Butylbenzene	61[c]	2 U	4	2 U	2 U	1 J
Halogenated Volatile Organics (HVOs)						
1,1,1-Trichloroethane	200[b], 540[c]	0.5 U	0.5 J	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	810[c]	0.5 U	0.2 J	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	64[c]	1	4.7	0.5 U	0.5 U	1.2
1,3-Dichlorobenzene	540[c]	0.5 U	0.3 J	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	0.44[c]	0.5 U	1.9	0.5 U	0.5 U	0.4 J
Chloroform	0.15[c]	0.5 U	0.5 U	0.2 J	0.2 J	0.5 U
cis-1,2-Dichloroethene	61[c]	0.8	9.8	0.5 U	0.5 U	3.2
Trichloroethene	5[b], 1.6[c]	7.2	6	5.0	5.2	11
Trichlorofluoromethane	1300[c]	0.2 J	0.5 U	0.5 U	0.5 U	0.5 U
Semi-Volatile Organic Compounds (µg/L)						
1,2-Dichlorobenzene	64[b]	10 U	1 J	10 U	10 U	10 U
1,4-Dichlorobenzene	0.44[b]	10 U	1 J	10 U	10 U	10 U
2-Methylnaphthalene	UA	10 U	10 U	10 U	10 U	4 J
Di-n-butyl phthalate	3700[c]	0.4 J	0.5 J	10 U	10 U	0.5 J
Fluorene	UA	10 U	1 J	10 U	10 U	10 U
Naphthalene	1500[c]	2 J	0.9 J	10 U	10 U	5 J
Pesticides (µg/L)						
4,4'-DDE	0.2[c]	0.04 U	0.006 J	0.04 U	0.04 U	0.04 U
Aldrin	11[c]	0.04 U	0.04 U	0.04 U	0.04 U	0.007 J
beta-BHC	0.04[c]	0.04 U	0.02 J	0.04 U	0.04 U	0.04 U
Endrin aldehyde	UA	0.04 U	0.009 J	0.04 U	0.04 U	0.04 U

TABLE 4.1-9 ANALYTES DETECTED IN GROUNDWATER AT BUILDING 35-752 DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID		AP3917	AP3920	AP3231		AP3918
Field-ID		985752033GW	985752035GW	985752036GW	985752037GW	985752039GW
Lab ID	Screening	K98376703	K98376701	K98382503	K98382504	K98382501
Date	Criteria	09-Jun-98	09-Jun-98	11-Jun-98	11-Jun-98 DUP	11-Jun-98
Metals (µg/L)						
Arsenic - Dissolved	50[b], 11[c]	5 U	2 J	5 U	5 U	1 J
Arsenic - Total	50[b], 11[c]	1 J	2 J	5 U	5 U	1 J
Barium - Dissolved	2000[b], 2600[c]	13	9	3 J	3 J	7
Barium - Total	2000[b], 2600[c]	16	11	3 J	3 J	8
Iron - Dissolved	11000[b]	59	612	20 U	20 U	27
Iron - Total	11000[b]	404	1220	28	29	775
Other Analyses (mg/L)						
Hardness (As CaCO3)		55.5	67.5	41.3	43.1	57.6
Suspended Solids		5 U	12	5 U	- -	5 U
Sulfate		10.6	10.2	8.6	- -	9.4
Nitrogen, Nitrate-Nitrite		0.7	1.1	0.5	- -	0.5

Notes:

U: Compound not detected; value reported is the method reporting limit (MRL).

J: Compound detected between the MRL and the method detection limit (MDL); value reported is considered an estimate.

--: Analysis not performed.

[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).

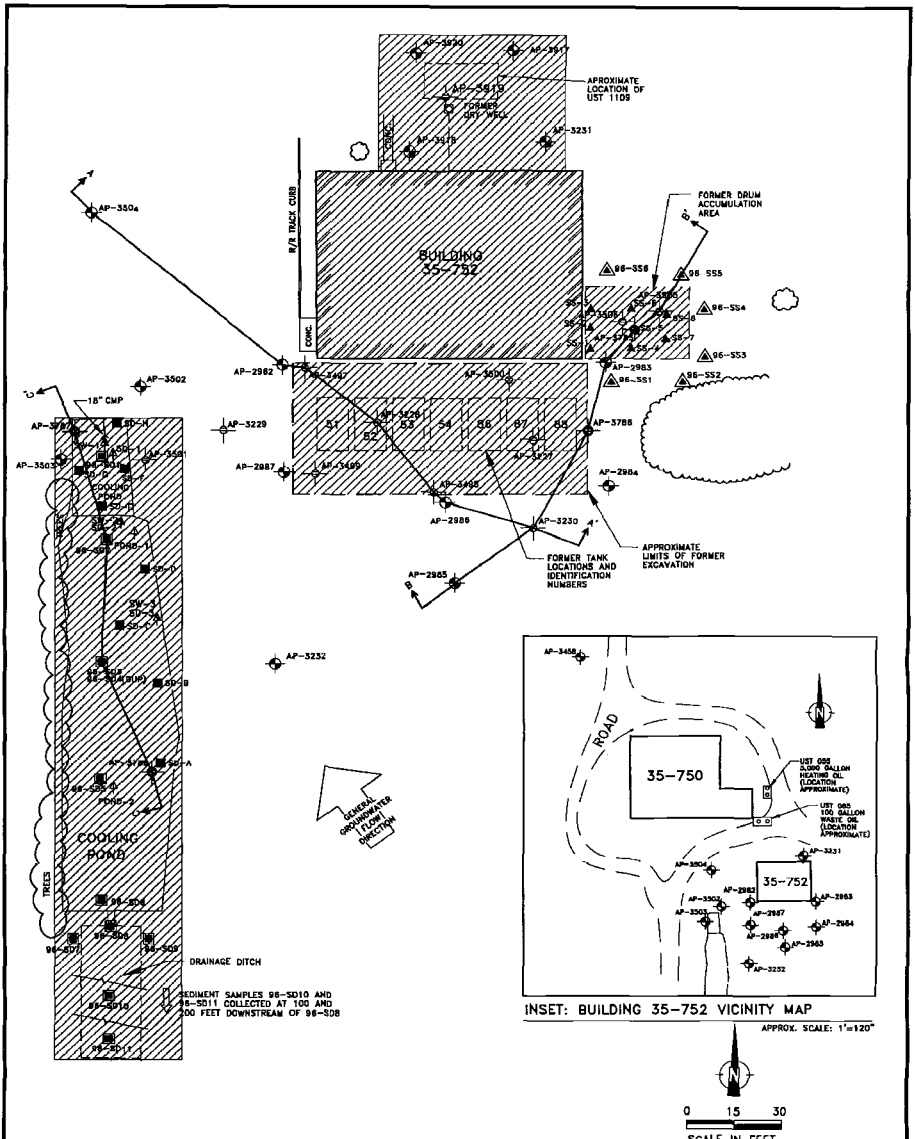
[b]Screening criteria Primary Maximum Contaminant levels (MCLs) EPA.

[c]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996) for tap water.

TABLE 4.1-10 ANALYTES DETECTED IN SOIL STOCKPILE SAMPLES AT BUILDING 35-752 DURING RELEASE INVESTIGATION OF FORMER UST 1109, SUMMER 1998

Location ID	West Side	South Side		East Side	North Side
Field-ID	985752028SL	985752029SL	985752032SL	985752030SL	985752031SL
Lab ID	K98339906	K98339907	K98339910	K98339908	K98339909
Date	28-May-98	28-May-98	28-May-98 DUP	28-May-98	28-May-98
Petroleum Hydrocarbons (mg/Kg)					
Diesel Range Organics	66	198	292	676	237
Residual Range Organics	325	728	1060	2370	1000
Semi-Volatile Organic Compounds (mg/Kg)					
Benzo(g,h,i)perylene	0.06 J	0.05 J	- -	0.09 J	0.06 J
bis-(2-ethylhexyl)phthalate	0.3 U	0.3 U	- -	0.2 J	0.3 U
Fluoranthene	0.3 U	0.3 U	- -	0.3 U	0.1 J
Phenanthrene	0.3 U	0.3 U	- -	0.3 U	0.1 J
Pyrene	0.3 U	0.3 U	- -	0.3 U	0.1 J
Pesticides (µg/Kg)					
4,4'-DDD	6 J	6 J	- -	11	7 J
4,4'-DDT	42	35	- -	8 J	19
Polychlorinated Biphenyls (PCBs) (mg/Kg)					
PCB-1260 (Aroclor 1260)	0.3	0.3	- -	0.2	0.2
Leachate Metals (mg/L)					
Barium - Total	0.5 U	0.5 U	- -	0.6	0.5 U
Lead - Total	0.05 U	0.05 U	- -	0.09	0.05 U
Total Solids (%)					
Total Solids	91.5	90.1	90.7	91.7	90.2

Notes:
U: Compound not detected; value reported is the method reporting limit (MRL).
J: Compound detected between the MRL and the method detection limit (MDL); value reported is considered an estimate.
--: Analysis not performed.



LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- SOIL BORING LOCATION (RI, 1998)
- SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (RI, 1998)
- SURFACE WATER/SEDIMENT SAMPLE LOCATION (PSE2, 1994)
- SURFACE WATER SAMPLE LOCATION (RI, 1998)
- SURFACE SAMPLE LOCATION (PSE2, 1994)
- SURFACE SAMPLE LOCATION (RI, 1998)
- AREAS OF INVESTIGATION

SOURCE: ENSR/9000-036/35-75285

RI/FS REPORT
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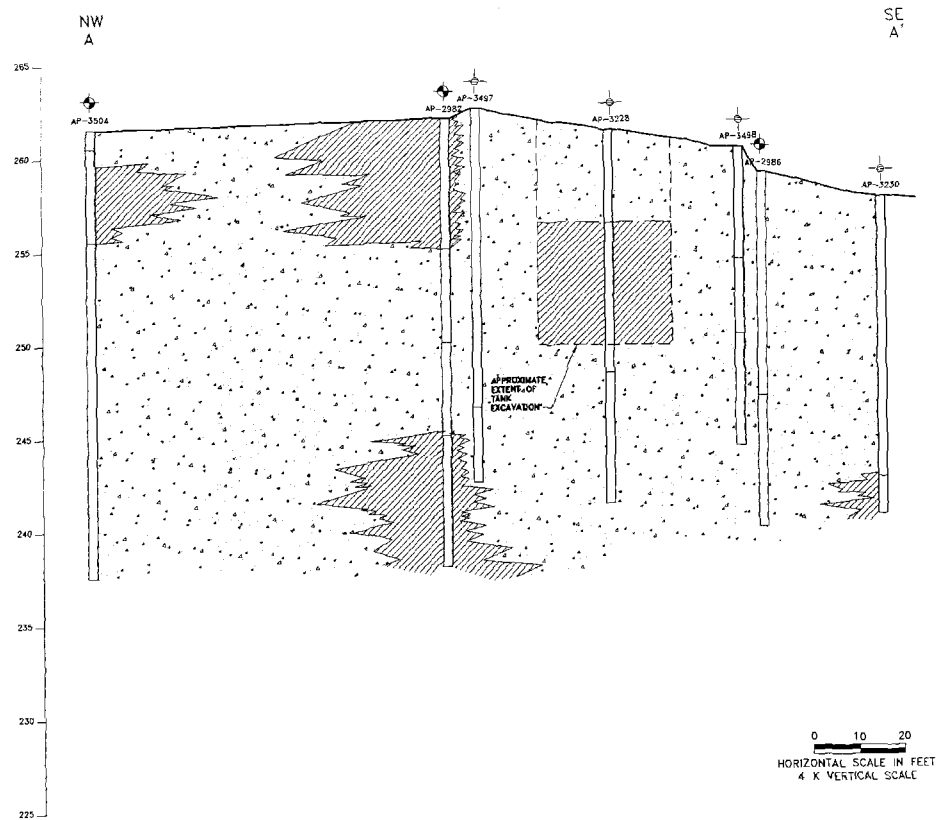
FIGURE 4.1-1
BUILDING 35-752
SAMPLE LOCATIONS AND
AREAS OF INVESTIGATION

DATE: 11/12/98	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 35-752
C/SC: 1:50 Z 11/97	DISK:	ENGINEER: J. SHAPIRO	CHECKED: J.SHAPIRO	PROJECT: 9000-107-090

OU-D 33364



LEGEND

SANDS AND GRAVELS WITH <15% FINES

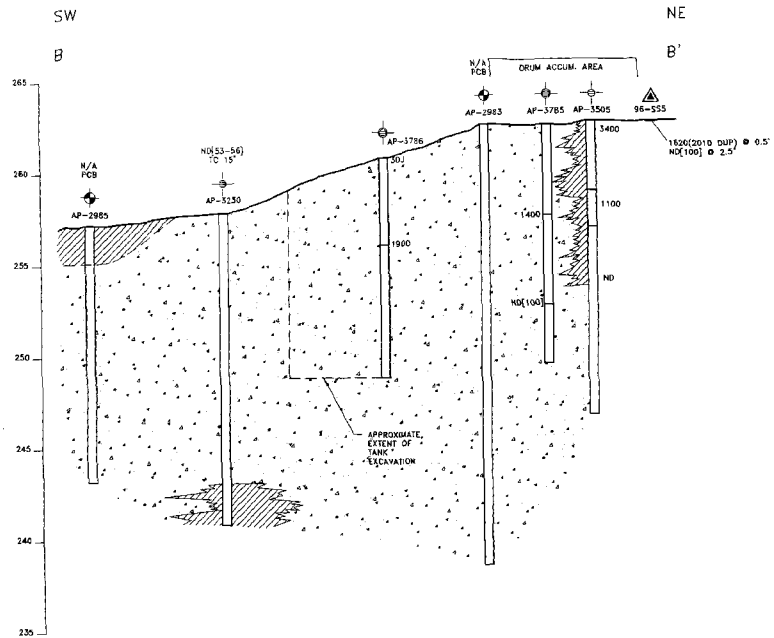
SILTY SANDS AND GRAVELS (>15% FINES)

SOURCE:

RI/FS REPORT
OPERABLE UNIT D
FORT RICHARDSON, ALASKA

FIGURE 4.1-2
BUILDING 35-752
CROSS SECTION A-A'

DATE: 9/29/98	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 35752AA
C/SC: 1:20 DISK: 11/97	ENGINEER: J. SHAPIRO	CHECKED: J. SHAPIRO	PROJECT: 9000-107-120



0 10 20
HORIZONTAL SCALE IN FEET
4 X VERTICAL SCALE

LEGEND

GRAVELS AND SANDS

SILT, SILTY SANDS AND GRAVELS

N/A PCB – SAMPLES NOT SUBMITTED FOR PCB ANALYSIS

ND[100] – NOT DETECTED ABOVE THE METHOD REPORTING LIMIT OF 100

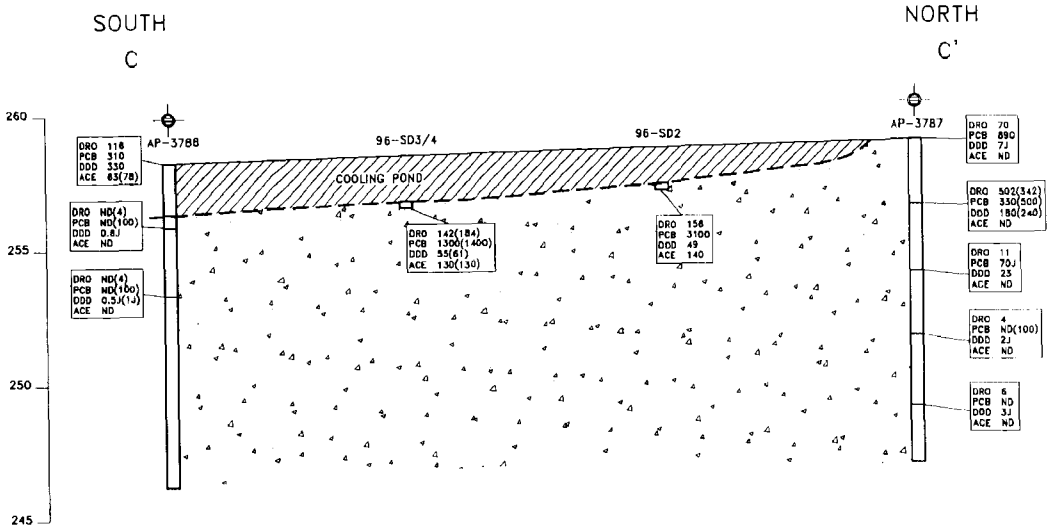
RESULTS REPORTED IN µg/Kg

SOURCE:

RI/FS REPORT
OPERABLE UNIT D
FORT RICHARDSON, ALASKA

FIGURE 4.1-3
BUILDING 35-752
CROSS SECTION B-B' WITH
CONCENTRATIONS OF PCBs SHOWN

DATE: 9/25/98	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 35752BB
C/SC: 1:20 DISK: 11/97	ENGINEER: J. SHAPIRO	CHECKED: J. SHAPIRO	PROJECT: 9000-107-120



LEGEND

DRO = DIESEL RANGE ORGANICS
PCB = POLYCHLORINATED BIPHENYL (PCB 1260)
DDD = 4,4'-DDD
ACE = ACETONE
ND(4) = NOT DETECTED ABOVE METHOD REPORTING LIMIT OF 4
J = ESTIMATED VALUE

SAND AND GRAVELS WITH <15% FINES

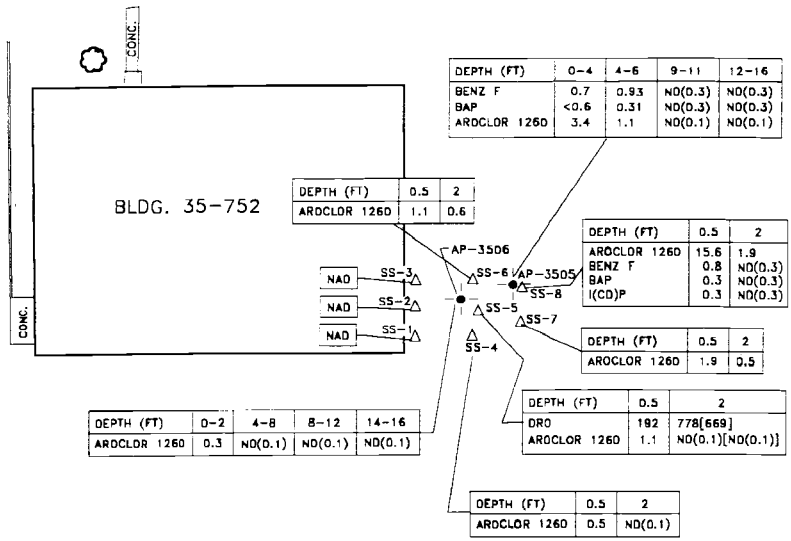
NOTE: ANALYTICAL RESULTS REPORTED AS µg/Kg EXCEPT DRO IS REPORTED AS mg/Kg

0 10 20
HORIZONTAL SCALE IN FEET
4 X VERTICAL SCALE

DRAWING: 35752CC	DRAWN: SR	FIGURE 4.1-4
C/SC: 1:20	DISK: 11/97	BUILDING 35-752
DATE: 9/29/98	CHECK: J.S.	CROSS SECTION C-C'

RI/FS REPORT
OPERABLE UNIT D
FORT RICHARDSON, ALASKA
PROJECT 9000-107-120

OU-D 33367



LEGEND

SOIL BORING LOCATION

SURFACE SOIL SAMPLE

ALL BORINGS DRILLED/SAMPLES COLLECTED IN 1994 (ENSR 1995)

BENZ F BENZO(B)FLUORANTHENE

BAP BENZO(A)PYRENE

DRO DIESEL RANGE ORGANICS

I(CD)P INDENO(1,2,3-CD)PYRENE

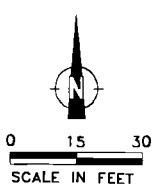
ND(0.1) NOT DETECTED ABOVE THE METHOD REPORTING LIMIT OF 0.1 mg/Kg

[ ] RESULT FROM DUPLICATE SAMPLE

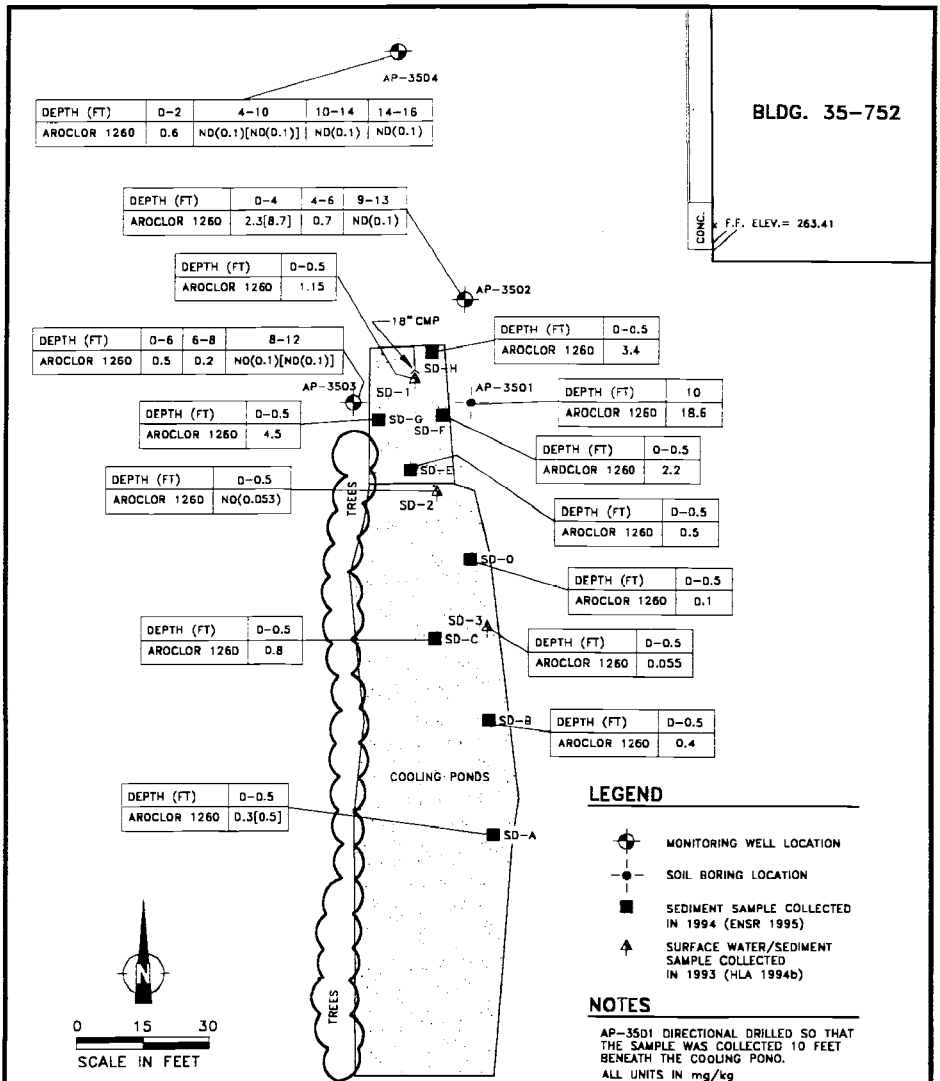
NAD NO ANALYTES DETECTED ABOVE SCREENING CRITERIA, (DETERMINED IN MANAGEMENT PLAN)

NOTES:

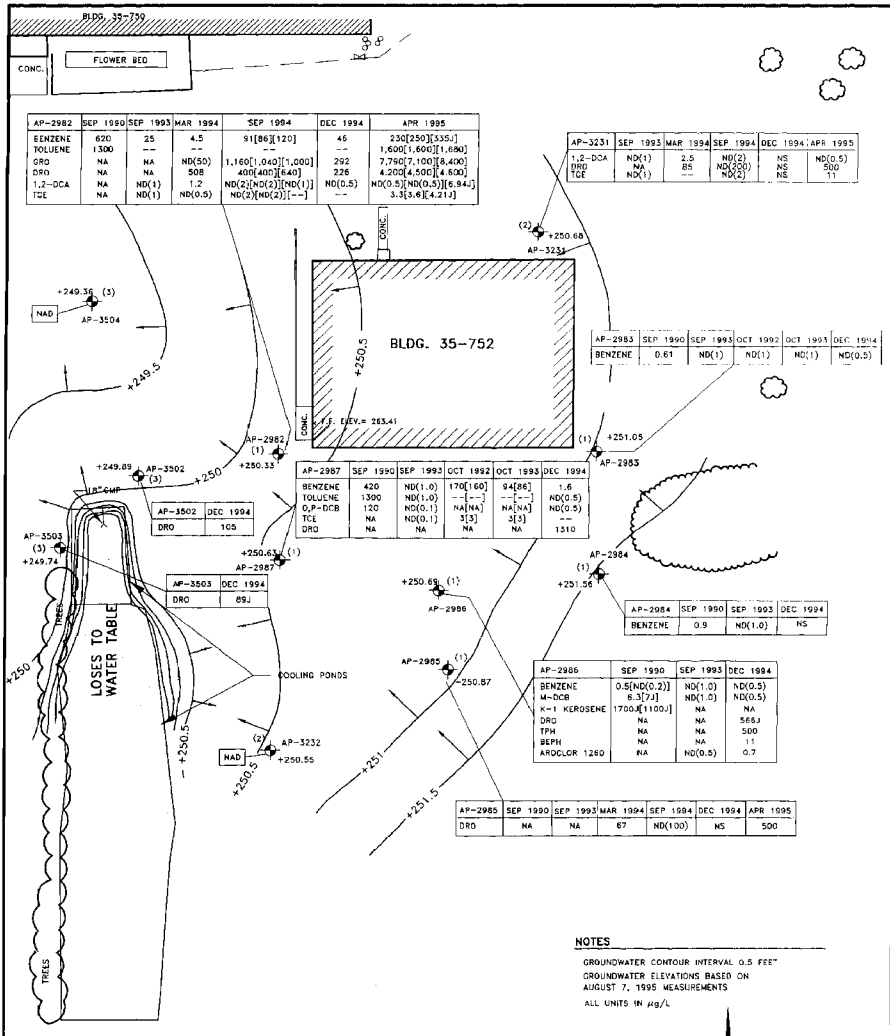
ALL SAMPLE LOCATIONS CONTAIN AROCLOR 1260 EXCEPT SS-1, SS-2, SS-3
RESULTS REPORTED IN mg/Kg



DRAWING: 35-7520A DRAWN: DM/SR C/SC: 1:30 DISK: 11/97 DATE: 2/6/98 CHECK: J.S.	FIGURE 4.1-5 BUILDING 35-752 ORGANIC ANALYTES EXCEEDING SCREENING CRITERIA IN SOIL DRUM ACCUMULATION AREA, (PRE-RI)	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120



DRAWING: 35-752CP DRAWN: DPM C/SC: 1:30 DISK: Z 11/97 DATE: 9/25/98 CHECK: SW	FIGURE 4.1-6 BUILDING 35-752 PCBs EXCEEDING SCREENING CRITERIA IN SOIL AND SEDIMENT COOLING PONDS (PRE-RI)	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120



AP-2982	SEP 1990	SEP 1993	MAR 1994	SEP 1994	DEC 1994	APR 1995
BENZENE	620	25	4.5	91[86][120]	46	230[250][535J]
TOLUENE	1300	--	--	--	--	1,600[1,600][1,680]
GRO	NA	NA	ND(50)	1,160[1,040][1,000]	292	7,750[7,100][8,400]
DRO	NA	NA	508	400[440][640]	226	4,200[4,500][4,600]
1,2-DCA	NA	ND(1)	1.2	ND(2)[ND(2)][ND(1)]	ND(0.5)	ND(0.5)[ND(0.5)][6.84J]
TCE	NA	ND(1)	ND(0.5)	ND(2)[ND(2)][--]	--	3.3[3.6][4.21J]

AP-3231	SEP 1993	MAR 1994	SEP 1994	DEC 1994	APR 1995
1,2-DCA	ND(1)	2.5	ND(2)	NS	ND(0.5)
GRO	NA	85	ND(200)	NS	500
TCE	ND(1)	--	ND(2)	NS	11

AP-2983	SEP 1990	SEP 1993	OCT 1992	OCT 1993	DEC 1994
BENZENE	0.61	ND(1)	ND(1)	ND(1)	ND(0.5)

AP-2987	SEP 1990	SEP 1993	OCT 1992	OCT 1993	DEC 1994
BENZENE	420	ND(1.0)	170[160]	94[86]	1.6
TOLUENE	1300	ND(1.0)	--[--]	--[--]	ND(0.5)
O,P-DCB	120	ND(0.1)	NA[NA]	NA[NA]	ND(0.5)
TCE	NA	ND(0.1)	3[3]	3[3]	--
DRO	NA	NA	NA	NA	1310

AP-3502	DEC 1994
DRO	105

AP-3503	DEC 1994
DRO	89J

AP-2984	SEP 1990	SEP 1993	DEC 1994
BENZENE	0.9	ND(1.0)	NS

AP-2986	SEP 1990	SEP 1993	DEC 1994
BENZENE	0.5[ND(0.2)]	ND(1.0)	ND(0.5)
M-DCB	6.3[7J]	ND(1.0)	ND(0.5)
K-1 KEROSENE	1700J[1100J]	NA	NA
DRO	NA	NA	566J
TPH	NA	NA	500
BEPH	NA	NA	11
AROCLOR 1260	NA	ND(0.5)	0.7

AP-2985	SEP 1990	SEP 1993	MAR 1994	SEP 1994	DEC 1994	APR 1995
DRO	NA	NA	67	ND(100)	NS	500

NOTES

GROUNDWATER CONTOUR INTERVAL 0.5 FEET
GROUNDWATER ELEVATIONS BASED ON AUGUST 7, 1995 MEASUREMENTS
ALL UNITS IN µg/L

N

0 15 30
SCALE IN FEET

LEGEND

⊕	MONITORING WELL LOCATION
+251.50	GROUNDWATER TABLE ELEVATION
(1)	MONITORING WELL INSTALLED IN 1990 (USACE 1991)
(2)	MONITORING WELL INSTALLED IN 1993 (RLA 1994B)
(3)	MONITORING WELL INSTALLED IN 1994 (ENSR 1995)
J	VALUE IS CONSIDERED AN ESTIMATE
NA	NOT ANALYZED
NS	NOT SAMPLED
BEPH	BIS(2-ETHYLHEXYL)PHTHALATE
DCA	DICHLOROETHANE
DCB	DICHLOROBENZENE
DRO	DIESEL RANGE ORGANICS
NAD	NO ANALYTES DETECTED ABOVE SCREENING CRITERIA
TCE	TRICHLOROETHENE
TPH	TOTAL PETROLEUM HYDROCARBONS
--	DETECTED, BUT NOT ABOVE SCREENING CRITERIA

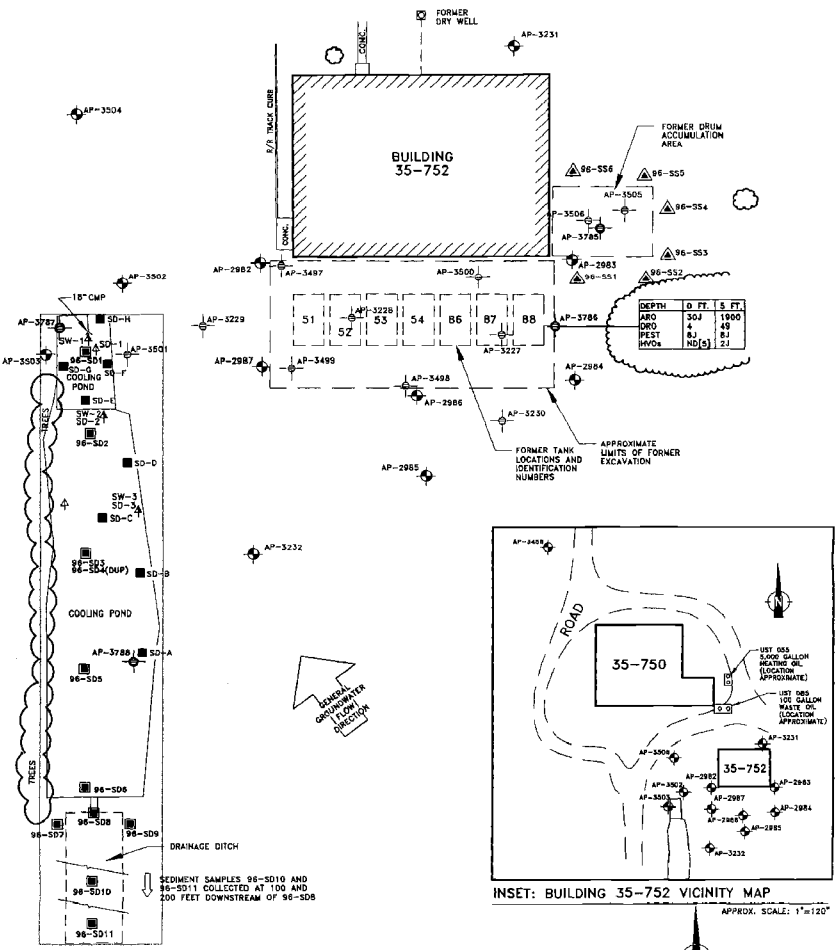
SOURCE: 8000-036\35-752BS

RI/FS REPORT
OPERABLE UNIT D
FT. RICHARDSON, ALASKA

FIGURE 4.1-7
BUILDING 35-752
ORGANIC COMPOUNDS EXCEEDING CRITERIA IN GROUNDWATER
(PRE-RI)

DATE:	DRAWN BY:	SCALE:	DRAWING:
9/29/98	SSR	AS SHOWN	35752DA1
C/SC: DISK: 1:300 Z 11/97	ENGINEER: J. SHAPIRO	CHECKED: J.SHAPIRO	PROJECT: 9000-107-120

OU-D 33370



LEGEND

- MONITORING WELL LOCATION
- MONITORING WELL LOCATION (RI, 1995)
- SOIL BORING LOCATION
- SOIL BORING LOCATION (RI, 1996)
- SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (RI, 1996)
- SURFACE WATER/SEDIMENT SAMPLE LOCATION (PSEZ, 1994)
- SURFACE WATER SAMPLE LOCATION (RI, 1996)
- SURFACE SAMPLE LOCATION (RI, 1996)

ARO = AROCLOR-1260
DRO = DIESEL RANGE ORGANICS (mg/Kg)
PEST = PESTICIDES (ESTIMATED TOTAL CONCENTRATION)
HVOs = ESTIMATED TOTAL HALOGENATED VOLATILE ORGANICS
J = ESTIMATED VALUE
ND[5] = NOT DETECTED ABOVE METHOD
R = REPORTING LIMIT OF 5

NOTE: ANALYTICAL RESULTS REPORTED AS ug/Kg EXCEPT DRO IS REPORTED AS mg/Kg

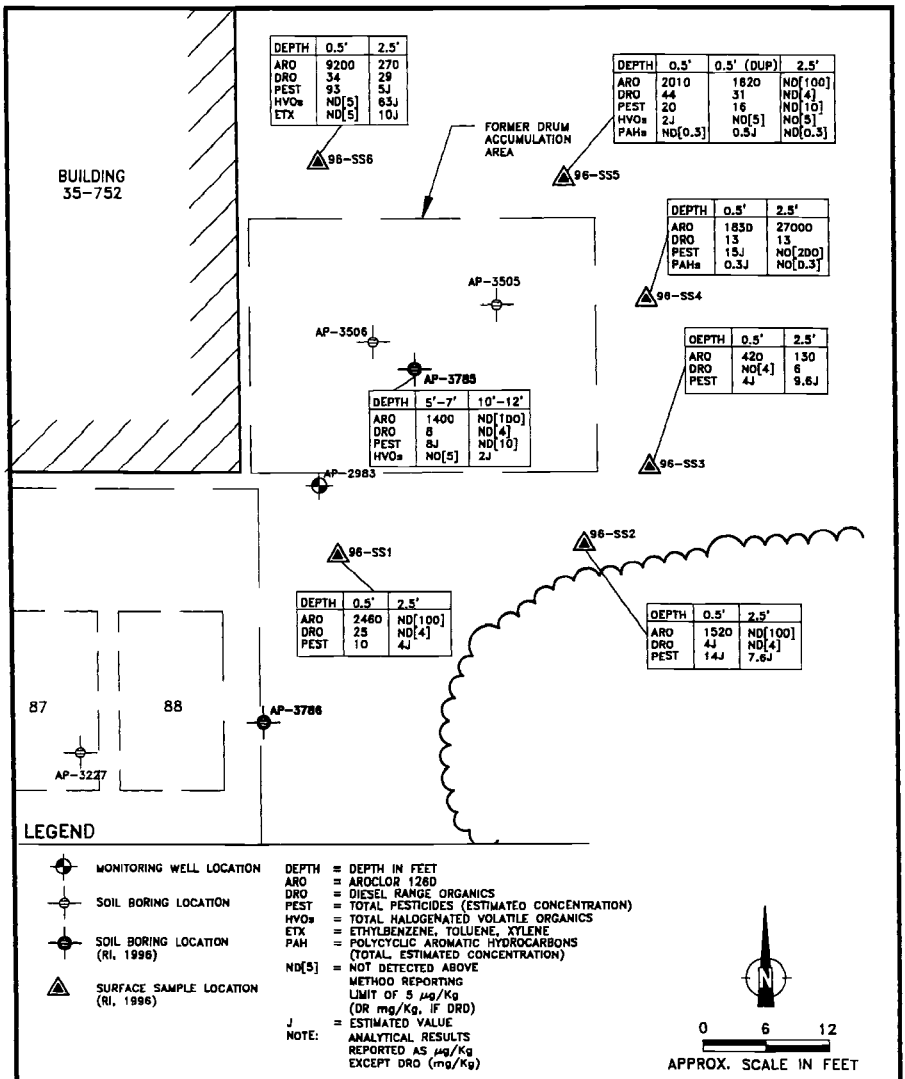
SOURCE: ENSR/9000-038/35-7528S

RI/FS REPORT
OPERABLE UNIT D
FT. RICHARDSON, ALASKA

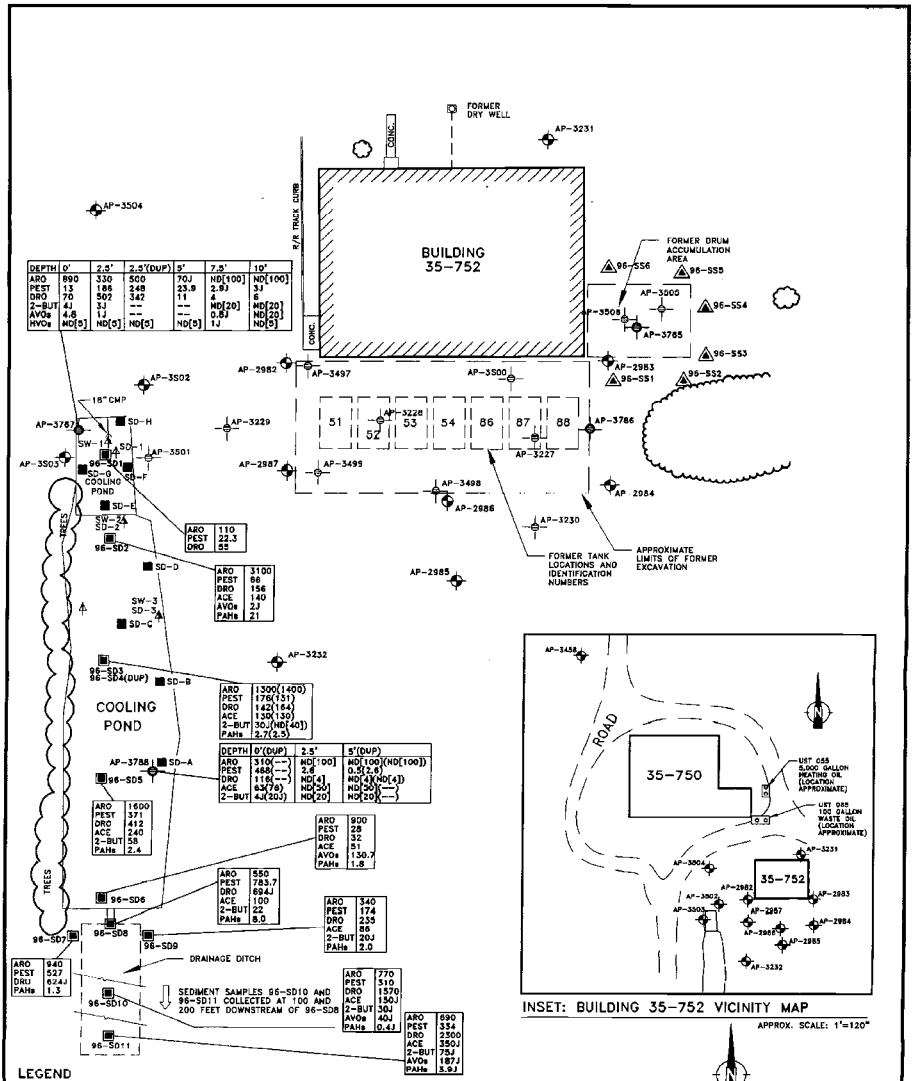
FIGURE 4.1-8
BUILDING 35-752
ORGANIC COMPOUNDS DETECTED IN SOIL BORING
FORMER UST LOCATIONS (RI)

DATE:	DRAWN BY:	SCALE:	DRAWING:
9/29/98	SSR	AS SHOWN	3575258
C/SC: D/SK: 1:30 Z 11/97	ENGINEER: J. SHAPIRO	CHECKED: J.SHAPIRO	PROJECT: 9000-107-120

OU-D 3337I



DRAWING: 357520C	DRAWN: SSR	FIGURE 4.1-9 ORGANIC COMPOUNDS DETECTED IN SOIL DRUM ACCUMULATION AREA (RI)
C/SC: 1:12	DISK: Z 11/97	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120
DATE: 9/29/98	CHECK: J.S.	



DEPTH	0'	2.5'	2.5'(DUP)	5'	7.5'	10'
ARO	890	330	500	70J	ND[100]	ND[100]
PEST	13	186	248	23.9	2.9J	3J
DRO	70	502	342	11	4	6
2-BUT	4J	3J	---	---	ND[20]	ND[20]
AVOs	4.6	1J	---	---	0.8J	ND[20]
HVOs	ND[5]	ND[5]	ND[5]	ND[5]	1J	ND[5]

ARO	110
PEST	22.3
DRO	55

ARO	3100
PEST	86
DRO	156
ACE	140
AVOs	2J
PAHs	21

ARO	1300(1400)
PEST	176(31)
DRO	142(164)
ACE	130(130)
2-BUT	30J(ND[40])
PAHs	2.7(2.5)

DEPTH	0'(DUP)	2.5'	5'(DUP)
ARO	310(---)	ND[100]	ND[100](ND[100])
PEST	468(---)	2.6	0.5(2.5)
DRO	116(---)	ND[4]	ND[4](ND[4])
ACE	63(70)	ND[50]	ND[50](---)
2-BUT	4J(20J)	ND[20]	ND[20](---)

ARO	1600
PEST	371
DRO	412
ACE	240
2-BUT	58
PAHs	2.4

ARO	900
PEST	28
DRO	32
ACE	51
AVOs	130.7
PAHs	1.8

ARO	550
PEST	783.7
DRO	694J
ACE	100
2-BUT	22
PAHs	8.0

ARO	340
PEST	174
DRO	235
ACE	86
2-BUT	20J
PAHs	2.0

ARO	940
PEST	527
DRO	624J
PAHs	1.3

ARO	770
PEST	510
DRO	1570
ACE	150J
2-BUT	30J
AVOs	40J
PAHs	0.4J

ARO	690
PEST	334
DRO	2300
ACE	350J
2-BUT	75J
AVOs	187J
PAHs	3.9J

LEGEND

- MONITORING WELL LOCATION
- MONITORING WELL LOCATION (RI, 1996)
- SOIL BORING LOCATION
- SOIL BORING LOCATION (RI, 1996)
- SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (RI, 1996)
- SURFACE WATER/SEDIMENT SAMPLE LOCATION (PSE2, 1994)
- SURFACE WATER SAMPLE LOCATION (RI, 1996)
- SURFACE SAMPLE LOCATION (PSE2, 1994)
- SURFACE SAMPLE LOCATION (PSE2, 1996)

DEPTH = DEPTH IN FEET
ARO = AROCLOR 1260
AVOs = ESTIMATED TOTAL AROMATIC VOLATILE ORGANICS
PEST = ESTIMATED TOTAL CHLORINATED PESTICIDES
DRO = DIESEL RANGE ORGANICS (mg/Kg)
ACE = ACETONE
2-BUT = 2-BUTANONE
PAHs = POLYCYCLIC AROMATIC HYDROCARBONS
HVOs = ESTIMATED TOTAL HALOGENATED VOLATILE ORGANICS
ND[40] = NOT DETECTED ABOVE METHOD REPORTING LIMIT OF 40 µg/Kg
--- = PARAMETER NOT ANALYZED
J = ESTIMATED VALUE (J HAS BEEN DROPPED IF NOT ALL SUMMED VALUES WERE ESTIMATED VALUES)

NOTE: ANALYTICAL SOIL RESULTS REPORTED AS µg/Kg EXCEPT DRO IN mg/Kg

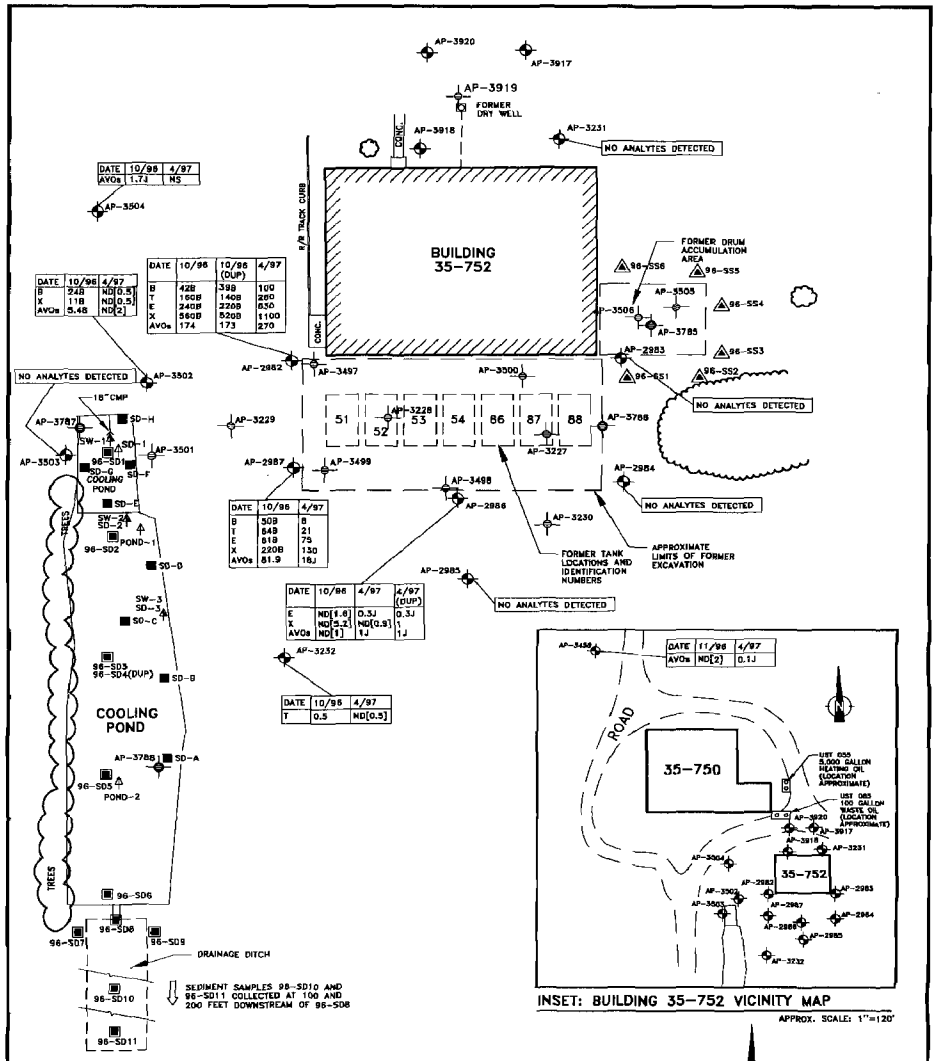
SOURCE: ENSR/9000-036/35-752BS

RI/FS REPORT
OPERABLE UNIT D
FT. RICHARDSON, ALASKA

FIGURE 4.1-10
BUILDING 35-752
ORGANIC COMPOUNDS DETECTED IN SOILS
COOLING POND (RI)

DATE: 9/25/98	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 357520CC
C/SC: 1:50 Z 11/97	DISK:	ENGINEER: J. SHAPIRO	CHECKED: J.SHAPIRO	PROJECT: 9000-107-120

OU-D 33373



LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- SOIL BORING LOCATION (RI, 1996)
- SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (RI, 1996)
- SURFACE WATER/SEDIMENT SAMPLE LOCATION (PSI2, 1994)
- SURFACE WATER SAMPLE LOCATION (RI, 1996)
- SURFACE SAMPLE LOCATION (RI, 1996)

B = BENZENE
T = TOLUENE
E = ETHYLBENZENE
X = XYLENE
AVOs = OTHER AROMATIC VOLATILE ORGANICS, ESTIMATED TOTAL CONCENTRATION
ND[12] = NOT DETECTED ABOVE METHOD REPORTING LIMIT OF 12 µg/L.
J = ESTIMATED VALUE
50B = COMPOUND WAS FOUND PRESENT IN AN ASSOCIATED METHOD, TRIP AND/OR RINSATE BLANK

NOTE: ANALYTICAL RESULTS REPORTED AS µg/L

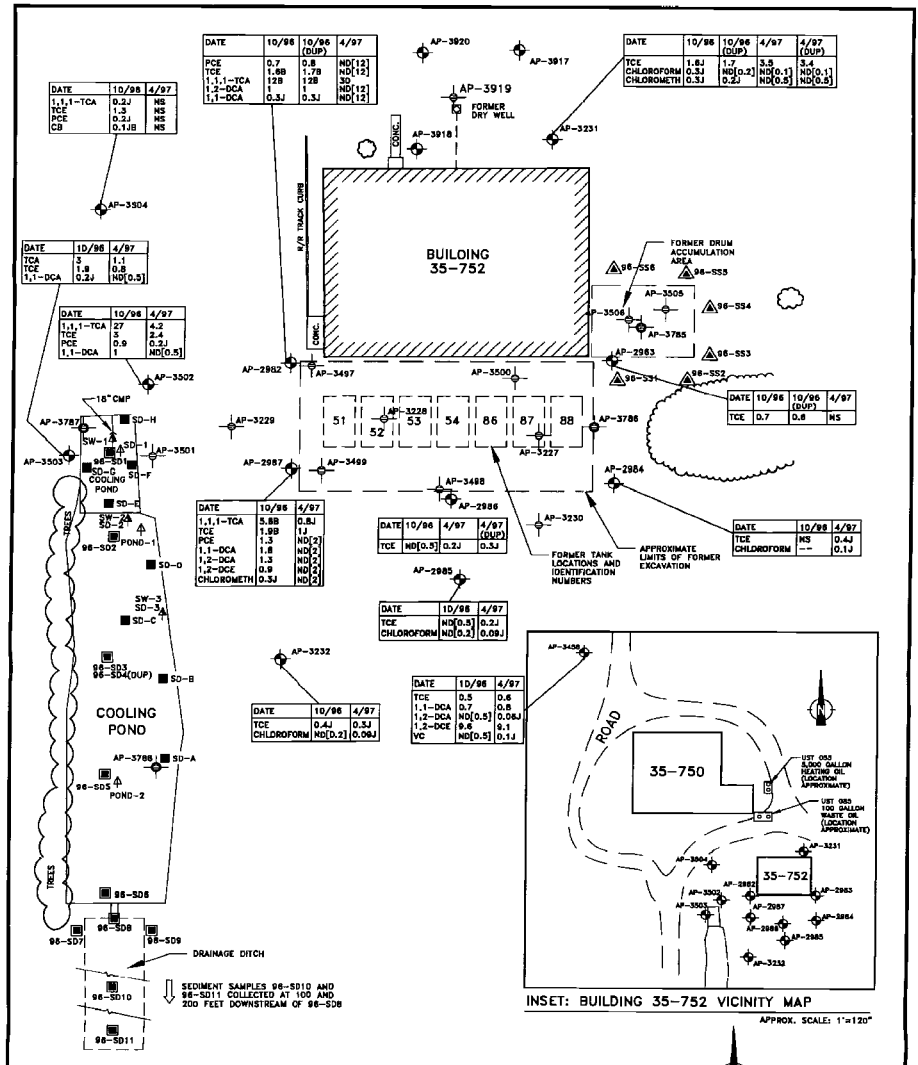
SOURCE: ENSR/9000-056/35-7528S

RI/FS REPORT
OPERABLE UNIT D
FT. RICHARDSON, ALASKA

FIGURE 4.1-11
BUILDING 35-752
AROMATIC VOLATILE ORGANICS (AVOs) DETECTED IN GROUNDWATER
OCTOBER96/APRIL97 (RI)

DATE: 11/18/98	DRAWN BY: SSR	SCALE: AS SHOWN	DRAWING: 35752VA
C/SC: 1:30 I 11/97	DISK:	ENGINEER: J. SHAPIRO	CHECKED: J.SHAPIRO	PROJECT: 9000-107-090

OU-D 33374



DATE	10/96	10/96 (DUP)	4/97
PCE	0.7	0.8	ND[12]
TCE	1.6B	1.7B	ND[12]
1,1,1-TCA	12B	12B	3D
1,2-DCA	1	1	ND[12]
1,1-DCA	0.3J	0.3J	ND[12]

DATE	10/96	4/97
1,1,1-TCA	0.3J	NS
TCE	1.3	NS
PCE	0.2J	NS
CB	0.13B	NS

DATE	10/96	10/96 (DUP)	4/97	4/97 (DUP)
TCE	1.6J	1.7	3.5	3.4
CHLOROFORM	0.3J	ND[0.2]	ND[0.1]	ND[0.1]
CHLOROMETH	0.3J	0.2J	ND[0.5]	ND[0.5]

DATE	10/96	4/97
TCA	3	1.1
TCE	1.8	0.8
1,1-DCA	0.2J	ND[0.5]

DATE	10/96	4/97
1,1,1-TCA	27	4.2
TCE	3	2.4
PCE	0.9	0.2J
1,1-DCA	1	ND[0.5]

DATE	10/96	10/96 (DUP)	4/97
TCE	0.7	0.8	NS

DATE	10/96	4/97
1,1,1-TCA	5.8B	0.8J
TCE	1.9B	1J
PCE	1.3	ND[2]
1,1-DCA	1.8	ND[2]
1,2-DCA	1.3	ND[2]
1,2-DCE	0.9	ND[2]
CHLOROMETH	0.3J	ND[2]

DATE	10/96	4/97	4/97 (DUP)
TCE	ND[0.5]	0.2J	0.3J

DATE	10/96	4/97
TCE	NS	0.4J
CHLOROFORM	--	0.1J

DATE	10/96	4/97
TCE	ND[0.5]	0.2J
CHLOROFORM	ND[0.2]	0.09J

DATE	10/96	4/97
TCE	0.4J	0.3J
CHLOROFORM	ND[0.2]	0.09J

DATE	10/96	4/97
TCE	0.5	0.6
1,1-DCA	0.7	0.8
1,2-DCA	ND[0.5]	0.06J
1,2-DCE	9.6	9.1
VC	ND[0.5]	0.1J

INSET: BUILDING 35-752 VICINITY MAP

APPROX. SCALE: 1"=120'

0 15 30

SCALE IN FEET

LEGEND

- MONITORING WELL LOCATION
- MONITORING WELL LOCATION (RI, 1996)
- SOIL BORING LOCATION
- SOIL BORING LOCATION (RI, 1996)
- SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (RI, 1996)
- SURFACE WATER/SEDIMENT SAMPLE LOCATION (FS12, 1994)
- SURFACE WATER SAMPLE LOCATION (RI, 1996)
- SURFACE SAMPLE LOCATION (RI,1996)

CB = CHLOROBENZENE
CHLOROMETH = CHLOROMETHANE
VC = VINYL CHLORIDE
1,1,1-TCA = 1,1,1-TRICHLOROETHANE
TCE = TRICHLOROETHENE
PCE = TETRACHLOROETHENE
TCA = TRICHLOROETHANE
1,1-DCA = 1,1-DICHLOROETHANE
1,2-DCA = 1,2-DICHLOROETHANE
1,2-DCE = cis-1,2-DICHLOROETHENE
ND[12] = NOT DETECTED ABOVE METHOD REPORTING LIMIT OF 12 µg/L
NS = NOT SAMPLED
J = ESTIMATED VALUE
NOTE: ANALYTICAL RESULTS REPORTED AS µg/L

SOURCE: ENSR/9000-036/35-752BS

RI/FS REPORT
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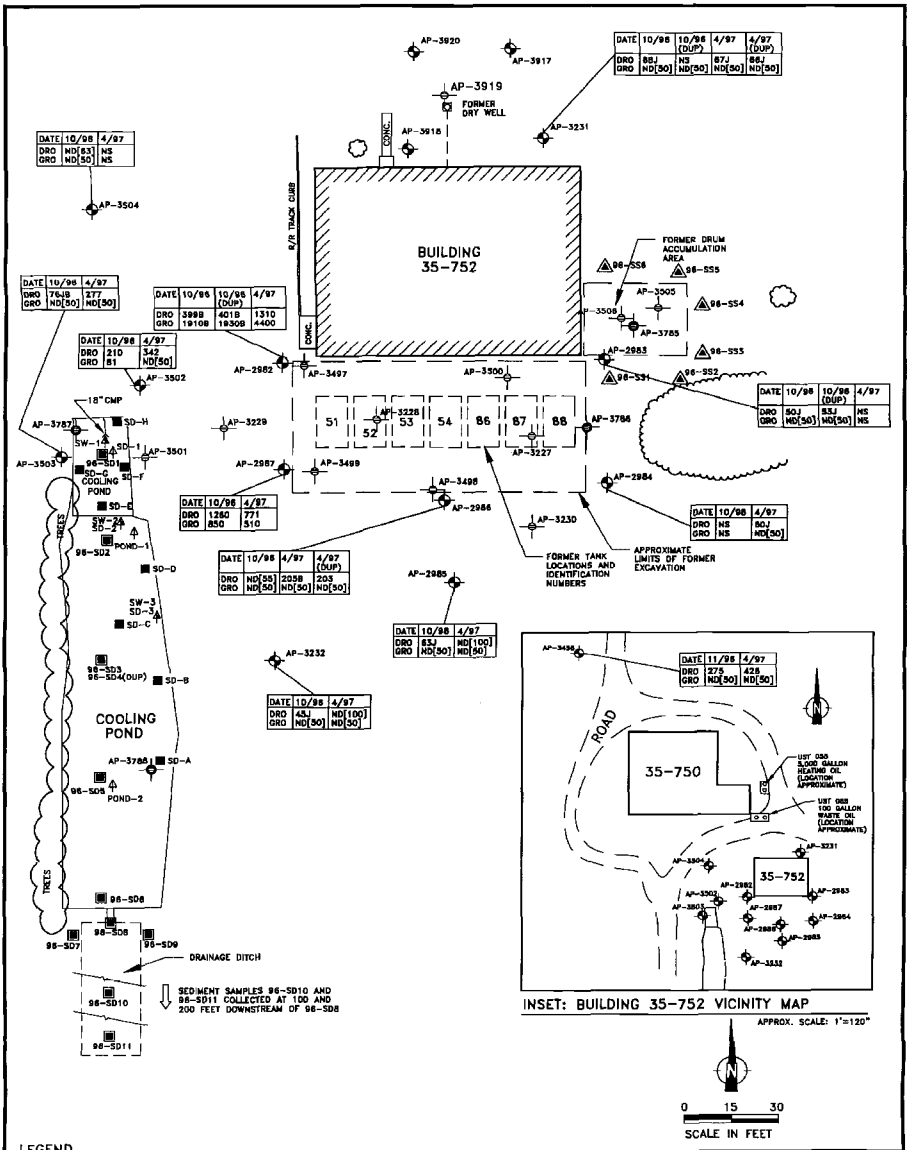
FT. RICHARDSON, ALASKA

FIGURE 4.1-12
BUILDING 35-752
HALOGENATED VOLATILE ORGANICS (HVOs) DETECTED IN GROUNOWATER
OCTOBER96/APRIL97 (RI)

DATE:	DRAWN BY:	SCALE:	DRAWING:
11/12/98	SSR	AS SHOWN	35752VC
C/SC: 1:30 Z 11/97	DISK:	ENGINEER: J. SHAPIRO	CHECKED: J.SHAPIRO
			PROJECT: 9000-107-090

OU-D 33375



LEGEND

- MONITORING WELL LOCATION
- MONITORING WELL LOCATION (RI, 1998)
- SOIL BORING LOCATION
- SOIL BORING LOCATION (RI, 1998)
- SEDIMENT SAMPLE LOCATION
- SEDIMENT SAMPLE LOCATION (RI, 1998)
- SURFACE WATER/SLUIMLMI SAMPLE LOCATION (PSE2, 1994)
- SURFACE WATER SAMPLE LOCATION (RI, 1998)
- SURFACE SAMPLE LOCATION (RI, 1998)

DRO = DIESEL RANGE ORGANICS
GRO = GASOLINE RANGE ORGANICS
ND[50] = NOT DETECTED ABOVE METHOD REPORTING LIMIT OF 50
NS = NOT SAMPLED
B = ANALYTE DETECTED IN ASSOCIATED METHOD, TRIP AND/OR FIELD BLANK
J = ESTIMATED VALUE
NOTE: ANALYTICAL RESULTS REPORTED AS µg/L

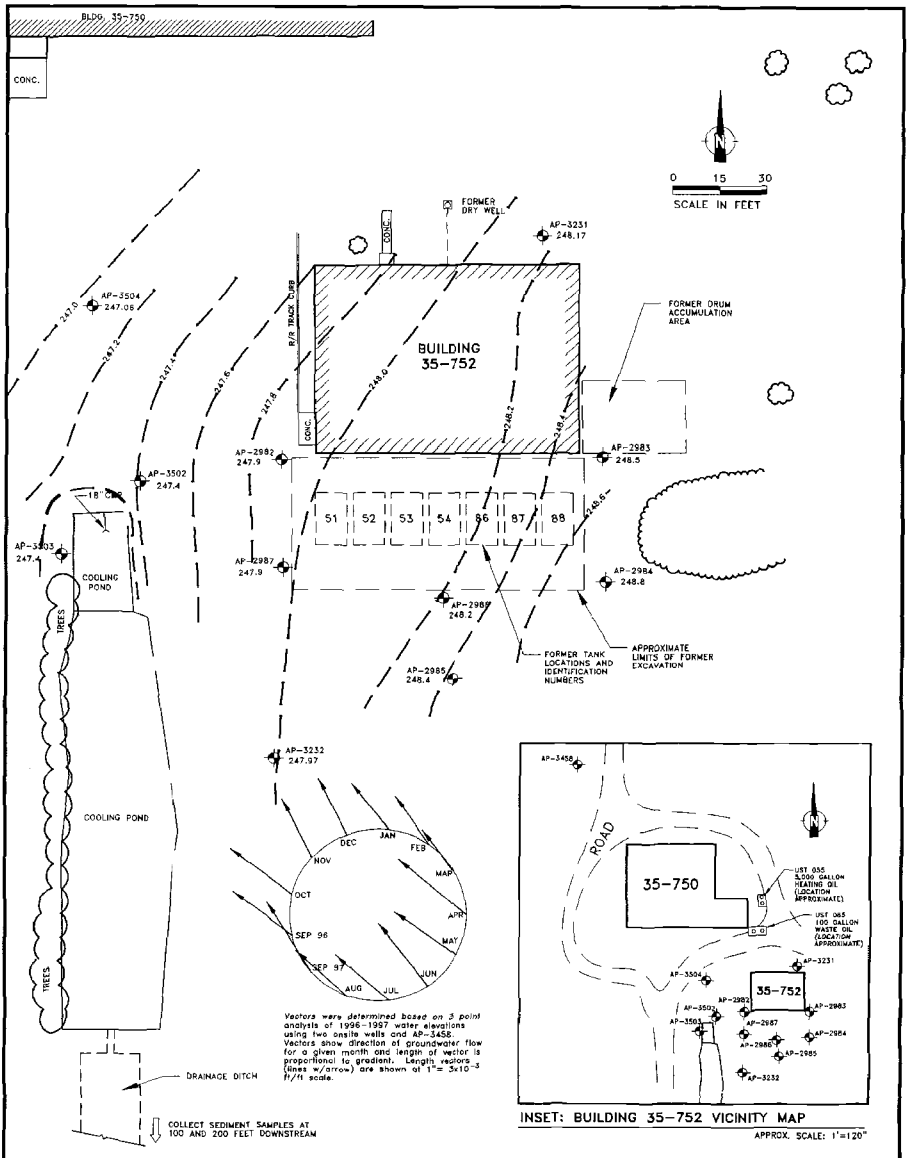
SOURCE: ENSR/9000-036/35-35752BS

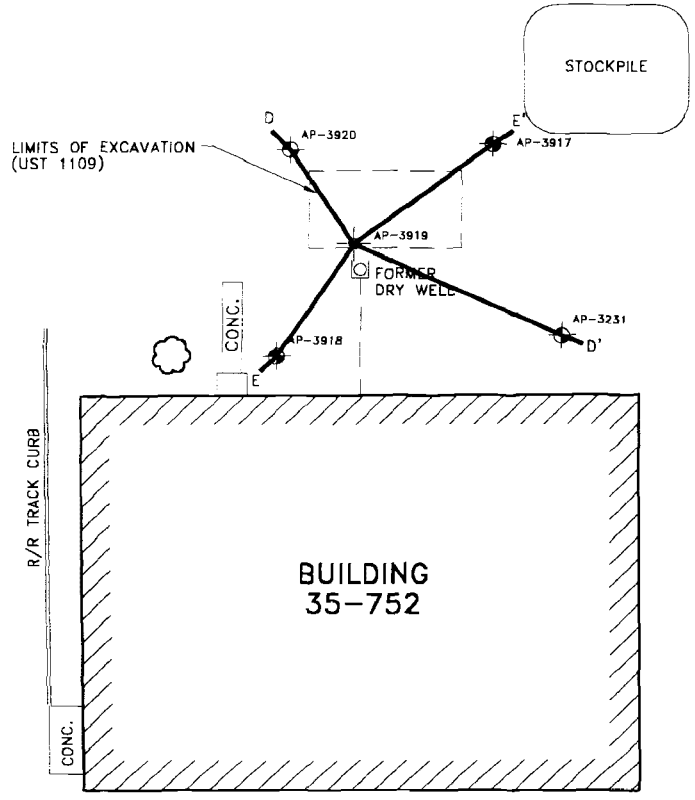
RI/FS REPORT
OPERABLE UNIT D
FT. RICHARDSON, ALASKA

FIGURE 4.1-13
BUILDING 35-752
GRO/DRO CONCENTRATIONS IN GROUNDWATER, OCTOBER96/APRIL97 (RI)

DATE:	DRAWN BY:	SCALE:	DRAWING:
11/12/98	SSR	AS SHOWN	35752DG
C/SC: DISK: 1:30 Z 11/97	ENGINEER: J. SHAPIRO	CHECKED: J.SHAPIRO	PROJECT: 9000-107-090

OU-D 33376


BLDG. 35-750
CONC.
0 15 30
SCALE IN FEET
FORMER DRY WELL
AP-3231 248.17
CONC.
AP-3504 247.08
247.0
247.2
247.4
247.6
247.8
R/R TRACK CURB
CONC.
BUILDING 35-752
248.0
248.2
248.4
FORMER DRUM ACCUMULATION AREA
AP-2982 247.9
AP-2983 248.5
AP-3502 247.4
18" CMP
51 52 53 54 86 87 88
248.6
AP-3503 247.4
COOLING POND
AP-2987 247.9
AP-2984 248.8
AP-2988 248.2
AP-2985 248.4
FORMER TANK LOCATIONS AND IDENTIFICATION NUMBERS
APPROXIMATE LIMITS OF FORMER EXCAVATION
AP-3232 247.97
TREES
COOLING POND
TREES
DRAINAGE DITCH
COLLECT SEDIMENT SAMPLES AT 100 AND 200 FEET DOWNSTREAM
DEC
JAN
FEB
NOV
MAR
OCT
APR
SEP 96
MAY
SEP 97
JUN
AUG
JUL
Vectors were determined based on 3 point analysis of 1996-1997 water elevations using two onsite wells and AP-3458. Vectors show direction of groundwater flow for a given month and length of vector is proportional to gradient. Lengths vectors (lines w/arrow) are shown at 1"= 5x10-3 ft/ft scale.
AP-3458
ROAD
35-750
UST 035 5,000 GALLON HEATING OIL (LOCATION APPROXIMATE)
UST 065 100 GALLON WASTE OIL (LOCATION APPROXIMATE)
AP-3231
AP-3504
35-752
AP-2983
AP-3502
AP-2982
AP-2987
AP-2984
AP-3503
AP-2986
AP-2985
AP-3232
INSET: BUILDING 35-752 VICINITY MAP
APPROX. SCALE: 1"=120'
LEGEND
MONITORING WELL LOCATION
NOTE: CONTOURS USE SEPTEMBER 1996 WATER LEVEL DATA
SOURCE: ENSR/9000-036/35-7S285
RI/FS REPORT
OPERABLE UNIT D
FT. RICHARDSON, ALASKA
FIGURE 4.1-14
BUILDING 35-752
GROUNDWATER GRADIENT VECTOR MAP
DATE: 9/29/98
DRAWN BY: DPM/SSR
SCALE: AS SHOWN
DRAWING: 35752VEC
C/SC: 1:30
DISK: Z 11/97
ENGINEER: J. SHAPIRO
CHECKED: J.SHAPIRO
PROJECT: 9000-107-120



LEGEND

SOIL BORING LOCATION

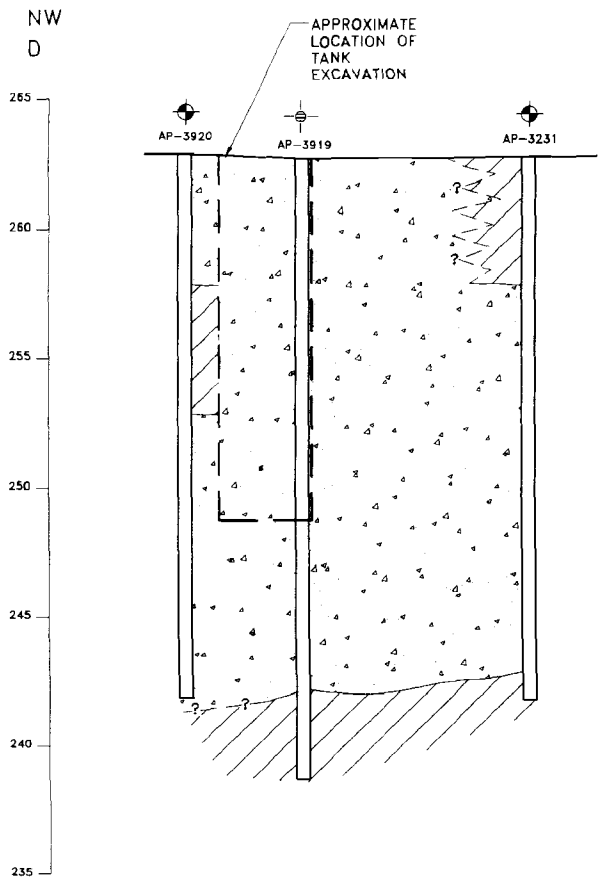
MONITORING WELL LOCATION

N

0 10 20

APPROX. SCALE IN FEET

DRAWING: 35752CSB2 DRAWN: SSR/VJF C/SC: 1:20 DISK: Z 11/97 DATE: 09/29/98 CHECK: S.W.	FIGURE 4.1-15 BUILDING 35-752 TANK 1109 SOIL BORING/MONITORING WELL LOCATIONS	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA 9000-107-090

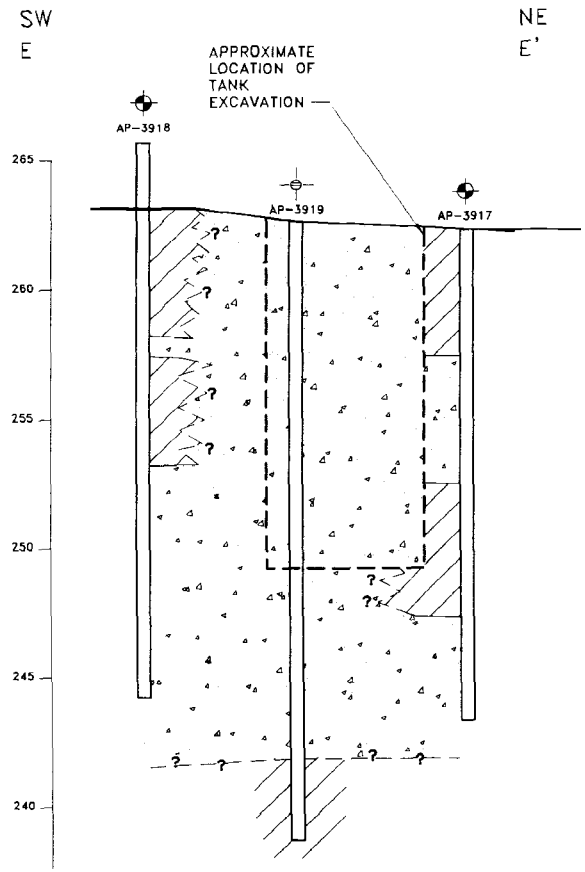


LEGEND

- SANDS AND GRAVELS <15% FINES
- SILT, SANDS AND GRAVELS >15% FINES
- MONITORING WELL
- SOIL BORING

0 10 20
HORIZONTAL SCALE IN FEET
4 X VERTICAL SCALE

DRAWING: 35752DD DRAWN: VF/SSR C/SC: 1:20 DISK: Z 11 DATE: 11/3/98 CHECK: J.S.	FIGURE 4.1-16 BUILDING 35-752 CROSS SECTION D-D'	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120



DRAWING: 35752EE DRAWN: VF/SSR C/SC: 1:20 DISK: Z 11 DATE: 11/16/98 CHECK: J.S.	FIGURE 4.1-17 BUILDING 35-752 CROSS SECTION E-E'	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120

ATTACHMENT 4.2
Tables and Figures

Table 4.2-1. Summary of Data Gaps as Identified in the Management Plan and Findings of the Remedial Investigation/Baseline Risk Assessments - Building 45-590.

Area of Concern as Identified in the Management Plan	Available Data (Prior to the Remedial Investigation)	Data Gaps Established in the Management Plan	Action Taken During the Remedial Investigation	Findings of the Remedial Investigation/Baseline Risk Assessments
Soil				
Potential presence of PCE and SVOC concentrations in soil at the dry well/abandoned sewer line.	Available analytical data for PCE have elevated detection limits due to interference from petroleum hydrocarbons. No SVOC data have been collected.	PCE and SVOC concentrations in soil at the dry well/abandoned sewer line.	Collected soil sample from area of the highest DRO concentrations and analyzed specifically for PCE. Collected several soil samples and analyzed for SVOCs and DRO.	No human health or ecological risks were identified. The area is sufficiently characterized.
GRO-impacted soil at boring MPC.	One soil sample from boring MPC detected elevated levels of GRO.	Vertical and lateral extent of GRO in soil near this boring.	Collected and analyzed soil samples from borings to evaluate the vertical and lateral extent of fuel contamination. Also assessed the presence of PCE in soil at the highest GRO concentrations.	No human health or ecological risks were identified. The area is sufficiently characterized.
Soil and groundwater contamination at the sumps.	Limited analytical data for sump discovered in the building during demolition. No data available for sump near the impound lot.	Contaminant concentrations in soil and groundwater near the sumps.	Collected and analyzed soil samples from borings to assess the presence and extent of soil contamination. Collected a sediment sample from the sump adjacent to the impound lot and analyzed specifically for PCE. The sump located near Bldg. 45-590 had been removed.	No human health or ecological risks were identified. The area is sufficiently characterized.
Groundwater				
Groundwater contamination throughout the site.	Analytical data for four sampling rounds from three wells at the site.	Source of PCE in groundwater. Upgradient and downgradient extent of PCE in groundwater.	Installed upgradient and downgradient monitoring wells (eleven total). Collected water samples from all wells.	The northern, southern and western extent of PCE in groundwater has been identified. Only PCE in groundwater has been identified as a risk. However, groundwater is not currently used, nor intended in the future, as a source of potable water.

Key:
DRO = Diesel range organics.
GC/MS = Gas chromatography/mass spectrometry.
GRO = Gasoline range organics.
PCE = Tetrachloroethene.
SIM = Selective ion monitoring.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

Table 4.2-2. Chemicals of Potential Concern as Identified in the Management Plan, Building 45-590.

Type	Source	Media	Carcinogens	Noncarcinogens
Monoaromatics	Fuels	Soil and groundwater	None	Diesel Range Organics (DRO) and Gasoline Range Organics (GRO)
Chlorinated aliphatics	Solvents	Groundwater	Tetrachloroethene (PCE) Chloroform	None
Metals	Background	Soil and groundwater	Arsenic, lead (groundwater only)	Chromium, mercury, barium (groundwater only)

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3779								
Depth (ft.)		0	5	10	15	15	20	25	30	35
Field-ID	Screening	96455965SL	96455966SL	96455967SL	96455968SL	96455969SL	96455970SL	96455971SL	96455972SL	96455973SL
Lab-ID	Criteria	K96613010	K96613011	K96613012	K96613013	K96613014 DUP	K96613015	K96613016	K96613017	K96613018
Petroleum Hydrocarbons (mg/Kg)										
Gasoline Range Organics	50-100[a]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Diesel Range Organics	100-200[a]	- -	- -	- -	176	218	- -	492	1630	- -
Volatile Organic Compounds (µg/Kg)										
Aromatic Volatile Organics (AVOs)										
Toluene	1.6E6[b]	5 U	2 J	5 U	25 U	25 U	25 U	5 U	5 U	5 U
Xylenes	1.6E7[b]	5 U	6	5 U	25 U	25 U	25 U	5 U	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	2 J	20 U	100 U	100 U	100 U	1 J	0.7 J	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	0.9 J	20 U	100 U	100 U	100 U	3 J	1 J	20 U
n-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	100 U	100 U	100 U	20 U	5 J	20 U
sec-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	70 J	120	30 J	7 J	1 J	20 U
tert-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	100 U	100 U	100 U	20 U	20 U	20 U
4-Isopropyltoluene	UA	20 U	20 U	20 U	80 J	150	30 J	10 J	2 J	20 U
Isopropylbenzene	UA	20 U	20 U	20 U	7 J	20 J	100 U	0.8 J	20 U	20 U
n-Propylbenzene	7.8E4[b]	20 U	20 U	20 U	100 U	40 J	100 U	3 J	20 U	20 U
Naphthalene	3.1E5[b]	20 U	20 U	20 U	100 U	100 U	100 U	27	4 J	20 U
Halogenated Volatile Organics (HVOs)										
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	25 U	25 U	25 U	5 U	5 U	5 U
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	25 U	25 U	25 U	5 U	5 U	5 U
1,2-Dichloroethane	700[b]	5 U	5 U	5 U	25 U	25 U	25 U	5 U	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	200 J	250 U	250 U	50 U	50 U	50 U
Methylene chloride	8500[b]	10 U	10 U	10 U	50 U	50 U	50 U	10 U	10 U	10 U
Organochlorine Pesticides										
delta-BHC	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDD	270[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDE	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDT	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Endosulfan sulfate	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -
Methoxychlor	3900[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -

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TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3779								
Depth (ft.)		0	5	10	15	15	20	25	30	35
Field-ID	Screening	96455965SL	96455966SL	96455967SL	96455968SL	96455969SL	96455970SL	96455971SL	96455972SL	96455973SL
Lab-ID	Criteria	K96613010	K96613011	K96613012	K96613013	K96613014 DUP	K96613015	K96613016	K96613017	K96613018
Semi-Volatile Organic Compounds (mg/Kg)										
2-Methylnaphthalene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Anthracene	2.3E3[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Benzo(a)anthracene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Benzo(a)pyrene	0.0088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Benzo(b)fluoranthene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Benzo(g,h,i)perylene	UA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Chrysene	8.8[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Fluoranthene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Fluorene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	1.5 U	0.3 U	0.3 U	0.3 U
Indeno(1,2,3-cd)pyrene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	0.3 U	0.3 U	0.1 J	0.1 J	1.5 U	0.3 U	0.3 U	0.3 U
Pyrene	230[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	1.5 U	0.3 U	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.1 U J,B	0.3 U	0.3 U	0.1 U J,B	0.1 U J,B	1.5 U	0.3 U	0.3 U B	0.3 U
Metals (mg/Kg)										
Arsenic	2.3[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Barium	550[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Chromium	39/7800[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Iron	2.3E3[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Lead	400[c]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Mercury	2.3[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Silver	39[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
R = Rejected.
- - = Analysis not performed on sample

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995)
[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995)

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TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED
AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3779			AP 3780					
Depth (ft.)		40	45	50	0	5	15	20	20	25
Field-ID	Screening	96455974SL	96455975SL	96455976SL	96455977SL	96455978SL	96455979SL	96455980SL	96455981SL	96455982SL
Lab-ID	Criteria	K96613019	K96613020	K96613021	K96614917	K96614918	K96614919	K96614920	K96614921 DUP	K96614922
Petroleum Hydrocarbons (mg/Kg)										
Gasoline Range Organics	50-100[a]	- -	- -	- -	- -	- -	270	8	4 J	5
Diesel Range Organics	100-200[a]	- -	- -	- -	- -	- -	205	35	18	68
Volatile Organic Compounds (µg/Kg)										
Aromatic Volatile Organics (AVOs)										
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	5 U	25 U J	5 U J	5 U	5 U
Xylenes	1.6E7[b]	5 U	5 U	5 U	5 U	5 U	25 U J	5 U J	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	70 J	20 U J	4	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	450 J	3 J	6 J	20 U
n-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	100 U J	20 U J	20 U	20 U
sec-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	60 J	20 U J	20 U	20 U
tert-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	10 J	20 U J	20 U	20 U
4-Isopropyltoluene	UA	20 U	20 U	20 U	20 U	20 U	160 J	20 U J	3 J	20 U
Isopropylbenzene	UA	20 U	20 U	20 U	20 U	20 U	7 J	20 U J	20 U	20 U
n-Propylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	40 J	20 U J	20 U	20 U
Naphthalene	3.1E5[b]	20 U	20 U	20 U	20 U	20 U	40 J	20 U J	20 U	20 U
Halogenated Volatile Organics (HVOs)										
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	5 U	5 U	25 U J	5 U J	5 U	5 U
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	5 U	5 U	25 U J	5 U J	5 U	5 U
1,2-Dichloroethane	700[b]	5 U	5 U	5 U	5 U	5 U	25 U J	5 U J	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	50 U	50 U	200 J	50 U J	40 J	50 U
Methylene chloride	8500[b]	10 U	10 U	10 U	10 U	3 J	50 U J	10 U J	10 U	10 U
Organochlorine Pesticides										
delta-BHC	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDD	270[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDE	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDT	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Endosulfan sulfate	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -
Methoxychlor	3900[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -

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TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3779			AP 3780					
Depth (ft.)		40	45	50	0	5	15	20	20	25
Field-ID	Screening	96455974SL	96455975SL	96455976SL	96455977SL	96455978SL	96455979SL	96455980SL	96455981SL	96455982SL
Lab-ID	Criteria	K96613019	K96613020	K96613021	K96614917	K96614918	K96614919	K96614920	K96614921 DUP	K96614922
Semi-Volatile Organic Compounds (mg/Kg)										
2-Methylnaphthalene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U
Anthracene	2.3E3[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U
Benzo(a)anthracene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	0.3 U	0.1 J	0.3 U
Benzo(a)pyrene	0.0088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U
Benzo(b)fluoranthene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U
Benzo(g,h,i)perylene	UA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U
Chrysene	8.8[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.2 J	0.3 U	0.1 J	0.3 U
Fluoranthene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3	0.3 U	0.1 J	0.3 U
Fluorene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Indeno(1,2,3-cd)pyrene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.4	0.1 J	0.2 J	0.3 U
Pyrene	230[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3	0.1 J	0.2 J	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.1 J	0.3 U	0.3 U	0.1 J	0.3 U
Metals (mg/Kg)										
Arsenic	2.3[b]	- -	- -	- -	- -	- -	6	6	8	5
Barium	550[b]	- -	- -	- -	- -	- -	56	58	86	76
Chromium	39/7800[b]	- -	- -	- -	- -	- -	32	26	36	38
Iron	2.3E3[b]	- -	-	- -	- -	- -	- -	- -	- -	- -
Lead	400[c]	- -	- -	- -	- -	- -	10 J	10 J	10 J	10 J
Mercury	2.3[b]	- -	- -	- -	- -	- -	0.07 J	0.07 J	0.07 J	0.06 J
Silver	39[b]	- -	- -	- -	- -	- -	2 U	2 U	2 U	2 U

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
R = Rejected.
- - = Analysis not performed on sample

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED
AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3780			AP 3781					
Depth (ft.) Field-ID Lab-ID	Screening Criteria	30 96455983SL K96614923	35 96455984SL K96614924	40 96455985SL K96614925	0 96455986SL K96619605	5 96455987SL K96619606	10 96455988SL K96619607	15 96455989SL K96619608	15 96455990SL K96619609 DUP	20 96455991SL K96619610
Petroleum Hydrocarbons (mg/Kg)										
Gasoline Range Organics	50-100[a]	- -	- -	- -	- -	- -	- -	5 U J	5 U J	5 U J
Diesel Range Organics	100-200[a]	- -	- -	- -	- -	- -	- -	26	21	4 U
Volatile Organic Compounds (µg/Kg)										
Aromatic Volatile Organics (AVOs)										
Toluene	1.6E6[b]	2 J	5 U	5 U	2 J	6	5 U	5 U	5 U	5 U J
Xylenes	1.6E7[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U J
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U J
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U J
n-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U J
sec-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U J
tert-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U J
4-Isopropyltoluene	UA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U J
Isopropylbenzene	UA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U J
n-Propylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U J
Naphthalene	3.1E5[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U J
Halogenated Volatile Organics (HVOs)										
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U J
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 J	5 U J
1,2-Dichloroethane	700[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U J
Acetone	7.8E5[b]	53	52	30 J	140	50 U	50 U	50 U	120	50 U J
Methylene chloride	8500[b]	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U J
Organochlorine Pesticides										
delta-BHC	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDD	270[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDE	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDT	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Endosulfan sulfate	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -
Methoxychlor	3900[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3780			AP 3781					
Depth (ft.)		30	35	40	0	5	10	15	15	20
Field-ID Lab-ID	Screening Criteria	96455983SL K96614923	96455984SL K96614924	96455985SL K96614925	96455986SL K96619605	96455987SL K96619606	96455988SL K96619607	964559895L K96619608	96455990SL K9661960 9 DUP	96455991SL K96819610
Semi-Volatile Organic Compounds (mg/Kg)										
2-Methylnaphthalene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Anthracene	2.3E3[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(a)anthracene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(a)pyrene	0.0088[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(b)fluoranthene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(g,h,i)perylene	UA	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Chrysene	8.8[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Fluoranthene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Fluorene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Indeno(1,2,3-cd)pyrene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Pyrene	230[b]	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	0.3 U	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.3 U	0.3 U	0.1 J	0.1 U J,B	- -	0.2 U J,B	0.1 U J,B	0.1 U J,B	0.1 U J,B
Metals (mg/Kg)										
Arsenic	2.3[b]	- -	- -	- -	- -	- -	- -	6	6	5
Barium	550[b]	- -	- -	- -	- -	- -	- -	61	64	53
Chromium	39/7800[b]	- -	- -	- -	- -	- -	- -	44	34	33
Iron	2.3E3[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Lead	400[c]	- -	- -	- -	- -	- -	- -	10 J	10 J	8 J
Mercury	2.3[b]	- -	- -	- -	- -	- -	- -	0.06 J	0.05 J	0.1 J
Silver	39[b]	- -	- -	- -	- -	- -	- -	2 U	2 U	2 U

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
R = Rejected.
- - = Analysis not performed on sample
[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

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TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3781				AP 3782				
Depth (ft.)		25	30	35	40	0	5	10	15	20
Field-ID		96455992SL	96455993SL	96455994SL	96455995SL	96455996SL	96455997SL	96455998SL	96455999SL	964559100SL
Lab-ID	Screening Criteria	K96619601	K96619602	K96619603	K96619604	K96622807	K96622808	K96622809	K96622810	K96622811
Petroleum Hydrocarbons (mg/Kg)										
Gasoline Range Organics	50-100[a]	5 U J	5 U J	- -	- -	- -	- -	5 U J	- -	- -
Diesel Range Organics	100-200[a]	4 U	4 U	- -	- -	- -	- -	97	- -	- -
Volatile Organic Compounds (µg/Kg)										
Aromatic Volatile Organics (AVOs)										
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes	1.6E7[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	2 J	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
n-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
sec-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
tert-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
4-Isopropyltoluene	UA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Isopropylbenzene	UA	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
n-Propylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Naphthalene	3.1E5[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Halogenated Volatile Organics (HVOs)										
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	700[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	7.8E5[b]	40 J	30 J	50 U	40 J	50 U	50 U	50 U	50 U	40 J
Methylene chloride	8500[b]	10 U	5 J	10 U	10 U	10 U	10 U	10 U	10 U	3 J
Organochlorine Pesticides										
delta-BHC	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDD	270[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDE	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDT	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Endosulfan sulfate	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -
Methoxychlor	3900[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -

OU-D 3390

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED
AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3781				AP 3782				
Depth (ft.)		25	30	35	40	0	5	10	15	20
Field-ID	Screening	96455992SL	96455993SL	96455994SL	96455995SL	96455996SL	96455997SL	96455998SL	96455999SL	96456000SL
Lab-ID	Criteria	K96619601	K96619602	K96619603	K96619604	K96622807	K96622808	K96622809	K96622810	K96622811
Semi-Volatile Organic Compounds (mg/Kg)										
2-Methylnaphthalene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Anthracene	2.3E3[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(a)anthracene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(a)pyrene	0.0088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(b)fluoranthene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(g,h,i)perylene	UA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chrysene	8.8[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Fluoranthene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Fluorene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Indeno(1,2,3-cd)pyrene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Pyrene	230[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.3 U	0.1 U J,B	0.1 U J,B	0.1 U J,B	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Metals (mg/Kg)										
Arsenic	2.3[b]	5	3	- -	- -	- -	- -	5	- -	- -
Barium	550[b]	68	62	- -	- -	- -	- -	56	- -	- -
Chromium	39/7800[b]	33	29	- -	- -	- -	- -	37	- -	- -
Iron	2.3E3[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -
Lead	400[c]	10 J	10 J	- -	- -	- -	- -	10 J	- -	- -
Mercury	2.3[b]	0.06 J	0.06 J	- -	- -	- -	- -	0.07 J	- -	- -
Silver	39[b]	2 U	2 U	- -	- -	- -	- -	2 U	- -	- -

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
R = Rejected.
- - = Analysis not performed on sample

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED
AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3782							
Depth (ft.)		25	30	30	35	40	40	45	50
Field-ID	Screening	964559102SL	964559103SL	964559104SL	964559105SL	964559106SL	964559106SL	964559107SL	964559108SL
Lab-ID	Criteria	K96622812	K96622813	K96622814 DUP	K96622815	K96622816	K96622816R REP	K96622817	K96622818
Petroleum Hydrocarbons (mg/Kg)									
Gasoline Range Organics	50-100[a]	5 U J	5 U J	5 U J	- -	- -	- -	- -	- -
Diesel Range Organics	100-200[a]	6	4	- -	- -	- -	- -	- -	- -
Volatile Organic Compounds (µg/Kg)									
Aromatic Volatile Organics (AVOs)									
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U
Xylenes	1.6E7[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U
n-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U
sec-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U
tert-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U
4-Isopropyltoluene	UA	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U
Isopropylbenzene	UA	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U
n-Propylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U
Naphthalene	3.1E5[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U
Halogenated Volatile Organics (HVOs)									
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U
1,2-Dichloroethane	700[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	50 U	50 U	- -	50 U	50 U
Methylene chloride	8500[b]	10 U	10 U	10 U	10 U	10 U	- -	10 U	3 J
Organochlorine Pesticides									
delta-BHC	UA	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDD	270[b]	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDE	190[b]	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDT	190[b]	- -	- -	- -	- -	- -	- -	- -	- -
Endosulfan sulfate	UA	- -	- -	- -	- -	- -	- -	- -	- -
Methoxychlor	3900[b]	- -	- -	- -	- -	- -	- -	- -	- -

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3782							
Depth (ft.) Field-ID Lab-ID	Screening Criteria	25 964559102SL K96622812	30 964559103SL K96622813	30 964559104SL K96622814 DUP	35 964559105SL K96622815	40 964559106SL K96622816	40 964559106SL K96622816R REP	45 964559107SL K96622817	50 964559108SL K96622818
Semi-Volatile Organic Compounds (mg/Kg)									
2-Methylnaphthalene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Anthracene	2.3E3[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Benzo(a)anthracene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Benzo(a)pyrene	0.0088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Benzo(b)fluoranthene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Benzo(g,h,i)perylene	UA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Chrysene	8.8[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Fluoranthene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Fluorene	310[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Indeno(1,2,3-cd)pyrene	0.088[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Pyrene	230[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U R	0.3 U J	0.3 U	0.3 U
Metals (mg/Kg)									
Arsenic	2.3[b]	6	5	- -	- -	- -	- -	- -	- -
Barium	550[b]	75	65	- -	- -	- -	- -	- -	- -
Chromium	39/7800[b]	41	27	- -	- -	- -	- -	- -	- -
Iron	2.3E3[b]	- -	- -	- -	- -	- -	- -	- -	- -
Lead	400[c]	10 J	9 J	- -	- -	- -	- -	- -	- -
Mercury	2.3[b]	0.06 J	0.07 J	- -	- -	- -	- -	- -	- -
Silver	39[b]	2 U	2 U	- -	- -	- -	- -	- -	- -

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
R = Rejected.
- - = Analysis not performed on sample

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

OU-D 33393

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3783				AP 3784			
Depth (ft.)		10	10	15	25	10	10	15	35
Field-ID	Screening	964559111SL	964559112SL	964559113SL	964559115SL	964559118SL	964559119SL	964559120SL	964559124SL
Lab-ID	Criteria	K96628901	K96628902 DUP	K96628903	K96628904	K96628908	K96628907 DUP	K96628910	K96628909
Petroleum Hydrocarbons (mg/Kg)									
Gasoline Range Organics	50-100[a]	188 J	162 J	5 U J	5 U J	5 U J	- -	5 U J	5 U J
Diesel Range Organics	100-200[a]	308	- -	4	4 U	22	4 U	4	4 U
Volatile Organic Compounds (µg/Kg)									
Aromatic Volatile Organics (AVOs)									
Toluene	1.6E6[b]	25 U	- -	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes	1.6E7[b]	25 U	- -	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	100 U	- -	20 U	20 U	20 U	20 U	20 U	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	60 J	- -	20 U	20 U	20 U	20 U	20 U	20 U
n-Butylbenzene	7.8E4[b]	10 J	- -	20 U	20 U	20 U	20 U	20 U	20 U
sec-Butylbenzene	7.8E4[b]	20 J	- -	20 U	20 U	20 U	20 U	20 U	20 U
tert-Butylbenzene	7.8E4[b]	100 U	- -	20 U	20 U	20 U	20 U	20 U	20 U
4-Isopropyltoluene	UA	100 J	- -	20 U	20 U	20 U	20 U	20 U	20 U
Isopropylbenzene	UA	100 U	- -	20 U	20 U	20 U	20 U	20 U	20 U
n-Propylbenzene	7.8E4[b]	100 U	- -	20 U	20 U	20 U	20 U	20 U	20 U
Naphthalene	3.1E5[b]	100 U	- -	20 U	20 U	20 U	20 U	20 U	20 U
Halogenated Volatile Organics (HVOs)									
Tetrachloroethene	1.2E3[b]	20 J	- -	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5.8E3[b]	25 U	- -	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	700[b]	10 J	- -	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	7.8E5[b]	250 U	- -	50 U	50 U	50 U	50 U	50 U	50 U
Methylene chloride	8500[b]	50 U	- -	10 U	10 U	10 U	10 U	10 U	10 U
Organochlorine Pesticides									
delta-BHC	UA	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDD	270[b]	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDE	190[b]	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDT	190[b]	- -	- -	- -	- -	- -	- -	- -	- -
Endosulfan sulfate	UA	- -	- -	- -	- -	- -	- -	- -	- -
Methoxychlor	3900[b]	- -	- -	- -	- -	- -	- -	- -	- -

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3783				AP 3784			
Depth (ft.) Field-ID Lab-ID	Screening Criteria	10 964559111SL K96628901	10 964559112SL K96628902 DUP	15 964559113SL K96628903	25 964559115SL K96628904	10 964559118SL K96628908	10 964559119SL K96628907 DUP	15 964559120SL K96628910	35 964559124SL K96628909
Semi-Volatile Organic Compounds (mg/Kg)									
2-Methylnaphthalene	310[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Anthracene	2.3E3[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(a)anthracene	0.088[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(a)pyrene	0.0088[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(b)fluoranthene	0.088[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(g,h,i)perylene	UA	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Chrysene	8.8[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Fluoranthene	310[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Fluorene	310[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Indeno(1,2,3-cd)pyrene	0.088[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Phenanthrene	UA	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Pyrene	230[b]	1.5 U	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	1.5 U	- -	0.1 J	0.3 U	0.1 J	0.3 U	0.3 U	0.3 U
Metals (mg/Kg)									
Arsenic	2.3[b]	6	- -	7	6	18	- -	6	6
Barium	550[b]	45	- -	89	52	71	- -	54	41
Chromium	39/7800[b]	26	- -	27	21	37	- -	25	28
Iron	2.3E3[b]		- -	24600	20600	33000	- -	22100	20500
Lead	400[c]	5	- -	9	5	7	- -	5	4
Mercury	2.3[b]	0.09 J	- -	0.06 J	0.07 J	0.06	- -	0.06 J	0.2 U
Silver	39[b]	10 U	- -	2 U	2 U	2 U	- -	2 U	2 U

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
R = Rejected.
- - = Analysis not performed on sample

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]*Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).*
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

OU-D 33395

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED
AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3864							
Depth (ft.)		5	10	15	15	25	25	30	30
Field-ID	Screening	97B704001SL	97B704002SL	97B704003SL	97B704012SL	97B704005SL	97B704009SL	97B704006SL	97B704010SL
Lab-ID	Criteria	K9737401	K9737402	K9737403	K9737408 DUP	K9737404	K9737740 DUP	K9737405	K9737407 DUP
Petroleum Hydrocarbons (mg/Kg)									
Gasoline Range Organics	50-100[a]	5 U	5 U	5 U	- -	5 U	5 U	5 U	- -
Diesel Range Organics	100-200[a]	49	30	3 J	7	4 J	- -	15	- -
Volatile Organic Compounds (µg/Kg)									
Aromatic Volatile Organics (AVOs)									
Toluene	1.6E6[b]	5 U	5 U	5 U	- -	5 U	- -	5 U	5 U
Xylenes	1.6E7[b]	5 U	5 U	5 U	- -	5 U	- -	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	- -	20 U	- -	20 U	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	- -	20 U	- -	20 U	20 U
n-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	- -	20 U	- -	20 U	20 U
sec-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	- -	20 U	- -	20 U	20 U
tert-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	- -	20 U	- -	20 U	20 U
4-Isopropyltoluene	UA	20 U	20 U	20 U	- -	20 U	- -	20 U	20 U
Isopropylbenzene	UA	20 U	20 U	20 U	- -	20 U	- -	20 U	20 U
n-Propylbenzene	7.8E4[b]	20 U	20 U	20 U	- -	20 U	- -	20 U	20 U
Naphthalene	3.1E5[b]	20 U	20 U	20 U	- -	20 U	- -	20 U	20 U
Halogenated Volatile Organics (HVOs)									
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	- -	5 U	- -	5 U	5 U
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	- -	5 U	- -	5 U	5 U
1,2-Dichloroethane	700[b]	5 U	5 U	5 U	- -	5 U	- -	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	- -	50 U	- -	50 U	50 U
Methylene chloride	8500[b]	10 U	10 U	5 J, B	- -	5 J, B	- -	5 J, B	5 J, B
Organochlorine Pesticides									
delta-BHC	UA	10 U	10 U	1 J	- -	0.8 J	- -	1 J	0.7 J
4,4'-DDD	270[b]	2 J	1 J	10 U	- -	10 U	- -	10 U	0.4 J
4,4'-DDE	190[b]	1 J	10 U	10 U	- -	10 U	- -	10 U	10 U
4,4'-DDT	190[b]	14	10 U	10 U	- -	10 U	- -	10 U	10 U
Endosulfan sulfate	UA	2 J	10 U	10 U	- -	10 U	- -	10 U	10 U
Methoxychlor	3900[b]	4 J	20 U	20 U	- -	20 U	- -	20 U	20 U

TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3864							
Depth (ft.)		5	10	15	15	25	25	30	30
Field-ID	Screening	97B704001SL	97B704002SL	97B704003SL	97B704012SL	97B704005SL	97B704009SL	97B704006SL	97B704010SL
Lab-ID	Criteria	K97737401	K97737402	K97737403	K97737408 DUP	K97737404	K97737410 DUP	K97737405	K97737407 DUP
Semi-Volatile Organic Compounds (mg/Kg)									
2-Methylnaphthalene	310[c]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Anthracene	2.3E3[b]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Benzo(a)anthracene	0.088[b]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Benzo(a)pyrene	0.0088[b]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Benzo(b)fluoranthene	0.088[b]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Benzo(g,h,i)perylene	UA	0.04 J	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Benzo(k)fluoranthene	0.88[b]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Chrysene	8.8[b]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Fluoranthene	310[b]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Fluorene	310[b]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Indeno(1,2,3-cd)pyrene	0.088[b]	0.04 J,B	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Phenanthrene	UA	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Pyrene	230[b]	0.07 J	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Bis(2-ethylhexyl) phthalate	4.6[b]	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -	0.3 U	0.3 U
Metals (mg/Kg)									
Arsenic	2.3[b]	7	7	5	4	6	- -	5	- -
Barium	550[b]	157	49	74	62	74	- -	113	- -
Chromium	39/7800[b]	48	32	41	44	35	- -	29	- -
Iron	2.3E3[b]	35500	30700	33600	33800	28800	- -	24300	- -
Lead	400[c]	13	7	6	5	7	- -	7	- -
Mercury	2.3[b]	0.08 J	0.1 J	0.09 J	0.09 J	0.08 J	- -	0.06 J	- -
Silver	39[b]	2 U	2 U	2 U	2 U	2 U	- -	2 U	- -

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
R = Rejected.
- - = Analysis not performed on sample.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995)
[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995)

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TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3871				AP3872					
Depth (ft.)		10	70	90	110	10	10	50	110	125	125
Field-ID	Screening	984559023SL	984559028SL	984559032SL	984559033SL	984559042SL	984559053SL	984559046SL	984559050SL	984559051SL	984559052SL
Lab-ID	Criteria	K9800287-001	K9800287-003	K9800287-007	K9800287-008	K9800366-004	K9800366-010 DUP	K9800366-005	K9800366-007	K9800366-008	K9800366-009 DUP
Petroleum Hydrocarbons (mg/Kg)											
Gasoline Range Organics	50-100[a]	- -	5 U	5 U	5 U	5 U	- -	5 U	5 U	5 U	5 U
Diesel Range Organics	100-200[a]	- -	11	5	5	10 U	10 U	3 J	- -	10 U	- -
Volatile Organic Compounds (µg/Kg)											
Aromatic Volatile Organics (AVOs)											
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U	5 U	5 U
Xylenes	1.6E7[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U	5 U	5 U
1,2,4-Trimethylbenzene	3.9E5[b]	20 U	0.7 J	20 U	20 U	20 U	- -	20 U	20 U	20 U	20 U
1,3,5-Trimethylbenzene	3.9E5[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U	20 U	20 U
n-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U	20 U	20 U
sec-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U	20 U	20 U
tert-Butylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U	20 U	20 U
4-Isopropyltoluene	UA	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U	20 U	20 U
Isopropylbenzene	UA	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U	20 U	20 U
n-Propylbenzene	7.8E4[b]	20 U	20 U	20 U	20 U	20 U	- -	20 U	20 U	20 U	20 U
Naphthalene	3.1E5[b]	20 U	1 J	20 U	20 U	20 U	- -	20 U	20 U	20 U	20 U
Halogenated Volatile Organics (HVOs)											
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U	5 U	5 U
Trichloroethene	5.8E3[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U	5 U	5 U
1,2-Dichloroethane	700[b]	5 U	5 U	5 U	5 U	5 U	- -	5 U	5 U	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	50 U	50 U	- -	50 U	50 U	50 U	50 U
Methylene chloride	8500[b]	10 U	10 U	10 U	10 U	10 U	- -	10 U	10 U	10 U	10 U
Organochlorine Pesticides											
delta-BHC	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDD	270[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDE	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
4,4'-DDT	190[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Endosulfan sulfate	UA	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Methoxychlor	3900[b]	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

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TABLE 4.2-3 ANALYTES DETECTED IN SOIL BORING SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP 3871				AP3872					
Depth (ft.)		10	70	90	110	10	10	50	110	125	125
Field-ID	Screening	984559023SL	984559028SL	984559032SL	984559033SL	984559042SL	984559053SL	984559046SL	984559050SL	984559051SL	984559052SL
Lab-ID	Criteria	K9800287-001	K9800287-003	K9800287-007	K9800287-008	K9800366-004	K9800366-010 DUP	K9800366-005	K9800366-007	K9800366-008	K9800366-009 DUP
Semi-Volatile Organic Compounds (mg/Kg)											
2-Methylnaphthalene	310[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Anthracene	2.3E3[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Benzo(a)anthracene	0.088[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Benzo(a)pyrene	0.0088[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Benzo(b)fluoranthene	0.088[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Benzo(g,h,i)perylene	UA	- -	0.07 J	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Benzo(k)fluoranthene	0.88[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Chrysene	8.8[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Fluoranthene	310[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Fluorene	310[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Indeno(1,2,3-cd)pyrene	0.088[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Phenanthrene	UA	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Pyrene	230[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Bis(2-ethylhexyl) phthalate	4.6[b]	- -	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	- -	0.3 U	- -
Metals (mg/Kg)											
Arsenic	2.3[b]	- -	4	4	4	6	5	5	- -	4	- -
Barium	550[b]	- -	56	43	54	57	56	40	- -	25	- -
Chromium	39/7800[b]	- -	46	41	36	34	34	22	- -	22	- -
Iron	2.3E3[b]	- -	28500	32200	27500	28100	29400	22600	- -	18800	- -
Lead	400[c]	- -	5 J	6 J	6 J	7	7	7	- -	5	- -
Mercury	2.3[b]	- -	0.05 J	0.04 J	0.04 J	0.1 J	0.06 J	0.6	- -	0.02 J	- -
Silver	39[b]	- -	2 U	2 U	2 U	2 U	0.7 J	2 U	- -	2 U	- -

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
R = Rejected.
- - = Analysis not performed on sample

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[b]Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996). Chromium VI (39)/Chromium III (7800).
[c]Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

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TABLE 4.2-4 ANALYTES DETECTED IN SEDIMENT SAMPLES COLLECTED FROM THE SUMP AT THE CONCRETE WASH PAD AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		Sump at Concrete Wash Pad			
Field-ID Lab-ID Sample Date	Screening Criteria	96455964SD K96613009 9/26/96	9645591345D L8223-1 10/25/96 QA	964559134SD K96689405 10/25/96	9645591355D K96689404 10/25/96 DUP
Petroleum Hydrocarbons (mg/Kg)					
Gasoline Range Organics	50-100[a]	13	28	36 J	44 J
Diesel Range Organics	100-200[a]	39,000	15,000	24,000 J	22,000 J
Volatile Organic Compounds (µg/Kg)					
Aromatic Volatile Organics (AVOs)					
Benzene	500[a], 2.2E3[c]	230	70	300 J	300 J
Ethylbenzene	7.8E5[b]	9,100	34,000	18,000	12,000
Toluene	1.6E6[b]	16,000	46,000	27,000	23,000
Xylenes	1.6E7[b]	49,000	174,000	93,000	66,000
Naphthalene	3.1E5[c]	11,000	na	15,000	10,000
1,2,4-Trimethylbenzene	3.9E5[c]	25,000	na	32,000	30,000
1,3,5-Trimethylbenzene	3.9E5[b]	8,300	na	11,000	10,000
Isopropylbenzene	UA	1,100	na	4,000	2,000
n-Butylbenzene	7.8E4[b]	100 U	na	3,000	3,000
n-Propylbenzene	7.8E4[b]	3,400	na	5,000	4,000
sec-Butylbenzene	7.8E4[b]	660	na	2,000	2,000
tert-Butylbenzene	7.8E4[b]	130	na	2,000 U	2,000 U
4-Isopropyltoluene	UA	900	na	2,000	2,000 J
Halogenated Volatile Organics (HVOs)					
Chloroethane	2.2E4[b]	25 U	6.4 J	500 U	500 U
1,1-Dichloroethane	7.8E5[b]	90	22	500 U	500 U
1,2-Dichloroethane	700[b]	25 U	8.6 U	300 J	500 U
Tetrachloroethene	1.2E3[c]	390	87	500 J	600
1,1,1-Trichloroethane	1.6E5[c]	45	8.6 U	500 U	500 U
Acetone	7.8E5[b]	960	350	5,000 U	5000 U
2-Butanone	4.7E6[b]	370	99	2,000 U	2000 U
Semi-Volatile Organic Compounds (mg/Kg)					
Polycyclic Aromatic Hydrocarbons (PAHs)					
Naphthalene	310[b]	3 J	na	13	13
2-Methylnaphthalene	310[b]	7 J	na	30	28
Acenaphthene	470[b]	3 J	na	8	8
Anthracene	2.3E3[a]	11 J	na	26	26
Benzo(a)anthracene	0.088[b]	23 J	na	73	72
Benzo(a)pyrene	0.0088[b]	13 J	na	44 J	41 J
Benzo(b)fluoranthene	0.088[b]	14 J	na	45 J	45 J
Benzo(g,h,i)perylene	UA	5 J	na	31 J	25 J
Benzo(k)fluoranthene	0.880[b]	17 J	na	48 J	42 J
Chrysene	8.8[b]	28 J	na	87	90
Dibenzo(a,h)anthracene	0.0088[b]	2 J	na	50 U	50 U
Dibenzofuran	31[b]	1 J	na	5	5 J
Fluoranthene	310[b]	49 J	na	160	140
Fluorene	310[b]	4 J	na	14	13
Indeno(1,2,3-cd)pyrene	0.088[b]	6 J	na	33 J	27 J
Phenanthrene	UA	39 J	na	75	75
Pyrene	230[b]	51 J	na	140 J	150 J
Benzyl butyl phthalate	UA	2 J	na	50 U	7 J
Bis(2-ethylhexyl) phthalate	4.6[b]	3 J B	na	14 J	16 J
Di-n-butyl phthalate	780[b]	6 U	na	2 J	2 J

Notes:

DUP = Field duplicate sample. QA = Referee QA sample.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
na = Target analyte not analyzed for in QA sample analysis.
[a] Screening criteria ADEC UST Soil cleanup levels (ADEC 1995).
[b] Screening criteria one-tenth of the EPA Region 3 RBCs (EPA 1996).

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID Field ID Laboratory ID Sample Date	Screening Criteria	AP3439 964559136GW K96693401 10/28/96	AP3440 964559140GW K96708802 11/1/96	AP3441 964559138GW K96704501 10/31/96	 964559021GW K980024506 1/13/98	AP3467 964559125GW K96680202 10/22/96	AP3468 964559153GW K96742303 11/14/96	 964559041GW K980036603 1/16/98	AP3469 964559132GW K96687903 10/24/96
Petroleum Hydrocarbons (µg/L)									
Gasoline Range Organics	15[a]	50 U	50 U	50 U	50 U	50 U	49 J	50 U	50 U
Diesel Range Organics	15[a]	100 U	41 J	100 U	26 U J,B	100 U	74 J	40 U J,B	100 U
Volatile Organic Compounds (µg/L)									
Aromatic Volatile Organics (AVOs)									
Benzene	15[a], 0.36[b], 5[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	1300[b], 700[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	750[b], 1000[c]	0.06 U J,B	0.2 U J,B	0.5 U	0.09 U J,B	0.5 U	0.5 U	0.3 U J,B	0.04 J
Xylenes	12000[b], 10000[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Naphthalene	1500[b]	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2,3-Trichlorobenzene	UA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
4-Isopropyltoluene	UA	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,3,5-Trimethylbenzene	12[b]	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2,4-Trimethylbenzene	12[b]	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Halogenated Volatile Organics (HVOs)									
Tetrachloroethene	1.10[b], 5[c]	4.7	8.9 B	0.5 U	0.5 U	0.5 U	100	91	0.5 U
Carbon tetrachloride	0.16[b], 5[c]	0.2 J	0.2 J	0.8	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	0.15b	0.06	0.3 U J,B	2.7 U B	2.7 U B	0.5 U	0.4 U J,B	0.8 U B	0.5 U
Bromodichloromethane	0.17[b]	0.5 U	0.5 U	0.04 U J,B	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	1.40[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1,2-Tetrachloroethane	0.41[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	0.5 U
Acetone	3700[b]	1 U J,B	1 U J,B	1 U J,B	1 J,B	2 U J,B	20 U	20 U	2 U J,B
Carbon Disulfide	1000[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	1900[b]	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Semi-Volatile Organic Compounds (µg/L)									
Bis(2-ethylhexyl)phthalate	4.8[b], 6[c]	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenanthrene	UA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	1500[b]	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Pyrene	1100[b]	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benz(a)anthracene	0.092[b]	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	9.20[b]	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3439	AP3440	AP3441		AP3467	AP3468		AP3469
Field ID		964559136GW	964559140GW	964559138GW	964559021GW	964559125GW	964559153GW	964559041GW	964559132GW
Laboratory ID		K96693401	K96708802	K96704501	K980024506	K96680202	K96742303	K980036603	K96687903
Sample Date	Screening Criteria	10/28/96	11/1/96	10/31/96	1/13/98	10/22/96	11/14/96	1/16/98	10/24/96
Metals (µg/L)									
Arsenic (dissolved)	11[b], 50[c]	2	1 J	5 U	5 U	14	5 U	5 U	8
Arsenic	11[b], 50[c]	55	2 J	58	1 J	15	154	5 U	9
Barium (dissolved)	2600[b], 2000[c]	7	8	21	13	39	22	17	45
Barium	2600[b], 2000[c]	307	9	351	15	40	1230	19	45
Chromium (dissolved)	180/37000[b], 100[c]	5 U	5 U	5 U	5 U	5 U	4 J	5 U	5 U
Chromium	180/37000[b], 100[c]	94	5 U	130	7	5 U	1240	12	5 U
Iron (dissolved)	11000[b]	20 U	20 U	687	20 J	22	--	22	20 U
Iron	11000[b]	85000	40	95100	409	93	--	289	128
Lead (dissolved)	15 (Action Level)[c]	2 U	2 U	2 J	2 U	2 U	2 U	2 U	2 U
Lead	15 (Action Level)[c]	24	2 U	28	2 U	2 U	137	2 U	2 U
Mercury (dissolved)	11[b], 2[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.2 J	0.5 U	0.5 U
Mercury	11[b], 2[c]	0.6	0.5 U	0.6	0.5 U	0.5 U	1.4	0.5 U	0.5 U
Nickel (dissolved)	730[b]	20 U	20 U	20 U	20 U	20 U	--	20 U	20 U
Nickel	730[b]	175	20 U	196	20 J	20 U	--	20 U	20 U
Selenium	180[b], 50[c]	20 U	5 U	5 U	5 U	5 U	20 U	5 U	5 U
Other Analyses (mg/L)									
Hardness (As CaCO3)		147	158	218	182	133	280	298	158
Suspended Solids		991	5 U	1560	6	5 U	5980	6	5 U
Sulfate		20	20	18	16	14	32	23.9	22
Nitrogen, Ammonia (as N)		0.05 U	0.12	0.05 U	0.05 U	0.2	0.05 U	0.05 U	0.15
Nitrogen, Nitrate-Nitrite		1	1.1	0.9	0.7	0.2 U	2.9	2.8	0.4

Notes:

DUP = Field duplicate sample.
UA = Unavailable
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
E = Analyte exceeded the concentration range of the instrument
- - = Analysis not performed on sample
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996). Chromium VI (180)/Chromium III (37000).
[c]Screening criteria Primary maximum Contaminant Level (MCL).

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TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3483		AP3534			AP3772		
Field ID Laboratory ID Sample Date	Screening Criteria	964559130GW K96687901 10/24/96	964559131GW K96686501 10/24/96 DUP	964559127GW K96682201 10/23/96	964559128GW K96682202 10/23/96 DUP	984559036GW K980028711 1/15/98	96455918GW K96576801 9/13/96	96455920GW K96576803 9/13/96 DUP	964559150GW K96721703 11/6/96
Petroleum Hydrocarbons (µg/L)									
Gasoline Range Organics	15[a]	50 U	50 U	50 U	50 U	31 J	--	--	50 U
Diesel Range Organics	15[a]	100 U	100 U	100 U	100 U	100 U	--	--	100 U
Volatile Organic Compounds (µg/L)									
Aromatic Volatile Organics (AVOs)									
Benzene	15[a], 0.36[b], 5[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	0.5 U
Ethylbenzene	1300[b], 700[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	0.5 U
Toluene	750[b], 1000[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.05 U J,B	--	--	0.08 U J,B
Xylenes	12000[b], 10000[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	0.5 U
Naphthalene	1500[b]	2 U	2 U	2 U	2 U	2 U	--	--	2 U
1,2,3-Trichlorobenzene	UA	2 U	2 U	2 U	2 U	2 U	--	--	2 U
4-Isopropyltoluene	UA	2 U	2 U	2 U	2 U	2 U	--	--	2 U
1,3,5-Trimethylbenzene	12[b]	2 U	2 U	2 U	2 U	2 U	--	--	2 U
1,2,4-Trimethylbenzene	12[b]	2 U	2 U	2 U	2 U	2 U	--	--	2 U
Halogenated Volatile Organics (HVOs)									
Tetrachloroethene	1.10[b], 5[c]	0.5 U	0.5 U	34	34	36	0.5 U	0.5 U	0.5 U
Carbon tetrachloride	0.16[b], 5[c]	0.5 U	0.5 U	0.1 J	0.5 U	0.5 U	--	--	0.5 U
Chloroform	0.15b	0.5 U	0.5 U	0.1 U J,B	0.1 U J,B	0.2 U J,B	--	--	0.5 U
Bromodichloromethane	0.17[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	0.5 U
Chloromethane	1.40[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	0.5 U
1,1,1,2-Tetrachloroethane	0.41[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	0.5 U
Acetone	3700[b]	20 U	20 U	1 U J,B	20 U	1 U J,B	--	--	1 U J,B
Carbon Disulfide	1000[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	0.5 U
2-Butanone	1900[b]	20 U	20 U	20 U	20 U	20 U	--	--	20 U
Semi-Volatile Organic Compounds (µg/L)									
Bis(2-ethylhexyl)phthalate	4.8[b], 6[c]	10 U	10 U	10 U	10 U	10 U	--	--	10 U
Phenanthrene	UA	10 U	10 U	10 U	10 U	10 U	--	--	10 U
Fluoranthene	1500[b]	10 U	10 U	10 U	10 U	10 U	--	--	10 U
Pyrene	1100[b]	10 U	10 U	10 U	10 U	10 U	--	--	10 U
Benz(a)anthracene	0.092[b]	10 U	10 U	10 U	10 U	10 U	--	--	10 U
Chrysene	9.20[b]	10 U	10 U	10 U	10 U	10 U	--	--	10 U

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3483		AP3534			AP3772		
Field ID Laboratory ID Sample Date	Screening Criteria	964559130GW K96687901 10/24/96	964559131GW K96686501 10/24/96 DUP	964559127GW K96682201 10/23/96	964559128GW K96682202 10/23/96 DUP	984559036GW K980028711 1/15/98	96455918GW K96576801 9/13/96	96455920GW K96576803 9/13/96 DUP	964559150GW K96721703 11/6/96
Metals (µg/L)									
Arsenic (dissolved)	11[b], 50[c]	3 J	5 U	5 U	5 U	5 U	--	--	1 J
Arsenic	11[b], 50[c]	5 U	5 U	5 U	1 J	1 J	--	--	1 J
Barium (dissolved)	2600[b], 2000[c]	4 J	5 U	8	8	9	--	--	7
Barium	2600[b], 2000[c]	5 U	5 J	9	9	10	--	--	7
Chromium (dissolved)	180/37000[b], 100[c]	5 U	5 U	5 U	5 U	5 U	--	--	5 U
Chromium	180/37000[b], 100[c]	5 U	5 U	5 U	5 U	5 U	--	--	5 U
Iron (dissolved)	11000[b]	436	20 U	20 U	20 U	20 U	--	--	26 E
Iron	11000[b]	32	46	20 U	22	20 U	--	--	100
Lead (dissolved)	15 (Action Level)[c]	3	2 U	2 U	2 U	2 U	--	--	2 U
Lead	15 (Action Level)[c]	2 U	1 J	2 U	1 J	2 U	--	--	2 U
Mercury (dissolved)	11[b], 2[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	0.5 U
Mercury	11[b], 2[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	--	--	0.5 U
Nickel (dissolved)	730[b]	20 U	20 U	20 U	20 U	20 U	--	--	20 U
Nickel	730[b]	20 U	20 U	20 U	20 U	20 U	--	--	20 U
Selenium	180[b], 50[c]	5 U	5 U	5 U	1 J	5 U	--	--	5 U
Other Analyses (mg/L)									
Hardness (As CaCO3)		144	150	155	158	156	--	--	155
Suspended Solids		5 U	5 U	5 U	5 U	5 U	--	--	5 U
Sulfate		0.2 U	20	22	22	20.3	--	--	19
Nitrogen, Ammonia (as N)		0.15	0.21	0.1 U	0.1 U	0.05 U	--	--	0.26
Nitrogen, Nitrate-Nitrite		0.9	1	1.4	1.3	1.5	--	--	1

Notes:

DUP = Field duplicate sample.
UA = Unavailable
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
E = Analyte exceeded the concentration range of the instrument
- - = Analysis not performed on sample
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996). Chromium VI (180)/Chromium III (37000).
[c]Screening criteria Primary maximum Contaminant Level (MCL).

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3773				AP3774			
Field ID		96455921GW	964559145GW	964559146GW	984559031GW	96455956GW	96455960GW	964559152GW	984559020GW
Laboratory ID		K96576804	K96716301	K96716302	K980028706	K96598501	K96598505	K96727202	K980024504
Sample Date	Screening Criteria	9/13/96	11/5/96	11/5/96 DUP	1/14/98	9/23/96	9/23/96 DUP	11/8/96	1/13/98
Petroleum Hydrocarbons (µg/L)									
Gasoline Range Organics	15[a]	--	50 U	50 U	50 U	--	--	50 U	50 U
Diesel Range Organics	15[a]	--	100 U	100 U	100 U	--	--	50 J	22 U J,B
Volatile Organic Compounds (µg/L)									
Aromatic Volatile Organics (AVOs)									
Benzene	15[a], 0.36[b], 5[c]	--	0.5 U	0.5 U	0.5 U	--	--	0.5 U	0.5 U
Ethylbenzene	1300[b], 700[c]	--	0.5 U	0.5 U	0.5 U	--	--	0.5 U	0.5 U
Toluene	750[b], 1000[c]	--	0.1 U J,B	0.2 U J,B	0.09 U J,B	--	--	0.2 U J,B	0.09 U J,B
Xylenes	12000[b], 10000[c]	--	0.5 U	0.5 U	0.5 U	--	--	0.5 U	0.5 U
Naphthalene	1500[b]	--	2 U	2 U	2 U	--	--	2 U	2 U
1,2,3-Trichlorobenzene	UA	--	2 U	2 U	2 U	--	--	2 U	2 U
4-Isopropyltoluene	UA	--	2 U	2 U	2 U	--	--	2 U	2 U
1,3,5-Trimethylbenzene	12[b]	--	2 U	2 U	2 U	--	--	2 U	2 U
1,2,4-Trimethylbenzene	12[b]	--	2 U	2 U	2 U	--	--	2 U	2 U
Halogenated Volatile Organics (HVOs)									
Tetrachloroethene	1.10[b], 5[c]	0.5 U	0.5 U	0.5 U	0.5 U	1.2	1.1	0.9	1.1
Carbon tetrachloride	0.16[b], 5[c]	--	0.5 U	0.5 U	0.5 U	--	--	0.2 J	0.5 U
Chloroform	0.15b	--	0.5 U	0.5 U	0.5 U	--	--	0.7 U B	0.8 U B
Bromodichloromethane	0.17[b]	--	0.5 U	0.5 U	0.5 U	--	--	0.5 U	0.5 U
Chloromethane	1.40[b]	--	0.5 U	0.5 U	0.5 U	--	--	0.5 U	0.6
1,1,1,2-Tetrachloroethane	0.41[b]	--	0.5 U	0.5 U	0.5 U	--	--	0.5 U	0.5 U
Acetone	3700[b]	--	0.8 U J,B	1 U J,B	20 U	--	--	3 U J,B	20 U
Carbon Disulfide	1000[b]	--	0.5 U	0.5 U	1.2 U B	--	--	0.5 U	0.5 U
2-Butanone	1900[b]	--	20 U	20 U	20 U	--	--	20 U	20 U
Semi-Volatile Organic Compounds (µg/L)									
Bis(2-ethylhexyl)phthalate	4.8[b], 6[c]	--	10 U	10 U	10 U	--	--	10 U	33
Phenanthrene	UA	--	10 U	10 U	10 U	--	--	10 U	10 U
Fluoranthene	1500[b]	--	10 U	10 U	10 U	--	--	10 U	10 U
Pyrene	1100[b]	--	10 U	10 U	10 U	--	--	10 U	10 U
Benz(a)anthracene	0.092[b]	--	10 U	10 U	10 U	--	--	10 U	10 U
Chrysene	9.20[b]	--	10 U	10 U	10 U	--	--	10 U	10 U

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3773				AP3774			
Field ID Laboratory ID Sample Date	Screening Criteria	96455921GW K96576804 9/13/96	964559145GW K96716301 11/5/96	964559146GW K96716302 11/5/96 DUP	984559031GW K980028706 1/14/98	96455956GW K96598501 9/23/96	96455960GW K96598505 9/23/96 DUP	964559152GW K96727202 11/8/96	98455902OGW K980024504 1/13/98
Metals (µg/L)									
Arsenic (dissolved)	11[b], 50[c]	--	2 J	2 J	1 J	--	--	5 U	5 U
Arsenic	11[b], 50[c]	--	2 J	2 J	1	--	--	5 U	5 U
Barium (dissolved)	2600[b], 2000[c]	--	14	15	11	--	--	5 U	11
Barium	2600[b], 2000[c]	--	13	14	12	--	--	5 U	12
Chromium (dissolved)	180/37000[b], 100[c]	--	5 U	5 U	5 U	--	--	5 U	5 U
Chromium	180/37000[b], 100[c]	--	5 U	5 U	5	--	--	5 U	5 U
Iron (dissolved)	11000[b]	--	20 U	20 U	10 J	--	--	20 U	20 J
Iron	11000[b]	--	20 U	20 U	84	--	--	20 E	52
Lead (dissolved)	15 (Action Level)[c]	--	2 U	2 U	2 U	--	--	2 U	2 U
Lead	15 (Action Level)[c]	--	2 U	2 U	2 U	--	--	2 U	2 U
Mercury (dissolved)	11[b], 2[c]	--	0.5 U	0.5 U	0.5 U	--	--	0.5 U	0.5 U
Mercury	11[b], 2[c]	--	0.5 U	0.5 U	0.5 U	--	--	0.5 U	0.5 U
Nickel (dissolved)	730[b]	--	20 U	20 U	20 U	--	--	20 U	20 U
Nickel	730[b]	--	20 U	20 U	20 U	--	--	20 U	20 U
Selenium	180[b], 50[c]	--	5 U	5 U	5 U	--	--	5 U	5 U
Other Analyses (mg/L)									
Hardness (As CaCO3)		--	155	144	146	--	--	0.2	198
Suspended Solids		--	5 U	5 U	5 U	--	--	5 U	5 U
Sulfate		--	19	19	18.7	--	--	0.2 U	22.6
Nitrogen, Ammonia (as N)		--	0.23	0.25	0.05 U	--	--	0.1 B	0.05 U
Nitrogen, Nitrate-Nitrite		--	1	0.9	0.9	--	--	0.2 U	1.2

Notes:

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UA = Unavailable
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
E = Analyte exceeded the concentration range of the instrument
- - = Analysis not performed on sample
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996). Chromium VI (180)/Chromium III (37000).
[c]Screening criteria Primary maximum Contaminant Level (MCL).

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3775			AP3776			
Field ID Laboratory ID Sample Date	Screening Criteria	96455957GW K96598502 9/23/96	964559149GW K96721702 11/6/96	984559030GW K980028705 1/14/98	96455959GW K96598504 9/23/96	964559142GW K96712501 11/4/96	964559143GW K96712502 11/4/96 DUP	984559018GW K980024503 1/12/98
Petroleum Hydrocarbons (µg/L)								
Gasoline Range Organics	15[a]	--	50 U	50 U	--	50 U	50 U	50 U
Diesel Range Organics	15[a]	--	100 U	21 U J,B	--	100 U	100 U	23 U J,B
Volatile Organic Compounds (µg/L)								
Aromatic Volatile Organics (AVOs)								
Benzene	15[a], 0.36[b], 5[c]	--	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U
Ethylbenzene	1300[b], 700[c]	--	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U
Toluene	750[b], 1000[c]	--	0.1 U J,B	0.1 U J,B	--	0.3 U J,B	0.2 U J,B	0.05 U J,B
Xylenes	12000[b], 10000[c]	--	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U
Naphthalene	1500[b]	--	2 U	2 U	--	0.1 U J,B	2 U	2 U
1,2,3-Trichlorobenzene	UA	--	2 U	2 U	--	0.1 J,B	2 U	2 U
4-Isopropylloluene	UA	--	2 U	2 U	--	2 U	2 U	2 U
1,3,5-Trimethylbenzene	12[b]	--	2 U	2 U	--	2 U	2 U	2 U
1,2,4-Trimethylbenzene	12[b]	--	2 U	2 U	--	2 U	2 U	2 U
Halogenated Volatile Organics (HVOs)								
Tetrachloroethene	1.10[b], 5[c]	0.6	0.6	1.2	0.5 U	0.8	0.8	1
Carbon tetrachloride	0.16[b], 5[c]	--	0.1 J	0.5 U	--	0.3 J	0.3 J	0.5 U
Chloroform	0.15b	--	0.5 U	0.06 U J,B	--	0.4 U J,B	0.4 U J,B	0.4 U J,B
Bromodichloromethane	0.17[b]	--	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U
Chloromethane	1.40[b]	--	0.5 U	0.5 U	--	0.5 U	0.2 J	0.4 J
1,1,1,2-Tetrachloroethane	0.41[b]	--	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U
Acetone	3700[b]	--	1 U J,B	20 U	--	20 U	20 U	1 J,B
Carbon Disulfide	1000[b]	--	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U
2-Butanone	1900[b]	--	20 U	20 U	--	20 U	20 U	20 U
Semi-Volatile Organic Compounds (µg/L)					--			
Bis(2-ethylhexyl)phthalate	4.8[b], 6[c]	--	10 U	10 U	--	10 U	10 U	10 U
Phenanthrene	UA	--	10 U	10 U	--	10 U	10 U	10 U
Fluoranthene	1500[b]	--	10 U	10 U	--	10 U	10 U	10 U
Pyrene	1100[b]	--	10 U	10 U	--	10 U	10 U	10 U
Benz(a)anthracene	0.092[b]	--	10 U	10 U	--	10 U	10 U	10 U
Chrysene	9.20[b]	--	10 U	10 U	--	10 U	10 U	10 U

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3775			AP3776			
Field ID Laboratory ID Sample Date	Screening Criteria	96455957GW K96598502 9/23/96	964559149GW K96721702 11/6/96	984559030GW K980028705 1/14/98	96455959GW K96598504 9/23/96	964559142GW K96712501 11/4/96	964559143GW K96712502 11/4/96 DUP	984559018GW K980024503 1/12/98
Metals (µg/L)								
Arsenic (dissolved)	11[b], 50[c]	--	1 J	1 J	--	5 U	5 U	5 U
Arsenic	11[b], 50[c]	--	2 J	1	--	1 J	1 J	5 U
Barium (dissolved)	2600[b], 2000[c]	--	13	8	--	18	18	14
Barium	2600[b], 2000[c]	--	14	9	--	22	19	15
Chromium (dissolved)	180/37000[b], 100[c]	--	5 U	5 U	--	5 U	5 U	5 U
Chromium	180/37000[b], 100[c]	--	5 U	5 U	--	11	5 U	5 U
Iron (dissolved)	11000[b]	--	31 E	20 U	--	20 U	36	20 J
Iron	11000[b]	--	231	136	--	820	94	37
Lead (dissolved)	15 (Action Level)[c]	--	2 U	2 U	--	2 U	2 U	2 U
Lead	15 (Action Level)[c]	--	2 U	1 J	--	2 U	2 U	2 U
Mercury (dissolved)	11[b], 2[c]	--	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U
Mercury	11[b], 2[c]	--	0.5 U	0.5 U	--	0.5 U	0.5 U	0.5 U
Nickel (dissolved)	730[b]	--	20 U	20 U	--	20 U	20 U	20 U
Nickel	730[b]	--	20 U	20 U	--	20 U	20 U	20 U
Selenium	180[b], 50[c]	--	5 U	5 U	--	5 U	5 U	5 U
Other Analyses (mg/L)								
Hardness (As CaCO3)		--	157	174	--	217	206	212
Suspended Solids		--	5 U	5 U	--	11	5 U	5 U
Sulfate		--	19	20.7	--	18	18	16.5
Nitrogen, Ammonia (as N)		--	0.27	0.05 U	--	0.22	0.24	0.05 U
Nitrogen, Nitrate-Nitrite		--	1.2	1.4	--	1	1	1

Notes:

DUP = Field duplicate sample.
UA = Unavailable
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
E = Analyte exceeded the concentration range of the instrument
- - = Analysis not performed on sample
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996). Chromium VI (180)/Chromium III (37000).
[c]Screening criteria Primary maximum Contaminant Level (MCL).

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3789		AP3790			AP3387	
Field ID Laboratory ID Sample Date	Screening Criteria	974559177GW K97112402 2/18/97	984559040GW K980036602 1/16/98	974559178GW K97112403 2/18/97	984559055GW K980051402 1/23/98	984559057GW K980051404 1/23/98 DUP	984559038GW K980028713 1/15/98	984559037GW K980028712 1/15/98 DUP
Petroleum Hydrocarbons (µg/L)								
Gasoline Range Organics	15[a]	50 U	50 U	50 U	50 U	50 U	68	68
Diesel Range Organics	15[a]	100 U	100 U	100 U	20 U J,B	20 U J,B	5900	5270
Volatile Organic Compounds (µg/L)								
Aromatic Volatile Organics (AVOs)								
Benzene	15[a], 0.36[b], 5[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	1300[b], 700[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	750[b], 1000[c]	0.1 U J,B	0.08 U J,B	0.2 U J,B	0.5 U	0.5 U	0.06 U J,B	0.08 U J,B
Xylenes	12000[b], 10000[c]	0.5 U	0.5 U	0.5 U	0.8 U B	0.8 U B	0.5 U	0.5 U
Naphthalene	1500[b]	2 U	2 U	2 U	2 U	2 U	2 U	2 U
1,2,3-Trichlorobenzene	UA	2 U	2 U	2 U	2 U	2 U	2 U	2 U
4-Isopropyltoluene	UA	2 U	2 U	2 U	2 U	2 U	0.09 J	0.09 J
1,3,5-Trimethylbenzene	12[b]	2 U	2 U	2 U	2 U	2 U	0.2 J	0.2 J
1,2,4-Trimethylbenzene	12[b]	2 U	2 U	2 U	2 U	2 U	0.09 U J,B	2 U
Halogenated Volatile Organics (HVOs)								
Tetrachloroethene	1.10[b], 5[c]	1.5	2.8	3.2	0.3 J	0.3 J	10	10
Carbon tetrachloride	0.16[b], 5[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	0.15[b]	0.5 U	0.5 U	1.8 U B	2.3 U B	2.3 U B	0.4 U J,B	0.4 U J,B
Bromodichloromethane	0.17[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	1.40[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1,2-Tetrachloroethane	0.41[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	3700[b]	20 U	20 U	20 U	20 U	20 U	3 U J,B	4 U J,B
Carbon Disulfide	1000[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	1900[b]	20 U	20 U	20 U	20 U	20 U	8 U J,B	8 U J,B
Semi-Volatile Organic Compounds (µg/L)								
Bis(2-ethylhexyl)phthalate	4.8[b], 6[c]	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenanthrene	UA	10 U	3 J	10 U	10 U	10 U	10 U	10 U
Fluoranthene	1500[b]	10 U	4 J	10 U	10 U	10 U	10 U	10 U
Pyrene	1100[b]	10 U	3 J	10 U	10 U	10 U	10 U	10 U
Benz(a)anthracene	0.092[b]	10 U	0.6 J	10 U	10 U	10 U	10 U	10 U
Chrysene	9.20[b]	10 U	0.8 J	10 U	10 U	10 U	10 U	10 U

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3789		AP3790			AP3387	
Field ID Laboratory ID Sample Date	Screening Criteria	974559177GW K97112402 2/18/97	984559040GW K980036602 1/16/98	974559178GW K97112403 2/18/97	984559055GW K980051402 1/23/98	984559057GW K980051404 1/23/98 DUP	984559038GW K980028713 1/15/98	984559037GW K980028712 1/15/98 DUP
Metals (µg/L)								
Arsenic (dissolved)	11[b], 50[c]	1 J	2 J	5 U	5 U	5 U	5 U	5 U
Arsenic	11[b], 50[c]	1 J	1 J	5 U	5 U	5 U	4 J	4 J
Barium (dissolved)	2600[b], 2000[c]	15	4 J	26	21	22	16	16
Barium	2600[b], 2000[c]	8	6	28	24	24	194	20
Chromium (dissolved)	180/37000[b], 100[c]	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chromium	180/37000[b], 100[c]	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Iron (dissolved)	11000[b]	--	20 J	--	35	31	22	20 J
Iron	11000[b]	--	20 J	--	88	63	1410	1470
Lead (dissolved)	15 (Action Level)[c]	2 U	2 U	2 U	1 J	2 U	2 U	2 U
Lead	15 (Action Level)[c]	2 U	2 U	2 U	2 U	2 U	2	2
Mercury (dissolved)	11[b], 2[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Mercury	11[b], 2[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Nickel (dissolved)	730[b]	--	20 U	--	20 U	20 U	20 U	10 J
Nickel	730[b]	20 U	20 U	--	20 U	20 U	20 U	20 U
Selenium	180[b], 50[c]	5 U	5 U	5 U	5 U	5 U	1 J	5 U
Other Analyses (mg/L)								
Hardness (As CaCO3)		138	151	367	361	367	295	301
Suspended Solids		5 U	5 U	9	5 U	--	5 U	--
Sulfate		20	19.7	31	24.1	--	76.5	--
Nitrogen, Ammonia (as N)		0.5 U	0.05 U	0.5 U	0.05 U	--	0.05 U	--
Nitrogen, Nitrate-Nitrite		1	1.1	3.8	4.5	--	0.4	--

Notes:

DUP = Field duplicate sample.
UA = Unavailable
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
E = Analyte exceeded the concentration range of the instrument
-- = Analysis not performed on sample
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996). Chromium VI (180)/Chromium III (37000).
[c]Screening criteria Primary maximum Contaminant Level (MCL).

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TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID Field ID Laboratory ID Sample Date	Screening Criteria	AP3870 984559059GW K980055201 1/26/98	AP3871 984559061GW K980057702 1/27/98	AP3872 984559062GW K980057703 1/27/98	AP3873 984559064GW K980061202 1/28/98	AP3873 984559065GW K980061203 1/28/98 DUP
Petroleum Hydrocarbons (µg/L)						
Gasoline Range Organics	15[a]	50 U	50 U	50 U	50 U	50 U
Diesel Range Organics	15[a]	100 U	100 U	100 U	100 U	100 U
Volatile Organic Compounds (µg/L)						
Aromatic Volatile Organics (AVOs)						
Benzene	15[a], 0.36[b], 5[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	1300[b], 700[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	750[b], 1000[c]	0.09 U J,B	0.8 U B	0.5 U	0.5 U	0.5 U
Xylenes	12000[b], 10000[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Naphthalene	1500[b]	2 U	2 U	2 U	2 U	2 U
1,2,3-Trichlorobenzene	UA	2 U	2 U	2 U	2 U	2 U
4-Isopropyltoluene	UA	2 U	2 U	2 U	2 U	2 U
1,3,5-Trimethylbenzene	12[b]	2 U	2 U	2 U	2 U	2 U
1,2,4-Trimethylbenzene	12[b]	2 U	2 U	2 U	2 U	2 U
Halogenated Volatile Organics (HVOs)						
Tetrachloroethene	1.10[b], 5[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon tetrachloride	0.16[b], 5[c]	0.5 U	1	0.5 U	0.4 J	0.5 U
Chloroform	0.15b	0.5 U J,B	5.3 U B	3.5 U B	1 U B	1 U B
Bromodichloromethane	0.17[b]	0.5 U	0.1 U J,B	0.5 U	0.5 U	0.5 U
Chloromethane	1.40[b]	0.5 U	0.5 U	0.6	0.5 U	0.5 U
1,1,1,2-Tetrachloroethane	0.41[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	3700[b]	20 U	20 U	20 U	20 U	20 U
Carbon Disulfide	1000[b]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	1900[b]	20 U	20 U	20 U	20 U	20 U
Semi-Volatile Organic Compounds (µg/L)						
Bis(2-ethylhexyl)phthalate	4.8[b], 6[c]	10 U	10 U	10 U	10 U	10 U
Phenanthrene	UA	10 U	10 U	10 U	10 U	10 U
Fluoranthene	1500[b]	10 U	10 U	10 U	10 U	10 U
Pyrene	1100[b]	10 U	10 U	10 U	10 U	10 U
Benz(a)anthracene	0.092[b]	10 U	10 U	10 U	10 U	10 U
Chrysene	9.20[b]	10 U	10 U	10 U	10 U	10 U

TABLE 4.2-5 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 45-590 DURING THE REMEDIAL INVESTIGATION

Location-ID Field ID Laboratory ID Sample Date	Screening Criteria	AP3870 984559059GW K980055201 1/26/98	AP3871 984559061GW K980057702 1/27/98	AP3872 984559062GW K980057703 1/27/98	AP3873 984559064GW K980061202 1/28/98	AP3873 984559065GW K980061203 1/28/98 DUP
Metals (µg/L)						
Arsenic (dissolved)	11[b], 50[c]	5 U	1 J	5 U	5 U	5 U
Arsenic	11[b], 50[c]	5 U	1 J	5 U	5 U	5 U
Barium (dissolved)	2600[b], 2000[c]	22	20	32	20	32
Barium	2600[b], 2000[c]	23	21	34	17	17
Chromium (dissolved)	180/37000[b], 100[c]	5 U	5 U	5 U	5 U	5 U
Chromium	180/37000[b], 100[c]	5 U	5 U	5 U	5 U	5 U
Iron (dissolved)	11000[b]	28	20 U	20 U	20 U	20 J
Iron	11000[b]	50	35	103	10 J	20 U
Lead (dissolved)	15 (Action Level)[c]	1 J	2 J	2 J	2 U	2 U
Lead	15 (Action Level)[c]	1 J	2 J	2 J	2 J	2 J
Mercury (dissolved)	11[b], 2[c]	0.5 U	0.1 J	0.5 U	0.5 U	0.5 U
Mercury	11[b], 2[c]	0.5 U	0.2 J	0.2 J	0.5 U	0.5 U
Nickel (dissolved)	730[b]	20 U	20 U	20 U	20 U	20 U
Nickel	730[b]	20 U	20 U	20 U	20 U	20 U
Selenium	180[b], 50[c]	5 U	5 U	5 U	5 U	5 U
Other Analyses (mg/L)						
Hardness (As CaCO3)		223	222	423	202	205
Suspended Solids		5 U	5 U	5 U	5 U	--
Sulfate		25.3	18.5	23.4	19.3	--
Nitrogen, Ammonia (as N)		0.05 U	0.05 U	0.05 U	0.05 U	--
Nitrogen, Nitrate-Nitrite		1.5	1.4	1.7	1.2	--

Notes:

DUP = Field duplicate sample.
UA = Unavailable
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
E = Analyte exceeded the concentration range of the instrument
- - = Analysis not performed on sample
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996). Chromium VI (180)/Chromium III (37000).
[c]Screening criteria Primary maximum Contaminant Level (MCL).

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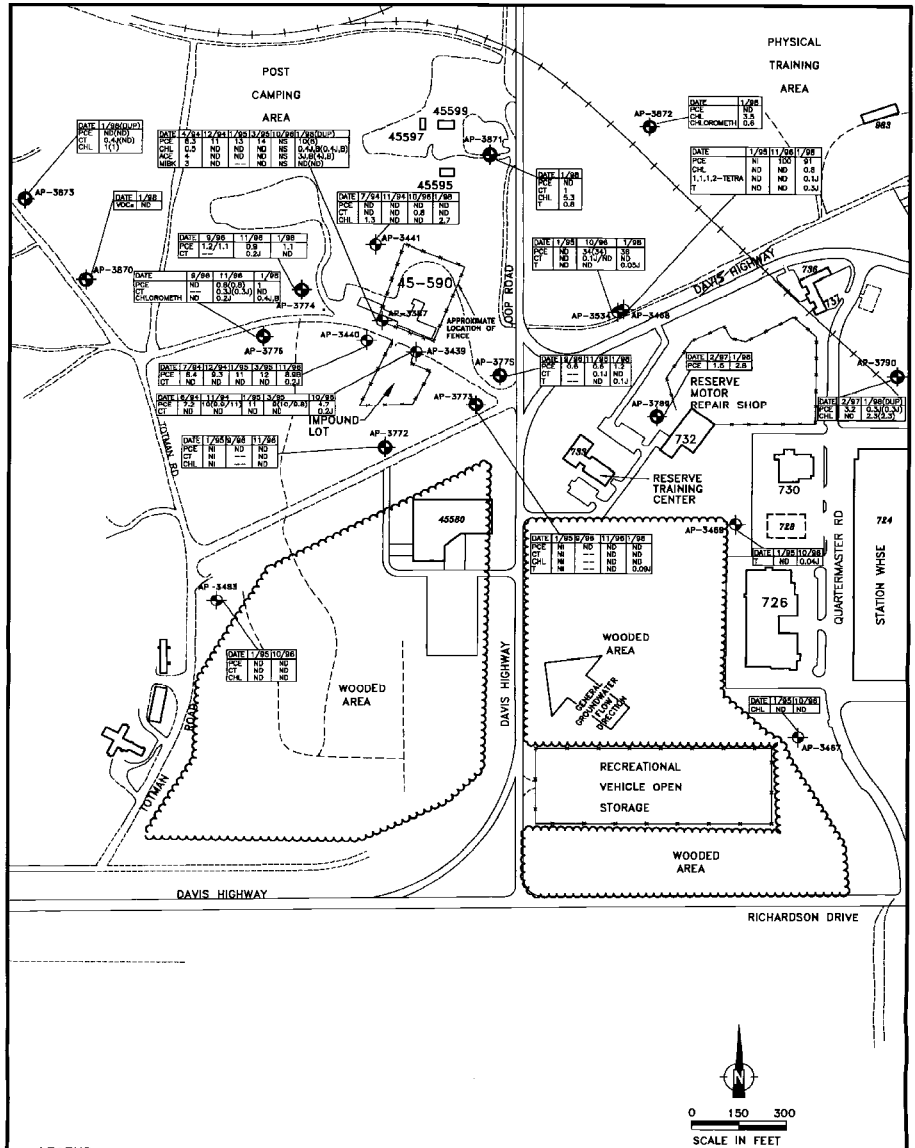


LEGEND

- MONITORING WELL LOCATION
- MONITORING WELL LOCATION (RI)

NOTE: ANALYTICAL RESULTS REPORTED AS µg/L

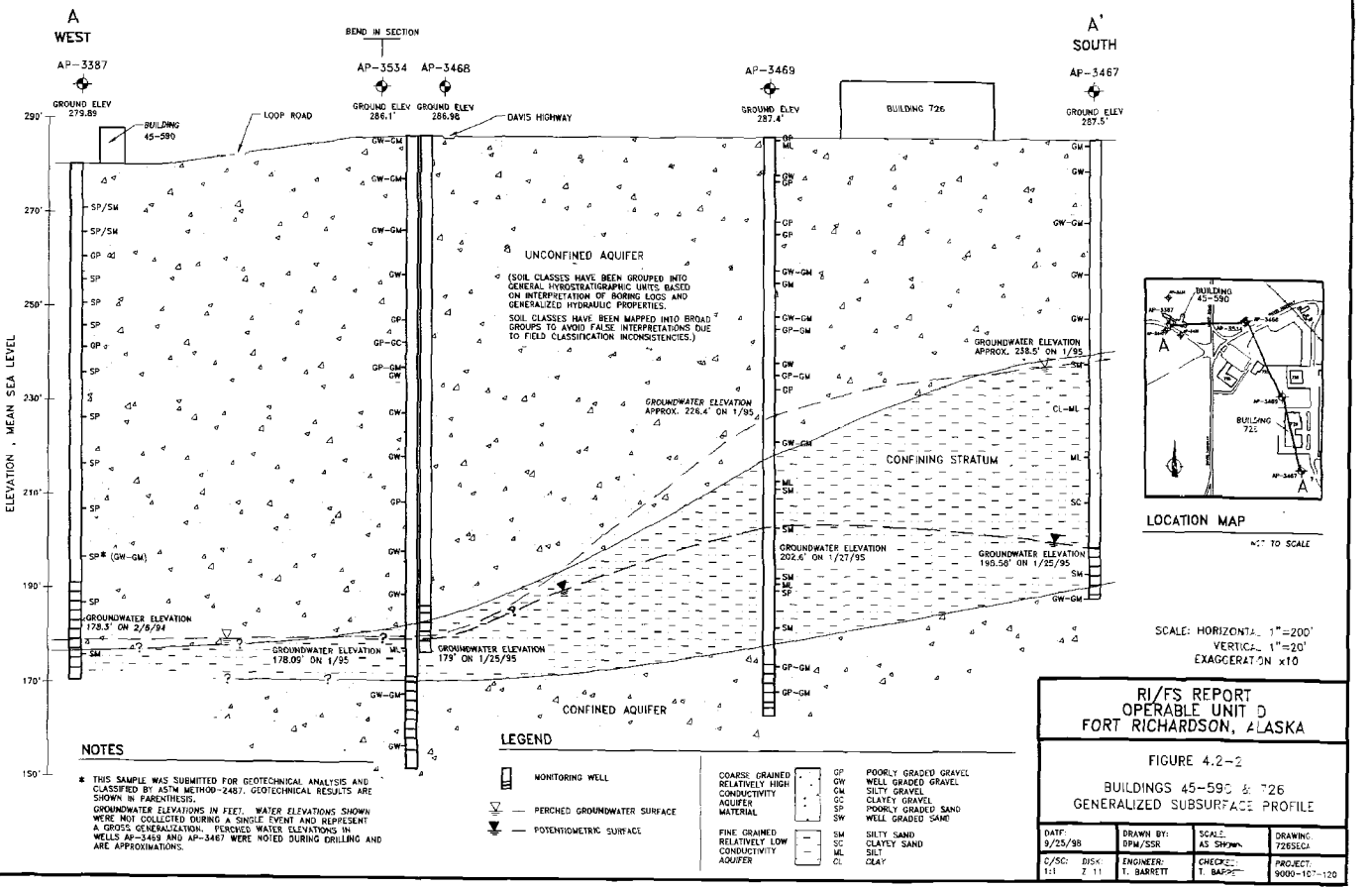
ACE	= ACETONE
CHLOROMETH	= CHLOROMETHANE
CHL	= CHLOROFORM
PCE	= TETRACHLOROETHENE
CT	= CARBON TETRACHLORIDE
MIBK	= METHYL ISOBUTYL KETONE
T	= TOLUENE
1,1,1,2-TETRA	= 1,1,1,2-TETRACHLOROETHANE
NS	= NOT SAMPLED
NI	= NOT INSTALLED
ND	= NOT DETECTED ABOVE METHOD REPORTING LIMIT
J	= ESTIMATED VALUE
B	= ANALYTE DETECTED IN ASSOCIATED BLANK
---	= PARAMETER NOT ANALYZED
(9.9/11)	= DUPLICATE AND QUALITY ASSURANCE SAMPLE RESULTS

SOURCE: ENSR/9000-036/35-752BS

RI/FS REPORT
OPERABLE UNIT D
FT. RICHARDSON, ALASKA

FIGURE 4.2-1
BUILDING 45-590
VOLATILE ORGANIC COMPOUNDS (VOCs)
DETECTED IN GROUNDWATER
(RI & PRE-RI)

DATE: 11/18/98	DRAWN BY: SSR/VJF	SCALE: AS SHOWN	DRAWING: 453900WJ
C/SC: DISK: 1:300 Z 11/97	ENGINEER: J. SHAPIRO	CHECKED: J.SHAPIRO	PROJECT: 9000-107-090



LOCATION MAP

NOT TO SCALE

SCALE: HORIZONTAL 1"=200'
VERTICAL 1"=20'
EXAGGERATION x10

NOTES

* THIS SAMPLE WAS SUBMITTED FOR GEOTECHNICAL ANALYSIS AND CLASSIFIED BY ASTM METHOD-2487. GEOTECHNICAL RESULTS ARE SHOWN IN PARENTHESIS.

GROUNDWATER ELEVATIONS IN FEET. WATER ELEVATIONS SHOWN WERE NOT COLLECTED DURING A SINGLE EVENT AND REPRESENT A GROSS GENERALIZATION. PERCHED WATER ELEVATIONS IN WELLS AP-3469 AND AP-3467 WERE NOTED DURING DRILLING AND ARE APPROXIMATIONS.

LEGEND

MONITORING WELL

PERCHED GROUNDWATER SURFACE

POTENTIOMETRIC SURFACE

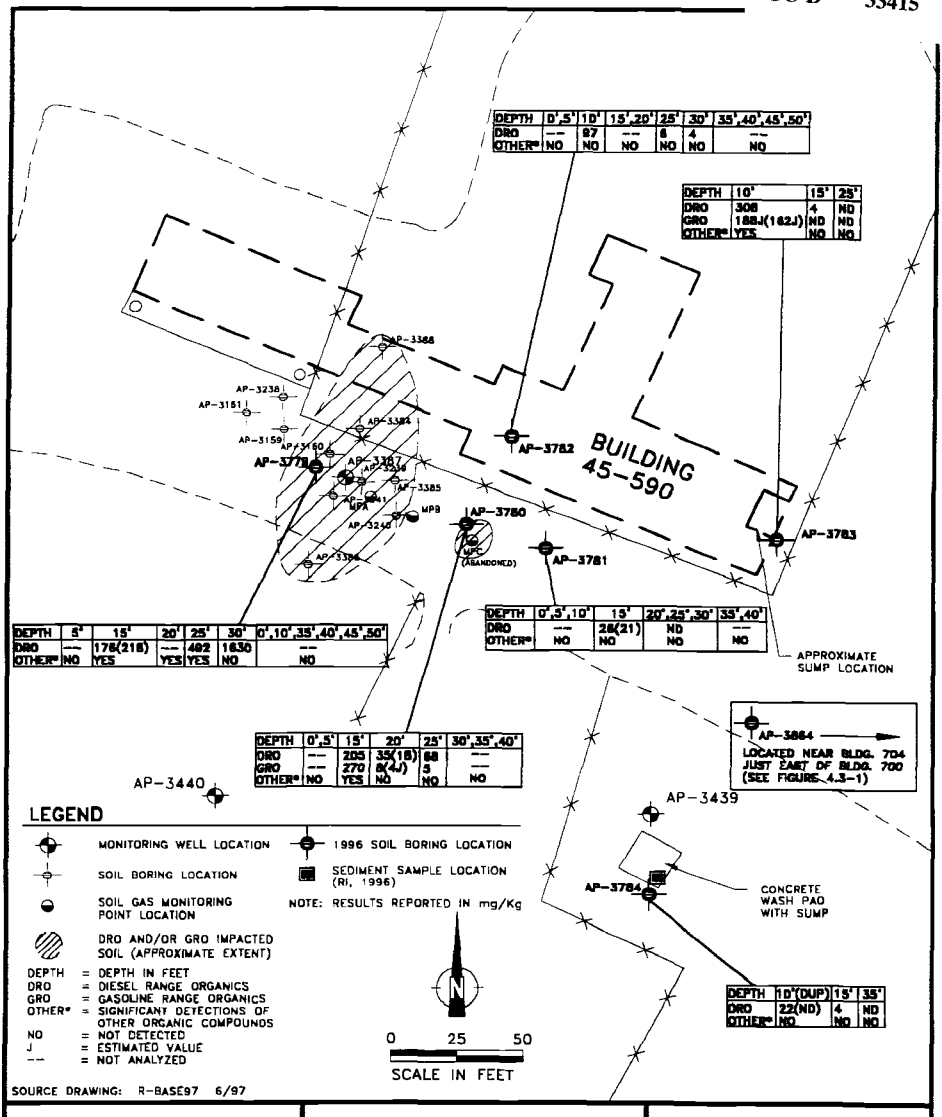
COARSE GRAINED RELATIVELY HIGH CONDUCTIVITY AQUIFER MATERIAL	GP	POORLY GRADED GRAVEL
	GW	WELL GRADED GRAVEL
	GM	SILTY GRAVEL
	GC	CLAYEY GRAVEL
	SP	POORLY GRADED SAND
	SW	WELL GRADED SAND
FINE GRAINED RELATIVELY LOW CONDUCTIVITY AQUIFER	SM	SILTY SAND
	SC	CLAYEY SAND
	ML	SILT
	CL	CLAY

RI/FS REPORT
OPERABLE UNIT D
FORT RICHARDSON, ALASKA

FIGURE 4.2-2

BUILDINGS 45-590 & 726
GENERALIZED SUBSURFACE PROFILE

DATE: 9/25/98	DRAWN BY: DPM/SSR	SCALE: AS SHOWN	DRAWING: 726SEC4
C/SC: 1:1 DISK: Z 11	ENGINEER: T. BARRETT	CHECKED: T. BARRETT	PROJECT: 9000-107-120



DEPTH	0',5'	10'	15',20'	25'	30'	35',40',45',50'
DRO	---	87	---	6	4	---
OTHER*	NO	NO	NO	NO	NO	NO

DEPTH	10'	15'	25'
DRO	308	4	ND
GRO	188J(162J)	ND	ND
OTHER*	YES	NO	NO

DEPTH	5'	15'	20'	25'	30'	0',10',35',40',45',50'
DRO	---	176(218)	---	492	1630	---
OTHER*	NO	YES	YES	YES	NO	NO

DEPTH	0',5',10'	15'	20',25',30'	35',40'
DRO	---	26(21)	ND	---
OTHER*	NO	NO	NO	NO

DEPTH	0',5'	15'	20'	25'	30',35',40'
DRO	---	205	35(18)	68	---
GRO	---	270	8(4J)	5	---
OTHER*	NO	YES	NO	NO	NO

DEPTH	10'(DUP)	15'	35'
DRO	22(ND)	4	ND
OTHER*	NO	NO	NO

LEGEND

- MONITORING WELL LOCATION
- 1996 SOIL BORING LOCATION
- SOIL BORING LOCATION
- SEDIMENT SAMPLE LOCATION (RI, 1996)
- SOIL GAS MONITORING POINT LOCATION
- NOTE: RESULTS REPORTED IN mg/Kg
- DRO AND/OR GRO IMPACTED SOIL (APPROXIMATE EXTENT)

DEPTH = DEPTH IN FEET
DRO = DIESEL RANGE ORGANICS
GRO = GASOLINE RANGE ORGANICS
OTHER* = SIGNIFICANT DETECTIONS OF OTHER ORGANIC COMPOUNDS
NO = NOT DETECTED
J = ESTIMATED VALUE
--- = NOT ANALYZED

SOURCE DRAWING: R-BASE97 6/97

DRAWING: 45590S82 DRAWN: SSR
C/SC: 1:50 DISK: Z 11/97
DATE: 9/25/98 CHECK: JS

FIGURE 4.2-3
BUILDING 45-590
SOIL SAMPLING LOCATIONS

RI/FS REPORT
OPERABLE UNIT D
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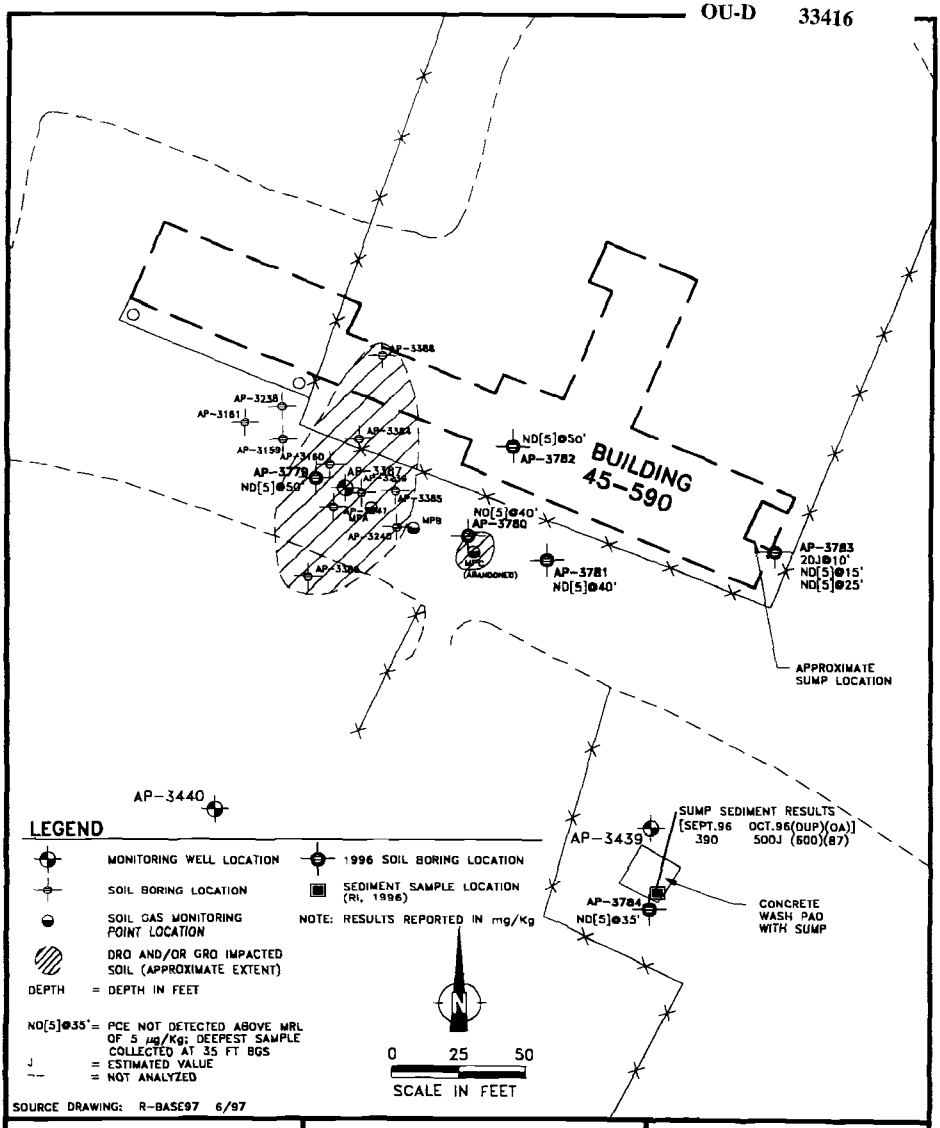
PROJECT 9000-107-120



DRAWING: 45590PCE DRAWN: SSR C/SC: 1:50 DISK: Z 11/97 DATE: 9/29/98 CHECK: J.S.	FIGURE 4.2-4 BUILDING 45-590 PCE DETECTED IN SOIL	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120

ATTACHMENT 4.3
Tables and Figures

Table 4.3-1. Summary of Data Gaps as Identified in the Management Plan and Findings of the Remedial Investigation/Baseline Risk Assessments - Building 726.

Areas of Concern as Identified in the Management Plan	Available Data (Prior to the Remedial Investigation)	Data Gaps Established in the Management Plan	Action Taken during the Remedial Investigation	Findings of the Remedial Investigation/Baseline Risk Assessments
Surface Soil				
Near surface soil at the edge of the asphalt west of the empty PCE drum storage area at Building 726.	No information available.	Solvent concentrations in near surface soil.	Collected surface and near-surface soil samples from the edge of the asphalt west of Building 726 near the empty PCE drum storage area.	PCE and GRO/DRO were detected in samples. Four soil borings were advanced and, although chemicals were detected, no human health or ecological risks were identified. The area is sufficiently characterized.

Key:

DRO = Diesel range organics.
GRO = Gasoline range organics.
PCE = Tetrachloroethene.
VOC = Volatile organics.

Table 4.3-2. Chemicals of Potential Concern as Identified in the Management Plan, Building 726.

Media	Source	Type	Carcinogens	Noncarcinogens
Monoaromatics	Underground solvent tanks	Soil	None	Stoddard Solvent
Chlorinated alkanes	Drums, possibly underground solvent tanks	Soil	Tetrachloroethene (PCE)	None

TABLE 4.3-3 ANALYTES DETECTED IN SOIL SAMPLES COLLECTED AT BUILDING 726 DURING THE REMEDIAL INVESTIGATION

Location ID		96-SS01			96-SS02			
Depth (ft.)		0.5	1	2	0.5	0.5	1	2
Field ID Lab ID Sample Date	Screening Criteria	96B72601SL K96614907 9/27/96	96B72604SL K96614910 9/27/96	96B72607SL K96614913 9/27/96	96B72602SL K96614908 9/27/96	96B72610SL K96614916 9/27/96 DUP	96B72605SL K96614911 9/27/96	96B72608SL K96614914 9/27/96
Petroleum Hydrocarbons (mg/Kg)								
Gasoline Range Organics	50-100[a]	--	55 J	71 J	4 J	10	12 J	19
Diesel Range Organics	100-200[a]	89	66	36	98	98	36	35
Volatile Organic Compounds (µg/Kg)								
Tetrachloroethene	1.2E3[b]	16	100	54	12	23	75	55
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Methylene chloride	8.5E3[b]	6 J	5 J	10 U	5 J	10 U	10 U	10 U
Semi-Volatile Organic Compounds (mg/Kg)								
bis-(2-ethylhexyl)phthalate	4.6[b]	--	--	--	--	--	--	--

Notes:

DUP = Field duplicate sample.

U = Analyte is not detected. Value reported is the method reporting limit (MRL).

J = Value reported is considered an estimate value.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for soil (EPA 1996).

TABLE 4.3-3 ANALYTES DETECTED IN SOIL SAMPLES COLLECTED AT BUILDING 726 DURING THE REMEDIAL INVESTIGATION

Location ID		96-SS03		
Depth (ft.)		0.5	1	2
Field ID		96B72603SL	96B72606SL	96B72609SL
Lab ID	Screening	K96614909	K96614912	K96614915
Sample Date	Criteria	9/27/96	9/27/96	9/27/96
Petroleum Hydrocarbons (mg/Kg)				
Gasoline Range Organics	50-100[a]	8	9	14 J
Diesel Range Organics	100-200[a]	38	50	29
Volatile Organic Compounds (µg/Kg)				
Tetrachloroethene	1.2E3[b]	5	12	11
Toluene	1.6E6[b]	5 U	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U
Methylene chloride	8.5E3[b]	4 J	3 J	3 J
Semi-Volatile Organic Compounds (mg/Kg)				
bis-(2-ethylhexyl)phthalate	4.6[b]	--	--	--

Notes:

DUP = Field duplicate sample.

U = Analyte is not detected. Value reported is the method reporting limit (MRL).

J = Value reported is considered an estimate value.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for soil (EPA 1996).

TABLE 4.3-3 ANALYTES DETECTED IN SOIL SAMPLES COLLECTED AT BUILDING 726 DURING THE REMEDIAL INVESTIGATION

Location ID		AP-3860					
Depth (ft.)		2-4	4-6	10-12	10-12	55-57	63-64
Field ID Lab ID Sample Date	Screening Criteria	97B72601SL K97706901 9/24/97	97B72602SL K97706902 9/24/97	97B72603SL K97706903 9/24/97	97B72604SL K97706904 9/24/97 DUP	97B72605SL K97706905 9/24/97	97B72606SL K97709701 9/25/97
Petroleum Hydrocarbons (mg/Kg)							
Gasoline Range Organics	50-100[a]	17	5 U	5 U	--	2200	5 U
Diesel Range Organics	100-200[a]	20	5	4 U	4 U	2890	6
Volatile Organic Compounds (µg/Kg)							
Tetrachloroethene	1.2E3[b]	7	3 J	8	33	880	5 U
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	30 U	2 J
Acetone	7.8E5[b]	50 U	50 U	50 U	50 U	300 U	50 U
Methylene chloride	8.5E3[b]	10 U	10 U	10 U	3 J	60 U	4 J
Semi-Volatile Organic Compounds (mg/Kg)							
bis-(2-ethylhexyl)phthalate	4.6[b]	0.3 U	0.3 U	0.3 U	0.1 J	0.4 J	0.3 U

Notes:

DUP = Field duplicate sample.

U = Analyte is not detected. Value reported is the method reporting limit (MRL).

J = Value reported is considered an estimate value.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for soil (EPA 1996).

TABLE 4.3-3 ANALYTES DETECTED IN SOIL SAMPLES COLLECTED AT BUILDING 726 DURING THE REMEDIAL INVESTIGATION

Location ID		AP-3861					
Depth (ft.)		0-2	0-2	4-6	10-12	55-57	57.5-58.5
Field ID		97B72619SL	97B72619SL	97B72621SL	97B72624SL	97B72633SL	97B72634SL
Lab ID	Screening	K97709702	K97709702RE	K97709704	K97709703	K97709705	K97709706
Sample Date	Criteria	9/25/97		9/25/97	9/25/97	9/25/97	9/25/97
Petroleum Hydrocarbons (mg/Kg)							
Gasoline Range Organics	50-100[a]	72	--	5 U	5 U	27	5 U
Diesel Range Organics	100-200[a]	19	--	4 U	4 U	5	4
Volatile Organic Compounds (µg/Kg)							
Tetrachloroethene	1.2E3[b]	5 U	--	5 U	5 U	4 J	1 J
Toluene	1.6E6[b]	5 U	--	5 U	5 U	5 U	5 U
Acetone	7.8E5[b]	50 U	--	50 U	50 U	50 U	50 U
Methylene chloride	8.5E3[b]	10 U	--	10 U	10 U	10 U	10 U
Semi-Volatile Organic Compounds (mg/Kg)							
bis-(2-ethylhexyl)phthalate	4.6[b]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U

Notes:

DUP = Field duplicate sample.

U = Analyte is not detected. Value reported is the method reporting limit (MRL).

J = Value reported is considered an estimate value.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for soil (EPA 1996).

TABLE 4.3-3 ANALYTES DETECTED IN SOIL SAMPLES COLLECTED AT BUILDING 726 DURING THE REMEDIAL INVESTIGATION

Location ID		AP-3862					
Depth (ft.)		0-2	4-6	10-12	55-57	55-57	57.5-59
Field ID		97B72635SL	97B72637SL	97B72640SL	97B72649SL	97B72652SL	97B72650SL
Lab ID	Screening	K97714403	K97714404	K97714405	K97714406	K97714408	K97714407
Sample Date	Criteria	9/26/97	9/26/97	9/26/97	9/26/97	9/26/97 DUP	9/26/97
Petroleum Hydrocarbons (mg/Kg)							
Gasoline Range Organics	50-100[a]	9	5 U	5 U	150	270	5 U
Diesel Range Organics	100-200[a]	19	4 U	4 U	73	334	4 U
Volatile Organic Compounds (µg/Kg)							
Tetrachloroethene	1.2E3[b]	2 J	1 J	5 U	19	60	1 J
Toluene	1.6E6[b]	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	40 J	50 U	50 U
Methylene chloride	8.5E3[b]	10 U	5 J	3 J	4 J	10 U	8 J,B
Semi-Volatile Organic Compounds (mg/Kg)							
bis-(2-ethylhexyl)phthalate	4.6[b]	0.3 U	0.3 U	0.3 U	0.1 J	0.7	0.3 U

Notes:

DUP = Field duplicate sample.

U = Analyte is not detected. Value reported is the method reporting limit (MRL).

J = Value reported is considered an estimate value.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for soil (EPA 1996).

OU-D 33424

TABLE 4.3-3 ANALYTES DETECTED IN SOIL SAMPLES COLLECTED AT BUILDING 726 DURING THE REMEDIAL INVESTIGATION

Location ID		AP-3863					
Depth (ft.)		0-2	4-6	10-12	55.5-56.5	55.5-56.5	56.5-57.5
Field ID Lab ID Sample Date	Screening Criteria	97B72654SL K97719501 9/29/97	97B72656SL K97719502 9/29/97	97B72659SL K97719503 9/29/97	97B72668SL K97719505 9/29/97	97B72670SL K97719507 9/29/97 DUP	97B72669SL K97719506 9/29/97
Petroleum Hydrocarbons (mg/Kg)							
Gasoline Range Organics	50-100[a]	5 U	5 U	5 U	5 U	5 U	5 U
Diesel Range Organics	100-200[a]	4 U	4 U	3 J	4 U	--	4 U
Volatile Organic Compounds (µg/Kg)							
Tetrachloroethene	1.2E3[b]	5 U	5 U	5 U	5 U	--	5 U
Toluene	1.6E6[b]	5 U	5 U	2 J	5 U	--	5 U
Acetone	7.8E5[b]	50 U	50 U	50 U	50 U	--	50 U
Methylene chloride	8.5E3[b]	3 J,B	10 U	7 J,B	5 J,B	--	4 J,B
Semi-Volatile Organic Compounds (mg/Kg)							
bis-(2-ethylhexyl)phthalate	4.6[b]	0.3 U	0.3 U	0.3 U	0.3 U	--	0.3 U

Notes:

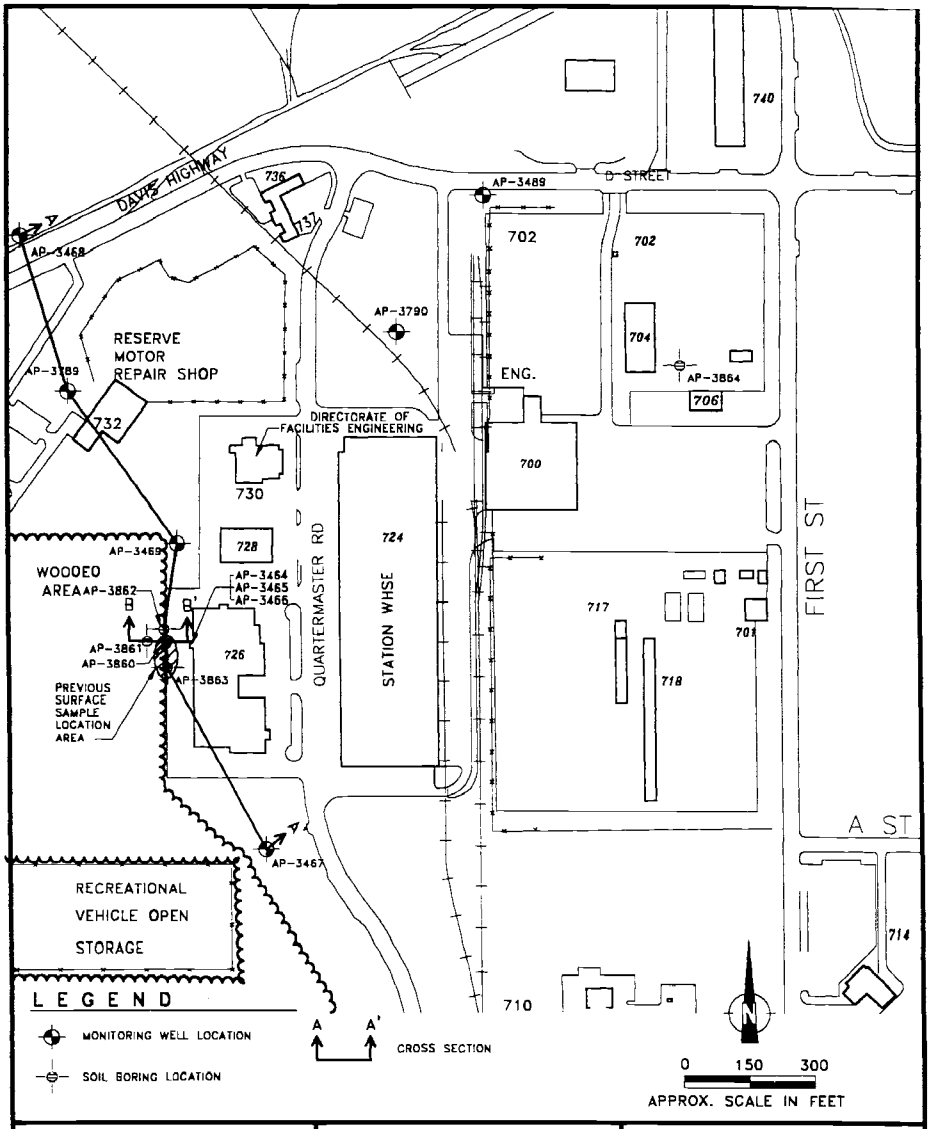
DUP = Field duplicate sample.

U = Analyte is not detected. Value reported is the method reportin

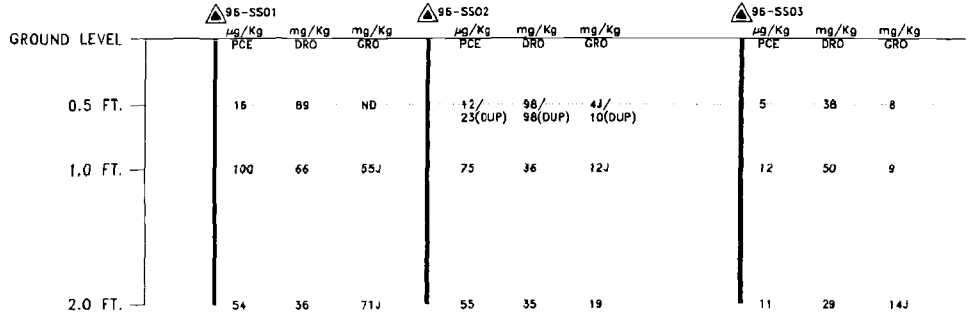
J = Value reported is considered an estimate value.

[a]Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

[b]Screening criteria one-tenth of the EPA Region 3 Risk-Based Co



DRAWING: 726ST9B ORAWN: SSR C/SC: 1:300 DISK: Z 11/97 DATE: 9/29/98 CHECK: S.W.	FIGURE 4.3-1 BUILDING 726/704 SAMPLE LOCATION MAP	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120



LEGEND

PCE = TETRACHLOROETHENE
GRO = GASOLINE RANGE ORGANICS
DRO = DIESEL RANGE ORGANICS

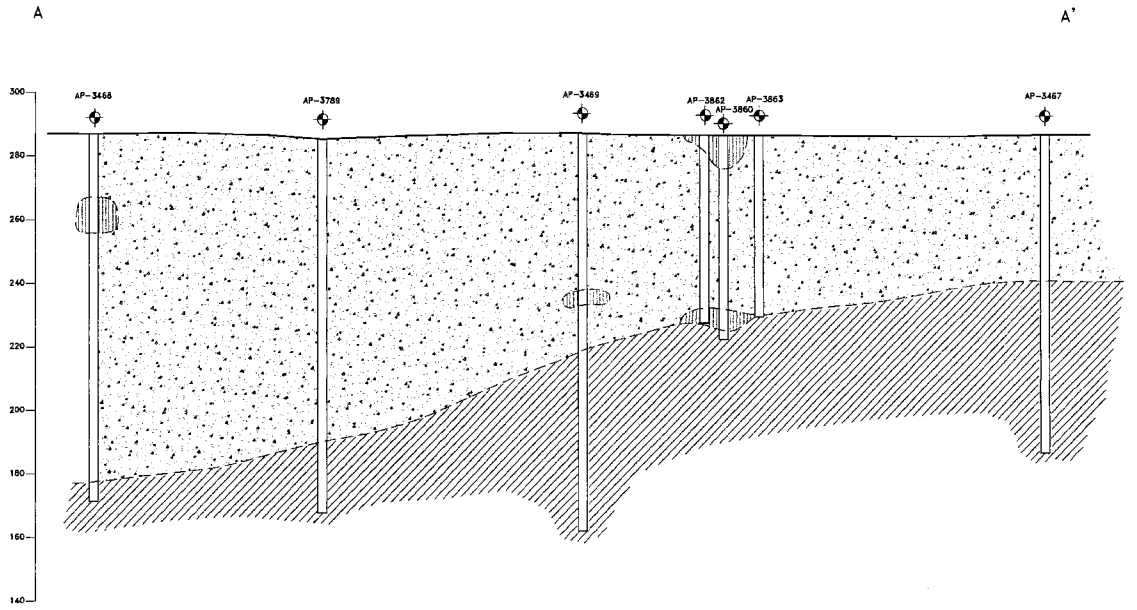
0 5 10

APPROX. HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION IS 10X

DRAWING: 726C597	DRAWN: SR	FIGURE 4.3-2 SUMMARY OF ANALYTES DETECTED IN SURFACE SAMPLES AT BUILDING 726
C/SC: 1:10	DISK: Z 11/97	
DATE: 9/29/98	CHECK: J.S.	

RI/FS REPORT
OPERABLE UNIT D
FT. RICHARDSON, ALASKA
PROJECT 9000-107-120

OU-D 33427



LEGEND

- SOILS WITH VOCs, DRO OR GRO
- SANDY GRAVELLY SOILS WITH >15% FINES
- SOILS WITH >15% FINES

0 150

APPROX. SCALE IN FEET

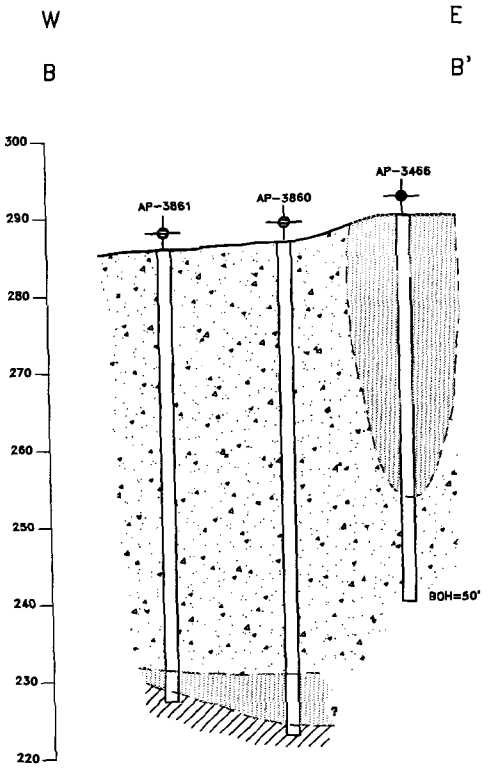
5 X VERTICAL SCALE

SOURCE:

RI/FS REPORT
OPERABLE UNIT C
FORT RICHARDSON, ALASKA

FIGURE 4.3-3
BUILDING 726
CROSS SECTION A-A'

DATE: 9/29/98	DRAWN BY: S. RICHARDSON	SCALE: AS SHOWN	DRAWING: 726CSAS'
C/SC: 1:150 DISK: 11/97	ENGINEER: J. SHAPIRO	CHECKED: J. SHAPIRO	PROJECT: 9000-107-120



LEGEND

- SOILS WITH DRO, GRO OR PCE
- GP-GM,SP-SM, GP, GW GW-GM, SW-SM, SP, SW
- ML

0 25 50
HORIZONTAL SCALE IN FEET
3 X VERTICAL SCALE

DRAWING: 726CSB97 DRAWN: SSR C/SC: 1:50 DISK: 11/97 DATE: 9/29/98 CHECK: J.S.	FIGURE 4.3-4 BUILDING 726 CROSS SECTION B-B'	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120

ATTACHMENT 4.4
Tables and Figures

Table 4.4-1. Summary of Data Gaps as Identified in the Management Plan and Findings of the Remedial Investigation/Baseline Risk Assessments - Building 796.

Area of Concern as Identified in the Management Plan	Available Data (Prior to the Remedial Investigation)	Data Gaps Established in the Management Plan	Action Taken During the Remedial Investigation	Findings of the Remedial Investigation/Baseline Risk Assessments
Groundwater				
Groundwater in the vicinity of Building 796	Low levels of carbon tetrachloride were detected in groundwater monitoring wells.	Nature and extent of carbon tetrachloride in groundwater.	Investigate nearby areas as potential source areas of the carbon tetrachloride.	The extent of carbon tetrachloride and chloroform in groundwater in the vicinity of the site has not been identified. However, although COPCs have been identified in the risk assessment, groundwater onsite is not used as a source of potable water, nor is it anticipated to be in the future, and therefore an incomplete pathway for risk exists.

Key:

COPCs = Chemicals of Potential Concern.

Table 4.4-2. Chemicals of Potential Concern as Identified in the Management Plan, Building 796.

Type	Media	Source	Carcinogens	Noncarcinogens
Petroleum hydrocarbons	Groundwater	Fuels	None	DRO
Chlorinated alkanes	Groundwater	Solvents, potentially upgradient	Carbon tetrachloride Chloroform	None
Metals	Groundwater	Fuels and oils; batteries	Arsenic Lead	Nickel Chromium

Key:
DRO = Diesel Range Organics

TABLE 4.4-3 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 796 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3513		AP3532		AP3533	
Field-ID		97B79636GW	97B79641GW	96B79630GW	97B79642GW	96B79628GW	97B79635GW
Lab-IDs		K97601502	K97601505	K96625701 K96625902	K97606301	K9622803	K97601504
Sample Date	Screening Criteria	8/19/97	8/19/97	10/2/96	8/20/97	10/1/96	8/19/97
Volatile Organic Compounds (µg/L)							
Aromatic Volatile Organics (AVOs)							
Toluene	750[b], 1000[c]	0.2 J	--	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes	12000[b], 10000[c]	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
Halogenated Volatile Organics (HVOs)							
1,1,1-Trichloroethane	540[b], 200[c]	0.5 U	--	0.5 U	0.2 J	0.5 U	0.5 U
Carbon tetrachloride	0.16[b], 5[c]	0.5 U	--	1.6	2.2	1.1	0.5 U
Chloroform	0.15[b]	1.3	--	0.2 U J,B	0.3 J,B	1.8 U B	1.8
Acetone	3700[b]	5 J	--	20 U	0.8 J,B	20 U	20 U
Methylene chloride	4.10[b]	0.5 J	--	1 U	1 U	1 U	1 U
Petroleum Hydrocarbons (µg/L)							
Diesel Range Organics	15[d]	173	--	100 U	41 J	51 U J,B	21 J
Metals (µg/L)							
Arsenic	11[b], 50[c]	5 J	--	2 J	1 J	5 U	5 U
Arsenic (dissolved)	11[b], 50[c]	--	--	5 U	--	5 U	--
Barium	2600[b], 2000[c]	111	--	8	5	18	19
Barium (dissolved)	2600[b], 2000[c]	--	--	8	--	16	--
Chromium	180/37000[b],100[c]	20	--	5 U	5 U	98	17
Chromium (dissolved)	180/37000[b],100[c]	--	--	5 U	--	5	--
Iron	11000[b]	16700	--	--	20 U	--	290
Lead	15[c] (Action Level)	3	--	2 U	2 U	2 U	2 U
Lead	15[c] (Action Level)	--	--	2 U	--	2 U	--
Mercury	11[b], 2[c]	0.5 U	--	0.5 U	0.5 U	0.5 U	0.5 U
Mercury	11[b], 2[c]	--	--	0.5 U	--	0.5 U	--
Nickel	730[b]	20 U	--	--	20 U	--	22
Selenium	180[b], 50[c]	1 J	--	5 U	5 U	5 U	1 J
Selenium	180[b], 50[c]	--	--	5 U	--	5 U	--
Semi-Volatile Organic Compounds (µg/L)							
2,6-Dinitrotoluene	37[b]	10 U	0.6 J	--	10 U	--	10 U
Benzo(a)anthracene	0.092[b]	0.8 J	10 U	--	10 U	--	10 U
Benzo(a)pyrene	0.0092[b]	1 J	10 U	--	10 U	--	0.5 J
Benzo(b)fluoranthene	0.092[b]	1 J	10 U	--	10 U	--	0.7 J
Benzo(g,h,i)perylene	UA	0.8 J	10 U	--	10 U	--	0.5 J
Benzo(k)fluoranthene	0.92[b]	2 J	10 U	--	10 U	--	1 J
Chrysene	9.20[b]	0.6 J	10 U	--	10 U	--	10 U
Diethyl phthalate	29,000[b]	0.3 J	0.6 J	--	10 U	--	10 U
Di-n-octyl phthalate	730[b]	0.8 J	10 U	--	10 U	--	10 U
Indeno(1,2,3-cd)pyrene	0.092[b]	0.4 J	10 U	--	10 U		10 U
Naphthalene	1500[c]	10 U	10 U	--	10 U	--	10 U
Other (mg/L)							
Hardness (As CaCO3)		385	--	202	202	255	340
Sulfate		--	--	15	26	66	130
Suspended Solids		--	--	5 U	5 U	7	6
Nitrogen, Ammonia (as N)		--	--	0.05 U	--	0.05 U	--
Nitrogen, Nitrate-Nitrite		3.2	--	2.4	2.4	3.2	4.6

Notes:

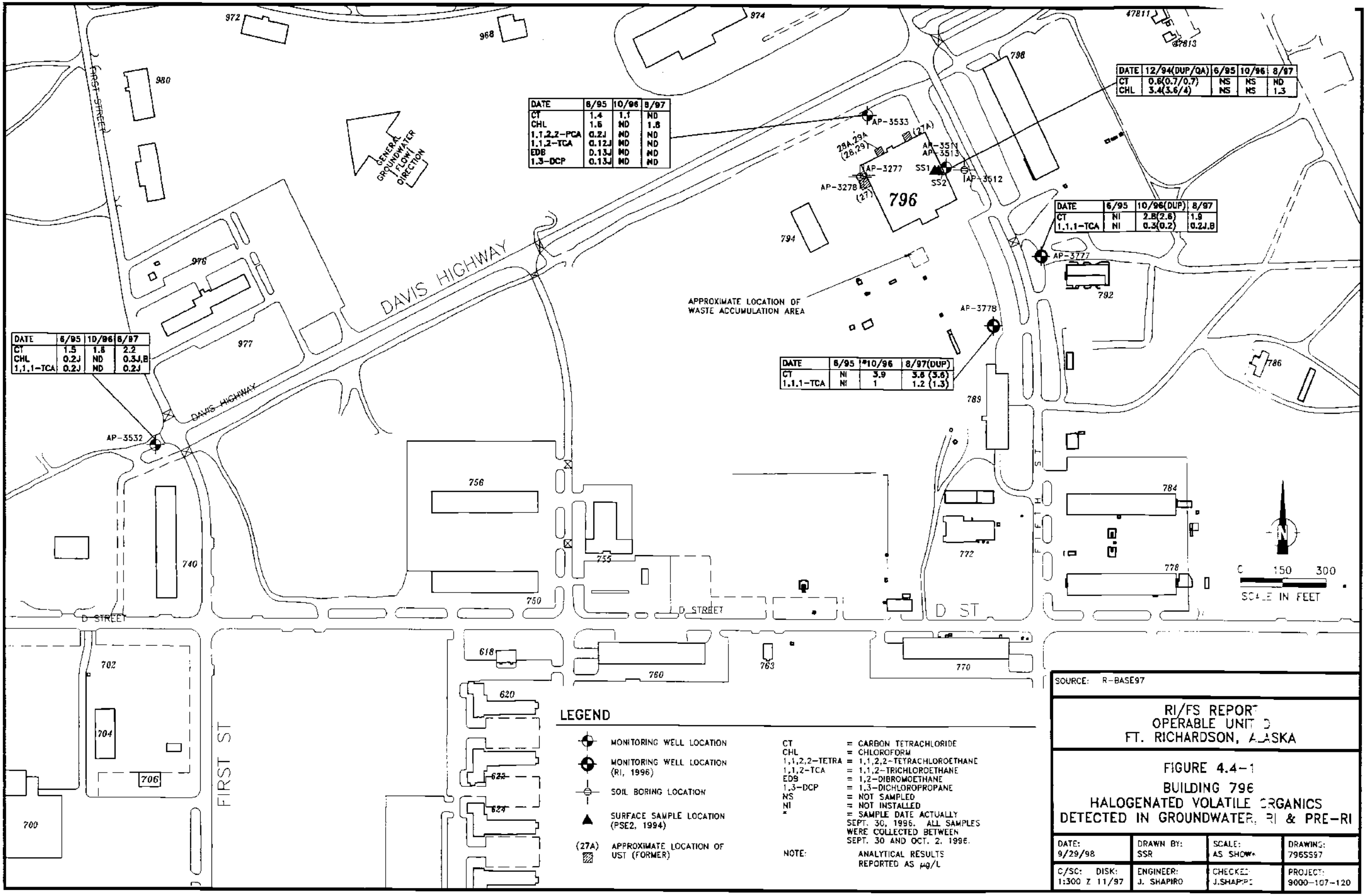
DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value detected between the method detection limit and MRL.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
-- = Analysis not performed on samble.
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996) for tap water. Chromium VI (180)/Chromium III (37000)
[c]Screening criteria Primary Maximum Contaminant levels (MCLs) EPA. **Action level for lead.

TABLE 4.4-3 ANALYTES DETECTED IN GROUNDWATER SAMPLES COLLECTED AT BUILDING 796 DURING THE REMEDIAL INVESTIGATION

Location-ID		AP3777			AP3778		
Field-ID		96B79624GW	96B79626GW	97B79644GW	96B79627GW	97B79646GW	97B79647GW
Lab-IDs		K96619611	K96622801	K97505302	K96622802	K97617902	K97617903
Sample Date	Screening Criteria	9/30/96	9/30/96 DUP	8/20/97	10/1/96	8/25/97	8/25/97 DUP
Volatile Organic Compounds (µg/L)							
Aromatic Volatile Organics (AVOs)							
Toluene	750[b], 1000[c]	0.4 U J,B	0.4 U J,B	0.09 J	0.3 U J,B	0.5 U	0.5 U
Xylenes	12000[b], 10000[c]	0.2 U J,B	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Halogenated Volatile Organics (HVOs)							
1,1,1-Trichloroethane	540[b], 200[c]	0.3 J	0.2 J	0.2 J	1	1.2	1.3
Carbon tetrachloride	0.16[b], 5[c]	2.8	2.6	1.9	3.9	3.6	3.6
Chloroform	0.15[b]	0.2 U J,B	0.2 U J,B	0.2 J,B	1 U B	0.8	0.8
Acetone	3700[b]	20 U	20 U	20 U	20 U	20 U	20 U
Methylene chloride	4.10[b]	1 U	1 U	1 U	1 U	1 U	1 U
Petroleum Hydrocarbons (µg/L)							
Diesel Range Organics	15[a]	100 U	100 U	32 J	64 U J,B	30 J	28 J
Metals (µg/L)							
Arsenic	11[b], 50[c]	5 U	5 U	1 J	5 U	5 U	5 U
Arsenic (dissolved)	11[b], 50[c]	5 U	5 U	--	5 U	--	--
Barium	2600[b], 2000[c]	36	37	33	38	23	23
Barium (dissolved)	2600[b], 2000[c]	36	33	--	36	--	--
Chromium	180/37000[b],100[c]	5 U	5 U	5 U	5 U	5 U	5 U
Chromium (dissolved)	180/37000[b],100[c]	5 U	5 U	--	5 U	--	--
Iron	11000[b]	--	--	812	--	20 J	20 J
Lead	15[c] (Action Level)	2 U	2 U	2 U	2 U	2 U	2 U
Lead	15[c] (Action Level)	2 U	2 U	--	2 U	--	--
Mercury	11[b], 2[c]	0.5 U	0.5 U	0.5 U	0.5 U	0.1 J	0.2 J
Mercury	11[b], 2[c]	0.5 U	0.5 U	--	0.5 U	--	--
Nickel	730[b]	--	--	20 U	--	20 U	20 U
Selenium	180[b], 50[c]	5 U	5 U	5 U	5 U	5 U	5 U
Selenium	180[b], 50[c]	5 U	5 U	--	5 U	--	--
Semi-Volatile Organic Compounds (µg/L)							
2,6-Dinitrotoluene	37[b]	--	--	10 U	--	10 U	10 U
Benzo(a)anthracene	0.092[b]	--	--	10 U	--	10 U	10 U
Benzo(a)pyrene	0.0092[b]	--	--	10 U	--	10 U	10 U
Benzo(b)fluoranthene	0.092[b]	--	--	10 U	--	10 U	10 U
Benzo(g,h,i)perylene	UA	--	--	10 U	--	10 U	10 U
Benzo(k)fluoranthene	0.92[b]	--	--	10 U	--	10 U	10 U
Chrysene	9.20[b]	--	--	10 U	--	10 U	10 U
Diethyl phthalate	29,000[b]	--	--	10 U	--	1 J	0.9 J
Di-n-octyl phthalate	730[b]	--	--	10 U	--	10 U	10 U
Indeno(1,2,3-cd)pyrene	0.092[b]	--	--	10 U	--	10 U	10 U
Naphthalene	1500[b]	--	--	10 U	--	10 U	10 U
Other (mg/L)							
Hardness (As CaCO3)		272	268	244	311	285	--
Sulfate		21	--	18	56	31	--
Suspended Solids		5 U	--	7	5 U	5 U	--
Nitrogen, Ammonia (as N)		0.05 U	--	-	0.05 U	--	--
Nitrogen, Nitrate-Nitrite		1.6	--	1.4	2.6	3	--

Notes:

DUP = Field duplicate sample.
UA = Unassigned or unavailable.
U = Analyte is not detected. Value reported is the method reporting limit (MRL).
J = Value reported is considered an estimate value detected between the method detection limit and MRL.
B = Analyte reported was additionally found present in an associated method, trip, and/or rinsate blank.
-- = Analysis not performed on sample.
[a]Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[b]Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1996) for tap water. Chromium VI (180)/Chromium III (37000).
[c]Screening criteria Primary Maximum Contaminant levels (MCLs) EPA. **Action level for lead.



DATE | 6/95 | 10/96 | 8/97
CT | 1.4 | 1.1 | ND
CHL | 1.6 | ND | 1.8
1,1,2,2-PCA | 0.2J | ND | ND
1,1,2-TCA | 0.12J | ND | ND
EDB | 0.13J | ND | ND
1,3-DCP | 0.13J | ND | ND
DATE | 12/94(DUP/QA) | 6/95 | 10/96 | 8/97
CT | 0.6(0.7/0.7) | NS | NS | ND
CHL | 3.4(3.6/4) | NS | NS | 1.3
DATE | 6/95 | 10/96(DUP) | 8/97
CT | NI | 2.8(2.6) | 1.9
1,1,1-TCA | NI | 0.3(0.2) | 0.2J,B
DATE | 6/95 | *10/96 | 8/97(DUP)
CT | NI | 3.9 | 3.6 (3.6)
1,1,1-TCA | NI | 1 | 1.2 (1.3)
DATE | 6/95 | 10/96 | 8/97
CT | 1.5 | 1.6 | 2.2
CHL | 0.2J | ND | 0.3J,B
1,1,1-TCA | 0.2J | ND | 0.2J
AP-3533
AP-3511
AP-3513
AP-3512
AP-3277
AP-3278
AP-3777
AP-3778
AP-3532
SS1
SS2
28A,29A (28,29)
(27A)
(27)
796
GENERAL GROUNDWATER FLOW DIRECTION
APPROXIMATE LOCATION OF WASTE ACCUMULATION AREA
DAVIS HIGHWAY
FIRST STREET
FIRST ST
D STREET
D ST
FIFTH ST
972
974
968
47811
47813
798
980
976
977
794
792
786
789
784
778
772
756
755
750
740
760
763
770
618
620
622
624
702
704
706
700
0 150 300
SCALE IN FEET
LEGEND
MONITORING WELL LOCATION
MONITORING WELL LOCATION (RI, 1996)
SOIL BORING LOCATION
SURFACE SAMPLE LOCATION (PSE2, 1994)
(27A) APPROXIMATE LOCATION OF UST (FORMER)
CT = CARBON TETRACHLORIDE
CHL = CHLOROFORM
1,1,2,2-TETRA = 1,1,2,2-TETRACHLOROETHANE
1,1,2-TCA = 1,1,2-TRICHLOROETHANE
EDB = 1,2-DIBROMOETHANE
1,3-DCP = 1,3-DICHLOROPROPANE
NS = NOT SAMPLED
NI = NOT INSTALLED
* = SAMPLE DATE ACTUALLY SEPT. 30, 1996. ALL SAMPLES WERE COLLECTED BETWEEN SEPT. 30 AND OCT. 2, 1996.
NOTE: ANALYTICAL RESULTS REPORTED AS µg/L
SOURCE: R-BASE97
RI/FS REPORT
OPERABLE UNIT D
FT. RICHARDSON, ALASKA
FIGURE 4.4-1
BUILDING 796
HALOGENATED VOLATILE ORGANICS
DETECTED IN GROUNDWATER, RI & PRE-RI
DATE: 9/29/98
DRAWN BY: SSR
SCALE: AS SHOWN
DRAWING: 796SS97
C/SC: 1:300
DISK: Z 11/97
ENGINEER: J. SHAPIRO
CHECKED: J.SHAPIRO
PROJECT: 9000-107-120

5.0 FATE AND TRANSPORT

5.1 Introduction

The fate of a chemical can be described in terms of those processes that are related to the movement or transport of the chemical in the environment and transformation mechanisms that degrade the chemical in different environmental compartments. The partitioning characteristics of a chemical are an expression of the chemical's tendency to migrate from one compartment to another. In many cases, the fate (i.e., transformation) of the chemical can depend greatly on which compartment it becomes associated with.

Site media in OUD that contain COPCs consist of groundwater, soil, subsurface soil, and sediment. In general, classes of COPCs in groundwater consist of:

- Halogenated aliphatic volatile organics,
- Bis(2-ethylhexyl)phthalate (DEHP)
- Alkylated monoaromatic hydrocarbons (and benzene),
- Chlorinated pesticides, and
- Metals.

Classes of COPCs in sediment consist of:

- Polychlorinated biphenyls (PCBs)
- Chlorinated insecticides, and
- Polycyclic aromatic hydrocarbons (PAHs)

Classes of COPCs in soil consist of:

- PCBs, and
- Chlorinated insecticides.

The only COPC detected in surface water was:

- DEHP

The environmental fate of chemicals is largely determined by their partitioning tendencies between atmospheric, aqueous, and organic phases. Typically, there are three types of organic phases: soil, sediment, and biological tissues (i.e., lipids). The partitioning of organic contaminants between organic material, water, and air is dependent on the gas-water partition coefficient (i.e., Henry's Law Constant), and on the sorption coefficient of the compound to soil and sediment organic matter (K_{oc}). Henry's Law and K_{oc} can be estimated from the solubility in water (S), vapor pressure (VP), and octanol/water partition coefficient (K_{ow}), or they can be

measured empirically, for a given compound. In general, the environmental fate of chemicals with low vapor pressure, low water solubility, and large K_{ow} is typically dominated by sorption to soil and sediment. However, depending on the particular chemical, biological tissues may also serve as a significant environmental compartment through bioconcentration and/or bioaccumulation. The bioconcentration factor (BCF) is simply a measure of the partitioning of a chemical between water and aquatic organisms (usually fish) via passive diffusion, but can also apply to biota in general. Recalcitrant compounds that have large BCFs may be found in the tissues of higher animals (i.e., secondary consumers or higher) at much greater concentrations than that measured in typical environmental media, such as sediment or surface water. The increase in concentration through food-chain transfer is referred to as bioaccumulation or biomagnification. Bioaccumulation factors (BAFs) have been developed for many compounds based on their BCFs and resistance to biodegradation.

Recently, EPA has published guidance on the toxicological implications of environmental mixtures of PCBs (EPA 1996a). This guidance also provides some discussion on fate and transport mechanisms of PCBs. Commercial PCBs (Aroclors) occur as mixtures of congeners, useful for their non-flammability, chemical stability, and insulating properties in capacitors, transformers, and other electrical equipment. However, it is these same chemical properties that result in their environmental persistence. Environmentally, PCBs also occur as mixtures; however, the composition differs from the original commercial product. The composition of PCB mixtures changes over time because of partitioning (adsorption), transformation, and preferential bioaccumulation. Congener distributions in sediment, soil, and biota do not necessarily resemble any Aroclor, and some of the more toxic congeners are selectively retained in these environmental compartments.

5.2 Transformation Processes

5.2.1 Biodegradation

Regarding the transformation of environmental chemicals, biodegradation is likely the most important process. Some hazardous environmental contaminants that are typically found in site media biodegrade relatively easily. For example, most of the petroleum hydrocarbons normally found in fuels (i.e., benzene, naphthalene, alkanes, etc.) can biodegrade quickly in soil or water in the presence of oxygen. Conversely, some halogenated chemicals undergo significant biological transformations only under strictly anaerobic conditions. For example, DDT (Bollag and Liu 1990) and PCBs can be reductively dechlorinated by various microorganisms (Rhee et al. 1989). Chlorinated solvents can also be biotransformed under typical environmental conditions, such as sediment and groundwater. However, reductive dechlorination is a relatively slow process under typical environmental conditions, which can result in the persistence of these compounds.

Under aerobic conditions, organic molecules containing functional groups with oxygen typically are more prone to biodegradation. This may be because the first step in the biodegradative pathway is often oxidation. For example, *n*-alkanes are first converted to alcohols, then to aldehydes, and finally to acids. Once converted to an acid, the organism can obtain large amounts of energy via beta-oxidation. However, there are exceptions. Some oxygenic functional groups are not susceptible to biodegradation, such as esters. DEHP was relatively recalcitrant in soil compared to naphthalene and phenanthrene, which were readily mineralized (i.e., complete oxidation to carbon dioxide and water; Efroymson and Alexander 1994). In addition, the presence of DEHP has been shown to substantially suppress the biodegradation of PCBs (Bedard 1990).

5.2.2 Abiotic Mechanisms

Some chemicals are susceptible to abiotic transformations, such as hydrolysis and photo-oxidation. Hydrolysis would not be expected to be a major mechanism of degradation for the COPCs selected in OUD. DEHP is the only COPC that has the potential for hydrolysis. In actuality, hydrolytic reactions in the environment are common in the microbial metabolism of ester linkages, and it would be difficult to prove that any hydrolysis of DEHP was abiotic.

Some compounds that are quite recalcitrant in soil, sediment, or water are relatively quickly broken down in the atmosphere by sunlight. As a class of compounds, the PAHs are considered recalcitrant in soil and sediment, but are easily photodegraded if transport mechanisms allow dispersion into the atmosphere. PCBs are recalcitrant in soil and sediment, but are also susceptible to photo-oxidation. However, the specific PAHs and PCBs that are detected in soil or sediment are not likely to volatilize. This is because these compounds are hydrophobic and would tend to stay sorbed to soil and sediment. Soil and sediment (if it is allowed to dry) may become airborne, as particulate, which may allow photo-oxidation of the compounds. However, this would not be expected to be a significant transformation mechanism.

5.3 Transport

Transport of contaminants depends on hydrostratigraphy, groundwater flow velocities, directions, and flowpaths.

5.3.1 Hydrostratigraphy

The dominant surficial units in the study area are well-graded to poorly graded gravels with varying amounts of sand and silt, to silty sand and clayey silt. Assuming the dissolved phase of the contamination remains in the upper section of the aquifer, this type of aquifer and groundwater flow velocity may produce a linear, elongate contamination zone. This also assumes constant gradient direction and no seasonal aquifer fluctuations resulting in smearing

of the contaminants. The confined aquifer apparently becomes semiconfined to unconfined northwest of a line running roughly beneath and parallel to the Davis Highway within OUD. This is possibly the result of erosion of the confining unit in this area. The confining unit is a silt or silty clay dipping to the north-northwest at an unknown angle. Based on boring log information, there is apparently little water above the confining unit in this area.

Many areas have fairly thin, discontinuous, and isolated lenses of low permeability clays and silts, resulting in perched aquifer conditions. These lenses can also cause semiconfining conditions to underlying aquifers.

5.3.2 Groundwater Flow Characteristics

The estimated groundwater velocity in the unconfined aquifer averages approximately 4.6 feet per day. This figure assumes a constant groundwater gradient of 0.5 feet per 50 feet, or 0.01. Groundwater flow in the unconfined aquifer is generally to the northwest, but may vary seasonally. The confined aquifer dips to the northwest and has a generally west to west-northwest direction of groundwater flow.

5.3.3 Contaminant Transport, Dilution, and Attenuation

The transport velocity of various contaminants in their pure phase (i.e., non-aqueous phase liquid [NAPL]) may be much less than groundwater velocity depending on viscosity, adsorption, solubility, temperature, and other variables. Physical and chemical characteristics -- such as water solubility, vapor pressure, and density -- will affect the expected migration rates and paths of the COPCs.

In the unconfined aquifer, transport of dissolved contaminants is in the direction of the groundwater gradient. Annual water table and gradient variations are assumed to be three dimensional, causing variable effects on contaminant dispersion. Subsurface contaminant pooling, migration path tortuosity, and dispersive effects caused by grain size variation and bedding can cause extensive smearing and plume dispersion.

In addition to dissolved-phase and pure-phase sources of contaminants in groundwater, gaseous phase is also a transport mechanism. In unsaturated soils, contaminants may partition into a gaseous phase. The tendency for a specific contaminant to go into the vapor phase depends in part on the vapor pressure of the contaminant. The gaseous phase will tend to migrate in a similar manner in the unsaturated soils as the NAPL would in the saturated zone. That is, dense NAPLs (DNAPLs), such as carbon tetrachloride or PCE, will have a gaseous phase that will tend to "sink" through the unsaturated zone because their vapor density will be greater than that of the air in the soils. However, in permeable unconsolidated deposits, such as those encountered at the OUD sites, vapor-phase transport can result in contaminants migrating in a much broader path than, and in advance of, dissolved- or pure-phase

contaminants, and the travel path is less dependent on orientation of confining-layer surface. Vapor-phase migration can follow preferential pathways (e.g., former fluvial deposits) and repartition into low concentration dissolved phase, and be detected at a location typically considered to be "upgradient" or "crossgradient" of the dissolved phase plume. This may lead to the apparently widespread presence of low concentrations of a contaminant in groundwater.

In the confined aquifer, flow is bounded by the confining layers, and contaminant migration can be limited by these layers. Groundwater flow is affected by many of the same factors as in the unconfined aquifer.

5.4 Site-Specific Discussions

5.4.1 Building 35-752

Building 35-752 has historically been used for housing electrical generating and transmission equipment, and has since been used as a storage building.

5.4.1.1 Soil and Sediment

PCBs, PAHs, and chlorinated pesticides can be classified as hydrophobic organic compounds (HOCs). HOCs have been detected in soil and sediment at Building 35-752. These chemicals are extremely hydrophobic, sorb very strongly to soils, and resist movement to the air phase. In general, the longer a given HOC is in a soil, the more tightly it becomes sorbed. However, the presence of miscible organic solvents in sediment may increase the mobility by decreasing sorption of HOCs to sediment.

Mobility of HOCs, can be influenced by other contaminants if they are present in the same medium (i.e., soil or sediment). This effect is typically referred to as "cosolvency." Investigative research has been conducted that demonstrates the presence of petroleum hydrocarbon fuels does not significantly increase the desorption (i.e., increase mobility) of HOCs sorbed to soil or sediment. However, the presence of other compounds can increase the mobility of HOCs in these media. Typically, miscible organic solvents (methanol, methyl ethyl ketone (MEK), acetone, etc.) increase solubility and decrease sorption of HOCs to soils, as would be expected based on other aqueous solubility results (see Appendix G). Acetone was detected in Cooling Pond sediment in 16 of 18 samples, and MEK was detected in 11 of 18 samples. The presence of these compounds could increase the mobility of PCBs and PAHs in the sediment. Currently, the full extent of the HOC contamination in sediment has not been determined. A sample collected approximately 200 feet downstream from the Cooling Pond contained HOCs.

5.4.1.2 Groundwater Sampling

Monitoring wells at Building 35-752 are completed in the unconfined aquifer at depths ranging from 10 to 20 feet. Groundwater movement in this aquifer is toward the northwest at an

approximate average rate of 4.6 feet per day. Aldrin was detected in 3 of 26 samples at levels ranging from 8 to 11 parts per billion (ppb). Since aldrin is immiscible and nearly insoluble in water, and responds poorly to biodegradation, it could be expected that the aldrin will move slowly with the groundwater gradient and will be present for an extended period of time.

The chromatographic signature of DRO detected in groundwater samples is not the same DRO signature seen in the sediment. For DRO detected in groundwater, the chromatogram exhibits the characteristic of a light distillate product (e.g., gasoline or mineral spirits). For DRO detected in sediments, the chromatogram exhibits the characteristics of a heavy residual product (e.g., mineral oil). DRO concentrations in water ranged from 25 to 1310 µg/L in 25 out of 34 groundwater samples. The presence of DRO may be due to the former USTs location south of building 35-752 or the former drum accumulation area, or possibly a source that has not yet been identified.

The natural attenuation and biodegradation of the DRO is probably very slow in this medium because of low groundwater temperatures; consequently, the contamination plume is assumed to be mobile and viable, with dilution being the primary risk-reduction factor.

5.4.2 Building 726

Building 726 has been and currently is a dry cleaning facility, utilizing dry cleaning solvents such as perchlorethylene (PCE) and Stoddard solvent. The solvents were at one time stored in 55-gallon drums on a raised platform at the rear of the building, but this practice has stopped in recent years. Three 2,000-gallon USTs were also used in the past for storage of cleaning solvent. The ground surface is paved within about 50 feet of the building. The soils around Building 726 are typically glacial outwash consisting of poorly sorted gravels, sands, and silts, having fairly flat surficial topography. The soils adjacent to the paved area were sampled in 1996 and had significant levels of PCE near the surface. Monitoring wells associated with the site were completed in the confined aquifer, since there was no appreciable groundwater found above the confining unit. No measurable amount of PCE or TCE was found in the confined aquifer. However, soil borings drilled in 1997 detected elevated levels of both Stoddard solvent and PCE in the saturated sands directly above the confining layer (silt) at a depth of approximately 50 to 60 feet bgs. The confining layer at this location dips to the north-northwest, with groundwater migrating along this surface within the lower, permeable unconsolidated soils in a perched condition. It appears likely that where this perched groundwater has traveled through the PCE- and Stoddard solvent-affected soils, these contaminants have dissolved into the groundwater and then migrated with water northerly to the aquifer(s). Once the perched groundwater enters the aquifer system, the dissolved plume would then be expected to follow the general groundwater flow pattern (generally westerly). Migration by vapor phase would also be expected to take place, resulting in the observance of low levels of dissolved-phase contaminants in groundwater down- and crossgradient from the presumed source area.

This area appears likely to have contributed much, if not all, of the dissolved PCE that has been detected in the area of Building 45-590, discussed below.

5.4.3 Building 45-590

Building 45-590 was built in 1943 and has had three major additions since then. It was used primarily as an automotive hobby repair shop and a cold weather gear storage warehouse, and was dismantled in 1995. It had an outdoor grease rack/wash station to the south of the building, a lined floor drain sump on the south side of the building, and had a concrete sump under the floor of the building that was not discovered until the building demolition took place. It was also serviced by wooden lath sewer lines that were subsequently abandoned.

PCE has been detected in groundwater on site. PCE has moderate to high potential mobility in the subsurface groundwater system and potential for anaerobic biodegradability, given optimal conditions. Consequently, it could move readily with the groundwater gradient.

It is possible that the source of this contamination is from within the site boundaries, since both contaminants are used in conjunction with automobile painting and repair activities. A more likely source would appear to be the laundry facility at Building 726, where PCE has been detected at elevated concentrations in the subsurface soils (Section 5.4.2).

Additional investigation performed in the area of Building 45-590 has identified the west and north extent of PCE in groundwater. It appears that the plume is fairly narrow, and extends from the area of wells AP-3534 and AP-3468 (along the west end of D Street) westward to the area of wells AP-3870 and AP-3873. Wells installed and sampled in January 1998 in areas west and north of the known plume area did not detect PCE. A possible explanation for that observance of low-level concentrations of PCE in well AP-3872, located upgradient of the highest concentrations, is attributable to vapor migration through the permeable subsurface soils.

5.4.4 Building 796

Carbon tetrachloride and chloroform have been detected in wells associated with Building 796. It is difficult to establish whether chloroform is truly present in the groundwater or is an artifact of field or laboratory procedures. Carbon tetrachloride, like PCE, is also a halogenated organic compound. It behaves similarly to PCE in its fate and transport, although it is more soluble and would be expected to go into the dissolved phase more readily than PCE. The geology at Building 796 is also similar to that of Building 45-590, in that it is complex and both a confined and unconfined aquifer exist in the vicinity of the building. Because the conditions (i.e., geology, contaminant properties) are similar at Building 796 and Building 45-590 no additional discussion is included.

5.5 Conclusions

The primary COPCs in soil and sediment are HOCs, which are known to sorb tightly to soil and sediment. However, their mobility may be increased by the presence of other compounds, such as miscible solvents. Research indicates that acetone and other oxygenated solvents, which have been detected in sediment, have been shown to desorb HOCs (see Appendix G).

Many of the COPCs detected in groundwater are susceptible to biotransformation. Halogenated volatile aliphatic compounds can be reductively dechlorinated under anoxic conditions, such as groundwater. However, this is typically a slow process that would not appreciably affect concentrations in the near future. Other groundwater contaminants, such as the alkylated monoaromatics and benzene, are biodegraded quickly in the presence of oxygen. However, conditions in groundwater are typically anoxic and, therefore, biodegradation of these compounds would also be expected to be relatively slow under current conditions.

The biodegradation of PCBs and chlorinated pesticides does occur under reducing conditions such as sediment. This process may be happening, albeit slowly. PAHs in sediment are not likely to biodegrade measurably because oxygen is typically required for biotransformation to occur. Therefore, biotransformation is not likely to affect concentrations of HOCs in the near future. DEHP has also been detected in Cooling Pond sediments and has been shown to be recalcitrant in soil mineralization studies (Efroymson and Alexander 1994).

6.0 CONCLUSIONS

The purpose of a RI is to determine the nature and extent of risks posed by uncontrolled hazardous waste sites (EPA 1989). For this project, the intent has been to develop an understanding of the source and extent of the contaminated areas that make up OUD, and to establish the associated risk to both human health and the environment.

Investigation of OUD sites has typically followed a progression of:

a) identification of contaminated sites;

b) determination of nature and extent of observed contamination;

c) investigation to determine source(s) of contamination; and

d) investigation to determine nature and extent of risk to human health and environment.

Identification of contaminated sites has historically consisted of a combination of follow-on investigation of previously identified sites, as delineated in the Federal Facilities Agreement, and follow-on investigation of sites identified during other investigations. For example, the investigation at Building 45-590 originally focused on a petroleum hydrocarbon release under a separate investigation, but was included in OUD when a volatile organic compound (i.e., PCE) was identified in the unconfined aquifer.

With the exception of the Building 45-590 site, the nature and extent of observed contamination at the OUD sites has not been fully completed. However, groundwater at Building 35-752 has been shown to exceed the non-carcinogenic threshold, and groundwater at Building 796 has been found to exceed the acceptable carcinogenic target risk range. The remaining two sites (Buildings 726 and 45-590) do not exhibit estimated risk above the regulatory threshold and/or excess lifetime cancer risk (ELCR) target range.

Determination of the source of the contaminants at each of the OUD sites is also presently somewhat incomplete. This is due to a combination of factors, but is complicated by the complex surficial geology of the Fort Richardson area. Presently, a research program is being conducted by the U. S. Army Cold Regions Research and Engineering Laboratory (CRREL) for the purpose of identifying the surficial geology and hydrogeology of the Fort Richardson area. Therefore, at the time of this report, a comprehensive evaluation and understanding of the soils and groundwater in the area of OUD has not been received.

The possibility remains that there may be numerous source areas that are contributing to the contaminated areas rather than a single point source (Figure 6-1, page 6-4). The groundwater plume containing primarily PCE is, at this time, considered to have a probable source area at the dry cleaning facility at Building 726. Release of PCE to both the surface and subsurface

soils has been confirmed at this location. Soil borings installed in 1997 detected elevated levels of both Stoddard solvent and PCE in the saturated sands directly above the confining layer (silt) at a depth of approximately 50 to 60 feet. A conceptual site model for Building 726 is presented in Figure 6-2 (page 6-5). Although the subsurface stratigraphy in this area is rather complex, through a combination of dissolved-phase and vapor-phase migration it appears likely that PCE from this source area has resulted in the dissolved PCE plume that is observed in groundwater in the area of Building 45-590.

Another concern at the Building 45-590 site is the presence of carbon tetrachloride in groundwater. The Fall 1996 groundwater sampling program resulted in detectable levels of carbon tetrachloride in six monitoring wells. Carbon tetrachloride had not previously been detected in any of these wells. This may be an indication of a migrating plume in this area. Confirmational sampling performed in this area during January 1998 did not detect carbon tetrachloride in the same wells, however, a new well (AP-3871) installed east of AP-3441 along Loop Road did contain carbon tetrachloride at a concentration of 1 μg/L. Although there is a hypothetical future residential risk associated with carbon tetrachloride at this site, the fact that no future residential use of this groundwater resource is expected eliminates this exposure and the resulting risk. Therefore, no additional investigation will be performed with regard to carbon tetrachloride in groundwater at this site.

Carbon tetrachloride was also considered the primary contaminant of concern in groundwater at the wells associated with Building 796. The source for the carbon tetrachloride in this area is not identified. However, the Baseline Human Health Risk Assessment (BHHRA; Volume IIa) has determined that although carbon tetrachloride levels observed in groundwater at this site do exceed the upper limit (10^{-6}) of the target range ELCR, they constitute a minority of the overall risk at this location. The majority (82%) of the risk in groundwater at this site is from benzo(a)pyrene and 1,2-dibromoethane. The source of these contaminants is unknown. However, the rationale that there is no exposure (present or future) has resulted in the determination that no additional investigation is required at this location. Because the majority of risk associated with this site resulted from a single sampling event, a round of groundwater sampling for confirmation purposes is planned to take place during Fall 1998.

Numerous contaminants in surface water, sediment, groundwater, and soil that are considered human health COPCs have been detected at Building 35-752. In addition, although there are no risk-based cleanup levels under CERCLA for petroleum hydrocarbons (DRO, GRO, and/or TPH), they are present at elevated levels in groundwater, sediment, surface soil and subsurface soil.

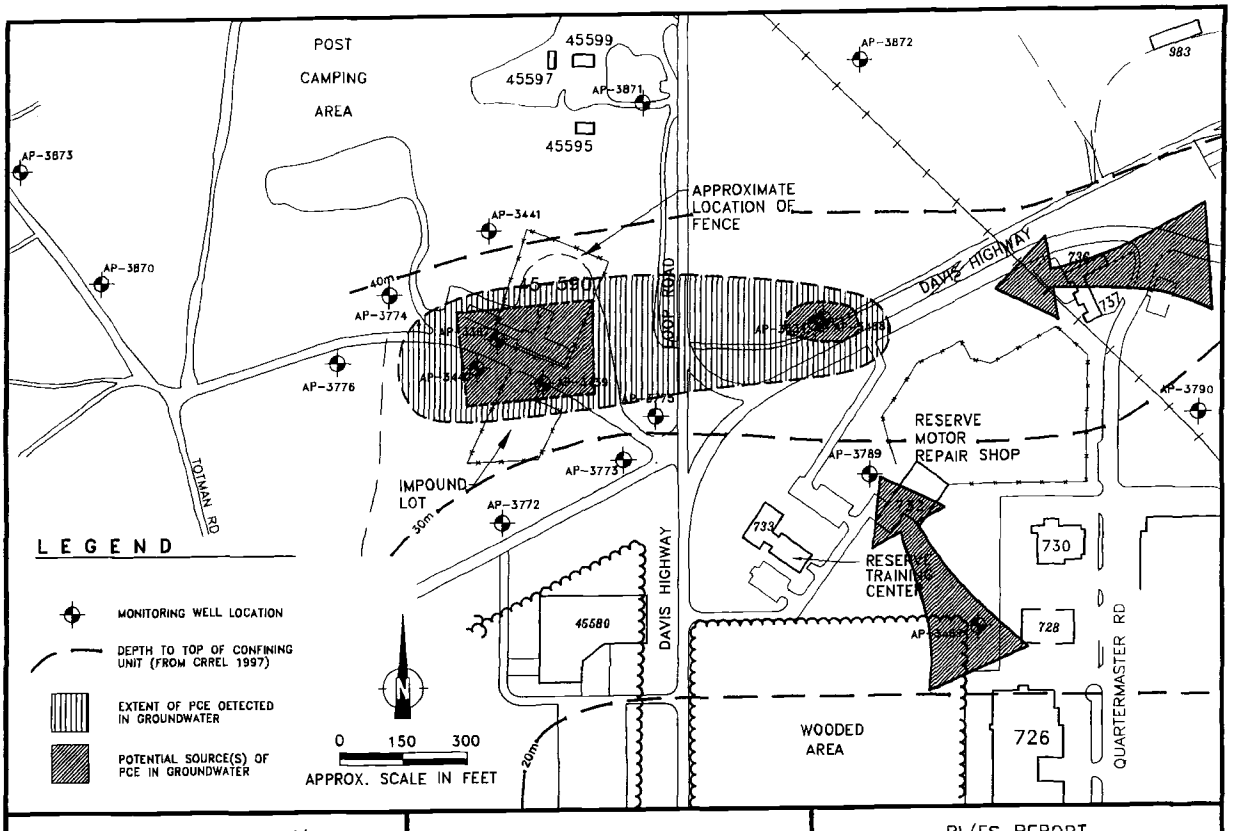
Chromatograms for the hydrocarbons (i.e., DRO) detected in pond sediment exhibit the characteristics of a heavy residual product.

Chromatograms for the petroleum hydrocarbons in groundwater exhibit characteristics of a light distillate, such as gasoline. The source for these hydrocarbons remains unclear, although no risk to human health or the environment has been identified, primarily due to the fact that there is no domestic use of the affected groundwater and none is likely to occur in the future.

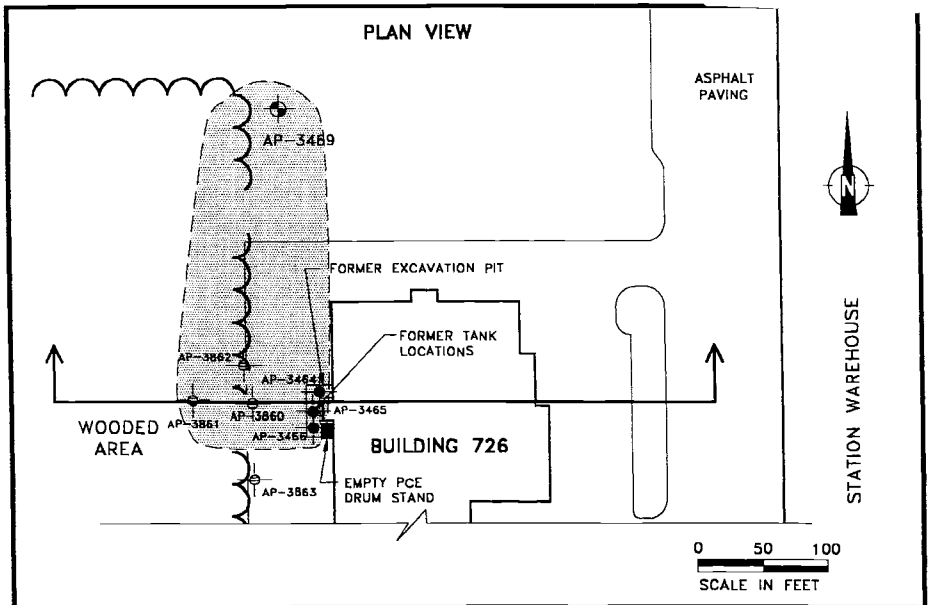
PCBs are present at elevated levels in soil and sediment at the Building 35-752 site. The source of PCBs is unclear. Storage of PCB-contaminated soil in bags inside the building has been suggested as one possible source. It is unclear how this source could lead to the widespread presence of these contaminants. Lateral extent of PCBs in sediment has been identified in outfall ditch samples collected and analyzed in 1997. All of the samples contained elevated levels of PCBs, although only those samples retrieved from the Cooling Pond exceed risk-based concentrations. Because of the widespread occurrence of these contaminants and the proximity of the ditch to the adjacent roadway, historical road oiling is considered to be a possible source.

PCBs in surface and subsurface soil have been identified in the Risk Assessment (Volume IIa) as exceeding target risk levels and have not been fully delineated. The area of disturbed ground surface south of Building 35-752 and east of the Cooling Pond has not been sampled. Analysis of samples collected from the drum storage area east of the building indicated that PCBs in the surface and subsurface soil exceed target risk levels. Additional soil sampling is recommended in order that the volume and area of PCB-affected soil can be more fully defined.

Elevated levels of pesticides are probably related to use as intended (i.e., application concentrations), and therefore no point source would be associated with its release.



DRAWING: 45590897J	DRAWN: SR/VJF	FIGURE 6-1 BUILDING 45-590 CONCEPTUAL SITE MODEL
C/SC: 1:300	DISK: Z 11/97	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120
DATE: 11/18/98	CHECK: S.W.	



DRAWING: 726CS4 DRAWN: SR/VJF C/SC: 1:100 DISK: Z 11/97 DATE: 9/29/98 CHECK: J.S.	FIGURE 6-2 BUILDING 726 CONCEPTUAL SITE MODEL	RI/FS REPORT OPERABLE UNIT D FT. RICHARDSON, ALASKA PROJECT 9000-107-120

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APPENDIX A

REMEDIAL INVESTIGATION BORING LOGS, WELL COMPLETION DIAGRAMS, GEOTECHNICAL ANALYSIS AND SURVEY DATA

BUILDING 35-752

- BORING LOGS/WELL COMPLETION DIAGRAMS
- GRAIN SIZE ANALYSIS
- SURVEY DATA

OU-D 33456

Key to ENSR boring logs

GW, GW-GM, GW-GC - Well graded gravels, sandy gravels, gravels with sand, little or no fines

GP, GP-GM, GP-GC - Poorly graded gravels, sandy gravels, gravels with sand, little or no fines

GM - Silty gravels, gravel-sand-silt mixtures

GC - Clayey gravels, gravel-sand-clay mixtures

SW, SW-SM, SW-SC - Well graded sands, gravelly sands, sands with gravel, little or no fines

SP, SP-SM, SP-SC - Poorly graded sands, gravelly sands, sands with gravel, little or no fines

SM - Silty sands, silt-sand mixtures

SC - Clayey sands, clay-sand mixtures

ML - Inorganic silts, very fine sands, rock flour, silty or clayey fine sands

CL - Inorganic clays, gravelly clays, sandy clays, silty clays, lean clays

PT - Peat

OU-D 33457

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 1 Of 2

Location Coordinates
Northing 113,158 Easting 125,665

Drilling Agency
[ ] Other Alaska District
[XXX] Corps of Engineers

Hole Number	Name of Driller	Weather
Field BH-12 Permanent AP-2982	K. Mitchell	Overcast, 60°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	24.0	24.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	[XXX] MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
4	Grab and Drive	16.0	21 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
262.20	T. Reed	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
					3"	brown, moist, rounded gravel, coarse to fine sand
5		1	GC-GM	Silty, Clayey GRAVEL with Sand and Cobbles	4"	56%Gr 27%Sa 17%Fines F2 brown, moist, rounded gravel, coarse to fine sand, LL=22, PI=4, HNu<1 *11/14/11
10		2	GW	Well-Graded GRAVEL with Sand	3"	65%Gr 30%Sa 5%Fines S1 gray to brown, moist, subangular gravel, medium to coarse sand, HNu=0 *23/49/52
15	▽	3	GW-GM	Well-Graded GRAVEL with Silt and Sand	2"	53%Gr;38%Sa;9%Fines S1 brown to gray, wet, rounded gravel, medium to coarse sand, HNu=2.0 *14/23/29
20		4	GM	Silty GRAVEL with Sand	1½"	44%Gr 41%Sa 15%Fines F2 brown, wet, rounded gravel, medium to coarse sand, HNu=0 *16/12/14
25						Bottom of hole 24.0 Elevation 238.2 Groundwater elev. 246.2 estimated during drilling *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation log)
30						

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2982

Piezometer

OU-D 33458

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

Piezometer

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 2 Of 2

Location Coordinates
Northing 113,158 Easting 125,665

Drilling Agency [XXX] Corps of Engineers
[ ] Other Alaska District

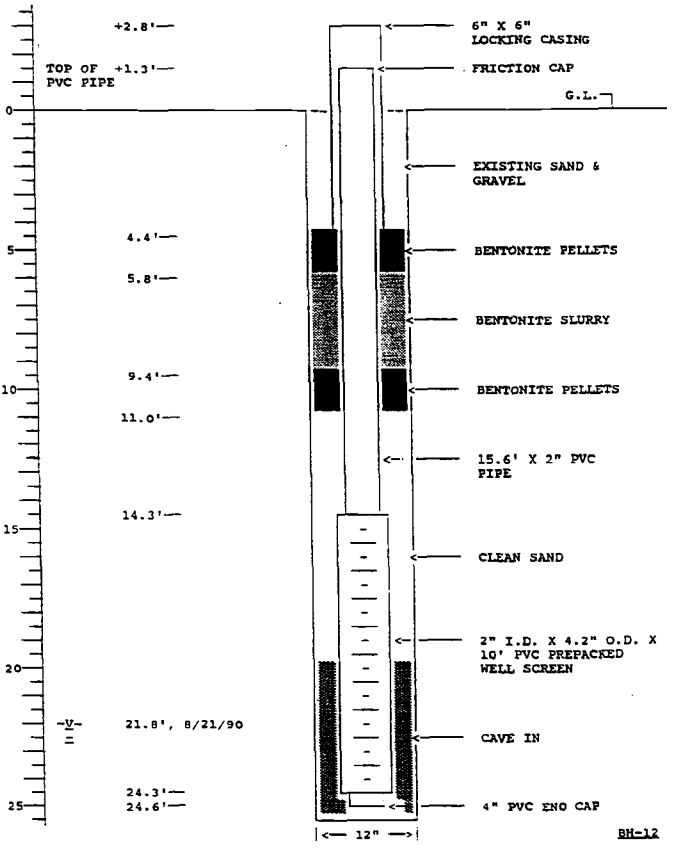
Hole Number	Name of Driller	Weather
Field BH-12 Permanent AP-2982	K. Mitchell	Overcast, 60°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	24.0	24.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	[XXX] MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
0		16.0	21 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
262.20	T. Reed	J. Raychel	D. Thomas



Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2982

33459

OU-D

Piezometer

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North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 1 of 1

Location Coordinates
Northing 113,158 Easting 125,767

Drilling Agency [XXX] Corps of Engineers
[ ] Other Alaska District

Hole Number	Name of Driller	Weather
Field BH-13 Permanent AP-2983	K. Mitchell	Overcast, 65°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	24.0	24.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	[XXX] MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
4	Grab and Drive	17.0	21 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
262.70	T. Reed	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
					3"	brown, moist, rounded gravel, medium to coarse sand, HNu=0
5		1	GP-GM	Poorly Graded GRAVEL with Silt, Sand, and Cobbles	3½"	70%Gr 24%Sa 6%Fines S1 brown, moist, rounded gravel, medium to coarse sand, HNu=0 *10/18/19
10		2	GP-GM	Poorly Graded GRAVEL with Silt, Sand, and Cobbles	4"	47%Gr 46%Sa 7%Fines S1 brown, moist, rounded gravel, medium to coarse sand, HNu=0 *33/34/45
15	▽	3	GW	Well-Graded GRAVEL with Sand and Cobbles	5"	61%Gr 36%Sa 3%Fines PFS brown, wet, semi-rounded gravel, medium to coarse sand, HNu=0 *11/28/39
20		4	SP	Poorly Graded SAND with Gravel and Cobbles	5"	45%Gr 50%Sa 5%Fines NFS brown, wet, rounded gravel, fine to coarse sand, HNu=7 *19/30/24
25						Bottom of hole 24.0 Elevation 238.7 Groundwater elev. 245.7 estimated during drilling *Number of blows to drive a 2⅜" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation log)
30						

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2983

Piezometer

33460

OU-D

Piezometer

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North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 2 Of 2

Location Coordinates
Northing 113,158 Easting 125,767

Drilling Agency
[ ] Other Alaska District
[XXX] Corps of Engineers

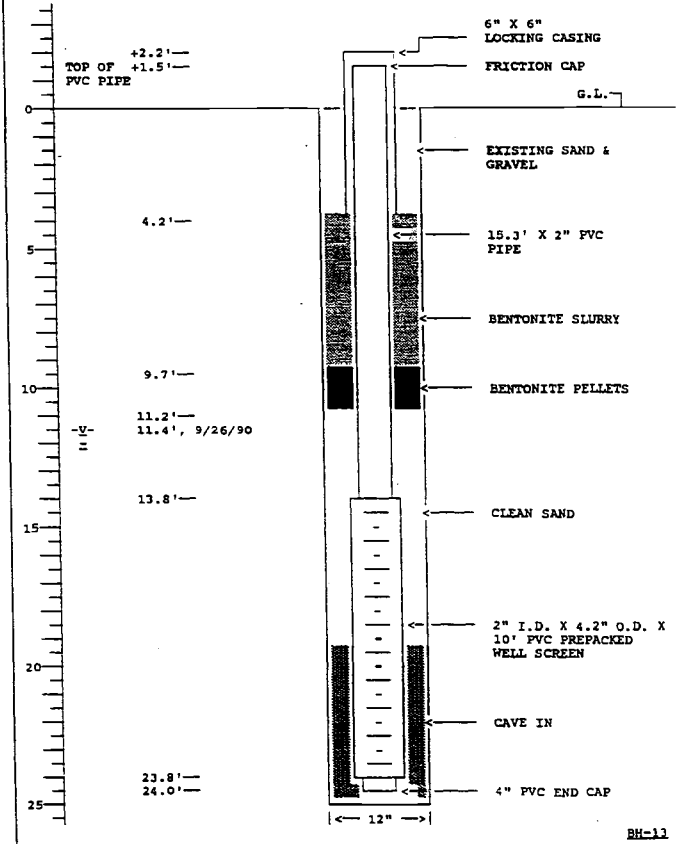
Hole Number	Name of Driller	Weather
Field BH-13 Permanent AP-2983	K. Mitchell	Overcast, 65°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	24.0	24.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	[XXX] MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
0		17.0	22 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
262.70	T. Reed	J. Raychel	D. Thomas



Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number
AP-2983

OU-D 33461

DEPARTMENT OF THE ARMY

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U.S. Army Engineer District Alaska

EXPLORATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Piezometer

Sheet 1 Of 2

Location Coordinates
Northing 113,118 Easting 125,767

Drilling Agency [XXX] Corps of Engineers
[ ] Other Alaska District

Hole Number	Name of Driller	Weather
Field BH-14 Permanent AP-2984	K. Mitchell	Overcast, 65°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	19.0	19.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	Elevation [XXX] MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
4	Drive	14.0	22 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
259.50	T. Reed	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		1			4"	no soil sample taken, brown, moist, sandy gravel, HNu=0, Fill
5		2	ML	SILT with Sand	½"	23%Sa 77%Fines F4 brown, moist, traces of gravel, fine sand, HNu=1 *4/6/8
10		3	GW	Well-Graded GRAVEL with Sand	2½"	64%Gr 32%Sa 4%Fines S1 brown, moist, angular gravel, medium to coarse sand, HNu=0 *8/18/22
15	▽	4	GW-GM	Well-Graded GRAVEL with Silt and Sand	2"	52%Gr 37%Sa 11%Fines F1 brown, wet gravel, medium to coarse sand, HNu=0 *9/18/25
20						Bottom of hole 19.0 Elevation 240.5 Groundwater elev. 245.5 estimated during drilling *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation log)
25						
30						

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2984

Piezometer

OU-D 33462

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 2 of 2

Location Coordinates
Northing 11,3118 Easting 125,767

Drilling Agency XXX Corps of Engineers
[ ] Other Alaska District

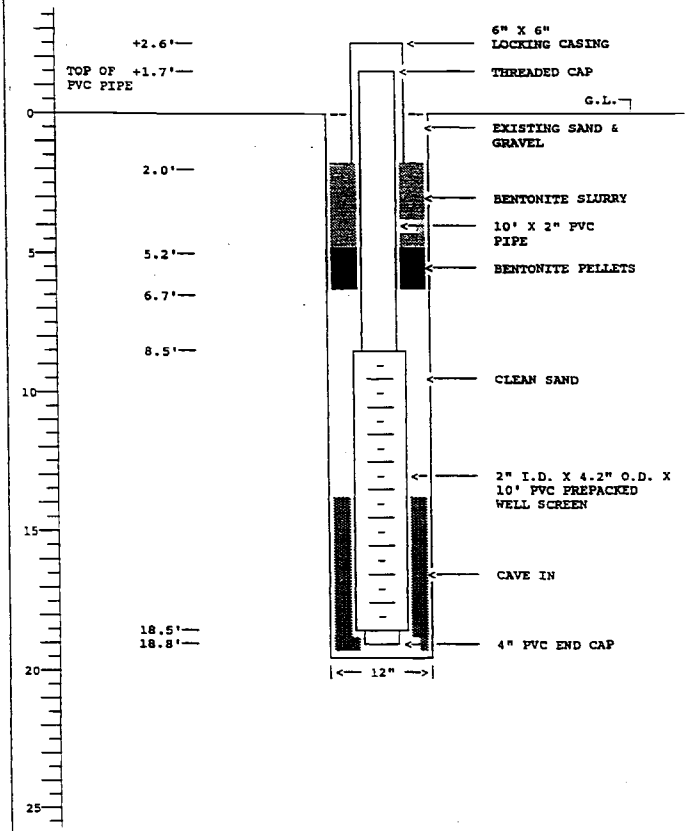
Hole Number	Name of Driller	Weather
Field BH-14 Permanent AP-2984	K. Mitchell	Overcast, 65°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	19.0	19.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	[XXX] MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
0		14.0	22 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
259.50	T. Reed	J. Raychel	D. Thomas



BH-14

OU-D 33463

Piezometer

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North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 1 of 1

Location Coordinates
Northing 113,086 Easting 125,718

Drilling Agency
[XXX] Corps of Engineers
[ ] Other Alaska District

Hole Number	Name of Driller	Weather
Field BH-15 Permanent AP-2985	K. Mitchell	Light rain, 65°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	14.0	14.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	[XXX] MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
2	Drive	10.5	23 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
257.20	T. Reed	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
						brown, moist silt with gravel, HNu=0 at 2' depth
5		1	GW	Well-Graded GRAVEL with Sand	3"	65%Gr 30%Sa 5%Fines PFS brown to gray, moist, rounded gravel, medium to coarse sand, HNu=0 *6/26/34
10	▽	2	SP	Poorly Graded SAND with Gravel and Cobbles	4"	33%Gr 62%Sa 5%Fines S2 brown to gray, wet, subrounded gravel, medium to coarse sand, HNu=0 *12/37/37
15						Bottom of hole 14.0 Elevation 243.2 Groundwater elev. 246.7 estimated during drilling *Number of blows to drive a 2½" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation well)
20						
25						
30						

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2985

Piezometer

OU-D 33464

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Piezometer

Sheet 2 of 2

Location Coordinates
Northing 113,086 Easting 125,718

Drilling Agency [XXX] Corps of Engineers
[ ] Other Alaska District

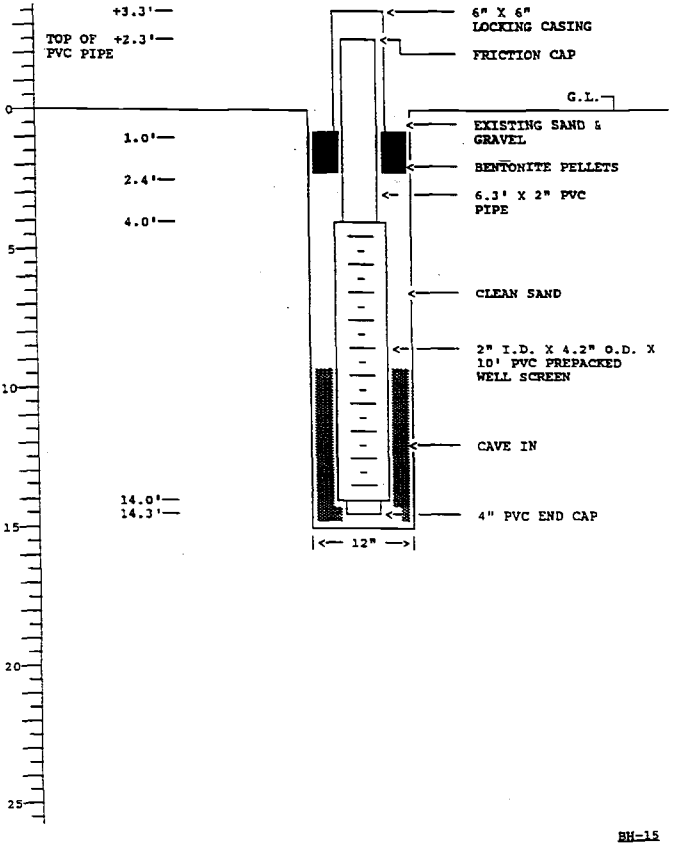
Hole Number	Name of Driller	Weather
Field BH-15 Permanent AP-2985	K. Mitchell	Light rain, 65°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	14.0	14.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	[XXX] MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
0		10.5	23 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
257.20	T. Reed	J. Raychel	D. Thomas



BH-15

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2985
Piezometer

OU-D 33465

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 1 Of 1

Location Coordinates
Northing 113,113 Easting 125,715

Drilling Agency XXX Corps of Engineers
[ ] Other Alaska District

Hole Number	Name of Driller	Weather
Field BH-16 Permanent AP-2986	K. Mitchell	Overcast, 60°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit XXX Auger Hole	0.0	19.0	19.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	XXX MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
3	Drive	14.0	23 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
259.20	T. Reed	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
					4"	brown, moist, rounded sandy gravel, medium to coarse sand with cobbles, HNu=0, Fill
5		1	GW	Well-Graded GRAVEL with Sand and Cobbles	4"	75%Gr 23%Sa 2%Fines NFS brown, moist, angular gravel, medium to coarse sand, HNu=0, may be Fill *9/30/21
10		2	GW	Well-Graded GRAVEL with Sand	3"	61%Gr 34%Sa 5%Fines S1 brown to gray, wet, rounded gravel, medium to coarse sand, strong petro odor, HNu=200 *13/27/32
15	▽	3	GW-GM	Well-Graded GRAVEL with Silt and Sand	2"	51%Gr 43%Sa 6%Fines S1 brown to gray, wet, angular gravel, medium to coarse sand, HNu=0 *19/22/22
20						Bottom of hole 19.0 Elevation 240.2 Groundwater elev. 245.2 estimated during drilling *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed (see installation log)
25						
30						

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2986
Piezometer

OU-D 33466

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

Piezometer

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 2 Of 2

Location Coordinates
Northing 113,113 Easting 125,715

Drilling Agency XXX Corps of Engineers
[ ] Other Alaska District

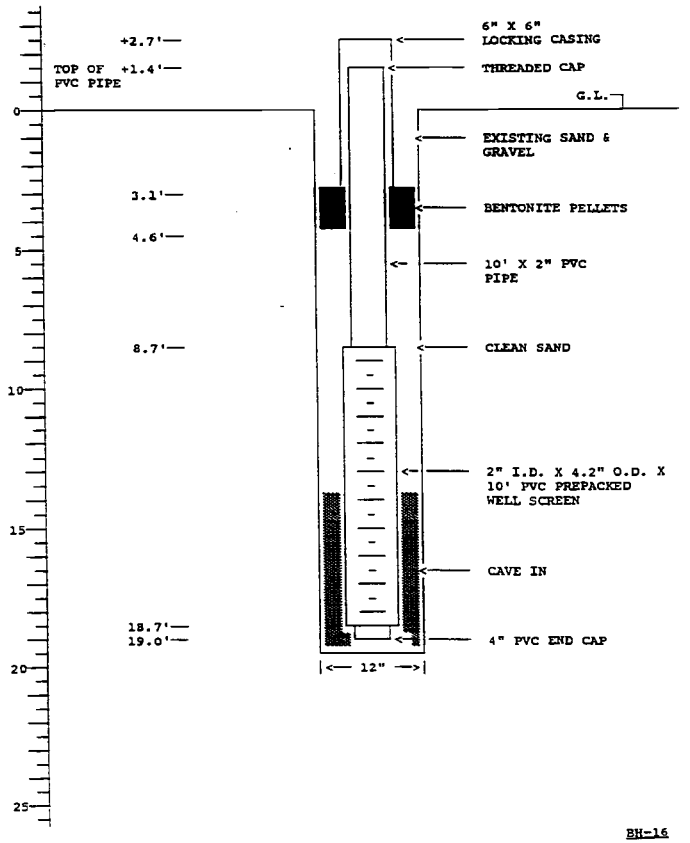
Hole Number	Name of Driller	Weather
Field BH-16 Permanent AP-2986	K. Mitchell	Overcast, 60°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit XXX Auger Hole	0.0	19.0	19.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	XXX MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
0		14.0	23 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
259.20	T. Reed	J. Raychel	D. Thomas



BH-16

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2986

OU-D 33467

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Piezometer

Sheet 1 of 1

Location Coordinates
Northing 113,123 Easting 125,664

Drilling Agency [XXX] Corps of Engineers
[ ] Other Alaska District

Hole Number	Name of Driller	Weather
Field BH-17 Permanent AP-2987	K. Mitchell	Overcast, 60°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	19.0	19.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	[XXX] MSL [ ]	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
3	Grab and Drive	13.5	24 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
260.10	T. Reed	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
					4"	brown, moist, rounded sandy gravel w/ cobbles, medium to coarse sand, HNu=0 at 2' depth, Fill
5		1	GP-GM	Poorly Graded GRAVEL with Silt, Sand, and Cobbles	5"	69%Gr 23%Sa 8%Fines S1 brown, moist, subangular gravel, fine to medium sand, HNu=0 *32/60 for 4"
10		2	GW	Well-Graded GRAVEL with Sand	3"	66%Gr 29%Sa 5%Fines S1 gray, wet, subrounded gravel, medium to coarse sand, HNu=0 *13/23/20
15	▽	3	SP	Poorly Graded SAND with Gravel and Cobbles	6"	43%Gr 53%Sa 4%Fines NFS gray, wet, rounded gravel, medium to coarse sand, HNu=0 *12/25/59
20						Bottom of hole 19.0 Elevation 241.1
25						Groundwater elev. 246.6 estimated during drilling
30						*Number of blows to drive a 2½" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30"
						Monitoring well installed (see installation log)

Project FT RICHARDSON, AK
UST REMEDIATION

Hole Number AP-2987
Piezometer

33468

OU-D

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

INSTALLATION LOG

Project FT RICHARDSON, AK
UST REMEDIATION

Sheet 2 Of 2

Location Coordinates
Northing 113,123 Easting 125,664

Drilling Agency [XXX] Corps of Engineers
[ ] Other Alaska District

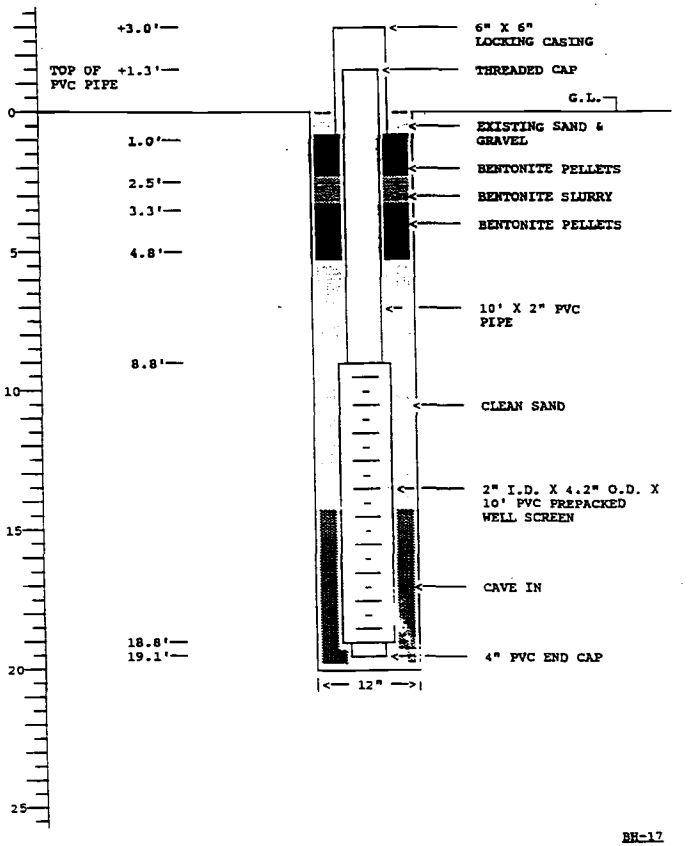
Hole Number	Name of Driller	Weather
Field BH-17 Permanent AP-2987	K. Mitchell	Overcast, 60°

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	19.0	19.0

Size and Type of Bit	Elevation Datum	Type of Equipment
12" Hollow Stem	[XXX] MSL	Acker Soil Max

Number of Samples	Type of Samples	Depth to Groundwater	Date
0		13.5	243 August 1990

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
260.10	T. Reed	J. Raychel	D. Thomas



BH-17

33469

OU-D

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Sheet 1 of 2

Location Coordinates
Northing 113,562 Easting 125,451

Drilling Agency [ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-12S Permanent AP-3458	S. Moore	Rain 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	0.0	34.5	36.0

Size and Type of Bit	Elevation Datum	Type of Equipment
8" Hollow Stem	[XXX] MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
5	Grab & Drive	21.8	25 Aug 94

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
262.65	J. Minor	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	3	1	PT	Peat @ 0-0.3'		Brown, moist w/roots organics
			SM	Silty Sand with Gravel	1"	39%Gr;48%Sa;13%Fines F2 Lt.brown,dry, suba.-subr. gravel, med. to coarse sand,NP fines,PID=ND,grab Rough drilling
5	2	2	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	2"	66%Gr;28%Sa;6%Fines S1 Brown/gray, slig.moist, suba.-subr.gravel,med. to coarse sand, NP fines PID=ND *3/21/22
10						Rough drilling indicates consistent material throughout - gravels
15	4	3	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand	1½"	48%Gr;44%Sa;8%Fines F1 Brown, slig.moist, suba.-subr. gravel,med-coarse sand, NP fines PID=ND *6/19/19
20						
	V					
25	5	4		Poorly Graded GRAVEL w/ Sand	1½"	58%Gr;38%Sa;4%Fines PFS Gray, moist, suba.-subr. gravel, med. to coarse sand, NP fines PID=3.5 *13/20/18
30						

NPA Form 19-E
Jun 92 Prev. Ed. Obsolete

Project Ft Richardson
28 Monitoring Wells

Hole Number AP-3458
Piezometer

OU-D 33470

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson
28 Monitoring Wells

Piezometer

Sheet 2 of 2

Location Coordinates
Northing 113,562 Easting 125,451

Drilling Agency: Corps of Engineers
XXX Other: Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-12S Permanent AP-3458	S. Moore	Rain 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
Test Pit / XXX Auger Hole	0.0	34.5	36.0

Size and Type of Bit	Elevation Datum	Type of Equipment
8" Hollow Stem	XXX MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
5	Grab & Drive	21.8	25 Aug 94

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
262.65	J. Minor	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
			GP	Poorly Graded GRAVEL w/ Sand		Rough drilling - gravels
35	7	S	GM	Silty GRAVEL w/ Sand	2½"	54%Gr;26%Sa;20%Fines F2 Gray/brown,wet,suba-subr. gravel, fine to coarse sand, NP fines PID=1.0 *8/13/14
						Bottom of hole 36.0 Elevation 226.65
						Groundwater elev. 240.88 after drilling
40						PID - Photo Ionization Detector (ppm)
						*Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling approx. 30"
45						Monitoring well installed
50						
55						
60						

NPA Form 19-E

Project: Ft Richardson
28 Monitoring wells

Hole Number AP-3458

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER – ALASKA DISTRICT
MONITORING WELL LOG

Location: Ft. Richardson, Alaska
Project: 28 Monitoring Wells

SHEET 1 OF 1

Location Coordinates
Northing 113,562 Easting 125,451

Drilling Agency
[XXXX] Ambler Exploration [ ] Corps of Engineers

Hole Number
Field AP-12S Permanent AP-3458

Name of Driller
S. Moore

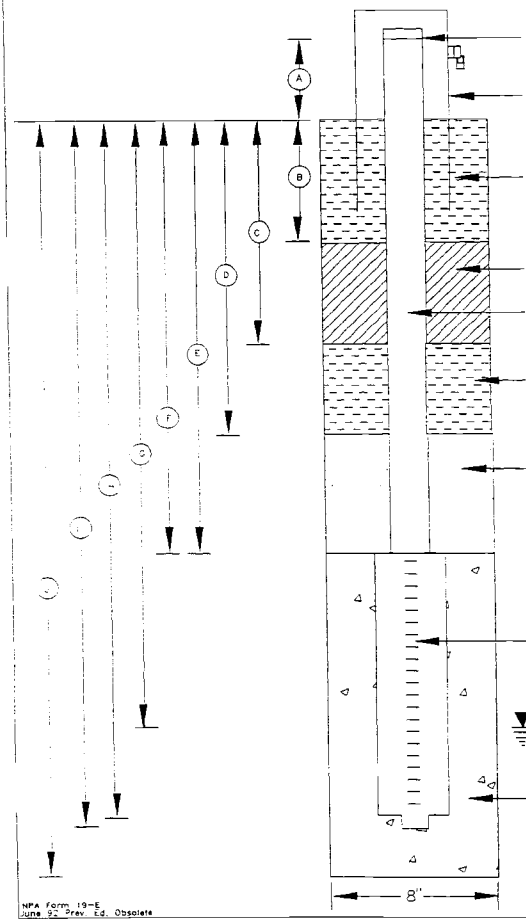
Weather
Rain, 50°F

Type of Hole	Depth to	Depth Drilled	Total Depth
[ ] Test Pit [XXXX] Auger		34.5	36.0

Size and Type of Bit	Elevation Datum	Type of Equipment
8" Hollow Stem	[XXXX] MSL [ ]	Mobile B-61

Number of Samples	Type of Samples	Depth to Groundwater	Date
5	Grab & Drive	21.77	25 Aug 94

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
262.65	J. Minor	J. Raychel	D. Thomas



NOTE:
Subsurface soils information is provided in exploration log AP-3458

WELL COMPLETION DETAILS

A	2.0	FT (AGS)	ELEV. 264.65
B	0.5	FT (BGS)	
C	21.0	FT (BGS)	
D	23.0	FT (BGS)	
E	25.0	FT (BGS)	
F	25.0	FT (BGS)	
G	21.77	FT (BGS)AD	ELEV. 240.88
H	34.5	FT (BGS)	
I	34.7	FT (BGS)	
J	36.0	FT (BGS)	

BGS Below Ground Surface
AGS Above Ground Surface
WD While Drilling
AD After Drilling

SUMMARY OF MATERIALS USED:

225 LBS. BENTONITE CHIPS
125 LBS. VOLCLAY GROUT
50 LBS. 10-20 SAND
3 – 2" I.D. x 10' SCH. 40 PVC RISER PIPE
1 – 2" I.D. x 3.75" O.D. x 9.7' 8-SLOT JOHNSON V-WIRE SCREEN PRE-PACK (40-60 SAND)
1 – 2" I.D. PVC END CAP
1 – 2" I.D. MORRISON END CAP
1 – 6" x 6" x 5' PROTECTIVE CASING

OU-D 33471

NPA Form 19-E
June 92 Prev. Ed. Obsolete

BORING LOG

BORING NUMBER: AP-3497

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, OPerable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3497

BORING DEPTH (ft): 20
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 262.7
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-2-94
DATE COMPLETED: 11-2-94
NORTHING: 113156.78
EASTING: 125670.72

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
0					7 7			GW	Medium orangish-brown SANDY GRAVEL (GW), coarse rounded to subangular gravel, fine to medium sand, slight coarse sand, dry, loose, no odor.	
					8 5	188.6			same as above	
					5 7					
					11 15	233.3			same as above	
5					6 9	6.6			Brownish-gray SANDY GRAVEL (GW), medium to coarse subrounded gravel, fine sand, slight medium to coarse sand, slight silt, dry, loose, no odor.	
					10 10					
					8 10	19.9			same as above	
					14 18					
10					8 23	33.3				
					21 23				Drilling very hard. GRAVEL (GW)	
					6 12			SW	Medium gray SAND (SW), medium to coarse, slight fine sand, silt, gravel, very moist, loose, moderate to strong hydrocarbon odor.	
15					20 18	233.4			same as above, very strong hydrocarbon odor, very moist.	
					15 17					
					14 16				Medium brownish-gray SAND (SW), medium to coarse, slight fine sand and silt, some rounded medium gravel, bottom 2" angular to rounded gravel, saturated to wet, slight hydrocarbon odor	
20					12 18	2.7				
					23 32				Total depth = 20 feet	
25										
30										

OU-D 33472

BORING LOG

BORING NUMBER: AP-3498

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richards Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3498

BORING DEPTH (ft): 16
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 264.6
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-2-94
DATE COMPLETED: 11-2-94
NORTHING: 113116.16
EASTING: 125711.42

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					1, 3, 5, 5	2.2		GW	Dark brown SANDY GRAVEL (GW), medium sand, medium to coarse rounded gravel, slight fine sand and silt, moist, no odor.	
					5, 8, 8, 9	3.6			same as above, color change to medium orangish-brown at 3.5', increase in fine sand and silt	
5					5, 11, 11, 9	1.8			Medium orangish-brown SANDY GRAVEL (GW), coarse rounded to subrounded gravel, fine to medium sand, some coarse sand with depth, moist, no odor.	
					16, 17, 26, 8	6.2			same as above	
10					7, 11, 14, 15	1242		SW	Medium gray SAND (SW), medium to coarse, slight fine sand, silt, and medium gravel, very moist, loose, strong hydrocarbon odor.	
15					5, 11, 16, 17	13.9		GW	Medium gray SANDY GRAVEL (GW), coarse sand, subrounded to angular gravel, very strong hydrocarbon odor, sheen on sampler, very moist.	
									Total depth = 16 feet	
20										
25										
30										

OU-D 33473

BORING LOG

BORING NUMBER: AP-3499

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hugnes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3499

BORING DEPTH (ft): 16
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 264.6
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-2-94
DATE COMPLETED: 11-2-94
NORTHING: 113122.18
EASTING: 125674.32

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					1 2 5 6	8.7		GW	Dark brown SANDY GRAVEL (GW), medium to coarse sand, medium to coarse rounded gravel, slight silt, moist, no odor.	
5					4 2 4 8 2 2	5.5		SM	Medium orangish-brown SANDY SILT (SM), fine sand, slight medium sand and gravel, few pockets of light gray clay, some wood, moist same as above, clay increasing with depth and sand decreasing.	
					2 1 1 2 8 11	22.5 5.5		SW	Medium orangish-brown SAND (SW), medium to coarse sand, slight rounded gravel, very moist, no odor. same as above, some silt, some gravel, moist to wet.	
10					5 12 15 12 13	8.0			same as above, soil gray, strong hydrocarbon odor, saturated	
15					12 15 33 8 11	8.7			Medium gray SAND (SW), medium to coarse sand, some subrounded to angular gravel, saturated, strong hydrocarbon odor Total depth = 16 feet	
20					21 18					
25										
30										

BORING LOG

BORING NUMBER: AP-3500

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3500

BORING DEPTH (ft): 18
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 262.5
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-2-94
DATE COMPLETED: 11-2-94
NORTHING: 113153.19
EASTING: 125735.07

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					1 3 4 3 3 4 3 3 2 2	18.4 30.0 8.0		GW	Dark brown SANDY GRAVEL (GW), fine to medium sand, medium to coarse rounded gravel, slight coarse sand and silt, very moist, no odor.	
5					4 10 11 13 14			SM	Medium brown SANDY SILT/SILTY SAND (SM), fine sand, slight gravel at top, clay at bottom, homogeneous, very moist to wet, moderate hydrocarbon (diesel?) odor	
					14 7 12 17 22 10 22 25	17.5 302		GW	Medium brownish-gray SANDY GRAVEL (GW), medium to coarse sand, slight fine sand, rounded to subrounded gravel, dry to moist, no odor. same as above	
10										
15					17 31 28 27 27 33 25 28 31	OR OR		SW	Medium gray SAND (SW), medium to coarse sand, some subrounded to angular gravel, very moist to wet, very strong hydrocarbon odor. Medium orange-brown SAND (SW), medium to coarse sand, very moist, very strong hydrocarbon odor.	
20									Total depth = 18 feet	
25										
30										

BORING LOG

BORING NUMBER: AP-3501

CLIENT: U.S. Army Corps of Engineers
PROJECT NAME: Fort Richardson Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling
METHOD: 4.25" ID HSA
FILENAME: AP3501

BORING DEPTH (ft): 15
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 262.4
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 12/8/95
DATE COMPLETED: 12/8/95
NORTHING: 125620.33
EASTING: 113126.81

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
0								GW	Angle boring: deviated 45 degrees from vertical, beginning at grade level.	
									SANDY GRAVEL, dark brown to black, fine to medium sandy gravel, medium to coarse gravel; saturated at 4 ft bgs.	
5									GRAVEL, sandy to coarse, medium to dark-brown, wet, no odors.	
10										
15									Total measured depth = 15' Approximate true vertical depth = 10.6'	
20										
25										
30										

BORING LOG BORING NUMBER: AP-350?

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: B752MW-1

BORING DEPTH (ft): 22
BORING DIAMETER (in): 6
WELL DEPTH (ft): 80
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 261.3
TOP OF PVC ELEVATION (ft): 261.05
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 silica
DATE STARTED: 11-7-94
DATE COMPLETED: 11-7-94
NORTHING: 113150.70
EASTING: 125618.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
0					1	9.8		SM	Dark to medium brown SILTY SAND (SM), fine sand, homomgeneous, very moist, slight natural (organic) odor.
					1				
					2				
					4	0.6			same as above
					4				
					4				
					9	0.5			same as above, grain size increasing with depth, very moist, no odor.
5					15				
					3				
					4				
					13				
					15				
					9	0.8		SW	Medium brown SAND (SW), fine to medium with slight coarse sand, some interbedded gravel, some iron oxidation staining (orange), moist, no odor
10					17				
					21				
					20	0.4			
					20				
					25				same as above
					28	2			
					22				
					8				same as above, saturated at 15'
15					24				
					28				
					24				drill ahead
20									
25									Total depth = 22 feet.
30									

WELL DIAGRAM: 2" SCH. 40 PVC; 2" SCH. 40 PVC, .6 SLOT SCREEN; GROUT; SAND PACK

OU-D 33477

BORING LOG BORING NUMBER:AP-3503

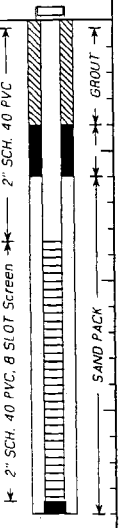
CLIENT: United States Army Corps of Engineers
PROJECT NAME: OPerable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: B752MW-2

BORING DEPTH (ft): 19
BORING DIAMETER (in): 6
WELL DEPTH (ft): 80
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 260.9
TOP OF PVC ELEVATION (ft): 263.66
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 silica
DATE STARTED: 11-8-94
DATE COMPLETED: 11-8-94
NORTHING:
EASTING:

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
					2	2.4		GW	SANDY GRAVEL (GW), possible fill
					1				
					2				
					3	2.1		SM	Med. brown SANDY SILT to SILTY SAND (SM), fine to medium sand, trace coarse rounded gravel, moist, no odor.
					3				
					2				same as above, sand grain size increasing with depth, very moist, no odor
					2	2.2			
5					3				
					3				
					4				
					3	1.9		SW	Med. brown SAND (SW), fine to medium with slight coarse sand, some silt, slight gravel, very moist, no odor.
					3				
					4				same as above, increase in gravel (6" gravel layer @8.5').
					4	1.8			
					7				
10					6	1.1			Med. brown SAND (SW), fine to medium sand, subangular to rounded interbedded gravel, saturated @11', no odor.
					9				
					16				drill ahead
					23				
					7				
					37				
					30				
15					35				
20									Total depth = 19 feet
25									
30									

WELL DIAGRAM



BORING LOG BORING NUMBER:AP-3504

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Operable Unit 2
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: B752MW-3

BORING DEPTH (ft): 24
BORING DIAMETER (in): 6
WELL DEPTH (ft): 24
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 261.6
TOP OF PVC ELEVATION (ft): 261.54
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 silica
DATE STARTED: 11-7-94
DATE COMPLETED: 11-7-94
NORTHING: 113208.25
EASTING: 125603.48

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
					48	2.4		GW	SANDY GRAVEL (GW), possible FILL, bottom 1' SILTY SAND (SM)
					42				
					18				
					10			SM	Medium brown SILTY SAND (SM), fine sand, homomgeneous, soil has orange tint (possible iron oxidation staining), dry, no odor.
					3	1.8			same as above
5					4				
					9				
					10	0.9		GW	
					8				Grayish brown to medium brown SANDY GRAVEL (GW), fine to medium sand, anguiar to subrounded gravel, dry, no odor.
					14				
					14	0.4			same as above, with slight orange staining (iron oxidation).
					20				
					9				
					14				
10					18	0.4			same as above, gravel layer (4") @11.5'
					22				
					8				
					24	0.2			same as above, with fine to coarse sand, abundant orange staining (iron oxidation), dry, no odor.
					29				
					27				
					8	0.2			same as above, coarse sand increasing with depth.
					16				
15					19				
					25				same as above, saturated at 16'
					16				
					12				
					21				
					28				
20									
25									Total depth = 24 feet
30									

WELL DIAGRAM: 2" SCH. 40 PVC; GROUT; 2" SCH. 40 PVC, .8 SLOT SCREEN; SAND PACK

BORING LOG

BORING NUMBER: AP-3505

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3505

BORING DEPTH (ft): 16
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 262.9
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-3-94
DATE COMPLETED: 11-3-94
NORTHING: 113175.73
EASTING: 125783.00

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					3	5.2		SM	Medium brown SANDY SILT to SILTY SAND (SM), fine sand, slight coarse rounded gravel, slight clay, moist, no odor, top 1-1.5' FILL	
					3					
					3					
					5	3.1			same as above	
					4					
					4					
					6	3.1			same as above, increase in fine sand.	
5					10					
					6					
					9					
					13					
					11					
					11	6.9		SP	Medium grayish-brown SAND (SP), fine to medium sand, with subangular to rounded gravel interbedded, moist, no odor.	
10					16					
					24					
					42					
					10	2.3		GW	Medium orange-brown SANDY GRAVEL (GW), medium to coarse sand, angular subrounded gravel, very moist, no odor.	
					15					
					14					
					15	2.0			same as above	
15					8					
					16					
					8					
					20				Total depth = 16 feet	
20										
25										
30										

BORING LOG

BORING NUMBER: AP-3506

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, OPerable Unit D
PROJECT LOCATION: Building 35-752
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3506

BORING DEPTH (ft): 16
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft): 263.3
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 11-3-94
DATE COMPLETED: 11-3-94
NORTHING: 113172.32
EASTING: 125771.18

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					2 3 4 7	5.2		SM	Medium brown SANDY SILT to SILTY SAND (SM), fine sand, slight coarse rounded gravel, slight clay, moist, no odor, top 1' FILL	
5					5 10 18 6 6 11 16	3.6 4.1		SW	Medium grayish-brown SAND (SW), fine to medium sand, with interbedded subangular to rounded gravel, moist, no odor. same as above	
10					18 9 18 15 13 9 10 10 13	3.6 3.6		GW	Medium orange-brown SANDY GRAVEL (GW), medium to coarse sand, angular subrounded gravel, very moist, no odor. same as above	
15					16 24 28 24	5.2		SW	Medium gray SAND (SW), medium to coarse, no odor. Total depth = 16 feet	
20										
25										
30										

OU-D 33481

BORING LOG

BORING NUMBER: AP-3785

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 35-752
JOB NUMBER: 9000-119
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 13
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 262.7
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 10/02/96
DATE COMPLETED: 10/02/96
NORTHING: 113169.75
EASTING: 125775.03

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
0								SW		
5			965752 25SL	SS	16	2.5			Yellow/orange **Well-graded SAND (SW)**, fine to medium, some coarse sand, little gravel to 2 inch diameter, subangular to subrounded, dry. mostly 1 to 2 inch gravel in cuttings.	
10			965752 26SL	SS	31	1.0			Olive gray **Well-graded SAND with Gravel (SW)**, fine to coarse grained, some gravel to 2 inch diameter, blocky, subrounded (mostly pea size), moist.	
▼									Groundwater encountered at 12.5 ft bgs.	
									End of coring at 13 feet.	
15										
20										

BORING LOG

BORING NUMBER: AP-3786

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 35-752
JOB NUMBER: 9000-119
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 12
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 260.9
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 10/03/96
DATE COMPLETED: 10/03/96
NORTHING: 113136.33
EASTING: 125760.30

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			965752 27SL	SS	4	0.5		SP	Dark brown Poorly Graded SAND with Gravel (SP), silty, fine grained, some pea gravel, subrounded, trace roots, dry. Yellow/orange, Poorly Graded SAND (SP), very fine sand, little medium to coarse sand, little pea sized gravel, dry.	
5			965752 28SL	SS	9	1.1			Lithology same as above, dry to moist at 5.75 feet.	
10			965752 29SL	SS	9	28.3			Olive gray and light brown Poorly Graded SAND (SP), silty, fine grained, little medium to coarse sand, little gravel to 2 inch diameter, subangular to subrounded, moist to wet, slight diesel odor. Groundwater at 11.5 feet.	
									End of boring at 12 feet.	
15										
20										

BORING LOG

BORING NUMBER: AP-3787

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 35-752
JOB NUMBER: 9000-119
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 12
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 258.9
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 10/03/96
DATE COMPLETED: 10/03/96
NORTHING: 113135.92
EASTING: 125598.45

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			965752 30SL	SS	2	1.1		SP	Medium brown **Poorly Graded SAND (SP)**, silty, fine grained, little medium to coarse sand, little pea gravel, dry to moist. Black contact grading to medium gray, loose, coarse to medium sand, with trace gravel to 2 inch diameter, subangular, wet.	
			965752 31SL	SS	2	1.5		SP SM	Light brown, lithology same as upper 10 inches, wet. Coarse sand, pea size gravel, loose, wet. Light gray, organically rich silt, little sand, thin band of organics at 3.75 feet, wet.	
5			965752 33SL	SS	27	1.3			Light brown, fine sand, moist. Light brown **Poorly Graded SAND with Silt and Gravel (SP-SM)**, coarse to medium grained, some cobbles to 3 inch diameter, angular, blocky, some silt, wet to dry at 6.08 feet.	
			965752 34SL	SS	45	1.4		SW	Light brown **Well-graded SAND with Gravel (SW)**, silty, fine to coarse grained, some pea sized 1/4 to 2 inch diameter gravel, subrounded, trace cobbles, angular, blocky, tight, moist.	
10			965752 35SL	SS	47	2.5		SP SM	Light yellow/orange to olive gray **Poorly Graded SAND with Silt (SP-SM)**, silty, fine to coarse grained, trace gravel to 2.5-inch diameter, subangular to subrounded, wet. Yellow/orange to olive gray **Poorly Graded SAND with Gravel (SP)**, coarse grained sand, and fine gravel to 3/4-inch diameter, rounded, wet.	
									End of boring at 12 feet.	
15										
20										

BORING LOG

BORING NUMBER: AP-3788

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 35-752

JOB NUMBER: 9000-119

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 12

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft): 258.2 msl

TOP OF CASING ELEV. (ft):

FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 10/03/96

DATE COMPLETED: 10/03/96

NORTHING: 113,023.75

EASTING: 125,622.64

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			965752 36SL and 965752 37SL (dup)	SS	2	1.5		ML	Olive gray SILT (ML), organically rich, little coarse sand in the top 2 inches, little fine sand, moist.	
								SP	Light brown Poorly Graded SAND (SP), medium to coarse grained, little pea sized gravel to 1/2-inch diameter, rounded, wet.	
			965752 38SL	SS	20	1.7		SW	Medium brown Well-graded SAND (SW), fine to coarse grained, little silt, little fine gravel to 2.5 inch diameter, subrounded, moist.	
5										
			965752 39SL and 965752 40SL (dup)	SS	24	1.1		SP	Light brown Poorly Graded SAND with Gravel (SP), medium to coarse grained, little silt, little gravel to 1-inch diameter, subrounded, some pea sized gravel, in bottom 5 inches, subrounded, wet.	
▼10			965752 41SL	SS	25	1.7			Olive gray Poorly Graded SAND (SP), coarse grained, gravel to 2 inch diameter, subrounded and angular, loose, wet.	
									Light yellow/orange, coarse to medium grained sand, gravel to 2 inch diameter, subrounded, loose, wet.	
									End of boring at 12 feet.	
15										
20										

BORING LOG

BORING NUMBER: AP3917

CLIENT: USACE
PROJECT NAME: Ft. Richardson, UST 1109, OUD
SITE: Bldg. 35-752
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA, 3" OD SS

BORING DEPTH (ft): 19
BORING DIAMETER (in): 8
WELL DEPTH (ft): 18.67
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 262.3
TOP OF CASING ELEV. (ft): 261.92
FIELD PARTY: D. Britch

SCREEN LENGTH (ft): 10
SCREEN TYPE: PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 fieldpack
DATE STARTED: 5/19/98
DATE COMPLETED: 5/19/98
NORTHING: 113261.05
EASTING: 125735.99

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
0	1.5	1.5	985752 003SL	SS	8	6.4		GM	Dark brown **Silty GRAVEL with Sand (GM)**, gravel 1/4 in. to 1.5 in. diameter, subrounded, some medium sand, greater than 15% silt.
								ML	Yellowish-orange **SILT (ML)**, zone of fine to medium sand at 18 to 21" in spoon, little gravel, 1/4 in. to 1/2 in. diamter, subrounded. Color change to dark brown/black at 21" in spoon. Color change may be due to bits of coal.
5	2.5	2.5	985752 004SL	SS	10	6.9		SP-SM	Dark to light brown **Poorly Graded SAND with Silt and Gravel (SP-SM)**. 5-5.33' Medium to coarse sand, 15% gravel, 1/4 in. to 1/2 in. diameter, subrounded, trace silt, moist. 5.33'-5.75' Fine sand grading to silt and back to fine sand. dry to moist. 5.75'-6.33' Fine to coarse sand, 20% gravel, 1/4 in. diameter, moist.
10	2.5	2.5	985752 005SL	SS	39	43.1		GM	Yellowish-orange **Silty GRAVEL with Sand (GM)**, Gravel 1/4 in. to 2 in. diameter, subrounded to subangular, poorly graded, some medium to coarse sand, some silt, wet, slight petroleum odor, possible staining at bottom of sample. Water level measured while drilling at approximately 11.7 ft bgs.
15	2.5	2.5	985752 006SL	SS	25	350		SP-SM	Dark gray **Poorly Graded SAND with Silt and Gravel (SP-SM)**, medium to coarse sand, little gravel to 2 in. diameter, subrounded, little silt, strong petroleum odor, staining, saturated. **Grain Size Analysis: 38% Gravel, 56% Sand, 7% Fines.**
20									End of boring at 19 feet.

WELL DIAGRAM

2" Sch. 40 PVC
bentonite chips
2" PVC 0.008" Slotted Scr., 40-60 fieldpack
10-20 outer annulus

OU-D 33486

BORING LOG

BORING NUMBER: AP3918

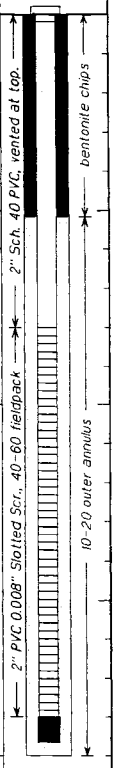
CLIENT: USACE
PROJECT NAME: Ft. Richardson, UST 1109, OUD
SITE: Bldg. 35-752
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA, 3" OD SS

BORING DEPTH (ft): 19
BORING DIAMETER (in): 8
WELL DEPTH (ft): 18.67
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 263.2
TOP OF CASING ELEV. (ft): 265.78
FIELD PARTY: D. Britch

SCREEN LENGTH (ft): 10
SCREEN TYPE: PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 fieldpack
DATE STARTED: 5/19/98
DATE COMPLETED: 5/19/98
NORTHING: 113228.05
EASTING: 125703.51

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
0			985752 007SL	SS	8	11.9*		SM	Light brown **Silty SAND (SM)**, 60% silt and fine sand, some coarse sand and gravel, gravel 1/4 in. to 2 1/2 in. diamter, subangular to subrounded, dry. Rootlets in top 6 in.
5			985752 008SL	SS	5	20.8*		SP	Lt. brown **Poorly Graded SAND with Gravel (SP)**, fine to medium sand, and gravel, 1/4 to 1 in. diam., subrounded, trace fines, moist.
								ML	Lt. brown **SILT (ML)**, silt with a couple of large pieces of gravel, 1 to 2 in. diam., rounded, moist.
10			985752 009SL	SS	54	17.4*		GP-GM	Light brown **Poorly Graded GRAVEL with Silt and Sand (GP-GM)**, gravel 1 in. to 2 in. diameter, subrounded to angular, some shattered by the spoon, some fine to coarse sand, little silt, dry to moist.
									Water measured while drilling at approximately 12.5 ft bgs. No product detected with interface probe although globules of (apparent) product were noticed on the probe upon retrieval.
15			985752 010SL	SS	30	450		SP-SM	Dark gray **Poorly Graded SAND with Silt and Gravel (SP-SM)**, medium to coarse sand, some gravel, little silt, strong hydrocarbon odor, sheen on spoon.
									Grain Size Analysis: 42% Gravel, 48% Sand, 10% Fines.
20									End of boring at 19 feet.

WELL DIAGRAM



BORING LOG

BORING NUMBER: AP3919

CLIENT: USACE

PROJECT NAME: Ft. Richardson, UST 1109, DUD

SITE: Bldg. 35-752

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25 ID HSA, 3" OD SS

BORING DEPTH (ft): 24

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft): 262.75

TOP OF CASING ELEV. (ft):

FIELD PARTY: D. Britch

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 5/20/98

DATE COMPLETED: 5/20/98

NORTHING: 113245.46

EASTING: 125715.07

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP-GM	Approximately 1 ft of asphalt underlain by fill.	
			985752 011SL	SS	9	10.9*			Light brown Poorly Graded GRAVEL with Silt and Sand (GP-GM), gravel 1/4 in. to 2 in. diameter, subrounded to subangular, and medium to coarse sand, little silt, moist.	
5			985752 012SL	SS	16	56*		SP-SM	Light brown Poorly Graded SAND with Silt and Gravel (SP-SM), medium to coarse sand, some gravel, 1/4 in. to 1.5 in. diameter, subrounded, little silt, moist.	
10			985752 013SL and 025SL (dup)	SS	27	521			Dark gray Poorly Graded SAND with Silt and Gravel (SP-SM), medium to coarse sand, and gravel, 1/4 in. to 2 in. diameter, subangular to subrounded, poorly graded, little silt, wet, staining, strong hydrocarbon odor.	
									Grain Size Analysis: 59% Gravel, 36% Sand, 6% Fines.	
15			985752 014SL and 026SL (dup)	SS	23	850			Dark gray Poorly Graded SAND with Silt and Gravel (SP-SM), strong hydrocarbon odor. 15-15.92' Medium to coarse sand and fine gravel (1/4 in. to 1/2 in. diameter, poorly graded, subrounded to subangular), little silt, wet. 15.92-16.42' Fine to medium sand, trace fines, wet. Water level measured while drilling at approximately 12.3 ft bgs. Product detected with interface probe - unable to determine thickness.	
20								SP		

OU-D 33488

BORING LOG

BORING NUMBER: AP3919

CLIENT: USACE
PROJECT NAME: Ft. Richardson, UST 1109, OUD
SITE: Bldg. 35-752
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA, 3" OD SS

BORING DEPTH (ft): 24
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 262.75
TOP OF CASING ELEV. (ft):
FIELD PARTY: D. Britch

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 5/20/98
DATE COMPLETED: 5/20/98
NORTHING: 113245.46
EASTING: 125715.07

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			985752 015SL and 016SL	SS	18	122 46		SP	20-20.75' Dk. gray **Poorly Graded SAND with Gravel (SP)**, medium to coarse sand, and fine gravel (1/4 to 1/2 in. diam.), trace fines, saturated.	
								SM	20.75-21.58' Olive gray **Silty SAND with Gravel (SM)**, fine sand, some silt, little gravel, to 1 in. diam., subrounded to subangular, poorly graded, wet.	
			985752 017SL	SS	5	43		CL	21.58-21.92' Olive gray **Sandy CLAY with Gravel (CL)**, fine sand, some gravel, to 1 in. diameter, subangular to subrounded, poorly graded, wet.	
									Greenish gray to yellowish-orange **Sandy CLAY with Gravel (CL)**, wet, similar to 21.58 to 21.92' interval. No noticeable staining or odor.	
25									End of boring at 22 feet. Last spoon collected from 22 to 24 ft bgs.	
									NOTE: Sample 985752015SL is for 20 to 20.75 ft bgs. Sample 985752016SL is for 20.75 to 21.92 ft bgs.	
30										
35										
40										

BORING LOG

BORING NUMBER: AP3920

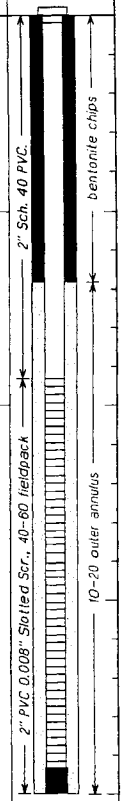
CLIENT: USACE
PROJECT NAME: Ft. Richardson, UST 1109, OUD
SITE: Bldg. 35-752
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPRDVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA, 3" OD HSA

BORING DEPTH (ft): 22
BORING DIAMETER (in): 8
WELL DEPTH (ft): 20
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 262.9
TOP OF CASING ELEV. (ft): 262.43
FIELD PARTY: D. Britch

SCREEN LENGTH (ft): 10
SCREEN TYPE: PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 fieldpack
DATE STARTED: 5/20/98
DATE COMPLETED: 5/20/98
NORTHING: 113260.09
EASTING: 125705.39

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
			985752 019SL	SS	15	24.3*		GP-GM	Drilled approximately one foot through asphalt and fill prior to collecting sample. Light brown Poorly Graded GRAVEL with Silt and Sand (GP-GM), gravel 1 in. to 3 in. diameter, blocky, subrounded to subangular, and medium to coarse sand, little fines, dry.
5			985752 020SL	SS	10	37*		SM	Yellowish-orange to light brown Silty SAND (SM), dry. 5-6.42' Interbedded fine sand and silt, dense, yellowish-orange. 6.42-6.67' Light brown fine to coarse sand, and gravel to 1 in. diameter, subrounded, poorly graded, trace fines.
10			985752 021SL	SS	15	184		SP-SM	Yellowish-orange to light brown Poorly Graded SAND with Silt and Gravel (SP-SM), medium to coarse sand, and gravel, mostly 1/4 in. to 1 in. diameter, subrounded to subangular, poorly graded, little silt, wet. Slight petroleum odor. Possible staining near bottom of sample.
▽									Water level measured while drilling at 13 ft bgs.
								GP-GM	
15			985752 022SL and 027SL (dup)	SS	28	372			Dark gray Poorly Graded GRAVEL with Silt and Sand (GP-GM), gravel 1/4 in. to 2 in. diameter, angular, some coarse sand, little silt, loose, saturated. Petroleum odor and staining noted.
20									

WELL DIAGRAM



BORING LOG

BORING NUMBER: AP3920

CLIENT: USACE
PROJECT NAME: Ft. Richardson, UST 1109, OUD
SITE: Bldg. 35-752
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA, 3" OD HSA

BORING DEPTH (ft): 22
BORING DIAMETER (in): 8
WELL DEPTH (ft): 20
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 262.9
TOP OF CASING ELEV. (ft): 262.43
FIELD PARTY: D. Britch

SCREEN LENGTH (ft): 10
SCREEN TYPE: PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 fieldpack
DATE STARTED: 5/20/98
DATE COMPLETED: 5/20/98
NORTHING: 113260.09
EASTING: 125705.39

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			985752023SL and 985752024SL	SS	32	63.6 47.4		GP-GM SP	Olive gray **Poorly Graded GRAVEL with Silt (GP-GM)**, fine to medium gravel (1/4 in. to 1 in. diameter), subrounded to rounded, little silt, little coarse sand, saturated, loose. **Grain Size Analysis: 46% Gravel, 51% Sand, 5% Fines.** Greenish gray **Poorly Graded SAND with Gravel (SP)**, fine sand, some gravel 1/2 in. to 2 in., subangular to subrounded, poorly graded, wet. **Grain Size Analysis: 17% Gravel, 47% Sand, 33% Fines.** End of boring at 20 feet. Last split spoon collected from 20 to 21.5 ft bgs. *Indicates elevated ATH reading may be due to baggie rather than an indication of contamination. **NOTE:** 985752023SL is sample of 20 to 20.8 ft bgs. 985752024SL is sample of 20.8 to 21.5 ft bgs.	

25
30
35
40

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Tank 1109 OUD/98-062
Sample Matrix: Soil

Service Request: K9803399
Date Collected: 5/19/98
Date Received: 5/29/98
Date Analyzed: 6/11/98

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 985752006SL
Lab Code: K9803399-001

Sand Fraction: Weight (Grams)	42.0629
Sand Fraction: Weight Recovered (Grams)	42.0300
Sand Fraction: Percent Recovery	99.9

Weight as received (Grams)	49.1058
Percent Solids	91.1
Weight Oven-Dried (Grams)	44.7354

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Medium Gravel GRAVEL	4.75 mm	4	17.1859	38.4
Fine Gravel CRS. SAND	2.00 mm	10	7.6927	17.2
Very Coarse Sand MEDIUM	0.850 mm	20	7.5897	17.0 } 28.7
Coarse Sand SAND	0.425 mm	40	5.2166	11.7 }
Medium Sand	0.250 mm	60	2.3531	5.26 } 9.55
Fine Sand FINE SAND	0.106 mm	140	1.5835	3.54 }
Very Fine Sand	0.075 mm	200	0.3334	0.75 }
Clay			1.1950	2.67
Silt			1.8300	4.09
		Total	44.9799	101

% GRAVEL
% SAND
% FINES

< 50 % FINES
% SAND > % GRAVEL

Approved By: Trina E. Wright Date: 6/18/98

00005

COLUMBIA ANALYTICAL SERVICES, INC. **OU-D 33493**

Analytical Report

Client: ENSR Consulting & Engineering
Project: Tank 1109 OUD/98-062
Sample Matrix: Soil

Service Request: K9803399
Date Collected: 5/19/98
Date Received: 5/29/98
Date Analyzed: 6/11/98

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 985752006SL
Lab Code: K9803399-001D

Sand Fraction: Weight (Grams)	41.7250
Sand Fraction: Weight Recovered (Grams)	41.6756
Sand Fraction: Percent Recovery	99.9

Weight as received (Grams)	49.547
Percent Solids	91.1
Weight Oven-Dried (Grams)	45.1373

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Medium Gravel GRAVEL	4.75 mm	4	13.0217	28.8
Fine Gravel CRS SAND	2.00 mm	10	9.4213	20.9
Very Coarse Sand] MED	0.850 mm	20	8.9279	19.8] 32.1
Coarse Sand] SAND	0.425 mm	40	5.5654	12.3]
Medium Sand]	0.250 mm	60	2.5186	5.58] 16.39
Fine Sand] F. SAND	0.106 mm	140	1.7584	3.90]
Very Fine Sand]	0.075 mm	200	0.4120	0.91]
Clay			1.3150	2.91
Silt			2.0000	4.43
		Total	44.9403	100

% GRAVEL
% SAND
% FINES

< 50 % FINES

% SAND > % GRAVEL

Approved By: Diane S. Vriezelaar Date: 6/18/98

00006

3399-1D.XLS - report 6/18/98

Page No.:

COLUMBIA ANALYTICAL SERVICES, INC. **OU-D 33494**

Analytical Report

Client: ENSR Consulting & Engineering
Project: Tank 1109 OUD/98-062
Sample Matrix: Soil

Service Request: K9803399
Date Collected: 5/19/98
Date Received: 5/29/98
Date Analyzed: 6/11/98

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 985752010SL
Lab Code: K9803399-002

Sand Fraction: Weight (Grams)	82.9386
Sand Fraction: Weight Recovered (Grams)	82.9835
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	99.2275
Percent Solids	92.9
Weight Oven-Dried (Grams)	92.1823

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Medium Gravel GRAVEL	4.75 mm	4	38.2900	41.5
Fine Gravel CRS SAND	2.00 mm	10	14.7804	16.0
Very Coarse Sand MED	0.850 mm	20	10.8986	11.8 21.8
Coarse Sand SAND	0.425 mm	40	9.2240	10.0
Medium Sand	0.250 mm	60	4.7747	5.18 10.44
Fine Sand F. SAND	0.106 mm	140	3.9258	4.26
Very Fine Sand	0.075 mm	200	0.9249	1.00
Clay			3.8850	4.21
Silt			5.2750	5.72
		Total	91.9784	100

% GRAVEL
% SAND
% FINES

<50% FINES
% SAND > % GRAVEL

Approved By: Elaine S Wiegel Date: 6/18/98

00007

3399-2.XLS - report 6/18/98

Page No.:

OU-D 33495

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Tank 1109 OUD/98-062
Sample Matrix: Soil

Service Request: K9803399
Date Collected: 5/20/98
Date Received: 5/29/98
Date Analyzed: 6/11/98

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 985752013SL
Lab Code: K9803399-003

Sand Fraction: Weight (Grams)	92.3231
Sand Fraction: Weight Recovered (Grams)	92.4213
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	103.2607
Percent Solids	94.9
Weight Oven-Dried (Grams)	97.9944

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Medium Gravel GRAVEL	4.75 mm	4	57.3295	58.5
Fine Gravel CRS SAND	2.00 mm	10	12.8158	13.1
Very Coarse Sand] MED	0.850 mm	20	11.5723	11.8] 15.97
Coarse Sand] SAND	0.425 mm	40	4.0838	4.17]
Medium Sand]	0.250 mm	60	2.4341	2.48]
Fine Sand F SAND	0.106 mm	140	3.1786	3.24] 6.63
Very Fine Sand]	0.075 mm	200	0.8931	0.91]
Clay			2.2200	2.27
Silt			4.0100	4.09
		Total	98.5372	101

% GRAVEL
% SAND
% FINES

< 50% FINES
% GRAVEL > % SAND

Approved By: Diane E. Weigel Date: 6/18/98

00008

OU-D 33496

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ENSR Consulting & Engineering	**Service Request:**	K9803399
Project:	Tank 1109 OUD/98-062	**Date Collected:**	5/20/98
Sample Matrix:	Soil	**Date Received:**	5/29/98
		Date Analyzed:	6/11/98

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 985752023SL
Lab Code: K9803399-004

Sand Fraction: Weight (Grams)	89.0203
Sand Fraction: Weight Recovered (Grams)	89.1639
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	102.423
Percent Solids	89.8
Weight Oven-Dried (Grams)	91.9759

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Medium Gravel GRAVEL	4.75 mm	4	41.9177	45.6
Fine Gravel CRS. SAND	2.00 mm	10	20.8297	22.6
Very Coarse Sand] MED.	0.850 mm	20	14.2226	15.5] 22.8
Coarse Sand] SAND	0.425 mm	40	6.7124	7.30]
Medium Sand]	0.250 mm	60	2.7489	2.99]
Fine Sand] F. SAND	0.106 mm	140	2.1053	2.29] 5.82
Very Fine Sand]	0.075 mm	200	0.4942	0.54]
Clay			2.0900	2.27
Silt			2.8800	3.13
		Total	94.0008	102

% GRAVEL
% SAND
% FINES

<50% FINES
% SAND > % GRAVEL

Approved By: Diane E. Wiegel Date: 6/18/98

3399-4.XLS - report 6/18/98

00009 Page No.:

COLUMBIA ANALYTICAL SERVICES, INC. OU-D 33497

Analytical Report

Client:	ENSR Consulting & Engineering	**Service Request:**	K9803399
Project:	Tank 1109 OUD/98-062	**Date Collected:**	5/20/98
Sample Matrix:	Soil	**Date Received:**	5/29/98
		Date Analyzed:	6/11/98

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 985752024SL
Lab Code: K9803399-005

Sand Fraction: Weight (Grams)	26.3045
Sand Fraction: Weight Recovered (Grams)	26.3567
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	44.993
Percent Solids	91.2
Weight Oven-Dried (Grams)	41.0336

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Medium Gravel GRAVEL	4.75 mm	4	6.9353	16.9
Fine Gravel CRS SAND	2.00 mm	10	4.3564	10.6
Very Coarse Sand MED	0.850 mm	20	3.2452	7.91 13.64
Coarse Sand SAND	0.425 mm	40	2.3517	5.73
Medium Sand	0.250 mm	60	2.4455	5.96 46.6
Fine Sand F. SAND	0.106 mm	140	4.7576	11.6 22.42
Very Fine Sand	0.075 mm	200	1.9924	4.86
Clay			2.3100	5.63 33.33
Silt			11.3800	27.7
		Total	39.7741	96.9

% GRAVEL 16.9
% SAND 46.6 <50% FINES
% FINES 33.3

SILTY SAND with GRAVEL

Approved By: Elaine E. Wiegel Date: 6/18/98

00010

OU-D 33498

U.S. ARMY CORPS OF ENGINEERS
SURVEY SECTION
FORT RICHARDSON, ALASKA / OPERABLE UNIT D
SUBSURFACE INVESTIGATION

Date: 05-27-97
List of Boring Points

AP ID	Northing	Easting	Elevation Top/PVC	Elevation on Grd.	Descriptor
AP-3772	116,837.01	125,870.98	281.75	278.6	Monitoring Well
AP-3773	116,979.34	126,157.60	285.20	281.7	Monitoring Well
AP-3774	117,363.01	125,605.42	285.24	281.7	Monitoring Well
AP-3775	117,078.32	126,233.41	285.07	281.6	Monitoring Well
AP-3776	117,207.21	125,482.62	282.00	279.6	Monitoring Well
AP-3777	118,614.09	131,203.35	324.91	321.4	Monitoring Well
AP-3778	118,389.54	131,039.86	323.61	320.1	Monitoring Well
AP-3779	117,241.03	125,851.41		280.5	Soil Boring
AP-3780	117,218.78	125,908.57		280.3	Soil Boring
AP-3781	117,209.42	125,938.32		280.2	Soil Boring
AP-3782	117,253.51	125,925.30		280.8	Soil Boring
AP-3783	117,213.20	126,024.37		281.2	Soil Boring
AP-3784	117,072.75	125,977.04		280.3	Soil Boring
AP-3785	113,169.75	125,775.03		262.7	Soil Boring
AP-3786	113,136.33	125,760.30		260.9	Soil Boring
AP-3787	113,135.92	125,598.45		258.9	Soil Boring
AP-3788	113,023.75	125,622.64		258.2	Soil Boring
3789	116,939.27	126,732.86	288.65	285.4	Monitoring Well
3790	117,076.33	127,493.77	294.98	292.2	Monitoring Well

U.S. ARMY CORPS OF ENGINEERS
SURVEY SECTION
FORT RICHARDSON, AK. / BUILDING 35-752
SUBSURFACE INVESTIGATION

OU-D 33499

Date: 06-16-98
List of Monitoring Wells

AP ID	Northing	Easting	Elevation @ lip PVC	Elevation @ Ground	Descriptor
AP-2982	113,158.04	125,664.97	262.32	* 262.7	Monitoring Well
AP-3917	113,261.05	125,735.99	261.92	* 262.3	Monitoring Well
AP-3918	113,228.05	125,703.51	265.78	263.2	Monitoring Well
AP-3919	113,245.46	125,715.07		262.75	Soil Boring
AP-3920	113,260.09	125,705.39	262.43	* 262.9	Monitoring Well

* Elevation on top of Well Casing

BUILDING 45-590

- BORING LOGS/WELL COMPLETION DIAGRAMS
- GRAIN SIZE ANALYSIS
- SURVEY DATA

Key to ENSR boring logs

GW, GW-GM, GW-GC - Well graded gravels, sandy gravels, gravels with sand, little or no fines

GP, GP-GM, GP-GC - Poorly graded gravels, sandy gravels, gravels with sand, little or no fines

GM - Silty gravels, gravel-sand-silt mixtures

GC - Clayey gravels, gravel-sand-clay mixtures

SW, SW-SM, SW-SC - Well graded sands, gravelly sands, sands with gravel, little or no fines

SP, SP-SM, SP-SC - Poorly graded sands, gravelly sands, sands with gravel, little or no fines

SM - Silty sands, silt-sand mixtures

SC - Clayey sands, clay-sand mixtures

ML - Inorganic silts, very fine sands, rock flour, silty or clayey fine sands

CL - Inorganic clays, gravelly clays, sandy clays, silty clays, lean clays

PT - Peat

LOG OF BORING AP-3159

Drilling Co. S P Enterprises Driller R. Wagster
Field Engineer J. Allen Drill Rig Mobile B-61
Elevation (ft) 280.32 Date Drilled 5/11/93
Northing (ft) 117261.04 Easting (ft) 125854.65

Sampling Method	Blows/6 Inch	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample ** Number	Depth (ft)	Samples	
SS	19				4		0		GRAVEL with silt and sand (GP-GM) medium dense, moist, dark brown
									GRAVEL with sand (GP) medium dense, moist, dark brown
SS	25				8	219SL	5		
									GRAVEL with clay and sand (GW-GC) dense, moist, brown
SS	83				1	220SL *221SL*	10		becomes gray-brown
SS	66	7.2	6.8		1	222SL	15		
SS	39	9.3	6.6	LL=NP PI=NP	4	223SL	20		SAND with silt and gravel (SP-SM) medium dense, moist, brown, with coal fragments
									GRAVEL with silt and sand (GP-GM) dense, moist, gray
SS	65				3	224SL	25		
SS	61/9"				6	225SL	30		
									GRAVEL with sand (GP) medium dense to dense, moist, gray
SS	43				13	226SL *227SL*	35		coal fragments noted in sample
							40		boring continued on next plate

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.
** The prefix 93RUT has been omitted for brevity. QA/QC duplicate samples in italics.

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring AP-3159
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLATE C

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
PB	21844	PCR	9/93	183j

LOG OF BORING AP-3159

Drilling Co. S P Enterprises Driller R. Wagster
Field Engineer J. Allen Drill Rig Mobile B-6
Elevation (ft) 280.32 Date Drilled 5/11/93
Northing (ft) 117261.04 Easting (ft) 125854.65

Sampling Method	Blows/* Foot	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample ** Number	Depth (ft)	Samples	
SS	75				10	228SL *229SL*	40		GRAVEL with sand (GP), continued
SS	100				4	230SL	45		
SS	66				4	231SL	50		no free groundwater encountered during drilling boring backfilled with bentonite

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RUT has been omitted for brevity. QA/QC duplicate samples in italics.

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring AP-3159 Cont.
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLATE C2

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
PB	21844	PCR	9/93	183j

OU-D 33504

LOG OF BORING AP-3160

Drilling Co. S P Enterprises Driller R. Wooster
Field Engineer J. Allen Drill Rig Mobile B-61
Elevation (ft) 280.32 Date Drilled 5/12/93
Northing (ft) 117251.17 Easting (ft) 125872.17

Sampling Method	Blows/* Foot	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample ** Number	Depth (ft)	Samples	
SS	53	2.1	5.4	LL=NP PI=NP	4	233SL	0		GRAVEL with silt and sand (GW-GM) medium dense, moist, dark brown
									GRAVEL with sand (GP) loose, moist, brown
SS	9				11	232SL	5		
									GRAVEL with clay and sand (GW-GC) dense, moist, brown
SS	92				9	234SL *235SL*	10		
SS	98				184	236SL *237SL*	15		becomes gray fuel odor noted in samples at 15, 20, and 25 feet
SS	80				186	238SL *239SL*	20		
SS	65	5.3	7.0		101	240SL *241SL*	25		
SS	95				214	242SL	30		GRAVEL with sand (GP) dense, moist, gray
SS	74				7	243SL	35		
							40		boring continued on next plate

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.
** The prefix 93RUT has been omitted for brevity. DA/DC duplicate samples in italics

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring AP-3160
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLATE C3

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
PB	21844	PCR	9/93	183j

LOG OF BORING AP-3160

Drilling Co. S P Enterprises Driller R. Waaster
Field Engineer J. Allen Drill Rig Mobile B-61
Elevation (ft) 280.32 Date Drilled 5/12/93
Northing (ft) 117251.17 Easting (ft) 125872.17

Sampling Method	Blows/• Foot	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample •• Number	Depth (ft)	Samples	
SS	65/9"				24	244SL	40		GRAVEL with sand (GP), continued
SS	75/9"				11	245SL	45		
SS	78				55	246SL	50		no free groundwater encountered during drilling boring backfilled with bentonite

Notes: • Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

•• The prefix 93RUT has been omitted for brevity. QA/QC duplicate samples in italics.

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring AP-3160 Cont.
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLA C4

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
PB	21844	PCR	9/93	183j

OU-D 33506

LOG OF BORING AP-3161

Drilling Co. S P Enterprises Driller R. Wagster
Field Engineer J. Allen Drill Rig Mobile B-61
Elevation (ft) 280.27 Date Drilled 5/13/93
Northing (ft) 117267.62 Easting (ft) 125840.37

Sampling Method	Blows/ Foot *	Moisture Content (%)	PSA -200(%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number **	Depth (ft)	Samples	
SS	55				4		0		GRAVEL with silt and sand (GP-GM) medium dense, moist, brown
SS	32				7	247SL	5		
SS	60/8"				6	248SL	10		GRAVEL with sand (GP) medium dense, moist, gray
SS	53	2.6	2.9	LL=NP PI=NP	5	249SL *250SL*	15		
SS	49	3.9	4.4	LL=NP PI=NP	4	251SL	20		no free groundwater encountered during drilling boring backfilled with bentonite

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RUT has been omitted for brevity. QA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring AP-3161
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLAT C

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
PB	21844	PCR	9/93	183j

OU-D 33507

LOG OF BORING AP-3238

Drilling Co. S P Enterprises Driller L. Lagro
Field Engineer H. Hoen Drill Rig Mobile B-6
Elevation (ft) 280.51 Date Drilled 11/16/93
Northing (ft) 117273.82 Easting (ft) 125854.11

Sampling Method	Blows/ Foot*	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number**	Depth (ft)	Samples	
							0		GRAVEL with silt and sand (GP-GM) loose, moist, brown, with cobbles to 4 inches diameter bits of polystyrene insulation in auger cuttings from 2.5 feet — Fill
SS	12				15	267SL	5		GRAVEL with sand (GP) medium dense, moist, brown, polyethylene liner and fiberglass in auger cuttings from 5.0 feet.
SS	32					*268SL*			
SS	54	8.8	12.9	LL=41 PI=20	1	269SL	10		Clayey GRAVEL with sand (GC) medium dense, moist, gray
SS	97	10.1	6.7	LL=33 PI=17	2	270SL	15		GRAVEL with clay and sand (GP-GC) dense, moist
SS	36	10.0	5.6	LL=NP PI=NP		271SL	20		SAND with silt and gravel (SP-SM) medium dense, moist, brown, with coal fragments
SS	38					272SL	25		GRAVEL with silt and sand (GP-GM) medium dense, moist, gray, with occasional cobbles

no free groundwater encountered during drilling

boring backfilled with bentonite

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RUT has been omitted for brevity. QA/QC duplicate samples are italics

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring AP-3238
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLAT C6

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	21844	PCR	12/93	210d

OU-D 33508

LOG OF BORING AP-3239

Drilling Co. S P Enterprises Driller L. Lagro
Field Engineer H. Hoen Drill Rig Mobile B-61
Elevation (ft) 280.38 Date Drilled 11/17/93
Northing (ft) 117240.43 Easting (ft) 125884.21

Sampling Method	Blows/ Foot*	Moisture Content (%)	PSA −200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample ** Number	Depth (ft)	Samples	
							0		GRAVEL with silt and sand (GP–GM) loose, moist, brown
SS	30				0	273SL	5		GRAVEL with sand (GP) medium dense, moist, brown
SS	70	4.9	6.5	LL=34 PI=15	4	274SL	10		GRAVEL with clay and sand (GW–GC) medium dense, moist, gray. with trace coal and cobbles throughout
SS	41				83	275SL	15		fuel odor from 15 feet to 61 feet
SS	41				90	276SL *277SL*	20		moisture increase at 20 feet
SS	47				131	278SL	25		oxidation staining at 25 feet
SS	64/10"				166	279SL	30		GRAVEL with sand(GP) dense, moist, gray
SS	87				109	280SL	35		
							40		boring continued on next plate

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RUT has been omitted for brevity. DA/DC duplicate samples in italics

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring AP-3239
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLATE C7

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	21844	PCR	12/93	210d

OU-D 33509

LOG OF BORING AP-3239 (cont.)

Drilling Co. S P Enterprises Driller L. Lagro
Field Engineer H. Hoen Drill Rig Mobile B-
Elevation (ft) 280.38 Date Drilled 11/17/93
Northing (ft) 117240.43 Easting (ft) 125884.21

Sampling Method	Blows/6" Foot	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample ** Number	Depth (ft)	Samples	
SS	80/11"				79	281SL	40		GRAVEL with sand (GP), continued
SS	85/10"				109	282SL	45		Gravelly SAND (SP) dense, moist, gray
SS	80/10"				238	283SL	50		GRAVEL with sand (GP) dense, moist, gray, with cobbles
SS	80/10"				130	284SL	55		
SS	75/10"	3.4	4.8	LL=NP PI=NP	135	285SL	60		no free groundwater encountered during drilling boring backfilled with bentonite

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RUT has been omitted for brevity. QA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring AP-3239 (cont.)
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLATE C8

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	21844	PCR	12/93	210d

OU-D 33510

LOG OF BORING AP-3240

Drilling Co. S P Enterprises Driller L. Lagro
Field Engineer H. Hoen Drill Rig Mobile B-61
Elevation (ft) 280.30 Date Drilled 11/19-20/93
Northing (ft) 117226.99 Easting (ft) 125897.59

Sampling Method	Blows/ Foot *	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number **	Depth (ft)	Samples	
							0		GRAVEL with silt and sand (GP-GM) medium dense, moist, brown, with cobbles throughout
							5		GRAVEL with clay and sand (GP-GC) medium dense, moist, brown
SS	42				35	293SL *294SL*	10		becomes gray at 13 feet. fuel odor from 13 to 40 feet.
							15		
SS	62	7.0	5.7	LL=33 PI=16	>1000	295SL	20		oxidation staining at 20 feet.
							25		
SS	75	7.2	4.0	LL=NP PI=NP	19	296SL	30		GRAVEL with sand (GW) dense, moist, gray, with trace coal and cobbles throughout
							35		
							40		boring continued on next plate

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RUT has been omitted for brevity. DA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring AP-3240
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLATE C9

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	21844	PCR	12/93	210a

OU-D 33511

LOG OF BORING AP-3240 (cont.)

Drilling Co. S P Enterprises Driller L. Lararo
Field Engineer H. Hoen Drill Rig Mobile B-6
Elevation (ft) 280.30 Date Drilled 11/19-20/93
Northing (ft) 117226.99 Easting (ft) 125897.59

Sampling Method	Blows/ Foot *	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number **	Depth (ft)	Samples	
SS	50/6"				39	297SL	40		GRAVEL with sand (GW), continued
							45		
SS	72/11"				2	298SL	50		
SS	50/4"				2	299SL			

no free groundwater encountered during drilling

boring backfilled with bentonite

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RUT has been omitted for brevity. QA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring AP-3240 (cont.)
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLA C10

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	21844	PCR	12/93	210d

OU-D 33512

LOG OF BORING AP-3241

Drilling Co. S P Enterprises Driller L. Laaro
Field Engineer H. Hoen Drill Rig Mobile B-61
Elevation (ft) 280.51 Date Drilled 11/18/93
Northing (ft) 117234.77 Easting (ft) 125873.63

Sampling Method	Blows/Foot	Moisture Content (%)	PSA -200 (%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number **	Depth (ft)	Samples	
							0		GRAVEL with silt and sand (GP-GM) medium dense, moist, brown
							5		GRAVEL with sand (GP) medium dense, moist, brown.
						268SL			
SS	75/9"	5.0	5.4	LL=30 PI=12	9	286SL	10		GRAVEL with clay and sand (GP-GC) medium dense, moist, gray. with trace coal fragments. cobbles throughout
									fuel odor from 14 feet to 66 feet
					19		15		
SS	81				106	287SL	20		
						288SL			
							25		
SS	45/10"				124	289SL	30		
									GRAVEL with sand (GP) dense, moist, gray
							35		
							40		boring continued on next plate

Notes: * Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

** The prefix 93RUT has been omitted for brevity. DA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and
Environmental Services

Log of Boring AP-3241
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLATE C1

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	21844	PCR	12/93	210d

LOG OF BORING AP-3241 (cont.)

Drilling Co. S P Enterprises Driller L. Lagro
Field Engineer H. Hoen Drill Rig Mobile B-6
Elevation (ft) 280.51 Date Drilled 11/18/93
Northing (ft) 117234.77 Easting (ft) 125873.63

Sampling Method	Blows/• Foot	Moisture Content (%)	PSA -200(%)	Atterberg Limits	Headspace VOC (ppm)	Sample Number**	Depth (ft)	Samples	
SS	50/4"						40		GRAVEL with sand (GP), continued
SS	85	3.9	3.1	LL=NP PI=NP	242	290SL	45		
							50		
SS	60/6"				34	291SL	55		fuel odor decreasing with depth below 55 feet
							60		
SS	90/9"				7	292SL	65		

no free groundwater encountered during drilling

boring backfilled with bentonite

Notes: • Blow counts obtained by driving a 4-inch O.D. split-spoon sampler 18 inches with a 300-pound hammer falling 30 inches. The blow count is the number of blows required to advance the sampler the final 12 inches unless otherwise noted.

•• The prefix 93RUT has been omitted for brevity. QA/QC duplicate samples in italics

Harding Lawson Associates
Engineering and Environmental Services

Log of Boring AP-3241 (cont.)
Site A, Building 45590
Release Investigation Report
Fort Richardson, Alaska

PLA
C12

DRAWN	PROJECT NUMBER	APPROVED	DATE	FILE NAME
DC	21844	PCR	12/93	210d

OU-D 33514

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3384
LOCATION	FORT RICHARDSON, ALASKA	PAGE	1 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.90'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/16/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
NA	NA	NA/9					CONCRETE (CON) Sample FRU33-1, 1000, 94FRU223SL. SILTY SAND (SM); 50-60% medium to fine sand; 30-40% silt; 10% gravel; no odor; no staining; slightly moist; color: 10YR 3/2.
1.5/1.5	9 10 10	NA/15		5			Sample FRU33-2, 1015, 94FRU224SL. SAND WITH GRAVEL (SP); with trace fines; 60% medium to coarse sand; 35-40% gravel and cobble; up to 5% fines; no odor; no staining; slightly moist; color: 10YR 4/2.
2.0/2.0	12 13 13 14	NA/50		10			Sample FRU33-3, 1035, 94FRU225SL. SILTY SAND WITH GRAVEL (SM); 50% sand; 30-40% gravel to 2 inch diameter; 10-20% silt; staining and petroleum-like odor from 11.5 feet to bottom of sample interval; moist sample; color: 7.5YR 5/0.
1.5/1.5	5 8 16	NA/260		15			Sample FRU33-4, 1045, 94FRU226SL. SILTY SAND WITH GRAVEL (SM); same as above; entire sample stained and has petroleum-like odor; moist; color: 10YR 5/1.
				20			

REMARKS

Location: Adjacent to building 45590. Geotech sample 94FRU515SL was classified as SP-SM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3384
LOCATION	FORT RICHARDSON, ALASKA	PAGE	2 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.90'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/16/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/2.0	8 17 19 23	NA/55					Sample FRU33-5, 1100, 94FRU227SL. **SILTY SAND WITH GRAVEL (SM)**; same as above; stain in central foot of sample; odor; moist sample; color: 7.5YR 5/0.
1.5/1.5	9 19 21	NA/130		25			Sample FRU33-6, 1115, 94FRU228SL. **SAND WITH GRAVEL (SP)**; 60-70% coarse to medium sand; 25-35% gravel and cobble; 5% silt; staining; petroleum-like odor; moist; color: 7.5YR 5/0.
2.0/2.0	17 17 19 18	NA/150		30			Sample FRU33-7, 1135, 94FRU229SL. **SAND WITH GRAVEL (SP)**; same as above; petroleum-like odor; staining in middle; slightly moist; color: 7.5YR 5.0.
1.5/1.5	12 12 15	NA/15		35			Sample FRU33-8, 1200, 94FRU230, and Geotech sample 94FRU515, 1200. **SAND WITH GRAVEL (SP)**; 80% medium to coarse sand; 20% gravel to 1 inch diameter; trace fines; slight stain at 36 feet; stale odor; slightly moist; color: 7.5YR 3/0. SAND (SW); 36.3 to 36.5 feet 100% coarse to medium sand.
				40			

REMARKS

Location: Adjacent to building 45590. Geotech sample 94FRU515SL was classified as SP-SM by ASTM Method D-2487.

OU-D 33516

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3384
LOCATION	FORT RICHARDSON, ALASKA	PAGE	4 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.90'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/16/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/1.5	6 42 79	NA/ND		65 70 75 80			Sample FRU33-13, 1430, 94FRU235SL and split 94FRU236SL, 1430. **SAND WITH GRAVEL (SW)**; 50% coarse to medium sand; 20% cobble; 30% gravel (.25 to 3 inch diameter); no odor; no staining; slightly moist; color: 2.5YR 4/2. Boring terminated at 62 feet and backfilled with 18 of bentonite chips. Driller: Scott Clinkenbeard Drill Rig: CME-75 Hammer: 300 lbs. Sampler Outside Diameter: 3-inches Northing: 117261.33 Easting: 125883.30

REMARKS

Location: Adjacent to building 45590. Geotech sample 94FRU515SL was classified as SP-SM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3385
LOCATION	FORT RICHARDSON, ALASKA	PAGE	1 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.90'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
NA	NA	NA/1					Sample FRU34-1, 1340, 94FRU237SL. **SILTY SAND WITH GRAVEL (SM)**; 70% medium to coarse sand; 20-25% silt; 5-10% gravel; no staining; no odor; slightly moist; color: 10YR 3/1.
1.5/1.0	7 3 4	NA/2		5			Sample FRU34-2, 1545, 94FRU238SL. **SILTY SAND WITH GRAVEL (SM)**; same as above; appears to be excavation back fill (very soft); no staining; no odor; slightly moist; color: 10YR 3/1.
2.0/2.0	7 7 5 8	NA/157		10			Sample FRU34-3, 1600, 94FRU239SL. **SAND WITH GRAVEL (SP)**; 60% coarse sand; 35% gravel 5% silt stringers. **SILT WITH GRAVEL (ML)**; 60-65% silt; 35-40 % gravel (to 1 inch diameter) well rounded; staining from 10.5 to 12 feet; petroleum-like odor; moist; color: 2.5YR 5/3.
1.5/1.5	8 12 16	NA/75		15			Sample FRU34-4, 1610, 94FRU240SL. **SAND WITH SILT AND GRAVEL (SP-SM)**; 25% cobble; fill = 30-40% silt; 40% medium to coarse sand; 20-30% gravel (.25 to 1 inch diameter); staining from 5.5 to 6.5 feet; petroleum-like odor; moist; color: 7.5YR 4/0.
				20			

REMARKS

Geotech sample 94FRU516SL from the 50-52' interval was classified as GP-GM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3385
LOCATION	FORT RICHARDSON, ALASKA	PAGE	2 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.90'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/2.0	7 8 11 12	NA/219					Sample FRU34-5, 1620, 94FRU241SL. **SAND WITH SILT AND GRAVEL (SP-SM)**; 50-60% coarse to medium sand; 30-40% gravel (to 1.5 inch diameter) well rounded; 5-10% silt; staining; petroleum-like odor; moist.
1.5/1.5	6 12 17	NA/185		25			Drilled to 25 feet and left augers in hole over night. Sample FRU34-6, 0930, 94FRU242SL. **SAND WITH SILT AND GRAVEL (SP-SM)**; 30% cobble; 40% coarse sand; 20% gravel 1.5 to 2.0 inches diameter; 10% silt; staining; petroleum-like odor; moist.
2.0/2.0	8 11 23 30	NA/371		30			Sample FRU34-7, 0950, 94FRU243SL. **SAND WITH GRAVEL (SP)**; 50% coarse sand; 35% gravel (.25 to 1 inch diameter) well rounded; 20% cobble > 3 inch diameter; 5% silt as stringers; staining; petroleum-like odor; moist.
1.5/1.5	12 18 24	NA/360		35			Sample FRU34-8, 1030, 94FRU244. **SAND WITH GRAVEL (SP)**; same as above; staining; petroleum-like odor; moist.
				40			

REMARKS

Geotech sample 94FRU516SL from the 50-52' interval was classified as GP-GM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3385
LOCATION	FORT RICHARDSON, ALASKA	PAGE	3 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.90'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/2.0	9 14 19 26	NA/50					Sample FRU34-9, 1050, 94FRU245SL. SAND WITH GRAVEL (SW); with trace fines; 60% coarse to medium sand; 40% gravel (.25 to 1.5 inch diameter); 10% cobble; staining; petroleum-like odor; moist. COAL
1.5/1.5	11 9 15	NA/200		45			Sample FRU34-10, 1130, 94FRU246SL. SAND WITH SILT AND GRAVEL (SP-SM); 50% cobble; SP fill = 50% coarse to medium sand; 40% gravel (.25 to 1.5 inch diameter) well rounded; 10% silt fines; staining; petroleum-like odor.
2.0/2.0	14 38 30 42	NA/220		50			Sample FRU34-11, 1145, 94FRU247SL and Geotech sample 94FRU516SL. SAND WITH GRAVEL (SP); 60% coarse to medium sand; 40% gravel to 3 inches diameter; slight staining; strong petroleum-like odor.
1.5/1.5	21 30 40	NA/75		55			Sample FRU34-12, 1230, 94FRU248SL. SAND WITH GRAVEL (SP); 40% gravel (.25 to 1.5 inch diameter); 50-60% coarse sand; petroleum-like odor; staining; moist.
				60			

REMARKS

Geotech sample 94FRU516SL from the 50-52' interval was classified as GP-GM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3385
LOCATION	FORT RICHARDSON, ALASKA	PAGE	4 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.90'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/1.5	28 67 62	NA/5		65 70 75 80			Sample FRU34-13, 1400, 94FRU249SL. SAND WITH GRAVEL (SP); 50-60% coarse sand; 30-40% gravel (.25 to 1.5 inch diameter) well rounded; 10% cobble > 3 inches; no stain; no odor; moist. Boring terminated at 62 feet, boring started at 1530, completed at 1400 and backfilled with 21.5 bags of bentonite chips at 1445. Driller: Scott Clinkenbeard Drill Rig: CME-75 Hammer: 300 lbs. Sampler Outside Diameter: 3-inches Northing: 117240.96 Easting: 125896.85

REMARKS

Geotech sample 94FRU516SL from the 50-52' interval was classified as GP-GM by ASTM Method D-2487.

OU-D 33521

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3386
LOCATION	FORT RICHARDSON, ALASKA	PAGE	1 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.50'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/14/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
NA	NA	NA/2					Sample FRU35-1, 1015, 94FRU209SL. **SAND WITH GRAVEL (SW);** 80% medium to fine sand; 20% gravel; no stain; no odor; slightly moist to dry; color: 10YR 3/3.
1.5/1.5	10 13 13	NA/16		5			Sample FRU35-2, 1015, 94FRU210SL. **SAND WITH GRAVEL (SW);** 60% medium to fine sand; 40% gravel to 1.5 inch diameter; no staining; petroleum-like odor; slightly moist; color: 10YR 2/2.
2.0/2.0	6 15 17 18	NA/120		10			Sample FRU35-3, 1030, 94FRU211SL and Geotech sample 94FRU514SL. **SILTY SAND WITH GRAVEL (SM);** 50% fine to medium sand; 35-40% gravel to 3 inches diameter; 10-15% silt as stringers; silt/sand lens at 11 feet approximately 3 inches thick; staining at 12 feet; petroleum-like odor; color: 7.5YR 4/0.
1.5/1.5	7 12 15	NA/41		15			Sample FRU35-4, 1045, 94FRU212SL. **SILTY SAND WITH GRAVEL (SM);** 50% fine to medium sand; 30% silt (stringers and lenses); 20% gravel; staining at 16 feet; petroleum-like odor; moist; color: 10YR 4/1.
				20			

REMARKS

Geotech sample 94FRU514SL from the 10-12' interval was classified by ASTM Method D-2487 as GW-GM.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3386
LOCATION	FORT RICHARDSON, ALASKA	PAGE	2 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.50'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/14/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/2.0	12 14 15 20	NA/372					Sample FRU35-5, 1100, 94FRU213SL. **SILTY SAND (SM)**; 20-21 feet - 60% medium to fine sand; 30% silt; 10% gravel. **SILTY SAND WITH GRAVEL (SM)**; 50% medium to fine sand; 20% silt; 30% gravel; petroleum-like odor; staining at 21 feet; moist; color: 7.5YR 5/0.
1.5	9 12 13	NA/132		25			Sample FRU35-6, 1115, 94FRU214SL. **GRAVELLY SAND WITH SILT (GP-GM)**; 50% cobble 40% medium to coarse sand; 10% silt stringers *around cobbles; staining in silt at 26 feet;* petroleum-like odor; color: 10YR 4/1.
2.0/1.5	23 19 38 63	NA/247		30			Sample FRU35-7, 1130, 94FRU215SL. **SAND WITH GRAVEL (SW)**; 50-60% medium to coarse sand; 30-40% gravel; 10% cobble > 3 inches; staining; petroleum-like odor - fresh; color: 7.5YR 5/0.
1.5/1.5	26 38 42	NA/215		35			Sample FRU35-8, 1145, 94FRU216. **SAND WITH GRAVEL (SP)**; 60% medium to coarse sand; 40% gravel up to 1.5 inches; staining; petroleum-like odor; moist; color: 7.5YR 3/0.
				40			

REMARKS

Geotech sample 94FRU514SL from the 10-12' interval was classified by ASTM Method D-2487 as GW-GM.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3386
LOCATION	FORT RICHARDSON, ALASKA	PAGE	3 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.50'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/14/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0	16 15 14 15	NA/ND					Sample FRU35-9, 1215, 94FRU217SL. SAND WITH GRAVEL (SP); 70-80% coarse sand; 20-30% gravel (0.5 to 1.5 inch diameter); petroleum-like odor; no staining; moist; Color: 10YR 4/1.
1.5/1.5	10 13 16	NA/ND		45			Sample FRU35-10, 1245, 94FRU218SL. SAND WITH GRAVEL (SP); trace fines; 80-85% coarse sand; 15-20% gravel (.25 to 1 inch diameter) rounded; trace silt around larger gravel; no staining; no petroleum-like odor; moist; color: 10YR 4/2.
2.0/2.0	30 32 25 24	NA/ND		50			Sample FRU35-11, 1310, 94FRU219SL. SAND WITH GRAVEL (SP); same as above; no staining; no odor; slightly moist; color: 10YR 4/2.
1.5/1.5	18 38 30	NA/ND		55			Sample FRU35-12, 1330, 94FRU220SL. SAND WITH GRAVEL (SP); 75% coarse sand; 25% gravel to 3 inch diameter; no staining; no odor; slighty moist to moist; color: 10YR 4/1.
				60			

REMARKS

Geotech sample 94FRU514SL from the 10-12' interval was classified by ASTM Method D-2487 as GW-GM.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3386
LOCATION	FORT RICHARDSON, ALASKA	PAGE	4 OF 4
DRILLED BY	DISCOVERY DRILLING	REFERENCE ELEV.	280.50'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	62.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	2/14/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0	13 17 23 24	NA/ND		65 70 75 80			Sample FRU35-13, 1345, 94FRU221SL and FRU35-14, 1400, 94FRU222SL (Duplicate). **SAND WITH GRAVEL (SP)**; same as above with coal fragments at 62 feet; no staining; no odor; slightly moist to moist; color: 10YR 4/2. **Boring terminated at 62 feet, boring started at 0950, completed at 1400 and backfilled with 18.5 bags of bentonite chips at 1440.** Driller: Scott Clinkenbeard Drill Rig: CME-75 Hammer: 300 lbs. Sample Outside Diameter: 3-inches Northing: 117207.60 Easting: 125864.14

REMARKS

Geotech sample 94FRU514SL from the 10-12' interval was classified by ASTM Method D-2487 as GW-GM.

OU-D 33525

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	VW-1
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	1 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.72'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	81.50'
LOGGED BY	Wes Willson	DATE COMPLETED	6/24/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				5				Drill to 10 feet for first sample.
2.0/2.0	14 18 14 25			10				GRAVEL WITH SAND (GP-GM); poorly graded gravel with sand to silty gravel with sand. 65% gravel (up to 2-inch diameter), 20% fines (low plasticity), 15% coarse to fine grained sand (subangular to angular); trace organics (wood fragments); slightly moist; no odor; slight staining (wood fragments); light olive brown (2.5Y, 5/3).
				15				
				20				

REMARKS

Dry well encountered on 10-feet bgs sample. Completed as Bioventing Air Injection Well VW-1.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	VW-1
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	4 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.72'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	81.50'
LOGGED BY	Wes Willson	DATE COMPLETED	6/24/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	14 22 19 46			65				GRAVEL WITH SAND (GP); poorly graded, sandy gravel; 70% gravel (up to 3-inch diameter), 35% very coarse to medium grained sand (subangular to angular), 5% fines (non-plastic); slight odor; slight staining; slightly moist to dry; olive gray (5Y, 5/2).
2.0/1.4	46 43 46			70				Same as above; slight odor; slight staining; slightly moist.
				75				
				80				

REMARKS

Dry well encountered on 10-feet bgs sample. Completed as Bioventing Air Injection Well VW-1.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	VW-1
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	5 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.72'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	81.50'
LOGGED BY	Wes Willson	DATE COMPLETED	6/24/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	17 34 38			85 90 95 100				Same as above. Boring terminated at 81.5 feet. Boring started at 0830, completed at 1700 and converted to Air Injection Well VW-1. Driller: Scott Clinkenbeard Drill Rig: CME-55 Hammer: 340 lbs., 36-inch drop Sampler Outside Diameter: 3-inches Northing: 117237.07 Easting: 125868.10

REMARKS

Dry well encountered on 10-feet bgs sample. Completed as Bioventing Air Injection Well VW-1.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPA
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	1 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.37'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	77.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/27/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				5				
				10				Grab sample at 10-feet.
1.5/1.4	14 18 24	NA/11.9		15				**GRAVEL WITH SAND (GP)**; poorly graded gravel with sand; 70% gravel (up to 1.5-inch diameter), 25% coarse to medium grained sand (subangular) 5% fines (low plasticity; dry; no odor; light olive brown (2.5Y, 5/3). **SILTY GRAVEL (GM)**; 65% gravel (up to 1-inch diameter); 30% fines (medium plasticity); 5% medium to fine grained sand (subrounded); moist; bluish-gray (5Y, 5/1).
				20				

REMARKS

Bioventing Monitoring Point A. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPA
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	2 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.37'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	77.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/27/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.5	15 20 26	NA/65.0		25				SILTY GRAVEL (GM); 55% gravel (up to 2-inch diameter, poorly graded), 40% fines (medium plasticity), 5% medium to fine grained sand (subrounded); moist; stained; petroleum-like odor; bluish-gray (5Y, 5/1).
				30				
	10 15 21 26	NA/114		35				SILTY SAND WITH GRAVEL (SM); 60% coarse to medium grained sand (subangular), 30% fines (non-plastic), 10% gravel (up to 1-inch diameter); petroleum-like odor; stained; moist; dark gray (2.5Y, 4/0).
				40				

REMARKS

Bioventing Monitoring Point A. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPA
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	3 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.37'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	77.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/27/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	13 20 27 27	NA/152		45				GRAVEL WITH SAND (GP); poorly graded gravel with sand; 70% gravel (up to 2-inch diameter), 20% very coarse to medium grained sand (subangular), 10% fines (non-plastic); dry; slightly stained; slight petroleum-like order; olive brown (2.5Y, 5/3). Same as above; trace coal.
				50				
2.0/2.0	32 53 35 18	NA/19.8		55				GRAVEL WITH SAND (GP); poorly graded gravel with sand; 70% gravel (5% cobbles, gravel to 1.5-inch diameter), 25% coarse to medium grained sand (subangular), 5% fines (low plasticity); slight odor; some staining; slightly moist to dry; olive gray (5Y, 5/2).
				60				

REMARKS

Bioventing Monitoring Point A. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPA
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	4 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.37'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	77.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/27/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/2.0	20 41 54 34	NA/77		65				Same as above.
				70				
2.0	20 45 38 17	NA/10		75				GRAVEL WITH SAND (GP); poorly graded gravel with sand; 80% gravel (up to 1.25-inch diameter), 15% coarse to medium sand (subangular, poorly graded) 5% fines (non-plastic); slight odor; some staining; slightly moist to dry. Boring terminated at 77 feet. Boring started at 0930, completed at 1700 and converted to Bioventing Monitoring Point A. Driller: Scott Clinkenbeard
				80				

REMARKS

Bioventing Monitoring Point A. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPA
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	5 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.37'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	77.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/27/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				85				Drill Rig: CME-55 Hammer: 340 lbs., 36-inch drop Sampler Outside Diameter: 3-inches Northing: 117234.02 Easting: 125887.21
				90				
				95				
				100				

REMARKS

Bioventing Monitoring Point A. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

OU-D 33533

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPB
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	1 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.43'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	78.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/28/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.0	40 47 18 NA	NA/1300		5 10 15 20				SILTY GRAVEL (GM); 55% gravel (up to 0.5-inch diameter), 35% fines (low plasticity); 10% medium to fine grained sand (poorly graded) dry; odor; stained; dark grayish-brown (2.5Y, 4/2).

REMARKS

Bioventing Monitoring Point B. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPB
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	2 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.43'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	78.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/28/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.0	16 19 18	NA/30		25				SILTY GRAVEL (GM); 60% gravel (up to 1.5-inch diameter, 2% cobbles, poorly graded), 35% fines (low to medium plasticity), 5% medium to fine grained sand; moist; slightly stained; slight odor.
				30				
1.5/1.4	16 13 12	NA/24		35				GRAVELLY SAND (SP); 70% coarse to medium grained sand (subrounded, poorly graded), 25% gravel (up to 2-inch diameter, poorly graded) 5% fines (non-plastic); slight odor; slight staining; moist; dark gray (2.5Y, 4/0).
				40				

REMARKS

Bioventing Monitoring Point B. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPB
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	3 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.43'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	78.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/28/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.4	16 12 17	NA/ND		45				SILTY GRAVEL (GM); 65% gravel (85% 0.25-inch diameter, 15% 0.5 to 1.5-inch diameter); 25% fines (low to medium plasticity); 10% coarse to medium grained sand (poorly graded, subrounded); slightly moist; no odor; no staining; olive brown (2.5Y, 5/3).
				50				
1.5/1.0	12 17 15	NA/ND		55				GRAVELLY SAND (SP); 70% gravel (0.25-inch diameter); 30% medium to coarse grained sand; 10% fines (non-plastic); no odor; moist; grayish brown (2.5Y 4/2).
				60				

REMARKS

Bioventing Monitoring Point B. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPB
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	4 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.43'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	78.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/28/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.5	38 54 63	NA/ND		65				SANDY GRAVEL (GP); 50% gravel (80% 0.25-inch diameter, 20% up to 1.5-inch diameter); 40% coarse to medium grained sand (subrounded, poorly graded); 10% fines (non-plastic); slightly moist; dark grayish-brown (2.5Y, 4/2).
				70				
1.5	6 16 29	NA/ND		75				Same as above.
				80				Boring terminated at 78 feet and converted to Bioventing Monitoring Point B. Driller: Scott Clinkenbeard Drill Rig: CME-55

REMARKS

Bioventing Monitoring Point B. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPB
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	5 OF 5
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.43'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	78.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/28/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				85				Hammer: 340 lbs., 36-inch drop Sampler Outside Diameter: 3-inches Northing: 117226.07 Easting: 125903.10
				90				
				95				
				100				

REMARKS

Bioventing Monitoring Point B. Soil Gas Monitoring Screens completed at 75 and 35-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPC
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	1 OF 1
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.08'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	13.50'
LOGGED BY	Wes Willson	DATE COMPLETED	6/29/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				5				Perched water at 9-feet bgs.
1.5	25 23 29	NA/179		10				SILTY GRAVEL (GM); 70% gravel (up to 1-inch diameter); 35% fines (low plasticity); 5% medium to fine grained sand; wet, odor, stained.
				15				Boring abandoned at 13.5-feet due to petroleum-like odor and high PID reading. Driller: Scott Clinkenbeard Drill Rig: CME-75 Hammer Weight: 340 lbs., 36-inch drop Sampler Outside Diameter: 3-inches Northing: 117216.77 Easting: 125925.63
				20				

REMARKS

Intended to be Background Soil Gas Monitoring Point. Abandoned due to encountered petroleum hydrocarbon impact.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPD
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	1 OF 2
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.58'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	20.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/30/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				5				GRAVELLY SAND (GM); 70% medium grained sand, 25% coarse gravel; 5% fine; moist; no odor; 10YR, 3/3.
				10				
2.0/1.7	30 17 21 18							As above; moist; no odor; high carbon content layer.
				15				
2.0	14 17 12 12			20				As above; moist; no odor.

REMARKS

Background Bioventing Monitoring Point D. Soil Gas Monitoring Screens completed at 18 and 12-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	Fort Richardson Release Investigation B	BORING NO.	MPD
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	2 Of
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	280.±
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	20.00'
LOGGED BY	Wes Willson	DATE COMPLETED	6/30/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				25				Boring terminated at 20-feet and converted to Background Bioventing Monitoring D. Driller: Scott Clinkenbeard Drill Rig: CME-75 Hammer Weight: 340 lbs., 36-inch drop Sampler Outside Diameter: 3-inches Northing: 117179.92 Easting: 125819.44
				30				
				35				
				40				

REMARKS

Background Bioventing Monitoring Point D. Soil Gas Monitoring Screens completed at 18 and 12-feet bgs.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3387
LOCATION	FORT RICHARDSON, ALASKA	PAGE	1 OF 6
DRILLED BY	DISCOVERY	REFERENCE ELEV.	279.89'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	111.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	3/30/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							Drilling to 10 feet prior to sampling.
2.0/2.0	12 17 20 22	NA/ND		10			Sample FRU46-1, 1310, 94FRU332SL. **SAND WITH SILT AND GRAVEL (SP-SM)**; 50% coarse sand; 20% gravel (.25 to 1 inch diameter); 20% cobble; 10% silt; odor in slough only; no staining; wood splinters and wire; medium dense; slightly moist.
2.0/1.5	16 20 13 16	NA/ND		15			FRU46-2, 1400, 94FRU333SL and split 94FRU334SL. **SAND WITH SILT AND GRAVEL (SP-SM)**; 50% coarse sand; 40% gravel (.25 to 2 inch diameter); 10% silt; petroleum-like odor; staining 15 to 16.5 feet; medium dense; moist with stain.
				20			

REMARKS

Geotech sample 94FRU520SL from the 85-86' interval was classified as GW-GM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3387
LOCATION	FORT RICHARDSON, ALASKA	PAGE	2 OF 6
DRILLED BY	DISCOVERY	REFERENCE ELEV.	279.89'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	111.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	3/30/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.0	35 28 31	NA/ND					FRU46-3, 1420, 94FRU335SL. GRAVELLY SAND (GP); 40% coarse sand; 30% gravel (.25 to 1-inch diameter); 30% cobble; staining; odor; dense; slightly moist.
2.0/2.0	13 16 23 24	NA/ND		25			Sample FRU46-4, 1445, 94FRU336SL and duplicate FRU46-5, 1500, 94FRU337SL. SAND WITH GRAVEL (SP); 60% coarse sand; 35% gravel (.25 to 1 inch diameter); 5% silt; staining; petroleum-like odor; slightly moist; medium dense.
1.5/1.5	8 11 12	NA/ND		30			FRU46-6, 1515, 94FRU338SL. SAND WITH GRAVEL (SP); lithology same as above; staining; petroleum-like odor; medium dense; moist.
2.0/2.0	10 11 14	NA/ND		35			FRU46-7, 1530, 94FRU339SL. SAND WITH GRAVEL (SP); 80% medium sand; 20% gravel (.5 to .75 inch diameter); petroleum-like odor and staining; moist; medium dense.
				40			

REMARKS

Geotech sample 94FRU520SL from the 85-86' interval was classified as GW-GM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3387
LOCATION	FORT RICHARDSON, ALASKA	PAGE	3 OF 6
DRILLED BY	DISCOVERY	REFERENCE ELEV.	279.89'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	111.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	3/30/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.5	20 16 17	NA/ND					FRU46-8, 1600, 94FRU340SL. GRAVELLY SAND (GP); 40% coarse sand; 30% gravel rock fragments; 25% cobble; 5% silt; petroleum-like odor; no staining; slightly moist; medium dense.
2.0/2.0	7 11 16 17	NA/ND		45			FRU46-9, 1650, 94FRU341SL. SAND WITH GRAVEL (SP); 90% medium to coarse sand; 10% gravel (up to 1 inch diameter), well rounded; staining; petroleum-like odor; moist; medium dense.
				50			
2.0	8 12 19 23	NA/ND		55			FRU46-10, 1645, 94FRU342SL. SAND WITH GRAVEL (SP); as above; moist; medium dense, no staining; eucalyptus odor.
				60			

REMARKS

Geotech sample 94FRU520SL from the 85-86' interval was classified as GW-GM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3387
LOCATION	FORT RICHARDSON, ALASKA	PAGE	4 OF 6
DRILLED BY	DISCOVERY	REFERENCE ELEV.	279.89'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	111.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	3/30/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.5	28 32 53	NA/ND		65			FRU46-11, 3/9/94, 0940, 94FRU343SL. **SAND WITH GRAVEL (SP)**; 80% coarse sand; 20% gravel (.25 to 1 inch diameter); no staining; no odor; moist; dense.
				70			
1.5/1.5	14 21 28	NA/ND		75			FRU46-12, 1030, 94FRU344SL. **SAND WITH GRAVEL (SP)**; 50% coarse sand; 50% gravel/cobble; no staining; no odor; slightly moist; medium dense.
				80			

REMARKS

Geotech sample 94FRU520SL from the 85-86' interval was classified as GW-GM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3387
LOCATION	FORT RICHARDSON, ALASKA	PAGE	5 OF 6
DRILLED BY	DISCOVERY	REFERENCE ELEV.	279.89'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	111.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	3/30/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/1.5	26 45	NA/ND		85			FRU46-13, 1130, 94FRU520SL, (GEOTECH sample only). SAND WITH GRAVEL (SP); 90% medium to coarse sand; 10% gravel (1.5 to 2 inch diameter); no staining; no odor; dense; slightly moist.
				90			
1.5	30 35 37	NA/ND		95			FRU46-14, 1215, 94FRU345SL. SAND WITH GRAVEL (SP); as above; moist; no staining; no odor; dense.
				100			

REMARKS

Geotech sample 94FRU520SL from the 85-86' interval was classified as GW-GM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

PROJECT NAME	FORT RICHARDSON USTs	BORING NO.	AP3387
LOCATION	FORT RICHARDSON, ALASKA	PAGE	6 OF 6
DRILLED BY	DISCOVERY	REFERENCE ELEV.	279.89'
DRILL METHOD	HOLLOW STEM AUGER	TOTAL DEPTH	111.00'
LOGGED BY	CARL BENSON	DATE COMPLETED	3/30/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							Auger stuck at 100 feet at 1400.
		NA/1.7		105			FRU46-15, 3/30/94, 1110, 94FRU347SL. SILTY SAND WITH GRAVEL (SM); 50% coarse sand; 35% gravel to 1 inch diameter; 15% fines; petroleum-like odor, staining; spotty sheening in interstitial water; wet sample; color: 10YR, 4/1.
				110			Boring terminated at 111 feet. Boring started on 3/8/94 at 1200, completed on 3/30/94. Driller: Scott Clinkenbeard Drill Rig: CME-75 Hammer: 300 lbs. Sampler Outside Diameter: 3-inches Northing: 117240.24 Easting: 125872.07
				115			
				120			

REMARKS

Geotech sample 94FRU520SL from the 85-86' interval was classified as GW-GM by ASTM Method D-2487.

LOG OF EXPLORATORY BORING

AP-3439

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-2
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	1 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.91'
DRILL METHOD	*Air Rotary*	*TOTAL DEPTH*	*110.00'*
LOGGED BY	Jim Daigle	DATE COMPLETED	6/13/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				5				Setting casing to water table prior to sampling.
				10				
				15				
				20				

REMARKS

250 feet southeast of Building 45590.

LOG OF EXPLORATORY BORING

3439

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-2
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	2 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.91'
DRILL METHOD	Air Rotary	TOTAL DEPTH	110.00'
LOGGED BY	Jim Daigle	DATE COMPLETED	6/13/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				25				
				30				
				35				
				40				

REMARKS

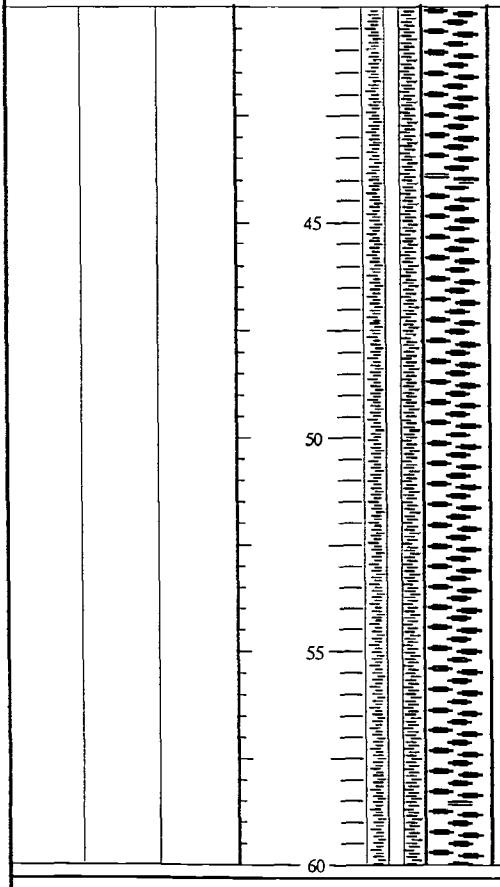
250 feet southeast of Building 45590.

LOG OF EXPLORATORY BORING

3439

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-2
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	3 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.91'
DRILL METHOD	Air Rotary	TOTAL DEPTH	110.00'
LOGGED BY	Jim Daigle	DATE COMPLETED	6/13/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION



REMARKS

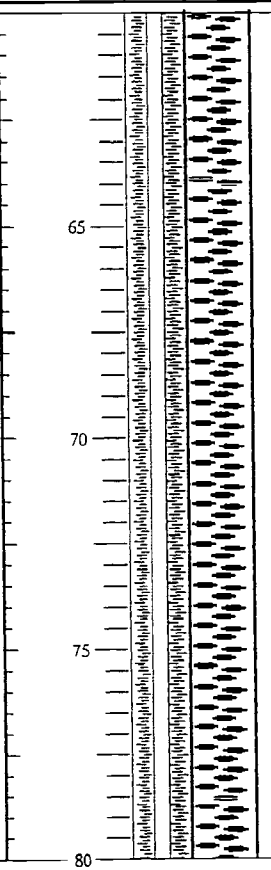
250 feet southeast of Building 45590.

LOG OF EXPLORATORY BORING

3939

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-2
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	4 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.91'
DRILL METHOD	Air Rotary	TOTAL DEPTH	110.00'
LOGGED BY	Jim Daigle	DATE COMPLETED	6/13/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION



REMARKS

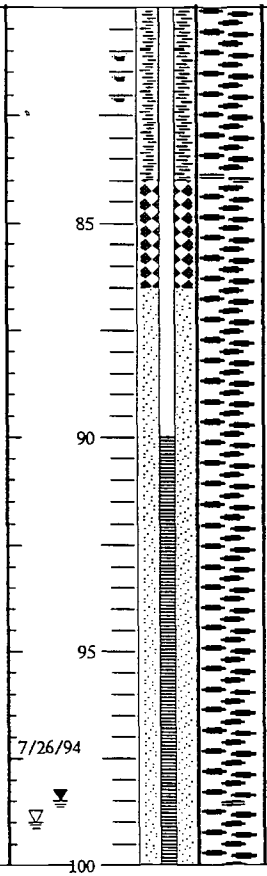
250 feet southeast of Building 45590.

LOG OF EXPLORATORY BORING

3457

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-2
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	5 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.91'
DRILL METHOD	Air Rotary	TOTAL DEPTH	110.00'
LOGGED BY	Jim Daigle	DATE COMPLETED	6/13/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION



Log Air Rotary Cuttings

GRAVEL WITH SAND (GP); 60% gravel up to 1-inch diameter, 25% very coarse to very fine grained sand (well graded), 15% fines (non-plastic, loose).

Water at 99 to 100-feet.

REMARKS

250 feet southeast of Building 45590.

LOG OF EXPLORATORY BORING

3939

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-2
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	6 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.91'
DRILL METHOD	Air Rotary	TOTAL DEPTH	110.00'
LOGGED BY	Jim Daigle	DATE COMPLETED	6/13/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
			7/14/94					GRAVEL WITH SAND (GP); as above.
				105				
				110				Boring terminated at 109-feet. Driller: Dave Harper Drill Rig: Air Rotary Northing: 117174.73 Easting: 125824.01
				115				
				120				

REMARKS

250 feet southeast of Building 45590.

LOG OF EXPLORATORY BORING

AP-3440

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-3
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	1 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.50'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	109.00'
LOGGED BY	Carl Benson	DATE COMPLETED	6/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/2.0	18 21 28 30	NA/ND		10				GRAVEL WITH SAND (GP-GM); 70% gravel, 20% coarse sand, 10% fines; silt stringers; glacial till; moist; no odor; no staining.

REMARKS

Located 75-feet south and 20 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP-3440

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-3
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	2 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.50'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	109.00'
LOGGED BY	Carl Benson	DATE COMPLETED	6/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0	12 13 16 18	NA/ND						**SILTY GRAVEL WITH SAND (GM)**; 50% gravel up to 2-inch diameter, 20% coarse sand, 30% silt; stringers and lenses; glacial till; moist; no staining; no odor. **SILT**; 10% fines.
2.0/2.0	14 18 23 24	NA/ND		25 30 35 40				**GRAVEL WITH SAND (GP)**; 50% gravel to 1.5-inch diameter, 45% coarse sand, ~5% fines; stringers; glacial till; moist; no odor; no staining.

REMARKS

Located 75-feet south and 20 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP-3440

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-3
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	3 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.50'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	109.00'
LOGGED BY	Carl Benson	DATE COMPLETED	6/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/2.0	13 18 29 34	NA/ND		45				GRAVEL WITH SAND (GP); 60% gravel, 10% cobble, 25% coarse sand, 5% coal; no staining; no odor; slightly moist.
2.0/2.0	23 29 48 65	NA/ND		50				SAND WITH COBBLES (SP);
				55				GRAVEL WITH SAND (GP); 50% gravel (rounded), 30% medium grained sand, 20% cobble; no odor; no staining; slightly moist.
				60				

REMARKS

Located 75-feet south and 20 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP-3990

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-3
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	4 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.50'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	109.00'
LOGGED BY	Carl Benson	DATE COMPLETED	6/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/2.0	17 24 28 30	NA/ND		65				GRAVEL WITH SAND (GP); 60-80% gravel to 3-inch diameter, 30-40% coarse sand (till); no staining; no odor; slightly moist.
2.0/2.0	28 40 68 34	NA/ND		70 75 80				GRAVELLY SAND (SP); 60% coarse sand, 40% gravel; no staining; no odor; slightly moist.

REMARKS

Located 75-feet south and 20 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP-3948

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-3
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	5 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.50'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	109.00'
LOGGED BY	Carl Benson	DATE COMPLETED	6/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
2.0/2.0	38 56 68 70	NA/ND		85 90 95 7/26/94 6/20/94 100				**GRAVELLY SAND (SP)**; 55% coarse sand, 45% gravel to 2-inch diameter; no staining; no odor; moist.

REMARKS

Located 75-feet south and 20 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP-345B

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-3
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	6 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	279.50'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	109.00'
LOGGED BY	Carl Benson	DATE COMPLETED	6/17/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				105				
				110				Boring terminated at 109 feet. Driller: Scott Clinkenbeard Drill Rig: CME-75 Hammer: 300 lbs. Sampler Outside Diameter: 3-inches Northing: ~~117137.36~~ 117 174.73 Easting: ~~125980.65~~ 125 824.01
				115				
				120				

REMARKS

Located 75-feet south and 20 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP-3941

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-4
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	1 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	285.40'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	113.00'
LOGGED BY	Wes Willson	DATE COMPLETED	7/15/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				5				
				10				Refusal of split spoon sampler at 10-feet.
	24 65 53	NA/1.5		15				SILTY GRAVEL (GM); 55% gravel (poorly graded, up to 0.5-inch diameter, 25% fines (non-plastic); 10% fine to medium grained sand (poorly graded, subrounded), 5% cobble up to 4-inch diameter; dry; light yellowish-brown (2.5Y, 6/3).
				20				

REMARKS

Located 250-feet north and 5 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP-3991

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-4
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	2 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	285.40'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	113.00'
LOGGED BY	Wes Willson	DATE COMPLETED	7/15/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	71 52 55	NA/ND		25				SANDY GRAVEL (GP-GM); 60% gravel up to 0.5-inch diameter, 25% medium to coarse grained sand (poorly graded, subrounded), 10% fines (low plasticity), 5% cobbles up to 4-inch diameter, trace coal; slightly moist; no staining; no odor; dark grayish-brown (2.5Y, 4/2).
1.5/1.0	35 70 100	NA/ND		30 35 40				SILTY GRAVEL WITH SAND (GM); 40% gravel up to 0.5-inch diameter (poorly graded), 15% medium to coarse sand (poorly graded, subrounded), 35% silt (low plasticity), 10% cobbles up to 3-inch diameter; slightly moist; olive brown (2.5Y, 4/3).

REMARKS

Located 250-feet north and 5 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP 3441

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-4
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	3 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	285.40'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	113.00'
LOGGED BY	Wes Willson	DATE COMPLETED	7/15/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
				45				Refusal of split spoon sampler.
1.5/1.5	27 73 51	NA/ND		50				SILTY GRAVEL WITH SAND (GM); 40% gravel up to 0.5-inch diameter (poorly graded, angular), 35% fine to coarse sand (graded, subrounded), 20% silt (very low plasticity), 5% cobbles up to 3-inch diameter; slightly moist; very dark grayish-brown (2.5Y, 3/2).
				55				
				60				

REMARKS

Located 250-feet north and 5 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AR-3441

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-4
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	4 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	285.40'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	113.00'
LOGGED BY	Wes Willson	DATE COMPLETED	7/15/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.5	40 35 60	NA/ND		65				SANDY GRAVEL (GP); 50% gravel 0.12 to 1-inch diameter, 30% coarse to medium grained sand (subrounded), 8% fines (low plasticity), 2% cobbles; slightly moist to moist; olive gray (5Y, 4/2).
1.0	35 127	NA/ND		70				As above; moist.
				75				
				80				

REMARKS

Located 250-feet north and 5 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP-344

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-4
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	5 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	285.40'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	113.00'
LOGGED BY	Wes Willson	DATE COMPLETED	7/15/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.0	80 100	NA/ND		85				**GRAVELLY SAND (SP)**; 65% medium to coarse sand (subrounded), 25% gravel up to 0.5-inch diameter (angular), 8% fines (low plasticity) 2% cobbles; moist; very dark grayish-brown (2.5Y, 3/2).
1.5/1.0	55 117 210	NA/ND		90				**SANDY GRAVEL (GP)**; 70% gravel 0.12 to 1-inch diameter (poorly graded), 20% coarse to medium grained sand (poorly graded, subrounded), 5% fines (low plasticity), 5% cobbles less than 2-inch diameter; moist.
1.0/1.0	54 210	NA/ND		95				**SANDY GRAVEL (GP)**; 50% gravel up to 1-inch diameter (poorly graded), 35% coarse to very coarse sand (subangular), 10% cobble to 2-inch diameter, 5% fines (low plasticity); olive brown (2.5Y, 4/3). Refusal at 96-feet.
				100				

REMARKS

Located 250-feet north and 5 degrees west of MW-1.

LOG OF EXPLORATORY BORING

AP-3991

PROJECT NAME	Fort Richardson Release Investigation A	BORING NO.	MW-4
LOCATION	Building 45590, Fort Richardson, Alaska	PAGE	6 OF 6
DRILLED BY	Discovery Drilling	REFERENCE ELEV.	285.40'
DRILL METHOD	Hollow Stem Auger	TOTAL DEPTH	113.00'
LOGGED BY	Wes Willson	DATE COMPLETED	7/15/94

Driven/ Recovery FT	Blows/ six inches	PID/ HEADSPACE	GROUND WATER LEVELS	DEPTH IN FT.	SAMPLES	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
1.5/1.4	19 5 50	NA/2.6						Water assumed to be at 100-feet.
2.0/2.0	28 40 68	NA/2.7						
			7/26/94	105				
			7/15/94					
				110				GRAVELLY SAND WITH SILT (SM); 60% medium to coarse sand, 30% gravel, 10% fines; no odor; moist. As above; moist to wet.
				115				Boring terminated at 113 feet. Driller: Scott Clinkenbeard Drill Rig: CME-75 Hammer: 300 lbs. Sampler Outside Diameter: 3-inches Northing: 117489.29 Easting: 125850.28
				120				

REMARKS

Located 250-feet north and 5 degrees west of MW-1.

OU-D 33565

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 1 of 4

Location Coordinates: Northing 117,281 Easting 126,635

Drilling Agency: XXX Corps of Engineers | XXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-5 Permanent AP-3468	S. Moore	Various

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	115.5	115.5

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Air Grab and Drive	108	22-28 Dec 1994

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
286.90	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		1	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand	1"	Brown, moist, subr.-suba. gravel (fractured by drilling), fine to coarse sand, NP fines, possible Fill
10	3	2	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	1"	62%Gr;32%Sa;6%Fines S1 Brown-gray, moist, subr. gravel, fine to coarse sand, NP fines w/orange ferrous stains & black coal nodules up to 1/8" dia.;PID=1.0 *4/8/11/23
20		3			2"	
	4	3A	GW-GM	Well-graded GRAVEL w/Silt, Sand & Cobbles	3"	64%Gr;30%Sa;6%Fines S1 Gray/brown, suba.-subr. gravel & cobbles;.fine to coarse sand, NP fines w/ clay; black coal nodules to 2" dia., w/orange ferrous stains throughout PID=0.9 *21/22/19/23
30						Continued

33566

OU-D

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 2 of 4

Location Coordinates: Northing 117,281 Easting 126,635

Drilling Agency: XXX Corps of Engineers | XXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-5 Permanent AP-3468	S. Moore	Various

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	115.5	115.5

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	Elevation XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Air Grab and Drive	108	22-28 Dec 1994

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
286.90	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	5	4	GW	Well-Graded GRAVEL w/ Sand	1"	63%Gr;32%Sa;5%Fines SI Brown, moist, suba.-subr. gravel, med. to coarse sand w/black coal nodules to 1/2" dia. and orange/ brown ferrous stains throughout *5/11/12/23
35						
40		5	GP	Poorly Graded GRAVEL w/Sand & Cobbles	>3"	Brown, moist, subr.-rnd. gravel, fine to coarse sand, NP fines; sample may not be representative *49/50 for 3"
45		6	GP-GC	Poorly Graded GRAVEL w/Clay, Sand & Cobbles	>3"	Brown, moist w/wet on some gravel, subr.-suba. gravel, fine to coarse sand, plas. fines, pieces of coal,fractured gravel PID=0.8 *14/26/31
50		7	GP-GM	Poorly Graded GRAVEL w/Silt, Sand & Cobbles	>3"	Brown, moist, subr.-suba. gravel, fine to coarse sand, NP fines, pieces of coal, fractured gravel *32/35/35/16 for 4"
	2	8	GW	Well-Graded GRAVEL w/ Sand	2"	57%Gr;39%Sa;4%Fines PFS Brown, moist w/ wet on some gravel, subr.-suba. gravel, fine to coarse sand, pieces of coal PID=0.7 *12/29/30/25
55						
60						Continued

NPA Form 19-E
Jun 92 Prev. Ed. Obsolete

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Hole Number: AP-3468

OU-D 33567

DEPARTMENT OF THE ARMY
North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 3 of 4

Location Coordinates: Northing 117,281 Easting 126,635

Drilling Agency: XXX Corps of Engineers; XXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-5 Permanent AP-3468	S. Moore	Various

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	115.5	115.5

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Air Grab and Drive	108	22-28 Dec 1994

Top of Hole Elevation	Inspector	Chief. Soils Section	Chief. Geotechnical Branch
286.90	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
65	2	9	GW	Well-Graded GRAVEL w/ Sand	>3"	64%Gr;32%Sa;4%Fines PFS Brown/gray, moist, suba.-subr. gravel, med. to coarse sand, frac.gravel *13/45/42/45
70	2	10	GW	Well-Graded GRAVEL w/ Sand	3"	68%Gr;28%Sa;4%Fines PFS Brown/gray, moist, suba.-subr. gravel, med. to coarse sand,piece of coal frac. gravel; PID=0.9 *16/41/40/50 for 5"
80	2	11	GP	Poorly Graded GRAVEL w/ Sand	3"	60%Gr;37%Sa;3%Fines PFS Brown/gray, moist, subr. gravel, fine to coarse sand; PID=0.8 *12/48/51/43
90		12				Continued

33568

OU-D

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 4 of 4

Location Coordinates: Northing 117,281 Easting 126,635

Drilling Agency: XXX Corps of Engineers | XXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-5 Permanent AP-3468	S. Moore	Various

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. ___ Test Pit ___ Auger Hole	0.0	115.5	115.5

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Air Grab and Drive	108	22-28 Dec 1994

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
286.90	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
95		12	GW	Well-Graded GRAVEL w/Sand	2"	Brown, moist, subr.gravel fine to coarse sand PID=0.6 *7/39/53/60 for 4"
100		13	GW	Well-Graded GRAVEL w/ Sand	2"	Brown, moist, subr.gravel fine to coarse sand PID=0.6 *77/50 for 2"
105						Granite boulder from 101 to 107 ft. Couldn't push casing through boulder so moved 18'west & redrilled to 110' without sampling. Coordinates reflect second location.
	▽ ≡		GW			
110	21	14	ML	SILT		1%Gr;13%Sa;86%Fines F4 Brown, wet, v.fine sand, coarse NP fines *19/41/65
115						Bottom of hole 115.5 Elevation 171.4
				*Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30"		Groundwater elev. 178.9 estimated during drillin
				Monitoring well installed		PID - Photo Ionization Detector
120						

NPA Form 19-E
Jun 92 Prev. Ed. Obsolete

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Hole Number: AP-3468

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER – ALASKA DISTRICT
MONITORING WELL LOG

Location: Ft. Richardson, Ak. | SHEET 1 OF 1
Project: Post Laundry Facility

Location Coordinates
Northing 117,281 Easting 126,635

Drilling Agency
XXXX Ambler Exploration XXXX Corps of Engineers

Hole Number
Field AP-5 Permanent AP-3468

Name of Driller
S. Moore

Weather
Overcast

Type of Hole		Depth to	Depth Drilled	Total Depth
___ Test Pit	___ Auger Hole	XXXX AIR ROTARY	115.5	115.5

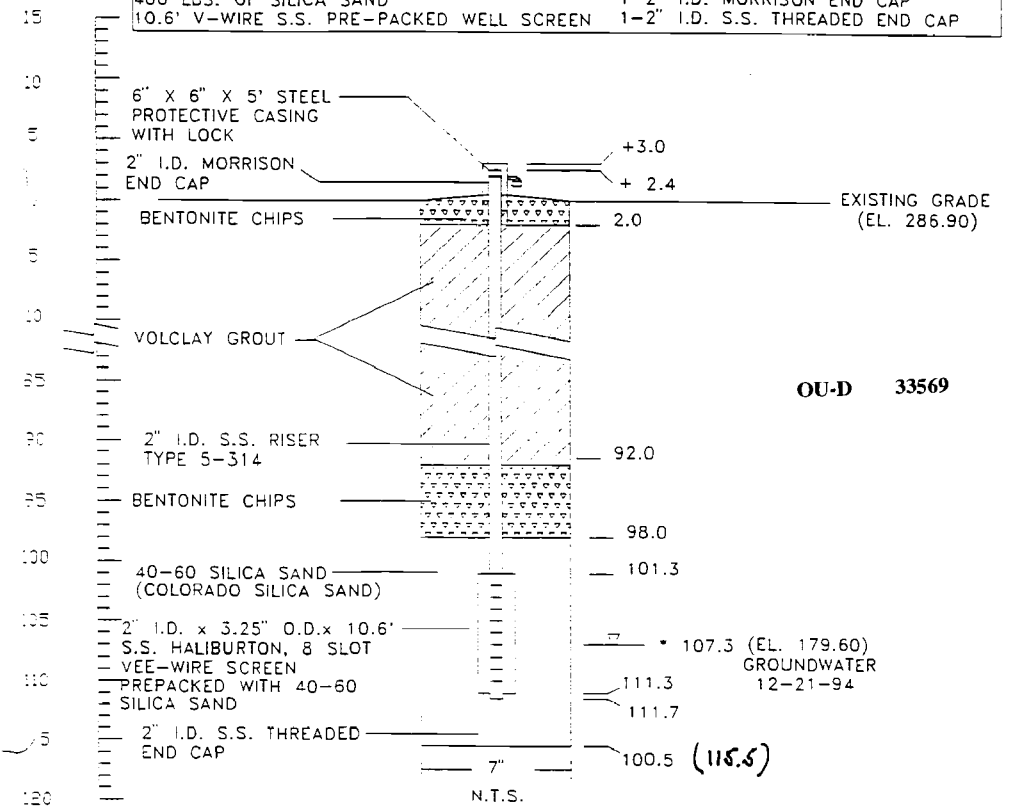
Size and Type of Bit	Elevation / Datum	Type of Equipment
5" Tri Cone	XXXX MSL / ___	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Grab and Drive	* 107.3	5 Jan 1995

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
286.9	C. Wilson/J. Saucedo	J. Roychel	D. Thomas

SUMMARY OF MATERIALS USED

600 LBS. OF VOLCLAY GROUT
200 LBS. OF BENTONITE CHIPS
400 LBS. OF SILICA SAND
10.6' V-WIRE S.S. PRE-PACKED WELL SCREEN
1-6" X 6" X 5' PROTECTIVE CASING
1-COMBINATION LOCK
100' OF 2" I.D. S.S. RISER PIPE
1-2" I.D. MORRISON END CAP
1-2" I.D. S.S. THREADED END CAP



OU-D 33569

NPA Form 19-F
June 92 Prev. Ed. Obsolete

*Groundwater measured after well installation

33570

OU-D

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Sheet 1 of 4

Location Coordinates
Northing 116,394 Easting 125,369

Drilling Agency [ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-13D Permanent AP-3483	S. Moore	ptly cldy 25°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	115.0	115.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
13	Air Grab & Drive	93.8	6-9 Jan 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
274.69	Sauceda/Wilson	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		1	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	2"	Brown, moist, suba. to subr gravel, fine to coarse sand, grab PID=0
5						
10	3	2	GW-GM	Well-Graded GRAVEL w/ Silt, Cobbles & Sand	4"	65%Gr; 29%Sa; 6%Fines Sl Brown, moist, subr. to suba gravel & cobbles, coarse sand, NP fines, pieces of coal, fractured gravel PID=0 *15/31/22
15						
20		3	GP-GM	Poorly Graded GRAVEL w/ Silt, Sand & Cobbles	4"	Brown, moist, subr. to suba gravel & cobbles, fine to coarse sand, slightly PL fines, pieces of coal, fractured gravel PID=0 *19/20/15/25
25						
30	2	4	GW-GM	Well Graded GRAVEL w/ Silt & Sand		Continued

OU-D 33571

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Piezometer

Sheet 2 of 4

Location Coordinates
Northing 116,394 Easting 125,369

Drilling Agency [ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-13D Permanent AP-3483	S. Moore	ptly cldy 25°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	115.0	115.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
13	Air Grab & Drive	93.8	6-9 Jan 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
274.69	Sauceda/Wilson	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	2	4	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	4"	66%Gr;28%Sa;6%Fines PFS Brown/gray, moist, subr. to suba. gravel, med. to coarse sand, pieces of coal, fractured gravel PID=0 *23/30/34/49
35						
40		5	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	3"	Gray,moist,subr. to suba. gravel, fine to coarse sand, NP fines, pieces of coal, fractured gravel PID=0 *7/17/23
45						
50		6	GP	Poorly Graded GRAVEL w/ Sand		Brown/gray,moist,subr. to suba. gravel, fine to coarse sand, NP fines, fractured gravel PID=0 *4/5/13/25 for 3"
55						
60	2	7	GP	Poorly Graded GRAVEL w/ Sand	3"	

Continued

33572

OU-D

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Piezometer

Sheet 3 of 4

Location Coordinates
Northing 116,394 Easting 125,369

Drilling Agency
[ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number: Field AP-13D Permanent AP-3483	Name of Driller: S. Moore	Weather: ptly cldy 25°F	
Type of Hole: [ ] Test Pit [ ] Auger Hole [XXX] Air Rot.	Depth To: 0.0	Depth Drilled: 115.0	Total Depth: 115.0
Size and Type of Bit: 5" Tri Cone	Elevation Datum: [XXX] MSL	Type of Equipment: Chicago Pneumatic CP-672	
Number of Samples: 13	Type of Samples: Air Grab & Drive	Depth to Groundwater: 93.8	Date: 6-9 Jan 95
Top of Hole Elevation: 274.69	Inspector: Sauceda/Wilson	Chief, Soils Section: J. Raychel	Chief, Geotechnical Branch: D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	2	7	GP	Poorly Graded GRAVEL w/ Sand	3"	55%Gr;41%Sa;4%Fines PFS Brown,moist,subr.gravel, fine to coarse sand,piece of coal, some fractured gravel PID=0 *16/24/22/28
65						
70		8	GW	Well-Graded GRAVEL w/ Sand	2"	Brown, moist,subr.gravel, fine to coarse sand PID=0 *17/32/24 for 4"
75						
80		9	GP	Well-Graded GRAVEL w/ Sand	>2"	Brown,moist,suba. to subr gravel, fine to coarse sand, piece of coal, some fractured gravel PID=0 *10/32/27
85						
						40%Gr;57%Sa;3%Fines NFS Brown,moist, subr.gravel, fine to coarse sand
90	2	10	SP	Poorly Graded SAND w/ Gravel	1"	PID=0 *16/20/30 Continued

OU-D 33573

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Sheet 4 of 4

Location Coordinates
Northing 116,394 Easting 125,369

Drilling Agency: XXX Other Ambler Exploration; Corps of Engineers

Hole Number	Name of Driller	Weather
Field AP-13D Permanent AP-3483	S. Moore	ptly cldy 25°F

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. (Test Pit / Auger Hole)	0.0	115.0	115.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
13	Air Grab & Drive	93.8	6-9 Jan 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
274.69	Sauceda/Wilson	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
95			SP	Poorly Graded SAND w/ Gravel	1"	Brown, moist, subr. gravel, fine to coarse sand
						Perched water table encountered at 99' while drilling
100	5	11	GM	Silty GRAVEL w/ Sand	1"	44%Gr;33%Sa;23%Fines F2 Brown, wet, subr. to suba. gravel, fine to med.sand, slig. plastic fines PID=0 *46/54/57
105						LL=40, PI=22
	18	12A	GC	Clayey GRAVEL w/ Sand	1"	52%Gr;23%Sa;25%Fines F3 Brown, wet, subr. to suba. gravel, fine to coarse sand, lean clay PID=0
110	5	12B	GW-GM	Well-Graded GRAVEL w/ Silt & Sand		62%Gr;32%Sa;6%Fines S1 Gray, wet, subr. to suba. gravel, fine to coarse sand, plastic fines PID=0 *38/100/23 for 2"
115						Bottom of hole 115' Elevation 159.69
				PID - Photo Ionization Detector (ppm)		Groundwater elev. 180.85 estimated during drilling
				*Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling approx. 30".		Monitoring Well installed
120						

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Project Ft Richardson
28 Monitoring Wells

Hole Number AP-3483

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER – ALASKA DISTRICT
MONITORING WELL LOG

Location: Ft. Richardson, Alaska
Project: 28 Monitoring Wells
SHEET 1 OF 1

Location Coordinates
Northing 116,394 Easting 125,369

Drilling Agency
XXXX Ambler Exploration
—— Corps of Engineers

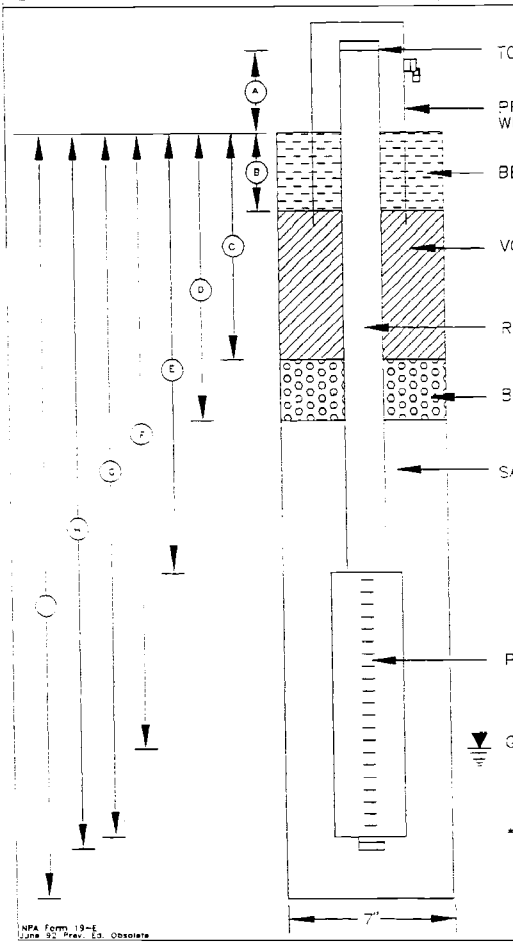
Hole Number	Name of Driller	Weather
Field AP-13D Permanent AP-3483	S. Moore	Clear, -10^{o}F

Type of Hole		Depth to	Depth Drilled	Total Depth
—— Test Pit	XXXX Air Rat.		115.0	115.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXXX MSL ——	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
13	Air Grab & Drive	93.84	10 Jan 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
274.69	C. Wilson	J. Raychel	D. Thomas



NOTE:
Subsurface soils information is provided in exploration log AP-3483

WELL COMPLETION DETAILS

A	2.4	FT (AGS)	ELEV. 277.09
B	3.0	FT (BGS)	
C	100.0	FT (BGS)	
D	102.0	FT (BGS)	
E	104.7	FT (BGS)	
F	93.84	FT (BGS)AD	ELEV. 180.85
G	114.0	FT (BGS)	
H	114.6	FT (BGS)	
I	115.0	FT (BGS)	

BGS Below Ground Surface
AGS Above Ground Surface
WD While Drilling
AD After Drilling

SUMMARY OF MATERIALS USED:

1 BUCKET BENTONITE CHIPS
150 LBS. BENTONITE CHIPS
650 LBS. VOLCLAY GROUT
275 LBS. 10-20 SAND
11 – 9.9' X 2" I.D. S.S. RISER PIPE
1 – 9.7' X 2" I.D. X 3.4 O.D. HALIBURTON S.S. VEE-WRAP 8-SLOT W/ 40-60 SILICA SAND PREPAK
1 – S.S. ENDCAP (0.2)
1 – PROTECTIVE CASING
1 – OTHER END PLUG

OU-D 33574

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OU-D 33575

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Sheet 1 of 5

Location Coordinates
Northing 117,271 Easting 126,617

Drilling Agency [ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number Field AP-21D Permanent AP-3534	Name of Driller S. Moore	Weather Cloudy 50°F		
Type of Hole [ ] Test Pit [ ] Auger Hole [XXX] Air Rot.	Depth To 0.0	Depth Drilled 135.0	Total Depth 135.0	
Size and Type of Bit 5" Tri Cone	Elevation Datum [XXX] MSL	Type of Equipment Chicago Pneumatic CP-672		
Number of Samples 3	Type of Samples Drive	Depth to Groundwater 108.	Date 11 May 95	
Top of Hole Elevation 286.09	Inspector J. Sauceda	Chief, Soils Section J. Raychel	Chief, Geotechnical Branch D. Thomas	

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
						Subsurface soils information from 0 to 100 ft. below existing grade may be obtained from AP-3468
5						
10						
15						
20						
25						
30						Continued

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Project Ft Richardson
28 Monitoring Wells

Hole Number
AP-3534
Piezometer

OU-D 33576

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Piezometer

Sheet 2 of 5

Location Coordinates
Northing 117,271 Easting 126,617

Drilling Agency
[ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number Field AP-21D Permanent AP-3534	Name of Driller S. Moore	Weather Cloudy 50°F	
Type of Hole [ ] Test Pit [ ] Auger Hole [XXX] Air Rot.	Depth To 0.0	Depth Drilled 135.0	Total Depth 135.0
Size and Type of Bit 5" Tri Cone	Elevation Datum [XXX] MSL	Type of Equipment Chicago Pneumatic CP-672	
Number of Samples 3	Type of Samples Drive	Depth to Groundwater 108.	Date 11 May 95
Top of Hole Elevation 286.09	Inspector J. Sauceda	Chief, Soils Section J. Raychel	Chief, Geotechnical Branch D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
						Subsurface soils information from 0 to 100 ft. below existing grade may be obtained from AP-3468
35						
40						
45						
50						
55						
60						Continued

OU-D 33577

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Sheet 3 of 5

Location Coordinates
Northing 117,271 Easting 126,617

Drilling Agency Corps of Engineers
XXX Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-21D Permanent AP-3534	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. Test Pit Auger Hole	0.0	135.0	135.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
3	Drive	108.	11 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
286.09	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
65						Subsurface soils information from 0 to 100 ft. below existing grade may be obtained from AP-3468
70						
75						
80						
85						
90						Continued

33578

OU-D

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Piezometer

Project Ft Richardson
28 Monitoring Wells

Sheet 4 of 5

Location Coordinates
Northing 117,271 Easting 126,617

Drilling Agency
XXX Other Ambler Exploration

Corps of Engineers

Hole Number	Name of Driller	Weather
Field AP-21D Permanent AP-3534	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	135.0	135.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
3	Drive	108.	11 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
286.09	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
						Subsurface soils information from 0 to 100 ft. below existing grade may be obtained from AP-3468
95						
100						
105						
	V					Groundwater at 108.01' after drilling
110		1		ML SILT w/ Sand		Brown, wet, fine sand, NP fines PID=ND *12/19/22
115						
						Increase in gravels
120				GW-GM Well-Graded GRAVEL w/ Silt & Sand		Continued

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Project Ft Richardson
28 Monitoring Wells

Hole Number
AP-3534

OU-D 33579

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Piezometer

Sheet 5 of 5

Location Coordinates
Northing 117,271 Easting 126,617

Drilling Agency [ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number Field AP-21D Permanent AP-3534	Name of Driller S. Moore	Weather Cloudy 50°F	
Type of Hole [XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	Depth To 0.0	Depth Drilled 135.0	Total Depth 135.0
Size and Type of Bit 5" Tri Cone	Elevation Datum [XXX] MSL	Type of Equipment Chicago Pneumatic CP-672	
Number of Samples 3	Type of Samples Drive	Depth to Groundwater 108.	Date 11 May 95
Top of Hole Elevation 286.09	Inspector J. Sauceda	Chief, Soils Section J. Raychel	Chief, Geotechnical Branch D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
125		2	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	1"	63%Gr;31%Sa;6%Fines S1 Gray/brown, wet, subr. gravel, fine to coarse sand, NP fines *70 for 5" Sample may not be representative due to small recovery of sample
130		3	GW	Well-Graded GRAVEL w/ Silt & Sand	>3"	62%Gr;34%Sa;4%Fines S1 Gray, wet, subr.-suba. gravel & cobbles, fine to coarse sand, NP fines PID=ND *3/21/28
135						Bottom of hole 135.0 Elevation 151.09 Groundwater elev. 178.08 after drilling *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling approx. 30" PID - Photo Ionization Detector (ppm) ND - Non-Detectable Monitoring Well installed
140						
145						
150						

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Project Ft Richardson
28 Monitoring Wells

Hole Number
AP-3534
Piezometer

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER – ALASKA DISTRICT
MONITORING WELL LOG

Location: Ft. Richardson, Alaska
Project: 28 Monitoring Wells

SHEET 1 OF 1

Location Coordinates
Northing 117,271 Easting 126.617

Drilling Agency
XXXX Ambler Exploration — Corps of Engineers

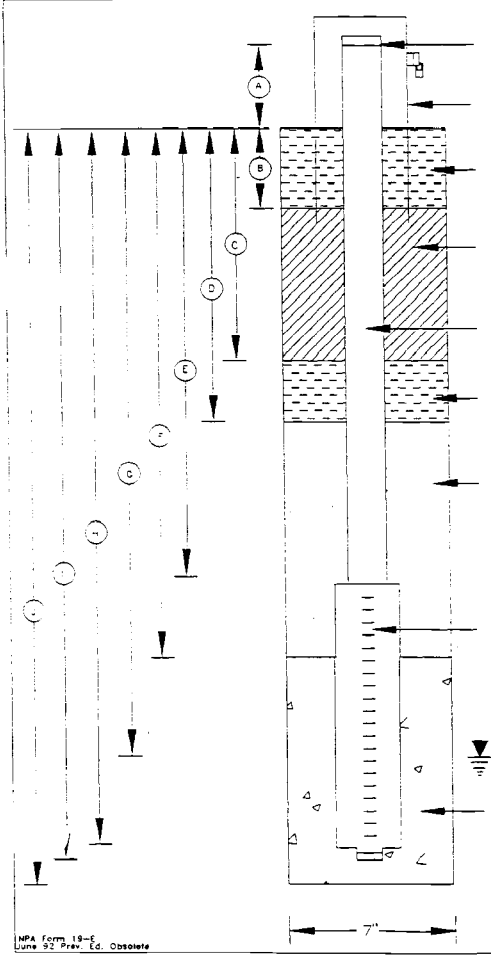
Hole Number	Name of Driller	Weather
Field AP-21D Permanent AP-3534	S. Moore	Cloudy, 50°F

Type of Hole	Depth to	Depth Drilled	Total Depth
XXXX Air Rot. — Test Pit		135.0	135.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXXX MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
3	Drive	108.01	11 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
286.09	J. Sauceda	J. Raychel	D. Thomas



NOTE:
Subsurface soils information is provided in exploration logs AP-3533 and AP-3468

WELL COMPLETION DETAILS

A	2.8	FT (AGS)	ELEV. 288.89
B	2.5	FT (BGS)	
C	112.7	FT (BGS)	
D	113.8	FT (BGS)	
E	116.1	FT (BGS)	
F	123.0	FT (BGS)	
G	108.01	FT (BGS)	ELEV. 178.08
H	135.9	FT (BGS)	
I	136.1	FT (BGS)	
J	136.5	FT (BGS)	

BGS Below Ground Surface
AGS Above Ground Surface
WD While Drilling
AD After Drilling

SUMMARY OF MATERIALS USED:

150 LBS. BENTONITE CHIPS
1250 LBS. VOLCLAY GROUT
500 LBS. 10-20 SAND
12 – 2" I.D x 1-' SCH. 40 PVC RISER PIPE
2 – 2" I.D. x 3.75" O.D. x 9.7' 8-SLOT JOHNSON V-WIRE PRE-PACK (40-60 SAND)
1 – 2" I.D. PVC END CAP
1 – 2" I.D. MORRISON END CAP
1 – 6" x 6" x 5' PROTECTIVE CASING

OU-D 33580

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June 92 Prev. Ed. Obsolete

BORING LOG

BORING NUMBER: 3772

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.2

BORING DIAMETER (in): 7

WELL DEPTH (ft): 117.2

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 278.6

TOP OF CASING ELEV. (ft): 281.75

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/06/96

DATE COMPLETED: 9/07/96

NORTHING: 116837.01

EASTING: 125870.98

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
0								GP-GM	Gravelly surface with vegetation.	
5									Gray Poorly Graded GRAVEL with Silt (GP-GM), gravelly cuttings discharging through line. Rounded gravels up to 30mm, large diameter gravel fractured by drilling, up to 10% fines, dry.	2" Sch. 40 PVC
10										Volclay Grout
15								GM	Dark olive gray Silty GRAVEL (GM), gravelly cuttings with trace (5%) fine sand, 15-20% fines, moist.	
20										

BORING LOG

BORING NUMBER: 3772

33582

OU-D

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.2

BORING DIAMETER (in): 7

WELL DEPTH (ft): 117.2

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 278.6

TOP OF CASING ELEV. (ft): 281.75

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/06/96

DATE COMPLETED: 9/07/96

NORTHING: 116837.01

EASTING: 125870.98

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GM		
25			964559 01SL	GS	N/A	0.6		GP	Gray Poorly Graded GRAVEL (GP), gravelly cuttings with 10% fine grained sand, 5% fines, dry.	
30									*Lithology same as above.*	*2" Sch. 40 PVC* *Volclay Grout*
35										
40										

BORING LOG

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING NUMBER: 3772

BORING DEPTH (ft): 117.2

BORING DIAMETER (in): 7

WELL DEPTH (ft): 117.2

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 278.6

TOP OF CASING ELEV. (ft): 281.75

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/06/96

DATE COMPLETED: 9/07/96

NORTHING: 116837.01

EASTING: 125870.98

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
45								GP		2" Sch. 40 PVC; Volclay Grout
50			984559 02SL	GS	N/A	1.7		GW	Medium Brown Well-Graded to Moderately Graded GRAVEL with Sand (GW/GP), well to moderately graded, 25%+ fine to medium sand, mode approximately 0.5 mm, no fines, damp, no odor.	
55										
60										

BORING LOG

BORING NUMBER: 3772

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.2

BORING DIAMETER (in): 7

WELL DEPTH (ft): 117.2

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 278.6

TOP OF CASING ELEV. (ft): 281.75

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/06/96

DATE COMPLETED: 9/07/96

NORTHING: 116837.01

EASTING: 125870.98

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GW		
65										
70										
75										
80										

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

BORING LOG

BORING NUMBER: 3772

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.2
BORING DIAMETER (in): 7
WELL DEPTH (ft): 117.2
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 278.6
TOP OF CASING ELEV. (ft): 281.75
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/06/96
DATE COMPLETED: 9/07/96
NORTHING: 116837.01
EASTING: 125870.98

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 03SL	GS	N/A	2.0		GW	Medium brown Well-Graded GRAVEL with Sand (GW), 30% subangular fine to medium sand, round gravel diameter up to 40mm, mode approximately .75mm, dry to damp, no odor.	
85										
90									Lithology same as above, moist.	
95										
			964559 04SL	SS	39	2.1		GP	Gray Poorly Graded GRAVEL with Sand (GP), subrounded gravel diameter 4.8 to 35 mm, 15% fine to medium grained sand, poorly graded, dense, moist, no hydrocarbon odor. Granitic and metavolcanic gravels. Grain Size Analysis: 87% gravel, 29% sand, <5% fines	
100										

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: 3772

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.2
BORING DIAMETER (in): 7
WELL DEPTH (ft): 117.2
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 278.6
TOP OF CASING ELEV. (ft): 281.75
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/06/96
DATE COMPLETED: 9/07/96
NORTHING: 116837.01
EASTING: 125870.98

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP		
100			964559 05SL	GS	N/A	2.0			Lithology same as above.	
105								ML	Gray SILT (ML), with 10% fine gravel, low plasticity, low cohesion, damp, no odor.	
110									Increasing moisture in silt.	
								GP-GM	First water encountered at 112 feet then it rose to 103 feet - no unconfined water. Set screen below silt and seal well in confining stratum only. The formation gravel is gray, 4.8 to 30mm, 10-15% silt, poorly graded.	
115									End of boring at 117.2 feet. Boring completed as a groundwater monitoring well.	
120										

2" Sch. 40 PVC
Bentonite chips
2" PVC 0.008" Slotted Screen
#40-60 Prepack

BORING LOG

BORING NUMBER: 3773

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: AlPine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 118

BORING DIAMETER (in): 7

WELL DEPTH (ft): 118

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 281.7

TOP OF CASING ELEV. (ft): 285.20

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/09/96

DATE COMPLETED: 9/10/96

NORTHING: 116979.34

EASTING: 126157.60

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP-GM	Gravelly surface with topsoil.
10			964559 08SL	GS	N/A	2.3			Gray Poorly Graded GRAVEL with Silt and Sand (GP-GM), diameter 4.8 to 20 mm, mode approximately 8mm, 10% fines, 15% sand (fine to coarse), gravels fractured (from drilling) to subrounded, dry, no hydrocarbon odor.
15			964559 07SL	GS	N/A	2.0			Lithology same as above with dark gray gravel - weathered coal, damp, no odor.

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

OU-D 33587

BORING LOG

BORING NUMBER: 3773

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 118

BORING DIAMETER (in): 7

WELL DEPTH (ft): 118

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 281.7

TOP OF CASING ELEV. (ft): 285.20

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/09/96

DATE COMPLETED: 9/10/96

NORTHING: 118979.34

EASTING: 126157.60

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP-GM	
25									
			964559 08SL	GS	N/A	3.1		SW	Medium brown Well-Graded SAND (SW), fine to coarse grained, mode approximately 0.6mm, well graded, with 10% gravel, dry, no odor.
30									
35			964559 08SL	GS	N/A	2.7			Dark brown Well-Graded SAND (SW), <5% gravel, fine to coarse, mode approximately 4.0mm, well graded, rounded to subrounded grains, dry to damp.
40									

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

BORING LOG

BORING NUMBER: 3773

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 118
BORING DIAMETER (in): 7
WELL DEPTH (ft): 118
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.7
TOP OF CASING ELEV. (ft): 285.20
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/09/96
DATE COMPLETED: 9/10/96
NORTHING: 116979.34
EASTING: 126157.80

DEPTH (feet)	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SW		
45			984559 10SL	GS	N/A	2.7		GP	Medium gray Poorly Graded GRAVEL with Sand (GP), diameter 4.8 to 30mm, rounded, 20% fine to coarse grained sand, trace fines, grains fractured during drilling, poorly graded, dry to damp, no odor.	
50										
55			984559 11SL	GS	N/A	2.2			Lithology same as above, no odor.	
60										

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: 3773

CLIENT: USACE

PROJECT NAME: Ft. Richardson – OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 118

BORING DIAMETER (in): 7

WELL DEPTH (ft): 118

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 281.7

TOP OF CASING ELEV. (ft): 285.20

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/09/96

DATE COMPLETED: 9/10/96

NORTHING: 116979.34

EASTING: 126157.60

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP		
65			964559 12SL	GS	N/A	2.2			Medium gray Poorly Graded GRAVEL with Sand (GP), diameter 4.8 to 45mm, subrounded, 15% fine to coarse sand, trace fines, poor to moderately graded, dry to damp, no odor.	
70										
75			964559 13SL	GS	N/A	2.3			Medium gray Poorly Graded GRAVEL with Sand (GP), diameter 4.8 to 45mm, 15% fine to coarse sand, well graded, trace fines, damp, no odor.	
80										

2" Sch. 40 PVC

Volclay Grout

BORING LOG

BORING NUMBER: 3773

CLIENT: USACE
PROJECT NAME: Ft. Richardson - DUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 118
BORING DIAMETER (in): 7
WELL DEPTH (ft): 118
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.7
TOP OF CASING ELEV. (ft): 285.20
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/09/96
DATE COMPLETED: 9/10/96
NORTHING: 116979.34
EASTING: 126157.60

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP		
85			964559 14SL	GS	N/A	2.8		SP	Medium brown Poorly Graded SAND (SP), fine to medium grained, mode approximately 0.5mm, poor to moderately graded, 10% gravel, trace fines, damp, no hydrocarbon odor.	
90										2" Sch. 40 PVC; Vadose Zone
95			964559 15SL	GS	N/A	2.2		GP	Medium gray Poorly Graded GRAVEL with Sand (GP), diameter 4.8 to 50mm, 15% fine to coarse sand, trace fines, damp, no odor.	
100										

OU-D 33591

BORING LOG

BORING NUMBER: 3773

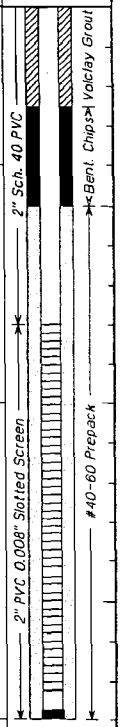
CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 118
BORING DIAMETER (in): 7
WELL DEPTH (ft): 118
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.7
TOP OF CASING ELEV. (ft): 285.20
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/09/96
DATE COMPLETED: 9/10/96
NORTHING: 116979.34
EASTING: 126157.60

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP	
105			964559 16SL	GS	N/A	0.6		ML	Gray SILT (ML), 10% sand, damp to moist. Gray Sandy SILT (ML), with trace clay in bottom foot, interlaminae of fine sand and silt, low plasticity, cohesive, hard, trace gravel, moist to wet, no odor. Grain Size Analysis: 50% silt, 13% clay, 35% sand
			964559 17SL	SS	35	0.5			
110								GW-GM	Gray Well-Graded GRAVEL with Silt and Sand (GW-GM), with 25% sand, 10% silt, well graded, saturated, no odor.
115									
120									End of boring at 118 feet. Boring completed as a groundwater monitoring well.

WELL DIAGRAM



BORING LOG

BORING NUMBER: 3774

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 113

BORING DIAMETER (in): 7

WELL DEPTH (ft): 112

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 281.70

TOP OF CASING ELEV. (ft): 285.24

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/19/96

DATE COMPLETED: 9/19/96

NORTHING: 117363.01

EASTING: 125605.42

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP	Gravelly surface with thin topsoil.
5			964559 22SL	GS	N/A	3.5			Gray Poorly Graded GRAVEL with Sand (GP), poorly graded, diameter 4.8 to 25 mm, rounded, 15-25% fine to coarse sand, dry, no odor.
10									
15			964559 23SL	GS	N/A	1.5			Lithology same as above.
									Encountered a boulder at 16.5 feet.
20									

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

BORING LOG

BORING NUMBER: 3774

CLIENT: USACE

PROJECT NAME: Ft. Richardson – OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 113

BORING DIAMETER (in): 7

WELL DEPTH (ft): 112

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 281.70

TOP OF CASING ELEV. (ft): 285.24

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/19/96

DATE COMPLETED: 9/19/96

NORTHING: 117363.01

EASTING: 125605.42

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP		
25			964559 24SL	GS	N/A	0.0		GW-GM	Gray Well-Graded GRAVEL with Silt (GW-GM), diameter 4.8 to 40 mm, rounded, 10% fine sand, 10-20% fines, non-cohesive, damp, no odor.	
30										
35			964559 25SL	GS	N/A	0.1		GP-GW	Gray Well-Graded to Poorly Graded GRAVEL with Sand (GP/GW), diameter 4.8 to 20 mm, rounded, 20% fine sand, little to no fines, moderately graded, damp, no odor.	
40										

2" Sch. 40 PVC

Volclay Grout

BORING LOG

BORING NUMBER: 3774

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 113
BORING DIAMETER (in): 7
WELL DEPTH (ft): 112
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.70
TOP OF CASING ELEV. (ft): 285.24
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/19/96
DATE COMPLETED: 9/19/96
NORTHING: 117363.01
EASTING: 125605.42

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP-GW		
45			964559 26SL	GS	N/A	0.1			Lithology same as above. no odor.	
50										
55			964559 27SL	GS	N/A	0.1			Lithology same as above. damp. no odor.	
60										

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: 3774

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 113
BORING DIAMETER (in): 7
WELL DEPTH (ft): 112
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.70
TOP OF CASING ELEV. (ft): 285.24
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/19/96
DATE COMPLETED: 9/19/96
NORTHING: 117363.01
EASTING: 125605.42

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP-GW		
65			964559 28SL	GS	N/A	0.1			Lithology same as above, dry to damp, no odor.	
70										
75			964559 29SL	GS	N/A	0.1		GP	Medium gray Poorly Graded GRAVEL with Sand (GP). diameter 4.8 to 25 mm, rounded, uniform, 20-25% fine to medium sand, damp, no odor.	
80										

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: 3774

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 113

BORING DIAMETER (in): 7

WELL DEPTH (ft): 112

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 281.70

TOP OF CASING ELEV. (ft): 285.24

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/19/96

DATE COMPLETED: 9/19/96

NORTHING: 117363.01

EASTING: 125605.42

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP	
								SP	Poorly Graded SAND (SP), medium grained, clean.
85			964559 30SL	GS	N/A	0.0		GP	Medium gray Poorly Graded GRAVEL (GP), uniform, 10-20 mm diameter, rounded. 10% fine to medium sand.
90									
95			964559 31SL	GS	N/A	0.2			Dark gray Poorly Graded GRAVEL with Sand (GP), 10 to 30 mm, with 25% very fine to fine sand, sand is black and appears to be weathered coal, dry, no odor.
100									

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

Bentonite chips

BORING LOG

BORING NUMBER: 3774

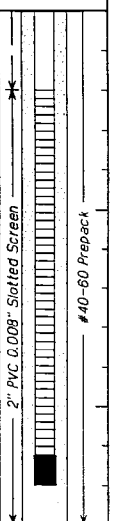
CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 113
BORING DIAMETER (in): 7
WELL DEPTH (ft): 112
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.70
TOP OF CASING ELEV. (ft): 285.24
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/19/96
DATE COMPLETED: 9/19/96
NORTHING: 117363.01
EASTING: 125805.42

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP	
105			964559 32SL	GS	N/A	0.8			Gray Poorly Graded GRAVEL with Sand (GP/SP), 35-65% fine grained sand, gravel diameter 5 to 15 mm, damp to moist, no odor.
									Increasing moisture content.
110			964559 33SL	SS	80	1.8		SW	Medium brown Well-Graded SAND with Gravel (SW), gravel diameter 4.8 to 45mm, fine to coarse sand, sand well graded, grain supported, very dense, saturated, no odor. Grain Size Analysis: 37% gravel, 57% sand, <5% fines
									End of boring at 113 feet. Boring completed as a groundwater monitoring well.
115									
120									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 3775

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6 casing

BORING DEPTH (ft): 112

BORING DIAMETER (in): 7

WELL DEPTH (ft): 111

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 281.6

TOP OF CASING ELEV. (ft): 285.07

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/20/96

DATE COMPLETED: 9/20/96

NORTHING: 117078.32

EASTING: 126233.41

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP	Gravelly surface.	
5			964559 34SL	GS	N/A	1.1			Light gray Poorly Graded GRAVEL with Sand (GP), with sand, poorly graded, gravel diameter 4.8 to 15 mm, fine sand, mode approximately 1 mm, dry, no odor.	
10										2" Sch. 40 PVC; Volclay Grout
15			964559 35SL	GS	N/A	1.0			Lithology same as above, dry, no odor.	
20										

OU-D 33599

BORING LOG

BORING NUMBER: 3775

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6 casing

BORING DEPTH (ft): 112
BORING DIAMETER (in): 7
WELL DEPTH (ft): 111
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.6
TOP OF CASING ELEV. (ft): 285.07
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/20/96
DATE COMPLETED: 9/20/96
NORTHING: 117078.32
EASTING: 126233.41

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP	Black cobble with moisture - appears to be weathered coal.	
25			964559 36SL	GS	N/A	2.3			Dark gray Poorly Graded GRAVEL with Sand (GP), 65% gravel, diameter 4.8 to 25 mm, rounded, poorly graded, 35% fine to coarse sand, well graded sand, damp, no odor.	
30										
35			964559 37SL	GS	N/A	2.4		GW-GM	Medium gray Well-Graded GRAVEL with Silt and Sand (GW-GM), well graded, 65% gravel, diameter 4.8 to 40mm, rounded, 25% fine sand, poorly graded sand, 10% fines, dry to damp, no odor.	
40										

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: 3775

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: AlPine Drilling
METHOD: Air rotary, 6 casing

BORING DEPTH (ft): 112
BORING DIAMETER (in): 7
WELL DEPTH (ft): 111
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.6
TOP OF CASING ELEV. (ft): 285.07
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/20/96
DATE COMPLETED: 9/20/96
NORTHING: 117078.32
EASTING: 128233.41

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GW-GM		
45			964559 38SL	GS	N/A	1.7		GP	Light gray Poorly Graded GRAVEL with Sand (GP), poorly graded, diameter 10 to 25 mm, 15% fine to medium sand, dry, no odor.	
50										
55			964559 39SL	GS	N/A	1.3			Medium brown Poorly Graded GRAVEL with Sand (GP), gravel diameter 10 to 25 mm, rounded, poorly graded, 30% fine to medium sand, mode approximately 1.0 to 1.5 mm, damp, no odor.	
60										

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: 3775

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6 casing

BORING DEPTH (ft): 112
BORING DIAMETER (in): 7
WELL DEPTH (ft): 111
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.6
TOP OF CASING ELEV. (ft): 285.07
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/20/96
DATE COMPLETED: 9/20/96
NORTHING: 117078.32
EASTING: 126233.41

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP	
65			984559 40SL	GS	N/A	1.8		SW	Light brown Well-Graded SAND with Gravel (SW), fine to coarse grained, with 30% gravel, well to moderately graded, damp, no odor.
70									
75			984559 41SL	GS	N/A	2.2		SP	Light brown Poorly Graded SAND (SP), poorly graded, fine to medium grained, mode approximately 0.5 to 1.0 mm, 80% quartz, 20% feldspar, 20% dark, subrounded, damp, no odor.
80									

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

BORING LOG

BORING NUMBER: 3775

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6 casing

BORING DEPTH (ft): 112
BORING DIAMETER (in): 7
WELL DEPTH (ft): 111
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.6
TOP OF CASING ELEV. (ft): 285.07
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/20/96
DATE COMPLETED: 9/20/96
NORTHING: 117078.32
EASTING: 126233.41

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SP	
85			984559 42SL	GS	N/A	1.4		GP-GM	Light gray Poorly Graded GRAVEL with Silt and Sand (GP-GM), 65% gravel, diameter 10 to 25 mm, 25% fine to medium sand, 10% fines, poorly graded, damp, no odor.
90									
95			984559 43SL	GS	N/A				Lithology same as above, dry to damp.
100									

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout; Bent.

BORING LOG

BORING NUMBER: 3775

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6 casing

BORING DEPTH (ft): 112
BORING DIAMETER (in): 7
WELL DEPTH (ft): 111
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 281.6
TOP OF CASING ELEV. (ft): 285.07
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/20/96
DATE COMPLETED: 9/20/96
NORTHING: 117078.32
EASTING: 126233.41

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP-GM	
105			964559 44SL	GS	N/A	2.4			Lithology same as above, dry.
			964559 45SL	GS	N/A	-		GM	Tan Silty GRAVEL (GM), well graded gravel, with 20% silt, 10% fine sand.
110			964559 46SL	SS	185	3.3		GW-GM	Medium brown Well-Graded GRAVEL with Silt and Sand (GW-GM), approximately 20% fractured cobbles, well graded, gravel diameter 4.8 to > 75 mm, fine to coarse sand, approximately 5% fines, very dense, saturated, no hydrocarbon odor. Grain Size Analysis: 48% gravel, 45% sand, 8% fines
									End of boring at 112 feet. Boring completed as a groundwater monitoring well.
115									
120									

WELL DIAGRAM: 2" PVC 0.008" Slotted Screen; #40-60 Prepack

BORING LOG

BORING NUMBER: 3776

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 111

BORING DIAMETER (in): 7

WELL DEPTH (ft): 108.5

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 279.6

TOP OF CASING ELEV. (ft): 282.00

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/21/96

DATE COMPLETED: 9/21/96

NORTHING: 117207.21

EASTING: 125482.62

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP	Thin topsoil surface.
5			984559 47SL	GS	N/A	2.5			Light gray Poorly Graded GRAVEL with Sand (GP), poorly graded, diameter 4.8 to 15 mm, rounded, 20% fine sand, poorly graded sand, damp, no odor.
10									
15									
20									

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

BORING LOG

BORING NUMBER: 3776

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 111
BORING DIAMETER (in): 7
WELL DEPTH (ft): 108.5
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 279.6
TOP OF CASING ELEV. (ft): 282.00
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/21/96
DATE COMPLETED: 9/21/96
NORTHING: 117207.21
EASTING: 125482.62

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
25			984559 48SL	GS	N/A	1.8		GP	Medium gray Poorly Graded GRAVEL with Sand (GP), poorly graded, new drill bit fracturing gravels - cannot tell size, 25% fine to coarse sand, well graded, no fines, damp, no odor.
30									
35			984559 49SL	GS	N/A	1.8			Lithology same as above, dry to damp, no odor.
40									

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

BORING LOG

BORING NUMBER: 3776

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 111

BORING DIAMETER (in): 7

WELL DEPTH (ft): 108.5

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 279.6

TOP OF CASING ELEV. (ft): 282.00

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/21/96

DATE COMPLETED: 9/21/96

NORTHING: 117207.21

EASTING: 125482.62

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP		
45			984559 50SL	GS	N/A	1.4		GW	Medium gray Well-Graded GRAVEL with Sand (GW), well graded, diameter 4.8 to 40 mm, 30% fine to coarse sand, well graded sand, dry to damp, no odor.	
50										2" Sch. 40 PVC; Volclay Grout
55			984559 51SL	GS	N/A	2.0			Lithology same as above, dry to damp, no odor.	
60										

BORING LOG

BORING NUMBER: 3776

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 111
BORING DIAMETER (in): 7
WELL DEPTH (ft): 108.5
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 279.6
TOP OF CASING ELEV. (ft): 282.00
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/21/96
DATE COMPLETED: 9/21/96
NORTHING: 117207.21
EASTING: 125482.62

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GW	
65			964559 52SL	GS	N/A	1.7			Medium gray Well-Graded GRAVEL with Sand (GW), diameter 4.8 to 40 mm, well graded, rounded, 15 to 20% fine to medium sand, damp, no odor.
70									
75			964559 53SL	GS	N/A	2.3		GP	Medium gray Poorly Graded GRAVEL (GP), diameter 4.8 to 20 mm, mode approximately 12 mm, uniform, poorly graded, 10% medium sand, dry, no odor.
80									

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

BORING LOG

BORING NUMBER: 3776

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 111

BORING DIAMETER (in): 7

WELL DEPTH (ft): 108.5

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 279.6

TOP OF CASING ELEV. (ft): 282.00

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/21/96

DATE COMPLETED: 9/21/96

NORTHING: 117207.21

EASTING: 125482.62

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP	
85			984559 54SL	GS	N/A	1.8			Lithology same as above.
90									
95			984559 55SL	GS	N/A	1.3		SP	Medium brown Poorly Graded SAND (SP), poorly graded, uniform, no gravel, fine to medium, mode approximately 0.75 mm, dry to damp, no odor.
100									

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

Bent. chips

#40-60 Prepack

BORING LOG

BORING NUMBER: 3776

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 111
BORING DIAMETER (in): 7
WELL DEPTH (ft): 108.5
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 279.6
TOP OF CASING ELEV. (ft): 282.00
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/21/96
DATE COMPLETED: 9/21/96
NORTHING: 117207.21
EASTING: 125482.62

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
105			964559 61SL	GS	N/A	0.8		SP	Lithology same as above.
			964559 62SL	GS	N/A	1.4		SW	Dark brown Well-Graded GRAVEL (GW), with cobbles, diameter 4.8 to > 70 mm, well graded, wet.
110			964559 63SL	SS	58	2.7			Medium brown Well-Graded SAND with Gravel (SW), with cobbles, well graded, fine to coarse sand, well graded sand, fines, very dense, saturated, no odor. Grain Size Analysis: 35% gravel, 80% sand, 5% fines
									End of boring at 111 feet. Boring completed as a groundwater monitoring well.
115									
120									

WELL DIAGRAM: 2" PVC 0.008" Slotted Screen; #40-60 Prepack

BORING LOG

BORING NUMBER: AP-3779

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75

BORING DEPTH (ft): 52
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 280.5
TOP OF CASING ELEV. (ft): NA
FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/26/96
DATE COMPLETED: 9/26/96
NORTHING: 117,241.03
EASTING: 125,851.41

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			984559 65SL	GS	N/A	1.1		GM	Medium brown Silty GRAVEL with Sand (GM), with cobbles, diameter 4.8 to > 70 mm, rounded, well graded, 20% fine sand, 20% fines, damp, no odor.	
5			984559 66SL	SS	11	1.3		GW-GM	Medium brown Well-graded GRAVEL with Silt (GW-GM), with cobbles, diameter 4.8 to > 70 mm, rounded, medium dense, 10% fine sand, 10% fines, damp, no odor.	
10			984559 67SL	SS	18	1.3			Lithology same as above, dry to damp, no odor.	
15			984559 68SL and 984559 69SL (dup)	SS	35	244			Lithology same as above, moist, gravel size coal, strong diesel odor and contamination.	
20								GM		

OU-D 33611

BORING LOG

BORING NUMBER: AP-3779

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75

BORING DEPTH (ft): 52

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft): 280.5

TOP OF CASING ELEV. (ft): NA

FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 9/26/96

DATE COMPLETED: 9/26/96

NORTHING: 117,241.03

EASTING: 125,851.41

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 70SL	SS	24	50.4		GM	Gray Silty GRAVEL with Sand (GM), diameter 4.8 to > 70 mm, well graded, 20 % fine to coarse sand, 10-20% silt, cohesive silt, medium dense, damp, strong odor.	
25			964559 71SL	SS	23	66.6		SP	Light to medium brown Poorly Graded SAND (SP), moderate grading, predominantly medium sand, mode approximately 1.5 mm, some fine, some coarse, thin laminae of oxidation, 10% gravel, medium dense, damp, diesel odor.	
30			964559 72SL	SS	46	70.4		GW-GM	Medium brown Well-Graded GRAVEL with Silt and Sand (GW-GM), diameter 4.8 to > 70 mm, 25% fine to coarse sand, 10% fines, well graded, dense, damp to moist, weak odor.	
35			964559 73SL	SS	29	1.5			Lithology same as above.	
								SP	Medium brown Poorly Graded SAND (SP), medium grained, mode 1 to 1.5 mm.	
								GW	Medium brown Well-Graded GRAVEL with Sand (GW), 30% sand, well graded, medium dense to dense, gravel size coal, damp, weak odor.	
40								GW-GM		

OU-D 33612

BORING LOG

BORING NUMBER: AP-3779

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75

BORING DEPTH (ft): 52
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 280.5
TOP OF CASING ELEV. (ft): NA
FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/26/96
DATE COMPLETED: 9/26/96
NORTHING: 117,241.03
EASTING: 125,851.41

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 74SL	SS	27	1.7		GW-GM	Medium brown **Well-Graded GRAVEL with Silt and Sand (GW-GM)**, diameter 4.8 to > 70 mm, 25% fine to coarse sand, 10% fines, well graded, medium dense to dense, damp to moist, no odor.	
45			964559 75SL	SS	22	1.4			Lithology same as above, moist.	
50			964559 76SL	SS	32	1.2			Lithology same as above.	
									End of boring at 52 feet.	
55										
60										

BORING LOG

BORING NUMBER: AP-3780

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25" ID HSA

BORING DEPTH (ft): 42

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft): 280.3 msl

TOP OF CASING ELEV. (ft):

FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 9/27/96

DATE COMPLETED: 9/27/96

NORTHING: 117,218.78

EASTING: 125,908.57

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 77SL	SS	8	1.8		SW	Medium brown Well-graded SAND (SW), silty, fine grained sand to pea sized gravel, little gravel to 1 inch diameter, subrounded, one 3 inch blocky gravel at the top, moist.	
5			964559 78SL	SS	5	2.0			Lithology same as above, gravel to 1 inch diameter, subrounded, moist.	
10				SS	24				No recovery.	
15			964559 79SL	SS		250		SP	Light gray Poorly Graded SAND (SP), silty fine to medium grained, little coarse grained sand, little gravel to 1 inch diameter, subrounded, moist, light gray weathered hydrocarbon.	
20								GW		

BORING LOG

BORING NUMBER: AP-3780

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25" ID HSA

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 280.3 msl
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/27/96
DATE COMPLETED: 9/27/96
NORTHING: 117,218.78
EASTING: 125,908.57

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			984559 80SL and 984559 81SL (dup)	SS	35	7.8		GW	Olive gray **Well-graded GRAVEL with Sand (GW)**, silty, fine to coarse grained sand, gravel to 3 inch diameter, blocky, angular, dry. Driller noted rocky drilling to 20 feet.	
25			984559 82SL	SS	47	27.7			Lithology same as above, gravel to 3 inch diameter, flat, angular.	
30			984559 83SL	SS	38	?			Olive gray to yellow/orange, lithology same as above.	
35			984559 84SL	SS	19	1.1		SP	Olive gray to yellow/orange **Poorly Graded SAND (SP)**, medium to coarse grained, lens of pea sized gravel at 35.42 to 35.58 feet, little silty fine sand, little gravel to 2 inch diameter, blocky, subangular to subrounded, wet.	
40								SW		

OU-D 33615

BORING LOG

BORING NUMBER: AP-3780

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25" ID HSA

BORING DEPTH (ft): 42

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft): 280.3 msl

TOP OF CASING ELEV. (ft):

FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 9/27/96

DATE COMPLETED: 9/27/96

NORTHING: 117,218.78

EASTING: 125,908.57

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 85SL	SS	27	2.1		SW	Olive gray **Well-graded SAND with Gravel (SW)**, silty fine to coarse grained, some gravel to 1 inch diameter, blocky, subangular, moist.	
									End of boring at 42 feet.	
45										
50										
55										
60										

BORING LOG

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25 ID HSA

BORING NUMBER: AP-3781

BORING DEPTH (ft): 42

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft): 280.2 msl

TOP OF CASING ELEV. (ft):

FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 9/30/96

DATE COMPLETED: 9/30/96

NORTHING: 117,209.402

EASTING: 125,938.32

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 88SL	SS	8	0.0		SW	Dark brown **Well-graded SAND (SW)**, silty fine to coarse grained, rounded, little gravel to 1 inch diameter, rounded, one piece of 2 inch blocky gravel at the bottom, dry.	
5			964559 87SL	SS	14				Lithology same as above, moist.	
10			964559 88SL	SS	31	0.8		SP	Yellow/orange to olive gray **Poorly Graded SAND with Gravel (SP)**, silty fine sand, some gravel and coarse gravel fragments to 2 inch diameter, blocky, angular, tight, moist.	
15			964559 89SL and 964559 90SL (dup)	SS	36	52.5		SW	Olive gray **Well-graded SAND with Gravel (SW)**, fine to coarse grained, well graded, some gravel to 2 inch diameter, blocky, subrounded, moist. PID reading of 4.0 ppm when spoon opened, slight hydrocarbon odor.	
20										

BORING LOG

BORING NUMBER: AP-3781

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 42

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft): 280.2 msl

TOP OF CASING ELEV. (ft):

FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 9/30/96

DATE COMPLETED: 9/30/96

NORTHING: 117,209.402

EASTING: 125,938.32

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 91SL	SS	29	2.0		SW	Lithology same as above, little silt, moist.	
25			964559 92SL	SS	24	3.7			Lithology same as above.	
30			964559 93SL	SS	24	1.3		SC SW	Yellow/orange to olive gray Clayey SAND (SC), coarse grained sand and pea sized to 1.5 inch diameter gravel, subrounded to rounded, moist. Lithology same as at 25 feet, piece of coal, moist.	
35			964559 94SL	SS	29	1.6			Lithology same as 30.5 to 31.42 foot interval.	
40										

BORING LOG

BORING NUMBER: AP-3781

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 280.2 msl
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/30/96
DATE COMPLETED: 9/30/96
NORTHING: 117,209.402
EASTING: 125,938.32

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			984559 95SL	SS	23	1.0		SW	Lithology same as above, some gravel, angular, some rounded, moist.	
									End of boring at 42 feet.	
45										
50										
55										
60										

BORING LOG

BORING NUMBER: AP-3782

CLIENT: USACE
PROJECT NAME: Ft. Richardson - DUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 52
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 280.8 msl
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK.
DATE STARTED: 10/01/96
DATE COMPLETED: 10/01/96
NORTHING: 117,253.51
EASTING: 125,925.30

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			96455998SL	SS	6	0.3		SW	Light brown to olive gray **Well-graded SAND with Gravel (SW)**, silty fine to coarse grained, some pea sized to 2.5 inch diameter gravel, subrounded, blocky, dry to moist at 0.58 feet.	
5			96455997SL	SS	20	0.8		SP	Dark brown Poorly Graded SAND (SP), fine grained, moist.	
								SW	Dark brown **Well-graded SAND with Gravel (SW)**, fine to coarse grained, some gravel, pea sized to 2 inch diameter, blocky, subrounded and angular dry.	
10			96455998SL	SS	42	54.9			Lithology same as above. Color change from light yellow/orange to yellow/orange and light gray, at 11 ft, slight hydrocarbon odor, moist.	
15			96455999SL	SS	35	1.2			Light yellow/orange as above, little clay, tight, moist.	
20										

BORING LOG

BORING NUMBER: AP-3782

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 52
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 280.8 msl
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 10/01/96
DATE COMPLETED: 10/01/96
NORTHING: 117,253.51
EASTING: 125,925.30

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 100SL and 964559 101SL (dup)	SS	34	2.3		SW	Light olive gray **Well-graded SAND with Gravel (SW)**, silty fine to coarse grained some gravel, to 1.5 inch diameter, angular to subrounded, moist, (one 2.5 inch piece at the top).	
25			964559 102SL	SS	36	8.3			Light olive gray, lithology same as above, gravel to 3 inch diameter, subangular to subrounded, moist.	
30			964559 103SL and 964559 104SL (dup)	SS	29	3.8		SC SP	Olive gray **Clayey SAND with Gravel (SC)**, coarse to medium grained sand, some gravel to 1 inch diameter, rounded, moist. Olive gray **Poorly Graded SAND with Gravel (SP)**, silty medium to coarse sand, little fine sand, little gravel to 1.5 inch diameter, subrounded to rounded, moist to wet. Dry, light gray, fractured gravel at 31.17 feet.	
35			964559 105SL	SS	28	5.0			Light yellow/orange **Poorly Graded SAND (SP)**, medium to coarse grained, some gravel, pea sized (rounded) to 2.5 inches (blocky, angular to subrounded), mode approximately 1 inch diameter, wet.	
40										

BORING LOG

BORING NUMBER: AP-3782

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 52

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft): 280.8 msl

TOP OF CASING ELEV. (ft):

FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 10/01/96

DATE COMPLETED: 10/01/96

NORTHING: 117,253.51

EASTING: 125,925.30

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			984559 108SL	SS	34	1.8		SP	Light yellow/orange to olive gray **Poorly Graded SAND** (SP), medium grained, little coarse grained sand, little gravel to 2 inch diameter, subrounded, wet.	
45			984559 107SL	SS	57	2.1			Olive gray **Poorly Graded SAND with Gravel** (SP), medium to coarse grained, pea sized gravel, subrounded to rounded, little gravel 1 to 2 inch diameters, subrounded, wet.	
50			984559 108SL	SS	80	3.4			Olive gray **Poorly Graded SAND with Gravel** (SP), medium to coarse grained, some gravel pea sized (rounded) to 2.5 inch diameter, blocky, angular (similar to above, large cobbles interbedded).	
									End of boring at 52 feet.	
55										
60										

BORING LOG

BORING NUMBER: AP-3783

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 27
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 281.2 msl
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 10/01/98
DATE COMPLETED: 10/01/98
NORTHING: 117,213.20
EASTING: 126,024.37

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 108SL	SS	2	2.2		SW	Dark brown **Well-graded SAND with Gravel (SW)**, silty fine to medium grained, some coarse sand and pea sized gravel, trace 2 inch gravel, rounded, wet.	
5			964559 110SL	SS	15	1.8			Dark brown **Well-graded SAND with Gravel (SW)**, silty fine to coarse grained, some gravel to 1.5 inch diameter, subrounded, moist.	
10			964559 111SL and 964559 112SL (dup)	SS	25	372.2		SP	Yellow/orange to olive gray **Poorly Graded SAND (SP)**, silty fine to medium grained, little gravel to 1 inch diameter, subrounded, trace 2 inch gravel, blocky, angular, moist to wet. Lithology same as above, light gray, possibly weathered product, strong hydrocarbon odor.	
15			964559 113SL	SS	63	2.8		SW	Yellow/orange to olive gray **Well-graded SAND with Gravel (SW)**, clayey, fine to coarse grained, some gravel to 1 inch diameter, subrounded, moist. Light gray, large, blocky gravel to 2 inch diameter, angular, occurs at 10.9 to 11 feet and at 11.2 to 11.4 feet, these are fractured and dry.	
20										

OU-D

33623

BORING LOG

BORING NUMBER: AP-3783

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 27
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 281.2 msl
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 10/01/96
DATE COMPLETED: 10/01/96
NORTHING: 117,213.20
EASTING: 126,024.37

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 114SL	SS	25	1.9		SW	Yellow/orange to olive gray **Well-graded SAND with Gravel (SW)**, clayey, fine to coarse grained, some gravel 1/4 to 2 inch diameters, angular, moist. One inch "clump" of yellow/orange silt, dense, dry, occurs at 20.83 feet.	
25			964559 115SL	SS	35	0.5		SP	Yellow/orange to olive gray **Poorly Graded SAND with Gravel (SP)**, clayey, coarse to medium grained, some gravel to 2 inch diameter, rounded, moist, blocks of light gray gravel at 25.58 to 25.75 feet, and again at 26.08 to 26.25 feet, dry.	
									End of boring at 27 feet.	
30										
35										
40										

BORING LOG

BORING NUMBER: AP-3784

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 37

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft): 280.3 msl

TOP OF CASING ELEV. (ft):

FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 10/02/96

DATE COMPLETED: 10/02/96

NORTHING: 117,072.75

EASTING: 125,977.04

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 116SL	SS	8	0.7		SP	Dark brown **Poorly Graded SAND with Gravel (SP)**, silty fine to medium grained, some pea sized gravel to 2 inch diameter, subangular to subrounded, trace roots, dry.	
5			964559 117SL	SS	38	2.7		SW	Yellow/orange **Well-graded SAND (SW)**, silty, fine to coarse grained, little gravel to 2 inch diameter, angular, dry to moist.	
10			964559 118SL and 964559 119SL (dup)	SS	30	4.3			Lithology same as above, tight.	
15			964559 120SL	SS	34	5.6		SP	Light yellow/orange **Poorly Graded SAND with Gravel (SP)**, clayey, medium to coarse grained, some gravel 3/4 to 2 inch diameter, subrounded to subangular, some fine sand in bottom 7 inches. 15 to 15.33 feet wet, 15.33 to 16.5 feet moist.	
20								SW		

BORING LOG

BORING NUMBER: AP-3784

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 37
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft): 280.3 msl
TOP OF CASING ELEV. (ft):
FIELD PARTY: C. Pelz

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 10/02/96
DATE COMPLETED: 10/02/96
NORTHING: 117,072.75
EASTING: 125,977.04

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			964559 121SL	SS	28	3.8		SW	Yellow/orange to olive gray **Well-graded SAND (SW)**, clayey, fine to coarse grained, little gravel to 1-1/2 inch diameter, subrounded to subangular, trace cobbles to 4 inch diameter, subrounded, moist. Lens of clayey pea sized gravel 1/4 to 1/2 inch diameters, subrounded.	
25			964559 122SL	SS	32	1.9			Light yellow/orange **Well-graded SAND with Gravel (SW)**, clayey, fine to coarse grained, some gravel mostly pea sized; 1/4 (rounded) to 1-1/2 inch (subrounded), trace cobbles, blocky, angular, moist.	
30			964559 123SL	SS	29	2.2		SP	Yellow/orange to olive gray **Poorly Graded SAND (SP)**, clayey, coarse to medium grained, little gravel to 2-inch diameter, subrounded to subangular, moist. Lithology same as above, fine sand at 31 to 31.33 feet, subrounded to subangular gravel to 2-inch diameter, moist.	
35			964559 124SL	SS	36	2.3			Yellow/orange to olive gray **Poorly Graded SAND with Gravel (SP)**, clayey, fine to medium grained, some gravel to 1-inch diameter, subrounded, one cobble (3 inches), flat, subrounded, moist.	
									End of boring at 37 feet.	
40										

BORING LOG

BORING NUMBER: AP3789

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.5

BORING DIAMETER (in): 7

WELL DEPTH (ft): 117.5

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 285.4

TOP OF CASING ELEV. (ft): 288.65

FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/30/97

DATE COMPLETED: 1/31/97

NORTHING: 116939.27

EASTING: 126732.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
0								GP	Brown Poorly Graded GRAVEL with Sand (GP), gravel to 1 inch, subangular to subrounded, and fine to medium sand, dry.
10			974559 155SL	GS	N/A	1.0		SP	Light olive gray Poorly Graded SAND with Gravel (SP), coarse sand (little fine sand), and gravel 1/4-3/4 inch diameter, angular, dry to slightly moist.
20								GP	

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

BORING LOG

BORING NUMBER: AP3789

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.5
BORING DIAMETER (in): 7
WELL DEPTH (ft): 117.5
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 285.4
TOP OF CASING ELEV. (ft): 288.65
FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/30/97
DATE COMPLETED: 1/31/97
NORTHING: 116939.27
EASTING: 126732.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			974559 156SL	GS	N/A	1.2		GP	Light olive gray to medium light gray Poorly Graded GRAVEL with Sand (GP), subrounded and angular (possibly fractured from drilling), some coarse to medium sand, angular to subrounded, trace fines, dry.	
25										
30			974559 157SL	GS	N/A	1.0		SP	Olive gray Poorly Graded SAND with Gravel (SP), medium sand, little fine sand, trace fines, some gravel mostly 3/4 inch diameter, ranges from 1/4 to 1 inch diameters, subangular to subrounded, moist.	
35										
40										

2" Sch. 40 PVC
Volclay Grout

OU-D 33628

BORING LOG

BORING NUMBER: AP3789

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OU0
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.5
BORING DIAMETER (in): 7
WELL DEPTH (ft): 117.5
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 285.4
TOP OF CASING ELEV. (ft): 288.65
FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/30/97
DATE COMPLETED: 1/31/97
NORTHING: 116939.27
EASTING: 126732.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			974559 158SL	GS	N/A	1.2		SP	Lithology same as above, moist.	
45										
50			974559 159SL	GS	N/A	1.2			Light gray Poorly Graded SAND with Gravel (SP), coarse sand and gravel to 3/4 inch diameter, looks like crushed stone, angular, dry.	
55										
60										

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

OU-D 33629

BORING LOG

BORING NUMBER: AP3789

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.5
BORING DIAMETER (in): 7
WELL DEPTH (ft): 117.5
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 285.4
TOP OF CASING ELEV. (ft): 288.65
FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/30/97
DATE COMPLETED: 1/31/97
NORTHING: 116939.27
EASTING: 126732.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			974559 160SL	GS	N/A	1.4		SP	Olive gray Poorly Graded SAND (SP), fine to medium sand, trace coarse sand, dry.	
65										
70			974559 161SL	GS	N/A	1.8		GP	Well-Graded GRAVEL with Sand (GW) gravel to 1-1/2 inch diameter, angular and rounded, well graded, and fine to medium sand, well graded, dry.	
75										
80										

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: AP3789

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.5

BORING DIAMETER (in): 7

WELL DEPTH (ft): 117.5

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 285.4

TOP OF CASING ELEV. (ft): 288.65

FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/30/97

DATE COMPLETED: 1/31/97

NORTHING: 116939.27

EASTING: 126732.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			974559 182SL	GS	N/A	1.6		GP	Olive gray Poorly Graded GRAVEL with Sand (GP), fine gravel 1/4 to 1/2 inch diameter, subangular to subrounded, and fine to medium sand, dry.	2" Sch. 40 PVC; Volclay Grout
90			974559 183SL	GS	N/A	2.2			Olive gray Poorly Graded GRAVEL with Sand (GP), gravel to 1 inch diameter, subangular, poorly graded, and fine to medium sand, little coarse sand, moist.	
95								ML	Clumps of dark gray fine sandy silt, moist, in cuttings at 96 feet.	
100								SM		

BORING LOG

BORING NUMBER: AP3789

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 117.5
BORING DIAMETER (in): 7
WELL DEPTH (ft): 117.5
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 285.4
TOP OF CASING ELEV. (ft): 288.65
FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/30/97
DATE COMPLETED: 1/31/97
NORTHING: 116939.27
EASTING: 126732.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
105			974559 184SL	GS	N/A	0.8		SM	Dark gray **Silty SAND with GRAVEL (SM)**, silty fine sand, little gravel to 3/4 inch diameter, subangular, poorly graded, clumps of silt (almost looks like fine gravel, rounded - but can break apart), moist. Boulder from approximately 101 to 103.5 ft bgs.
110			974559 185SL	GS	N/A	0.0		GW	Light gray **Well-Graded GRAVEL (GW)**, gravel to 1 inch, well graded, subangular to subrounded, some apparently broken by roller bit, dry. Encountered water during drilling at approximately 112 feet.
115			974559 186SL	SS	137/ 10"	0		GP	Light olive gray **Poorly Graded GRAVEL with Sand (GP)**, subrounded gravel to 1 inch diameter, poorly graded, couple of blocky, subrounded pieces to 2-1/2 inches, and fine to medium sand, some coarse sand in bottom 3 inches, trace silt, dense, saturated. **Grain Size Analysis: 66% gravel, 33% sand, 3% fines** Drilled to 117.5 feet, cuttings gravel up to 2 inches, subrounded, wet. No indication of any silt unit.
120									End of boring at 117.5 feet. Boring completed as a groundwater monitoring well.

WELL DIAGRAM: 2" Sch. 40 PVC; 2" PVC 0.008" Slotted Screen; #40-60 Prepack; Bent. chips; Volclay Grout

OU-D

33632

BORING LOG

BORING NUMBER: AP3790

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 80.5

BORING DIAMETER (in): 7

WELL DEPTH (ft):

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 292.2

TOP OF CASING ELEV. (ft): 294.98

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 2/1/97

DATE COMPLETED: 2/3/97

NORTHING: 117076.33

EASTING: 127493.77

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SM	Grass surface - dark brown Silty SAND (SM), fine sand, dry.
5								GW	Well-Graded GRAVEL (GW), diameter to 2 inch, subrounded to subangular, well graded, dry, cuttings (visual on cuttings).
10			974559 187SL	GS	N/A	0.0		SP	Dark gray and olive gray Poorly Graded SAND with Gravel (SP), coarse sand and gravel angular to 1 inch, well graded, dry, fragments from drilling (?).
15									
20								SW	

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

OU-D 33633

BORING LOG

BORING NUMBER: AP3790

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 80.5
BORING DIAMETER (in): 7
WELL DEPTH (ft):
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 292.2
TOP OF CASING ELEV. (ft): 294.98
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 2/1/97
DATE COMPLETED: 2/3/97
NORTHING: 117076.33
EASTING: 127493.77

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			974558 188SL	GS	N/A	0.8		SW	Lithology similar to above, fine to coarse sand, well graded. Well-Graded SAND with Gravel (SW), dry.	
25										
30			974559 189SL	GS	N/A	0.5		SP-SM	Olive gray Poorly Graded SAND with Silt and Gravel (SP-SM), medium to coarse sand, little silt, and gravel to 1 inch, angular, 1/4-1/2 inch subrounded, well graded, moist.	
35										
40								SP		

2" Sch. 40 PVC
Volclay Grout

OU-D 33634

BORING LOG

BORING NUMBER: AP3790

CLIENT: USACE
PROJECT NAME: Ft. Richardson ~ OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 80.5
BORING DIAMETER (in): 7
WELL DEPTH (ft):
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 292.2
TOP OF CASING ELEV. (ft): 294.98
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 2/1/97
DATE COMPLETED: 2/3/97
NORTHING: 117076.33
EASTING: 127493.77

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
45			974559 170SL	GS	N/A	94.2*		SP	Olive gray Poorly Graded SAND (SP), fine to medium sand, trace gravel to 1/2 inch diameter, subangular to subrounded, dry to moist.
50			974559 171SL	GS	N/A	94.4*		GW	Olive gray Well-Graded GRAVEL with Sand (GW), gravel fine to 1-1/2 inch, subangular to subrounded, well graded, and medium sand, dry to moist.
55									
60								SW	

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

OU-D

33635

BORING LOG

BORING NUMBER: AP3790

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 80.5
BORING DIAMETER (in): 7
WELL DEPTH (ft):
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 292.2
TOP OF CASING ELEV. (ft): 294.98
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 2/1/97
DATE COMPLETED: 2/3/97
NORTHING: 117076.33
EASTING: 127493.77

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
			974559 172SL	GS	N/A	0.0		SW	Olive gray **Well-Graded SAND with Gravel (SW)**, fine to coarse sand, well graded, some fine gravel to 3/4 inch diameter, angular to subangular, dry.
65									
70			974559 173SL	GS	N/A	0.0		GP	Olive gray **Poorly Graded GRAVEL with Sand (GP)**, fine gravel to 3/4 inch, subrounded to subangular, some possibly fractured by drilling, little fine to medium sand, dry.
▽75									Measured water level at 75 feet.
			974559 174SL	GS	N/A	0.0		SP-SM	**Poorly Graded SAND with Silt (SP-SM)**, fine sand cuttings, gravel approximately 1 inch, little fines.
			974559 175SL	SS	183	0		ML	Olive brown **SILT with Sand (ML)**, fine sand grading to very fine to fine sand, with interlaminae of clay, tight, dry. Color change to Olive gray in shoe - silt, little fine sand, dry. **Grain Size Analysis: 65% silt, 10% clay, 26% sand**
80									

WELL DIAGRAM

2" Sch. 40 PVC
Bentonite chips
2" PVC 0.008" Slotted Screen
#40-60 Prepack

BORING LOG

BORING NUMBER: AP3790

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 80.5

BORING DIAMETER (in): 7

WELL DEPTH (ft):

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 292.2

TOP OF CASING ELEV. (ft): 294.98

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 2/1/97

DATE COMPLETED: 2/3/97

NORTHING: 117076.33

EASTING: 127493.77

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								ML	End of boring at 80.5 feet. Boring completed as a groundwater monitoring well. ** Questionable PID reading.	
85										
90										
95										
100										

BORING LOG

BORING NUMBER: AP3864

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 704

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 42

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft):

TOP OF CASING ELEV. (ft):

FIELD PARTY: M. Field

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 9/30/97

DATE COMPLETED: 9/30/97

NORTHING: 116,999.67

EASTING: 128,142.98

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GW	Drilled ahead to 5 ft bgs - ground surface was disturbed during uncove ring of drywell.	
5			97B704 001SL	SS	12	1.8			Dark brown Well Graded GRAVEL with Sand (GW), gravels 1/4" to 2", well graded, subrounded, and medium to coarse sand, some silt in top 6", moist.	
						1.8			***Resampled interval 10/1/97 and submitted for analyses*** Not enough in 1st spoon; drove additional spoon.	
10			97B704 002SL	SS	28	0.8			Yellowish-orange, lithology as above, moist.	
						27.4*			***Resampled interval 10/1/97 and submitted for analyses***	
15			97B704 003SL and 97B704 012SL (dup)	SS	36	0.0			Yellowish-orange to greenish gray at 12", lithology as above, moist.	
20										

OU-D 33638

BORING LOG

BORING NUMBER: AP3864

CLIENT: USACE
PROJECT NAME: Ft. Richardson – OUD
SITE: 704
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/30/97
DATE COMPLETED: 9/30/97
NORTHING: 116,999.67
EASTING: 128,142.98

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B704 004SL	SS	40	0		GW	Yellowish-orange, lithology same as above, bits of coal, moist.	
25			97B704 005SL and 97B704 009SL	SS	33	0			Yellowish-orange, lithology similar to above, increased amount of gravels, sizes at 1" and 3", blocky, poorly graded.	
30			97B704 006SL and 97B704 010SL	SS	33	0			Same lithology as above, gravels to 2", moist. Large chunk of coal at 6".	
								SP-SM	Yellowish-orange Poorly Graded SAND with Silt and Gravel (SP-SM), medium sand, and gravel at 1/2" and 2", subrounded, poorly graded, little silt, moist.	
								GW-GM		
35			97B704 007SL	SS	49	0			Yellowish-orange Well Graded GRAVEL with Silt and Sand (GW-GM), gravels 1/2" to 2", subrounded, blocky, well graded, and medium to coarse sand, little silt, moist.	
40								SP-SM		

BORING LOG

BORING NUMBER: AP3864

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 704
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 42
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/30/97
DATE COMPLETED: 9/30/97
NORTHING: 116,999.67
EASTING: 128,142.98

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B704 008SL	SS	55	0		SP-SM GW-GM	Yellowish-orange Poorly Graded SAND with Silt and Gravel (SP-SM), coarse sand, and gravel to 1", subrounded.	
									Lithology similar to 35' interval.	
									Bottom of auger hole at 40 ft bgs, last sample at 40-42 ft bgs.	
45										
50										
55										
60										

OU-D 33640

BORING LOG

BORING NUMBER: AP3870

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 120
BORING DIAMETER (in): 7
WELL DEPTH (ft): 107
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 275.1
TOP OF CASING ELEV. (ft): 277.98
FIELD PARTY: T. Barrett

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/8/98
DATE COMPLETED: 1/12/98
NORTHING: 117395.23
EASTING: 124922.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
0								GW	Well-graded GRAVEL with Sand (GW), subrounded to angular gravel, sand grains have silt coating, less than 10% fines, moist, no odor.	2" Sch. 40 PVC; Volclay Grout
5								GW-GM		
10			984559 001SL and 984559 002SL	GS		0.1			Well-graded GRAVEL with Silt and Sand (GW-GM), gravel is subrounded to rounded basalt to 3/4" diameter, with weathering rind 1/8" to 1/4" thick. Sand made up of basalt, quartz, some Kspar, rounded to subrounded, silt coating on grains. Some dark gray organic sandy silt clasts, no odor, moist. Grain Size Analysis: 51% Gravel, 41% Sand, 7% fines.	
15								SW-SM		
20				GS		NR				

BORING LOG

BORING NUMBER: AP3870

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE. 45-590

JOB NUMBER: 9000-107

LOGGED BY: C. Basye APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 120

BORING DIAMETER (in): 7

WELL DEPTH (ft): 107

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 275.1

TOP OF CASING ELEV. (ft): 277.98

FIELD PARTY: T. Barrett

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/8/98

DATE COMPLETED: 1/12/98

NORTHING: 117395.23

EASTING: 124922.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SW-SM	Dark gray/black **Well-graded SAND with Silt (SW-SM)**, sand with silt clasts, 50% angular/subangular, 50% subrounded, moist, no odor.	
				GS		NR		GW	**Well-graded GRAVEL (GW)**, gravel with minor sand, gravel up to 1 1/2 in. diameter, 1/8 in. weathering rind, fine grained dark basalt, quartz veins, moist.	
25										
30			984559 003SL and 984559 004SL	GS		0.2			Lithology similar to above.	
35								GP-GM		
40			984559 005SL and 984559 006SL	GS		0.0				

2" Sch. 40 PVC

Volclay Grout

BORING LOG

BORING NUMBER: AP3870

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: C. Basye APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 120

BORING DIAMETER (in): 7

WELL DEPTH (ft): 107

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 275.1

TOP OF CASING ELEV. (ft): 277.98

FIELD PARTY: T. Barrett

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/8/98

DATE COMPLETED: 1/12/98

NORTHING: 117395.23

EASTING: 124922.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP-GM	Dark gray **Poorly Graded GRAVEL with Silt and Sand (GP-GM)**, 1/4 in. to 1/2 in. diameter pea gravel, with sand and little silt, moist, no odor.
								SM	**Silty SAND with Gravel (SM)**, finer pea gravel to 1/2 in. diameter, some sand, dark gray to black matrix, grain supported, basalt, moist, no odor.
45				GS		NR			Lithology similar to above.
								SP	
50			984558 007SL and 984559 008SL	GS		0.0			**Poorly Graded SAND (SP)**, Sand, reworked, poorly graded (well sorted), minor (<10%) gravel, 50% quartz grains, some basalt and other grains, moist, no odor. Increasing gravel content with depth (up to 50%).
55								SW	
60			984559 009SL and 984559 010SL	GS		0.1			

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

BORING LOG

BORING NUMBER: AP3870

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 120
BORING DIAMETER (in): 7
WELL DEPTH (ft): 107
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 275.1
TOP OF CASING ELEV. (ft): 277.98
FIELD PARTY: T. Barrett

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/8/98
DATE COMPLETED: 1/12/98
NORTHING: 117395.23
EASTING: 124922.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SW	**Well-graded SAND (SW).** Gravelly sand, minor silt, greater than 50%, quartz grains angular to subangular, basalt subangular to subrounded, some limonite staining, gravel approximately 25%, sand approximately 75%.	
				GS		NR		GW	Well-graded GRAVEL (GW), gravel much darker, coated with organics (?), moist, spongy coating.	
65				GS		NR			Gray to dark gray gravel with sand.	
								SW		
70				GS		NR			**Well-graded SAND with Gravel (SW),** sand to gravelly sand, sand with quartz, some arkosic grains, gravel is subrounded to subangular, with little angular to 3/4 in. diameter, mostly basalt, with 1/8 in. rind, moist, no odor.	
75								GW		
80			984559 011SL and 984559 012SL	GS		0.1				

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: AP3870

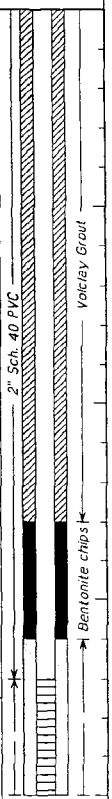
CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 120
BORING DIAMETER (in): 7
WELL DEPTH (ft): 107
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 275.1
TOP OF CASING ELEV. (ft): 277.98
FIELD PARTY: T. Barrett

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/8/98
DATE COMPLETED: 1/12/98
NORTHING: 117395.23
EASTING: 124922.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GW	Well-graded GRAVEL with Sand (GW), fine to medium sandy gravel. Gravel is angular to subangular, to 3/4 in. diameter, quartzite and basalt. Sand is angular to subrounded, approximately 50% quartz, some Kspar, quartzite, basalt, argillic weathering, some clay coatings only on grains, moist.
85									
90				GS		NR			Well-graded GRAVEL with Sand (GW), gravel to 3/4 in. diameter, pea gravel, with coarse grained sand, moist.
95									
			984559 013SL and 984559 014SL	GS		0.0		SW	Well-graded SAND with Gravel (SW), gravelly sand to sandy gravel, subangular to subrounded grains, >50% arkosic grains with quartz, moist. Grain Size Analysis: 52% Gravel, 46% Sand, <1% Fines.
100				GS		0.3			

WELL DIAGRAM



BORING LOG

BORING NUMBER: AP3870

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 120
BORING DIAMETER (in): 7
WELL DEPTH (ft): 107
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 275.1
TOP OF CASING ELEV. (ft): 277.98
FIELD PARTY: T. Barrett

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/8/98
DATE COMPLETED: 1/12/98
NORTHING: 117395.23
EASTING: 124922.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
100								SW	**Well-graded SAND with Gravel (SW),** 80% sand, 20% gravel, minor silt, gravel is angular to subangular, quartzite, basalt, limonite, granite, sand is angular to subrounded with significant silt, quartz, quartzite, basalt, moist, no odor.
								GP	Hit water at 102 ft - drive sample from 106 to 108 ft.
105			984559 015SL	SS	70/ 9"	NR			**Well-graded GRAVEL with Sand (GP),** gravel/cobbles in bottom, fining upward, fine to medium sand at top, minor silt, saturated.
110									
115									Boring advanced to 120 ft bgs. Completed as groundwater monitoring well.
120									

WELL DIAGRAM

2" PVC 0.008" Slotted Screen

#40-60 Prepack, #10-20 Outer Pack

OU-D 33646

BORING LOG

BORING NUMBER: AP3871

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. ShaPiro APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 122

BORING DIAMETER (in): 7

WELL DEPTH (ft): 118

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 287.7

TOP OF CASING ELEV. (ft): 289.46

FIELD PARTY: C. Basye

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 01/13/98

DATE COMPLETED: 01/14/98

NORTHING: 117798.10

EASTING: 126198.99

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
10			984559 023SL	SS	38	NA		SW	Light brown **well-graded SAND with Gravel (SW)**, fine to coarse sand, some gravel, predominantly 3/4" diameter, subangular to subrounded, few large pieces (2" to 3" diameter), subangular, dry to moist.	2" Sch. 40 PVC; Volclay Grout
15								SP-SM		
20			984559 024SL	SS	58	0.8				

BORING LOG

BORING NUMBER: AP3871

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 122
BORING DIAMETER (in): 7
WELL DEPTH (ft): 118
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 287.7
TOP OF CASING ELEV. (ft): 289.46
FIELD PARTY: C. Basye

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 01/13/98
DATE COMPLETED: 01/14/98
NORTHING: 117798.10
EASTING: 126198.99

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SP-SM	Yellowish-orange Poorly graded SAND with Silt and Gravel (SP-SM), medium to coarse sand, some gravel, 1/4" to 2" diameter, subrounded, poorly graded, little fines (mostly silt, little clay), moist to wet.	2" Sch. 40 PVC; Volclay Grout
25										
30			984559 025SL	SS	88	0.7			Olive gray and yellowish-orange Poorly Graded SAND with Silt and Gravel (SP-SM), medium to coarse sand, and gravel, mostly 1/4" diameter, few to 2" diameter, subanguiar to subrounded, poorly graded, little fines, moist to wet.	
35								SW-SM		
40			984559 026SL	SS	23	0.1				

BORING LOG

BORING NUMBER: AP3871

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 122

BORING DIAMETER (in): 7

WELL DEPTH (ft): 118

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 287.7

TOP OF CASING ELEV. (ft): 289.46

FIELD PARTY: C. Basye

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 01/13/98

DATE COMPLETED: 01/14/98

NORTHING: 117798.10

EASTING: 126198.99

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SW-SM	Yellowish-orange and olive gray **well-graded SAND with Silt and Gravel (SW-SM)**, fine to coarse sand, some gravel, mostly 1/4" to 1/2" diameter, subrounded, few to 1 1/2" diameter, subrounded, little silt, wet.	2" Sch. 40 PVC; Volclay Grout
45										
50			984559 027SL	SS	52	0.2			Lithology similar to above, increased fine gravel content, wet.	
55										
60								SP		

BORING LOG

BORING NUMBER: AP3871

CLIENT: USACE
PROJECT NAME: Ft. Richardson OUD
SITE: 45-690
JOB NUMBER: 9000-107
LOGGED BY: J. Shadiro APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 122
BORING DIAMETER (in): 7
WELL DEPTH (ft): 118
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 287.7
TOP OF CASING ELEV. (ft): 289.46
FIELD PARTY: C. Basye

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 01/13/98
DATE COMPLETED: 01/14/98
NORTHING: 117798.10
EASTING: 126198.99

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SP		
65										
70			98455902 8SL	SS	65	3.8			Olive gray Poorly Graded SAND with Gravel (SP), fine to medium sand, little coarse sand, some gravel, 1/2" to 2" diameter, subangular to subrounded, well graded, one piece of 3" diameter, flat, quartzite at bottom (cored by sampler), moist to wet.	
75										
80								SW-GM		

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: AP3871

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 122

BORING DIAMETER (in): 7

WELL DEPTH (ft): 118

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 287.7

TOP OF CASING ELEV. (ft): 289.46

FIELD PARTY: C. Basye

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 01/13/98

DATE COMPLETED: 01/14/98

NORTHING: 117798.10

EASTING: 126198.99

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
85								GW-GM		2" Sch. 40 PVC; Volclay Grout
90			984559 032SL	SS	107	0.5			Olive gray **Well-graded GRAVEL with Silt and Sand (GW-GM)**, gravel, 1/4" to 2" diameter, angular, subangular and subrounded, well graded, some fine to coarse sand, little silt, dry.	
95										
100										

BORING LOG

BORING NUMBER: AP3871

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-167
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 122
BORING DIAMETER (in): 7
WELL DEPTH (ft): 118
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 287.7
TOP OF CASING ELEV. (ft): 289.46
FIELD PARTY: C. Basye

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 01/13/98
DATE COMPLETED: 01/14/98
NORTHING: 117798.10
EASTING: 126198.99

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
105								GW-GM	
110									
115			984559 033SL	SS	132	0.4			Lithology similar to above, gravels mostly 1" diameter, subrounded, poorly graded, wet.
120									

WELL DIAGRAM: 2" Sch. 40 PVC; Bent. chips; 2" PVC 0.008" Slotted Screen; #40-60 Prepack, #10-20 outer pack

OU-D 33652

BORING LOG

BORING NUMBER: AP3871

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 122
BORING DIAMETER (in): 7
WELL DEPTH (ft): 118
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 287.7
TOP OF CASING ELEV. (ft): 289.46
FIELD PARTY: C. Basye

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 01/13/98
DATE COMPLETED: 01/14/98
NORTHING: 117798.10
EASTING: 126198.99

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GW-GM		
									Borehole advanced to 122 ft bgs, completed as monitoring well.	
125										
130										
135										
140										

BORING LOG

BORING NUMBER: AP3872

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: C. Basye APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 125

BORING DIAMETER (in): 7

WELL DEPTH (ft): 120

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 289.6

TOP OF CASING ELEV. (ft): 292.77

FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/16/98

DATE COMPLETED: 1/17/98

NORTHING: 117891.79

EASTING: 126705.84

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SM	
10			984559 042SL	SS	44	0.2			Olive gray/light brown Silty SAND with Gravel (SM), silty fine to medium sand, well graded, some gravel, subrounded to subangular, well graded, minor clay, little cohesion, moist.
20			984559 043SL	SS	34	0.5			

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

BORING LOG

BORING NUMBER: AP3872

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 125
BORING DIAMETER (in): 7
WELL DEPTH (ft): 120
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 289.6
TOP OF CASING ELEV. (ft): 292.77
FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/16/98
DATE COMPLETED: 1/17/98
NORTHING: 117891.79
EASTING: 126705.84

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SM	Silty SAND with Gravel (SM), silty sand, well graded, some gravel, increasing clay content, clayey intervals, coaly, limonite staining, some cohesion in clayey zones, moist.	
								GW	Grades to Well-graded GRAVEL (GW), primarily subrounded to subangular, well graded, from 1/4 in. to 1 1/2 in. diameter.	
25								GM		
30			984559 044SL	SS	96	0.3			Gray/brown Silty GRAVEL with Sand (GM), well graded silty gravel, subangular to subrounded clasts, iron stains, cobbles in shoe, some sand, moist, no odor.	2" Sch. 40 PVC / Volclay Grout
35										
40			984559 045SL	SS	53	0.2				

BORING LOG

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: C. Basye APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING NUMBER: AP3872

BORING DEPTH (ft): 125

BORING DIAMETER (in): 7

WELL DEPTH (ft): 120

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 289.6

TOP OF CASING ELEV. (ft): 292.77

FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/16/98

DATE COMPLETED: 1/17/98

NORTHING: 11789.79

EASTING: 126705.84

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
45								GM	Light brown/olive gray Silty GRAVEL with Sand (GM), gravel angular to subangular with cobbles, coaly clasts, limonite stains, gravel is gap graded to 1/4 in. then 1 in. and above, wood particles, abundant silt, moist.
50			984559 046SL	SS	83	NR			Silty GRAVEL with sand (GM), gravel from 1/4 in. to 3/8 in, suban gular to subrounded, some silty sand, grain supported, moist.
55									
60								GW-GM	

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

BORING LOG

BORING NUMBER: AP3872

CLIENT: USACE
PROJECT NAME: Ft. Richardson – OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 125
BORING DIAMETER (in): 7
WELL DEPTH (ft): 120
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 289.6
TOP OF CASING ELEV. (ft): 292.77
FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/16/98
DATE COMPLETED: 1/17/98
NORTHING: 117891.79
EASTING: 126705.84

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
65								GW-GM		2" Sch. 40 PVC; Volclay Grout
70			984559 047SL	SS	88	NR			Olive gray Well-graded GRAVEL with Silt (GW-GM), well graded gravel, angular to subrounded, some sand, significant fines, moist.	
75										
80								SP-SM		

BORING LOG

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: C. Basye APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING NUMBER: AP3872

BORING DEPTH (ft): 125

BORING DIAMETER (in): 7

WELL DEPTH (ft): 120

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 289.6

TOP OF CASING ELEV. (ft): 292.77

FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/16/98

DATE COMPLETED: 1/17/98

NORTHING: 117891.79

EASTING: 126705.84

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
85								SP-SM		2" Sch. 40 PVC; Volclay Grout
90			984559 048SL	SS	95	0.8			Light brown Poorly Graded SAND with Silt and Gravel (SP-SM), medium sand, 5 to 12% fines, gravel mostly 3/4 in. diameter, rounded to subrounded, moist.	
95										
100								SM		

BORING LOG

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: C. Basye APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING NUMBER: AP3872

BORING DEPTH (ft): 125

BORING DIAMETER (in): 7

WELL DEPTH (ft): 120

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 289.6

TOP OF CASING ELEV. (ft): 292.77

FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/16/98

DATE COMPLETED: 1/17/98

NORTHING: 117891.79

EASTING: 126705.84

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
105								SM	
110			984559 050SL	SS	35/ 6"	NR			Light brown Silty SAND with Gravel (SM), fine to medium sand, significant fines, some gravel, mostly greater than 1 in. diamter, subrounded, dry.
115									
120									

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

2" PVC 0.008" Slotted Screen

#40-60 Prepack, #10-20 Outer Pack

BORING LOG

BORING NUMBER: AP3872

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 125
BORING DIAMETER (in): 7
WELL DEPTH (ft): 120
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 289.6
TOP OF CASING ELEV. (ft): 292.77
FIELD PARTY: J. Shapiro

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/16/98
DATE COMPLETED: 1/17/98
NORTHING: 117891.79
EASTING: 126705.84

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SM		1#40-60 Prepack, #10-20 Outer Pack
								GP	Water encountered during drilling - rose to 113 after 45 minutes.	
125			984559 051SL	SS	94	NR			Poorly Graded GRAVEL with Sand (GP) Grain Size Analysis: 52% Gravel, 42% Sand, 2% Fines.	
									Boring advanced to 125 ft bgs. Boring completed as groundwater monitoring well.	
130										
135										
140										

BORING LOG

BORING NUMBER: AP3873

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 112.5
BORING DIAMETER (in): 7
WELL DEPTH (ft): 107
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 276.9
TOP OF CASING ELEV. (ft): 279.38
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/19/98
DATE COMPLETED: 1/20/98
NORTHING: 117655.63
EASTING: 124729.14

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SM	Dark brown Silty SAND with Gravel (SM), sand 60%, gravel 40%, gravel is angular to rounded, 1/2 in. to 1 1/4 in. diameter, moist.	
10			984559 067SL	GS		0.3			Lithology similar to above.	
20			984559 068SL	GS		0.2				

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: AP3873

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: C. Basye APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (DDEX), 7" casing

BORING DEPTH (ft): 112.5

BORING DIAMETER (in): 7

WELL DEPTH (ft): 107

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 276.9

TOP OF CASING ELEV. (ft): 279.38

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/19/98

DATE COMPLETED: 1/20/98

NORTHING: 117655.63

EASTING: 124729.14

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SM	Lithology similar to above.	
25										
30			984559 069SL	GS		0.3			Silty SAND with Gravel (SM), 70% sand and fines, 30% gravel, gravel is angular to subangular, 1/2 in. to 1 in. diameter. Grain Size Analysis: 38% Gravel, 57% Sand, <5% Fines.	2" Sch. 40 PVC; Volclay Grout
								SW-SM		
35										
40			984559 070SL	GS		0.2				

OU-D 33662

BORING LOG

BORING NUMBER: AP3873

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: C. Basye APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 112.5

BORING DIAMETER (in): 7

WELL DEPTH (ft): 107

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 276.9

TOP OF CASING ELEV. (ft): 279.38

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/19/98

DATE COMPLETED: 1/20/98

NORTHING: 117655.63

EASTING: 124729.14

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SW-SM	Well-graded SAND with Silt and Gravel (SW-SM), 70% sand, 30% gravel, gravel is angular to subrounded, less fines than above.
45									
50			984559 071SL	GS		0.3			Well-graded SAND with Silt and Gravel (SW-SM), 50% sand, 50% gravel, gravel is angular to subrounded, 1/4 in. to 3/4 in. diameter.
55									
60				GS		0.3			

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

BORING LOG

BORING NUMBER: AP3873

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 112.5
BORING DIAMETER (in): 7
WELL DEPTH (ft): 107
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 276.9
TOP OF CASING ELEV. (ft): 279.38
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/19/98
DATE COMPLETED: 1/20/98
NORTHING: 117655.63
EASTING: 124729.14

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SW-SM		
								SP		
65									Increased sand content.	
								SW-SM		
70			984559 072SL	GS		0.3			Well-graded SAND with Silt and Gravel (SW-SM).	
								SP	Poorly Graded SAND (SP), 90% sand, 10% gravel.	
75										
								SW		
80			984559 073SL	GS		NR				

2" Sch. 40 PVC
Volclay grout

BORING LOG

BORING NUMBER: AP3873

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 45-590

JOB NUMBER: 9000-107

LOGGED BY: C. Basye APPROVED BY: S. Wrenn

DRILLED BY: Tester Drilling

METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 112.5

BORING DIAMETER (in): 7

WELL DEPTH (ft): 107

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 276.9

TOP OF CASING ELEV. (ft): 279.38

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 1/19/98

DATE COMPLETED: 1/20/98

NORTHING: 117655.63

EASTING: 124729.14

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
85								SW	Well-graded SAND with Gravel (SW), 70% sand, 25% gravel, 5% fines.
90									Lithology similar to above.
95									
100			984559 074SL	GS		NR		SP-SM	

WELL DIAGRAM

2" Sch. 40 PVC

Volclay Grout

BORING LOG

BORING NUMBER: AP3873

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 45-590
JOB NUMBER: 9000-107
LOGGED BY: C. Basye APPROVED BY: S. Wrenn
DRILLED BY: Tester Drilling
METHOD: Air rotary (ODEX), 7" casing

BORING DEPTH (ft): 112.5
BORING DIAMETER (in): 7
WELL DEPTH (ft): 107
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 276.9
TOP OF CASING ELEV. (ft): 279.38
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 1/19/98
DATE COMPLETED: 1/20/98
NORTHING: 117655.63
EASTING: 124729.14

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SP-SM	Poorly Graded SAND with Silt and Gravel (SP-SM), 80% sand/fines, 20% gravel, gravel is 3/8 in. to 3/4 in. diameter.
								SP	Encounter water while drilling. Water rose to 101.9 ft bgs after 24 hours.
105			984559 075SL and 984559 076SL	SS	41	0.0			Poorly Graded SAND with Gravel (SP), 80% sand, 20% gravel, poorly graded sand, trace fines, gravel is subrounded to subangular, 1/2 in. to 1 in. diameter. Grain Size Analysis: 32% Gravel, 76% Sand, 2% Fines.
110									
									Borehole advanced to 112.5 ft bgs. Completed as monitoring well.
115									
120									

WELL DIAGRAM: 2" PVC 0.008" Slotted Screen; #40-60 Prepack, #10-20 Outer Pack

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Ft. Richardson OUD/9000-17
Sample Matrix Soil

Service Request: K9605769
Date Collected: 9/7/96
Date Received: 9/14/96
Date Analyzed: 9/25/96

AP3772
964559WL01-98

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 96455904SL
Lab Code: K9605769-001

Sand Fraction: Weight (Grams)	94.8351
Sand Fraction: Weight Recovered (Grams)	93.9283
Sand Fraction: Percent Recovery	99.0

Weight as received (Grams)	100.501
Percent Solids	96.9
Weight Oven-Dried (Grams)	97.3856

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium Gravel~~	4.75 mm	4	65.1556	66.9
~~Fine Gravel~~ (coarse sand)	2.00 mm	10	13.8329	14.2
Very Coarse Sand (med)	0.850 mm	20	6.1163	6.28
Coarse Sand (sand)	0.425 mm	40	3.5657	3.66
Medium Sand (fine,	0.250 mm	60	2.3709	2.43
Fine Sand (sand)	0.106 mm	140	2.1759	2.23
Very Fine Sand)	0.075 mm	200	0.5515	0.57
Clay			0.9850	1.01
Silt			3.1700	3.26
		Total	97.9238	101

	%
Gravel	66.9
Coarse sand	14.2
Med sand	9.9
Fine sand	- 5.2
Fines	4.3

Approved By: _____ Date: 10/9/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Ft. Richardson OUD/9000-17
Sample Matrix Soil

Service Request: K9605769
Date Collected: 9/9/96
Date Received: 9/14/96
Date Analyzed: 9/25/96

3773
AP ~~3790~~
964559WL02 ~~79~~ 107

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 96455917SL
Lab Code: K9605769-002

Sand Fraction: Weight (Grams)	3.2051
Sand Fraction: Weight Recovered (Grams)	3.2167
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	10.101
Percent Solids	85.1
Weight Oven-Dried (Grams)	8.5960

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	0.0000	0.00
~~Fine Gravel~~ / coarse Sand	2.00 mm	10	0.0535	0.62
Very Coarse Sand / med	0.850 mm	20	0.0875	1.02
Coarse Sand / sand	0.425 mm	40	0.1315	1.53
Medium Sand / fine	0.250 mm	60	0.4780	5.56
Fine Sand / sand	0.106 mm	140	1.6479	19.2
Very Fine Sand	0.075 mm	200	0.5777	6.72
Clay			1.1050	12.9
Silt			4.3350	50.4
		Total	8.4161	97.9

	%
Gravel	0
Coarse sand	0.6
Med sand	2.6
Fine sand	31.5
Fines	63.3

Approved By: _____ Date: 10/7/96

OU-D 33668

COLUMBIA ANALYTICAL SERVICES. INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI/9000-107
Sample Matrix Soil

Service Request: K9606072
Date Collected: 9/19/96
Date Received: 9/27/96
Date Analyzed: 10/10/96

AP3774
964559WL03 -109.3

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 964559335L
Lab Code: K9606072-007

Sand Fraction: Weight (Grams)	85.0204
Sand Fraction: Weight Recovered (Grams)	85.0301
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	95.4861
Percent Solids	94.0
Weight Oven-Dried (Grams)	89.7569

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	33.4186	37.2
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	17.7946	19.8
Very Coarse Sand / med	0.850 mm	20	10.8777	12.1
Coarse Sand / Sand	0.425 mm	40	9.3453	10.4
Medium Sand / fine	0.250 mm	60	8.1465	9.08
Fine Sand / Sand	0.106 mm	140	4.4977	5.01
Very Fine Sand	0.075 mm	200	0.7424	0.83
Clay			1.1900	1.33
Silt			2.9250	3.26
		Total	88.9378	99.1

c/o

Gravel 37.2
Coarse Sand 19.8
Med Sand - 22.5
Fine Sand 14.9
Fines 4.6

Approved By: _____ Date: 10/11/96

COLUMBIA ANALYTICAL SERVICES. INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI/9000-107
Sample Matrix Soil

Service Request: K9606072
Date Collected: 9/20/96
Date Received: 9/27/96
Date Analyzed: 10/10/96

AP 3775
96455946WL04 - 110

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 96455946SL
Lab Code: K9606072-005

Sand Fraction: Weight (Grams)	57.1938
Sand Fraction: Weight Recovered (Grams)	57.2047
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	65.0845
Percent Solids	92.8
Weight Oven-Dried (Grams)	60.3984

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	29.5585	48.9
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	12.6087	20.9
Very Coarse Sand	0.850 mm	20	7.8417	13.0
Coarse Sand	0.425 mm	40	3.7004	6.13
Medium Sand	0.250 mm	60	1.4176	2.35
Fine Sand	0.106 mm	140	1.4773	2.45
Very Fine Sand	0.075 mm	200	0.3850	0.64
Clay			2.1400	3.54
Silt			2.6200	4.34
		Total	61.7492	102

	%
Gravel	48.9
Coarse Sand	20.9
Med Sand	19.1
Fine Sand	~~4.8~~ 5.4
Fines	7.9

Approved By: _____ Date: 10/11/96

OU-D 33670

6072-5.XLS \10/10/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI/9000-107
Sample Matrix Soil

Service Request: K9606072
Date Collected: 9/21/96
Date Received: 9/27/96
Date Analyzed: 10/10/96

AP 3776
96455963WL05 - 109

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 96455963SL
Lab Code: K9606072-006

Sand Fraction: Weight (Grams)	66.2844
Sand Fraction: Weight Recovered (Grams)	66.3044
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	75.6472
Percent Solids	91.8
Weight Oven-Dried (Grams)	69.4441

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	24.1277	34.7
~~Fine Gravel~~ coarse sand	2.00 mm	10	13.6945	19.7
Very Coarse Sand / med	0.850 mm	20	9.2667	13.3
Coarse Sand / sand	0.425 mm	40	10.8774	15.7
Medium Sand / fine	0.250 mm	60	4.8340	6.96
Fine Sand / sand	0.106 mm	140	2.7907	4.02
Very Fine Sand	0.075 mm	200	0.5186	0.75
Clay			1.2100	1.74
Silt			2.3900	3.44
		Total	69.7096	100

	%
Gravel	34.7
Coarse Sand	19.7
Med Sand	29.0
Fine Sand	11.7
Fines	5.2

Approved By: _____ Date: 10/11/96

6072-6.XLS \10/10/96

OU-D 33671

COLUMBIA ANALYTICAL SERVICES. INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI/9000-107
Sample Matrix Soil

Service Request: K9701125
Date Collected: 2/1/97
Date Received: 2/20/97
Date Analyzed: 2/25/97

AP3789
974559WL06-113

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 974559166SL
Lab Code: K9701125-001

Sand Fraction: Weight (Grams)	95.5501
Sand Fraction: Weight Recovered (Grams)	95.4517
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	103.243
Percent Solids	92.9
Weight Oven-Dried (Grams)	95.9127

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	62.9064	65.6
~~Fine Gravel~~ (coarse sand)	2.00 mm	10	12.2192	12.7
Very Coarse Sand (med sand)	0.850 mm	20	7.8166	8.15
Coarse Sand (sand)	0.425 mm	40	5.2231	5.45
Medium Sand (fine sand)	0.250 mm	60	3.6309	3.79
Fine Sand	0.106 mm	140	2.4554	2.56
Very Fine Sand	0.075 mm	200	0.6687	0.70
Clay			1.0550	1.10
Silt			2.0650	2.15
		Total	98.0403	102

	%
Gravel	65.6
Coarse sand	12.7
Med sand	13.6
Fine sand	7.0
Fines	3.3

Approved By: aup Date: 3/4/97

OU-D 33672

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI/9000-107
Sample Matrix Soil

Service Request: K9701125
Date Collected: 2/3/97
Date Received: 2/20/97
Date Analyzed: 2/25/97

AP3790
974559WL07-79'

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 974559175SL
Lab Code: K9701125-002

Sand Fraction: Weight (Grams)	17.3732
Sand Fraction: Weight Recovered (Grams)	17.3162
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	61.5385
Percent Solids	85.5
Weight Oven-Dried (Grams)	52.6154

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	0.8010	1.52
~~Fine Gravel~~ coarse sand	2.00 mm	10	0.5742	1.09
Very Coarse Sand / med	0.850 mm	20	0.1483	0.28
Coarse Sand / sand	0.425 mm	40	0.1812	0.34
Medium Sand / fine	0.250 mm	60	0.5855	1.11
Fine Sand / sand	0.106 mm	140	6.8523	13.0
Very Fine Sand	0.075 mm	200	5.1813	9.85
Clay			4.7700	9.07
Silt			34.3850	65.4
		Total	53.4788	102

	%
Gravel	1.5
Coarse sand	1.1
Med sand -	~~0.3~~ 0.6
Fine sand	24.0
Fines	74.5

Approved By: _____ Date: 3/4/97

1125-2.XLT \2/28/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: FTR UOD Addendum / 9000-107
Sample Matrix Sediment

Service Request: K9707374
Date Collected: 10/1/97
Date Received: 10/7/97
Date Analyzed: 10/18/97

AP 3864
97B704B1101 - 10'

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 97B704002SL
Lab Code: K9707374-002

Sand Fraction: Weight (Grams)	199.8242
Sand Fraction: Weight Recovered (Grams)	200.0277
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	224.98
Percent Solids	95.3
Weight Oven-Dried (Grams)	214.4059

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium Gravel~~	4.75 mm	4	134.9727	63.0
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	22.8390	10.7
Very Coarse Sand / med	0.850 mm	20	18.4504	8.6
Coarse Sand / sand	0.425 mm	40	12.0470	5.6
Medium Sand / fine	0.250 mm	60	5.2865	2.5
Fine Sand / sand	0.106 mm	140	4.7310	2.2
Very Fine Sand	0.075 mm	200	1.4876	0.7
Clay			6.6300	3.1
Silt			9.8000	4.6
		Total	216.2442	101

	%
Gravel	63.0
Coarse Sand	10.7
Med Sand	14.2
Fine Sand	5.4
Fines	7.7

Approved By: _____ Date: 10/23/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: FTR UOD Addendum / 9000-107
Sample Matrix: Sediment

Service Request: K9707374
Date Collected: 10/1/97
Date Received: 10/7/97
Date Analyzed: 10/18/97

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 97B704002SL 97B704BH01 10'
Lab Code: K9707374-002d AP 3864

Sand Fraction: Weight (Grams)	196.2172
Sand Fraction: Weight Recovered (Grams)	195.7523
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	220.46
Percent Solids	95.3
Weight Oven-Dried (Grams)	210.0984

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	146.7336	69.8
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	15.8709	7.6
Very Coarse Sand / med	0.850 mm	20	13.9252	6.6
Coarse Sand / sand	0.425 mm	40	9.8245	4.7
Medium Sand / fine	0.250 mm	60	3.7980	1.8
Fine Sand / Sand	0.106 mm	140	4.1980	2.0
Very Fine Sand	0.075 mm	200	1.2017	0.6
Clay			5.2950	2.5
Silt			11.1550	5.3
		Total	212.0019	101

o/o
Gravel 69.8
Crs Sand 7.6
Med Sand 11.3
Fine Sand 4.4
Fines 7.8

Approved By: _____ Date: 10/23/97

00007

OU-D 33675

7370-2D.XLS \10/22/97

Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI
Sample Matrix: Soil

Service Request: K9707097
Date Collected: 9/24/97
Date Received: 9/27/97
Date Analyzed: 10/15/97

AP3860
97B726 BH01-55'

Sample Name: 97B72605SL
Lab Code: K9707097-7

Particle Size Determination
ASTM Method D422 Modified

Sand Fraction: Weight (Grams)	251.3092
Sand Fraction: Weight Recovered (Grams)	251.2216
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	313.1
Percent Solids	90.0
Weight Oven-Dried (Grams)	281.7900

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	186.8506	66.3
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	23.9641	8.5
Very Coarse Sand] med	0.850 mm	20	18.9222	6.7
Coarse Sand] sand	0.425 mm	40	11.7390	4.2
Medium Sand] fine	0.250 mm	60	4.8849	1.7
Fine Sand] sand	0.106 mm	140	3.8915	1.4
Very Fine Sand]	0.075 mm	200	0.8240	0.3
Clay			1.6600	0.6
Silt			4.3250	1.5
		Total	257.0613	91

	%
Gravel	66.3
Coarse Sand	8.5
Med Sand	10.9
Fine Sand	3.4
Fines	2.1

Approved By: _____ Date: 10/21/97

OU-D 33676 00009

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: FTR OUD Mod 2 / 9000-107
Sample Matrix Soil

Service Request: K9801514
Date Collected: 1/8/98
Date Received: 3/11/98
Date Analyzed: 3/25/98

AP 3870

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 984559001SL
Lab Code: K9801514-001d

Sand Fraction: Weight (Grams)	93.6617
Sand Fraction: Weight Recovered (Grams)	93.6953
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	103.98
Percent Solids	97.4
Weight Oven-Dried (Grams)	101.2763

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Medium Gravel	4.75 mm	4	51.9867	51.33
Fine Gravel	2.00 mm	10	23.5229	23.23
Very Coarse Sand	0.850 mm	20	9.9165	9.79
Coarse Sand	0.425 mm	40	3.9252	3.88
Medium Sand	0.250 mm	60	2.0062	1.98
Fine Sand	0.106 mm	140	1.7420	1.72
Very Fine Sand	0.075 mm	200	0.4407	0.44
Clay			4.3500	4.3
Silt			2.6000	2.6
		Total	100.4902	99.2

51.33
23.23
13.67
4.14
6.9
41

Approved By: _____ Date: 3/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ENSR Consulting & Engineering	**Service Request:**	K9801514
Project:	FTR OUD Mod 2 / 9000-107	**Date Collected:**	1/8/98
Sample Matrix	Soil	**Date Received:**	3/11/98
		Date Analyzed:	3/25/98

AP 3870

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 984559001SL
Lab Code: K9801514-001

Sand Fraction: Weight (Grams)	94.7538
Sand Fraction: Weight Recovered (Grams)	94.6759
Sand Fraction: Percent Recovery	99.9

Weight as received (Grams)	105.273
Percent Solids	97.4
Weight Oven-Dried (Grams)	102.5356

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered	
Medium Gravel	4.75 mm	4	57.0753	55.66	55.66
Fine Gravel	2.00 mm	10	21.6629	21.13	21.13
Very Coarse Sand	0.850 mm	20	8.2656	8.06	11.62
Coarse Sand	0.425 mm	40	3.6462	3.56	
Medium Sand	0.250 mm	60	1.6252	1.59	3.81
Fine Sand	0.106 mm	140	1.8438	1.80	
Very Fine Sand	0.075 mm	200	0.4279	0.42	
Clay			4.3200	4.2	4.2
Silt			2.5900	2.5	2.5
		Total	101.4569	98.9	

CLS
mixed
86.56
6.7

OU-D 33678

Approved By: _____ Date: 3/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: FTR OUD Mod 2 / 9000-107
Sample Matrix Soil

Service Request: K9801514
Date Collected: 1/8/98
Date Received: 3/11/98
Date Analyzed: 3/25/98

AP3871

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 984559013SL
Lab Code: K9801514-002

Sand Fraction: Weight (Grams)	92.9512
Sand Fraction: Weight Recovered (Grams)	93.0894
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	100.838
Percent Solids	94.1
Weight Oven-Dried (Grams)	94.8887

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Medium Gravel	4.75 mm	4	49.5512	52.22
Fine Gravel	2.00 mm	10	8.4130	8.87
Very Coarse Sand	0.850 mm	20	8.1952	8.64
Coarse Sand	0.425 mm	40	13.0499	13.75
Medium Sand	0.250 mm	60	8.5448	9.01
Fine Sand	0.106 mm	140	4.8001	5.06
Very Fine Sand	0.075 mm	200	0.4810	0.51
Clay			0.1500	0.2
Silt			0.6300	0.7
		Total	93.8152	98.9

52.22
8.87
36.97
46.35
0.2
0.7
0.9

OU-D 33679

Approved By: _____ Date: 3/25/98

1514-2.XLS - report 3/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: FTR OUD Mod 2 / 9000-107
Sample Matrix Soil

Service Request: K9801514
Date Collected: 1/19/98
Date Received: 3/11/98
Date Analyzed: 3/25/98

AP 3873

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 984559069SL
Lab Code: K9801514-003

Sand Fraction: Weight (Grams)	92.4551
Sand Fraction: Weight Recovered (Grams)	92.516
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	100.288
Percent Solids	97.2
Weight Oven-Dried (Grams)	97.4799

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered	
Medium Gravel	4.75 mm	4	37.2525	38.22	38.22
Fine Gravel	2.00 mm	10	18.4520	18.93	18.93
Very Coarse Sand	0.850 mm	20	16.1961	16.61	29.43
Coarse Sand	0.425 mm	40	12.4962	12.82	
Medium Sand	0.250 mm	60	5.1816	5.32	8.22
Fine Sand	0.106 mm	140	2.3542	2.42	
Very Fine Sand	0.075 mm	200	0.4721	0.48	
Clay			2.1100	2.2	4.7
Silt			2.4750	2.5	
		Total	96.9897	99.5	

OU-D 33680

Approved By: _____ Date: 3/25/98

1514-3.XLS - report 3/25/98

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: FTR OUD Mod 2 / 9000-107
Sample Matrix Soil

Service Request: K9801514
Date Collected: 1/19/98
Date Received: 3/11/98
Date Analyzed: 3/25/98

AP3873

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 984559076SL
Lab Code: K9801514-004

Sand Fraction: Weight (Grams)	95.4716
Sand Fraction: Weight Recovered (Grams)	95.3889
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	102.227
Percent Solids	86.0
Weight Oven-Dried (Grams)	87.9150

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Medium Gravel	4.75 mm	4	28.4136	32.32
Fine Gravel	2.00 mm	10	5.9319	6.75
Very Coarse Sand	0.850 mm	20	17.9301	20.39
Coarse Sand	0.425 mm	40	27.9548	31.80
Medium Sand	0.250 mm	60	10.1460	11.54
Fine Sand	0.106 mm	140	4.4042	5.01
Very Fine Sand	0.075 mm	200	0.5375	0.61
Clay			0.4000	0.5
Silt			1.3450	1.5
		Total	97.0631	110

32.32 %
6.75
52.19
109.35
17.16
0.5
1.5
76.1
2.0

OU-D 33681

Approved By: _____ Date: 3/25/98

1514-4.XLS - report 3/25/98

ALASKA TESTLAB
A Division of DOWL, Incorporated

AASHTO ACCREDITED
CONSTRUCTION
MATERIALS TESTING
LABORATORY

W.O. A27717
March 21, 1998

Columbia Analytical
P.O. Box 479
Kelso, Washington 98626

Attention: Ms. Elizabeth Schneider

Project: Lab NO. K98 1514

Client Sample Identification	ATL Lab Number	Date Received	Test Method	Results
984559001SL	452	3/13/98	ASTM D4318, Plasticity Index	LL = 28, PI = 11
984559013SL	453	3/13/98	ASTM D4318, Plasticity Index	Non Plastic
984559069SL	454	3/13/98	ASTM D4318, Plasticity Index	Non Plastic
984559076SL	455	3/13/98	ASTM D4318, Plasticity Index	Non Plastic

OU-D 33682

U.S. ARMY CORPS OF ENGINEERS
SURVEY SECTION
FORT RICHARDSON, ALASKA / OPERABLE UNIT D
SUBSURFACE INVESTIGATION

Date: 05-27-97
List of Boring Points

AP ID	Northing	Easting	Elevation Top/PVC	Elevation on Grd.	Descriptor
AP-3772	116,837.01	125,870.98	281.75	278.6	Monitoring Well
AP-3773	116,979.34	126,157.60	285.20	281.7	Monitoring Well
AP-3774	117,363.01	125,605.42	285.24	281.7	Monitoring Well
AP-3775	117,078.32	126,233.41	285.07	281.6	Monitoring Well
AP-3776	117,207.21	125,482.62	282.00	279.6	Monitoring Well
AP-3777	118,614.09	131,203.35	324.91	321.4	Monitoring Well
AP-3778	118,389.54	131,039.86	323.61	320.1	Monitoring Well
AP-3779	117,241.03	125,851.41		280.5	Soil Boring
AP-3780	117,218.78	125,908.57		280.3	Soil Boring
AP-3781	117,209.42	125,938.32		280.2	Soil Boring
AP-3782	117,253.51	125,925.30		280.8	Soil Boring
AP-3783	117,213.20	126,024.37		281.2	Soil Boring
AP-3784	117,072.75	125,977.04		280.3	Soil Boring
AP-3785	113,169.75	125,775.03		262.7	Soil Boring
AP-3786	113,136.33	125,760.30		260.9	Soil Boring
AP-3787	113,135.92	125,598.45		258.9	Soil Boring
AP-3788	113,023.75	125,622.64		258.2	Soil Boring
3789	116,939.27	126,732.86	288.65	285.4	Monitoring Well
3790	117,076.33	127,493.77	294.98	292.2	Monitoring Well

U.S. ARMY CORPS OF ENGINEERS
SURVEY SECTION
FORT RICHARDSON, ALASKA / OPERABLE UNIT "D"
SUBSURFACE INVESTIGATION

ate: 12-03-97
ist of Boring Points

P ID	Northing	Easting	Elevation @ Grd.	Elevation top PVC	Descriptor
Building 726					
P-3860	116,360.78	126,958.60	286.8		Soil Boring
P-3861	116,363.11	126,912.62	285.8		Soil Boring
P-3862	116,390.45	126,952.35	286.9		Soil Boring
P-3863	116,301.44	126,959.33	286.9		Soil Boring
Building 704					
P-3864	116,999.67	128,142.98	294.5		Soil Boring
Fish Hatchery					
P-3865	112,178.98	127,350.21	276.6	276.67	Monitoring Well
P-3866	112,063.27	127,431.27	278.1	277.78	Monitoring Well

U.S. ARMY CORPS OF ENGINEERS
SURVEY SECTION
FORT RICHARDSON, ALASKA / OPERABLE UNIT D
SUBSURFACE INVESTIGATION

Date: 03-12-98
List of Monitoring Wells

AP ID	Northing	Easting	Elevation @ lip PVC	Elevation @ ground	Descriptor
AP-3870	117,395.23	124,922.88	277.98	275.1	Monitoring Well
AP-3871	117,798.10	126,198.99	289.46	287.7	Monitoring Well
AP-3872	117,891.79	126,705.84	292.77	289.6	Monitoring Well
AP-3873	117,655.63	124,729.14	279.38	276.9	Monitoring Well

BUILDING 726

- BORING LOGS/WELL COMPLETION DIAGRAMS
- GRAIN SIZE ANALYSIS
- SURVEY DATA

Key to ENSR boring logs

GW, GW-GM, GW-GC - Well graded gravels, sandy gravels, gravels with sand, little or no fines

GP, GP-GM, GP-GC - Poorly graded gravels, sandy gravels, gravels with sand, little or no fines

GM - Silty gravels, gravel-sand-silt mixtures

GC - Clayey gravels, gravel-sand-clay mixtures

SW, SW-SM, SW-SC - Well graded sands, gravelly sands, sands with gravel, little or no fines

SP, SP-SM, SP-SC - Poorly graded sands, gravelly sands, sands with gravel, little or no fines

SM - Silty sands, silt-sand mixtures

SC - Clayey sands, clay-sand mixtures

ML - Inorganic silts, very fine sands, rock flour, silty or clayey fine sands

CL - Inorganic clays, gravelly clays, sandy clays, silty clays, lean clays

PT - Peat

OU-D 33688

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 2 of 2

Location Coordinates: Northing 0± Easting 0±

Drilling Agency: XXX Corps of Engineers | XXXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-3 Permanent AP-3466	S. Woodstock	cloudt 40°F

Type of Hole	Depth To	Depth Drilled	Total Depth
Test Pit; XXXX Auger Hole	52.0	50.0	52.0

Size and Type of Bit	Elevation Datum	Type of Equipment
8" hollow stem	XXX MSL	Mobile B-61

Number of Samples	Type of Samples	Depth to Groundwater	Date
12	Grab & Drive	NE	6-7 Oct 94

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
0 ±	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	5	7	GW	Well-Graded GRAVEL w/ Sand	>3"	65%Gr;30%Sa;5%Fines Sl Dk.gray,moist,subr.-suba. gravel & cobble, fine to coarse sand, NP fines w/ orange ferrous stains & blk.coal pieces to 1/2", strong chemical odor PID=291 *20/21/21/18
35		8	GW	Well-Graded GRAVEL w/ Sand & Cobbles	>3"	Dk.gray,moist,subr.-suba. gravel & cobbles, fine to coarse sand, NP fines, strong chemical odor PID=285 *15/15/17/32
40		9	GW-GM	Well-Graded GRAVEL w/ Silt, Sand & Cobbles	>3"	Slight chemical odor Brown/gray w/ orange ferrous stains,subr.-suba gravel & cobbles, fine to coarse sand, NP fines, no sample recovery PID=9.5 *9/14/16/30 for 3"
45	5	10	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	>1"	47%Gr;45%Sa;8%Fines Sl Brown, moist, subr.-suba. gravel, fine to coarse sand, NP fines PID=1.0 *21/60 for 4"
50		11	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	<1"	Dk.gray/brown,moist,subr. -suba.gravel, fine to coarse sand, NP fines PID=0.8 *14/12/32/26
55						Bottom of hole 52.0 Elevation -52.0 No groundwater encountered *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Coordinates and elevation data not available Boring backfilled with bentonite
60						

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Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Hole Number: AP-3466

OU-D 33689

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson, Ak.
Bldg. 726 - Post Laundry

Sheet 1 of 2

Location Coordinates
Northing 0± Easting 0±

Drilling Agency XXX Corps of Engineers
XXX Other Ambler

Hole Number	Name of Driller	Weather
Field AP-3 Permanent AP-3466	S. Woodstock	cloudy 40°F

Type of Hole	Depth To	Depth Drilled	Total Depth
Test Pit; XXX Auger Hole	52.0	50.0	52.0

Size and Type of Bit	Elevation Datum	Type of Equipment
8" hollow stem	XXX MSL	Mobile B-61

Number of Samples	Type of Samples	Depth to Groundwater	Date
12	Grab & Drive	NE	6-7 Oct 94

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
0 ±	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	2	1	GP	Poorly Graded GRAVEL w/ Sand	2"	3" Ashalt 74%Gr;22%Sa;4%Fines PFS Brown, moist, subr.-rnd. gravel, fine to coarse sand, NP fines, possible fill PID=6.3
5	7	2	SW-SM	Well-Graded SAND w/ Silt & Gravel	<1"	45%Gr;47%Sa;8%Fines S2 Brown, moist, subr.-rnd. gravel, fine to coarse sand, NP fines, possible fill PID=0.7 *4/3/2/1
10		3	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	1"	Brown, moist, subr.-rnd. gravel, fine to coarse sand, NP fines, possible fill PID=0.2 *10/8/5/7 No sample recovered
15		4	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	1"	Possible fill PID=4.5
	4	4A	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	>3"	64%Gr;31%Sa;5%Fines S1 Gray, moist, subr.-suba. gravel, fine to coarse sand, NP fines, blk.coal pieces, strong chemical odor PID=270 *9/23/20/22
20	4	5	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	>3"	Rough drilling at 15.9' 59%Gr;35%Sa;6%Fines S1 Dk.gray, moist, subr.-ang gravel & cobbles (frac. gravel), fine to coarse sand, NP fines w/blk.coal pieces, strong chem.odor PID=294 *8/21/17/22
25		6	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	>3"	Chemical odor No sample recovered
		6A	SP-SW	Poor to Well-Graded SAND	1/4	Dk.gray,moise,subr.-suba. gravel,med.-fine sand,NP fines- slight chem.odor w/2" blk.coal nodules PID=275 *8/7/5/11
30			GW	Well-Graded GRAVEL w/ Sand		Continued

OU-D 33690

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 2 of 2

Location Coordinates: Northing 0± Easting 0±

Drilling Agency: XXX Corps of Engineers | XXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-2 Permanent AP-3465	S. Woodstock	cloudy 48°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [XXX] Auger Hole	50.0	48.0	50.0

Size and Type of Bit	Elevation Datum	Type of Equipment
8" hollow stem	XXX MSL	Mobile B-61

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Grab & Drive	NE	4-5 Oct 94

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
0 ±	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	4	7	GW	Well-Graded GRAVEL w/ Sand	>3"	Strong chemical odor 68%Gr;27%Sa;5%Fines Sl Dk.gray, moist,subr.-ang. gravel & cobbles, fine to coarse sand, NP fines w/ orange ferrous stains & blk.coal seams (Sample wet to moist w/chemical residue) PID=330 *13/22/24/26
35		8	GW	Well-Graded GRAVEL w/ Sand & Cobbles	>3"	PID=347 *16/16/25/22
						Slow, rough drilling
40		9				Small sample recovery *50 for 4"
	4	9A	GW	Well-Graded GRAVEL w/ Sand	>3"	62%Gr;33%Sa;5%Fines Sl Dk.gray, moist,subr.-suba gravel & cobbles, fine to coarse sand, NP fines w/ orange ferrous stains & blk.coal stains through-out; No odor PID=1.9 *10/18/19/20
45		10	GW	Well-Graded GRAVEL w/ Sand	>3"	Gray,moist,subr-rnd grav. & cobbles, fine to coarse sand, NP fines PID=1.2 *16/27/32/38
50						Bottom of hole 50.0 Elevation -50.0
						No groundwater encountered
						PID - Photo Ionization Detector
55						*Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30"
						Coordinates and elevation data not available
60						Boring backfilled with bentonite

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Project Ft Richardson, Ak. Bldg. 726 - Post Laundry | Hole Number AP-3465

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DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson, Ak.
Bldg. 726 - Post Laundry

Sheet 1 of 2

Location Coordinates
Northing 0± Easting 0±

Drilling Agency XXX Corps of Engineers
XXX Other Ambler

Hole Number	Name of Driller	Weather
Field AP-2 Permanent AP-3465	S. Woodstock	cloudy 48°F

Type of Hole	Depth To	Depth Drilled	Total Depth
Test Pit XXX Auger Hole	50.0	48.0	50.0

Size and Type of Bit	Elevation Datum	Type of Equipment
8" hollow stem	XXX MSL	Mobile B-61

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Grab & Drive	NE	4-5 Oct 94

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
0 ±	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		1	GP-GM	Poorly Graded GRAVEL w/ Sand	<2"	2" Asphalt Dk.brown, moist, subr-suba gravel, fine to coarse sand, NP fines, fill. PID=0.8
						Slow, rough drilling
5	8	2	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	<2"	50%Gr;44%Sa;6%Fines S1 Dk.brown, moist, subr-rnd gravel, fine to coarse sand, NP fines, fill. PID=0.4 *2/2/4/5 (approx. 6" of concrete w/ fine aggregate at 5.5' (loosely compacted)
10		3	GP	Poorly Graded GRAVEL w/ Sand	>2"	Dk.brown, moist, subr-rnd gravel, fine to coarse sand, NP fines, fill. PID=0.2 *1/3/2/4
15	4	4	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	>3"	64%Gr;30%Sa;6%Fines S1 Gray/dk.brown w/ orange ferrous stains, subr-suba gravel & cobbles, fine to coarse sand, NP fines w/ blk.coal nodules to 1/2" PID=0.4 *12/25/30/27
		4A				PID=0.5 *18/23/18/22 *50 for 3"
		4B				Cobble plug at 19' PID=4.8;Strong chem.odor
20		5				
	3	5A	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	>3"	64%Gr;31%Sa;5%Fines S1 Gray,wet-moist,subr-suba gravel & cobbles, fine to coarse sand, NP fines w/orange ferrous strains & blk.coal seams through-out PID=293 *13/26/23/30 Strong chemical odor
25		6	GW	Well-Graded GRAVEL w/ Sand & Cobbles	>3"	Gray, moist, subr.-suba. gravel & cobbles, fine to coarse sand, NP fines w/ orange ferrous stains, blk.coal nodules to 1/ PID=280 *16/19/18/
30						Continued

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Project Ft Richardson, Ak.
Bldg. 726 - Post Laundry

Hole Number AP-3465

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DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson, AK.
Bldg. 726 - Post Laundry
Sheet 2 of 2

Location Coordinates
Northing 0± Easting 0±

Drilling Agency XXX Corps of Engineers
XXX Other Ambler

Hole Number	Name of Driller	Weather
Field AP-1 Permanent AP-3464	S. Woodstock	various 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
Test Pit XXX Auger Hole	52.0	50.0	52.0

Size and Type of Bit	Elevation Datum XXX MSL	Type of Equipment
8" hollow stem		Mobile B-61

Number of Samples	Type of Samples	Depth to Groundwater	Date
11	Grab & Drive	NE	1-3 Oct 94

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
0 ±	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		7	GM-GC	Silty & Clayey GRAVEL w/ Sand & Cobbles	>3"	Dk.gray/brown,moist,subr-ang.gravel & cobbles,fine to coarse sand, NP fines w/intermittant coal seams up to 1/2" thick, orange ferrous staining through-out;slight chemical odor; PID=125 *18/25/23/25
35	4	8	GW	Well-Graded GRAVEL w/ Sand	>3"	67%Gr;29%Sa;4%Fines S1 Dk.gray/brown w/orange ferrous stains, moist, subr.-ang.gravel, fine to coarse sand, NP fines w/ 3" blk.coal seam at 36 3' *18/23/21/22 Slow, rough drilling
40	4	9	GW	Well-Graded GRAVEL w/ Sand		63%Gr;32%Sa;5%Fines S1 Gray, moist, w/orange ferrous stains,suba.-subr gravel, fine to coarse sand, NP fines w/blk.coal nodules up to 1/4" dia. PID=1.9 *29/28/23/24
45	4	10	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	>3"	61%Gr;33%Sa;6%Fines S1 Gray-brown w/ orange ferrous stains, subr-suba gravel & cobbles, fine to med.sand, NP fines w/blk. coal nodules up to 1/2" dia. PID=0.9 *17/38/39/54
50	4	11	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand	>3"	54%Gr;41%Sa;5%Fines S1 Dk.gray/brown w/orange ferrous stains,subr.-rnd. gravel PID=0.5 *18/39/38/60
55				Coordinates and elevation data not available at this time.		Bottom of hole 52.0 Elevation -52.0
				Boring backfilled w/bentonite		No groundwater encountered
60						PID - Photo Ionization Detector
						*Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30"

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Project Ft Richardson, Ak.
Bldg. 726 - Post Laundry

Hole Number AP-3464

OU-D 33693

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Ft Richardson, Ak.
Bldg. 726 - Post Laundry

Sheet 1 of 2

Location Coordinates
Northing 0± Easting 0±

Drilling Agency XXX Corps of Engineers
XXX Other Ambler

Hole Number	Name of Driller	Weather
Field AP-1 Permanent AP-3464	S. Woodstock	various 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
Test Pit XXX Auger Hole	52.0	50.0	52.0

Size and Type of Bit	Elevation Datum	Type of Equipment
8" hollow stem	XXX MSL	Mobile B-61

Number of Samples	Type of Samples	Depth to Groundwater	Date
11	Grab & Drive	NE	1-3 Oct 94

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
0 ±	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	3	1	GP	Poorly Graded GRAVEL w/ Sand	>1"	2" Asphalt 67%Gr;28%Sa;5%Fines PFS Dk.brown,moist,subr.-ang. gravel, fine to coarse sand, possible Fill
5	4	2	GW	Well-Graded GRAVEL w/ Sand	<2"	60%Gr;35%Sa;5%Fines S1 Dk.brown, moist,rnd.-ang. gravel, fine to coarse sand, NP fines, possible fill (loosely compacted) PID=0.5 *5/8/7/7
10		3	GM	Silty GRAVEL w/ Sand (Fill)	2"	Dk.brown, moist to wet, subr. gravel, fine to coarse sand, NP fines, possible fill (loosely compacted) PID=0.2 *3/2/7/7
						No sample recovery
15		4	GP-GM	Silty GRAVEL w/ Sand & Cobbles	>3"	Dk.gray/brown,moist,rnd.-suba. gravel & cobbles, fine to coarse sand, NP fines w/orange ferrous stains & blk.coal nodules up to 1/4" dia. PID=0.5 *1/3/6/14
20	4	5	GW	Well-Graded GRAVEL w/ Sand	>3"	63%Gr;32%Sa;5%Fines S1 Brown/gray w/ orange ferrous stains, moist to wet subr.-ang. gravel & cobbles, fine to coarse sand, NP fines, strong chemical odor PID=290 *10/14/16/24
25	3	6	GW-GM	Well-Graded GRAVEL w/ Silt & Sand		59%Gr;34%Sa;6%Fines S1 Dk.gray/brown,moist,subr.-suba.gravel & cobbles, fine to coarse sand, NP fines w/blk.coal nodule up to 1/4" dia., strong chemical odor PID=243 *19/64/26/2
30			GM-GC	Silty & Clayey GRAVEL		Continued

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Project Ft Richardson, Ak. Bldg. 726 - Post Laundry

Hole Number AP-3464

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 1 of 4

Location Coordinates: Northing 115,990 Easting 127,202

Drilling Agency: [XXX] Corps of Engineers [XXX] Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-4 Permanent AP-3467	S. Moore	Various

Type of Hole	Depth To	Depth Drilled	Total Depth
[XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	99.5	100.4

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
13	Air Grab and Drive	74**	19 Nov - 18 Dec 1994

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
287.50	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
5	10	1	GM	Silty GRAVEL w/ Sand	1"	55%Gr;25%Sa;20%Fines F2 Fl, Dk. Brown, moist, suba. to subr. gravel, fine to coarse sand, NP fines, PID=1.3ppm Air Grab
10	<1	2	GW	Well-Graded GRAVEL w/ Sand	1½"	81%Gr 17%Sa 2%Fines NFS Grey, moist, suba. to angular gravel, med. to coarse sand, PID=1.4ppm *18/5/29
20	4	3	GW-GM	Well-Graded GRAVEL w/ Silt, Sand and Cobbles	>3"	51%Gr 42%Sa 7%Fines Fl Dk. brown, moist, suba. to subr. gravel, med. to coarse sand, pieces of coal, ferrous stains, PID=1.1ppm *9/20/22/21
30	1	4	GW	Well-Graded GRAVEL w/ Sand and Cobbles	>3"	CONTINUED

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DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson, Ak.
Bldg. 726 - Post Laundry

Sheet 2 of 4

Location Coordinates
Northing 115,990 Easting 127,202

Drilling Agency XXX Corps of Engineers
XXX Other Ambler

Hole Number	Name of Driller	Weather
Field AP-4 Permanent AP-3467	S. Moore	Various

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. ___ Test Pit ___ Auger Hole	0.0	99.5	100.4

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
13	Air Grab and Drive	74**	19 Nov - 18 Dec 1994

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
287.50	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		4	GW	Well-Graded GRAVEL w/ Sand and Cobbles	>3"	76%Gr 21%Sa 3%Fines PFS Brown/grey, moist, subr. to suba. gravel, med. to coarse sand, pieces of coal, PID=.9ppm *9/19/22/25 *4/29/31/27 *20/30/35
		5				
		6				
35						
	2	7	GW	Well-Graded GRAVEL w/ SAND and Cobbles	>3"	75%Gr 22%Sa 3%Fines PF Brown/grey, moist, subr. to rounded gravel, med. to coarse sand, pieces of coal, PID=1.1ppm *10/23/33/34
40						
45						
						Some perched water at 49'
	11	8	SM	Silty SAND	1"	5%Gr 53%Sa 42%Fines F4 Brown, moist to wet, subr. gravel, fine to coarse sand, NP fines, PID=3.8ppm *10/16/22/23
50						
55						
	18	9	CL-ML	Silty CLAY w/ Sand	-	1%Gr 17%Sa 82%Fines F Brown/grey, moist, fine sand, LL=22 PI=5, some lenses of fine sand PID=1.1ppm *3/10/24/28
60						CONTINUED

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DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 3 of 4

Location Coordinates: Northing 115,990 Easting 127,202

Drilling Agency: XXX Corps of Engineers; XXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-4 Permanent AP-3467	S. Moore	Various

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	99.5	100.4

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
13	Air Grab and Drive	74**	19 Nov - 18 Dec 1994

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
287.50	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
65						
70	17	10	ML	SILT	-	6%Sa 94%Fines F4 Brown/grey, moist, fine sand, NP fines, PID=.8ppm *6/7/23/28
75	V					
80	10	11	SC	Clayey SAND w/ Gravel	1"	21%Gr 32%Sa 47%Fines F4 Dk. grey, moist, subr. to rounded gravel, fine to coarse sand, LL=23 PI=9, PID=.5ppm *13/35/33/65 for 4"
85						
90						CONTINUED

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DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 4 of 4

Location Coordinates: Northing 115,990 Easting 127,202

Drilling Agency: XXX Corps of Engineers; XXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-4 Permanent AP-3467	S. Moore	Various

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. ; Test Pit ; Auger Hole	0.0	99.5	100.4

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
13	Air Grab and Drive	74**	19 Nov - 18 Dec 1994

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
287.50	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
95	8	12	SM	Silty SAND w/ Gravel and Cobbles	>3"	33%Gr 46%Sa 21%Fines F2 Grey, moist, suba. to subr. gravel, fine to coarse sand, NP fines *27/100 for 3"
100	6	13	GW-GM	Well-Graded GRAVEL w/ Silt, Sand and Cobbles	>3"	47%Gr 47%Sa 6%Fines S1 Dk. brown, wet, suba. to subr. gravel, fine to coarse sand *35/70 for 5"
105						Bottom of hole 100.4 Elevation 187.1 **Groundwater rose to elev. 213.5 after being first encountered near elev. 193 PID - Photo Ionization Detector *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30" Monitoring well installed
110						
115						
120						

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER – ALASKA DISTRICT
MONITORING WELL LOG

Location: Ft. Richarason, Ak
Project: Post Laundry Facility

SHEET 1 OF 1

Location Coordinates
Northing 115,990 Easting 127,202

Drilling Agency
XXXX Other Ambler Exploration ____ Corps of Engineers

Hole Number	Name of Driller	Weather
Field AP-4 Permanent AP-3467	S. Moore	Various

Type of Hole		Depth to	Depth Drilled	Total Depth
____ Test Pit	____ Auger Hole	XXXX AIR ROTARY	99.5	100.4

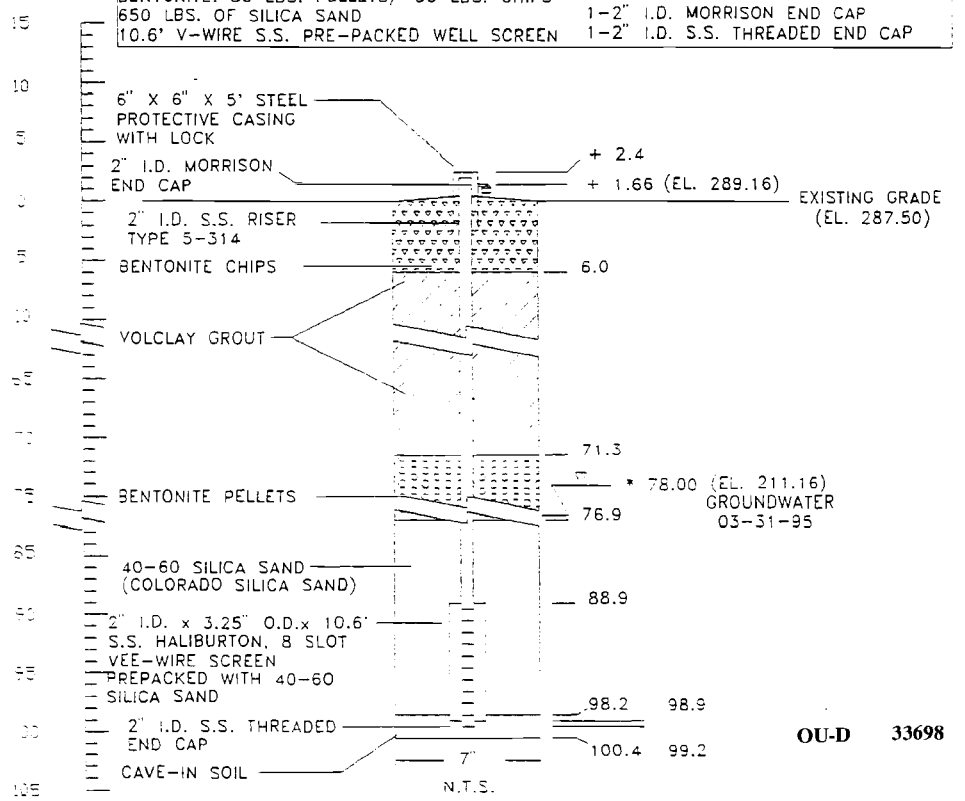
Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXXX MSL ____	Chicago Pnuematic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
13	Air Grab and Drive	* 78.00	19 Nov – 18 Dec 1994

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
287.5	J. Saucedo	J. Raychel	D. Thomas

SUMMARY OF MATERIALS USED

550 LBS. OF VOLCLAY GROUT
BENTONITE: 50 LBS. PELLETS/ 50 LBS. CHIPS
650 LBS. OF SILICA SAND
10.6' V-WIRE S.S. PRE-PACKED WELL SCREEN
1-6" X 6" X 5' PROTECTIVE CASING
1-COMBINATION LOCK
95' OF 2" I.D. S.S. RISER PIPE
1-2" I.D. MORRISON END CAP
1-2" I.D. S.S. THREADED END CAP



OU-D 33698

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*Graundwater measured after well installation

OU-D 33699

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 1 of 5

Location Coordinates: Northing 116,539 Easting 126,973

Drilling Agency: XXX Corps of Engineers | XXX Other: Ambler

Hole Number: Field AP-6 Permanent AP-3469

Name of Driller: S. Moore

Weather: Overcast, 0-15°F

Type of Hole: XXX Air Rot. ( ) Test Pit ( ) Auger Hole

Depth To: 0.0 | Depth Drilled: 125.0 | Total Depth: 125.0

Size and Type of Bit: 5" Tri Cone

Elevation Datum: XXX MSL

Type of Equipment: Chicago Pneumatic C9-672

Number of Samples: 23

Type of Samples: Air Grab and Drive

Depth to Groundwater: 76**

Date: 11-20 Jan 1995

Top of Hole Elevation: 287.40

Inspector: J. Sauceda

Chief, Soils Section: J. Raychel

Chief, Geotechnical Branch: D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
			GP	Poorly Graded GRAVEL w/Sand		Brown,frozen,subr.gravel, fine to coarse sand, ground-up gravel
		1	ML	Sandy SILT		Reddish brown,frozen,fine to medium gravel,NP fines
5						
10	2	2	GW	Well-Graded GRAVEL w/Sand	4"	68%Gr;27%Sa;5%Fines S1 Brown,moist,subr.gravel, fine to coarse sand,piece of coar,frac.gravel *17/19/18/16
	3	3	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand	3"	58%Gr;37%Sa;5%Fines S Brown,moist,subr.gravel, fine to coarse sand, pieces of coal, fractured gravel; PID=2.5 *22/25/26/22 for 4"
15						
20	10	4	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand	3"	57%Gr;33%Sa;10%Fines F1 Brown,gray & rust, moist subr.gravel, fine to med. sand, slightly plastic fines,many pieces of coal frac. gravel; PID=4.3 *9/15/28/18
		5	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand		Brown,gray & rust, moist subr.gravel, fine to coarse sand, slightly plastic fines; pieces of coal, frac. gravel *26/57/52/34
25						
30	4	6	GW-GM	Well-Graded GRAVEL w/ Silt & Sand		63%Gr;30%Sa;7%Fines S1 Brown,gray & rust, moist subr. gravel, fine to coarse sand, slightly plastic fines, pieces of coal, frac. gravel PID=0.5 *20/19/22/22

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DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson, Ak.
Bldg. 726 - Post Laundry

Sheet 2 of 5

Location Coordinates
Northing 116,539 Easting 126,973

Drilling Agency XXX Corps of Engineers
XXX Other Ambler

Hole Number	Name of Driller	Weather
Field AP-6 Permanent AP-3469	S. Moore	Overcast, 0-15°F

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. Test Pit Auger Hole	0.0	125.0	125.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
23	Air Grab and Drive	76**	11-20 Jan 1995

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
287.40	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		6	GW-GM			
		7	GM	Silty GRAVEL w/ Sand	3	Brown,gray & rust, moist subr. gravel, fine to coarse sand, pieces of coal, fractured gravel *46/59/32/20
35						
	3	8	GW-GM	Well-Graded GRAVEL w/ Sand		73%Gr;24%Sa;3%Fines P. Brown,gray & rust, moist subr.gravel, fine to coarse sand, pieces of coal, fractured gravel PID=0.5 *6/13/24/24
40		9	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand		Brown,gray & rust, moist, subr.gravel, fine to coarse sand, pieces of coal, fractured gravel *37/27/38/48
45						
	2	10	GW	Well-Graded GRAVEL w/ Sand	3"	67%Gr;28%Sa;5%Fines S1 Gray/brown, moist, subr.-ang.gravel,fine to coarse sand,NP fines,w/frac.grav *21/85/27/43
50		11	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand	3"	Gray,brown, moist, subr.-suba.gravel,med.to coarse sand,NP fines, frac.grav. due to drilling action *8/21/39/50 for 5"
		12				No recovery of Sample #12 *75/3"
55		13			3"	*3/12/20/40
	3	14	GW	Well-Graded GRAVEL w/ Sand	>3"	58%Gr;38%Sa;4%Fines P Brown w/orange ferrous stains, subr.-suba.grave. med.-coarse sand,NP fines w/blk coal pcs throughout *12/23/24/30
60						Continued

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DEPARTMENT OF THE ARMY
North Pacific Division
U.S. Army Engineer District Alaska
EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 3 of 5
Location Coordinates: Northing 116,539 Easting 126,973
Drilling Agency: XXX Corps of Engineers | XXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-6 Permanent AP-3469	S. Moore	Overcast, 0-15°F

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. ( ) Test Pit ( ) Auger Hole	0.0	125.0	125.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
23	Air Grab and Drive	76**	11-20 Jan 1995

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
287.40	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
			GW	Well-Graded GRAVEL w/ Sand		
	V					Some perched water between 62.5 & 60 ft. Driller reported no significant water.
65						
	5	15	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	>3"	64%Gr;30%Sa;6%Fines S1 Brown, wet, subr.-suba. gravel & cobbles, fine to coarse sand, NP fines
70						
75	24	16	ML	SILT		0%Gr;12%Gr;88%Fines F4 Dk.brown, wet, fine sand, NP fines; PID=0.6 *18
	19	17	SM	Silty SAND		2%Gr;75%Sa;23%Fines F4 Dk.brown/tan-gray, wet, med.-coarse sand, NP fines intermittant silt lenses up to 1" thick from 75.5-76 ft. *41/50/52
	V					
80						
85	22	18	SM	Silty SAND		0%Gr;53%Sa;47%Fines F2 Dk.brown/gray, wet, fine sand, NP fines PID=0.6 *6/6/12/1
90						Continued

OU-D 33702

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 4 of 5

Location Coordinates
Northing 116,539 Easting 126,973

Drilling Agency XXX Corps of Engineers
XXX Other Ambler

Hole Number	Name of Driller	Weather
Field AP-6 Permanent AP-3469	S. Moore	Overcast, 0-15°F

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. Test Pit Auger Hole	0.0	125.0	125.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
23	Air Grab and Drive	76**	11-20 Jan 1995

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
287.40	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
			SM	Silty SAND		0%Gr;82%Sa;18%Fines F2 Brown/gray, wet, fine-med sand, NP fines PID=0.6 *11
95	18	19	SM	Silty SAND		0%Gr;2%Sa;98%Fines F4 Gray,wet,stiff,NP fines *12/19
	24	20 21	ML	SILT		Brown,wet,fine sand,NP fines *26
			SP-SM	Poorly Graded SAND w/ Silt		
100						
105	11	22	SM	Silty SAND w/ Gravel	<2"	29%Gr;38%Sa;33%Fines F4 Dk.gray,moist,subr.-suba. gravel, fine sand, NP-PL fines; gravels cemented, s/ sm.coal pieces inter-mixed - sample may not be representative due to sm. recovery *11/100 for 4"
110						
115	8	23	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand	<2"	48%Gr;44%Sa;8%Fines S1 Gray, wet,subr.-rnd.grav. med. to coarse sand, NP fines *68/72 for 3"
120						Continued

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Project Ft Richardson, Ak. Bldg. 726 - Post Laundry | Hole Number AP-3469

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DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Sheet 5 of 5

Location Coordinates: Northing 116,539 Easting 126,973

Drilling Agency: XXX Corps of Engineers | XXX Other: Ambler

Hole Number	Name of Driller	Weather
Field AP-6 Permanent AP-3469	S. Moore	Overcast, 0-15°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [ ] Auger Hole [XXX] Air Rot.	0.0	125.0	125.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic C9-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
23	Air Grab and Drive	76**	11-20 Jan 1995

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
287.40	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
			GP-GM	Poorly Graded GRAVEL w/ Silt & Sand		Heaving soils at 123 ft.
				SAND		Gray, wet, mostly fine sand w/some med. & coarse sand NP fines
125						Bottom of hole 125.0 Elevation 162.4
						**Groundwater rose to elev. 210.9 after first being encountered near elev. 173.5
130						PID - Photo Ionization Detector
						*Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling 30"
135						Monitoring Well installed
140						
145						
150				▮ Frozen		

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Project: Ft Richardson, Ak. Bldg. 726 - Post Laundry | Hole Number: AP-3469

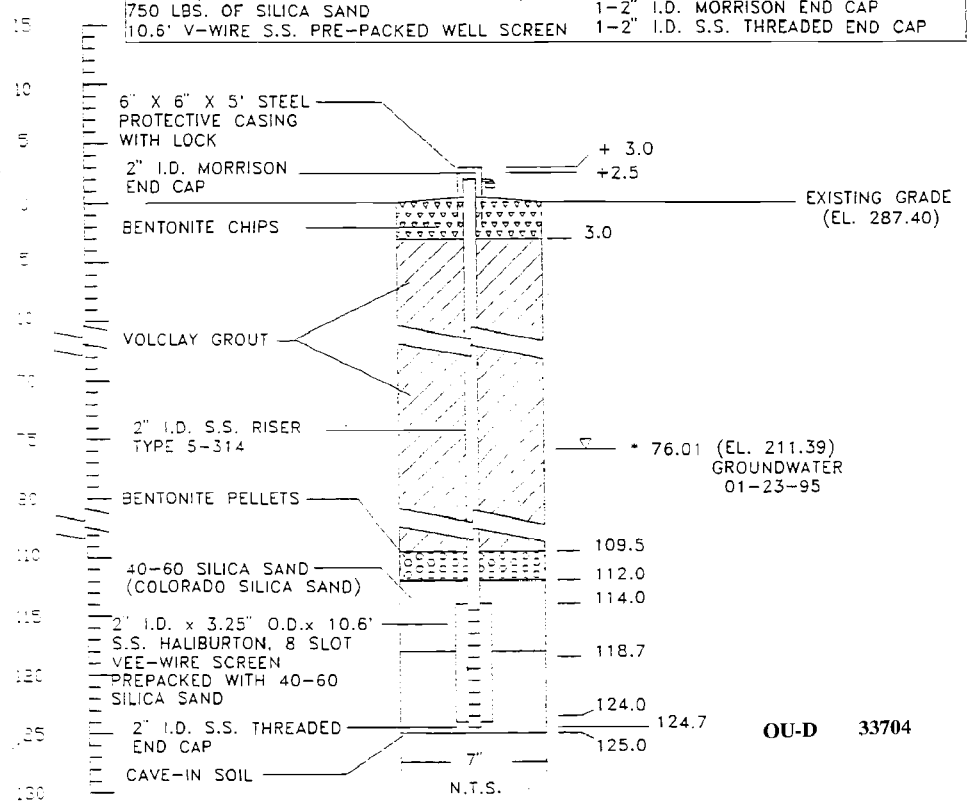
DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER - ALASKA DISTRICT
MONITORING WELL LOG

Location: Ft. Richardson, Ak. SHEET 1 OF 1
Project: Post Laundry Facility
Location Coordinates
Northing 115,991 Easting 127,202
Drilling Agency Corps of Engineers
XXXX Ambler Exploration

Hole Number Field AP-6 Permanent AP-3469	Name of Driller S. Moore		Weather Varible
Type of Hole ___ Test Pit ___ Auger Hole XXXX AIR ROTARY	Depth to	Depth Drilled 125.0	Total Depth 125.0
Size and Type of Bit 5" Tri Cone	Elevation Datum XXXX MSL ___	Type of Equipment Chicago Pnuematic CP-672	
Number of Samples 13	Type of Samples Air Grab and Drive	Depth to Groundwater * 76.01	Date 11 - 20 Jan 1995
Top of Hole Elevation 287.4	Inspector J. Sauceda/J. Raychel	Chief, Soils Section J. Raychel	Chief, Geotechnical Branch D. Thomas

SUMMARY OF MATERIALS USED

850 LBS. OF VOLCLAY GROUT
50 LBS./100 LBS OF BENTONITE PELLETS/CHIPS
750 LBS. OF SILICA SAND
10.6' V-WIRE S.S. PRE-PACKED WELL SCREEN
1-6" X 6" X 5' PROTECTIVE CASING
1-COMBINATION LOCK
115' OF 2" I.D. S.S. RISER PIPE
1-2" I.D. MORRISON END CAP
1-2" I.D. S.S. THREADED END CAP



OU-D 33704

NPA Form 19-E June 93 Prev. Ed. Obsolete

*Groundwater measured after well installation

BORING LOG

BORING NUMBER: AP3860

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 63
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/24/97
DATE COMPLETED: 9/25/97
NORTHING: 116360.78
EASTING: 126958.60

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 007SL	SS	13	11.9		SP-SM	Dark brown **Poorly Graded Sand with Silt and Gravel (SP-SM)**, medium to coarse sand, and gravel, 3/4 to 2 inches in diameter, subrounded, well graded, little fines, moist. Approximately one inch of asphalt at surface.	
			97B726 001SL	SS	28	111.0			Lithology similar to above.	
			964559 002SL	SS	44	5.2			Lithology similar to above, moist to wet.	
5								GP	Poorly Graded Gravel (GP), cobbles, blocky, angular, little sand, dry.	
			97B726 008SL	SS	27	2.7			Dark brown **Poorly Graded Gravel with Sand (GP)**, gravel 3/4 to 3 inches in diameter, subangular, some fine to medium sand, trace fines, moist.	
			97B726 009SL	SS	38	4.9			Lithology similar to above, some fine to coarse sand, dry to moist.	
10			97B726 003SL and 97B726 004SL (dup)	SS	35	0.0		SW	Dark brown **Well Graded Sand with Gravel (SW)**, fine to coarse sand, some gravel to 1 inch in diameter, moist.	
								GP	Poorly Graded Gravel (GP), blocky, broken gravel and cobbles (to 3 inches in diameter), dry.	
15			97B726 010SL	SS	23	0.0		SP-SC	Olive gray **Poorly Graded Sand with Clay and Gravel (SP-SC)**, medium to coarse sand, and gravel, to 2 inches in diameter, subrounded, poorly graded, little clay, moist.	
								GP	Poorly Graded Gravel (GP), blocky, broken, gravel, little bit of clayey sand at bottom of shoe.	
20								GP-GM		

BORING LOG

BORING NUMBER: AP3860

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 63
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/24/97
DATE COMPLETED: 9/25/97
NORTHING: 116360.78
EASTING: 126958.60

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 011SL	SS	33	0.0		GP-GM	Medium brown Poorly Graded Gravel with Silt and Sand (GP-GM), gravel to 2 inches in diameter, subrounded and angular, and fine to coarse sand, little fines, dry to moist.	
25			97B726 012SL	SS	24	0.0		GP	Poorly Graded Gravel with Sand (GP), lithology similar to above, smaller diameter gravel, trace fines, moist. Broken up rock at bottom of sample; piece of coal at top of sample.	
30			97B726 013SL	SS	31	0.0			Lithology similar to above, bits of coal in matrix, moist to wet.	
35			97B726 014SL	SS	46	0.0		GP-GM	Dark brown Poorly Graded Gravel with Silt and Sand (GP-GM), large gravels to 2.5 inches in diameter, blocky, subrounded, some medium to coarse sand, little silt, moist to wet. Color change to yellowish-orange/olive gray at 50.3 feet bgs.	
40								SP-SC		

BORING LOG

BORING NUMBER: AP3860

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 63
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/24/97
DATE COMPLETED: 9/25/97
NORTHING: 116360.78
EASTING: 126958.60

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 015SL	SS	22	0.0		SP-SC	Yellowish-orange **Poorly Graded Sand with Clay and Gravel (SP-SC)**, medium to coarse sand, and gravel to 2 inches in diameter, well graded, subrounded, little clay, moist to wet.	
45			97B726 016SL	SS	34			SP	Olive gray **Poorly Graded Sand with Gravel (SP)**, medium to coarse sand, and gravel, mostly <3/4 inch in diameter, subrounded, poorly graded, trace fines.	
50			97B726 017SL	SS	42			SM	Olive gray **Silty Sand with Gravel (SM)**, medium sand, and gravel, 3/4 inch diameter, tight, moist.	
								GW	Olive gray **Well Graded Gravel with Sand (GW)**, gravel to 2 inches in diameter, subrounded to subangular, and medium to coarse sand, trace fines, moist to wet.	
55			97B726 005SL	SS	28	1873		GP	Olive gray **Poorly Graded Gravel with Sand (GP)**, gravel to 3 inches in diameter, subrounded to subangular, and medium to coarse sand, chemical odor - solvent? - 82 on PID. Grain Size Analysis: 66% Gravel, 23% Sand, 2% Fines.	
60								SP		

BORING LOG

BORING NUMBER: AP3860

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 63
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/24/97
DATE COMPLETED: 9/25/97
NORTHING: 116360.78
EASTING: 126958.60

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 018SL	SS	36/ 9"	1348		SP	Olive gray **Poorly Graded Sand with Gravel (SP)**, coarse to medium sand, some gravel, 3/4 inch diameter, subrounded, poorly graded, band of very fine to fine sand at top 6 inches, **solvent odor - 8.2 on PID.** Plug at bottom of sample of gravels with medium to coarse sand and little fines, wet.	
								ML	Driller noted harder drilling at approximately 62 feet bgs - will drive spoon at 63 feet bgs.	
			97B726 008SL	SS	28/ 12"	90.4			Dark gray Silt with Gravel (ML), tight silt, some gravel to 2 inches in diameter, subrounded, poorly graded, pebbles scattered throughout sample, sample appears dry. **Grain Size Analysis: 8% Gravel, 42% Sand, 30% Silt, 14% Clay.**	
65									Bottom of augers to 63 ft bgs, last sample interval 63-64 ft bgs.	
70										
75										
80										

BORING LOG

BORING NUMBER: AP3861

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 58.5
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/25/97
DATE COMPLETED: 9/25/97
NORTHING: 116363.11
EASTING: 126912.62

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 018SL	SS	24	286		ML	Dark brown topsoil and roots. Light brown SILT (ML).	
								GP	Dark brown Poorly Graded GRAVEL with Sand (GP), gravel to 1", subrounded, broken, some fine to coarse sand, dry.	
			97B726 020SL	SS	28	NR		ML	Light brown SILT (ML), silt and organic materials (roots, wood fibers), moist. No sample collected.	
			964559 021SL	SS	31	92.2		GP	Light brown Poorly Graded GRAVEL with Sand (GP), gravel to 3", subrounded and broken, poorly graded, some fine to medium sand, dry.	
5			97B726 022SL	SS	45	3.8			Light olive gray Poorly Graded GRAVEL (GP), gravel mostly 3/4" to 1", subrounded, poorly graded, broken, some blocky to 2.5", little silty very fine to coarse sand, dry.	
			97B726 023SL	SS	34	0			Light yellowish-orange Poorly Graded GRAVEL with Sand (GP), gravels blocky, subrounded to angular, broken, up to 2", poorly graded, little fine to medium sand, dry.	
								SW-SC	Light yellowish-orange Well-Graded SAND with Clay and Gravel (SW-SC), fine to coarse sand, little clay, and gravels at 1/4" to 1", subrounded, well graded, moist.	
10			97B726 024SL	SS	29	2.0		SP	Light brown Poorly Graded SAND with Gravel (SP), fine to medium sand, some gravel at 1/4" and 1", subrounded, poorly graded, dry.	
								SW	Light brown Well-Graded SAND (SW), fine to coarse sand and gravels at 3/4" and 2", subrounded, dry to moist.	
15			97B726 025SL	SS	23	0.0		GP-GC	Light brown Poorly Graded GRAVEL with Clay and Sand (GP-GC), gravels at 3/4" and 2", subrounded, some fine to coarse sand, little fines/clay, moist.	
20								SP-SM		

BORING LOG

BORING NUMBER: AP3861

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 58.5
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/25/97
DATE COMPLETED: 9/25/97
NORTHING: 116363.11
EASTING: 126912.62

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 026SL	SS	40	0.0		SP-SM	Lithology similar to above, increased sand content Poorly Graded SAND with Silt and Sand (SP-SM), moist.	
25			97B726 027SL	SS	25	0.0			Lithology same as above. bits of coal, increasing fines content from 12 to 20", moist.	
30			97B726 028SL	SS	23	0.0		SP-SC	Light brown Poorly Graded SAND with Clay and Gravel (SP-SC), gravels from 1/4" to 1 3/4", subrounded, poorly graded, and medium to coarse sand, little clay, moist.	
35			97B726 029SL	SS	40	0.0		GW-GC	Light brown Well-Graded GRAVEL with Clay and Sand (GW-GC), gravel from 1/4" to 1", well graded, subrounded, little large gravel to 2 1/2", blocky, broken, some fine to coarse sand (little clay in matrix), moist.	
40								GP-GC		

BORING LOG

BORING NUMBER: AP3861

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 726

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 58.5

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft):

TOP OF CASING ELEV. (ft):

FIELD PARTY: M. Field

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 9/25/97

DATE COMPLETED: 9/25/97

NORTHING: 116363.11

EASTING: 126912.62

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 030SL	SS	38	0.0		GP-GC	Yellowish-orange Poorly Graded GRAVEL with Clay and Sand (GP-GC), gravels from 1" to 2.5", subrounded, poorly graded, matrix similar to above (little clay), dense, moist.	
45			97B726 031SL	SS	48	4.2*		GP	Light brown Poorly Graded GRAVEL with Sand (GP), coarse gravel at 2", subrounded, poorly graded, some fine to coarse sand, dry to moist.	
50			97B726 032SL	SS	28	5.6*		SP	Olive gray Poorly Graded SAND with Gravel (SP), medium sand, some gravel in bottom 6" (well graded, 1/4" to 1"), moist.	
55			97B726 033SL	SS	42	1071		GP	Light brown Poorly Graded GRAVEL with Sand (GP), coarse gravel to 3", blocky, subrounded to subangular, poorly graded, and silty medium to coarse sand, loose, saturated. Moderate solvent odor. Grain Size Analysis: 79% gravel, 23% sand, 2.5% fines.	
			97B726 034SL	SS	32/ 12"	14.3		ML	Encountered possible confining unit at 57.5. Light yellowish-orange to olive gray SILT (ML), very fine sand and silt, a few lenses of fine sand, moist. Grain Size Analysis: 8% sand, 77% silt, 11% clay.	
60									Bottom of boring at 57.5 ft bgs, sample to 58.5 ft bgs.	

BORING LOG

BORING NUMBER: AP3862

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 59
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/26/97
DATE COMPLETED: 9/26/97
NORTHING: 116390.45
EASTING: 126952.35

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 035SL and 053SL dup	SS	18	45		GW-GM	Dark brown Well-Graded GRAVEL with Silt and Sand (GW-GM), gravel to 3", blocky, subrounded, broken, well graded, matrix of medium to coarse sand (little silt in matrix), moist in top 3", dry to moist in remainder.	
			97B726 036SL	SS	23	57			Lithology same as above.	
			964559 037SL	SS	31	2.2			Lithology same as above, dry.	
5			97B726 038SL	SS	35	1.9		SP-SM	Dark brown Poorly Graded SAND with Silt and Gravel (SP-SM), medium to coarse sand, little silt, some gravels from 1/4" to 1", poorly graded, subrounded, moist.	
								GW-GM	Well-graded GRAVEL with Silt and Sand (GW-GM), lithology same as 4-6 foot interval, dry to moist.	
			97B726 039SL	SS	28	0		GP	Dark brown Poorly Graded GRAVEL (GP), gravel from 1" to 3", subangular, blocky, broken, poorly graded.	
								GP-GC	Yellowish-orange Poorly Graded GRAVEL with Clay and Sand (GP-GC), gravels from 1/4" to 1", subrounded, poorly graded in matrix of clayey (some) medium sand, dry to moist.	
10			97B726 040SL	SS	27	1.1*		SP	Dark brown Poorly Graded SAND (SP), fine to medium sand, little coarse sand, moist (possibly dragged down during augering).	
								GP	Poorly Graded GRAVEL with Sand (GP), gravels at 3", blocky, broken, subrounded and angular, poorly graded, little medium to coarse sand, dry to moist.	
15			97B726 041SL	SS	17	0			Dark brown Poorly Graded GRAVEL with Sand (GP), gravel at 1", blocky, angular, poorly graded, and medium to coarse sand, dry.	
								GP-GC	Yellowish-orange Poorly Graded GRAVEL with Clay and Sand (GP-GC), gravel at 1 to 2", subrounded, broken, poorly graded, matrix of clayey (little) coarse to medium sand, cohesive, moist. Approximate 1" thick lens of dry, clean, fine sand at 16".	
20								SP		

BORING LOG

BORING NUMBER: AP3862

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 59
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/26/97
DATE COMPLETED: 9/26/97
NORTHING: 116390.45
EASTING: 126952.35

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 042SL	SS	42	0.7		SP	Dark brown Poorly Graded SAND (SP), coarse to medium sand, dry.	
								GP-GC	Poorly Graded GRAVEL with Clay, Sand and Cobbles (GP-GC), gravel at 1 to 2", subangular to sub- rounded, poorly graded, and cobbles (3"), blocky, subangular, broken, matrix of medium to coarse sand (little clay in matrix), dry.	
25			97B726 043SL	SS	30	0			Lithology similar to above, gravel 1/4" to 1", subrounded, poorly graded, and clayey medium to coarse sand. At 12 to 17", clean medium sand with little fine gravel (1/4"), moist.	
30			97B726 044SL	SS	33	0		SP	Dark brown Poorly Graded SAND with Gravel (SP), medium to coarse sand, some fine gravel (1/4"), moist.	
								GW-GC	Yellowish-orange Well-Graded GRAVEL with Clay and Sand (GW-GC), gravel from 1/4" to 2", subrounded, well graded, some broken, and clayey (little) coarse to medium sand, moist.	
35			97B726 045SL	SS	29	0			Similar lithology to above, few cobbles subrounded, moist to wet.	
40								SP-SM		

BORING LOG

BORING NUMBER: AP3862

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 59
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: M. Field

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/26/97
DATE COMPLETED: 9/26/97
NORTHING: 116390.45
EASTING: 126952.35

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 046SL	SS	33	0		SP-SM	Dark brown Poorly Graded SAND with Silt (SP-SM), medium to coarse sand, little silt, some 1/4" gravel, dry.	
								GP	Yellowish-orange Poorly Graded GRAVEL (GP), gravels predominantly 1", and medium to coarse sand in bottom foot of sample, moist.	
45			97B726 047SL	SS	33	0		GW-GC	Yellowish-orange ell-Graded GRAVEL with Clay and Sand (GW-GC), gravels from 1/2" to 3", subrounded to subangular, well graded, matrix of clayey (little) medium to coarse sand, moist to wet.	
50			97B726 048SL	SS	37	0		SP	Yellowish-orange to olive gray Poorly Graded SAND with Gravel (SP), medium sand, and gravels from 1/4" to 1", subrounded, poorly graded, moist. Large cobble at approximately 3". No noticeable odor or elevated PID reading on split spoon.	
55			97B726 049SL and 052SL (dup)	SS	36	1798		GW	Olive gray Well-Graded GRAVEL with Sand (GW), gravels at 3/4" to 2", subrounded, well graded, and medium to coarse sand, saturated. SOLVENT ODOR. PID on split spoon was 400. Grain Size Analysis: 49% Gravel, 48% Sand, 4% Fines.	
			97B726 050SL	SS	28	137		SP	Encountered possible confining unit at 57 ft bgs. Olive gray Poorly Graded SAND with Gravel (SP), medium to coarse sand and gravel from 1/4" to 1", subrounded, saturated.	
								ML	Light brown SILT with Sand (ML), very fine sand and silt, thin lenses of fine sand, tight, dry. (Analytical sample collected from the 58.33 to 59 feet).	
60									Bottom of boring 57.5, last sample 57.5 to 59 ft bgs.	

BORING LOG

BORING NUMBER: AP3863

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 726

JOB NUMBER: 9000-107

LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn

DRILLED BY: Hughes Drilling

METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 57

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

SURFACE ELEVATION (ft):

TOP OF CASING ELEV. (ft):

FIELD PARTY: A. Seuss

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

FILTER PACK:

DATE STARTED: 9/29/97

DATE COMPLETED: 9/29/97

NORTHING: 116301.44

EASTING: 128959.33

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 054SL and 071SL dup	SS	10	0		GW-GM	Dark brown Well-Graded GRAVEL with Silt and Sand (GW-GM), gravel 1/4" to 2", subrounded, broken, well graded, matrix of silty (little) medium to coarse sand, moist.	
			97B726 055SL	SS	22	0			Lithology similar to above, gravels to 3", moist.	
			984559 056SL	SS	23	2.3			Lithology similar to above, dry to moist.	
5			97B726 057SL	SS	24	1.5			Lithology same as above, gravels to 2", dry to moist.	
			97B726 058SL	SS	27	5.8			Lithology same as above, large cobble (4") wedged in shoe, dry.	
10			97B726 059SL	SS	21	0.3		SP	Dark brown Poorly Graded SAND with Gravel (SP), medium to coarse sand, some gravel to 1/2", subrounded, poorly graded, dry.	
15			97B726 080SL	SS	27	0.9		GW-GC	Yellowish-orange Well-Graded GRAVEL with Clay and Sand (GW-GC), gravel from 1/4" to 2", subrounded, well graded, and coarse to medium sand, little clay, moist.	
20										

BORING LOG

BORING NUMBER: AP3863

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 57
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: A. Seuss

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/29/97
DATE COMPLETED: 9/29/97
NORTHING: 116301.44
EASTING: 126959.33

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 061SL	SS	21	0.6		GW-GC	Lithology same as above, moist.	
25			97B726 062SL	SS	28	2.3			Lithology similar to above, few cobbles (3", blocky, subrounded), moist.	
30			97B726 063SL	SS	26	1.7		SW-SM	Dark brown Well-Graded SAND with Silt and Gravel (SW-SM), fine to coarse sand, gravel to 3/4", subrounded, poorly graded, little silt, dry to moist.	
								GW-GC	Same as 25 foot interval. Well-Graded GRAVEL with Clay and Sand (GW-GC).	
35			97B726 064SL	SS	28	5.6		GW	Yellowish-orange Well-Graded GRAVEL with Sand (GW), gravel 1/4" to 1", sub- rounded, well graded, some coarse to medium sand, moist to wet.	
40										

BORING LOG

BORING NUMBER: AP3863

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 726
JOB NUMBER: 9000-107
LOGGED BY: J. Shapiro APPROVED BY: S. Wrenn
DRILLED BY: Hughes Drilling
METHOD: CME 75, 4.25 ID HSA

BORING DEPTH (ft): 57
BORING DIAMETER (in): 8
WELL DEPTH (ft):
WELL DIAMETER (in):
SURFACE ELEVATION (ft):
TOP OF CASING ELEV. (ft):
FIELD PARTY: A. Seuss

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 9/29/97
DATE COMPLETED: 9/29/97
NORTHING: 116301.44
EASTING: 126959.33

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
			97B726 065SL	SS	25	1.8		GW	Well-graded GRAVEL with Sand (GW), lithology similar to above.	
45			97B726 066SL	SS	41	0		SP-SM	Dark brown Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medum sand, and fine gravel (1/4"), subangular to subrounded, poorly graded, little silt, dense, dry (possibly dragged down with augers).	
								GW	Well-Graded GRAVEL with Sand (GW), lithology similar to 40 ft interval, some cobbles to 3", blocky, subrounded, moist. Grain Size Analysis: 72% Gravel, 28% Sand, 3% Fines.	
50			97B726 067SL	SS	51	2.6		SP-SM	Poorly Graded SAND with Silt and Gravel (SP-SM). Same as 45 to 45.75 foot interval.	
								SP-SM	Well graded GRAVEL with Sand (GW), similar to 40 foot interval, moist to wet.	
55			97B726 068SL, 069SL and 070SL (dup)	SS	23			SP	Olive gray SAND (SP), medium to coarse sand, loose, saturated, no noticeable odor.	
								ML	Yellowish-orange SILT (ML), very fine sand and silt, laminae of fine sand, tight, dry, possible confining unit. Grain Size Analysis: 23% Gravel, 48% Sand, 21% Silt, 9% Clay. NOTE: Not enough sample of 56.4 ft interval for analytical params; drove additional spoon and retrieved approximately 12 inches of yellowish-orange silty (some) fine sand.	
60									Bottom of auger hole to 55 ft, last sample to 58 ft bgs.	

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Cl. ENSR Consulting & Engineering
Project: Fort Richardson OUD RI
Sample Matrix: Soil

Service Request: K9707097
Date Collected: 9/24/97
Date Received: 9/27/97
Date Analyzed: 10/15/97

AP3860
97B726 BH01-55'

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 97B72605SL
Lab Code: K9707097-7

Sand Fraction: Weight (Grams)	251.3092
Sand Fraction: Weight Recovered (Grams)	251.2216
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	313.1
Percent Solids	90.0
Weight Oven-Dried (Grams)	281.7900

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	4.75 mm	4	186.8506	66.3
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	23.9641	8.5
Very Coarse Sand] med	0.850 mm	20	18.9222	6.7
Coarse Sand] Sand	0.425 mm	40	11.7390	4.2
Medium Sand] Fine	0.250 mm	60	4.8849	1.7
Fine Sand] Sand	0.106 mm	140	3.8915	1.4
Very Fine Sand]	0.075 mm	200	0.8240	0.3
Clay			1.6600	0.6
Silt			4.3250	1.5
		Total	257.0613	91

	%
Gravel	66.3
Coarse Sand	8.5
Med Sand	10.9
Fine Sand	3.4
Fines	2.1

Approved By: _____ Date: 10/21/97

OU-D 33718

00009

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI
Sample Matrix Soil

Service Request: K9707097
Date Collected: 9/25/97
Date Received: 9/27/97
Date Analyzed: 10/15/97

AP3860
97B726 BH01-63'

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 97B72606SL
Lab Code: K9707097-1

Sand Fraction: Weight (Grams)	23.351
Sand Fraction: Weight Recovered (Grams)	23.4388
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	50.7227
Percent Solids	92.7
Weight Oven-Dried (Grams)	47.0199

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	3.7173	7.9
~~Fine Gravel~~ coarse sand	2.00 mm	10	3.5368	7.5
Very Coarse Sand / med	0.850 mm	20	2.8870	6.1
Coarse Sand / sand	0.425 mm	40	3.0757	6.5
Medium Sand / fine	0.250 mm	60	2.9088	6.2
Fine Sand / sand	0.106 mm	140	5.3709	11.4
Very Fine Sand /	0.075 mm	200	1.7842	3.8
Clay			6.5950	14.0
Silt			14.1550	30.1
		Total	44.0307	94

	%
Gravel	7.9
Coarse Sand	7.5
Med Sand	12.6
Fine Sand	21.4
Fines	~~65.5~~ 44.1

Approved By: _____ Date: 10/15/97

7097-1.XLS \10/15/97

00005
Page No.:

OU-D 33719

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI
Sample Matrix Soil

Service Request: K9707097
Date Collected: 9/25/97
Date Received: 9/27/97
Date Analyzed: 10/15/97

AP 3860
97B726 BH01 - 63'

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 97B72606SL
Lab Code: K9707097-1d

Sand Fraction: Weight (Grams)	25.0005
Sand Fraction: Weight Recovered (Grams)	24.9972
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	50.6505
Percent Solids	92.7
Weight Oven-Dried (Grams)	46.9530

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel / Sand	4.75 mm	4	7.5995	16.2
~~Fine Gravel~~ Coarse ~~Sand~~	2.00 mm	10	2.3013	4.9
Very Coarse Sand / med	0.850 mm	20	2.8480	6.1
Coarse Sand / Sand	0.425 mm	40	2.8646	6.1
Medium Sand / fine	0.250 mm	60	2.8700	6.1
Fine Sand / sand	0.106 mm	140	4.5595	9.7
Very Fine Sand	0.075 mm	200	1.7738	3.8
Clay			6.4400	13.7
Silt			14.3150	30.5
		Total	45.5717	97

	%
Gravel	16.2
Coarse sand	4.9
Med sand	12.2
Fine sand	19.6
Fines	44.2

Approved By: _____ Date: 10/15/97

00006

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI
Sample Matrix Soil

Service Request: K9707097
Date Collected: 9/25/97
Date Received: 9/27/97
Date Analyzed: 10/15/97

AP 3861
97B726BH02-55'

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 97B72633SL
Lab Code: K9707097-5

Sand Fraction: Weight (Grams)	400.299
Sand Fraction: Weight Recovered (Grams)	400.1667
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	427.9
Percent Solids	91.9
Weight Oven-Dried (Grams)	393.2401

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	311.3100	79.2
~~Fine Gravel~~ coarse sand	2.00 mm	10	21.6283	5.5
Very Coarse Sand / med	0.850 mm	20	26.7172	6.8
Coarse Sand / sand	0.425 mm	40	21.9515	5.6
Medium Sand / fine	0.250 mm	60	8.7469	2.2
Fine Sand / sand	0.106 mm	140	7.7071	2.0
Very Fine Sand	0.075 mm	200	1.6902	0.4
Clay			2.3700	0.6
Silt			7.4000	1.9
		Total	409.5212	104

	%
Gravel	79.2
Coarse Sand	5.5
Med Sand	12.4
Fine Sand	4.6
Fines	2.5

Approved By: _____ Date: 10/15/97

00007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Fort Richardson OUD RI
Sample Matrix Soil

Service Request: K9707097
Date Collected: 9/25/97
Date Received: 9/27/97
Date Analyzed: 10/15/97

AP 3861
97B726BH02-57.5

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 97B72634SL
Lab Code: K9707097-6

Sand Fraction: Weight (Grams)	10.7804
Sand Fraction: Weight Recovered (Grams)	10.7574
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	150.534
Percent Solids	85.4
Weight Oven-Dried (Grams)	128.5560

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	0.0000	0.00
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	0.0000	0.00
Very Coarse Sand / med	0.850 mm	20	0.4379	0.3
Coarse Sand / Sand	0.425 mm	40	0.5253	0.4
Medium Sand / fine	0.250 mm	60	1.3996	1.1
Fine Sand / Sand	0.106 mm	140	4.7551	3.7
Very Fine Sand	0.075 mm	200	2.7524	2.1
Clay			14.0600	10.9
Silt			99.1500	77.1
		Total	123.0803	96

	%
Gravel	0
Coarse Sand	0
Med Sand	0.7
Fine Sand	6.9
Fines	88.0

Approved By: _____ Date: 10/15/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	ENSR Consulting & Engineering	**Service Request:**	K9707144
Project:	Fort Richardson OUD RI	**Date Collected:**	9/26/97
Sample Matrix	Soil	**Date Received:**	9/30/97
		Date Analyzed:	10/15/97

AP 3862
97B726BH03 SS

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 97B72652SL
Lab Code: K9707144-8

Sand Fraction: Weight (Grams)	159.9326
Sand Fraction: Weight Recovered (Grams)	160.1589
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	176.596
Percent Solids	93.2
Weight Oven-Dried (Grams)	164.5875

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	80.5064	48.9
~~Fine Gravel~~ coarse Sand	2.00 mm	10	27.4127	16.7
Very Coarse Sand med	0.850 mm	20	22.6959	13.8
Coarse Sand sand	0.425 mm	40	16.6334	10.1
Medium Sand fine	0.250 mm	60	6.9310	4.2
Fine Sand sand	0.106 mm	140	4.6376	2.8
Very Fine Sand	0.075 mm	200	1.1602	0.7
Clay			1.3650	0.8
Silt			5.2350	3.2
		Total	166.5772	101

	%
Gravel	48.9
Coarse Sand	16.7
Med Sand	23.9
Fine Sand	7.7
Fines	4

Approved By: _____ Date: 10/15/97

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ent: ENSR Consulting & Engineering
ject: Fort Richardson OUD RI
nple Matrix Soil

Service Request: K9707195
Date Collected: 9/29/97
Date Received: 10/1/97
Date Analyzed: 10/15/97

AP3863
17B726BH04-50' 45'

Particle Size Determination
ASTM Method D422 Modified

nple Name: 97B72666SL
Code: K9707195-4

Sand Fraction: Weight (Grams)	521.171
Sand Fraction: Weight Recovered (Grams)	521.142
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	550.6
Percent Solids	96.5
Weight Oven-Dried (Grams)	531.3290

scription	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~dium~~ Gravel	4.75 mm	4	384.8400	72.4
~~e Gravel~~ Coarse Sand	2.00 mm	10	47.1337	8.9
ry Coarse Sand Med Sand	0.850 mm	20	33.0125	6.2
arse Sand	0.425 mm	40	26.7684	5.0
dium Sand Fine Sand	0.250 mm	60	14.4248	2.7
ne Sand	0.106 mm	140	11.6414	2.2
ry Fine Sand	0.075 mm	200	2.8325	0.5
ay			7.0400	1.3
t			10.9400	2.1
		Total	538.6333	101

c/o
Gravel 72.4
Coarse Sand 8.9
Med Sand -11.2
Fine Sand 5.4
Fine 3.4

pproved By: _____ Date: 10/16/97

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7195-4.XLS \10/16/97

OU-D 33724

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

..ient:	ENSR Consulting & Engineering	**Service Request:**	K9707195
Project:	Fort Richardson OUD RI	**Date Collected:**	9/29/97
Sample Matrix	Soil	**Date Received:**	10/1/97
		Date Analyzed:	10/15/97

AP 3863
97B726 BH04-55'

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 97B72669SL
Lab Code: K9707195-6

Sand Fraction: Weight (Grams)	197.4979
Sand Fraction: Weight Recovered (Grams)	197.38
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	313.1
Percent Solids	89.4
Weight Oven-Dried (Grams)	279.9114

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	63.0906	22.5
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	19.2671	6.9
Very Coarse Sand / med	0.850 mm	20	20.2498	7.2
Coarse Sand / sand	0.425 mm	40	31.7840	11.4
Medium Sand / fine,	0.250 mm	60	22.7677	8.1
Fine Sand / sand	0.106 mm	140	31.0100	11.1
Very Fine Sand	0.075 mm	200	8.3669	3.0
Clay			26.3600	9.4
Silt			58.6850	21.0
		Total	281.5811	101

	%
Gravel	22.5
Coarse Sand	6.9
Med Sand	18.6
Fine Sand	22.2
Fines	30.4

Approved By: _____ Date: 10/15/97

00006

U.S. ARMY CORPS OF ENGINEERS
SURVEY SECTION
FORT RICHARDSON, ALASKA / OPERABLE UNIT "D"
SUBSURFACE INVESTIGATION

Date: 12-03-97
List of Boring Points

AP ID	Northing	Easting	Elevation @ Grd.	Elevation top PVC	Descriptor
Building 726					
AP-3860	116,360.78	126,958.60	286.8		Soil Boring
AP-3861	116,363.11	126,912.62	285.8		Soil Boring
AP-3862	116,390.45	126,952.35	286.9		Soil Boring
AP-3863	116,301.44	126,959.33	286.9		Soil Boring
Building 704					
AP-3864	116,999.67	128,142.98	294.5		Soil Boring
Fish Hatchery					
AP-3865	112,178.98	127,350.21	276.6	276.67	Monitoring Well
AP-3866	112,063.27	127,431.27	278.1	277.78	Monitoring Well

BUILDING 796

- BORING LOGS/WELL COMPLETION DIAGRAMS
- GRAIN SIZE ANALYSIS
- SURVEY DATA

Key to ENSR boring logs

GW, GW-GM, GW-GC - Well graded gravels, sandy gravels, gravels with sand, little or no fines

GP, GP-GM, GP-GC - Poorly graded gravels, sandy gravels, gravels with sand, little or no fines

GM - Silty gravels, gravel-sand-silt mixtures

GC - Clayey gravels, gravel-sand-clay mixtures

SW, SW-SM, SW-SC - Well graded sands, gravelly sands, sands with gravel, little or no fines

SP, SP-SM, SP-SC - Poorly graded sands, gravelly sands, sands with gravel, little or no fines

SM - Silty sands, silt-sand mixtures

SC - Clayey sands, clay-sand mixtures

ML - Inorganic silts, very fine sands, rock flour, silty or clayey fine sands

CL - Inorganic clays, gravelly clays, sandy clays, silty clays, lean clays

PT - Peat

BORING LOG

BORING NUMBER: AP-3511

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, ODerable Unit D
PROJECT LOCATION: Building 796
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3511

BORING DEPTH (ft): 18
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft):
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 10-25-94
DATE COMPLETED: 10-25-94
NORTHING: 118899.29
EASTING: 130876.84

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					13 7 4 3			SM	med. brown FILL-SILTY SAND (SM), with gravel, gravel sub rounded to angular (up to 2.5"), sand poorly sorted, dry, no odors	
5					2 2 2 3				same as above, moist, mostly gravel, no stain, no odor	
10					3 4 5 12 7 13 19				same as above, gravel increasing in size (up to 4"), no stain or odor Med. brown FILL-SILTY SAND (SM), gravel, coarse angular to subrounded gravel interbedded, fine to medium sand, slight clay, common pockets of light yellow silt, very wet, no odor.	
15					28 12 88 63 88 8 84 108 70			SW GW	Medium brown SAND (SW), fine to medium sand, some silt and interbedded gravel, gravel up to 3" dia., wet, no odor Brown-gray SANDY GRAVEL (GW), fine to coarse sand, gravel increasing with depth, moist, no odor. Total depth = 18 feet	
20										
25										
30										

BORING LOG

BORING NUMBER: AP-3512

CLIENT: United States Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit 0
PROJECT LOCATION: Building 796
JOB NUMBER: 9000-036
LOGGED BY: J. Winkler APPROVED BY: S. Wing
DRILLED BY: Hughes Drilling Co.
METHOD: 4.25" ID HSA
FILENAME: AP3512

BORING DEPTH (ft): 19
BORING DIAMETER (in): 6
WELL DEPTH (ft): NA
WELL DIAMETER (in): NA
REFERENCE ELEVATION (ft):
CASING STICKUP (ft): NA
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): NA
SCREEN TYPE: NA
SLOT SIZE (in): NA
FILTER PACK: NA
DATE STARTED: 10-25-94
DATE COMPLETED: 10-25-94
NORTHING: 118890.83
EASTING: 130939.20

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
					6 6 6 6			SM	medium brown FILL-SILTY SAND (SM),with gravel. gravel subrounded to angular (up to 2.5"), sand poorly sorted. fine-medium, no stain, no odor, moist	
5					4 7 18 15 6 5 7				As above. dry. no odor as above. dry. no odor	
10					13 9 14 17 18			SW	Medium brown SAND (5% to medium sand. some silt and interbedded gravel. very moist; sand poorly sorted. gravel (up to 3") increasing with de.	
15					9 23 34 42				As above, 4" gravel layer (subrounded) in midle section of sampler	
					16 18 16 17			GW	Medium brown SANDY GRAVEL (GW). fine to coarse sand. gravel increasing with depth. slight iron oxidation staining. moist, no odor, trace silt	
20									Total deoth = 19 feet	
25										
30										

BORING LOG BORING NUMBER AP-3513

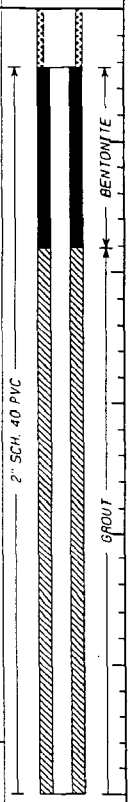
CLIENT: U.S. Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 796
JOB NUMBER: 9000-036
LOGGED BY: E. Rapport APPROVED BY: S. Wing
DRILLED BY: Alpine Drilling
METHOD: Air Rotary
FILENAME: AP3513

BORING DEPTH (ft): 91.5
BORING DIAMETER (in): 8
WELL DEPTH (ft): 91
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft):
TOP OF PVC ELEVATION (ft): 321.89
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: PVC
SLOT SIZE (in): 0.010
FILTER PACK: 0.020
DATE STARTED: 2/12/95
DATE COMPLETED: 2/14/95
NORTHING: 118899.30
EASTING: 130876.46

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
0								GP	Frost. Base of frost estimated to be 4 feet.
5									Coarse sand and gravel cuttings.
									Core barrel covered with bentonite slurry. Observed hole in sidewall of north side.
10						3.8			Bentonite cuttings in slurry.
15									
20						4.4			GRAVEL (GP), sandy, medium olive gray, <0.062mm-6cm, bimodal, fine mode=0.2mm, coarse mode=2cm, subrounded to subangular (sands subang), 60% lithic fragments (siltstone, metavolcanic, granitoid, quartzite), 30% quartz, 10% Na feldspar. Bentonite in sampler to 18.4 feet. Lost sampler shoe in hole and warped sampler. Moist to slightly moist.
25									
30						126.8		GW	GRAVEL (GW), muddy, as above, fine mode 0.1mm, slightly cohesive (gravels have grain to grain contact. Slightly moist.

WELL DIAGRAM



BORING LOG BORING NUMBER: AP-3513

CLIENT: U.S. Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 796
JOB NUMBER: 9000-036
LOGGED BY: E. Rapport APPROVED BY: S. Wing
DRILLED BY: Alpine Drilling
METHOD: Air Rotary
FILENAME: AP3513

BORING DEPTH (ft): 91.5
BORING DIAMETER (in): 8
WELL DEPTH (ft): 91
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft):
TOP OF PVC ELEVATION (ft): 321.89
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: PVC
SLOT SIZE (in): 0.010
FILTER PACK: 0.020
DATE STARTED: 2/12/95
DATE COMPLETED: 2/14/95
NORTHING: 118899.30
EASTING: 130876.46

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
35								GW	
40						L.3		GP	GRAVEL (GP), sandy, as above.
45									
50						2.5		GW	GRAVEL (GW), muddy, as above, slightly moist. Refusal at 49.5 feet.
55									
60						2.8			GRAVEL (GW), muddy, as above, slightly moist. Refusal at 59.7 feet.

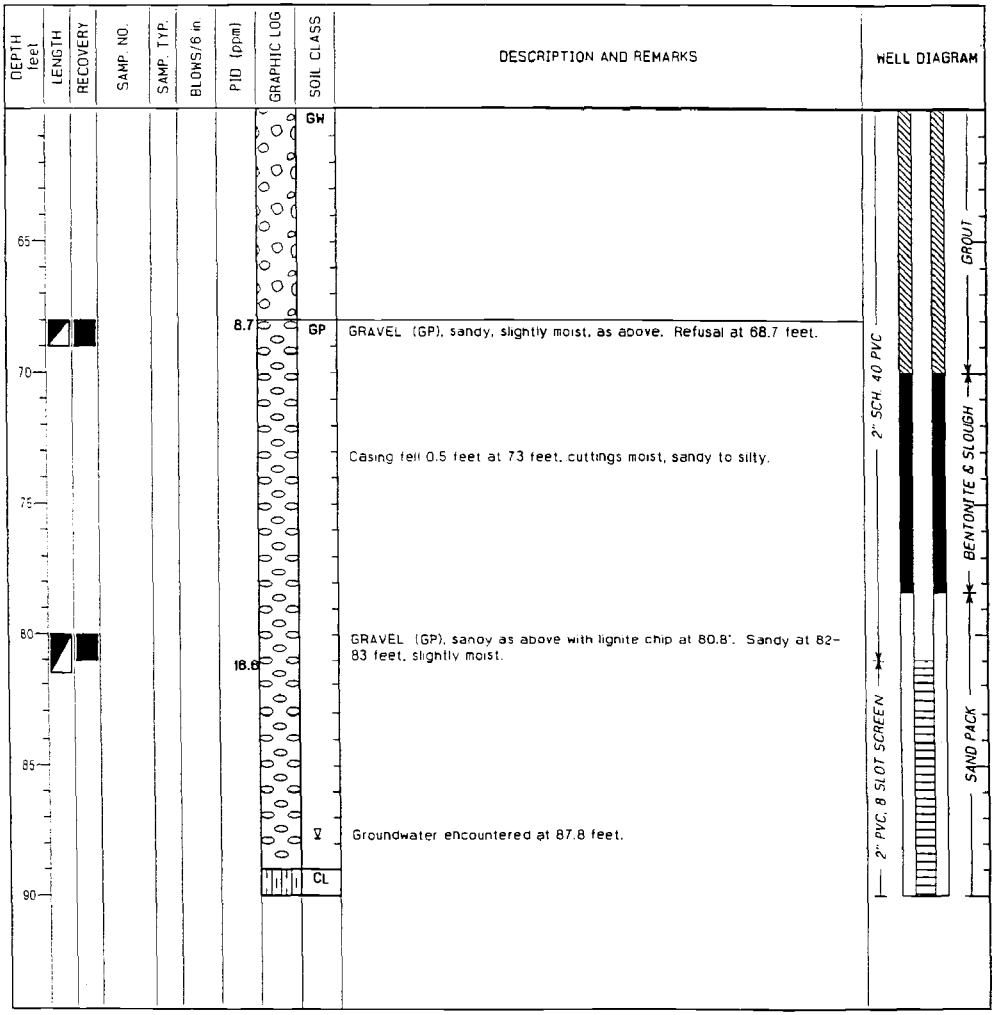
WELL DIAGRAM: 2" SCH. 40 PVC; GROUT

BORING LOG BORING NUMBER AP-3513

CLIENT: U.S. Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 796
JOB NUMBER: 9000-036
LOGGED BY: E. Rapport APPROVED BY: S. Wing
DRILLED BY: Alpine Drilling
METHOD: Air Rotary
FILENAME: AP3513

BORING DEPTH (ft): 91.5
BORING DIAMETER (in): 8
WELL DEPTH (ft): 91
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft):
TOP OF PVC ELEVATION (ft): 321.89
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: PVC
SLOT SIZE (in): 0.010
FILTER PACK: 0.020
DATE STARTED: 2/12/95
DATE COMPLETED: 2/14/95
NORTHING: 118899.30
EASTING: 130876.46



BORING LOG BORING NUMBER AP-3513

CLIENT: U.S. Army Corps of Engineers
PROJECT NAME: Fort Richardson, Operable Unit D
PROJECT LOCATION: Building 796
JOB NUMBER: 9000-036
LOGGED BY: E. Radcort APPROVED BY: S. Wing
DRILLED BY: Alpine Drilling
METHOD: Air Rotary
FILENAME: AP3513

BORING DEPTH (ft): 915
BORING DIAMETER (in): 8
WELL DEPTH (ft): 91
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft):
TOP OF PVC ELEVATION (ft): 321.89
FIELD PARTY: H. Kent

SCREEN LENGTH (ft): 10
SCREEN TYPE: PVC
SLOT SIZE (in): 0.010
FILTER PACK: 0.020
DATE STARTED: 2/12/95
DATE COMPLETED: 2/14/95
NORTHING: 118899.30
EASTING: 130876.46

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/6 in.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								CL		
95										
100										
105										
110										
115										
120										

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Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson
28 Monitoring Wells

Sheet 1 of 5

Location Coordinates
Northing 117,990 Easting 128,220

Drilling Agency: [ ] Corps of Engineers [XXX] Other: Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-19D Permanent AP-3532	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[ ] Test Pit [ ] Auger Hole [XXX] Air Rot.	0.0	135.0	137.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
17	Drive	109.	2-3 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
302.10	J. Raychel	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
10	3	1	GW	Well-Graded GRAVEL w/ Sand	2.5	68%Gr;29%Sa;3%Fines PFS Gray, dry, fine to coarse subr. gravel, med. to coarse sand PID=ND *9/15/17
20	7	2	GW-GC	Well-Graded GRAVEL w/ Clay & Sand	2"	55%Gr;38%Sa;7%Fines S1 Gray, moist, fine to coarse gravel, fine to coarse sand PID=ND *16/18/27
30						Continued

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DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Piezometer

Sheet 2 of S

Location Coordinates
Northing 117,990 Easting 128,220

Drilling Agency Corps of Engineers
XXX Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-19D Permanent AP-3532	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. Test Pit Auger Hole	0.0	135.0	137.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
17	Drive	109.	2-3 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
302.10	J. Raychel	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	6	3	GP-GM	Poorly Graded GRAVEL w/ Clay & Sand	>3"	LL=39, PI=22 69%Gr;25%Sa;6%Fines S1 Brown,moist to wet,subr.-suba. gravel & cobbles, fine to coarse sand, NP fines w/blk.coal nodules up to 1/4" PID=0.5 *19/32/27
35						
40		4	GW-GM	Well-Graded GRAVEL w/ Silt, Sand & Cobbles	>3"	Gray/brown, moist, subr.-suba. gravel & cobbles, med. to coarse sand, NP fines w/ orange ferrous stains & blk. coal smears throughout PID=ND *9/12/21
45						
50		5	GW-GP	Well to Poorly Graded GRAVEL w/ Sand & Cobbles	>3"	Gray, moist, subr.-suba. gravel, fine to coarse sand, NP fines PID=ND *24/32/45
55						
			GP	Poorly Graded GRAVEL w/ Sand		
60						Continued

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Piezometer

DEPARTMENT OF THE ARMY
North Pacific Division
U.S. Army Engineer District Alaska
EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells
Sheet 3 of 5

Location Coordinates
Northing 117,990 Easting 128,220

Drilling Agency [ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-19D Permanent AP-3532	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	135.0	137.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
17	Drive	109.	2-3 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
302.10	J. Raychel	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
	3	6	GW	Well-Graded GRAVEL w/ Sand	>3"	62%Gr;34%Sa;4%Fines PFS Gray, moist, subr.-suba. gravel & cobbles, fine to coarse sand, NP fines PID=ND *14/27/18
65						
70	2	7	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	>3"	61%Gr;32%Sa;7%Fines Sl Brown, moist, subr.-suba. gravel & cobbles, fine to coarse sand, NP fines PID=ND *33/46/32
75						
80	2	8	GW	Well-Graded GRAVEL w/ Sand	2"	59%Gr;38%Sa;3%Fines PFS Gray/brown, moist, subr.-rnd. gravel, fine to coarse sand, NP fines PID=ND *11/20/40 for 4"
85						
90			GP	Poorly Graded GRAVEL w/ Sand		Continued

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OU-D

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Sheet 4 of 5

Location Coordinates
Northing 117,990 Easting 128,220

Drilling Agency [ ] Corps of Engineer
[XXX] Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-19D Permanent AP-3532	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	135.0	137.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
17	Drive	109.	2-3 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
302.10	J. Raychel	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		9	GP	Poorly Graded GRAVEL w/ Sand	2"	Brown/gray,moist to wet, subr. gravel, med.to coarse sand, NP fines PID=ND *7/28/28
95						
100		10	GP	Poorly Graded GRAVEL w/ Sand	2.5	Gray/brown, moist, subr.-suba. gravel, med. to coarse sand, NP fines PID=ND *14/41/30
						Confining layer @ 101.0'
105						Perched water table (PWT)
						Groundwater at -108.62' after drilling
	▽ ≡					64%Gr;30%Sa;6%Fines S1
110	5	11	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	1.5	Gray/brown,wet,subr.-rnd. gravel, med. to coarse sand, NP fines; PID=ND
	14	11A	ML	SILT w/ Sand	0.5	4%Gr;14%Sa;82%Fines F4 Brown,moist,subr.gravel, fine-med.sand,NP fines w/ sm.pcs of coal to 1/8" throughout,over-consolidated PID=ND *14/23/40
115		12	GM	Silty GRAVEL w/ Sand & Cobbles	2.5	Brown/gray,wet,subr.grav. med. to coarse sand, NP fines; PID=ND
		12A	ML	Sandy SILT	.25	2%Gr;30%Sa;68%Fines F Brown, wet, fine sand, NP fines w/ intermittent sand lenses to 3/4" *12/30/26
120						Continued

NPA Form 19-E

Project Ft Richardson
28 Monitoring Wells

Hole Number AP-3532

OU-D 33739

Piezometer

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Sheet 5 of 5

Location Coordinates
Northing 117,990 Easting 128,220

Drilling Agency [ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-19D Permanent AP-3532	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	135.0	137.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
17	Drive	109.	2-3 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
302.10	J. Raychel	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
		13				No sample recovery *3/15/8
125		14	SW	Well-Graded SAND w/ Silt & Gravel	.5"	43%Gr;53%Sa;4%Fines NFS Gray, wet, subr.-suba. gravel, fine to coarse sand, NP fines PID=ND *9/11/26/20
130						
135		15	GW	Well-Graded GRAVEL w/ Sand	1.5	12" of heaving soil 80%Gr;19%Sa;1%Fines NFS Gray,wet,subr.-rnd.gravel fine to coarse sand, NP fines; PID=ND; *2/6/9/15
140						Bottom of hole 137.0 Elevation 165.1 Groundwater elev. 193.48 after drilling *Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling approx. 30" PID - Photo Ionization Detector (ppm) Monitoring Well installed ND - Non-Detectable
145						
150						

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER – ALASKA DISTRICT
MONITORING WELL LOG

Location: Ft. Richarason, Alaska
Project: 28 Monitoring Wells
SHEET 1 OF

Location Coordinates
Northing 117,990 Easting 128,220

Drilling Agency
XXXX Ambler Exploration ____ Corps of Engineer

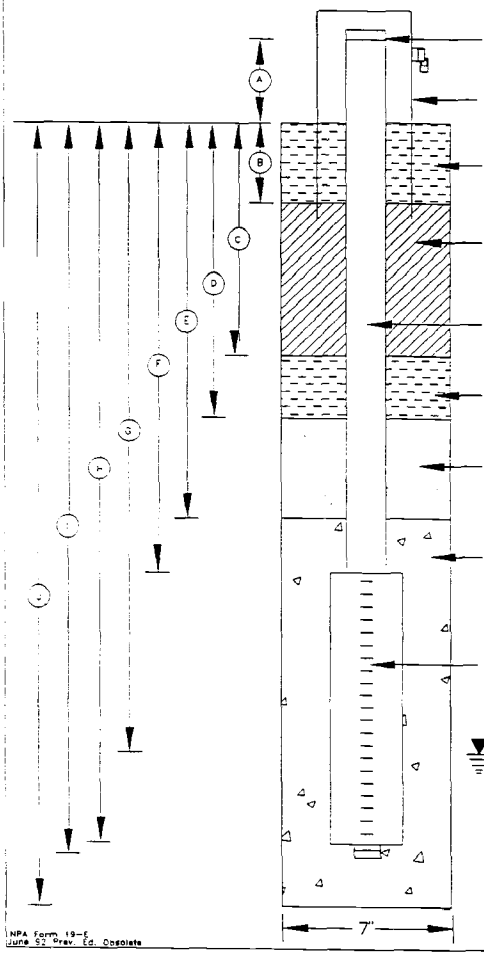
Hole Number	Name of Driller	Weather
Field AP-19D Permanent AP-3532	S. Moore	Cloudy, 50°F

Type of Hole	Depth to	Depth Drilled	Total Depth
XXXX Air Rot. ____ Test Pit		135.0	137.0

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXXX MSL ____	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
17	Drive	108.62	6-7 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
302.10	J. Raychel	J. Raychel	D. Thomas



NOTE:

Subsurface soils information is provided in exploration log AP-3532

Had difficulty in plugging casing w/ bentonite chips during well construction.

WELL COMPLETION DETAILS

A	2.8	FT (AGS)	ELEV. 304.9
B	2.5	FT (BGS)	
C	97.0	FT (BGS)	
D	98.6	FT (BGS)	
E	112.0	FT (BGS)	
F	113.5	FT (BGS)	
G	108.62	FT (BGS)AD	ELEV. 193.48
H	133.3	FT (BGS)	
I	133.7	FT (BGS)	
J	137.0	FT (BGS)	

BGS Below Ground Surface
AGS Above Ground Surface
WD While Drilling
AD After Drilling

SUMMARY OF MATERIALS USED:

50 LBS. BENTONITE CHIPS
850 LBS. VOLCLAY GROUT
400 LBS. 10-20 SAND
12 – 2" I.D. X 10' SCH. 40 PVC RISER PIPE
2 – 2" I.D. X 3.75" O.D. X 9.7' 8-SLOT JOHNSON V-WIRE PRE-PACK (40-60 SAND)
1 – 2" I.D. PVC END CAP
1 – 2" I.D. MORRISON END CAP
1 – 6" x 6" x 5' PROTECTIVE CASING

OU-D 33740

NPA Form 19-E
June 52 Prev. Ed. Obsolete

OU-D 33741

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Piezometer

Sheet 1 of 5

Location Coordinates
Northing 119,053 Easting 130,585

Drilling Agency [ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-20D Permanent AP-3533	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	130.0	131.5

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Drive	103.	8 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
320.62	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
10	2	1	GW	Well-Graded GRAVEL w/ Sand	>3"	68%Gr;27%Sa;5%Fines Sl Gray, moist, subr.-suba. gravel & cobbles, fine to coarse sand, NP fines PID=ND *17/20/50 for 3"
15						Perched groundwater table (PWT) Confining layer at 18.5'
15			(PWT)			
20	7	2	GM-GC	Poorly Graded GRAVEL w/ Clay & Sand		LL=31, PI=16 46%Gr;44%Sa;10%Fines F1 Brown/gray w/orange ferrous stains, wet, subr.-ang. gravel, fine to coarse sand, NP to slig. PL fines PID=ND *25/31/36
25		3	GM-GC	Silty-Clayey GRAVEL w/ Sand & Cobbles	>3"	Brown, wet, subr.-suba. gravel & cobbles, fine to coarse sand, NP to PL fines w/ blk.coal nodules up to 1/2" PID=ND *11/18/37
30						Continued

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DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Piezometer

Sheet 2 of 5

Location Coordinates
Northing 119,053 Easting 130,585

Drilling Agency — Corps of Engineers
XXX Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-20D Permanent AP-3533	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
XXX Air Rot. / Test Pit / Auger Hole	0.0	130.0	131.5

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	XXX MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Drive	103.	8 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
320.62	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
			GM-GC	Silty-Clayey GRAVEL w/ Sand & Cobbles		
35	6	4	GP-GC	Poorly Graded GRAVEL w/ Clay & Sand	>3"	LL=37, PI=20 62%Gr;31%Sa;7%Fines S1 Brown/gray, moist, subr.-suba. gravel & cobbles, fine to coarse sand, NP to PL fines w/orange ferous stains & blk.coa nodules up to 1/2" PID=ND *13/41/2
40						
45		5				No sample recovery *12/34/50 for 4"
50						
55		6	GW-GM	Well-Graded GRAVEL w/ Silt, Sand & Cobbles	>3"	Brown/gray, wet to moist, subr.-suba. gravel & cobbles, fine to coarse sand, NP fines *6/26/2 PID=ND
60						Continued

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OU-D

DEPARTMENT OF THE ARMY

North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells

Piezometer

Sheet 3 of 5

Location Coordinates
Northing 119,053 Easting 130,585

Drilling Agency
XXX Other Ambler Exploration

Corps of Engineers

Hole Number
Field AP-20D Permanent AP-3533

Name of Driller
S. Moore

Weather
Cloudy 50°F

Type of Hole
XXX Air Rot. Test Pit Auger Hole

Depth To 0.0
Depth Drilled 130.0
Total Depth 131.5

Size and Type of Bit
5" Tri Cone

Elevation Datum XXXX MSL

Type of Equipment
Chicago Pneumatic CP-672

Number of Samples 14
Type of Samples Drive
Depth to Groundwater 103.
Date 8 May 95

Top of Hole Elevation 320.62
Inspector J. Sauceda
Chief, Soils Section J. Raychel
Chief, Geotechnical Branch D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
65		7	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand	1"	Brown/gray, moist to wet, subr.-rnd.gravel, fine to coarse sand, NP fines w/ orange ferrous stains & blk.coal pcs to 1/4" PID=ND *6/20/32
70						
75	5	8	GP-GM	Poorly Graded GRAVEL w/ Silt & Sand	.75	55%Gr;35%Sa;10%Fines PFS Brown, moist, subr.-suba. gravel, med. to coarse sand, NP fines w/blk.coal nodules up to 1" PID=ND *11/24/36
80						
85		9	GW-GP	Well to Poorly Graded GRAVEL w/ Sand	1.5	Brown/gray, moist, subr.-suba. gravel, med. to coarse sand, NP fines PID=ND *7/22/30
			ML	SILT w/ Gravel		
90						Continued

OU-D 33744

Piezometer

DEPARTMENT OF THE ARMY
North Pacific Division
U.S. Army Engineer District Alaska
EXPLORATION LOG

Project Ft Richardson
28 Monitoring Wells
Sheet 4 of 5

Location Coordinates
Northing 119,053 Easting 130,585

Drilling Agency [ ] Corps of Engineers
[XXX] Other Ambler Exploration

Hole Number	Name of Driller	Weather
Field AP-20D Permanent AP-3533	S. Moore	Cloudy 50°F

Type of Hole	Depth To	Depth Drilled	Total Depth
[XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	0.0	130.0	131.5

Size and Type of Bit	Elevation Datum	Type of Equipment
5" Tri Cone	[XXX] MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Drive	103.	8 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnical Branch
320.62	J. Sauceda	J. Raychel	D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
95	17	10	ML	SILT	0.5	3%Gr;4%Sa;93%Fines F4 Brown, moist to wet, subr. gravel, fine to medium sand, NP fines PID=ND *1/5/20/37
100						
	▽					Groundwater at -103.25' after drilling
105	9	11	SM	Silty SAND w/ Gravel	>2"	36%Gr;42%Sa;22%Fines F2 Brown, moist to wet, subr.-ang. gravel, fine to coarse sand, NP fines PID=ND *6/50/50/50 for 4"
110						
115		12				15" heaving soil No representative sample *16/15/3
120			GP	Poorly Graded GRAVEL		Continued

OU-D 33745

Piezometer

DEPARTMENT OF THE ARMY
North Pacific Division
U.S. Army Engineer District Alaska

EXPLORATION LOG

Project: Ft Richardson
28 Monitoring Wells
Sheet 5 of 5

Location Coordinates
Northing 119,053 Easting 130,585

Drilling Agency: [ ] Corps of Engineers [XXX] Other: Ambler Exploration

Hole Number: Field AP-20D Permanent AP-3533	Name of Driller: S. Moore	Weather: Cloudy 50°F	
Type of Hole: [XXX] Air Rot. [ ] Test Pit [ ] Auger Hole	Depth To: 0.0	Depth Drilled: 130.0	Total Depth: 131.5
Size and Type of Bit: 5" Tri Cone	Elevation Datum: [XXX] MSL	Type of Equipment: Chicago Pneumatic CP-672	
Number of Samples: 14	Type of Samples: Drive	Depth to Groundwater: 103.	Date: 8 May 95
Top of Hole Elevation: 320.62	Inspector: J. Sauceda	Chief, Soils Section: J. Raychel	Chief, Geotechnical Branch: D. Thomas

Depth in Feet	% Water	Sample	Soil Legend	Classification	Max Size	Description and Remarks
125		13	GW	Well-Graded GRAVEL w/ Sand	>3"	60%Gr;36%Sa;4%Fines PFS Gray, wet, subr.gravel, fine to coarse sand, NP fines PID=ND *20/40/38
130		14	GW-GM	Well-Graded GRAVEL w/ Silt & Sand	2"	57%Gr;38%Sa;5%Fines S1 Brown/gray, wet, subr.-suba. gravel, fine to coarse sand, NP fines PID=ND *11/35/50
135						Bottom of hole 131.5 Elevation 189.12
140						Groundwater elev. 217.37 after drilling
145						*Number of blows to drive a 2.5" I.D. split spoon sampler each 6" increment with a 300-pound hammer falling approx. 30"
150						PID - Photo Ionization Detector (ppm)
						ND - Non-Detectable
						Monitoring Well installed

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER – ALASKA DISTRICT
MONITORING WELL LOG

Lacation: Ft. Richardson, Alaska
Project: 28 Monitoring Wells

SHEET 1 OF 1

Location Coordinates
Northing 119,053 Easting 130,585

Drilling Agency: Ambler Exploration — Corps of Engineers

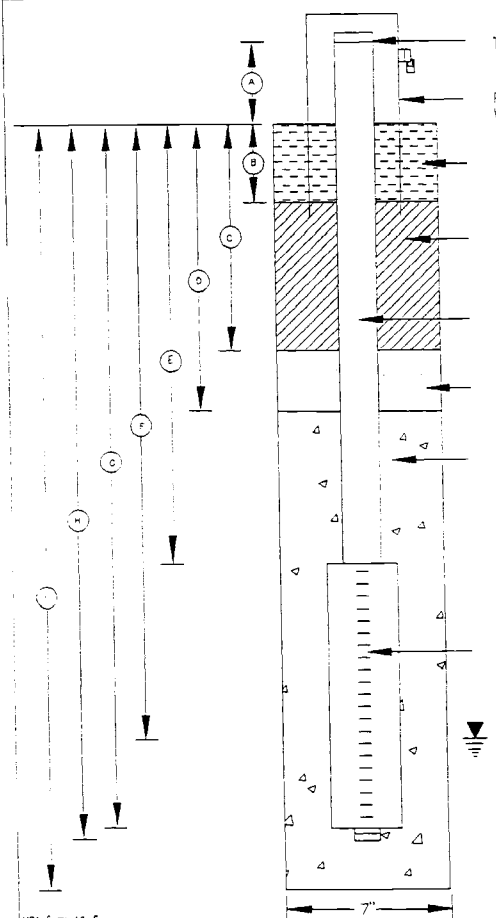
Hole Number	Name of Driller	Weather
Field AP-20D Permanent AP-3533	S. Moore	Sunny, 65°F

Type of Hole	Depth to	Depth Drilled	Total Depth
Air Rot. / Test Pit		130.0	131.5

Size and Type of Bit	Elevation / Datum	Type of Equipment
5" Tri Cone	MSL	Chicago Pneumatic CP-672

Number of Samples	Type of Samples	Depth to Groundwater	Date
14	Grab & Drive	103.25	10 May 95

Top of Hole Elevation	Inspector	Chief, Soils Section	Chief, Geotechnicol Branch
320.62	J. Sauceda	J. Raychel	D. Thomas



NOTE:
Subsurface soils information is provided in exploration log AP-3533

WELL COMPLETION DETAILS

A	2.5	FT (AGS)	ELEV. 323.12
B		FT (BGS)	
C	99.7	FT (BGS)	
D	101.7	FT (BGS)	
E	111.3	FT (BGS)	
F	103.25	FT (BGS)	ELEV. 217.37
G	131.1	FT (BGS)	
H	131.4	FT (BGS)	
I	131.5	FT (BGS)	

BGS Below Ground Surface
AGS Above Ground Surface
WD While Drilling
AD After Drilling

SUMMARY OF MATERIALS USED:

100 LBS. BENTONITE CHIPS
1200 LBS. VOLCLAY GROUT
100 LBS. 10-20 SAND
12 – 2" I.D x 1-' SCH. 40 PVC RISER PIPE
2 – 2" I.D. x 3.75" O.D. x 9.7' 8-SLOT JOHNSON V-WIRE PRE-PACK (40-50 SAND)
1– 2" I.D. PVC END CAP
1 – 2" I.D. MORRISON END CAP
1 – 6" x 6" x 5' PROTECTIVE CASING

OU-D 33746

NPA form 19-E
June 92 Prev. Ed. Obsolete

BORING LOG

BORING NUMBER: 3777

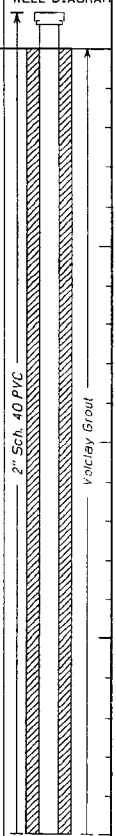
CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 796
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 96
BORING DIAMETER (in): 7
WELL DEPTH (ft): 92
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 321.4
TOP OF CASING ELEV. (ft): 324.9
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/11/96
DATE COMPLETED: 9/12/96
NORTHING: 118614.09
EASTING: 131203.35

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GM	Gravelly surface.
5			96N796 01SL	GS	N/A	0.1			Medium gray Silty GRAVEL (GM), diameter 4.8 to 20mm, 15% fines, poorly graded, dry, no odor.
			96B796 02SL	SS	43	1.3		GP-GM	Brownish gray Poorly Graded GRAVEL with Silt (GP-GM), diameter 4. 8 to 65mm, rounded. 10-15% fine to medium sand, 5-10% fines, poor to moderately graded, dense, dry, no odor.
10									
15			96B796 03SL	GS	N/A	0.9			Lithology same as above, dry.
20									

WELL DIAGRAM



BORING LOG

BORING NUMBER: 3777

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 796
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 96
BORING DIAMETER (in): 7
WELL DEPTH (ft): 92
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 321.4
TOP OF CASING ELEV. (ft): 324.9
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/11/96
DATE COMPLETED: 9/12/96
NORTHING: 118614.09
EASTING: 131203.35

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP-GM	
25			96B796 04SL	GS	N/A	2.1			Lithology same as above, damp, no odor.
30									
35			96B796 05SL	GS	N/A	2.0		GP/GW-GM	Dark gray Poorly to Well-Graded GRAVEL with Silt and Sand (GP/GW-GM), diameter 4.8 to 75mm, 15-20% sand, 10% fines, rounded to subrounded gravel, subrounded sand, damp, no odor.
40									

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout

BORING LOG

BORING NUMBER: 3777

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 796
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 96
BORING DIAMETER (in): 7
WELL DEPTH (ft): 92
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 321.4
TOP OF CASING ELEV. (ft): 324.9
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/11/96
DATE COMPLETED: 9/12/96
NORTHING: 118614.09
EASTING: 131203.35

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP/GW-GM		
45			96B796 06SL	GS	N/A	1.9			Lithology same as above, damp to moist.	
50										
55			96B796 07SL	GS	N/A	2.7			Lithology same as above.	
60										

2" Sch. 40 PVC
Volclay Grout

BORING LOG

BORING NUMBER: 3777

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 796

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 96

BORING DIAMETER (in): 7

WELL DEPTH (ft): 92

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 321.4

TOP OF CASING ELEV. (ft): 324.9

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/11/96

DATE COMPLETED: 9/12/96

NORTHING: 118614.09

EASTING: 131203.35

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								GP/GW-GW	
65			96B796 08SL	GS	N/A	3.0		GW	Dark gray Well-Graded GRAVEL with Sand (GW), 25% fine to medium sand, gravel diameter 4.8 to 60mm, well graded, damp, no odor.
70									
75			96B796 09SL	GS	N/A	2.2			Lithology same as above, damp, no odor.
80								ML	

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout; Bent. chips

BORING LOG

BORING NUMBER: 3777

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 796
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 96
BORING DIAMETER (in): 7
WELL DEPTH (ft): 92
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 321.4
TOP OF CASING ELEV. (ft): 324.9
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/11/96
DATE COMPLETED: 9/12/96
NORTHING: 118614.09
EASTING: 131203.35

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								ML	Thin brown SILT (ML), up to 1 foot thick layer, drill through
								GM	into Silty GRAVEL (GM), damp to moist.
85			96B796 10SL	GS	N/A	1.2		ML	Brown SILT (ML), low plasticity, coarse, dry to damp.
								SP	Light brown Poorly Graded SAND (SP), medium grained, mode approximately 1.5 to 2mm, 75% quartz, subrounded, poorly graded, moist to wet, no odor.
90			96B796 11SL	SS	75	2.3		SM	Light brown Silty SAND with Gravel (SM), alternating layers of sand/gravel predominance, layers are moderately graded, very dense, saturated, no odor. Stopped drilling for 1/2 hour, water entered casing. Grain Size Analysis: 14% Gravel, 83% Sand, 14% Silt, 8% Clay
95			96B796 12SL	SS	85	2.1		GM ML	Light brown Silty GRAVEL/Gravelly Silt (GM/ML), till, matrix supported (gravel), gravel diameter 20 to 70mm, rounded, 10% fines, sand occuring in thin beds approximately 30mm thick, low plasticity, moderate cohesion, hard, saturated and heaving, no odor. Grain Size Analysis: 42% Gravel, 50% Sand, 14% Fines
									End of boring at 96 feet. Boring completed as a groundwater monitoring well.
100									

WELL DIAGRAM

2" PVC 0.008" Slotted Screen
#40-60 Prepack

BORING LOG

BORING NUMBER: 3778

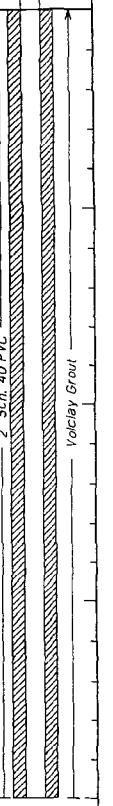
CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 796
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 98
BORING DIAMETER (in): 7
WELL DEPTH (ft): 94
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 320.1
TOP OF CASING ELEV. (ft): 323.61
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/12/96
DATE COMPLETED: 9/13/96
NORTHING: 118389.54
EASTING: 131039.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
0								GW GP	Gravel surface - parking lot.
5			98B796 13SL	SS	34	1.1			Medium brown Poorly to Well-Graded GRAVEL with Sand (GW/GP), gravel diameter 4.8 to 55mm, 20% fine to coarse sand, sand mode approximately 1mm, moderately graded, iron oxide staining, dense, dry to damp, no odor.
10									
15			98B796 14SL	GS	N/A	1.7		GW	Medium brown Well-Graded GRAVEL with Sand (GW), as above, trace fines, dry, no odor.
20									

WELL DIAGRAM



BORING LOG

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 796

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING NUMBER: 3778

BORING DEPTH (ft): 98

BORING DIAMETER (in): 7

WELL DEPTH (ft): 94

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 320.1

TOP OF CASING ELEV. (ft): 323.61

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-80 PrePack

DATE STARTED: 9/12/96

DATE COMPLETED: 9/13/96

NORTHING: 118389.54

EASTING: 131039.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GW		
25			96B796 15SL	GS	N/A	2.0		GP	Grayish brown Poorly Graded GRAVEL with Sand (GP), diameter 4.8 to 40mm, 15% fine to medium sand, poorly graded, dry, no odor.	
30										2" Sch. 40 PVC; Volclay Grout
35			96B796 18SL	GS	N/A	2.8			Lithology same as above, dry, no odor.	
40										

BORING LOG

CLIENT: USACE

PROJECT NAME: Ft. Richardson - OUD

SITE: 796

JOB NUMBER: 9000-107

LOGGED BY: T. Barrett APPROVED BY: S. Wrenn

DRILLED BY: Alpine Drilling

METHOD: Air rotary, 6" casing

BORING NUMBER: 3778

BORING DEPTH (ft): 98

BORING DIAMETER (in): 7

WELL DEPTH (ft): 94

WELL DIAMETER (in): 2

SURFACE ELEVATION (ft): 320.1

TOP OF CASING ELEV. (ft): 323.61

FIELD PARTY:

SCREEN LENGTH (ft): 10

SCREEN TYPE: Slotted PVC

SLOT SIZE (in): 0.008

FILTER PACK: 40-60 PrePack

DATE STARTED: 9/12/96

DATE COMPLETED: 9/13/96

NORTHING: 118389.54

EASTING: 131039.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GP		2" Sch. 40 PVC; Volclay Grout
45			96B796 17SL	GS	N/A	2.1			Lithology same as above, dry.	
50										
55			96B796 18SL	GS	N/A	2.9			Lithology same as above.	
60										

OU-D 33754

BORING LOG

BORING NUMBER: 3778

CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 796
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 98
BORING DIAMETER (in): 7
WELL DEPTH (ft): 94
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 320.1
TOP OF CASING ELEV. (ft): 323.61
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/12/96
DATE COMPLETED: 9/13/96
NORTHING: 118389.54
EASTING: 131039.86

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
65			96B796 10SL	GS	N/A	1.1		GP	Lithology same as above, dry.
70									
75			96B796 20SL	GS	N/A	1.2		GP GM	Medium brown Silty GRAVEL (GM), with up to 20% fines, well rounded gravels, gravel mode approximately 20mm, poorly graded, grain supported, damp to moist, no odor.
▼								ML	Increasing SILT (ML) content.
80								SM	

WELL DIAGRAM: 2" Sch. 40 PVC; Volclay Grout; Bent. chips

OU-D 33755

BORING LOG

BORING NUMBER: 3778

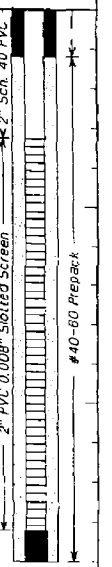
CLIENT: USACE
PROJECT NAME: Ft. Richardson - OUD
SITE: 798
JOB NUMBER: 9000-107
LOGGED BY: T. Barrett APPROVED BY: S. Wrenn
DRILLED BY: Alpine Drilling
METHOD: Air rotary, 6" casing

BORING DEPTH (ft): 98
BORING DIAMETER (in): 7
WELL DEPTH (ft): 94
WELL DIAMETER (in): 2
SURFACE ELEVATION (ft): 320.1
TOP OF CASING ELEV. (ft): 323.61
FIELD PARTY:

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.008
FILTER PACK: 40-60 PrePack
DATE STARTED: 9/12/96
DATE COMPLETED: 9/13/96
NORTHING: 118389.54
EASTING: 131039.88

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SM	SILTY SAND (SM), damp to moist.
85			96B798 21SL Dup 22SL	SS	30	3.2			Tan-brown SILTY SAND (SM), fine grained sand, mode approximately 0.25mm, low cohesion, <5% gravel, no features, poorly graded, very stiff, wet to saturated, no odor.
			96B798 23SL	SS	13	2.2			Tan-brown SILTY SAND (SM), same as above. Grain Size Analysis: 1% Gravel, 76% Sand, 18% Silt, 5% Clay
90									Drilled ahead to 98 feet to go below heaving silt. Let formation stabilize over night. Set well on 9/13.
95									
100									End of boring at 98 feet. Boring completed as a groundwater monitoring well.

WELL DIAGRAM



COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Ft. Richardson OUD/9000-17
Sample Matrix Soil

Service Request: K9605769
Date Collected: 9/11/96
Date Received: 9/14/96
Date Analyzed: 9/25/96

AP 3777
96B796 WL01 -89'

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 96B79611SL
Lab Code: K9605769-003

Sand Fraction: Weight (Grams)	27.9595
Sand Fraction: Weight Recovered (Grams)	27.9498
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	40.3977
Percent Solids	88.7
Weight Oven-Dried (Grams)	35.8328

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	5.0198	14.0
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	3.1364	8.75
Very Coarse Sand med	0.850 mm	20	2.2883	6.39
Coarse Sand sand	0.425 mm	40	3.6762	10.3
Medium Sand fine	0.250 mm	60	6.6033	18.4
Fine Sand sand	0.106 mm	140	5.9691	16.7
Very Fine Sand	0.075 mm	200	1.0222	2.85
Clay			2.8150	7.86
Silt			5.0950	14.2
		Total	35.6253	99.4

	%
Gravel	14.0
Coarse sand	8.8
Med sand	16.7
Fine sand	38.0
Fines	22.1

Approved By: _____ Date: 10/7/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

lient: ENSR Consulting & Engineering
roject: Ft. Richardson OUD/9000-17
ample Matrix Soil

Service Request: K9605769
Date Collected: 9/11/96
Date Received: 9/14/96
Date Analyzed: 9/25/96

AP3777
96B796WL01-95

Particle Size Determination
ASTM Method D422 Modified

ample Name: 96B79612SL
ab Code: K9605769-004

Sand Fraction: Weight (Grams)	40.0463
Sand Fraction: Weight Recovered (Grams)	40.0833
Sand Fraction: Percent Recovery	100

Weight as received (Grams)	50.2546
Percent Solids	86.4
Weight Oven-Dried (Grams)	43.4200

escription	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~ledium~~ Gravel	4.75 mm	4	18.1166	41.7
~~ne~~ Gravel coarse Sand	2.00 mm	10	3.8293	8.82
ery Coarse Sand med	0.850 mm	20	3.2394	7.46
oarse Sand Sand	0.425 mm	40	3.4321	7.90
ledium Sand fine	0.250 mm	60	5.2456	12.1
ine Sand sand	0.106 mm	140	5.3873	12.4
ery Fine Sand	0.075 mm	200	0.6291	1.45
lay			2.6200	6.03
ilt			3.4000	7.83
		Total	45.8994	106

	%
Gravel	41.7
Coarse Sand	8.8
Med Sand	~~27.5~~ 15.4
Fine Sand	26.0
Fines	13.9

OU-D 33758

pproved By: _____ Date: 10/9/96

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: ENSR Consulting & Engineering
Project: Ft. Richardson OUD/9000-17
Sample Matrix Soil

Service Request: K9605769
Date Collected: 9/12/96
Date Received: 9/14/96
Date Analyzed: 9/25/96

AP3778
96B796WL02 -87'

Particle Size Determination
ASTM Method D422 Modified

Sample Name: 96B79623SL
Lab Code: K9605769-005

Sand Fracuon: Weight (Grams)	49.9144
Sand Fraction: Weight Recovered (Grams)	49.9033
Sand Fracuon: Percent Recovery	100

Weight as received (Grams)	75.484
Percent Solids	83.3
Weight Oven-Dried (Grams)	62.8782

Description	Sieve Size	Sieve Number	Dry Weight (Grams)	Percent of Total Weight Recovered
~~Medium~~ Gravel	4.75 mm	4	0.6212	0.99
~~Fine Gravel~~ Coarse Sand	2.00 mm	10	0.5156	0.82
~~Very~~ Coarse Sand / med	0.850 mm	20	1.5561	2.47
Coarse Sand / Sand	0.425 mm	40	7.3030	11.6
Medium Sand / fine	0.250 mm	60	17.2153	27.4
Fine Sand / Sand	0.106 mm	140	17.2842	27.5
Very Fine Sand	0.075 mm	200	3.8682	6.15
Clay			3.2850	5.22
Silt			9.8350	15.6
		Total	61.4836	97.8

	%
Gravel	1.0
Coarse Sand	0.8
Med Sand	14.1
Fine Sand	61.1
Fines	20.8

OU-D 33759

Approved By: _____ Date: 10/9/96

U.S. ARMY CORPS OF ENGINEERS
SURVEY SECTION
FORT RICHARDSON, ALASKA / OPERABLE UNIT D
SUBSURFACE INVESTIGATION

Date: 05-27-97
List of Boring Points

AP ID	Northing	Easting	Elevation Top/PVC	Elevation on Grd.	Descriptor
AP-3772	116,837.01	125,870.98	281.75	278.6	Monitoring Well
AP-3773	116,979.34	126,157.60	285.20	281.7	Monitoring Well
AP-3774	117,363.01	125,605.42	285.24	281.7	Monitoring Well
AP-3775	117,078.32	126,233.41	285.07	281.6	Monitoring Well
AP-3776	117,207.21	125,482.62	282.00	279.6	Monitoring Well
AP-3777	118,614.09	131,203.35	324.91	321.4	Monitoring Well
AP-3778	118,389.54	131,039.86	323.61	320.1	Monitoring Well
AP-3779	117,241.03	125,851.41		280.5	Soil Boring
AP-3780	117,218.78	125,908.57		280.3	Soil Boring
AP-3781	117,209.42	125,938.32		280.2	Soil Boring
AP-3782	117,253.51	125,925.30		280.8	Soil Boring
AP-3783	117,213.20	126,024.37		281.2	Soil Boring
AP-3784	117,072.75	125,977.04		280.3	Soil Boring
AP-3785	113,169.75	125,775.03		262.7	Soil Boring
AP-3786	113,136.33	125,760.30		260.9	Soil Boring
AP-3787	113,135.92	125,598.45		258.9	Soil Boring
AP-3788	113,023.75	125,622.64		258.2	Soil Boring
3789	116,939.27	126,732.86	288.65	285.4	Monitoring Well
3790	117,076.33	127,493.77	294.98	292.2	Monitoring Well

APPENDIX B

WATER SAMPLING FIELD SHEETS

BUILDING 35-752

MONITORING WELL DEVELOPMENT FORMS

ENSR

AP3917

MONITORING WELL DEVELOPMENT RECORD

DATE: 5/22/98 WELL I.D.: 985752WL01

PROJECT NAME: Tank 1109 Release Inv. LOCATION: 35.752

PROJECT NUMBER: 9000.107.620 DEVELOPER: J. Shapiro, D. Britch

[X] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: _____

toc ~5" bgs

WELL DATA

Well Diameter	2"	Geology at Screened Interval	
Total Well Depth	18.3 btoc 18.9" bgs		
Depth to Top of Screen	8 bgs 7'7" bgs btoc ~~7'2" btoc~~	Likely Contaminants	
Depth to Bottom of Screen	18 17'7" bgs btoc ~~bgs 7'2" btoc~~		
Depth to Static Water Level	8.65 btoc	Purge Water and Sediment Disposal Method	

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
purged 1 gal - went dry	Waterra surge and purge dry	

ACCEPTANCE CRITERIA

No product detected w/ interface probe

SEE ATTACHED PURGE RECORD

Signature _____ Date _____

M890322

OU-D 33763

AP3917

ENSR Groundwater Purge Record Well No: 985752WL01

Ft. Richardson OU D Field Sampling Plan Date: 5/22/98 Event: Well dev.

1. Water Level Data (from ToC) 18.3 btoc

a. Total Well Length = WD	~~18.8~~ (feet)	Screen Length	10'	(feet)
b. Depth to Water = GW	11.65 (feet)	Borehole Diam. = BD	8 1/4"	(feet)
c. Depth to top gravel pack = GP	5'4" (feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method Waterra

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]) x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

.25 x 2.55 x [18.3 - 11.65]
+ .17 [18.3 - 11.65]
4.24 + 1.13
= 5.37 gal/vol

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Began purging at approx 1100

Field Testing Equipment µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~	Turbidity (NTU)	Dissolved O_2 ~~(%)~~ mg/L	Redox Potential (mV)	pH (units)	Color
1410	5	6.5	341	opaque	NR		6.91	brown
1455	6	5.0	295	"	"		6.91	gray
1535	7	4.6	296	"	"		6.71	"
1609	~~89~~	4.9	279	"	"		6.71	"
1627	11	5.0	280	"	"		6.65	"

Figure 2-1. Groundwater Purge Record.

ENSR

MONITORING WELL DEVELOPMENT RECORD

AP 3916

DATE: 5/22/98 WELL I.D.: 985752WL02

PROJECT NAME: Tank 1109 Release Inv. LOCATION: 35.752

PROJECT NUMBER: 9000-107-620 DEVELOPER: J. Shapiro, D. Britch

☑ ORIGINAL DEVELOPMENT ☐ REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: _____

WELL DATA

33" S.U. = 2.75'

Well Diameter	2"	Geology at Screened Interval	
Total Well Depth	21.43 btoc 18.68 bgs (18.7 as installed)		
Depth to Top of Screen	0' bgs 10.75 btoc	Likely Contaminants	
Depth to Bottom of Screen	18' bgs 20.75 btoc		
Depth to Static Water Level	15.53 btoc	Purge Water and Sediment Disposal Method	

DEVELOPMENT METHOD	PURGING METHOD	PERMEABILITY TEST RESULTS
	Waterra surge + purge + dry	

ACCEPTANCE CRITERIA

SEE ATTACHED PURGE RECORD

Signature _____ Date _____

M890322

OU-D 33765

HP3-918

ENSR Groundwater Purge Record Well No: 985752WL02

Ft. Richardson OU D Field Sampling Plan Date: 5/22/98 Event: Well dev.

1. Water Level Data (from ToC)

a. Total Well Length = WD	21.43	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	15.53	(feet)	Borehole Diam. = BD	8 1/4"	(feet)
c. Depth to top gravel pack = GP	7.9	(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method Waterra

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

.25 x 2.55 x [21.43-15.53] + .17 [21.43-15.53]

3.76 + 1.00

4.76 gal/vol

Short Form: For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form: For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* = If GP is below GW, then GP* = GP; If GP is above GW, then GP* = GW

Began pumping at approx 1300

Field Testing Equipment MS/Lm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%) mg/L	Redox Potential (mV)	pH (units)	Color
1410	2.5	5.0	287	opaque	NR		7.00	gray sheen
1452	3	4.9	315	"	NR		6.73	"
1532	3.5	4.9	294	"	"		6.70	"
1606	4	4.0	286	" settle	"		6.63	
1637	4.5	4.0	375	" clearer	"		6.55	

Figure 2-1. Groundwater Purge Record.

AP3920

ENSR

MONITORING WELL DEVELOPMENT RECORD

ATE: 5/22/98 WELL I.D.: 985752WL04

F CT NAME: Tank 1109 Release Inv. LOCATION: 35.752

ROJECT NUMBER: _____ DEVELOPER: J. Shapiro, D. Britch

[Y] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: _____

TOC approx 6" bgs

/ELL DATA

/ell Diameter	2"
otal Well Depth	20' bgs 19'6" btoc as installed + measured
epth to Top f Screen	9'4" bgs 8'10" btoc
epth to Bottom f Screen	19'4" bgs 18'10" btoc
epth to Static /ater Level	12.29 btoc

Geology at Screened Interval	
Likely Contaminants	PCBs, oil, solvents
Purge Water and Sediment Disposal Method	

DEVELOPMENT METHOD

i - submersible pump alternating surge and purge

PURGING METHOD

Purged dry after 1 gal; back Y10' every 50s

PERMEABILITY TEST RESULTS

CCEPTANCE CRITERIA

No product detected w/interface probe

SEE ATTACHED PURGE RECORD

Signature _____ Date _____

890322

OU-D 33767

AP3920

ENSR Groundwater Purge Record — Well No: 985752W104

Ft. Richardson OU D Field Sampling Plan — Date: 5/22/98 — Event: Well Dev.

1. Water Level Data (from ToC)

a. Total Well Length = WD 19.5 (feet) — Screen Length 10 (feet)

b. Depth to Water = GW 12.29 (feet) — Borehole Diam. = BD 8" = .67 (feet)

c. Depth to top gravel pack = GP 6.3 (feet) — Well Diam. = CD 2" = .17 (feet)

2. Well Purging Data

a. Purge Method ~~Waterra~~ subm. pump

General Calculation: $\pi(\frac{.17}{2})^2$ .1122

b. Required Purge Volume: (see Calculations)

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P [(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + ~~[(GP* - GW) x {π (BD/2)^2 x 7.48}]~~ = gallons Porosity (P) = 0.25

.00723 3.14

7.48 x [.78 x (19.5 - 12.29)] = 5.62 gal

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

.0227 + .0824

assume 10" [worst case, actually 8"] →

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - ~~GP*~~ GW)] + ~~[(GP* - GW) x (0.22)]~~ = gal

GP* =
~~If GP is below GW, then GP* = GP~~
If GP is above GW, then GP* = GW (circled)

Began purging at approx 10:00.

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~ uS/cm	Turbidity (NTU)	Dissolved O_2 ~~(%)~~ mg/L	Redox Potential (mV)	pH (units)	Color
1405	7	4.5	445	opaque	NR	X	7.30	gray sheen
1450	8	4.2	390	opaque	NR	X	6.66	" "
1529	9	4.0	409	↓ (getting lighter)	NR	X	6.51	" "
1603	10	4.2	379	↓ lighter	NR	X	6.59	" "
1634	11	4.5	354	↓ "	NR		6.48	" "

Figure 2-1. Groundwater Purge Record.

2.55 x (19.5 - 12.29) + .17 (19.5 - 12.29)
18.39 + 1.23 = 19.62

1.2 = 3.0

OU-D 33768

BUILDING 35-752

SAMPLING FORMS

SAMPLING FORMS

1996

ENSR **Groundwater Purge Record** Well No: AP2982

Ft. Richardson OU D Field Sampling Plan

Date: ~~10/8/96~~ 10/9/96 BP. Event: 96575245 96575245(Dup) 96575246

1. Water Level Data (from ToC)

a. Total Well Length = WD 26.84 (feet) Screen Length 10' (feet)

b. Depth to Water = GW 15.21 (feet) Borehole Diam. = BD 12" = 1' (feet)

c. Depth to top gravel pack = GP 11.66 ~~13.68~~ (feet) Well Diam. = CD 2" ID = 0.167' (feet)

length of gravel pack = 13.68' Stickup = 1.3'

2. Well Purging Data

a. Purge Method Grundfos

b. Required Purge Volume: 16.25 (see Calculations)

= [7.48 × {π (0.083)² + π · 0.25 [(0.5)² - (0.083)²]} × (25.84 - 15.21)] + 0.

= 16.25 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P[(BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW.

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1015	0	—						
1027	16	6.4	182.9	8.30	56%	130.3	5.7	Clear
1037	32	6.4	191.7	4.99	45%	132.6	4.94	Clear
1049	48	6.5	190.0	3.96	64%	126.4	~~5.41~~ 5.65	"

Figure 2-1. Groundwater Purge Record.

16.2 gal (1.60) 0.061 0.0069

ENSR **Groundwater Purge Record** Well No: ±0.1 ±5% <25 ±10% ± 0.1

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
~~1049~~	48	6.5	170.0	3.96	64%	126.4	5.65	Clear
1057	64	6.4	167.0	3.15	65%	129.7	5.77	
1110	80	6.5	181.7	2.30	69%	122.1	5.85	
1119	96	6.4	169.3	2.35	67%	132.8	5.92	
1131	112	6.5	168.0	2.00	67%	133.7	5.92	
1147	128	7.0	164.1	2.11	56%	136.5	5.98	
1158	144	6.9	163.5	1.72	56%	138.6	5.29	

— 1155 - Spoke w/ HKent about the fact that the parameters aren't agreeing very well although we've removed a lot of water. We agreed to sample the well at this pt and decide whether to sample it later (based on a review of the well parameters)

1700 Sampled well (collected sample 965752454W + QA/QC samples (965752456W + 965752464W)

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: Z983

Ft. Richardson OU D Field Sampling Plan Date: 10/1/96 Event: 9657525ZGW

1. Water Level Data (from ToC)

a. Total Well Length = WD		(feet)	Screen Length		(feet)
b. Depth to Water = GW		(feet)	Borehole Diam. = BD		(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD		(feet)

2. Well Purging Data

a. Purge Method Grundfos

b. Required Purge Volume: (see Calculations)

15.50 gal ≈ 16 gal

General Calculation:

1 Borehole volume = $[7.48 \times \{\pi (CD/2)^2 + \pi P (BD/2)^2 - (CD/2)^2]\} \times (WD - GP^*)] + [(GP^* - GW) \times \{\pi (CD/2)^2 \times 7.48\}]$ = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
Water level = 15.64' - TOC								
Top of pump @ -20'								
Controller @ -174 hz								
Flow Rate = 1gpm								

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: DP 2985

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
		±0.1	±5%	<25	±10%	—	±0.1	
1087	0	6.1°C	—	—	—	—	—	Cloudy Brn
1049	16	6.2°C	110.3	182	74%	208.8	6.25	Slightly Brn
1104	32	6.4	110.6	9.70	78%	202.5	5.92	"
1124	52	6.5	111.2	7.84	77%	245.0	6.28	"
1139	64	6.5	111.0	5.53	77%	244.5	6.30	"
1156	80	6.5	111.6	4.75	75%	240.1	6.30	"
1204- We have 3 consecutive readings w/in tolerance so we'll begin collecting samples								

DI 6.14 pH 6.20

6.26
6.25
1

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AR2985

Ft. Richardson OU D Field Sampling Plan Date: 10/10/96 Event: 96595 SOG4

1. Water Level Data (from ToC)

a. Total Well Length = WD	(feet)	Screen Length	(feet)
b. Depth to Water = GW	(feet)	Borehole Diam. = BD	(feet)
c. Depth to top gravel pack = GP	(feet)	Well Diam. = CD	(feet)

2. Well Purging Data

a. Purge Method Grundfos

b. Required Purge Volume: (see Calculations) 8.8 gal

General Calculation:

1 Borehole volume = $[7.48 \times \{\pi (CD/2)^2 + \pi P (BD/2)^2 - (CD/2)^2]\} \times (WD - GP^*)] + [(GP^* - GW) \times \{\pi (CD/2)^2 \times 7.48\}]$ = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1317	0	7.4	—	—	—	—	—	Light brown slightly cloudy

Figure 2-1. Groundwater Purge Record.

ENSR

Groundwater Purge Record

Well No:

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
		±0.1	±5%	<25	±10%	—	±0.1	
Start Pump set at 13.7' below TOC; 0.6' drawdown Control 150 - 6.17 ≈ 1gpm								
1323	9	7.2	~~189.3~~ 113.2	5.45	67%	189.5	6.17	clear
1335	18	7.5	112.9	3.00	66%	191.4	6.07	"
Dupe	18	7.5	113.6	3.92	68%	190.2	6.19	"
1347	27	7.2	113.0	1.92	66%	191.5	5.84	"
1358	36	7.1	114.1	1.56	67%	189.9	5.50	"
1405	45	7.1	113.8	1.40	66%	187.7	5.96	"
1409	54	6.9	113.7	1.17	66%	199.7	5.47	"
1428	63	7.0	113.8	1.17	67%	206.1	5.13	"
1441	70	7.2	113.9	1.12	66%	206.8	5.96	"

— We've removed 7 boring volumes. Although the parameters Temp + pH have not stabilized according to the FSP. Spoke w/Holly and ~~mentioned that~~ described the trends. I told her that although the parameters T + pH have not stabilized I am confident a sample pulled ~~now is~~ after the 8th BH volume will be representitive of the aquifer she agreed. ~~and~~

1451 - Begin pulling sample 96575250GW

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP 2986

Ft. Richardson OU D Field Sampling Plan Date: 10/10/96 Event: 96575249(GW)

1. Water Level Data (from ToC)

a. Total Well Length = WD	20.42 (feet)	Screen Length		(feet)
b. Depth to Water = GW	12.30 (feet)	Borehole Diam. = BD	12"	(feet)
c. Depth to top gravel pack = GP	6.00 (feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method Grundfos

b. Required Purge Volume: (see Calculations) 12.9 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
0	0	6.9	—	—	—	—	—	—

Test pump 16 ft below TOC; Controller @ 15 Hz; flow 1 gal/1:15 = 0.850.9 gpm; = 0.18' drawdown

(Over)

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: —

	±0.1	±5%	<25	±10%	—	±0.1	
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1055	13	9.0	138.9	1.38	415%	~~240.7~~ 209.7	6.72	rusty
1116	26	7.4	137.5	0.70	415%	208.0	5.84	Clear
1128	39	7.5	138.0	0.68	414%	195.0	5.82	"
1147	52	7.4	138.0	0.85	410%	193.9	5.84	"

— Since parameters are constant we'll pull sample. 9605240840

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: MP 2987

Ft. Richardson OU D Field Sampling Plan

Date: 10/9/96 Event: 96576247

1. Water Level Data (from ToC)

a. Total Well Length = WD		(feet)	Screen Length	10	(feet)
b. Depth to Water = GW		(feet)	Borehole Diam. = BD	12" = 1 FT	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2" = .167	(feet)

2. Well Purging Data

a. Purge Method: Grund

General Calculation:

b. Required Purge Volume: (see Calculations)

1 Borehole volume = $[7.48 \times \{\pi (CD/2)^2 + \pi P (BD/2)^2 - (CD/2)^2\} \times (WD - GP^*)] + [(GP^* - GW) \times \{\pi (CD/2)^2 \times 7.48\}]$ = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

Figure 2-1. Groundwater Purge Record.

30239
33

ENSR **Groundwater Purge Record** Well No: —

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
		±0.1	±5%	<25	±10%	—	±0.1	
1453	0	8.1	—	—	—	—	—	Yellowish orange
flow = 0.85 g/min; ∆ set @ 150hz; Pump at 16' below TOC; Has slight petro odor								
1512	12	8.9	281	2.96	17%	152.4	5.05	
1519	24	8.9	274	7.26	15%	151.2	5.38	
1521	(Dup)	8.8	275	2.34	17%	150.1	5.44	
1534	36	8.7	270	2.12	16%	150.7	5.04	
1551	48	9.5	267	1.91	15%	152.4	5.09	
1608	60	9.4	266	1.75	16%	151.2	5.18	
1622	72	8.8	264	1.62	19%	154.3	5.24	

→ It appears that since the water is travelling through ≈80' of hose it is being warmed by ambient conditions the two readings >9.0°C corresponded to a short period of sunshine. We will go ahead w/ sampling at this time.

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP8281

Ft. Richardson OU D Field Sampling Plan Date: 10/21/96 Event: 9658262GW

1. Water Level Data (from ToC)

a. Total Well Length = WD	23.75	(feet)	Screen Length	2"	(feet)
b. Depth to Water = GW	18.08	(feet)	Borehole Diam. = BD	12"	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method: handbail

b. Required Purge Volume: (see Calculations)

Assume 12" whole H_2O below top of gravel pack

Purge Vol = 1.59(23.75 - 18.08)
= 1.59(5.67)
= 9.02 gal ≈ 9 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP 5231

Ambient truck temp.	Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
	1036	0	4.1	—	—	—	—	—	—
23	1105	9	4.6	127.6	703	84%	244.9	6.21	Brown Cloudy
19	1121	18	5.0	126.3	434	80%	245.7	6.32	"
19	1150	27	5.0	126.8	888	79%	243.0	6.25	"
ope 19	~~1155~~	—	7.4	126.5	875	82%	241.2	6.21	"
19	1227	36	4.6	126.7	978	78%	248.3	6.27	"
18	1246	45	4.9	127.0	670	79%	237.9	6.25	"

– Based on the stability of the parameters (except T and Turbidity) it was decided to sample the well. ~~Temp~~ The low temp reading of 4.6°C was attributed to the fact that the sample beaker sat in the outside air & pre-chilled. ~~[illegible]~~ On the subsequent sample the beaker was kept in the truck until sample time and the resulting temperature was in line w/ previous samples. According to the 1995 Ft Rich Groundwater sampling report AP5231 has a history of being silty. It was decided to sample the well after removing 5 casing volumes

1315 Collected 96575262GW.
63 WP

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP 3232

Ft. Richardson OU D Field Sampling Plan Date: 10/19/96 Event: 0657S2S96GD1

1. Water Level Data (from ToC)

a. Total Well Length = WD (TOC 18.32 (feet) Screen Length ______ (feet)

b. Depth to Water = GW " 12.10 (feet) Borehole Diam. = BD 12" (feet)

c. Depth to top gravel pack = GP ______ (feet) Well Diam. = CD 2" (feet)

2. Well Purging Data

a. Purge Method Grundfos

General Calculation:

b. Required Purge Volume: (see Calculations)

Assume 12" diameter boring
H_2O below gravel pack
Bhvol = 1.58 gal/ft H_2O (18.32 - 12.10) ft H_2O
= 10 gal

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
Top of Grundfos set @ 14.5' TOC								
SS waterlevel = 13.08'								
Flow rate ≈ 0.67 gpm								

Figure 2-1. Groundwater Purge Record.

Rumbleoff
(truck interior)

ENSR **Groundwater Purge Record** Well No: BP525Z

	Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
	– We started pumping as soon as the deconned pump was put in the well to prevent freeze up. ∴ missed the first readings.								
15	1239	19	5.5	158.0	18.3	71%	262.2	5.80	Slightly cloudy
16	1254	30	6.1	124.0	9.59	68%	254.7	6.28	"
18	1310	46	5.9	123.8	6.85	66%	234.2	6.00	Clear
18	1327	50	5.6	123.8	6.61	66%	224.5	5.96	clear
16	1343	60	5.9	124.6	4.49	65%	225.5	6.01	"

Since, with the exception of T which may be influenced by ambient outside temp, the parameters are w/in tolerances we will ~~sample~~ collect sample 965752594GW.

60GW Grundfos Rinsate

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP34687

Ft. Richardson OU D Field Sampling Plan

Date: 10/18/96 11/11/96

Event: [illegible]

1. Water Level Data (from ToC)

a. Total Well Length = WD	36.7'	(feet)	Screen Length	[illegible]	(feet)
b. Depth to Water = GW	27.94	(feet)	Borehole Diam. = BD	8	(feet)
c. Depth to top gravel pack = GP	25'	(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method: Grundfos

General Calculation:

b. Required Purge Volume: (see Calculations)

1 Borehole volume = $[7.48 \times \{\pi (CD/2)^2 + \pi P (BD/2)^2 - (CD/2)^2]\} \times (WD - GP^*)] + [(GP^* - GW) \times \{\pi (CD/2)^2 \times 7.48\}]$ = gallons Porosity (P) = 0.25

Assume: ~~H2O Level below gravel pack~~ 12" ~~boring diameter~~

$0.78 \text{ gal/ft}_{H_2O} (36.7 - 27.94)$

6.8 gal ≈ 7 gal

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

28.39
37

Figure 2-1. Groundwater Purge Record.

3231 - 10.0 cas 21 bgs
To Scr 10.75gs
S.O. 2.8 gs

19L 15L w T= 6.3 pH = 5.91/6.13 purge vol 0.079/0.08 Eh 83/85

pH 6.59
Cond 298
Eh -14 mV
purge 0.28 L/min

38

3504

384-6784

ENSR **Groundwater Purge Record** Well No: AP3458

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1019	0	4.0	—	—	—	—	6.90	Silty Orange
1229	7	6.0	461	18.1	48%	-300	6.80	Slightly Cloudy
← Pump does not pump. Controller shuts down w/ overload light illuminated. See 1048 field notes for details.								
11/8/96 - Pulled dedicated pump + piping to allow sampling w/ our non dedicated Grundfos or by hand.								
11/11/96 — Set ENSR Grundfos 1' from bottom of well but pump still drew the well dry. Decided to hand bail								
1130	0	7.0	—	—	—	—	—	Cloudy orange
1251	7	6.3	463	1004	51%	-6.1	7.80	"
1410	14	5.9	471	1064+	54%	24.1	7.41	"
1529	21	6.0	479	62.6	28%	18.1	7.40	Slightly orange
1636	28	5.8	484	91.6	52%	-16.8	7.43	"
1710	35	5.8	485	102.4	36%	-7.7	7.45	"

Parameters are reasonably stable w/the exception of DO. Although this well does not qualify as a slow recharger as defined by the work plan its not all that fast. We've been removing about 2.25 gal to get the well dry. In about 10 min the well recharges to 8' (of an original 9) Thus it takes about 45 min to remove 1 volume. Since we have bailed dry more than 3 times, since pH + cond are very stable and the other parameters are reasonably stable we will start sampling @ 1805

66 sample
67 rinsate

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: 3502

Ft. Richardson OU D Field Sampling Plan Date: 10/15/96 Event: 96.5752.55.421

1. Water Level Data (from ToC)

a. Total Well Length = WD	21.65	(feet)	Screen Length		(feet)
b. Depth to Water = GW	13.70	(feet)	Borehole Diam. = BD	8"	(feet)
c. Depth to top gravel pack = GP	—	(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method bailer

b. Required Purge Volume: (see Calculations)

$5.875\{0.028+0.25[0.444-0.028]\}$

$= 0.78\ gal/ft_{H_2O}$

$= 0.78(21.65-13.70)$

$= 6.20\ gal$

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP 3502

	±0.1	± 5%	<25	±10%	—	±0.1	
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1103	0	7.0	—	—	—	—	—	Clear
1153	1.5	7.0	208	7.50	48%	247.4	6.05	"
1428	10.5	7.3	206	6.90	50%	242.1	6.08	—
1510	14.5	7.0	205	4.92	46%	233.1	6.04	
1551	17.5	6.9	205	7.34	41%	229.3	5.29	
1645	23.5	6.7	205	6.06	52% 51%	230.1	5.97	
1735	29.5	6.8	205	8.6	48%	229.6	5.91	

5.39 bc

filter sand observed in bailer

— We've = 5 boring volumes and the parameters are generally within limits. The pH taken at 1551 is anomalously low and the DO taken at 1645 is high. Both these values were double checked w/ good agreement. A possible explanation for this vast these variation is ~~that~~ instrument drift due to temperature variation. The instruments are set up on the back seat of the crewcab and the truck is left running. Opening + shutting the door may fluctuate the temperature of the instruments.

— Collected sample 965752.55GW.

Well pack

— There seemed to be a significant amount of sand coming out in the bailer.

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** **Well No:** AP 3503

Ft. Richardson OU D Field Sampling Plan

Date: 10/16/96 10/16/96

Event: 96575258GW

1. Water Level Data (from ToC)

a. Total Well Length = WD 22.03 (feet) Screen Length (feet)

b. Depth to Water = GW 16.25 (feet) Borehole Diam. = BD (feet)

c. Depth to top gravel pack = GP (feet) Well Diam. = CD (feet)

2. Well Purging Data

a. Purge Method Hand Bail

b. Required Purge Volume: (see Calculations)

Assume ~~12" dia bhole~~ 8" borehole as per ENSR completion log.

2" dia. casing

1 borehole volume = 9.62 gal

1 bh Vol = 0.78 gal/ft H_2O (22.03-16.25) = 4.5 gal

*General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox, Potential (mV)	pH (units)	Color
—	May be obstructed; please see daily notes							
—	Ran stainless steel bailer right to bottom. No signs of obstruction,							
	although wtr in ~~the~~ bailer is very silty and has strong organic,							
	fecal odor.							

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP 3503

Ambient (°C)	Time	Volume (gal)	Temp. (°C) ±0.1	Spec. Cond. (mmhos/cm) ±5%	Turbidity (NTU) <25	Dissolved O_2 (%) within ±10%	Redox Potential (mV)	pH (units) ±0.1	Color
	1055	0	—	Sample Not taken					
11	1105	4.5	6.8	257	888	53%	243.0	6.34	Silty orange
10	1116	9.0	7.0	257	1020	56%	244.4	5.87	Silty orange
20	1281	13.5	7.1	251	451	66%	217.1	6.45	Silty orange
17 ~~20~~	1247	18.0	7.5	255	907	58%	242.7	6.09	"
15	1330 ~~1483~~	22.5	6.6	249	878	49%	236.9	6.25	"
13	1357	27	7.0	258	820	46%	230.6	5.92	"
Dupe =	"	"	7.2	258	838	50%	231.2	6.03	"
	1414	31.5	6.9	262	694	48%	228.6	5.70	"
6	1436	36.0	7.0	264	785	47%	227.3	5.65	"
8	1450	40.5	7.0	263	853	48%	225.7	5.71	"

– Since we've hand bailed 9 boring volumes from the well and since all the parameters are w/in tolerances except turbidity, we will sample this well; 965752580W -57GW2

Bailer Rinsate Work

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP 3504

Ft. Richardson OU D Field Sampling Plan

Date: 10/18/96 Event: 9657S2 GW

1. Water Level Data (from ToC)

a. Total Well Length = WD		(feet)	Screen Length		(feet)
b. Depth to Water = GW	14.67	(feet)	Borehole Diam. = BD	8"	(feet)
c. Depth to top gravel pack = GP	22.24	(feet)	Well Diam. = CD	2"	(feet)

14.67
22.24

2. Well Purging Data

a. Purge Method: hand bail w/ disposable HDPE bailer

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²}] x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.481] = gallons Porosity (P) = 0.25

For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Purging Vol = 5.9 gal ≈ 6.0 gal

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
Top of pump = 19.5 BGS								
~~Pump~~ Controller setting = 95								
Drawdown = 1.5'								
Pumping rate = ≈0.66 gpm								

Figure 2-1. Groundwater Purge Record.

Ambient truck Temp

ENSR **Groundwater Purge Record** Well No: B304

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
15°C 1355	6.0	5.3	182	958	66%	175.6	6.14	Slightly cloudy
14 1405	8 14	5.9	130	78	68%	175.6	5.78	"
15 1414	6 20	6.1	180	39.4	68%	175.6	6.02	"
13 1424	6 26	6.1	129	10.76	65%	176.6	6.20	"
14 1434	6 32	6.0	129	7.48	69%	177.3	6.25	"
12 1445	6 38	6.2	129.8	8.42	67%	175.9	6.24	"
— 3 consecutive good readings. We will collect 9657526161GW.								

Figure 2-1. Groundwater Purge Record (Cont'd).

240-5703

SAMPLING FORMS

1997

pump intake @ approx 20.66 below TOC
purging approx ½ gal/min
WL drawn down to approx 10.38 bgs

ENSR **Groundwater Purge Record** Well No: 2982

Ft. Richardson OU D Field Sampling Plan Date: 4/17/97 Event: GW Sampling 2nd round

1. Water Level Data (from ToC)

a. Total Well Length = WD	25.34	(feet)	Screen Length	10'	(feet)
b. Depth to Water = GW	10.16	(feet)	Borehole Diam. = BD	12" = 1'	(feet)
c. Depth to top gravel pack = GP	11.66	(feet)	Well Diam. = CD	0.167	(feet)

2. Well Purging Data

a. Purge Method grundfos w/disp. tubing

General Calculation:

b. Required Purge Volume: (see Calculations)

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = — gallons Porosity (P) = 0.25

$1.59(25.34 - 10.16) + .16(\frac{11.66}{25.34} - 10.16)$

24.14 + 2.43 qp 0.24

27 gal 24.38 ~24

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

C450 ixgen purging

0.1 µS/cm

Field Testing Equipment	±5%	<25	10%	—	±0.1

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(µmhos/cm)~~	Turbidity (NTU)	Dissolved O_2 (%)/mg/L	Redox Potential (mV)	pH (units)	Color
1055	7	3.6	325	—	39/—	164.1	6.55	clear
1130	27	4.1 1st min	292	0.91	38/4.8	145.6	6.40	clear
1205	51	3.7/4.0 2nd min	290	0.96	39/5.1	158.4	6.48	"
1245	75	3.9/4.3 3rd min	289	1.01	39/4.9	143.3	6.47	

~84 3.9 (temp only)

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** **Well No:**

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
Params Stable								
1300 Collected Samples								
696W + ~~QA (696W)~~ cancelled								
[1400] ~~106W (Blind dup)~~ cancelled made up time]								
~~VOC~~ ~~GRO~~ DRO								
SVOC, P/PCB								
~~Total Metals, Diss. Metal,~~ [~~TSS, Hardness~~],								
[~~Ammonia~~]								

Figure 2-1. Groundwater Purge Record (Cont'd).

1030 began purg. well

ENSR **Groundwater Purge Record** Well No: AP2984

Ft. Richardson OU D Field Sampling Plan — Date: 4/23/97 — Event: biann. mon @ 35:732

1. Water Level Data (from ToC)

a. Total Well Length = WD: 21.4 (feet) — Screen Length: 10' (feet)

b. Depth to Water = GW: 8.98 (feet) — Borehole Diam. = BD: 12" = 1' (feet)

c. Depth to top gravel pack = GP: 9.2 (feet) — Well Diam. = CD: 2" = 0.167 (feet)

2. Well Purging Data

a. Purge Method: grundfos + disp. PE tubing

General Calculation:

b. Required Purge Volume: (see Calculations)

1.59 (21.4 - ~~8.~~ 9.2) + (0.16)(9.2 - 8.98)

= 19.4

~ 20 gal/vol

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]) x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1050	20	2.6	162.6	6.51	75/10.1	295.7	6.50	clear
1105	40	2.6	162.0	2.13 ~~6.50~~	74/9.9	287.5	6.50	
dup		2.6	162.0	2.46 ~~6.49~~	76/10.1	283.6	6.49	
1125	60	2.6	161.6	1.43	74/10.0	290.1	6.48	

1130 Collected sample 97575Z806W

Figure 2-1. Groundwater Purge Record.

1430 began purging well - approx 0.25 gpm
pump approx mid screen
no phase (used interf. probe)

ENSR **Groundwater Purge Record** Well No: AP2985

Ft. Richardson OU D Field Sampling Plan Date: 4/21 Event: biannual mon. @ 35752

1. Water Level Data (from ToC)

a. Total Well Length = WD	14.3	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	8.56	(feet)	Borehole Diam. = BD	?12"	(feet)
c. Depth to top gravel pack = GP	+0.50 4	(feet)	Well Diam. = CD	2" = 0.17	(feet)

2. Well Purging Data

a. Purge Method: Grundfos disp. pe. tubing

b. Required Purge Volume: (see Calculations)

1.59 (14.3 - 8.56)
9.12
~9 gal/vol

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = ___ gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment: µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~	Turbidity (NTU)	Dissolved O₂ (%)/mg/L	Redox Potential (mV)	pH (units)	Color
~~1445~~	9	3.1	119.6	7.05	83/10.8	229.9	6.53	clear
1500	18	3.2	121.3	5.61	84/11.0	231.6	6.52	"
1510	27	3.0	122.2	4.21	82/10.6	220.7	6.52	"
1525	36	3.0	122.8	2.44	81/10.5	232.0	6.52	"

1530 params stable collected 975752 76 GW

Figure 2-1. Groundwater Purge Record.

1250 began purging - approx 1 gpm
no floating product detected w/ interface probe

ENSR	Groundwater Purge Record	Well No: 2986

Ft. Richardson OU D Field Sampling Plan

Date: 4/29/97

Event: biann. mon @ 35.752

1. Water Level Data (from ToC)

a. Total Well Length = WD	20.42	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	9.35	(feet)	Borehole Diam. = BD	12"	(feet)
c. Depth to top gravel pack = GP	6.00	(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method grundfos + disp tubing

b. Required Purge Volume: (see Calculations)

1.59 (20.42 - 9.35)
17.6 gal/vol
~18 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = — gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment: [illegible]

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (~~mmhos/cm~~)	Turbidity (NTU)	Dissolved O_2 (%) / mg/L	Redox Potential (mV)	pH (units)	Color
1315	18	4.0	166	17.9	34 / 4.5	197.2	6.44	clear
1330	36	3.4	166	7.92	47 / 5.8	201.7	6.24	clear
1345	54	3.2	168	7.16	42 / 5.5	246.2	6.21	"
1400	72	3.1	168	2.32	50 / 5.5	252.4	6.29	

Figure 2-1. Groundwater Purge Record.

1410 Params stable, collect
1410 9757528GW all params
1430 9757528GW (dup) all params except TSS..., nitrate/...

OU-D 33798

- pump approx mid screen
- W.L. constant at 8.38 ft b.toc
- began purging @ 1450 - water translucent yellow
- ~~wtr ft~~ purging at 1 gpm

ENSR **Groundwater Purge Record** Well No: MW2987

Ft. Richardson OU D Field Sampling Plan Date: 4/17 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	20.4	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	8.28	(feet)	Borehole Diam. = BD	12" = 1	(feet)
c. Depth to top gravel pack = GP	6.1	(feet)	Well Diam. = CD	2" = .167	(feet)

2. Well Purging Data

a. Purge Method Grundfost disp. tubing

b. Required Purge Volume: (see Calculations)

1.59(20.4 - 8.28)
1.59(12.12)
19.3

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = ~~—~~ gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment MS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(umhos/cm)~~	Turbidity (NTU)	Dissolved O_2 (%) / mg/L	Redox Potential (mV)	pH (units)	Color
1505	19	2.2	151.8	8.90	40/5.4	239.1	6.42	Clear
1520	38	2.3	147.9	7.63	39/5.1	244.8	6.27	
1540	57	2.3	147.4	7.10	41/5.4	233.5	~~5.96~~ 6.30	
1555	76	2.3	147.7	6.89	41/5.5	229.2	6.39	

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No:

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1610	95	2.3	147.3	6.80	0.40/5.5	230.3	6.38	
1615 = Params Stable. Collecting sample.								
97975271GW (MS/MSD for P/PCBs								
Grundfos+ disp tubing								

Figure 2-1. Groundwater Purge Record (Cont'd).

OU-D 33800

1010 began purging 3231 - approx 1gpm
no floating product detected
W.L approx 14.5 below TOC while purging

ENSR Groundwater Purge Record Well No: 3231

Ft. Richardson OU D Field Sampling Plan Date: 4/29/97 Event: biann. mon. @35.752

1. Water Level Data (from ToC)

a. Total Well Length = WD	23.75 (feet)	Screen Length	assume 10'	(feet)
b. Depth to Water = GW	13.99 (feet)	Borehole Diam. = BD	assume 12"	(feet)
c. Depth to top gravel pack = GP	_____ (feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method grundfos + disp. p.e. tubing

General Calculation:

b. Required Purge Volume: (see Calculations)

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2}] x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = ___ gallons Porosity (P) = 0.25

assume water is in gravel pack

1.59 (23.75 - 13.99)

= 15.5 gal

≈ 16 gal/vol.

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment U1 Flow

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (~~mmhos/cm~~)	Turbidity (NTU)	Dissolved O$_2$ (%) / mg/L	Redox Potential (mV)	pH (units)	Color
1030	16	3.9	208	8.92	46/12.1	334.3	6.69	clear
1050	32	3.9	211	5.79	98/17.4	299.4	6.58	"
1110	48	3.9	212	2.62	87/12.1	288.3	6.52	"
1130	54	3.9	213	2.63	96/12.4	288.8	6.48	"

Figure 2-1. Groundwater Purge Record.

Params stable - collect 9757528 4GW 11:30 full params
8566W (dup) 1200 all params except nitrate/ite + TSS, hard...

used Solinst interface probe - no floating product detected
1205 purged dry again - recharged to 22.ft bgs after 25 min?

ENSR **Groundwater Purge Record** Well No: AP3458

Ft. Richardson OU D Field Sampling Plan Date: 4/18/97 Event: 35-752 biannual mon.

1. Water Level Data (from ToC)

a. Total Well Length = WD	36.7	(feet)	Screen Length		(feet)
b. Depth to Water = GW	27.64	(feet)	Borehole Diam. = BD	8"	(feet)
c. Depth to top gravel pack = GP	25'	(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method: HDPE bailer (dispos.)

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²}] x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = ~ gallons Porosity (P) = 0.25

See 11/11/96 data

0.78 gal/ft (36.7-27.64)

= 7.1

~7 gal/ft

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment: MS/cm ★

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1145	7	6.2	504	163	20/2.4	52.3	6.82	
1235	14	6.84	493	609	25/3.1	57.5	7.46	cloudy tan
1330	16	6.9	486	37.1	18/2.1	59.8	7.26	clear, grey
1400	20	6.5	487	147	19/2.3	63.3	7.18	grey
1435	24	6.6	480	121 ~~96~~	17/2.1	77.9	7.07	grey

Figure 2-1. Groundwater Purge Record.

★ Turbidity meter battery will not hold charge. Low Batt. signal is on and meter fluctuates on 0.02 NTU standard.

used interface probe -
no product detected

ENSR **Groundwater Purge Record** Well No: AP3502

Ft. Richardson OU D Field Sampling Plan Date: 4/22/97 Event: A brann. mon. 35-752

1. Water Level Data (from ToC)

a. Total Well Length = WD	21.65	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	9.27	(feet)	Borehole Diam. = BD	8"	(feet)
c. Depth to top gravel pack = GP	9.65	(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method HDPE bailer

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = — gallons Porosity (P) = 0.25

0.78 gal/ft h_2o (21.65 - 9.65) + (9.65 - 9.27)(.16) ~ 9.4 ~ 9.5 gal/vol

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%) / mg/L	Redox Potential (mV)	pH (units)	Color
1200	9	3.2	194	188	58 / 7.3	268.3	6.76	tan
1245	18	2.5	169	123	66 / 8.9	264.2	6.48	"
1405	30	2.8	170	167	67 / 9.2	268.8	6.33	"
1435	40	2.6	170	135	67 / 9.5	275.3	6.52	"

Figure 2-1. Groundwater Purge Record.

Sample time 1445 97575278GW

used interface probe – no free product detected

ENSR **Groundwater Purge Record** Well No: AP 3503

Ft. Richardson OU D Field Sampling Plan Date: 4/22/97 Event: biann. mon @ 35752

1. Water Level Data (from ToC)

a. Total Well Length = WD	22.03	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	11.90	(feet)	Borehole Diam. = BD	8"	(feet)
c. Depth to top gravel pack = GP	8.5	(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method HDPE bailer

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = ___ gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

0.78 (22.03 - 11.90)

= 7.9

≈ 8 gal/ft

Field Testing Equipment µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (~~mmhos/cm~~)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1240	8	2.6	180	325	72/9.5	260.6	6.71	lt brown
1300	16	2.7	184.7	288	69/9.3	257.6	6.68	"
1322	24	2.7	184.8	224	71/9.3	260.4	6.61	
1330	Collected samples				9757527760			

(MS/MSD for all organic parameters)

Figure 2-1. Groundwater Purge Record.

1150 began purging, purge rate approx. 1.5gpm, turned down to approx 1 gpm
no interface detected
pump approx mid screen
switched turb - same model, Hazco # 7277

ENSR **Groundwater Purge Record** Well No: AP323Z

Ft. Richardson OU D Field Sampling Plan Date: 4/21/97 Event: braun, man. @ 35-752

1. Water Level Data (from ToC)

a. Total Well Length = WD	18.33	(feet)	Screen Length		(feet)
b. Depth to Water = GW	7.38	(feet)	Borehole Diam. = BD	12"	(feet)
c. Depth to top gravel pack = GP	?	(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method: Grundfos, disp. tubing

General Calculation: casing borehole - casing

b. Required Purge Volume: (see Calculations)

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2)] x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = ~~—~~ gallons Porosity (P) = 0.25

1.59(18.33 - 7.38)
~~worst case~~
+ .16(~~9.38 - 4.35~~)
~17.4 gal
~18 gals

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

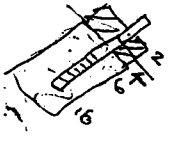
Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x ~~(0.22)~~] = gal 0.16

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment: US/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~	Turbidity (NTU)	Dissolved O_2 (%)/mg/L	Redox Potential (mV)	pH (units)	Color
1200	18	2.9	178.5	8.97	75/9.7	190.6	6.68	clear
1215	36	2.9	168.1	3.14	74/9.8	171.5	6.57	
1230	54	2.8	~~169.4~~ 168.3	2.68	73/9.6	184.9	6.63	
dup		2.9	164.4	2.50	75/0.9	183.2	6.62	

Figure 2-1. Groundwater Purge Record.



ENSR	Groundwater Purge Record					Well No:		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1250	72	2.9	162.8	6.92	72/9.6	187.8	6.61	
1300	Params Stabilized - Collected Sample ID: 97575275GW							

Figure 2-1. Groundwater Purge Record (Cont'd).

SAMPLING FORMS

1998

ENSR Groundwater Purge Record Well No: AP3917

Ft. Richardson OU D Field Sampling Plan Date: 6/9/98 1000 Event:

1. Water Level Data (from ToC) NO PRODUCT DETECTED 6/11/98

a. Total Well Length = WD 18.3 (feet) Screen Length 10 (feet)

b. Depth to Water = GW 8.36 (feet) Borehole Diam. = BD 8 1/4 (feet)

c. Depth to top gravel pack = GP 5' 4" (feet) Well Diam. = CD (feet)

2. Well Purging Data

a. Purge Method Grundfos Waterra

b. Required Purge Volume: (see Calculations)

7.7 gal/vol

W.L. Stable during purging at 8.55 ft btoc

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P [(BD/2)^2 - (CD/2)^2]] x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

Short Form: For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form: For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* = If GP is below GW, then GP* = GP If GP is above GW, then GP* = GW

Field Testing Equipment			±0.1	±5%	<25	±10%		±0.1
Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~	Turbidity (NTU)	Dissolved O_2 ~~(%)~~ mg/L	Redox Potential (mV)	pH (units)	Color
1210	10	6.4	170.4	>1000	9.6	121.9	6.10	gray
1217	16	5.1	169.3	>1000	9.5	94.1	6.20	"
1228	24	5.7	167.5	>200	9.5	101.9	6.32	"
1240	32	6.0	166.8	>200	10.3	120.6	6.39	"
1250	40	5.6	166.5	17.7	12.8	116.9	6.41	clear
1301	48	5.6 ✓	166.1 ✓	13.3 ✓	11.8	118.4	6.40 ✓	"

sheen @ 20

Figure 2-1. Groundwater Purge Record.

ENSR Groundwater Purge Record Well No: AP3910

Ft. Richardson OU D Field Sampling Plan Date: ~~6/9/98~~ 6/11/98 ~~6/10/98~~ Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD 21.43 (feet) Screen Length 10' (feet)

b. Depth to Water = GW 6/11 12.79 ~~12.27~~ (feet) Borehole Diam. = BD 8 1/4 (feet)

c. Depth to top gravel pack = GP 7.9 (feet) Well Diam. = CD (feet)

2. Well Purging Data

a. Purge Method Waterra Grundfos

General Calculation:

b. Required Purge Volume: (see Calculations)

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form: For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.48 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

7.1 gal/vol

- sheen on water
- no product detected

Short Form: For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* = If GP is below GW, then GP* = GP If GP is above GW, then GP* = GW

Field Testing Equipment µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 ~~(%)~~ mg/L	Redox Potential (mV)	pH (units)	Color
1549	7	6.2	173.3	>200	9.0	143.6	6.65	clear w/slight cloudy
1600	14	5.9	173.1	>200	9.9	123.6	6.60	
1612	21	6.1	173.2	1988	10.0	121.6	6.56	
1624	28	5.6	171.1	17.40	10.0	122.5	6.51	
1632	35	5.4	1708	12.53	10.4	117.5	6.49	
1641	42	5.4	170.9	8.62	10.1	127.9	6.50	

Figure 2-1. Groundwater Purge Record.

ENSR Groundwater Purge Record Well No: AP3920

Ft. Richardson OU D Field Sampling Plan Date: 6/9/98 Event: -

OU-D 33810

1. Water Level Data (from ToC)

a. Total Well Length = WD 19.5 (feet) Screen Length 10 (feet)

b. Depth to Water = GW 9.20 (feet) Borehole Diam. = BD 8 1/4" (feet)

c. Depth to top gravel pack = GP 6.3 (feet) Well Diam. = CD 2' (feet)

2. Well Purging Data 6/11 no product detected

a. Purge Method ~~Waterra~~ Grundfos

General Calculation:

b. Required Purge Volume: (see Calculations)

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]) x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

7.98 gal/vol

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

WATER LEVEL STABLE @ ±9.3' BTC DURING PURGING.

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment YSI ( ) = no stabilize

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (~~mmhos/cm~~) µS/cm	Turbidity (NTU)	Dissolved O_2 (~~%~~) mg/L	Redox Potential (mV)	pH (units)	Color
1642	8	6.5	235		4.0	-60.1	5.61	light green cloudy
1649	16	4.8	208		4.2	(-70:-90)	5.69	"
1700	32	5.3	206		4.9	-53.8	5.71	" clearing
1708	40	5.6	203	>200	4.0	-54.7	5.84	clearing but still slight cloud
1717	48	5.6	202	17	4.0	(+25:-100)	5.83	clear all
1725	54	5.5	202	10.5	4.4	-64	? [6.20	" "

1730 ~~1725~~ begin sampling

✓ ✓ ✓ ✓

6.05 @ ~58 (took All ...

pH stable 6th borehole vol.; all other params stable so collected sample

rate and running out of room in purge H_2O drum ... Started

Figure 2-1. Groundwater Purge Record.

ENSR — Groundwater Purge Record — Well No: AP3231

Ft. Richardson OU D Field Sampling Plan — Date: 6/11/98 — Event: ______

1. Water Level Data (from ToC) — *NO PRODUCT DETECTED W/INTERFACE PROBE

a. Total Well Length = WD	23.70 (feet)	Screen Length	? (feet)
b. Depth to Water = GW 6/11	12.43 ~~11.89~~ (feet)	Borehole Diam. = BD	8¼? 10? (feet)
c. Depth to top gravel pack = GP	assume 10 (feet)	Well Diam. = CD	2" (feet)

2. Well Purging Data

a. Purge Method: Grundfos

b. Required Purge Volume: (see Calculations)

8 1/4 9.5
or
10" ϕ? (13.5) Δ H₂O level
↓
13 gal

water level ~12.65 ft btoc during purging

General Calculation:

1 Borehole volume = $[7.48 \times (\pi (CD/2)^2 + \pi P[(BD/2)^2 - (CD/2)^2]) \times (WD - GP^*)] + [(GP^* - GW) \times (\pi (CD/2)^2 \times 7.48)]$ = gallons   Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment: µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (~~mmhos/cm~~)	Turbidity (NTU)	Dissolved O_2 (~~%~~ mg/L)	Redox Potential (mV)	pH (units)	Color
1035	13	5.6	140.0	16.77	NR	260.9	6.35	clear
1054	26	5.5	139.6	6.30	13.5	244.0	6.52	"
1112	39	5.4	138.6	4.50	12.2	263.4	6.29	"
1130	52	5.7	139.4	2.60	12.1	284.5	6.11	clear
1147	65	5.4	138.6	3.05	12.1	277.8	6.01	clear
1203	78	5.5	142.3	2.35	11.8	286.5	5.75	

Figure 2-1. Groundwater Purge Record.

1210 Collect sample 9857520360GW and dup (-037GW - made up time of 1100)

1150 Checked pH meter in standards - meter has drifted down 4.0 reading = ~ 7.00 reading 6.39.

BUILDING 45-590

MONITORING WELL DEVELOPMENT FORMS

AP3774,
AP3775'

ENSR Consulting and Engineering
FIELD ACTIVITIES NOTEBOOK

DAILY CHRONOLOG (Continued)

Project Number: 9000-107-002 Date: 9/23/9

ENTRIES SHOULD BE CHRONOLOGICAL WITH TIME INCLUDED

AP3774

on site at 9:15
4559WL03 Water level 110.13 *2 Dr
(sample #56) . DTB 116.32 55ga 25ga
Calibrate instruments total 80
Sample Well @ 10:50 (generated 2 drums 55gal 9 2
Decon pump at water treatment pad
11:30 Decon pump
11:55 Set up at 4559WL04

WATER LEVEL = 109.53 TOTAL DEPTH = 114.42
12:15 begin pump / water tan/brown
more sediment than WL03
pumped dry lowered pump may have
to hand pump

AP 3775

14:50 Sample Well 4559WL04 (455957GW)
generated 2 drum (55gal 9 35gal)
15:05 at Decon pad - decon pump 15:40 455958 Equipment
15:55 Set up on 4559WL05
Water level 106.87 Total depth 110.32
Start pumping at 16:20

Deborah McGhee 9/23/96
(Signed) (Date) (Reviewed) (Date)

OU-D 33813

AP 3776

ENSR Consulting and Engineering
FIELD ACTIVITIES NOTEBOOK

DAILY CHRONOLOG (Continued)

Project Number: 9800-107-002 Date: 9/23/96

ENTRIES SHOULD BE CHRONOLOGICAL WITH TIME INCLUDED

17:35 Sample well 4559WL05 (9604559-59GW)
2 drums 1 55gal 1 30gal
offsite 17:50 will decon pump at office.

Sample Summary
4559WL03 9604559-56GW
Field Duplicate 9604559-60GW
4559WL04 9604559-57GW
EB 9604559-58GW
4559WL05 9604559GW

Deborah McKee 9/23/96
(Signed) (Date) (Reviewed) (Date)

p1 of 2

ENSR

MONITORING WELL DEVELOPMENT RECORD

2/13/97 — WELL I.D.: 9645591WL06

PROJECT NAME: 29000-107-002 — LOCATION: Bldg 732

PROJECT NUMBER: FT RICH OUD — DEVELOPER: J. Shapiro, M. Field

[✓] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT — ORIGINAL DEVELOPMENT DATE: _____

hrd sp. 15

WELL DATA

Well Diameter (from top of riser)	2" (assume 7" borehole)	Geology at Screened Interval	
Total Well Depth	120.43		
Depth to Top of Screen	110.5	Likely Contaminants	PCE
Depth to Bottom of Screen	~~120.5~~ 119.75		
Depth to Static Water Level	113.96	Purge Water and Sediment Disposal Method	decon pad - 762

DEVELOPMENT METHOD

	gallon	time
	1	1154
	7	1205
	11	1217
	16	1227
	21	234
	27	1244
	33	1252
	39	1302

PURGING METHOD

pH	temp	% D.O.	µS/cm cond.
6.[illegible]	5.5	46	308
7.49	8.3	46	297
7.65	8.2	46	297
7.78	7.8	43	298
7.89	8.2	45	297
7.99	7.8	48	296
8.12	7.8	45	296
8.23	7.9	47	296

PERMEABILITY TEST RESULTS

turb.	observ.
984	lt. brown; surged @ 4 gal
768	" surged @ 8 gal
715	surged - mid H_2O
1090	surged - bottom
530	"
144	surged bottom
156	no surging
21.6	

cond. on next pg.

ACCEPTANCE CRITERIA

- pump approx mid-wetted interval
- surged upper portion then lower portion of wetted screened interval
- no stratification of water - stable @ 14.00

Signature _____ Date 2/13/97

33815

OU-D

M890322

NSR

MONITORING WELL DEVELOPMENT RECORD

WELL I.D.: 964559WL06

ECT NAME: _____ LOCATION: _____

ECT NUMBER: _____ DEVELOPER: _____

[ ] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: _____

DATA

Diameter	
Well Depth	
to Top een	
to Bottom een	
to Static Level	

Geology at Screened Interval	
Likely Contaminants	
Purge Water and Sediment Disposal Method	

DEVELOPMENT METHOD

gal	time
48	1314
50	1324
56	1334
62	1345
68	1355

PURGING METHOD

pH	temp	DO	cond
8.37	8.0	47	296
8.35	7.9	45	296
8.44	7.9	45	296
8.41	7.9	47	296
8.43	7.9	47	296

PERMEABILITY TEST RESULTS

turb	obs.
7.4	Clear
4.75	"
2.89	"
2.84	
2.17	

EPTANCE CRITERIA

Purged approx 71 gals + stopped development. After pump pulled:
Water level 113.96
T.D. 120.4
00 ~~Decon~~ Pull pump and off to decon pad. Emptied approx 70 gals of purgewater into Tk 2.

Signature _____ Date 2/13/97

OU-D 33816

ENSR

MONITORING WELL DEVELOPMENT RECORD

: 2/17/97 WELL I.D.: 974559WL07

PROJECT NAME: FT RICH OUD R1 LOCATION:

PROJECT NUMBER: DEVELOPER: J. Shapiro, M. Fidd

[V] ORIGINAL DEVELOPMENT [ ] REDEVELOPMENT ORIGINAL DEVELOPMENT DATE: 2/4/90

headspace · 3, probably moisture

WELL DATA

Well Diameter	2"	Geology at Screened Interval	
Total Well Depth	82 ft	assume 4" borehole vol = 0.62 gal/ft x (81.6 - 74.8) = 4.2 gal/f	
Depth to Top of Screen	72.5	Likely Contaminants	PCE
Depth to Bottom of Screen	81.55		
Depth to Static Water Level	74.79	74.73 porter inst. pump Purge Water and Sediment Disposal Method	holding tank → decon pad

DEVELOPMENT METHOD / **PURGING METHOD** / **PERMEABILITY TEST RESULTS**

gal	time	temp	µS/cm Cond	pH	D.O.	turb	
1	1130	6.3	840	7.43	67	—	turbid
13	1152	8.1	845	7.69	72	—	surged @ 6 gal
19	1158	8.1	840	7.69	76	220	↓
27	1213	7.8	839	7.77	66	235	
34	1223	8.0	839	7.82	79	25.2	
38	1230	8.2	839	7.74	78	12.4	
42	1237	8.2	839	7.76	78	8.40	
46	1244	8.1	839	7.78	78	5.70	

ACCEPTANCE CRITERIA

Surging at top of screen to start (and purging) approx every 6 gals. Surged and purged through entire column. W.L. fairly constant. Water clears up pretty quickly after surging. Stopped surging after pulling 30 gals.

D.T. bottom 82.2 + 0.3 = 82.5 ft after development

S.C. riser 34"
S.C. casing 37"

Signature ____________ Date ____________

M890322

OU-D 33817

Well Developme

ENSR **Groundwater Purge Record** Well No: AP3870 WL08

Ft. Richardson OU D Field Sampling Plan Date: 1-19-98 Event:

1. Water Level Data (from ToC) 111.9 (measured) LOG STATS TD = 120'

a. Total Well Length = WD	[illegible]	(feet)	Screen Length	20 (feet)
b. Depth to Water = GW	102.03	(feet)	Borehole Diam. = BD	8 in (feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2 in (feet)

2. Well Purging Data

a. Purge Method GRUNDFOS

b. Required Purge Volume: (see Calculations)

(calculation based on 120' TOTAL DEPTH

1 vol = 13.9 gal

3 vol = 41.8 gal ≈ 42 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
13:20	240	7.33	441	16.5	11.23	27.6	7.53	cl
13:30	248	7.14	449	5.9	10.79	23.6	7.55	cl
1383	256	7.40	444	2.9	11.70	93.6	7.64	cl
1384	264	7.45	444	2.8	12.95	30.9	7.65	cl

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP 3870

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1406	272	7.22	444	5.2	13.05	1.5	7.66	cl
1419	280	7.35	446	3.5	13.07	8.7	7.64	cl
1433	288	7.19	444	2.7	12.45	3.9	7.61	cl
Finish development								

Figure 2-1. Groundwater Purge Record (Cont'd).

Well Development

ENSR Groundwater Purge Record AP3871 Well No: WL09

Ft. Richardson OU D Field Sampling Plan Date: 1-20-98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD 120.1 (feet) Screen Length 10 (feet) 13 sand

b. Depth to Water = GW 113.09 (feet) Borehole Diam. = BD 8 in (feet)

c. Depth to top gravel pack = GP ____ (feet) Well Diam. = CD 2 in (feet)

Assumed 20' sand pack (Anchor Hill)

2. Well Purging Data

a. Purge Method GRUNDFOS Pump

b. Required Purge Volume: (see Calculations)

1 vol = 5.4 gal

3 vol = 16.3 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P[(BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = ____ gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = ____ gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = ____ gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
11:00	Begin pumping initially @ 2 gpm pumped dry — slow flow rate and surge.							
12:54	175	8.34	445	10.0	7.79	0.9	7.41	cl
1307	185	8.38	449	2.9	8.77	9.0	7.57	cl

Figure 2-1. Groundwater Purge Record.

ENSR	Groundwater Purge Record					Well No: AP3871		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
320	191	8.39	454	1.2	8.50	-8.3	7.64	cl
1334	199	8.13	456	1.0	8.43	-7.8	7.65	cl
1348	207	8.14	458	0.6	8.76	-13.3	7.65	cl
1358	215	8.11	459	1.0	8.98	-19.5	7.68	cl
Finish Development								

Figure 2-1. Groundwater Purge Record (Cont'd).

Well Development

ENSR Groundwater Purge Record Well No: AP3872 WL10

Ft. Richardson OU D Field Sampling Plan Date: 1/21/98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	123.9	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	116.23	(feet)	Borehole Diam. = BD	8 in	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2 in	(feet)

2. Well Purging Data

a. Purge Method: Grundfos pump

b. Required Purge Volume: (see Calculations)

1 volume - 5.9 gal

5 vol = 17.8 gal

(used 12' sand pack)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P[(BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.57)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1130	begin pumping slow ~ 1gal/min or less							
	well drawing down 1"/2 min							
	draw down stabilizes with surging							
	at 40 gallons up flow rate to 2gal/min							

Figure 2-1. Groundwater Purge Record.

ENSR	Groundwater Purge Record				Well No: AP3872			
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
alternate purging and surge up to 200 gal								
1445	~220	7.88	~~786~~	0.8	10.98	24.9	6.61	cl
~~1450~~ 1500	228	7.91	773	0.9	10.95	12.9	6.91	cl
1512	236	7.95	776	0.8	10.74	0.9	6.95	cl
1524	244	7.90	779	0.6	10.16	-8.7	7.03	cl
1534	252	7.81	781	0.6	9.84	-18.1	7.04	cl
1545	260	7.84	781	0.5	9.89	-23.2	7.07	cl
✓ parameters stable								
removed ~40 borehole volumes								

Figure 2-1. Groundwater Purge Record (Cont'd).

Well Development

ENSR Groundwater Purge Record AP 3873 Well No: WL11

Ft. Richardson OU D Field Sampling Plan Date: 1-22-98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	110.1	(feet)	Screen Length	10 (ASSUMED)	(feet)
b. Depth to Water = GW	103.49	(feet)	Borehole Diam. = BD	8 in	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2 in	(feet)

2. Well Purging Data

a. Purge Method GRUNDFOS PUMP

b. Required Purge Volume: (see Calculations)

1 vol = 5.12

3 vol = 15.4 gal

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]) x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.57)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

not functioning

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1257	133	7.36	773	12.1	7.94		7.48	cl
1313	141	7.48	774	5.4	10.14		7.54	cl
1325	149	7.50	775	3.0	10.56		7.54	cl
1338	157	7.54	775	1.9	10.80		7.54	cl

Figure 2-1. Groundwater Purge Record.

ENSR	Groundwater Purge Record					Well No: AP3873		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1351	165	7.49	775	1.4	11.02		7.55	cl
1404	173	7.56	774	1.1	11.11		7.55	cl
1409	FINISHED DEVELOPMENT.							

Figure 2-1. Groundwater Purge Record (Cont'd).

BUILDING 45-590

SAMPLING FORMS

SAMPLING FORMS

1996

ENSR **Groundwater Purge Record** Well No: AP 34137

Ft Richardson OU D Field Sampling Plan Date: 10/28/96 Event:

Well cover missing 1 bolt

1. Water Level Data (from TOC)

a. Total Well Length = 109.93 (feet) Screen Length 20 (feet)

b. Depth to Water = GW 104.53 (feet) Borehole Diam. = BD AIR-ROTARY as shown 8 1/2 (feet)

c. Depth to top gravel pack = GP 86.5 (feet) bgs Well Diam. = CD 2 1/2 (feet)

2. Well Purging Data

a. Purge Method ~~Grundfos pump~~ bailer

General Calculation:

b. Required Purge Volume: (see Calculations)

depth to water > depth to gravel pack

∴ purge vol =

0.78 gal/ft (109.93 - 104.53)

0.78 gal/ft (5.4 ft)

= 4.2 gal/vol

≈ 4.5 gal/well vol

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

±0.1°C ±5% <25 ±10% ±0.1

Field Testing Equipment µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (~~mmhos/cm~~)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1205 AP	0	8.7	—	—	—	—	—	yellowish orange
1240	4.5	6.7	316	154	69%.	249.2	7.36	yellowish brown
1310	9.0	6.4	318	61.7	68%.	237.7	7.35	"
1350	13.5	6.1	316	262	70%.	245.9	7.39	"

Figure 2-1. Groundwater Purge Record.

ENSR			Groundwater Purge Record			Well No:		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~ µS/cm	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1425	18	6.0	317	83	66%	262.6	7.40	"
1507	22.5	6.1	318	930	[illegible]	264.8	7.42	"

1515-1545 Collected samples

~~Emptied holding tank and back to office. Decon'd grundfos (as we did for using it, even though we were unable to get water to come up~~

~~1930 Collected equip blank on bailer (9645591376W)~~

~~1840 SS and CP finished~~

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AR8440

Ft. Richardson OU D Field Sampling Plan Date: 11/1/96 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	110.40 109' (feet)		Screen Length	(feet)
b. Depth to Water = GW	105.20 (feet)		Borehole Diam. = BD	8" Assumed (feet)
c. Depth to top gravel pack = GP	86' (feet)		Well Diam. = CD	2" (feet)

2. Well Purging Data

a. Purge Method Grundfos

b. Required Purge Volume: (see Calculations)

~~0.78 (109')~~
0.78 gal/ft (110.40 - 105.20)
= 4.056
≈ 4 gal

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2)] x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
H_2O level @ ~~end~~ steady state drawdown = 105.17'								
Purge rate 4gal / 1½ min = 2.7 gpm								

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP 8540

Time	Volume (gal)	Temp. (°C).	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1141	0	6.3	—	—	— *	—	—	—
1148	4	8.3	337	70.0	—	258.9	7.51	Slightly Cloudy
1154	8	8.3	342	6.36	—	256.2	7.60	"
1202	12	8.3	353	2.15	—	260.0	7.58	"
1209	16	8.3	345	1.35	—	250.2	7.59	

1214 3 very stable readings, will sample

* replaced batter, anode solution, membrane + generally cleaned but DO meter is not functioning

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: DP 8411

Ft. Richardson OU D Field Sampling Plan Date: 10/29/96 Event
10/31/96

1. Water Level Data (from ToC) BGS

a. Total Well Length = 113 (feet)* Screen Length (feet)

b. Depth to Water = GW = 107.78 (3 stickup) Borehole Diam. = 8D (feet)

c. Depth to top gravel pack = GP 92 (feet) Well Diam. = CD 2" (feet)

2. Well Purging Data

a. Purge Method

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Assume 8" BH dia.

Borehole Volume = 0.78 gal/ft$_{H_2O}$ (113-107.78)

= 4.07 gal

= 4 gal

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

10/31 WL = 110.83 (ToC)
107.83 (bgs)

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

Figure 2-1. Groundwater Purge Record.

OFL = Out of range
recal DO meter
Slope = 1.14

Repeated OFL readings in sample. Changed batt, recaled (1.10, 100%), read 98% in air OFL errors continued in sample

ENSR Groundwater Purge Record — Well No: AP 5441

µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (~~mmhos/cm~~)	Turbidity (NTU)	Dissolved O. (%)	Redox Potential (mV)	pH (units)	Color
0949	0	6.3	—	—	—	—	—	—
1046	4	6.2	455	210	OFL / 91%	258.4	7.16	lt tan
1135	8	6.1	450	880	96%	218.0	7.18	Brown slightly cloudy
1207	12	6.4	447	155.7	90%	219.3	7.17	
1238	16	6.5	453	860	*	214.4	7.20	Brown
1338	20	6.4	447	1040	OFL	208.0	7.36	"
1430	24	6.3	445	863	—	190.6	7.35	"
515	28	6.3	448	962	—	214.9	7.33	"
1525	Collecting samples							
			964559138GW		—	AP 5441		
			964559159GW		—	Rinsate Sample of disp. bailer		

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP 3467

Ft. Richardson OU D Field Sampling Plan Date: 10/22/96 Event: 9655901251(4)

1. Water Level Data (from ToC)

a. Total Well Length = WD		(feet)	Screen Length		(feet)
b. Depth to Water = GW		(feet)	Borehole Diam. = BD		(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD		(feet)

2. Well Purging Data

a. Purge Method GrundFos

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
— This well has a dedicated pump. We purged and sampled this well at ≈ 3gpm (1gal/7.5sec) because at slower flowrates air bubbles became entrained in the flow. Well recharges well. ≈0.5' of drawdown on when pumping at 1gal/25sec rate								

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP-35467

Ambient truck T 14°C

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1402	0	5.7	—	—	—	—	—	Clear
1411	12	6.7	275	10.7	22%	211.6	7.76	"
1419	16/28	6.8	275	3.60	21%	204.1	7.87	"
1425	17/40	6.8	274	5.24	21%	208.6	7.97	"
1430	17/52	6.7	275	6.72	29%	167.6	7.96	"
1439	20/72	6.8	274	2.73	25%	176.5	8.02	"

- Since all parameters are w/in tolerances specified in work plan we will sample.

1445 Collected 965590125 GW

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP3468

Ft. Richardson OU D Field Sampling Plan

Date: 10/23/96 Event: ______

1. Water Level Data (from ToC) STICK UP approx 7.6 (difficult to measure due to snowpack) 115.5

a. Total Well Length = WD 118.1 ~~103~~ (feet) Screen Length 10 (feet)

b. Depth to Water = GW (feet) 110.15 (toc) Borehole Diam. = BD 7/12 (feet)

c. Depth to top gravel pack = GP ~~79.5~~ 100.6 (feet) Well Diam. = CD 2/12 (feet)

2. Well Purging Data

a. Purge Method Grundfos

b. Required Purge Volume: (see Calculations)

for water below gravel pack, multiply water column by 0.62

0.62 (118.1 − 110.15)

= 4.9 ~ 5 gal

General Calculation:

1 Borehole volume = $[7.48 \times \{\pi (CD/2)^2 + \pi P (BD/2)^2 - (CD/2)^2]\} \times (WD - GP^*)] + [(GP^* - GW) \times \{\pi (CD/2)^2 \times 7.48\}]$ = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
Unable to sample. Insufficent water above pump. Top of pump @ 111.7 (toc) ± 1.5' H_2O. (See daily field notes for more info.								

Figure 2-1. Groundwater Purge Record.

33836

OU-D

ENSR **Groundwater Purge Record** Well No: AP8460

	±0.1	± 5%	<25	± 10%	—	± 0.1	
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (~~mmhos/cm~~ µS/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
	0							
TRUCK T/C								
1200	Began purging					AP3469		
1201	0	6.6	—	—	—	—	—	~~Hazy~~
1211	14	7.5	351	1.59	23	194.1	7.69	clear
1228	28	8.0	341	0.68	-23	193.5	7.70	"
dup		8.0	341	0.62	24	191.3	7.78	"
1240	42	8.0	338	0.56	22	189.5	7.76	"
1254	56	8.0	336	0.68	23	192.7	7.72	"
		WL = 67.44 bgs during sampling						
1300	Collecting sample							
		9645591326W						

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AR3468

Ft. Richardson OU D Field Sampling Plan Date: 11/14/96 Event:

ATTN: See 10/23/96 Record for details of 1st, unsuccessful sampling attempt.

1. Water Level Data (from ToC)

a. Total Well Length = WD 114.66 (feet) Screen Length (feet)

b. Depth to Water = GW 110.23 (feet) Borehole Diam. = BD Assumed 7" (feet)

c. Depth to top gravel pack = GP (feet) Well Diam. = CD 2" (feet)

2. Well Purging Data

a. Purge Method Grundfos bailer Stainless steel - pumping HDPE - Sampling

General Calculation:

b. Required Purge Volume: (see Calculations)

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²}] x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48)}] = gallons Porosity (P) = 0.25

Purge Vol = 0.62 gal/ft (114.66-110.23)

= 2.75 gal

≃ 3 gal

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

pump set appx 1 ft off bottom

1205 Start pumping

Field Testing Equipment		±0.1	µS/cm	±5%	<25	±10%		±0.1	
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color	
1218	0	1.1						opaque brown	
1355	3	6.7	554	0.16+	96%	175.2	7.51	"	
1443	6	6.7	579	120	92%	187.3	7.48	"	
1528	9	6.4	584	300	92	189.1	7.46	"	

Figure 2-1. Groundwater Purge Record.

* Sample is opaque - possibly throwing off turbidimeter, once silt started settling out reading actually increased to

1535 Spoke to H. Kent - ok'ed for us to sample - we felt that since all params were stable with only a minor variation

ENSR	Groundwater Purge Record				Well No:			
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
in temp that we had purged enough. Also, it was taking approx 1 hr to purge 1-volume as we had to use the Stainless Steel bailer (the HDPE kept getting stuck on the ridges of the well). Also, the inverse variation in the temp on the last volume may have been because there was actually more water pulled in that bailer than the previous 2 volumes and may not have started warming up as rapidly.								
Collected 9645591536W.								

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP3483

Ft. Richardson OU D Field Sampling Plan Date: 10/24/96 Event:

hdspcl - 0,0 2.5 ~5' SU 118

1. Water Level Data (from ToC)

a. Total Well Length = WD 99.15 (feet) Screen Length 10 (feet)

b. Depth to Water = GW 99.15 (feet) Borehole Diam. = BD 7/12 (feet)

c. Depth to top gravel pack = GP 105.0 (feet) Well Diam. = CD 2/12 (feet) Stainless Steel

2. Well Purging Data

a. Purge Method Grundfos

General Calculation:

b. Required Purge Volume: (see Calculations)

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2}] x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

$0.162(118-105) + 0.16(105-99.15)$

$= 8.06 + 0.94$

$= 9$ gal/vol

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
Pumped well at ≈ 1.125 gpm → lowest rate w/o entrained bubbles.								

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP3485

Ambient truck Tcc) ≈ 10°C

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
0930	0	5.9						Slightly cloudy
0945	9/9	6.2	307	6.83	58%	227.7	7.53	"
0953	9/18	5.9	309	2.76	56%	212.4	7.31	"
1001	9/27	5.9	308	1.72	53%	214.3	7.61	"
1009	9/36	5.9	309	1.52	55%	218.7	7.61	"
1017	9/45	5.9	309	1.20	55%	212.4	7.63	"

— Since the parameters have stabilized we will collect sample

1022 964559181.30GW - AP3485 + MS/MSD for GRO

964559130GW } AP3485 Dupes

964559131GW }

~~+ MS/MSD~~

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP 3534

Ft. Richardson OU D Field Sampling Plan

Date: 10/23/96

Event: 964559127GW + (QA/QC Dup 964559128GW)

1. Water Level Data (from ToC)

a. Total Well Length = WD	137.8	(feet)	Screen Length	20'	(feet)
b. Depth to Water = GW	113.5 ~~41466~~	(feet)	Borehole Diam. = BD	7"	(feet)
c. Depth to top gravel pack = GP	116.6	(feet)	Well Diam. = CD	2"	(feet)

Top of pump appears to be @ 126.5 (toc) [by H2O level sounding]

2. Well Purging Data

a. Purge Method (dedicated) Grundfos

b. Required Purge Volume: WL above GP (see Calculations)

0.62(137.8 − ~~110.5~~ 116.6)

13.1 gal/vol +

.16(3.1) = 0.5

= 13.6 gal. ~14 gal

General Calculation:

1 Borehole volume = $[7.48 \times \{\pi (CD/2)^2 + \pi P (BD/2)^2 - (CD/2)^2]\} \times (WD - GP^*)] + [(GP^* - GW) \times \{\pi (CD/2)^2 \times 7.48\}]$ = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
WL at 113.55 ft below ToC during purging								

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP3539

Sampling ±0.1 ±5% <25 ±10% — ±0.1

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
TRUCK TEMP 11° 8°								
1126	0	4.6		flow rate ~ 3/4 gpm			7.53	
1146	14	7.4	358	1.30	53%	235.6	7.53	clear
1202	28	7.5	351	1.01	53%	231.2	6.69	"
1222	42	7.4	345	0.53	49%	229.6	6.75	"
1240	56	7.3	344	0.35	51%	214.2	7.50	"
1300	70	7.4	344	0.32	50%	214.7	7.53	"
1314	84	7.3	340	0.37	50%	224.2	7.54	

1330 collected Sample + QA/QC and MS/MSD for VOC/GRO. 965590127

965590128 (blind dup)

During purging some air bubbles in water (approx dime size); will increase flow rate for VOC and GRO collection to remove air bubbles and then turn pump rate down to original 3/4 gpm (low rate (for low flow sampling)

1415 Demob and heading to water treatment plant to drain holding tank.

1510 off to well AP 3483 to check h_2o level

h_2o: 99.02 top of pump 107.8 (?)

h_2o 99.17 (AP3469)

Figure 2-1. Groundwater Purge Record (Cont'd).

AP3772

ENSR **Groundwater Purge Record** Well No: WL01

Ft. Richardson OU D Field Sampling Plan Date: 11/6/96 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	120.20	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	106.46	(feet)	Borehole Diam. = BD:	8"	(feet)
c. Depth to top gravel pack = GP	109.45	(feet)	Well Diam. = CD:	2"	(feet)

2. Well Purging Data

a. Purge Method Grundfos

b. Required Purge Volume: (see Calculations)

$0.78(120.20 - 106.46) + 0.16(109.45 - 106.46) \approx 8.4 + 0.5 = 8.9$

~9 gal/volume

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2)] x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = ____ gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
top of pump = 112' below toc.								

Figure 2-1. Groundwater Purge Record.

OU-D 33844

28

$(1/3.8)\frac{gal}{l} \cdot 18/28s \cdot \frac{60s}{min} = 0.56$ gpm

ENSR	Groundwater Purge Record					Well No:		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1323	0	5.8	←	—	—	—	—	Slightly silty
1334	9	7.0	371	65.9	—	228.3	7.91	"
1347	18	7.2	320	16.0	—	225.6	7.94	"
1400	27	7.2	320	9.0	—	226.1	7.95	"
1413	36	7.2	320	6.14	—	225.0	7.92	"
1417 - 3 consecutive stable reading. We'll now sample.								

0.7 gpm

Figure 2-1. Groundwater Purge Record (Cont'd).

OU-D 33845

AP3773

ENSR **Groundwater Purge Record** Well No: #WL02

Ft. Richardson OU D Field Sampling Plan Date: 11/5/96 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD. = 121.50 (feet) Screen Length = 10' (feet)

b. Depth to Water = GW 110.16 (feet) Borehole Diam. = BD 8" (feet)

c. Depth to top gravel pack = GP 111'10" (feet) Well Diam. = CD 2" (feet)

2. Well Purging Data

a. Purge Method Grundfos

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2)] x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = ___ gallons Porosity (P) = 0.25

Purge vol = 0.78 gal/ft H_2O (121.5-110.16)
= 8.84 gal
≈ 9 gal

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

Figure 2-1. Groundwater Purge Record.

Next Pg

ENSR Groundwater Purge Record Well No: WL-02

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1038	0	9.09	—	—	—	—	7.76	—
1041	9	7.5	813	8.45	—	745.5	7.65	slightly cloudy
1059	18	7.6	813	1.34	—	739.8	7.80	CLEAR
1112	27	7.6	812	0.91	—	739.7	7.95	"
1126	36	7.6	811	0.93	—	735.2	7.95	"
1139	45	7.6	813	1.44	—	736.3	8.00	"

~0.7 gpm

1144 Since parameters are w/in tolerance we will begin sampling

1200 Collected 964559145GW – Sample

" Dupe for CAS

" MS

" MSD

964559 146 GW – Dupe for Rockwell

964559 147 GW – Rinsate on Grunfos

Figure 2-1. Groundwater Purge Record (Cont'd).

AP3774

ENSR **Groundwater Purge Record** Well No: WL03

Ft. Richardson OU D Field Sampling Plan Date: 11/6/96 Event:

1. Water Level Data (from ToC) 116.67 as inst.

a. Total Well Length = WD	116.30 (feet)	Screen Length	10	(feet)
b. Depth to Water = GW	110.65 (feet)	Borehole Diam. = BD	8"	(feet)
c. Depth to top gravel pack = GP	105.67 (feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = — gallons Porosity (P) = 0.25

0.75(116.30-110.65) = 4.4 gal 45 gal

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

Figure 2-1. Groundwater Purge Record.

next pg

flow rate ~ 0.5gpm

±5% <25 ±10% — ±0.1

ENSR Groundwater Purge Record Well No:

±0.1 uS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1253	0	8.1	—	—	—	—	—	clear
1302	45	8.3	417	15.4	69%	239.3	7.37	"
1314	9.0	8.0	415	9.25	67%	235.8	7.40	"
1325	13.5	7.9	416	4.13	67%	237.5	7.40	"
1335	18.0	8.0	415	2.60	67%	237.5	7.42	"

1345 Collected 96455915260W
VOC
GRO
DRO
SVOC
TSS
Tot. met
diss. met
nitrate/ite
Decon and demob
1415 To drum stor area

1310 3458

Figure 2-1. Groundwater Purge Record (Cont'd).

OU-D 33849

AP-3775

ENSR **Groundwater Purge Record** Well No: WLØ4

Ft. Richardson OU D Field Sampling Plan

Date: 11/6/96 Event: ______

1. Water Level Data (from ToC)

a. Total Well Length = WD	115.49	(feet)	Screen Length	10'	(feet)
b. Depth to Water = GW	110.03	(feet)	Borehole Diam. = BD	8"	(feet)
c. Depth to top gravel pack = GP	104' 11"	(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method Grundfos

General Calculation:

b. Required Purge Volume: (see Calculations)

Purge Volume = 0.78(115.49 - 110.03) = 4.25 gal

* DO meter was cleaned and new membrane put on — appeared to be working then began drifting again

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = — gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment μS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1040	0	9.6	—	—	—*	—	—	—
1048	4.75	8.6	329	95.6	—*	219.6	7.80	lt gray/yell (silty)
1055	9.25	8.1	330	17.4	—*	224.2	7.84	less cloudy
1103	13.5	8.2	330	19.01	*	220.3	7.85	

Figure 2-1. Groundwater Purge Record.

flow rate just under 1 gpm

OU-D 33850

ENSR **Groundwater Purge Record** **Well No:**

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1108	17.75	7.8	329	15.67	*	218.0	7.85	clear
1114	22	7.7	329	11.20	*	212.7	7.86	
1120	26.5	7.6	328	8.40	*	216.5	7.86	
1125	30.75	7.7	329	7.13	*	228.9	7.90	

1130 Collected Sample

Figure 2-1. Groundwater Purge Record (Cont'd).

AP3776

ENSR **Groundwater Purge Record** Well No: WL05

Ft. Richardson OU D Field Sampling Plan Date: 11/4/96 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	111.30 (feet)	Screen Length	10 (feet)
b. Depth to Water = GW	107.35 (feet)	Borehole Diam. = BD	8" (feet)
c. Depth to top gravel pack = GP	____ (feet)	Well Diam. = CD	2" (feet)

2. Well Purging Data

a. Purge Method Grundfos

General Calculation:

b. Required Purge Volume: (see Calculations)

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2)] x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = ____ gallons Porosity (P) = 0.25

Purge Vol = 0.78 gal/ft$_{H_2O}$ (111.30-107.35)

= 3.08 gal

≈ 3 gal

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1103	0	8.3	—	—	—	—	—	brown
1111	3	8.3	434	60.5	—	247.9	~~7.80~~ 7.47	
1116	7	7.2	438	46.5	—	237.6	7.65	
1124	10	8.2	437	3.15	—	235.6	7.64	

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** **Well No:**

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1134	13	8.2	439	6.50	—	240.2	7.62	
1142	16	8.2	438	3.92	—	225.2	7.67	
1150	Collected Sample 964559142GW							

Figure 2-1. Groundwater Purge Record (Cont'd).

SAMPLING FORMS

1997

OU-D 33854

hdsp.0

AP3789

ENSR Groundwater Purge Record — Well No: 974559WL06

Ft. Richardson OU D Field Sampling Plan — Date: 2/18/97 — Event: Sampling

1. Water Level Data (from ToC)

a. Total Well Length = WD: 120.43 (measured) (feet) — Screen Length: 10 (9) (feet)

b. Depth to Water = GW: 114.04 (feet) — Borehole Diam. = BD: 7" (feet)

c. Depth to top gravel pack = GP: 110.5 (feet) — Well Diam. = CD: 2" (feet)

2. Well Purging Data

a. Purge Method: grundfos w/dedicated polyeth. tubing

b. Required Purge Volume: (see Calculations) — prev. calculated (see AP3534)

0.62 gal/ft (6.39) = 3.96

4 gal/~~ft~~ vol.

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P (BD/2)^2 - (CD/2)^2)] x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = ___ gallons Porosity (P) = 0.25

Short Form: For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form: For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* = If GP is below GW, then GP* = GP; If GP is above GW, then GP* = GW

- pump is approx 2 ft off bottom
- no drawdown on water level while purging + sampling

Field Testing Equipment — µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1140	0	4.6	296	55.3	53	264.2	8.08	white/lt gray
1154	4	8.2	295	9.9	54	261.2	8.12	clear
1203	8	8.2	296	4.10	52	250.9	8.13	"
1211	12	8.2	296	2.47	53	257.7	8.14	"
1221	16	8.1	296	1.83	53	257.3	8.14	"
1229	20	8.3	296	1.28	52	257.6	8.14	"

Figure 2-1. Groundwater Purge Record.

1235 Params are Stable. Collected 974559177GW

VOC	3 VOAs w/HCl	metals (total)	1 poly w/HNO_3
GRO	3 VOAs w/HCl	metals (diss)	1 poly
DRO	2 amb w/HCl	TSS, salinity	1 poly
SVOC	2 ambers	NH_3/NO_2/NO_3	1 poly w/H_2SO_4

OU-D 33855

ENSR	Groundwater Purge Record				Well No:			
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

Figure 2-1. Groundwater Purge Record (Cont'd).

AP 3790

ENSR **Groundwater Purge Record** Well No: 974559MW07

Ft. Richardson OU D Field Sampling Plan Date: 2/18 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	82.3	(feet)	Screen Length	9	(feet)
b. Depth to Water = GW	74.74	(feet)	Borehole Diam. = BD	7"	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method grundfos w/ sed. tubing (½" OD PE)

General Calculation:

b. Required Purge Volume: (see Calculations)

0.62 gal/ft (7.56) = 4.7 ~5 gal/vol

pump approx 2ft off bottom

flow rate ~0.6 gpm

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²}] x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

Short Form: For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form: For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* = If GP is below GW, then GP* = GP If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (~~mmhos~~ µs/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1500	5	8.3	843	31.5	75	278.8	7.76	Clear to H. S
1517	10	8.4	842	26.7	75	270.9	7.85	Clear
1529	16	8.3	842	11.4	75	265.7	7.84	"
1536	20	8.4	842	08.2	76	261.7	7.83	"
(DUP		8.1	840	08.2	75	260.1	7.85)	
1547	25	8.4	841	8.26	78	266.5	7.87	

Figure 2-1. Groundwater Purge Record.

1550 Collect samples

ENSR	Groundwater Purge Record					Well No:		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

Figure 2-1. Groundwater Purge Record (Cont'd).

SAMPLING FORMS

1998

ENSR Groundwater Purge Record Well No: TD 33[illegible]

Ft. Richardson OU D Field Sampling Plan Date: 1/5/98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	12.45	(feet)	Screen Length	20	(feet)
b. Depth to Water = GW	[illegible]	(feet)	Borehole Diam. = BD	8 inches	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2 inches	(feet)

2. Well Purging Data

a. Purge Method GRUNDFOS

b. Required Purge Volume: (see Calculations)

1vol = 5.4 gal
3vol = 16.0 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π [(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48)] = gallons . Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1207	16	9.05	567	2.6	0.86	-155.4	6.66	cl
1218	24	9.01	571	2.3	0.77	-165.2	6.89	cl
1234	32	8.95	572	2.2	0.78	-171.7	6.91	cl
1248	40	8.80	571	2.3	0.80	-162.2	6.91	cl

Figure 2-1. Groundwater Purge Record.

comment: Hydrocarbon odor noticed in purge water. very slight sheen.

ENSR	Groundwater Purge Record					Well No: AP3387		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
13:00	TAKE SAMPLE			9855037 CW		QC		
				" 038		QA W/PRIMARY		
13:35	LEFT AP3387 FOR EDW FAC.							
13:40	ARRIVE TDW FAC. PUMP ≈ 60 Gal.							
1430	Arrive at AP3534							

Figure 2-1. Groundwater Purge Record (Cont'd).

M. FIELD & B. VELTKAMP

ENSR **Groundwater Purge Record** Well No: AP 3441

Ft. Richardson OU D Field Sampling Plan Date: 1-13-98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	113.0	(feet)	Screen Length	20	(feet)
b. Depth to Water = GW	109.45	(feet)	Borehole Diam. = BD	8 in dia	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2 in dia	(feet)

2. Well Purging Data

a. Purge Method GRUNDFOS PUMP

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]} x (WD - GP^w)] + [(GP^w - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP^w)] + [(GP^w - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP^w)] + [(GP^w - GW) x (0.22)] = gal

GP^w =
If GP is below GW, then GP^w = GP
If GP is above GW, then GP^w = GW

PARAMETER TAKEN WITH:
FLOW THROUGH - DO, TEMP
FIELD KIT - PH, SP COND
" " REDOX / TURB.

1 VOL = 2.75 gal.
3 VOL = 8.25 gal ≈ 9.0

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
14:56	9.0	7.12	374	14.0	16.69	32.9	8.24	cl
15:05	18.0	7.07	373	6.8	16.07	63.7	8.04	cl
[illegible]	[illegible]	7.03	372	5.5	[illegible]	[illegible]	7.97	cl
15:23	24	7.15	375	4.4	16.00	38.0	7.87	cl

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP3441

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1530	28	7.16	375	3.7	16.02	23.3	7.84	cl
1538	32	7.13	372	3.0	15.07	24.6	7.77	cl
1547	36	7.24	373	2.5	16.33	0.6	7.67	cl
1557	40	7.26	373	2.3	16.2	23.4	7.75	cl
1600	TAKE SAMPLES			9845590216W				

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR Groundwater Purge Record Well No: AP3468

Ft. Richardson OU D Field Sampling Plan Date: 1/16/98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	114.71	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	110.21	(feet)	Borehole Diam. = BD	7 7/8 in	(feet)
c. Depth to top gravel pack = GP	17.5	(feet)	Well Diam. = CD	2 in	(feet)

2. Well Purging Data

a. Purge Method: GRUNDFOS Pump (SLOW RECHARGE ≈ 0.1 gal/min)

General Calculation:

b. Required Purge Volume: (see Calculations)

1 vol = 2.8 gal

3 vol = 8.4 gal

1 Borehole volume = [7.48 x {π (CD/2)² + π P [(BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48)] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1511	4	7.99	577	37.0	8.66	-31.5	7.88	cl
1539	7	8.96	577	40.0	9.32	-30.4	7.68	cl
1611	10	8.38	578	33.8	9.68	-31.2	7.59	cl
1642	13	7.50	583	13.5		-36.6	7.60	cl

YSI BATTERY RAN OUT COULD NOT GET DO READING TOOK TEMP READING FROM FIELD KIT PH meter.

Figure 2-1. Groundwater Purge Record.

ENSR	Groundwater Purge Record					Well No: AP 3468		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
4:30	collect sample 9845550416W							

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR | Groundwater Purge Record | Well No: AP3534

FL Richardson OU D Field Sampling Plan | Date: 1-15-98 | Event:

Dedicated pump

1. Water Level Data (from ToC)

a. Total Well Length = WD	126.3	(feet)	Screen Length	20	(feet)
b. Depth to Water = GW	112.27	(feet)	Borehole Diam. = BD	2"	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2"	(feet)

2. Well Purging Data

a. Purge Method: Dedicated pump

b. Required Purge Volume: (see Calculations)

1 vol. = 8.73 gal

3 vol = 26.2 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = _____ gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
15:43	20	7.09	328	2.4	4.36	-50.6	7.78	cl
15:52	28	7.06	330	0.6	4.40	-35.9	7.80	cl
16:02	36	7.08	331	0.2	4.36	-24.4	7.80	cl
16:11	44	7.04	334	0.1	4.42	-9.3	7.86	cl

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP3534

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
16:22	52	7.07	333	2.2	4.46	-5.8	7.86	cl
16:33	60	7.09	323	0.2	4.43	2.2	7.82	cl
16:40	TAKE SAMPLE	9845559036GW						

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP3773

Ft. Richardson OU D Field Sampling Plan Date: 1/14/98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD 121.95 (feet) Screen Length 10 (feet)

b. Depth to Water = GW 108.74 (feet) Borehole Diam. = BD Binder (feet)

c. Depth to top gravel pack = GP _____ (feet) Well Diam. = CD 2 inches (feet)

2. Well Purging Data

a. Purge Method Grundfos Pump

b. Required Purge Volume: (see Calculations)

1 vol = 8.28 gal
3 vol = 24.8 ≈ 29 gal

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]) x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
15:28	16	7.04	294	2.2	4.77	10.4	7.89	cl
15:46	24	7.16	306	0.9	5.06	42.4	7.91	cl
15:57	32	7.11	301	0.8	4.95	40.7	7.93	cl
16:11	40	7.13	299	1.6	4.99	30.6	7.73	cl

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP 3773

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
16:24	48	7.12	304	0.5	5.17	33.1	7.96	cl
16:30	TAKE SAMPLE		98455903/GW					
16:53	LEFT AP3773							
17:00	ARRIVE IDW FAC PUMP ≈ 55 gal.							
17:20	DEPART IDW FAC.							
17:50	ARRIVE WASH HOUSE.							

Figure 2-1. Groundwater Purge Record (Cont'd).

M. Field & B Veltkamp

ENSR **Groundwater Purge Record** Well No: AF3774

Ft. Richardson OU D Field Sampling Plan Date: 1/13/98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	115.5 (feet)		Screen Length	(feet)
b. Depth to Water = GW	107.20 (feet)		Borehole Diam. = BD	(feet)
c. Depth to top gravel pack = GP	(feet)		Well Diam. = CD	(feet)

2. Well Purging Data

a. Purge Method GRUNDFOS PUMP

b. Required Purge Volume: (see Calculations)

FROM PROGRAM IN HP 48
PROGRAMMED BY M. FIELD
1 VOL = 5.66 gal
3 VOL = 16.98 gal ≈ 17.00

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1140	44	7.24	373	2.28	23.4	54.8	7.61	cl
1222	50	7.29	373	1.2	21.01	63.4	7.73	cl
1235	56	7.34	378	1.6	19.1	62.5	7.67	cl
12:48	START TAKING SAMPLE 98455902066W							

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** **Well No:**

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP3775

Ft. Richardson OU D Field Sampling Plan Date: 1/14/98 Event: ~~AP3775~~

1. Water Level Data (from ToC)

BV

a. Total Well Length = WD 108.59 (feet) Screen Length 10 (feet)

b. Depth to Water = GW 14.45 (feet) Borehole Diam. = BD 8 inches (feet)

c. Depth to top gravel pack = GP _____ (feet) Well Diam. = CD 2 inches (feet)

2. Well Purging Data

a. Purge Method Grundfos Pump

b. Required Purge Volume: (see Calculations)

1 vol = 4.54 gal

3 vol = 13.62 gal

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]) x (WD - GP*)] + [(GP* - GW) x (π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
11:57	12	7.64	335	12.0	7.86	34.7	7.70	cl
12:05	16	7.43	337	7.5	7.22	36.5	7.88	cl
12:12	20	7.59	335	5.2	7.11	30.2	7.85	cl
12:19	24	7.54	340	6.1	7.22	50.4	7.85	cl

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** **Well No:** AP3775

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
12:27	28	7.63	341	5.0	7.4	37.0	7.84	cl
12:33	32	7.53	342	3.9	7.57	29.6	7.83	cl
12:35	TAKE SAMPLE			7045	59030GW / MS/MSD			

Figure 2-1. Groundwater Purge Record (Cont'd).

M-FIELD : B. Voltkamp

ENSR Groundwater Purge Record Well No: AP3776

Ft. Richardson OU D Field Sampling Plan Date: 1-12-98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD 110.50 (feet) Screen Length 10 (feet)

b. Depth to Water = GW 106.01 (feet) Borehole Diam. = BD 8.0 inches (feet)

c. Depth to top gravel pack = GP _____ (feet) Well Diam. = CD 2.0 inches (feet)

2. Well Purging Data

a. Purge Method GRUNDFOS PUMP

b. Required Purge Volume: (see Calculations)

FROM PROGRAM IN HP 48
PROGRAMMED BY M. FIELD
1 VOL = 3.48
PURGE VOL = 3 (VOL) = 10.44 Gallons

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P[(BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x (π (CD/2)² x 7.48)] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
13:13	12	7.15	805	2.8	57.5	82.3	9.15	cl
13:21	16	7.16	930	2.0	53.9	73.6	8.05	cl
13:30	20	7.07	950	1.7	55.4	71.5	8.11	cl
13:41	24	7.18	890	1.5	57.8	66.8	9.01	cl

Figure 2-1. Groundwater Purge Record.

ENSR

Groundwater Purge Record

Well No: AP3776

Note	Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
	13:50	28	7.3	900	1.3	59.5	70.6	9.21	cl
	14:01	33	7.3	900	0.9	61.1	67.2	9.70	cl
	14:08	37	7.32	900	1.0	62.5	88.2	9.52	cl
	14:16	41	7.40	900	0.8	67.7	71.5	6.79	cl
	14:28	45	7.36	850-900	1.3	72.0	81.8	7.57	cl
	14:38	49	7.42	850-900	1.4	68.9	83.0	7.59	cl
POSSIBLE BACKFLUSH →	14:51	54	7.4	880	26	85.6	70.0	5.44	
	14:57	58	7.21	880	3.2	87.9	67.5	5.75	Cloudy
	15:03	62	7.31	880	1.4	81.0	28.7	6.84	
	15:09	66	7.17	880	1.1	75.0	45.0	8.20	
	15:17	70	7.41	880	0.8	74.2	46.5	8.56	
→	DECIDE TO GO AHEAD AND SAMPLE. FLOW THROUGH METERS READING NEVER STABILIZED SUSPECT CONTAMINATION IN PROBE VESSEL. THOROUGH DECON TONIGHT.								
	15:25	74	7.41	880	0.6	86.3	45.5	8.05	
	15:33	78	7.50	880	[illegible]	82.6	[illegible]	7.89	
FLOW/[illegible]	15:44	83	7.55	880	0.6	88.3	40.4	7.17/7.23	
	15:51	87	7.50	880/372	0.5	83.5	36.4	7.99/7.52	
	15:59	91	7.63	880/382	0.7	[illegible]	31.7	7.96/7.56	
16:04	TAKE SAMPLES 5845590/BGW								

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR Groundwater Purge Record Well No: AP3789

Ft. Richardson OU D Field Sampling Plan Date: 1-16-97 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	120.4	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	111.60	(feet)	Borehole Diam. = BD	8in	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2in	(feet)

2. Well Purging Data

a. Purge Method: Grundfos pump

b. Required Purge Volume: (see Calculations)

1 vol = 6.82 gal
3 vol = 20.46 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P[(BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1137	16	7.20	301	0.9	2.25	399	8.05	cl
1151	24	7.25	302	0.8	2.27	33.2	8.08	cl
1205	32	7.19	301	0.2	2.38	24.4	8.06	cl
1219	40	7.24	302	0.1	2.49	30.9	8.10	cl

Figure 2-1. Groundwater Purge Record.

ENSR	Groundwater Purge Record					Well No: AP3789		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1725	TRIP	SAMPLE	9845590406W					

Figure 2-1. Groundwater Purge Record (Cont'd).

ENSR **Groundwater Purge Record** Well No: AP 3790

Ft. Richardson OU D Field Sampling Plan Date: 1-23-98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD 81.95 (feet) Screen Length 10 (feet)

b. Depth to Water = GW 74.36 (feet) Borehole Diam. = BD 8 in (feet)

c. Depth to top gravel pack = GP 13.5' OF GRAVEL PACK (feet) Well Diam. = CD 2 in (feet)

2. Well Purging Data

a. Purge Method Grundfos Pump.

b. Required Purge Volume: (see Calculations)

1 vol = 5.9 gal

3 vols = 17.6 gal

Note: 1st reading SPCOND Taken with Flow Through All others with field kit

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P [(BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1122	16	9.07	1597	5.4	6.35	-180.3	7.49	cl
1137	24	8.02	798	3.4	8.48	-159.4	7.52	cl
50	32	7.60	804	5.5 T.3	9.85	-163.3	7.53	cl
1201	40	7.54	809	5.3	7.64	-163.8	7.58	cl

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP3790

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
12:17	48	7.76	868	3.8	7.40	-164.2	7.54	cl
12:29	56	7.70	810	2.3	10.06	-162.9	7.53	cl
12:46	64	8.13	810	2.3	8.44	-166.8	7.53	cl
1300	72	8.12	812	1.4	8.85	-168.3	7.53	cl
1313	80	8.18	813	1.4	8.80	-164.2	7.54	cl
13:20	TIME SAMPLE 9845570555(IN), 57 PRIM, QA, QC							

Figure 2-1. Groundwater Purge Record (Cont'd).

AP3870

ENSR **Groundwater Purge Record** Well No: LLC6

Ft. Richardson OU D Field Sampling Plan Date: 1-26-96 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD: ~~109.9~~ 111.9 (feet) LAB REPORT MAY BE INCORRECT Screen Length: (ASSUMED) 20 (feet)

b. Depth to Water = GW: 102.08 (feet) Borehole Diam. = BD: 8 in (feet)

c. Depth to top gravel pack = GP: _____ (feet) Well Diam. = CD: 2 in (feet)

2. Well Purging Data

a. Purge Method: GRUNDFOS PUMP.

b. Required Purge Volume: (see Calculations)

1 VOL = 6.0 L gal

3 vol = 18.2 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1137	16	5.03	5.12	5.0	16.35	244.5	7.42	cl
49	24	8.25	854	.8	19.80	231.5	7.43	cl
1158	32	8.33	858	1.1	1981	225.3	7.42	cl
1215	40	8.57	858	0.7	1293	230.7	7.42	cl

Figure 2-1. Groundwater Purge Record.

AP3820

ENSR **Groundwater Purge Record** Well No: 2W208

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1221	48	3.95	553	0.7	13.80	216.5	7.42	cl
1249	56	2.89	557	0.6	19.60	206.4	7.33	cl
1307	64	9.01	855	0.6	22.06	198.0	7.42	cl
1321	70	8.98	850	0.5	21.05	192.5	7.38	cl
1325	TIME SAMPLE		9845570596W					

Figure 2-1. Groundwater Purge Record (Cont'd).

AP 3871

ENSR **Groundwater Purge Record** Well No: UL09

Ft Richardson OU D Field Sampling Plan Date: 1-27-98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	120.2	(feet)	Screen Length	10 (Assumed)	(feet)
b. Depth to Water = GW	113.12	(feet)	Borehole Diam. = BD	8 in	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2 in	(feet)

2. Well Purging Data

a. Purge Method GRUNDFOS PUMP

b. Required Purge Volume: (see Calculations)

1 Vol = 5.5 gal

3 Vol = 16.5 gal

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P[(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48}] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1113	16	10.4	878	13.5	7.35	228.2	7.47	cl
1126	24	9.59	885	1.3	11.64	210.7	7.57	cl
1137	32	8.57	886	0 =	12.72	211.4	7.57	cl
1.48	40	8.32	887	0.7	12.01	209.8	7.58	cl

Figure 2-1. Groundwater Purge Record.

ENSR **Groundwater Purge Record** Well No: AP 38 71

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1155	TAKE SAMPLE		980559061 GW					

Figure 2-1. Groundwater Purge Record (Cont'd).

AP3872

ENSR **Groundwater Purge Record** Well No: WL10

Ft. Richardson OU D Field Sampling Plan Date: 1-27-98 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	123.9	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	116.3	(feet)	Borehole Diam. = BD	8 in	(feet)
c. Depth to top gravel pack = GP		(feet)	Well Diam. = CD	2 in	(feet)

2. Well Purging Data

a. Purge Method GRUNDFOS PUMP.

b. Required Purge Volume: (see Calculations)

1 Vol = 6.0 gal

3 Vol = 18.0

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)^2 + π P [(BD/2)^2 - (CD/2)^2]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)^2 x 7.48)] = gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1402	16	7.94	1586	4.4	6.30	228.1	7.05	cl
1417	24	7.96	1586	3.2	12.78	213.7	7.08	cl
1417	28	7.97	1585	2.8	12.55	212.5	7.08	cl
1430	36	7.99	1585	2.3	9.22	212.3	7.10	cl

Figure 2-1. Groundwater Purge Record.

ENSR 4544 **Groundwater Purge Record** AP3872 Well No: WL10

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1445	~~Bail~~	8.04	1585	2.1	8.68	211.7	7.10	cl
1458	52	8.07	1583	1.9	10.95	209.3	7.09	cl
1507	60	~~8.09~~	1583	2.0	10.92	208.8	7.09	cl
1525	68	8.09	1583	2.1	9.31	204.6	7.10	cl
1530		TAKE SAMPLE 9845590626W						
16:00		LEAVE WL10						
16:05		ARRIVE IDW FAC.				~130		
16:20		LEAVE IDW FAC.						
1709		ARRIVE ENSR						

Figure 2-1. Groundwater Purge Record (Cont'd).

AP3873

ENSR Consulting and Engineering
FIELD ACTIVITIES NOTEBOOK

DAILY CHRONOLOG (Continued)

Project Number: 4000-107-220 Date: 1-28-98

ENTRIES SHOULD BE CHRONOLOGICAL WITH TIME INCLUDED

0800 ARRIVE ENSR TO MOB AND BS con
0900 TAKE EB BLANK 9845570636W
1000 depart ENSR
1100 arrive at WL11 AP3873
TD = 110.2 purged with grundfos
TW = 103.56
screen interval = 10
borehole dia = 6 casing dia = 2
1 screen volume = 5.1 gal
3 borehole volume = 15.44 gal

time	vol	Temp	Spec. Cond	Turb	DO	Redox	pH	cols
1214	16	7.77	754	2.3	5.63	295.3	7.43	cl
1225	24	7.76	754	1.1	7.76	283.3	7.51	cl
1235	32	7.98	752	1.2	9.20	284.6	7.51	cl
250	40	8.34	757	1.1	9.29	276.8	7.52	cl
305	48	8.49	752	1.1	9.81	267.2	7.52	cl
319	56	7.71	791	0.6	10.04	25.54	7.52	cl
1337	64	7.67	750	0.4	9.24	264.7	7.52	cl
1347	72	7.68	785	0.1	9.42	265.0	7.52	cl

1350 TAKE SAMPLE 9845559064GW = PRIMARY & QA
FIELD TIME = 1500 9845559065GW = QC
430 LEAVE WL11

(Signed) (Date) (Reviewed) (Date)

BUILDING 796

SAMPLING FORMS

SAMPLING FORMS

1996

OU-D 33888

AP3777

ENSR Consulting and Engineering
FIELD ACTIVITIES NOTEBOOK

DAILY CHRONOLOG (Continued)

Project Number: Date: 9/30/96

ENTRIES SHOULD BE CHRONOLOGICAL WITH TIME INCLUDED

09:30 Equipment Calibration
Oxygen meter = slope 1.06 ok
PH meter - cal 7 4 10 buffers
check with 7 reading 7.06
12:00 On site @ 12:00
Set up on well # B796WL01 AP-3777
Water level 84.32 Total depth 95.98

12:20 Begin pumping - water grayish/brown
thick with sediment

2" ϕ well

13:30 slow recharge rate turbidity near 25 NTU
ready to begin samples for meter readings.
(PH, conductivity, temp, oxygen)

Approx 15 min for 7.5 gal slow recharge

15:15 Sample well 2 drums 27W
16:00 off site 28W
96B79624GW main sample for WL01
96B79625GW equipment blank
96B79626GW duplicate of WL01

(Signed) [signature] (Date) 9/30/96 (Reviewed) (Date)

AP3778

ENSR Consulting and Engineering
FIELD ACTIVITIES NOTEBOOK

DAILY CHRONOLOG (Continued)

Project Number: Date: 10/1/96

ENTRIES SHOULD BE CHRONOLOGICAL WITH TIME INCLUDED

Onsite 9:30 setup on B796WLO2 AP 3778
Water Level 81.15 total depth 98.2
Calibrate instruments
pH meter reading (#10 buffer) 10.04
did not recalibrate
Dissolved Oxygen meter slope 1.09

Begin pumping at 10:00 water dark brown
slight with no sediments

12:10 Probe on pH meter changed
recalibrate
Buffer 7 reading 7.06 adjust to 7.00
Buffer 10 reading 10.20 adjust to 10.00
Check against buffer 7 reading 7.05

13:42 Sample 96B79627GW
VOC's 3 voa
DRO (7) 1 liter
Total Metals & Hardness 1 liter
Dis. Metals 1 liter
Amm. Nitrogen / Nitrate / Nitrite 1 liter
TSS & Sulfate 1 liter

(Signed) (Date) (Reviewed) (Date)

DACA-85-94-00100

ENSR Consulting and Engineering
FIELD ACTIVITIES NOTEBOOK

DAILY CHRONOLOG (Continued)

Project Number: Date: 10/1/96

ENTRIES SHOULD BE CHRONOLOGICAL WITH TIME INCLUDED

14:05 3 drums 29W, 30W, 31W labelled.

14:15 off site

At well AP-3533 inspecting dedicated pump 3/4" od
prepairing to pump
water lvl 113.53 total depth (to pump) approx 124.2
14:55
Began pumping
15:00 pumped dry .8 gal per min +/- (approx)
well slow recharge
Called Steve Wrath to get approval to consider this well a slow recharge
Per sampling plan one well volume is required to be purged and all parameters measured then sample.
Steve gave his ok.

16:05 Sample Well AP-3533 96B79628GW
16:45 Equipment Blank 96B79679GW
1 drum 2 10 gallons 32W

D. McKee
(Signed) (Date) (Reviewed) (Date)

ENSR Consulting and Engineering
FIELD ACTIVITIES NOTEBOOK

DAILY CHRONOLOG (Continued)

Project Number: Date: 10/2/96

ENTRIES SHOULD BE CHRONOLOGICAL WITH TIME INCLUDED

on site at 9:15 set up on well # AP-3532
water level 112.59' TD (approx) 127.68
AP-3532 has a dedicated Corp pump.
Begin pumping at 9:40

Instrument calibration
pH meter buffer 7 reading = 7.02
buffer 10 reading = 10.09 adjust to 10.00
Check 10 = 10.01 OK
Dissolved Oxygen Meter system calibration
slope = error encountered while running a system calibration - cleaned the probe and replaced membrane with new as per specifications - also inserted a new battery - the probe/meter does not work. Called Hollis to let her know. The cleaning of the electrode takes approx. 4 hours. Low on cleaning solution, will have to clean at the office. Hollis will try to get a new meter. Dissolved oxygen will not be checked today. Note: DO is not now been a stable parameter on all wells so far.

(Signed) (Date) (Reviewed) (Date)

348-9550

ENSR Consulting and Engineering
FIELD ACTIVITIES NOTEBOOK

DAILY CHRONOLOG (Continued)

Project Number: Date: 10/2/96

ENTRIES SHOULD BE CHRONOLOGICAL WITH TIME INCLUDED

12:40 Sample well AP-3532 (96B79630GW)

Well casing 1/2 full of water that leaked out of connection at the top of the well also the well casing lid will not close tightly. We need to get a bailer or pump to remove water from casing

Drum # 33W ~ 50 gallons
offsite at 13:05

Lunch
On site at AP-3235 has dedicated pump 4" ∅ (14:00)
14:00 Water level 121.3 Total depth
Strong Hydrocarbon odor
Called Ostuk Wrynn to get more info on this well - there was no log in the sampling plan. Steve called with info total dept 128.6 top of screen 20' 108.3 to 128.3
97.3 sand pack 9" bore hole

Deborah McAfee 10/2/96
(Signed) (Date) (Reviewed) (Date)

ENSR Consulting and Engineering
FIELD ACTIVITIES NOTEBOOK

DAILY CHRONOLOG (Continued)

Project Number: Date: 9/10/2/96

ENTRIES SHOULD BE CHRONOLOGICAL WITH TIME INCLUDED

14:45 Collected equipment Blanks from attachment hose (for dedicated well pumps) 96B7963/GW

15:00 After repeated attempts to get water to flow through the pump we abandoned well for today. Mike thinks that the pump may be above the water table.

15:15 offsite

Mike is returning to AP-3532 to pump the standing water out of the well casing (water) and to place a label on the drum.

Deb returning to office to check in samples

Deborah McGee 10/2/96
(Signed) (Date) (Reviewed) (Date)

SAMPLING FORMS

1997

ENSR **Groundwater Purge Record** Well No: AP3512

Ft. Richardson OU D Field Sampling Plan — Date: 8/18/97 — Event: ______

1. Water Level Data (from ToC)

a. Total Well Length = WD	90.95	(feet)	Screen Length	10'	(feet)
b. Depth to Water = GW	87.88	(feet)	Borehole Diam. = BD	8/12 .67	(feet)
c. Depth to top gravel pack = GP	78.5	(feet)	Well Diam. = CD	2" = .17	(feet)

2. Well Purging Data

a. Purge Method HDPE bailer

b. Required Purge Volume: (see Calculations)

7.48 x [{π (0.17/2)² + π(0.25)[(.67/2)² − (0.17/2)²]} x (90.95 − 87.88)]

[.6] = 7.48 {0.023 + 0.785(.1123 − .0072) x 3.07}

2.4 gal/vol

General Calculation:

1. Borehole volume = [7.48 x {π (CD/2)² + π P[(BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

Short Form: For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form: For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* = If GP is below GW, then GP* = GP. If GP is above GW, then GP* = GW

Field Testing Equipment: YSI/CUM

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (µmhos/cm)	Turbidity (NTU)	Dissolved O_2 mg/L	Redox Potential (mV)	pH (units)	Color
1315	0	12.8	1011	325	7.2	5.88	7.69	lt. gray
1335	WL = 90.1 ft bgs							
1405	Recharged to 89.7 ft bgs - will pull sample for params as Criteria for slow recharge is bail dry, take params on 1st vol, let recharge and sample.							

Figure 2-1. Groundwater Purge Record.

Haven't taken params after 1st volume, so will do so now

ENSR **Groundwater Purge Record** Well No:

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1415	2	10.6	976	turbid-opaque	0.9	39.7	7.69	gray
1420	Sealed up well will let recharge and move to another well.							
1600	Collected sample. 3 VOA vials and 1 1L amber (unable to purge any more)							

Figure 2-1. Groundwater Purge Record (Cont'd).

020

ENSR **Groundwater Purge Record** Well No. AP3533

Ft. Richardson OU D Field Sampling Plan Date: 8/19/97 Event: ____

1. Water Level Data (from ToC)

a. Total Well Length = WD 133.9 (feet) Screen Length 20 (feet)

b. Depth to Water = GW 116.48 (feet) Borehole Diam. = BD 7/12 = 0.583 (feet)

c. Depth to top gravel pack = GP 102.2 (feet) Well Diam. = CD 2" = .17 (feet)

GP is above GW, GP* = GW

2. Well Purging Data

a. Purge Method Dedicated pump

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

Short Form: For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form: For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* = If GP is below GW, then GP* = GP. If GP is above GW, then GP* = GW

$7.48 \times \left\{\pi\left(\frac{.17}{2}\right)^2 + \pi(.25)\left[\left(\frac{0.583}{2}\right)^2 - \left(\frac{.17}{2}\right)^2\right]\right\} \times \{133.9 - 116.48\}$

8/20/97

$7.48\left[\pi(.0072) + \pi(.25)(.085\ \text{.0425} - .0072)\right] \times 17.42$

= 6.6 gal/vol. – should have been 11 gals

1215 began purging; H_2O level drawn down ~~to~~ – let recharge ~ recharging at ½ ft/2min

Field Testing Equipment		~~10%~~ 5%	< 25NTU	10%	—	±0.1	
Time	Volume (gal)	Temp. (°C) ±0.1	Spec. Cond. (mmhos/cm) µS/cm	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1215	2	10.8	~~05~~ 690	18.9	11.9	156.0	7.81	clear
1325	6	16.2	688	15.3	12.0	195.8	7.95	
1500	~~9~~ 12	18.5	684	2.88	10.4	224.7	7.80	
1620	18	17.6	683	2.50	11.0	237.9	7.96	

1635 Collect 97BT9638GW.

Figure ~~2~~-1. Groundwater Purge Record.

OU-D 33898

– purge rate ~0.3 L/min
– had to purge dry, let recharge, purge dry... – pump is probably too far off bottom so we're not able to pull in enough volume
switched over to letting pump purge continuously) —

ENSR **Groundwater Purge Record** Well No: AP3532

Ft. Richardson OU D Field Sampling Plan Date: 8/20/97 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD 136.1 (feet) Screen Length 20' (feet)

b. Depth to Water = GW 113.40 (feet) Borehole Diam. = BD 7/12 = 0.58 (feet)

c. Depth to top gravel pack = GP 101.4 (feet) Well Diam. = CD 2"/12 = .17 (feet)

2. Well Purging Data

a. Purge Method Dedicated pump

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²}] x (WD - GP°)] + [(GP° - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

$7.48 \times \left\{ \pi\left(\frac{.17}{2}\right)^2 + \pi(.25)\left[\left(\frac{.58}{2}\right)^2 - \left(\frac{.17}{2}\right)^2\right] \right\} \times (136.1 - 113.40)$

$7.48 \times \{.023 + .0604\} \times 22.7$

$= 14.16$

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP°)] + [(GP° - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP°)] + [(GP° - GW) x (0.22)] = gal

GP° =
If GP is below GW, then GP° = GP
If GP is above GW, then GP° = GW
GP ABOVE GW; GP° = GW

Field Testing Equipment YSI/CM

Time	Volume (gal)	Temp. (°C)	Spec. Cond. ~~(mmhos/cm)~~	Turbidity (NTU)	Dissolved O₂ ~~(%)~~ mg/L	Redox Potential (mV)	pH (units)	Color
1130	1	8.3	413	3.08	5.4	173.6	7.63	Clear
1140	14	8.6	421	4.80	4.8	178.5	7.92	"
205	28	9.4	419	1.81	5.0	180.9	7.91	"
1225	42	9.0	417	1.4	5.3	179.8	7.90	clear
1WP		7.2	416	1.1	6.3	180.3	7.91	

Figure ~~2-2~~. Groundwater Purge Record.

1242 56 9.1 417 0.57 4.6 180.7 7.91 clear

0841 - .0072

1245 Collected 97B796426W

ENSR Groundwater Purge Record Well No: 79-AP3777

Ft. Richardson OU D Field Sampling Plan Date: 8/20/97 Event:

1. Water Level Data (from ToC)

a. Total Well Length = WD	96	(feet)	Screen Length	10	(feet)
b. Depth to Water = GW	85.05	(feet)	Borehole Diam. = BD	6" = 0.5	(feet)
c. Depth to top gravel pack = GP	~~83~~	(feet)	Well Diam. = CD	2" = 0.17	(feet)

2. Well Purging Data

a. Purge Method: Grundfos + disp. tubing (polyeth.)

b. Required Purge Volume: (see Calculations)

General Calculation:

1 Borehole volume = [7.48 x {π (CD/2)² + π P (BD/2)² - (CD/2)²]} x (WD - GP*)] + [(GP* - GW) x {π (CD/2)² x 7.48}] = gallons Porosity (P) = 0.25

$$7.48 \times \left\{\pi\left(\frac{.17}{2}\right)^2 + \pi(.25)\left[\left(\frac{0.5}{2}\right)^2 - \left(\frac{.17}{2}\right)^2\right]\right\} \times (96 - 85.05)$$

.063 .007

$$= 7.48 \times \{0.023 + 0.043\} \times 10.95$$

$$= 5.4 \text{ gal/vol}$$

pull 6 gal

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment: µS/cm

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%) mg/L	Redox Potential (mV)	pH (units)	Color
1510	1	10.1	490	1122	1.3	153.4	7.56	turbid-lt. brown
1518	6	10.5	489	787	1.5	160.5	7.52	"
1528	12	10.6	489	440	1.2	193.0	7.54	
535	18	~10.4	490	243	2.7	201.3	7.53	
1542	24	10.2	489	98	62	201.5	7.55	

Figure 2-1. Groundwater Purge Record.

W.L. steady at 88.07 ft. bt.o.c.

ENSR	Groundwater Purge Record					Well No:		
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1551	30	10.2	490	92.0	—	203.9	7.56	
1600	36	10.2	490	55.5	—	205.7	7.52	
1608	42	10.1	491	39.5	—	209.8	7.59	
1616	48	10.4	491	32.8	—	213.4	7.57	
1628	54	10.1	491	22.0	—	206.7	7.54	
1633		10.1	491	16.8	—	209.4	7.53	
1640	Collecting samples 97B79644GW							

Figure 2-1. Groundwater Purge Record (Cont'd).

inside fence

ENSR — **Groundwater Purge Record** — Well No: AP3778

Ft. Richardson OU D Field Sampling Plan — Date: 8/25/97 — Event: ______

1. Water Level Data (from ToC)
   - a. Total Well Length = WD: 98.3 (measured) (feet) — Screen Length: ______ (feet)
   - b. Depth to Water = GW: 82.09 (feet) — Borehole Diam. = BD: ______ (feet)
   - c. Depth to top gravel pack = GP: 84.5 (feet) — Well Diam. = CD: ______ (feet)

2. Well Purging Data
   - a. Purge Method: Grundfos + [illegible] tubing
   - b. Required Purge Volume: (see Calculations)

~~=3.46~~

assume [illegible] pack

(98.3 - 82.09) .49

= 7.9 - 8 gallons

General Calculation:

1 Borehole volume = [7.48 x (π (CD/2)² + π P (BD/2)² - (CD/2)²)] x (WD - GP*)] + [(GP* - GW) x (π (CD/2)² x 7.48)] = ______ gallons Porosity (P) = 0.25

Short Form:
For 4" casing (CD) and 10" borehole (BD): 1 BV = [1.49 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.67)] = ______ gal

Short Form:
For 2" casing (CD) and 10" borehole (BD): 1 BV = [1.14 gal/ft x (WD - GP*)] + [(GP* - GW) x (0.22)] = ______ gal

GP* =
If GP is below GW, then GP* = GP
If GP is above GW, then GP* = GW

Field Testing Equipment: [illegible]

Time	Volume (gal)	Temp. (°C)	Spec. Cond. (µmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
Purged 8 gals w/out taking readings to let water clear up a little (waiting for new cond. meter)								
1220	16	10.8	564	64.3	3.0	170.1	7.55	
1232	24	11.8	564	9	2.9	168	7.59	

Figure 2-1. Groundwater Purge Record.

ENSR	Groundwater Purge Record				Well No:			
Time	Volume (gal)	Temp. (°C)	Spec. Cond. (mmhos/cm)	Turbidity (NTU)	Dissolved O_2 (%)	Redox Potential (mV)	pH (units)	Color
1240	32	10.7	565	6.44	3.2	75.7	7.57	
1248	40	10.7	565	4.95	3.	164.0	7.50	
1255	48	10.6	566	3.36	3.2	178.5	7.58	
1305	Collected samples.							
	97B79646GW							
	97B79647GW (Blind dup)							

Figure 2-1. Groundwater Purge Record (Cont'd).

APPENDIX C

WATER LEVEL SURVEY MEASUREMENTS

Groundwater Level Measurements

Buildings 45-590 and 796

		Elevation	Depth to Water (from TOC)						
Site	Well ID	from TOC	September	October	November	December	January	February	March
Building	AP-3387	279.89	NR	NR	NR	NR	NR	NR	NR
45-590	AP-3439	279.91	104.04	104.27	104.84	105.03	105.35	105.52	105.88
	AP-3440	279.50	104.64	104.86	105.44	105.62	105.98	106.11	106.49
	AP-3441	285.40	110.11	110.53	111.07	111.3	111.63	111.78	112.14
	AP-3467	289.16	82.91	82.73	83.6	82.77	82.9	82.88	84.07
	AP-3468	289.26	110.11	110.18	110.52	110.4	110.55	110.45	110.75
	AP-3469	289.93	85.76	85.78	86.56	85.58	85.75	85.72	86.85
	AP-3483	277.09	98.61	98.77	99.41	99.42	99.75	99.83	100.4
	AP-3534	288.89	113.11	113.34	113.86	114.05	114.4	114.59	114.93
	AP-3772	281.75	NI	106.05	106.57	106.71	107.02	107.15	107.51
	AP-3773	285.20	NI	109.78	110.35	110.54	110.85	111	111.34
	AP-3774	285.24	NI	110.19	110.78	111	111.32	111.46	111.85
	AP-3775	285.07	NI	109.61	110.18	110.35	110.74	110.87	111.21
	AP-3776	282.00	NI	106.95	107.56	107.74	106.1	108.23	108.59
	AP-3789	288.65	NI	NI	NI	NI	NI	NR	114.22
	AP-3790	294.98	NI	NI	NI	NI	NI	NR	74.77
Building	AP-3513	321.89	87.62	NR	NR	87.8	87.84	87.83	87.9
796	AP-3532	304.90	112.56	NR	NR	112.71	112.78	112.77	112.94
	AP-3533	323.12	112.9	NR	NR	113.13	113.4	113.49	113.8
	AP-3777	324.91	NI	NR	NR	84.71	84.85	84.8	84.93
	AP-3778	323.61	NI	NR	NR	81.48	81.74	81.76	81.9

NI = Not Installed.

NR = No reading.

Groundwater Level Measurements

Buildings 45-590 and 796

		Elevation	Groundwater Elevation (ft above msl)						
Site	Well ID	from TOC	September	October	November	December	January	February	March
Building	AP-3387	279.89	NR	NR	NR	NR	NR	NR	NR
45-590	AP-3439	279.91	175.87	175.64	175.07	174.88	174.56	174.39	174.03
	AP-3440	279.50	174.86	174.64	174.06	173.88	173.52	173.39	173.01
	AP-3441	285.40	175.29	174.87	174.33	174.10	173.77	173.62	173.26
	AP-3467	289.16	206.25	206.43	205.56	206.39	206.26	206.28	205.09
	AP-3468	289.26	179.15	179.08	178.74	178.86	178.71	178.81	178.51
	AP-3469	289.93	204.17	204.15	203.37	204.35	204.18	204.21	203.08
	AP-3483	277.09	178.48	178.32	177.68	177.67	177.34	177.26	176.69
	AP-3534	288.89	175.78	175.55	175.03	174.84	174.49	174.30	173.96
	AP-3772	281.75	NI	175.70	175.18	175.04	174.73	174.60	174.24
	AP-3773	285.20	NI	175.42	174.85	174.66	174.35	174.20	173.86
	AP-3774	285.24	NI	175.05	174.46	174.24	173.92	173.78	173.39
	AP-3775	285.07	NI	175.46	174.89	174.72	174.33	174.20	173.86
	AP-3776	282.00	NI	175.05	174.44	174.26	175.90	173.77	173.41
	AP-3789	288.65	NI	NI	NI	NI	NI	NR	174.43
	AP-3790	294.98	NI	NI	NI	NI	NI	NR	220.21
Building	AP-3513	321.89	234.27	NR	NR	234.09	234.05	234.06	233.99
796	AP-3532	304.90	192.34	NR	NR	192.19	192.12	192.13	191.96
	AP-3533	323.12	210.22	NR	NR	209.99	209.72	209.63	209.32
	AP-3777	324.91	NI	NR	NR	240.20	240.06	240.11	239.98
	AP-3778	323.61	NI	NR	NR	242.13	241.87	241.85	241.71

NI = Not Installed.

NR = No reading.

Groundwater Level Measurements

Buildings 45-590 and 796

		Elevation	Depth to Water (from TOC)					
Site	Well ID	from TOC	April	May	June	July	August	September
Building	AP-3387	279.89	NR	107.21	106.8	105.78	105.34	105
45-590	AP-3439	279.91	NR	106.54	106.13	105.12	104.67	104.44
	AP-3440	279.50	106.88	107.12	106.71	105.7	105.25	105.03
	AP-3441	285.40	112.51	112.56	112.4	111.38	110.92	110.68
	AP-3467	289.16	84.95	86.36	87.17	87.03	86.13	86.02
	AP-3468	289.26	110.74	110.29	109.9	110.5	110.5	110.19
	AP-3469	289.93	87.68	89.12	89.84	89.55	88.81	88.65
	AP-3483	277.09	100.8	101.17	100.83	99.85	99.2	99.16
	AP-3534	288.89	115.32	115.58	115.25	114.32	113.82	113.54
	AP-3772	281.75	107.88	108.15	107.77	106.82	106.43	106.21
	AP-3773	285.20	111.68	111.93	111.59	110.65	110.2	109.95
	AP-3774	285.24	112.19	112.46	112.03	110.99	110.56	110.34
	AP-3775	285.07	111.58	111.85	111.51	110.55	110.08	109.82
	AP-3776	282.00	108.96	109.23	108.67	107.72	107.3	107.1
	AP-3789	288.65	114.59	114.89	114.58	113.66	113.16	112.89
	AP-3790	294.98	74.77	74.15	74.33	74.41	74.27	73.64
Building	AP-3513	321.89	87.85	87.79	87.79	87.84	87.87	87.72
796	AP-3532	304.90	113.13	113.36	113.5	113.51	113.37	113.26
	AP-3533	323.12	114.46	115.66	116.23	116.75	116.62	115.59
	AP-3777	324.91	84.98	85.09	85	85.04	85.02	84.87
	AP-3778	323.61	82.11	82.19	82	82.04	82.1	81.87

NI = Not Installed.

NR = No reading.

OU-D

33907

Groundwater Level Measurements

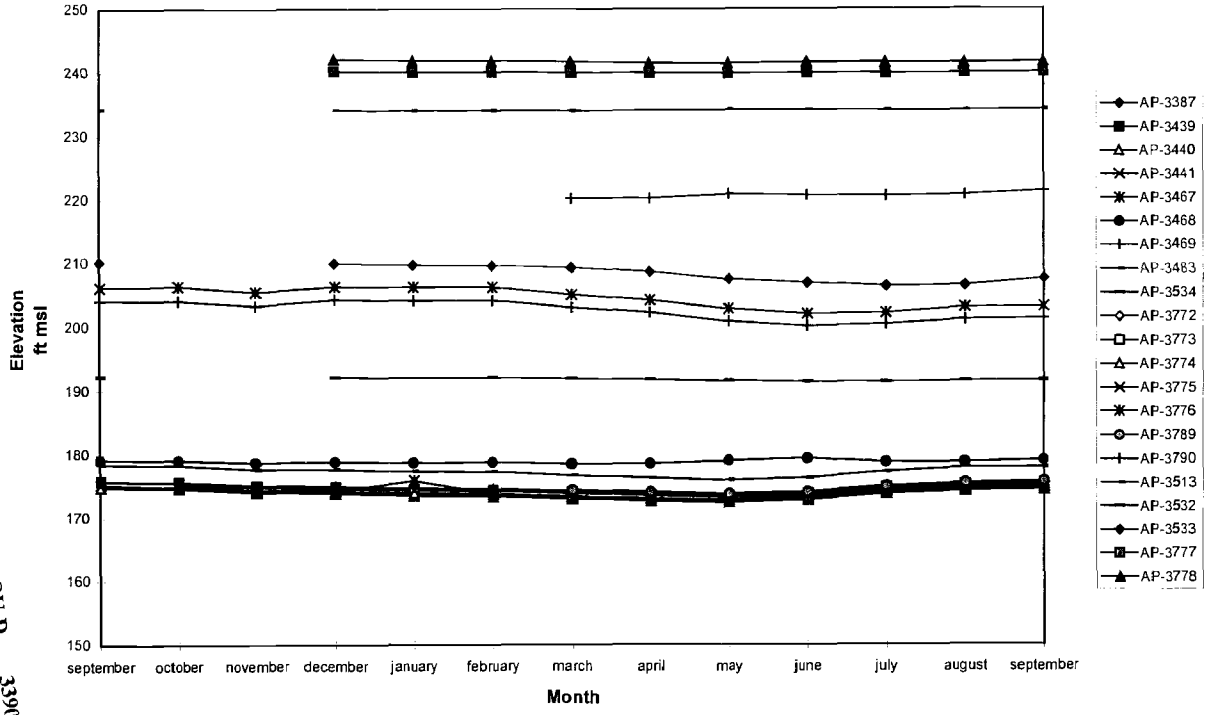
Buildings 45-590 and 796

		Elevation	Groundwater Elevation (ft above msl)					
Site	Well ID	from TOC	April	May	June	July	August	September
Building	AP-3387	279.89	NR	172.68	173.09	174.11	174.55	174.89
45-590	AP-3439	279.91	NR	173.37	173.78	174.79	175.24	175.47
	AP-3440	279.50	172.62	172.38	172.79	173.80	174.25	174.47
	AP-3441	285.40	172.89	172.84	173.00	174.02	174.48	174.72
	AP-3467	289.16	204.21	202.80	201.99	202.13	203.03	203.14
	AP-3468	289.26	178.52	178.97	179.36	178.76	178.76	179.07
	AP-3469	289.93	202.25	200.81	200.09	200.38	201.12	201.28
	AP-3483	277.09	176.29	175.92	176.26	177.24	177.89	177.93
	AP-3534	288.89	173.57	173.31	173.64	174.57	175.07	175.35
	AP-3772	281.75	173.87	173.60	173.98	174.93	175.32	175.54
	AP-3773	285.20	173.52	173.27	173.61	174.55	175.00	175.25
	AP-3774	285.24	173.05	172.78	173.21	174.25	174.68	174.90
	AP-3775	285.07	173.49	173.22	173.56	174.52	174.99	175.25
	AP-3776	282.00	173.04	172.77	173.33	174.28	174.70	174.90
	AP-3789	288.65	174.06	173.76	174.07	174.99	175.49	175.76
	AP-3790	294.98	220.21	220.83	220.65	220.57	220.71	221.34
Building	AP-3513	321.89	234.04	234.10	234.10	234.05	234.02	234.17
796	AP-3532	304.90	191.77	191.54	191.40	191.39	191.53	191.64
	AP-3533	323.12	208.66	207.46	206.89	206.37	206.50	207.53
	AP-3777	324.91	239.93	239.82	239.91	239.87	239.89	240.04
	AP-3778	323.61	241.50	241.42	241.61	241.57	241.51	241.74

NI = Not Installed.

NR = No reading.

Groundwater Fluctuations - Buildings 45-590 & 796



OUD

33909

Groundwater Level Measurements

Building 35-752

Site	Well ID	Elevation of TOC	Depth to Groundwater (from TOC)						
			September	October	November	December	January	February	March
Building	AP-2982	263.61	15.72	15.20	16.81	17.38	18.26	18.38	18.62
35-752	AP-2983	264.24	15.74	15.26	17.28	17.94	18.90	19.06	19.29
	AP-2984	261.80	13.04	12.69	14.85	15.46	16.50	17.10	17.33
	AP-2985	259.54	11.16	10.72	12.38	12.93	13.97	14.05	14.34
	AP-2986	260.98	12.77	12.30	13.64	14.53	15.50	15.60	15.88
	AP-2987	261.75	13.85	13.34	14.81	15.31	16.23	16.29	16.59
	AP-3231	265.62	17.45	16.90	17.83	19.46	20.38	20.56	20.77
	AP-3232	259.79	11.82	11.39	NR	13.19	14.14	14.15	14.52
	AP-3458	264.65	27.81	27.94	28.50	28.77	29.14	29.24	29.37
	AP-3502	261.05	13.65	13.15	NR	16.67	17.43	17.45	17.77
	AP-3503	263.66	16.23	15.77	16.95	17.32	18.14	18.17	18.44
	AP-3504	261.54	14.49	13.97	NR	NR	NR	NR	NR

NR = No reading.

NI = Not installed.

OU-D 33910

Groundwater Level Measurements

Building 35-752

Site	Well ID	Elevation of TOC	Groundwater Elevation						
			September	October	November	December	January	February	March
Building	AP-2982	263.61	247.90	248.41	246.80	246.23	245.35	245.23	244.99
35-752	AP-2983	264.24	248.51	248.98	246.96	246.30	245.34	245.18	244.95
	AP-2984	261.80	248.76	249.11	246.95	246.34	245.30	244.70	244.47
	AP-2985	259.54	248.39	248.82	247.16	246.61	245.57	245.49	245.20
	AP-2986	260.98	248.22	248.68	247.34	246.45	245.48	245.38	245.10
	AP-2987	261.75	247.90	248.41	246.94	246.44	245.52	245.46	245.16
	AP-3231	265.62	248.17	248.72	247.79	246.16	245.24	245.06	244.85
	AP-3232	259.79	247.97	248.40	NR	246.60	245.65	245.64	245.27
	AP-3458	264.65	236.84	236.71	236.15	235.88	235.51	235.41	235.28
	AP-3502	261.05	247.40	247.90	NR	244.38	243.62	243.60	243.28
	AP-3503	263.66	247.43	247.89	246.71	246.34	245.52	245.49	245.22
	AP-3504	261.54	247.06	247.57	NR	NR	NR	NR	NR

NR = No reading.

NI = Not installed.

OU-D 33911

Groundwater Level Measurements

Building 35-752

Site	Well ID	Elevation of TOC	Depth to Groundwater (from TOC)					
			April	May	June	July	August	September
Building	AP-2982	263.61	15.63	13.69	12.65	14.62	13.36	10.10
35-752	AP-2983	264.24	14.96	13.65	12.49	14.86	15.66	10.02
	AP-2984	261.80	11.52	11.10	9.98	12.33	13.18	7.58
	AP-2985	259.54	9.86	9.03	7.93	10.18	10.93	5.49
	AP-2986	260.98	12.11	10.65	9.57	11.76	12.53	7.09
	AP-2987	261.75	13.45	11.85	10.81	12.72	13.44	8.22
	AP-3231	265.62	17.41	15.39	14.30	16.50	17.21	11.72
	AP-3232	259.79	11.00	9.91	8.87	10.73	11.44	6.36
	AP-3458	264.65	29.48	26.02	26.09	26.54	26.99	24.92
	AP-3502	261.05	NR	11.68	10.67	12.46	13.16	8.02
	AP-3503	263.66	16.21	14.27	13.18	14.99	15.69	10.66
	AP-3504	261.54	NR	NR	NR	13.30	13.96	8.90

NR = No reading.

NI = Not installed.

OU-D 33912

Groundwater Level Measurements

Building 35-752

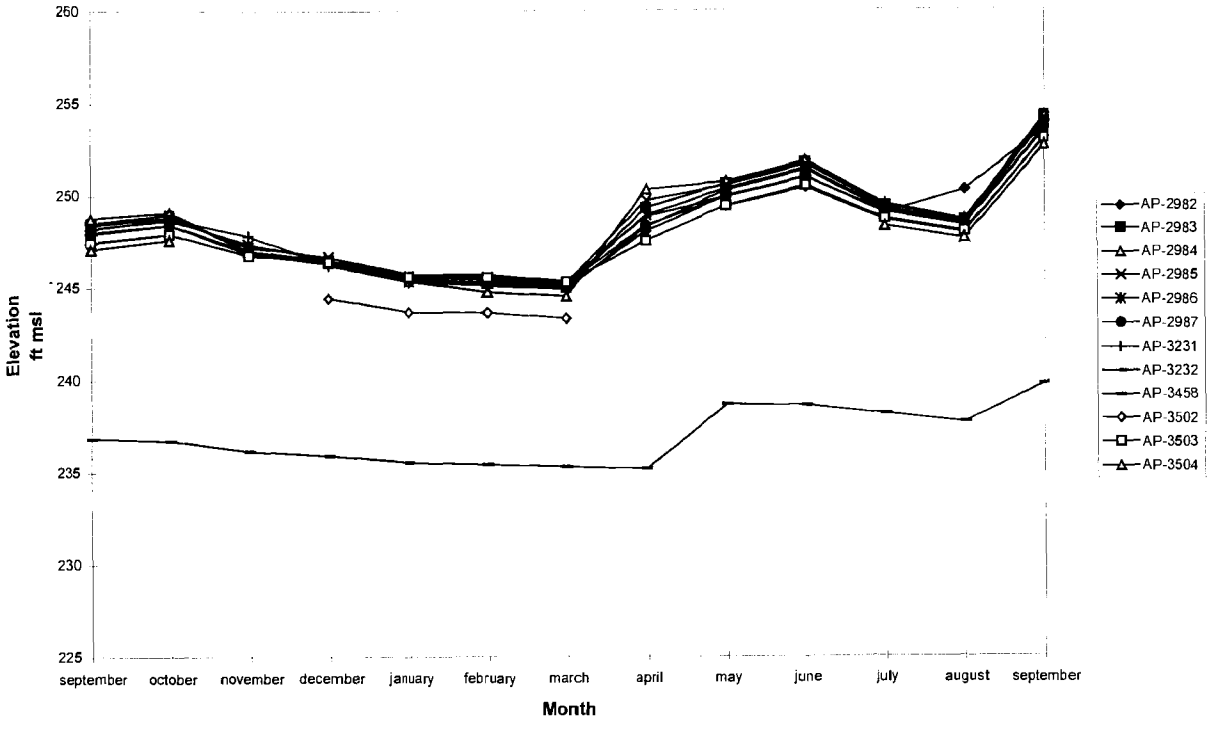
Site	Well ID	Elevation of TOC	Groundwater Elevation					
			April	May	June	July	August	September
Building	AP-2982	263.61	247.98	249.92	250.96	248.99	250.25	253.51
35-752	AP-2983	264.24	249.28	250.59	251.75	249.38	248.58	254.22
	AP-2984	261.80	250.28	250.70	251.82	249.47	248.62	254.22
	AP-2985	259.54	249.68	250.51	251.61	249.36	248.61	254.05
	AP-2986	260.98	248.87	250.33	251.41	249.22	248.45	253.89
	AP-2987	261.75	248.30	249.90	250.94	249.03	248.31	253.53
	AP-3231	265.62	248.21	250.23	251.32	249.12	248.41	253.90
	AP-3232	259.79	248.79	249.88	250.92	249.06	248.35	253.43
	AP-3458	264.65	235.17	238.63	238.56	238.11	237.66	239.73
	AP-3502	261.05	NR	249.37	250.38	248.59	247.89	253.03
	AP-3503	263.66	247.45	249.39	250.48	248.67	247.97	253.00
	AP-3504	261.54	NR	NR	NR	248.24	247.58	252.64

NR = No reading.

NI = Not installed.

OU-D 33913

Groundwater Fluctuation - Bldg. 35-752



APPENDIX D

DATA FROM PREVIOUS INVESTIGATIONS

Table D-1
Summary of PCBs Detected, Building 35-752 Concrete Floor Wipe Samples[a]

Sample ID	Laboratory Code	Date Collected	Polychlorinated Biphenyls (PCBs)	
			Aroclor 1254 (μg/100 cm^2)	Aroclor 1260 (μg/100 cm^2)
94575249MI	K947753-001	12/9/94	750	ND
94575250MI	K947753-002	12/9/94	18	ND
94575251MI[b]	K947753-003	12/9/94	37	ND
94575252MI	K947753-004	12/9/94	41	6
94575253MI	K947753-005	12/9/94	41	24
94575254MI	K947753-006	12/9/94	82	14
94575255MI	K947753-007	12/9/94	76	ND
94575256ML	K947753-008	12/9/94	6	ND
94575257MI	K947753-009	12/9/94	88	ND
94575258MI	K947753-010	12/9/94	64	ND
94575259MI	K947753-011	12/9/94	130	ND
94575260MI	K947753-012	12/9/94	40	ND
94575261MI[b]	K947753-013	12/9/94	19	ND
94575262MI	K947753-014	12/9/94	38	3
94575263MI	K947753-015	12/9/94	33	ND
94575264MI	K947753-016	12/9/94	34	4
94575265MI[b]	K947753-017	12/9/94	19	2
94575266MI	K947753-018	12/9/94	71	12
94575267MI	K947753-019	12/9/94	140	13
94575268MI	K947753-020	12/9/94	71	17
94575269MI	K947753-021	12/9/94	580	29
94575270MI	K947753-022	12/9/94	120	24
94575271MI	K947753-023	12/9/94	63	35
94575291MI	K947753-024	12/9/94	22	32
94575292MI	K947753-025	12/9/94	140	27
94575293MI	K947753-026	12/9/94	610	39
94575294MI[b]	K947753-027	12/9/94	160	ND
94575295MI	K947753-028	12/9/94	62	8
94575296MI	K947753-029	12/9/94	9	ND
94575297MI	K947753-030	12/9/94	27	10
94575298MI	K947753-031	12/9/94	58	31
94575299MI	K947753-032	12/9/94	73	24

[a] ENSR 1995. Preliminary Source Evaluation 2, Operable Unit D, Fort Richardson, August.
[b] Duplicate of preceding sample.
ND = Non-detected at the method reporting limit (MRL) of 1 μg/100 cm^2.
PCBs = Polychlorinated biphenyls.

Table D-2
Soil Sample Results from the 1990 U.S. Army Corps of Engineers Borings[a]

Hole ID Log: Hole ID Survey: Sample Number 90FRUST: Sampling Depth (feet):		BH-12 AP-2982 86 Soil 5 - 6.5	BH-12 AP-2982 87 Soil 10 - 11.5	BH-12 AP-2982 88 Soil 15 - 16.5	BH-12 AP-2982 89 Soil 20 - 21.5	BH-13 AP-2983 90 Soil 5 - 5.5	BH-13 AP-2983 91 Soil 10 - 11.5	BH-13 AP-2983 93 Soil 15 - 16.5	BH-13 AP-2983 96 Soil 20 - 21.5	BH-14 AP-2984 97 Soil 5 - 6.5	BH-14 AP-2984 98 Soil 10 - 11.5
VOCs: EPA Method 8020 (µg/Kg)	**Screening Criteria**										
Benzene	2200[d], 100-5D0[c]	ND(12)	ND(10)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(12)	ND(11)
Toluene	1.6E6[d]	23	ND(10)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(12)	ND(11)
Chlorobenzene	1.6E5[d]	ND(12)	ND(10)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(12)	ND(11)
Ethylbenzene	7.8E5[d]	ND(12)	ND(10)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(12)	ND(11)
Total Xylenes	1.6E7[d]	ND(12)	ND(10)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(11)	ND(12)	ND(11)
m-Dichlorobenzene	7E5[d]	ND(12)	ND(10)	ND(11)	ND(11)	ND(22)	ND(21)	ND(21)	ND(22)	ND(24)	ND(22)
o,p-Dichlorobenzene	2.7 E3[d]	ND(12)	ND(10)	ND(11)	ND(11)	ND(22)	ND(21)	ND(21)	ND(22)	ND(24)	ND(22)
PHCs: EPA Method 8015M (mg/Kg)[b]	**Screening Criteria**										
K-1 Kerosene	N/A	ND(2.1)	ND(1.8)	ND(1.8)	ND(18)	ND(18)	ND(1.8)	ND(1.8)	ND(1.9)	ND(2)	ND(1.8)
Gasoline	50-100[e]	ND(2.1)	ND(1.8)	ND(1.8)	ND(18)	ND(18)	ND(1.8)	ND(1.8)	ND(1.9)	ND(2)	ND(1.8)
Diesel Fuel No. 2	100-200[e]	ND(2.1)	ND(1.8)	ND(1.8)	ND(18)	ND(18)	ND(1.8)	ND(1.8)	ND(1.9)	ND(2)	ND(1.8)
Jet Fuel Jet A	N/A	ND(2.1)	ND(1.8)	ND(1.8)	ND(18)	ND(18)	ND(1.8)	ND(1.8)	ND(1.9)	ND(2)	ND(1.8)
Bunker Fuel No. 6D	N/A	ND(10)	ND(8.9)	ND(7.1)	ND(92)	ND(92)	ND(9)	ND(9)	ND(9.3)	ND(10)	ND(9.1)

Table D-2 (Cont'd)
Soil Sample Results from the 1990 U.S. Army Corps of Engineers Borings[a]

Hole ID Log: Hole ID Survey: Sample Number 90FRUST: Sampling Depth (feet):		BH-14 AP-2984 99 Soil 15 - 16.5	BH-15 AP-2985 100 Soil 5 - 6.5	BH-15 AP-2985 101 Soil 10 - 11.5	BH-16 AP-2986 102 Soil 5 - 6.5	BH-16 AP-2986 103 Soil 10 - 11.5	BH-16 AP-2986 104 Soil 15 - 16.5	8H-17 AP-2987 105 Soil 5 - 6.5	BH-17 AP-2987 106 Soil 10 - 11.5	BH-17 AP-2987 109 Soil 15 - 16.5
VOCs: EPA Method 8020 (µg/Kg)	**Screening Criteria**									
Benzene	2200[d], 100-500[e]	ND(11)	ND(10)	ND(11)	ND(10)	ND(500)	ND(11)	ND(11)	ND(11)	ND(11)
Toluene	1.6E6[d]	ND(11)	23	ND(11)	ND(10)	770	ND(11)	ND(11)	ND(11)	ND(11)
Chlorobenzene	1.6E5[d]	ND(11)	ND(10)	ND(11)	ND(10)	500	ND(11)	ND(11)	ND(11)	ND(11)
Ethylbenzene	7.8E5[d]	ND(11)	ND(10)	ND(11)	ND(10)	300[c]	ND(11)	ND(11)	ND(11)	ND(11)
Total Xylenes	1.6E7[d]	ND(11)	ND(10)	ND(11)	ND(10)	1,830[c]	ND(11)	ND(11)	ND(11)	ND(11)
m-Dichlorobenzene	7E5[d]	ND(22)	ND(21)	ND(22)	ND(21)	980[c]	ND(22)	ND(22)	ND(22)	ND(22)
o,p-Dichlorobenzene	2.7E3[d]	ND(22)	ND(21)	ND(22)	ND(21)	5,000	ND(22)	ND(22)	ND(22)	ND(22)
PHCs: EPA Method 8015M (mg/Kg)[b]	**Screening Criteria**									
K-1 Kerosene	N/A	ND(1.9)	ND(1.8)	ND(1.8)	ND(1.8)	ND(18)	ND(1.8)	ND(1.8)	ND(1.8)	ND(1.9)
Gasoline	50-100[e]	ND(1.9)	ND(1.8)	ND(1.8)	ND(1.8)	ND(18)	ND(1.8)	ND(1.8)	ND(1.8)	ND(1.9)
Diesel Fuel No. 2	100-200[e]	ND(1.9)	ND(1.8)	ND(1.8)	ND(1.8)	730[c]	ND(1.8)	ND(1.8)	ND(1.8)	ND(1.9)
Jet Fuel Jet A	N/A	ND(1.9)	ND(1.8)	ND(1.8)	ND(1.8)	ND(18)	ND(1.8)	ND(1.8)	ND(1.8)	ND(1.9)
Bunker Fuel No. 6D	N/A	ND(9.3)	ND(8.9)	ND(9.2)	ND(8.9)	ND(92)	ND(9.1)	ND(9.2)	ND(9.1)	ND(9.6)

Notes:

[a] USACE 1991a.

[b] U.S. Army Corps of Engineers modification.

[c] Laboratory estimate.

[d] Screening criteria one-tenth of the EPA Region 3 risk-based concentrations for soil (EPA 1995b).

[e] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).

Shaded values exceed screening criteria.

Key:

90FRUST = 1990 Fort Richardson Underground Storage Tank Project; EPA = U.S. Environmental Protection Agency; mg/Kg = Milligrams per kilogram; N/A = Not applicable; ND = Not detected, the analyte concentration is less than the detection limit shown in parentheses; PHC = Petroleum hydrocarbons; µg/Kg = Micrograms per kilogram; and VOC = Volatile organic compound.

Table D-3
Groundwater Sample Results during U.S. Army Corps of Engineer's 1990 Sampling Effort, Building 35-752[a]

Hole ID Log: Hole ID Survey: Sample Number 90FRUST:		BH-12 AP-2982 266 Water	BH-13 AP-2983 259 Water	BH-14 AP-2984 260 Water	BH-15 AP-2985 261 Water	BH-16 AP-2986 262 Water	BH-16 AP-2986 264 Water	BH-17 AP-2987 265 Water
VOCs: EPA Method 602 (µg/L)	Screening Criteria							
Benzene	5[d], 0.36[e]	620	0.61	0.9	ND(0.2)	0.57	ND(0.2)	420
Toluene	1,000[d], 750[e]	1,300	0.74	0.83	0.44	1.6	2.5	1,300
Chlorobenzene	39[e]	ND(0.40)	ND(0.2)	ND(0.2)	ND(0.2)	4.7	11	ND(0.4)
Ethylbenzene	700[d], 1,300[e]	370	ND(0.2)	ND(0.2)	ND(0.2)	ND(0.2)	5.1	120
Total Xylenes	10,000[d], 12,000[e]	90	ND(0.2)	ND(0.2)	ND(0.2)	9.7	12	710
m-Dichlorobenzene	3[e]	ND(0.808)	ND(0.4)	ND(0.4)	ND(0.4)	6.3	7.1	ND(0.8)
o,p-Dichlorobenzene	2.4[e]	100	ND(0.4)	ND(0.4)	ND(0.4)	ND(0.4)	9.7	120
PHCs: EPA Method 8016M[b] (µg/L)	Screening Criteria							
K-1 Kerosene	15[f]	ND(280)	ND(56)	ND(56)	NT	1,700[c]	1,100[c]	ND(560)
Gasoline	15[f]	ND(280)	ND(56)	ND(56)	NT	ND(56)	ND(56)	ND(560)
Diesel Fuel No. 2	15[f]	ND(280)	ND(56)	ND(56)	NT	ND(56)	ND(56)	ND(560)
Jet Fuel Jet A	15[f]	ND(280)	ND(56)	ND(56)	NT	ND(56)	ND(56)	ND(560)
Bunker Fuel No. 6D	15[f]	ND(1,400)	ND(280)	ND(280)	NT	ND(280)	ND(280)	ND(2,800)

Notes:
[a] USACE 1991a.
[b] U.S. Army Corps of Engineers modification.
[c] Laboratory estimate.
[d] Screening criteria Maximum Contaminant Levels (EPA 1995a).
[e] Screening criteria EPA Region 3 Risk-Based Concentrations (EPA 1995b).
[f] Screening criteria Alaska Water Quality Regulations, 18 AAC 70 (ADEC 1989).
Shaded values exceed screening criteria.

Key:
90FRUST = 1990 Fort Richardson Underground Storage Tank Project; EPA = U.S. Environmental Protection Agency; ND = Not detected, the analyte concentration is less than the detection limit shown in parentheses; NT = Not tested; µg/L = Micrograms per liter; PHC = petroleum hydrocarbons; and VOC = volatile organic compound.

Table D-4
Analytes Detected in Soil Samples during HLA's Site Assessment, Building 35-752[a]

Boring: Sample Number: Depth (feet): Date Sampled:		AP-3227 93RTS001SL 5 08/23/93	AP-3227 93RTS002SL 10 08/23/93	AP-3227 93RTS003SL 15 08/23/93	AP-3228 93RTS004SL 5 08/24/93	AP-3228 93RTS005SL 15 08/24/93	AP-3228 93RTS008SL 18.5 08/24/93	AP-3229 93RTS009SL 10 08/25/93	AP-3229 93RTS010SL 11.5 08/25/93	AP-3229 93RTS013SL 18.5 08/25/93
VOCs: Method 8020 (µg/Kg)	**Screening Criteria**									
1,2-Dichlorobenzene	7.0E5[j]	ND(2.3)	ND(2.2)	ND(2.2)	ND(2.2)[b]	240[b]	ND(2.5)[b]	ND(2.1)[b]	ND(2.1)[b]	ND(2.2)
1,3-Dichlorobenzene	7.0E5[j]	ND(2.3)	ND(2.2)	ND(2.2)	ND(2.2)[b]	98[b]	ND(2.5)[b]	ND(2.1)[b]	ND(2.1)[b]	ND(2.2)
1,4-Dichlorobenzene	2,700[l]	ND(2.3)	ND(2.2)	ND92.2)	ND(2.2)[b]	58[b]	ND(2.5)[b]	ND(2.1)[b]	ND(2.1)[b]	ND(2.2)
Ethylbenzene	7.8E5[j]	ND(3.4)	ND(3.3)	ND(3.3)	ND(3.4)	88	ND(3.7)	ND(3.2)	ND(3.2)	ND(3.3)
Toluene	1.6E6[j]	ND(2.8)	ND(2.8)	ND(2.8)	ND(2.8)	200	ND(3.1)	ND(2.6)	ND(2.7)	ND(2.8)
Total Xylenes	1.6E7[l]	ND(3.4)	ND(3.3)	83	ND(3.4)	20	ND(3.7)	ND(3.2)	ND(3.2)	ND(3.3)
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**									
Aroclor-1260	0.16[l]	3.8	0.27	ND(0.53)	3.4	84	0.054[c]	ND(0.052)	ND(0.054)	ND(0.056)
Metals (mg/Kg)										
Cadmium (Method 6010)	2.2[l]	4.6	5.0	5.8	5.0	4.1	5.0	4.7	4.5	4.0
Chromium (Method 6010)	39[l], 43.8[l]	27	27	30	31	40	31	38	37	29
Arsenic (Method 7060)	2.3[l], 8.4[l]	3.6[d]	0.8[d]	4.7[d]	4.4[d]	3.9[d]	3.8[d]	4.0[d]	4.0[d]	3.8[d]
Lead (Method 7421)	400[m], 11.7[l]	25	1.3	5.0	85	34	4.0	5.3	5.3	4.5[d]
PHCs: (mg/Kg)	**Screening Criteria**									
Gasoline Range Organics (Method 8015M[e])	50-100[k]	ND(1.1)	ND(1.1)	390	ND(1.1)	330	5.3	ND(1.0)	ND(1.1)[b]	ND(1.1)[b]
Diesel Range Organics (Method 8100M[e])	100-200[k]	150[f]	140[f]	80[f]	470	2,800	17	8.6	ND(4.3)	ND(4.5)
TPH (Method 418.1)	UA	410	400	170	1,500	4,400	23	ND(10)	ND(5.3)[n]	ND(11)[g]
Other: (mg/Kg)	**Screening Criteria**									
Total Organic Carbon (Method 415.1)	UA	NR	NR	400[f]	NR	8,000[c]	NR	NR	NR	NR

Table D-4 (Cont'd)
Analytes Detected in Soil Samples during HLA's Site Assessment, Building 35-752[a]

Boring: Sample Number: Depth (feet): Date Sampled:		AP-3230 3RTS020SL 5 08/26/93	AP-3230 93RTS021SL 13 08/26/93	AP-3230 93RTS024SL 15 08/26/93	AP-3231 93RTS017SL 10 08/26/93	AP-3231 93RTS018SL 15 08/26/93	AP-3231 93RTS019SL 20 08/26/93	AP-3232 93RTS014SL 5 08/25/93	AP-3232 93RTS015SL 10 08/25/93	AP-3232 93RTS016SL 15 08/25/93
VOCs: Method 8020 (µg/Kg)	**Screening Criteria**									
1,2-Dichlorobenzene	7.0E5[j]	ND(2.1)	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.2)	ND(2.2)	ND(2.1)	ND(2.1)	ND(2.3)
1,3-Dichlorobenzene	7.0E5[j]	ND(2.1)	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.2)	ND(2.2)	ND(2.1)	ND(2.1)	ND(2.3)
1,4-Dichlorobenzene	2,700[j]	ND(2.1)	ND(2.1)	ND(2.2)	ND(2.1)	ND(2.2)	ND(2.2)	ND(2.1)	ND(2.1)	ND(2.3)
Ethylbenzene	7.8E5[j]	ND(3.1)	ND(3.2)	ND(3.4)	ND(3.1)	ND(3.3)	ND(3.3)	ND(3.1)	ND(3.2)	ND(3.4)
Toluene	1.6E6[j]	ND(2.6)	ND(2.7)	ND(2.8)	ND(2.6)	ND(2.7)	ND(2.7)	ND(2.6)	ND(2.7)	ND(2.9)
Total Xylenes	1.6E7[j]	ND(3.1)	190	ND(3.4)	ND(3.1)	ND(3.3)	ND(3.3)	ND(3.1)	ND(3.2)	ND(3.4)
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**									
Aroclor-1260	0.16[j]	ND(0.053)	ND(0.054)	ND(0.056)	ND(0.052)	ND(0.054)	ND(0.056)	ND(0.052)	ND(0.054)	ND(0.057)
Metals (mg/Kg)	**Screening Criteria**									
Cadmium (Method 6010)	3.9[j], 2.2[l]	ND(2.1)	ND(2.2)	ND(2.2)	ND(2.1)	ND(2.2)	ND(2.2)	5.6	4.7	5.7
Chromium (Method 6010)	39[j], 43.8[l]	31	33	26	34	36	29	33	26	28
Arsenic (Method 7060)	2.3[j], 8.4[l]	5.2[d,h]	4.1[d,h]	3.8[d]	4.0[d,h]	4.8[d,h]	11[d]	3.5[d]	4.1[d]	4.6[d]
Lead (Method 7421)	400[m], 11.7[l]	10[d,h]	4.7[d,h]	4.2[d]	5.1[d,h]	5.5[d,h]	5.2	4.8	4.9	5.0
PHCs: (mg/Kg)	**Screening Criteria**									
Gasoline Range Organics (Method 8015M[c])	50-100[k]	ND(1.1)	36	ND(1.1)	ND(1.0)[i]	ND(1.1)[i]	ND(1.1)	ND(1.0)[b]	ND(1.1)[b]	ND(1.1)[b]
Diesel Range Organics (Method 8100M[c])	100-200[k]	ND(4.2)	150	ND(4.4)	ND(4.2)	ND(4.3)	ND(4.5)	ND(4.1)	5.4	ND(4.6)
TPH (Method 418.1)	UA	ND(11)	200	14	ND(10)	12	12	12[g]	12[g]	22
Other: (mg/Kg)	**Screening Criteria**									
Total Organic Carbon (Method 415.1)	UA	NR	NR	NR	NR	NR	NR	NR	NR	NR

Table D-4 (Cont'd)
Analytes Detected in Soil Samples during HLA's Site Assessment, Building 35-752[a]

Notes:

[a] HLA 1994b.
[b] Daily calibration percent recovery exceeded acceptance limits.
[c] The value is an estimate. Analyte concentration is greater than the instrument detection limit but less than the contract-required method reporting limit.
[d] Post-digestion spike data is reported due to a matrix interference, which caused out-of-control matrix spike and matrix spike duplicate (MD/MSD) data.
[e] Alaska Department of Environmental Conservation modification.
[f] Discussed in laboratory results section of HLA's report (1994b).
[g] The relative percent difference for the MS/MSD exceeds acceptance criteria as a result of the heterogeneous sample.
[h] Results should be considered low estimates due to low MS/MSD recoveries.
[i] MS/MSD recoveries were not calculated because they were over the calibration range.
[j] Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for Soil (EPA 1995b)
[k] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[l] Screening criteria 95 percent upper tolerance limit background concentrations (E&E 1996).
[m] Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).
[n] The quality assurance sample result has been substituted for the project result per the U.S. Army Corps of Engineers' Chemical Quality Assurance Report.

Shaded values exceed screening criteria.

Key:

mg/Kg	=	Milligrams per kilogram.
ND	=	Not detected, the analyte concentration is less than the method reporting limit shown in parentheses.
NR	=	Not requested.
PCBs	=	Polychlorinated biphenyls.
PHCs	=	Petroleum hydrocarbons.
TPH	=	Total petroleum hydrocarbons.
UA	=	Unavailable.
µg/Kg	=	Micrograms per kilogram.
VOCs	=	Volatile organic compounds.

Table D-5
Groundwater Sample Results during HLA's Site Assessment, Building 35-752[a]

Monitoring Well: Sample Number: Date Sampled:		AP-2982 93RTS015WA 09/02/93	AP-2983 93RTS008WA 08/31/93	AP-2984 93RTS007WA 08/31/93	AP-2985 93RTS006WA 08/31/93	AP-2986 93RTS009WA 08/31/93	AP-2987 93RTS011WA 09/03/93	AP-3231 93RTS014WA 09/20/03	AP-3232 93RTS010WA 09/01/93
VOCs: EPA Method 8260/524.2 (µg/L)[b,c]	**Screening Criteria**								
Benzene	5[e], 0.36[f]	25	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)[d]	ND(1.0)	ND(1.0)[d]
Ethylbenzene	700[e], 1,300[f]	19	ND(1.0)	ND(1.0)	ND(1.0)	2.2	ND(1.0)	ND(1.0)	ND(1.0)
Naphthalene	1,500[f]	4	ND(1.0)	ND(1.0)	ND(1.0)	1.4	ND(1.0)	ND(1.0)	ND(1.0)
n-Propylbenzene	UA	1.4	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,1,1-Trichloroethane	200[e], 1,300[f]	5.3	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
1,2,4-Trimethylbenzene	300[f]	11	ND(1.0)	ND(1.0)	ND(1.0)	2.7	ND(1.0)	ND(1.0)	ND(1.0)
1,3,5-Trimethylbenzene	300[f]	3	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)	ND(1.0)
Toluene	1,000[e], 750[f]	89	ND(1.0)	ND(1.0)	ND(1.0)	2.4	ND(1.0)[d]	ND(1.0)	ND(1.0)[d]
Xylenes	10,000[e], 1,40D[f]	91	ND(1.0)	ND(1.0)	ND(1.0)	12.5	ND(1.0)	ND(1.0)	ND(1.0)
PCBs: EPA Method 8080 (µg/L)	**Screening Criteria**								
Aroclor-1016	0.5[e]	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1221	0.5[e]	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1232	0.5[e]	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1242	0.5[e]	ND(0.6)	ND(0.6)	ND(0.6)	ND(0.6)	ND(0.6)	ND(0.6)	ND(0.6)	ND(0.6)
Aroclor-1248	0.5[e]	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1254	0.5[e]	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1260	0.5[e]	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
Other: (µg/L)	**Screening Criteria**								
Lead (EPA Method 7421)	15[e]	ND(2)	2	ND(2)	7	ND(2)	ND(2)	ND(2)	ND(2)
Total Organic Carbon (EPA Method 415.1)	UA	1,400	NR	NR	NR	NR	14,000	1,400	NR

Table D-5 (Cont'd)
Groundwater Sample Results during HLA's Site Assessment, Building 35-752[a]

Notes:

[a] HLA 1994b.
[b] No duplicates or matrix spike recoveries were submitted for VOCs by Method 524.2.
[c] All samples were analyzed by Method 8260 except samples AP-2987 and AP-3232, which were analyzed by Method 524.2.
[d] Relative percent differences exceed acceptance limits.
[e] Screening criteria *Maximum Contaminant Levels* (EPA 1995a).
[f] Screening criteria EPA Region 3 risk-based concentrations (EPA 1995b).

Shaded values exceed screening criteria.

Key:

mg/L = *Milligrams per liter.*
ND = Not detected. The analyte concentration is less than the detection limit shown in parentheses.
NR = Not requested.
PCBs = Polychlorinated biphenyls.
UA = Unavailable.
µg/L = Micrograms per liter.
VOCs = Volatile organic compounds.

Table D-6
Summary of Analytes Detected in Soil during the PSE2
Former UST Location, Building 35-752[a]

Location:			SB AP-3497					SB AP-3498		
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0-4 94575273SL K946882-006 11/2/94	4-10 94575274SL K946882-007 11/2/94	4-10 94575275SL K946882-008 11/2/94	14-16 94575276SL K946882-009 11/2/94	18-20 94575278SL K946882-010 11/2/94	0-4 94575279SL K946882-011 11/2/94	4-8 94575280SL K946882-001 11/2/94	10-12' 94575281SL K946882-002 11/2/94
PHCs: (mg/Kg)	**Screening Criteria**	**MRL**								
GRO (Method 8015M)	50-100[c]	5	ND	ND	ND	ND	ND	ND	ND	920
DRO (Method 8100M)	100-200[c]	10	487	ND	ND	ND	ND	15	ND	8,150
TPH (Method 418.1)	UA	10	610	ND	ND	ND	ND	ND	ND	6,900
Organochlorine Pesticides: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**								
4,4'-DDT	0.19[b]	0.01	<0.07	ND	ND	ND	ND	<0.02	ND	ND
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**								
Aroclor-1260	0.16[b]	0.1	4.1	ND	ND	ND	ND	0.7	ND	ND
VOCs: Method 8260 (µg/Kg)	**Screening Criteria**	**MRL**								
Acetone	7.8E5[b]	50	ND	ND	ND	ND	ND	ND	76	<12,000
Trichloroethene (TCE)	5,800[b]	5	34	23	22	ND	ND	ND	ND	<1,200
Ethylbenzene	7.8E5[b]	5	ND	ND	ND	ND	ND	ND	ND	2,300
Total Xylenes	1.6E7[b]	5	6	6	ND	ND	ND	ND	ND	14,000
1,3,5-Trimethylbenzene	3.9E5[b]	20	ND	ND	ND	ND	ND	ND	ND	7,800
1,2,4-Trimethylbenzene	3.9E5[b]	20	ND	ND	ND	ND	ND	ND	ND	18,000
Naphthalene	3.1E5[b]	20	ND	ND	ND	ND	ND	ND	ND	<5,000

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Table D-6 (Cont'd)
Summary of Analytes Detected in Soil during the PSE2
Former UST Location, Building 35-752[a]

Location:			SB AP-3499			SB AP-3500				
Sample Depth: Sample ID: Laboratory Code: Date Collected:			0-2 94575282SL K946882-003 11/2/94	4-8 94575283SL K946882-004 11/2/94	8-12 94575284SL K946882-005 11/2/94	0-4 94575286SL K946921-005 11/3/94	0-4 94575287SL K946921-006 11/3/94	4-8 94575288SL K946921-007 11/3/94	8-12 94575289SL K946921-008 11/3/94	14-16 94575290SL K946921-009 11/3/94
PHCs: (mg/Kg)	**Screening Criteria**	**MRL**								
GRO (Method 8015M)	50-100[b]	5	ND	ND	ND	ND	ND	ND	ND	910
DRO (Method 8100M)	100-200[c]	10	352	74	50	10	15	40	ND	1,310
TPH (Method 418.1)	UA	10	430	91	27	35	24	40	ND	1,800
Organochlorine Pesticides: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**								
4,4'-DDT	0.19[a], 0.81[d]	0.01	<0.04	0.01	ND	ND	ND	ND	ND	ND
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**								
Aroclor-1260	0.16[a]	0.1	0.9	ND	ND	ND	ND	ND	ND	ND
VOCs: Method 8260 (µg/Kg)	**Screening Criteria**	**MRL**								
Acetone	7.8E5[a]	50	ND	ND	ND	ND	ND	ND	ND	<13,000
Trichloroethene (TCE)	5,800[c]	5	ND	ND	ND	ND	ND	ND	ND	<1,300
Ethylbenzene	7.8E5[b]	5	ND	ND	ND	ND	ND	ND	ND	2,700
Total Xylenes	1.6E7[b]	5	ND	ND	ND	ND	5	ND	ND	15,000
1,3,5-Trimethylbenzene	3.9E5[b]	20	ND	ND	ND	ND	ND	ND	ND	5,600
1,2,4-Trimethylbenzene	3.9E5[b]	20	ND	ND	ND	ND	ND	ND	ND	14,000
Naphthalene	3.1E5[a]	20	ND	ND	ND	ND	ND	ND	ND	5,300

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Table D-6 (Cont'd)
Summary of Analytes Detected in Soil during the PSE2
Former UST Location, Building 35-752[a]

Location:			SB AP-3497					SB AP-3498		
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0-4 94575273SL K946882-006 11/2/94	4-10 94575274SL K946882-007 11/2/94	4-10 94575275SL K946882-008 11/2/94	14-16 94575276SL K946882-009 11/2/94	18-20 94575278SL K946882-010 11/2/94	0-4 94575279SL K946882-011 11/2/94	4-8 94575280SL K946882-001 11/2/94	10-12' 94575281SL K946882-002 11/2/94
SVOCs: Method 8270 (mg/Kg)	**Screening Criteria**	**MRL**								
Naphthalene	310[b]	0.3	ND	ND	ND	ND	ND	ND	ND	<6
2-Methylnaphthalene	UA	0.3	ND	ND	ND	ND	ND	ND	ND	10
Di-n-oclyl Phthalate	160[b]	0.3	0.7	ND	ND	ND	ND	0.36	ND	<6
Total Metals: Method 6010 except where noted (mg/Kg)	**Screening Criteria**	**MRL**								
Arsenic (Method 7060)	2.3[b], 8.4[d]	1	6	4	4	5	5	4	5	5
Barium	550[b], 89.2[d]	1	66	50	46	42	37	59	72	44
Chromium	39[b], 43.8[d]	2	27	36	35	30	31	26	42	28
Lead (Method 7421)	400[c], 11.7[d]	1	20	6	7	7	5	5	6	6
Nickel	160[b], 51.5[d]	10	31	32	37	34	35	29	37	30
Selenium (Method 7740)	39[b]	1	1UJ	1UJ	1UJ	1UJ	1UJ	1UJ	1UJ	1UJ

Table D-6 (Cont'd)
Summary of Analytes Detected in Soil during the PSE2
Former UST Location, Building 35-752[a]

Location:			SB AP-3499			SB AP-3500				
Sample Depth: Sample ID: Laboratory Code: Date Collected:			0-2 94575282SL K946882-003 11/2/94	4-8 94575283SL K946882-004 11/2/94	8-12 94575284SL K946882-005 11/2/94	0-4 94575286SL K946921-005 11/3/94	0-4 94575287SL K946921-006 11/3/94	4-8 94575288SL K946921-007 11/3/94	8-12 94575289SL K946921-008 11/3/94	14-16 94575290SL K946921-009 11/3/94
SVOCs: Method 8270 (mg/Kg)	**Screening Criteria**	**MRL**								
Naphthalene	310[b]	0.3	ND	ND	ND	ND	ND	ND	ND	1.66
2-Methylnaphthalene	UA	0.3	ND	ND	ND	ND	ND	ND	ND	4.48
Di-n-octyl Phthalate	160[b]	0.3	ND	ND	ND	ND	ND	ND	ND	<1.5
Total Metals: Method 6010, except where noted (mg/Kg)	**Screening Criteria**	**MRL**								
Arsenic (Method 7060)	2.3[b], 8.4[c]	1	6	5	5	6	5	6	5	5
Barium	550[b], 89.2[c]	1	58	94	50	75	61	90	56	57
Chromium	39[b], 43.8[d]	2	20	31	30	28	32	32	28	31
Lead (Method 7421)	400[e], 11.7[c]	1	94	8	6	6	5	5	5	5
Nickel	160[b], 51.5[d]	10	24	30	30	35	33	36	29	35
Selenium (Method 7740)	39[b]	1	1UJ	1UJ	1UJ	1UJ	1UJ	1UJ	1UJ	1UJ

Notes:
[a] ENSR 1995.
[b] Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for soil (EPA 1995b).
[c] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[d] Screening criteria 95 percent upper tolerance limit background concentrations (E&E 1996).
[e] Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).
Shaded values exceed screening criteria.

Key:
< = Less than, analytical reporting limit has been elevated due to matrix interference or sample requiring dilution; DRO = Diesel range organics; GRO = Gasoline range organics; J = Value is considered an estimate; MRL = Method reporting limit; NA = Not analyzed; ND = Not detected above the MRL; PCBs = Polychlorinated biphenyls; PHCs = Petroleum hydrocarbons; SVOCs = Semivolatile organic compounds; VOCs = Volatile organic compounds; UA = Unavailable; and UJ = The analyte was not detected at the MRL; however, the MRL is considered an estimate.

Table D-7
Summary of Analytes Detected in Groundwater during the PSE2
Building 35-752[a]

Location:			MW AP-3502	MW AP-3503	MW AP-3504		MW AP-2982	MW AP-2983	MW AP-2986	MW AP-2987
Sample ID:			9457528AW	9457525AGW	9457521AGW	9457522AGW	9457523AGW	9457526AGW	9457527AGW	9457524AGW
Laboratory Code:			K948015-003	K947974-005	K947938-001	K947938-002	K948015-001	K947974-001	K947974-007	K947974-003
Date Collected:			12/21/94	12/20/94	12/19/94	12/19/94	12/20/94	12/20/94	12/20/94	12/20/94
PHCs: (µg/L)	**Screening Criteria**	**MRL**								
GRO (Method 8015M)	15[d]	50	ND	ND	ND	NA	292	ND	ND	ND
DRO (Method 8100M)	15[d]	50	105	89J	ND	ND	226	ND	566J	1,310
TPH (Method 418.1)	15[d]	200	ND	ND	ND	ND	ND	ND	500	ND
PCBs: Method 8080 (µg/L)	**Screening Criteria**	**MRL**								
Aroclor-1260	0.5[b], 0.73[c]	0.2	ND	ND	ND	ND	ND	ND	0.7	0.2UJ
VOCs: Method 8260 (µg/L)	**Screening Criteria**	**MRL**								
1,1-Dichloroethane	810[c]	0.5	ND	ND	ND	NA	0.6	ND	ND	ND
1,1,1-Trichloroethane (TCA)	200[b], 1,300[c]	0.5	ND	ND	3.4	NA	9.7	ND	ND	ND
Benzene	5[b], 0.36[c]	0.5	ND	ND	ND	NA	46	ND	ND	1.6
Trichloroethene (TCE)	5[b], 1.6[c]	0.5	ND	ND	0.6	NA	0.6	0.5	ND	0.6
Toluene	1,000[b], 750[c]	0.5	ND	ND	ND	NA	2.8	ND	ND	ND
Ethylbenzene	700[b], 1,300[c]	0.5	ND	ND	ND	NA	22	ND	ND	ND
Total Xylenes	10,000[b], 12,000[c]	0.5	ND	ND	ND	NA	56	ND	ND	ND
1,3,5-Trimethylbenzene	300[c]	2	ND	ND	ND	NA	2	ND	ND	ND
1,2,4-Trimethylbenzene	300[c]	2	ND	ND	ND	NA	11	ND	ND	ND
Naphthalene	1,500[c]	2	ND	ND	ND	NA	9	ND	ND	ND

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Table D-7 (Cont'd)
Summary of Analytes Detected in Groundwater during the PSE2
Building 35-752[a]

Location:			MW AP-3502	MW AP-3503	MW AP-3504		MW AP-2982	MW AP-2983	MW AP-2986	MW AP-2987
Sample ID:			9457528AW	9457525AGW	9457521AGW	9457522AGW	9457523AGW	9457526AGW	9457527AGW	9457524AGW
Laboratory Code:			K948015-003	K947974-005	K947938-001	K947938-002	K948015-001	K947974-001	K947974-007	K947974-003
Date Collected:			12/21/94	12/20/94	12/19/94	12/19/94	12/20/94	12/20/94	12/20/94	12/20/94
SVOCs: Method 8270 (µg/L)	**Screening Criteria**	**MRL**								
Bis(2-ethylhexyl) Phthalate	4.8[c]	10	ND	ND	ND	ND	ND	ND	11	ND
Total Metals: Method 6010, except where noted (µg/L)	**Screening Criteria**	**MRL**								
Arsenic (Method 7060)	50[b], 11[c]	5	5	52J	29	34	27	28J	48J	27J
Barium	2,000[b], 2,600[c]	5	129	1,480	683	722	424	761	245	604
Cadmium	5[b], 18[c]	3	ND	6	ND	ND	ND	ND	ND	ND
Chromium	100[b], 180[c]	5	17	402	206	229	97	182	72	154
Lead (Method 7421)	15[a]	2	5	112	48	53	26	64	44	52
Mercury (Method 7471)	2[b], 11[c]	0.5	ND	1.8	1.2	1.2	0.7	1.5	0.7	1.1
Nickel	100[b], 730[c]	20	25	546	316	345	153	290	102	229

Notes:
[a] ENSR 1995.
[b] Screening criteria maximum contaminant levels (EPA 1995a).
[c] Screening criteria EPA Region 3 risk-based concentrations (EPA 1995b).
[d] Screening criteria ADEC Water Quality Regulations, 18 AAC 70 (ADEC 1989).
Shaded values exceed screening criteria.

Key:
DRO = Diesel-range organics; GRO = Gasoline-range organics; J = Value is considered an estimate; MRL = Method reporting limit; NA = Not analyzed; ND = Not detected above the MRL; PCBs = Polychlorinated biphenyls; PHCs = Petroleum hydrocarbons; SVOCs = Semivolatile organic compounds; TPH = Total petroleum hydrocarbons; UJ = The analyte was not detected at the MRL--however, the MRL is considered an estimate; and VOCs = Volatile organic compounds.

Table D-8
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SB AP-3505				SB AP-3506			
Sample Depth (feet):			0-4	4-8	9-11	12-16	0-2	4-8	8-12	14-16
Sample ID:			94575219SL	94575220SL	94575221SL	94575222SL	94575223SL	94575224SL	94575225SL	94575226SL
Laboratory Code:			K946921-001	K946921-002	K946921-003	K946921-004	K946921-010	K946921-011	K946921-012	K946921-013
Date Collected:			11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94
PHCs: (mg/Kg)	**Screening Criteria**	**MRL**								
GRO (Method 8015M)	100-200[c]	10	81	61	ND	ND	83	ND	ND	ND
TPH (Method 418.1)	UA	10	146	56	ND	ND	350	ND	ND	ND
Organochlorine Pesticides: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**								
4,4'-DDD	0.27[b]	0.01	<0.1	<0.06	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.19[b], 0.81[d]	0.01	<0.1	<0.1	ND	ND	<0.02	NO	ND	ND
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**								
Aroclor-1260	0.16[b]	0.1	3.4	1.1	ND	ND	0.3	ND	ND	ND
VOCs: Method 8260 (µg/Kg)	**Screening Criteria**	**MRL**								
Trichloroethene (TCE)	5,800[b]	5	10	6	ND	ND	ND	ND	ND	ND
Toluene	1.6E6[b]	5	5	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	7.8E5[b]	5	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	1.6E7[b]	5	9	6	7	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.9E5[b]	20	ND	ND	ND	ND	ND	ND	ND	ND

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SS 1			SS 2		SS 3	
Sample Depth (feet):			0.5	0.5	2	0.5	2	0.5	2
Sample ID:			94575201SL	94575202SL	94575218SL	94575203SL	94575217SL	94575204SL	94575216SL
Laboratory Code:			K945240-001	K945240-002	K946306-008	K945240-003	K946306-007	K945240-004	K946306-006
Date Collected:			10/6/94	10/6/94	10/10/94	10/6/94	10/10/94	10/6/94	10/10/94
PHCs: (mg/Kg)	**Screening Criteria**	**MRL**							
DRO (Method 8100M)	100-200[c]	10	55	50	ND	18	15	70	ND
TPH (Method 418.1)	UA	10	182	27	13J	28	27J	43	16J
Organochlorine Pesticides: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**							
4,4'-DDD	0.27[b]	0.1	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.19[b], 0.81[d]	0.1	ND	0.04	ND	ND	ND	0.02	ND
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**							
Aroclor-1260	0.16[b]	0.1	ND	ND	ND	ND	ND	ND	ND
VOCs: Method 8260 (µg/Kg)	**Screening Criteria**	**MRL**							
Trichloroethene (TCE)	5.800[b]	5	ND	ND	ND	ND	ND	ND	ND
Toluene	1.6E6[b]	5	ND	ND	ND	ND	8	6	ND
Ethylbenzene	7.8E5[b]	5	ND	ND	ND	ND	6	ND	ND
Total Xylenes	1.6E7[b]	5	ND	ND	ND	ND	38	6	ND
1,2,4-Trimethylbenzene	3.9E5[b]	20	ND	ND	ND	ND	23	ND	ND

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SS 4		SS 5			SS 6	
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0.5 94575205SL K945240-005 10/6/94	2 94575215SL K946306-005 10/10/94	0.5 94575206SL K946242-001 10/6/94	2 94575213SL K946306-003 10/10/94	2 94575214SL K946306-004 10/10/94	0.5 94575207SL K946242-002 10/6/94	2 94575212SL K946306-002 10/10/94
PHCs: (mg/Kg)	**Screening Criteria**	**MRL**							
DRO (Method 8100M)	100-200[c]	10	92	61	192	778	669	97	52
TPH (Method 418.1)	UA	10	270	35J	740	1,300J	1,700J	41	87J
Organochlorine Pesticides: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**							
4,4'-DDD	0.27[b]	0.01	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.19[b], 0.81[d]	0.01	0.12	ND	ND	ND	ND	ND	<0.04
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**							
Aroclor-1260	0.16[b]	0.1	0.5	ND	1.1	ND	ND	1.1	0.6
VOCs: Method 8080 (µg/Kg)	**Screening Criteria**	**MRL**							
Trichloroethene (TCE)	5,800[b]	5	ND	ND	ND	ND	ND	ND	ND
Toluene	1.6E6[b]	5	6	ND	ND	ND	ND	ND	ND
Ethylbenzene	7.8E5[b]	5	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	1.6E7[b]	5	6	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.9E5[b]	20	ND	ND	ND	ND	ND	ND	ND

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SS 7		SS 8	
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0.5 94575208SL K946242-003 10/6/94	2 94575211SL K946306-001 10/10/94	0.5 94575209SL K946242-004 10/6/94	2 94575210SL K946242-005 10/6/94
PHCs: (mg/Kg)	**Screening Criteria**	**MRL**				
DRO (Method 8100M)	100-200[c]	10	ND	17	100	ND
TPH (Method 418.1)	UA	10	ND	14J	48	13
Organochlorine Pesticides: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**				
4,4'-DDD	0.27[b]	0.01	ND	ND	<0.06	0.01
4,4'-DDT	0.19[b], 0.81[d]	0.01	<0.04	<0.02	<0.50	<0.04
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**				
Aroclor-1260	0.16[b]	0.1	1.9	0.5	15.6	1.9
VOCs: Method 8260 (µg/Kg)	**Screening Criteria**	**MRL**				
Trichloroethene (TCE)	5,800[b]	5	ND	ND	ND	ND
Toluene	1.6E6[b]	5	ND	ND	ND	5
Ethylbenzene	7.8E5[b]	5	ND	ND	ND	ND
Total Xylenes	1.6E7[b]	5	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.9E5[b]	20	ND	ND	ND	ND

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SB AP-3505				SB AP-3506			
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0-4 94575219SL K946921-001 11/3/94	4-6 94575220SL K946921-002 11/3/94	9-11 94575221SL K946921-003 11/3/94	12-16 94575222SL K946921-004 11/3/94	0-2 94575223SL K946921-010 11/3/94	4-8 94575224SL K946921-011 11/3/94	8-12 94575225SL K946921-012 11/3/94	14-16 94575226SL K946921-013 11/3/94
SVOCs: Method 8270 (mg/Kg)	**Screening Criteria**	**MRL**								
Fluoranthene	310[b]	0.3	<0.6	0.73	ND	ND	<0.6	ND	ND	ND
Pyrene	230[b]	0.3	<0.6	0.69	ND	ND	<0.6	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	4.6[b]	0.3	<0.6	ND	ND	ND	0.80	ND	ND	ND
Chrysene	8.8[b]	0.3	<0.6	0.85	ND	ND	<0.6	ND	ND	ND
Di-n-octyl Phthalate	160[b]	0.3	<0.6	0.97	ND	ND	1.32	0.36	0.41	0.3
Benzo(b)fluoranthene	0.088[b]	0.3	0.7	0.93	ND	ND	<0.6	ND	ND	ND
Benzo(k)fluoranthene	0.88[b]	0.3	0.7	0.65	ND	ND	<0.6	ND	ND	ND
Benzo(a)pyrene	0.0088[b]	0.3	<0.6	0.31	ND	ND	<0.6	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.088[b]	0.3	<0.6	ND	ND	ND	<0.6	ND	ND	ND

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SS 1			SS 2		SS 3	
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0.5 94575201SL K945240-001 10/6/94	0.5 94575202SL K945240-002 10/6/94	2 94575218SL K946306-008 10/10/94	0.5 94575203SL K945240-003 10/6/94	2 94575217SL K946306-007 10/10/94	0.5 94575204SL K945240-004 10/6/94	2 94575216SL K946306-006 10/10/94
SVOCs: Method 8270 (mg/Kg)	**Screening Criteria**	**MRL**							
Fluoranthene	310[b]	0.3	ND	ND	ND	ND	ND	ND	ND
Pyrene	230[b]	0.3	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl) Phthalate	4.6[b]	0.3	ND	ND	ND	ND	ND	ND	ND
Chrysene	8.8[b]	0.3	ND	ND	ND	ND	ND	ND	ND
Di-n-octyl Phthalate	160[b]	0.3	ND	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	0.088[b]	0.3	ND	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	0.88[b]	0.3	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	0.0088[b]	0.3	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.088[b]	0.3	ND	ND	ND	ND	ND	ND	ND

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SS 4		SS 5			SS 6	
Sample Depth (feet):			0.5	2	0.5	2	2	0.5	2
Sample ID:			94575205SL	94575215SL	94575206SL	94575213SL	94575214SL	94575207SL	94575212SL
Laboratory Code:			K945240-005	K946306-005	K946242-001	K946306-003	K946306-004	K946242-002	K946306-002
Date Collected:			10/6/94	10/10/94	10/6/94	10/10/94	10/10/94	10/6/94	10/10/94
SVOCs: Method 8270 (mg/Kg)	Screening Criteria	MRL							
Fluoranthene	310[b]	0.3	ND	ND	ND	ND	<0.7	ND	ND
Pyrene	230[b]	0.3	ND	ND	ND	ND	<0.7	ND	ND
Bis(2-ethylhexyl) Phthalate	4.6[b]	0.3	ND	ND	ND	ND	<0.7	ND	ND
Chrysene	8.8[b]	0.3	0.3	ND	ND	ND	<0.7	ND	ND
Di-n-octyl Phthalate	160[b]	0.3	ND	ND	ND	ND	<0.7	ND	ND
Benzo(b)fluoranthene	0.088[b]	0.3	ND	ND	ND	ND	<0.7	ND	ND
Benzo(k)fluoranthene	0.88[b]	0.3	ND	ND	ND	ND	<0.7	ND	ND
Benzo(a)pyrene	0.0088[b]	0.3	ND	ND	ND	ND	<0.7	ND	ND
Indeno(1,2,3-cd)pyrene	0.088[b]	0.3	ND	ND	ND	ND	<0.7	ND	ND

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SS 7		SS 8	
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0.5 94575208SL K946242-003 10/6/94	2 94575211SL K946306-001 10/10/94	0.5 94575209SL K946242-004 10/6/94	2 94575210SL K946242-005 10/6/94
SVDCs: Method 8270 (mg/Kg)	**Screening Criteria**	**MRL**				
Fluoranthene	310[b]	0.3	ND	ND	0.8	ND
Pyrene	230[b]	0.3	ND	ND	0.7	ND
Bis(2-ethylhexyl) Phthalate	4.6[b]	0.3	ND	ND	ND	ND
Chrysene	8.8[b]	0.3	ND	ND	0.8	ND
Di-n-octyl Phthalate	160[b]	0.3	ND	ND	ND	ND
Benzo(b)fluoranthene	0.088[b]	0.3	ND	ND	0.8	ND
Benzo(k)fluoranthene	0.88[b]	0.3	ND	ND	0.7	ND
Benzo(a)pyrene	0.0088[b]	0.3	ND	ND	0.3	ND
Indeno(1,2,3-cd)pyrene	0.088[b]	0.3	ND	ND	0.3	ND

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SB AP-3505				SB AP-3506			
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0-4 94575219SL K946921-001 11/3/94	4-6 94575220SL K946921-002 11/3/94	9-11 94575221SL K946921-003 11/3/94	12-16 94575222SL K946921-004 11/3/94	0-2 94575223SL K946921-010 11/3/94	4-8 94575224SL K946921-011 11/3/94	8-12 94575225SL K946921-012 11/3/94	14-16 94575226SL K946921-013 11/3/94
Total Metals: Method 6010 except where noted (mg/Kg)	**Screening Criteria**	**MRL**								
Arsenic (Method 7060)	2.3[b], 8.4[d]	1	6	7	4	6	5	4	6	6
Barium	550[b], 89.2[d]	1	69	76	44	37	70	63	44	44
Chromium	39[b], 43.8[d]	2	26	28	30	27	30	40	31	32
Lead (Method 7421)	400[c], 11.7[d]	1	18	8	4	5	24	6	5	6
Nickel	160[b], 51.5[d]	10	31	30	25	32	33	33	30	39
Selenium (Method 7740)	39[b]	1	1UJ	1UJ	1UJ	1UJ	1UJ	1UJ	1UJ	1UJ
Aluminum	7,800[b]	10	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	UA	10	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	470[b]	2	NA	NA	NA	NA	NA	NA	NA	NA
Copper	290[b]	2	NA	NA	NA	NA	NA	NA	NA	NA
Iron	UA	4	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	UA	2	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	39[b]	1	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	UA	400	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	UA	20	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	55[b]	2	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	2,300[b]	2	NA	NA	NA	NA	NA	NA	NA	NA

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SS 1			SS 2		SS 3	
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0.5 94575201SL K945240-001 10/6/94	0.5 94575202SL K945240-002 10/6/94	2 94575218SL K946306-008 10/10/94	0.5 94575203SL K945240-003 10/6/94	2 94575217SL K946306-007 10/10/94	0.5 94575204SL K945240-004 10/6/94	2 94575216SL K946306-006 10/10/94
Total Metals: Method 6010 except where noted (mg/Kg)	**Screening Criteria**	**MRL**							
Arsenic (Method 7060)	2.3[b], 9.2[d]	1	6J	10J	5	7J	7	8J	5
Barium	550[b], 101.7[b]	1	77	97	58	64	57	99	49
Chromium	39[b], 43.8[d]	2	29	35	30	29	38	36	24
Lead (Method 7421)	400[c], 18.6[d]	1	5	8	6	8	8	12	5
Nickel	160[b], 50.8[d]	10	33	42	37	33	44	49	27
Selenium (Method 7740)	39[b]	1	1UJ	1UJ	ND	1UJ	ND	1UJ	ND
Aluminum	7,800[b]	10	15,100	19,200	NA	13,300	NA	18,700	NA
Calcium	UA	10	4,360	5,230	NA	3,940	NA	5,670	NA
Cobalt	470[b]	2	11	13	NA	10	NA	13	NA
Copper	290[b]	2	28	39	NA	28	NA	31	NA
Iron	UA	4	25,100	30,800	NA	22,000	NA	30,900	NA
Magnesium	UA	2	7,420	9,240	NA	7,300	NA	10,300	NA
Manganese	39[b]	1	564	720	NA	477	NA	669	NA
Potassium	UA	400	440	590	NA	440	NA	590	NA
Sodium	UA	20	122	158	NA	108	NA	171	NA
Vanadium	55[b]	2	45	57	NA	41	NA	60	NA
Zinc	2,300[b]	2	57	72	NA	52	NA	72	NA

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SS 4		SS 5			SS 6	
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0.5 94575205SL K945240-005 10/6/94	2 94575215SL K946306-005 10/10/94	0.5 94575206SL K946242-001 10/6/94	2 94575213SL K946306-003 10/10/94	2 94575214SL K946306-004 10/10/94	0.5 94575207SL K946242-002 10/6/94	2 94575212SL K946306-002 10/10/94
Total Metals: Method 6010 except where noted (mg/Kg)	**Screening Criteria**	**MRL**							
Arsenic (Method 7060)	2.3[b], 9.2[d]	1	7J	5	5	6	8	7	6
Barium	550[b], 101.7[d]	1	110	81	220J	81	93	73J	93
Chromium	39[b], 43.8[d]	2	30	36	23	31	38	25	34
Lead (Method 7421)	400[e], 18.6[d]	1	10	10	36	11	18	8	10
Nickel	160[b], 50.8[d]	10	30	36	23	32	38	27	34
Selenium (Method 7740)	39[b]	1	1UJ	ND	1UJ	ND	ND	1UJ	ND
Aluminum	7,800[b]	10	17,300	NA	8,620	NA	NA	13,300	NA
Calcium	UA	10	3,150	NA	7,220	NA	NA	3,310	NA
Cobalt	470[b]	2	11	NA	7	NA	NA	10	NA
Copper	290[b]	2	20	NA	22	NA	NA	24	NA
Iron	UA	4	22,700	NA	18,500	NA	NA	22,400	NA
Magnesium	UA	2	5,930	NA	6,820	NA	NA	6,250	NA
Manganese	39[a]	1	472	NA	383	NA	NA	455	NA
Potassium	UA	400	ND	NA	ND	NA	NA	450	NA
Sodium	UA	20	116	NA	65	NA	NA	111	NA
Vanadium	55[c]	2	46	NA	28	NA	NA	41	NA
Zinc	2,300[b]	2	47	NA	86	NA	NA	53	NA

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Location:			SS 7		SS 8	
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0.5 94575208SL K946242-003 10/6/94	2 94575211SL K946306-001 10/10/94	0.5 94575209SL K946242-004 10/6/94	2 94575210SL K946242-005 10/6/94
Total Metals: Method 6010 except where noted (mg/Kg)	**Screening Criteria**	**MRL**				
Arsenic (Method 7060)	2.3[b], 9.2[d]	1	7	6	7	7
Barium	550[b], 101.7[d]	1	67J	90	83J	92J
Chromium	39[b], 43.8[d]	2	30	34	33	32
Lead (Method 7421)	400[c], 18.6[d]	1	6	16	13	7
Nickel	160[b], 50.8[d]	10	30	40	34	29
Selenium (Method 7740)	39[b]	1	1UJ	ND	1UJ	1UJ
Aluminum	7,800[b]	10	14,800	NA	16,200	17,000
Calcium	UA	10	4,110	NA	4,240	5,620
Cobalt	470[b]	2	10	NA	12	12
Copper	290[b]	2	28	NA	34	29
Iron	UA	4	26,600	NA	28,800	28,800
Magnesium	UA	2	7,430	NA	8,170	7,840
Manganese	39[b]	1	502	NA	544	628
Potassium	UA	400	610	NA	530	570
Sodium	UA	20	116	NA	112	134
Vanadium	55[b]	2	47	NA	50	50
Zinc	2,300[b]	2	61	NA	68	63

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Notes:

[a] ENSR 1995.
[b] Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for soil (EPA 1995b).
[c] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[d] Screening criteria 95 percent upper tolerance limit background concentrations (E&E 1996).
[e] Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

Shaded values exceed screening criteria.

Key:

< = Less than. Analytical reporting limit has been elevated due to matrix interference or sample requiring dilution.
DRO = Diesel range organics.
GRO = Gasoline range organics.
J = Value is considered an estimate.
MRL = Method reporting limit.
NA = Not analyzed.
ND = Not detected above the MRL.
PCBs = Polychlorinated biphenyls.
PHCs = Petroleum hydrocarbons.
SVOCs = Semivolatile organic compounds.
TPH = Total petroleum hydrocarbons.
UA = Unavailable.
UJ = The analyte was not detected at the MRL; however, the MRL is considered an estimate.
VOCs = Volatile organic compounds.

Table D-8 (Cont'd)
Analytes Detected in Soil during the PSE2
Drum Accumulation Area, Building 35-752[a]

Notes:

[a] ENSR 1995.
[b] Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for soil (EPA 1995b).
[c] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[d] Screening criteria 95 percent upper tolerance limit background concentrations (E&E 1996).
[e] Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

Shaded values exceed screening criteria.

Key:

<	= Less than. Analytical reporting limit has been elevated due to matrix interference or sample requiring dilution.
DRO	= Diesel range organics.
GRO	= Gasoline range organics.
J	= Value is considered an estimate.
MRL	= Method reporting limit.
NA	= Not analyzed.
ND	= Not detected above the MRL.
PCBs	= Polychlorinated biphenyls.
PHCs	= Petroleum hydrocarbons.
SVOCs	= Semivolatile organic compounds.
TPH	= Total petroleum hydrocarbons.
UA	= Unavailable.
UJ	= The analyte was not detected at the MRL; however, the MRL is considered an estimate.
VOCs	= Volatile organic compounds.

Table D-9
Summary of Analytical Results for Surface Water Samples
Cooling Ponds, Building 35-752[a]

Location: Sample Number: Date Sampled:	SW-1 93RTS001WA 08/30/93	SW-2 93RTS002WA 08/30/93	SW-3 93RTS003WA 08/30/93
VOCs: Method 524.2 (µg/L)			
Benzene	ND(1.0)	ND(1.0)	ND(0.4)[b]
Ethylbenzene	ND(1.0)	ND(1.0)	ND(1.0)
Naphthalene	ND(1.0)	ND(1.0)	ND(1.0)
n-Propylbenzene	ND(1.0)	ND(1.0)	ND(1.0)
1,1,1-Trichloroethane	ND(1.0)	ND(1.0)	ND(1.0)
1,2,4-Trimethylbenzene	ND(1.0)	ND(1.0)	ND(1.0)
1,3,5-Trimethylbenzene	ND(1.0)	ND(1.0)	ND(1.0)
Toluene	ND(1.0)	ND(1.0)	ND(1.0)
o-Xylene	ND(1.0)	ND(1.0)	ND(1.0)
m- & p-Xylene	ND(1.0)	ND(1.0)	ND(1.0)
PCBs: Method 8080 (µg/L)			
Aroclor-1016	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1221	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1232	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1242	ND(0.6)	ND(0.6)	ND(0.6)
Aroclor-1248	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1254	ND(0.5)	ND(0.5)	ND(0.5)
Aroclor-1260	ND(0.5)	ND(0.5)	ND(0.5)
Other: (µg/L)			
Lead: Method 7421	ND(2)	3	ND(2)

Notes:
[a] HLA 1994b.
[b] Quality assurance sample result has been substituted for project result per the Chemical Quality Assurance Report (HLA 1994b).

Key:
ND = Not detected. The analyte concentration is less than the method reporting limit shown in parentheses.
PCBs = Polychlorinated biphenyls.
µg/L = Micrograms per liter.
VOCs = Volatile organic compounds.

Table D-10
Analytes Detected in Sediment during HLA's Site Assessment
Cooling Ponds, Building 35-752[a]

Location: Sample Number: Date Sampled:		SD-1 93RTS001SD 09/02/93	SD-2 93RTS002SD 09/02/93	SD-3 93RTS003SD 09/02/93
VOCs: EPA Method 8020 (µg/Kg)	Screening Criteria			
1,2-Dichlorobenzene	UA	ND(2.5)	ND(2.2)	ND(2.2)
1,3-Dichlorobenzene	UA	ND(2.5)	ND(2.2)	ND(2.2)
1,4-Dichlorobenzene	UA	ND(2.5)	ND(2.2)	ND(2.2)
Ethylbenzene	UA	ND(3.7)	ND(3.3)	ND(3.3)
Toluene	UA	ND(3.1)	ND(2.7)	ND(2.8)
Total Xylenes	UA	ND(3.7)	ND(3.3)	ND(3.3)
PCBs: EPA Method 8080 (mg/Kg)				
Aroclor-1260	0.005	1.15	ND(0.058)	0.055[b]
Metals (mg/Kg)				
Cadmium: EPA Method 6010	UA	ND(2.3)	ND(2.3)	ND(2.2)
Chromium: EPA Method 6010	26	21	28	32
Arsenic: EPA Method 7060	6	2.8	4.5	3
Lead: EPA Method 7421	31	21	5.5	8.9
PHCs (mg/Kg)				
Gasoline Range Organics: EPA Method 8015M[c]	UA	ND(1.2)	ND(1.1)	ND(1.1)
Diesel Range Organics: EPA Method 8100M[c]	UA	120	5.8	37
TPH: EPA Method 418.1 (mg/Kg)	UA	175	22	100

Notes:
[a] HLA 1994b.
[b] Value is between the Instrument Detection Limit and the Contract-Required Detection Limit.
[c] Alaska Department of Environmental Conservation modification.

Screening criteria consist of toxicological benchmarks from several sources (ENSR 1995). The lowest benchmark value was reported on this table. See Appendix E of the PSE2 report (ENSR 1995) for a complete list of benchmark values.

Shaded values exceed the benchmark.

Key:
mg/Kg = Milligrams per kilogram.
ND = Not detected. The analyte concentration is less than the method reporting limit shown in parentheses.
PCBs = Polychlorinated biphenyls.
PHCs = Petroleum hydrocarbons.
TPH = Total petroleum hydrocarbons.
UA = Unavailable.
µg/Kg = Micrograms per kilogram.
VOCs = Volatile organic compounds.

Table D-11
Analytes Detected in Sediment Samples during the PSE2
Cooling Ponds, Building 35-752[a]

Location:			A		B	C	D	E	F	G	H
Sample Depth (feet):			0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
Sample ID:			94575240SD	94575241SD	94575242SD	94575243SD	94575244SD	94575245SD	94575246SD	94575247SD	94575248SD
Laboratory Code:			K947714-001	K947714-002	K947714-003	K947714-004	K947714-005	K947714-006	K947714-007	K947714-008	K947714-009
Date Collected:			12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94
Total Petroleum Hydrocarbons (mg/Kg)	**Screening Criteria**	**MRL**									
TPH (Method 418.1)	UA	10	230	240	240	420	290	83	186	440	260
Organochlorine Pesticides: EPA Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**									
4,4'-DDD	0.002	0.01	0.03	0.1	0.03	0.02	0.07	<0.04	<0.1	<0.08	<0.05
4,4'-DDT	0.001	0.01	<0.2	<0.3	<0.02	<0.04	0.04	<0.04	<0.1	<0.08	<0.07
Polychlorinated Biphenyls: EPA Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**									
Aroclor-1260	0.005	0.1	0.3	0.5	0.4	0.8	0.1	0.5	2.2	4.5	3.4
Volatile Organic Compounds: EPA Method 8260 (µg/Kg)	**Screening Criteria**	**MRL**									
Acetone	64	50	160	170	190	420	210	240	110	180	230
2-Butanone (MEK)	UA	20	47	43	ND	58	33	20	ND	40	ND
1,1,1-Trichloroethane (TCA)	0.179	5	18	ND	ND	<10	ND	14	10	<10	ND
1,4-Dichlorobenzene	UA	5	ND	ND	ND	<10	ND	ND	ND	15	6
Semivolatile Organic Compounds: EPA Method 8270 (mg/Kg)	**Screening Criteria**	**MRL**									
Phenanthrene	0.225	0.3	ND	ND	ND	<4	0.4	2.2	1.5	1.5	0.7
Fluoranthene	0.6	0.3	ND	0.3	ND	<4	0.5	3.9	2.1	2.3	4.4
Pyrene	0.35	0.3	ND	ND	ND	<4	0.4	0.7	1.9	<0.8	5.4
Benz(a)anthracene	0.108	0.3	ND	ND	ND	<4	ND	0.6	ND	<0.8	1.5
Bis(2-ethylhexyl) Phthalate	8.9E5	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	0.4

Table D-11 (Cont'd)
Analytes Detected in Sediment Samples during PSE2
Cooling Ponds, Building 35-752[a]

Location:			A		B	C	D	E	F	G	H
Sample Depth (feet):			0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
Sample ID:			94575240SD	94575241SD	94575242SD	94575243SD	94575244SD	94575245SD	94575246SD	94575247SD	94575248SD
Laboratory Code:			K947714-001	K947714-002	K947714-003	K947714-004	K947714-005	K947714-006	K947714-007	K947714-008	K947714-009
Date Collected:			12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94	12/8/94
Semivolatile Organic Compounds: EPA Method 8270 (mg/Kg) (Cont'd)	**Screening Criteria**	**MRL**									
Chrysene	0.4	0.3	ND	ND	ND	<4	ND	1.1	0.8	<0.8	1.8
Benzo(b)fluoranthene	UA	0.3	ND	ND	ND	<4	ND	0.7	0.4	<0.8	2
Benzo(k)fluoranthene	UA	0.3	ND	ND	ND	<4	ND	0.4	0.5	<0.8	1.3
Benzo(a)pyrene	0.14	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	1.2
Indeno(1,2,3-cd)pyrene	UA	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	0.5
Benzo(g,h,i)perylene	UA	0.3	ND	ND	ND	<4	ND	ND	ND	<0.8	0.5
Total Metals: EPA Method 6010 except where noted (mg/Kg)	**Screening Criteria**	**MRL**									
Arsenic (Method 7060)	6	1	4	4	4	3	5	3	3	5	5
Barium	500	1	103	114	113	65	96	44	49	83	61
Chromium	26	2	34	35	43	33	46	33	26	45	43
Lead (Method 7421)	31	1	22	26	48	23	21	14	31	61	36
Nickel	16	10	29	30	37	31	42	35	40	44	40

[a] ENSR 1995.

Key:
MRL = Method reporting limit.
ND = Not detected above the MRL.
< = Less than. Analytical reporting limit has been elevated due to matrix interferences or sample requiring dilution.

Screening criteria consist of toxicological benchmarks from several sources (ENSR 1995). The lowest benchmark value was reported on this table. See Appendix E in the PSE2 Report (ENSR 1995) for a complete list of benchmark values.

Shaded values exceed the benchmark.

Table D-12
Analytes Detected in Soil Samples during the PSE2 Cooling Ponds, Building 35-752[a]

Location:			MW AP-3502				MW AP-3503			
Sample Depth (feet):			0-4	0-4	4-6	9-13	0-6	6-8	8-12	8-12
Sample ID:			94575227SL	94575228SL	94575229SL	94575230SL	94575231SL	94575232SL	94575233SL	94575234SL
Laboratory Code:			K946995-001	K946995-002	K946995-003	K946995-004	K947040-001	K947040-002	K947040-003	K947040-004
Date Collected:			11/7/94	11/7/94	11/7/94	11/7/94	11/8/94	11/8/94	11/8/94	11/8/94
PHCs: (mg/Kg)	**Screening Criteria**	**MRL**								
GRO (Method 8015M)	50-100[c]	5	8	ND	ND	ND	ND	ND	ND	ND
DRO (Method 8100M)	100-200[c]	10	107J	151J	24J	ND	55	34	ND	ND
TPH (Method 418.1)	UA	10	71	183	26	ND	64	18	ND	ND
Organochlorine Pesticides: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**								
4,4'-DDD	0.27[b]	0.01	<0.1	<0.1	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.19[b]	0.01	<0.1	<0.2	<0.02	ND	0.12	<0.04	ND	ND
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**								
Aroclor-1260	0.16[b]	0.1	2.3	8.7	0.7	ND	0.5	0.2	ND	ND
Total Metals: Method 6010 except where noted (mg/Kg)	**Screening Criteria**	**MRL**								
Arsenic (Method 7060)	2.3[b], 8.4[d]	1	5	5	5	5	5	4	4	4
Barium	550[b], 89.2[d]	1	99	91	89	46	47	54	69	56
Chromium	39[b], 43.8[d]	2	33	34	37	25	27	21	30	29
Lead (Method 7421)	400[e], 11.7[d]	1	9	11	7	6	9	5	7	6
Nickel	160[b], 51.5[d]	10	30	34	37	30	38	44	36	31

Table D-12 (Cont'd)
Analytes Detected in Soil Samples during the PSE2
Cooling Ponds, Building 35-752[a]

Location:			MW AP-3504					SB AP-3501
Sample Depth (feet):			0-2	4-10	4-10	10-14	14-16	10
Sample ID:			94575235SL	94575236SL	94575237SL	94575238SL	94575239SL	94575240SL
Laboratory Code:			K947072-001	K947072-002	K947072-003	K947072-004J	K947072-005	K7108-001
Date Collected:			11/9/94	11/9/94	11/9/94	11/9/94	11/9/94	11/11/94
PHCs: (mg/Kg)	**Screening Criteria**	**MRL**						
GRO (Method 8015M)	50-100[c]	5	ND	ND	ND	ND	ND	ND
DRO (Method 8100M)	100-200[c]	10	51	ND	ND	ND	29	100
TPH (Method 418.1)	UA	10	89	12	20	13	13	137
Organochlorine Pesticides: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**						
4,4'-DDD	0.27[b]	0.01	<0.08	ND	0.03	ND	ND	<0.15
4,4'-DDT	0.19[b]	0.01	0.1	ND	0.03	ND	ND	<0.30
PCBs: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**						
Aroclor-1260	0.16[b]	0.1	0.6	ND	ND	ND	ND	18.6
Total Metals: Method 6010 except where noted (mg/Kg)	**Screening Criteria**	**MRL**						
Arsenic (Method 7060)	2.3[b], 8.4[d]	1	5J	4J	5J	4J	6J	5
Barium	550[b], 89.2[d]	1	79	60	44	64	63	57
Chromium	39[b], 43.8[d]	2	32	38	31	36	36	38
Lead (Method 7421)	400[e], 11.7[d]	1	12	5	6	5	6	13J
Nickel	160[b], 51.5[d]	10	29	36	30	45	38	33

Table D-12 (Cont'd)
Analytes Detected in Soil Samples during the PSE2
Cooling Ponds, Building 35-752[a]

Location:			MW AP-3502				MW AP-3503			
Sample Depth (feet): Sample ID: Laboratory Code: Date Collected:			0-4 94575227SL K946995-001 11/7/94	0-4 94575228SL K946995-002 11/7/94	4-6 94575229SL K946995-003 11/7/94	9-13 94575230SL K946995-004 11/7/94	0-6 94575231SL K947040-001 11/8/94	6-8 94575232SL K947040-002 11/8/94	8-12 94575233SL K947040-003 11/8/94	8-12 94575234SL K947040-004 11/8/94
VOCs: Method 8260 (µg/Kg)	Screening Criteria	MRL								
Acetone	7.8E5[b]	50	420	710	ND	ND	ND	ND	ND	ND
Methylene Chloride	8.500[b]	10	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	4.7E6[b]	20	90	120	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	7.8E4[b]	5	6	ND	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	5,800[b]	5	ND	ND	6	ND	ND	ND	ND	ND
Total Xylenes	1.6E7[b]	5	16	11	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.9E5[b]	20	21	46	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	UA	20	ND	21	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	2,700[b]	5	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	3.1E5[b]	20	ND	36	ND	ND	ND	ND	ND	ND

Table D-12 (Cont'd)
Analytes Detected in Soil Samples during the PSE2
Cooling Ponds, Building 35-752[a]

Location:			MW AP-3504					SB AP-3501
Sample Depth (feet):			0-2	4-10	4-10	10-14	14-16	10
Sample ID:			94575235SL	94575236SL	94575237SL	94575238SL	94575239SL	94575240SL
Laboratory Code:			K947072-001	K947072-002	K947072-003	K947072-004]	K947072-005	K7108-001
Date Collected:			11/9/94	11/9/94	11/9/94	11/9/94	11/9/94	11/11/94
VOCs: Method 8260 (µg/Kg)	**Screening Criteria**	**MRL**						
Acetone	7.8E5[b]	50	ND	ND	ND	ND	ND	59
Methylene Chloride	8,500[b]	10	20	ND	ND	ND	ND	ND
2-Butanone (MEK)	4.7E6[b]	20	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	7.8E4[c]	5	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	5,800[b]	5	ND	12	19	ND	ND	ND
Total Xylenes	1.6E7[b]	5	8	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.9E5[b]	20	ND	ND	ND	ND	ND	ND
4-Isopropyltoluene	UA	20	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	2,700[b]	5	ND	ND	ND	ND	ND	7
Naphthalene	3.1E5[b]	20	ND	ND	ND	ND	ND	ND

Notes:
[a] ENSR 1995.
[b] Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for soil (EPA 1995a).
[c] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[d] Screening criteria 95 percent upper tolerance level background concentrations (E&E 1996).
[e] Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).
Shaded values exceed screening criteria.

Key:
< = Less than. Analytical reporting limit has been elevated due to matrix interference or sample requiring dilution; DRO = Diesel range organics; GRO = Gasoline range organics; J = Value is considered an estimate; MRL = method reporting limit; ND = Not detected above the MRL; PCBs = Polychlorinated biphenyls; PHCs = Petroleum hydrocarbons; TPH = Total petroleum hydrocarbons; UA = Unavailable; and UJ = The analyte was not detected at the MRL; however, the MRL is considered an estimate.

Table D-13
Results for Groundwater Samples from AP-2983 and AP-2987
Building 35-752[a]

Well: Sample Date:			AP-2983 October 1992	AP-2983 October 1993	AP-2987 October 1992	AP-2987 October 1992 (duplicate)[b]	AP-2987 October 1993	AP-2987 October 1993 (duplicate)[b]
VOCs: Method 8240 (µg/L)	**Screening Criteria**	**MRL**						
Benzene	5[d], 0.36[e]	1	ND	ND	170	160	94	86
Ethylbenzene	700[d], 1,300[e]	1	ND	ND	86	86	150	140
Methylene Chloride	5[d], 4.1[e]	5	ND	ND	ND	ND	ND	4J
Toluene	1,000[d], 750[e]	1	ND	ND	370[c]	390[c]	300[c]	280
1,1,1-Trichloroethane	200[d], 1,300[e]	1	ND	ND	10	10	ND	13
Trichloroethene	5[d], 1.6[e]	1	ND	ND	3	3	3	3
Xylenes	10,000[d], 12,000[e]	1	ND	ND	370	340	710	640
PCBs: Method 8080 (µg/L)	**Screening Criteria**	**MRL**						
Aroclor-1260	0.5[d], 0.73[e]	1.0	ND	ND	ND	ND	ND	ND

Notes:
[a] ENSR 1994a.
[b] Field duplicate sample of AP-2987.
[c] Value from a five-fold diluted analysis.
[d] Screening criteria Maximum Contaminant Levels (EPA 1995a).
[e] Screening criteria EPA Region 3 Risk-Based Concentrations (EPA 1995b).

Shaded values exceed screening criteria.

Key:
J = Value is considered and estimate.
MRL = Method reporting limit.
ND = Not detected above the MRL.
PCBs = Polychlorinated biphenyls.
VOCs = Volatile organic compounds.

Table D-14
Results for Groundwater Samples from AP-2982, AP-2985, and AP-3231

Well:			AP-2982			AP-2985			AP-3231		
Sample Date:			3/18/94	9/13/94	4/11/95	3/18/94	9/13/94	4/11/95	3/18/94	9/13/94	4/11/95
PHCs: (µg/L)	**Screening Criteria**	**MRL**									
GRO (Method 8015M)	15[b]	50	ND	1,160[1,040][1,000]	7,790[7,100][8,400]	ND	ND	ND	ND	ND	ND
DRO (Method 8100M)	15[b]	50	508[a]	400[400][640]	4,200[a][4,500[a]][4,600J]	87[a]	ND(100)	500[a]	85[a]	ND(200)	500[a]
PCBs: Method 8080 (µg/L)	**Screening Criteria**	**MRL**									
Aroclor 1260	0.5[c], 0.73[d]	0.1	ND	ND(ND)[ND(0.5)]	0.804J[0.794J][ND(0.48)]	ND	ND	ND(0.4)J	ND	ND	ND(0.4)J
VOCs: Method 8260 (µg/L)	**Screening Criteria**	**MRL**									
Acetone	3,700[d]	2	10	ND(5)[ND(5)][ND(2)]	ND(10)[ND(10)][ND(0.5)]	ND	ND	ND(10)	14	ND(5)	ND(10)
Benzene	5[c], 0.35[d]	0.5	4.5	91[86][120]	230[250][335J]	ND	ND(2)	ND	ND	ND(2)	ND
1,1-Dichloroethane	UA	0.5	0.6	ND(2)[ND(2)][ND(1)]	1.1[1.2][1.19J]	ND	ND(2)	ND	ND	ND(2)	ND
1,2-Dichloroethane	5[c], 0.12[d]	0.5	1.2	ND(2)[ND(2)][ND(1)]	ND[ND][6.94J]	ND	ND(2)	ND	2.5	ND(2)	ND
1,1,1-Trichloroethane	200[c], 1,300[d]	0.5	5.4	ND(2)[ND(2)][15]	48[51][46.8J]	ND	ND(2)	ND	ND	ND(2)	ND
Trichloroethene	5[c], 1.6[d]	0.5	0.6	ND(2)[ND(2)][1.3]	3.3[3.6][4.21J]	ND	ND(2)	ND	1.4	ND(2)	11
Ethylbenzene	700[c], 1,300[d]	0.5	ND(0.6)	71[57][87]	320[340][480J]	ND	ND(2)	ND	ND	ND(2)	ND
Naphthalene	1,500[d]	2	ND	13[11][15]	54[65][80.6J]	ND	ND(5)	ND(1)	ND	ND(5)	ND(1)
Isopropylbenzene	UA	2	ND	4[3][3.3]	16[17][19.4J]	ND	ND(2)	ND(1)	ND	ND(2)	ND(1)
n-Propylbenzene	UA	2	ND	6[5][5.7]	26[28][29.5J]	ND	ND(2)	ND(1)	ND	ND(2)	ND(1)
1,2,4-Trimethylbenzene	300[d]	2	ND	40[35][38]	170[180][275J]	ND	ND(2)	ND(1)	ND	ND(2)	ND(1)
1,3,5-Trimethylbenzene	300[d]	2	ND	31[10][10]	46[50][53.6J]	ND	ND(2)	ND(1)	ND	ND(2)	ND(1)
Toluene	1,000[c], 750[d]	0.5	ND	280[120][260]	1,600[1,600][1,680]	ND	ND(2)	ND	ND	ND(2)	ND
Xylenes	10,000[c], 12,000[d]	0.5	ND(0.7)	285[242][NR]	1,500[1,600][NR]	ND	ND(2)	ND	ND	ND(2)	ND
Total Metals: Method 6010 except where noted (µg/L)	**Screening Criteria**	**MRL**									
Aluminum	37,000[d]	50	3,660	57,900[41,300][31,000]	1,000[1,200][1,100]	8,750	77,900	9,000	86,800	93,100	12,400

Table D-14 (Cont'd)
Results for Groundwater Samples from AP-2982, AP-2985, and AP-3231

Well:			AP-2982			AP-2985			AP-3231		
Sample Date:			3/18/94	9/13/94	4/11/95	3/18/94	9/13/94	4/11/95	3/18/94	9/13/94	4/11/95
Arsenic (Method 7060)	50[c], 11[d]	5	ND	16[14][ND]	ND[ND][0.85]	5	26	ND	46	22	8
Barium	2,000[c], 2,600[d]	5	30	420[333][220]	22[33][22]	66	476	72	860	899	221
Calcium	UA	UA	27,200	31,400[30,500][27,000]	42,400[45,100][50,400]	55,400	38,300	37,100	36,700	33,400	45,300
Chromium	100[c], 180[d]	5	6	115[79][60]	ND(10)[10][ND(0.5)]	12	122	20	139	158	20
Cobalt	2,200[d]	10	ND	33[31][ND(50)]	10[20][9.5]	ND	60	11	82	95	10
Copper	1,300[c], 1,500[d]	10	ND	146[115][100]	ND[20][9.4]	22	186	20	323	305	50
Iron	300[e], 11,000[d]	20	5,380	64,500[46,200][43,000]	1,240[1,480][1,600]	10,900	88,500	9,390	126,000	116,700	16,900
Lead (Method 7421)	15[c]	2	2	20[19][12]	ND[ND][1.4]	8	28	14	54	27	8
Magnesium	UA	UA	6,070	22,900[16,800][16,000]	8,910[9,460][10,200]	12,100	24,900	9,030	35,700	30,500	12,500
Manganese	50[e], 180[d]	5	814	2,360[2,180][1,900]	3,940[4,310][4,500]	391	2,940	440	4,760	4,580	635
Mercury	2[c], 11[d]	0.5	1.0	ND[ND][ND]	ND[ND][ND(0.02)]	ND	0.5	ND	1.3	1.4	ND
Nickel	730[d]	20	ND	120[71][70]	ND(30)[ND(30)][22]	ND	164	ND(30)	247	261	ND(30)
Potassium	UA	2,000	ND	7,600[5,900][3,800]	ND(1,000)[ND(1,000)][ND(1,000)]	ND	7,200	ND(1,000)	6,700	10,300	ND(1,000)
Sodium	UA	UA	7,600	8,700[8,080][8,400]	9,800[10,100][10,300]	13,400	10,500	13,900	9,630	9,010	11,500
Vanadium	260[d]	10	11	133[99][80]	ND(10)[20][ND(5)]	23	163	30	225	190	40
Zinc	5,000[e]	10	18	211[162][130]	20[40][29]	44	264	50	404	352	70

Analytical results from Chemical Data Report, Groundwater Study (Spring 1994), Fort Richardson, Alaska (USACE 1994).

Notes:
[a] Not a typical diesel chromatogram.
[b] Screening criteria Alaska Water Quality Criteria (18 AAC 70).
[c] Screening criteria Primary Maximum Contaminant Level (MCL) (EPA 1995a).
[d] Screening criteria EPA Region 3 Risk-Based Concentration (EPA 1995b).
[e] Screening criteria Secondary MCL (EPA 1995a).

Key: [ ] = Duplicate/triplicate sample result; DRO = diesel-range organic; GRO = gasoline-range organic; J = estimated value; MRL = method reporting limit; ND = Non-detected at the MRL, or detection limit in parentheses; NR = Not reported; PCB = polychlorinated biphenyl; PHC = petroleum hydrocarbon; VOC = volatile organic compound; UA = Unavailable.
Shaded values exceed screening criteria.

Table D-15
Summary of Waste Accumulation Closure Soil Samples, Building 45-590[a]

Method		Maximum Concentration Detected (mg/Kg)	Background Concentration (ppm)
Metals: Method 6010 (mg/kg)	**Screening Criteria**		
Barium	550[b]	91.0	8.8[e]
Chromium	39[b]	53.0	43.8[e]
Lead	400[d]	69.0	14.2[e]
VOCs: Method 8260 (µg/kg)	**Screening Criteria**		
Methylene Chloride	8,500[c]	8.05	N/A
SVOCs: Method 8240 (mg/kg)	**Screening Criteria**		
Fluoranthene	310[b]	11	N/A
Fluorene	310[b]	10	N/A
Phenanthrene	UA	20	N/A
PHCs:	**Screening Criteria**		
DRO Method 8100M	2,000[c]	1,210	N/A
TPH Method 418.1	UA	2,910	N/A
Residual Range Petroleum Hydrocarbons (TPH, DRO, GRO)	2,000[c]	1,700	N/A

Notes:
[a] EMCON 1994c.
[b] One-tenth of the risk-based concentration from EPA Region III table, March 7, 1995.
[c] Soil target cleanup levels from ADEC UST Regulations, 1995 (Level D for the Waste Accumulation area).
[d] EPA's cleanup standard for lead in soil (Wilkening 1995).
[e] Background concentrations (E&E 1996).

Key:
DRO = Diesel range organics; GRO = Gasoline range organics; N/A = Not applicable; PHC = Petroleum hydrocarbons; SVOC = semivolatile organic compounds; TPH = Total petroleum hydrocarbons; UA = Unavailable; and VOC = Volatile organic compounds.

Table D-16
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT219SL A-1 AP-3159 5 K2690-1	93RUT220SL A-1 AP-3159 10 K2690-2 93RUT221SL	93RUT221SL A-1 AP-3159 10 K2690-3 93RUT220SL	93RUT222SL A-1 AP-3159 15 K2690-4	93RUT223SL A-1 AP-3159 20 K2690-5	93RUT224SL A-1 AP-3159 25 K2690-6	93RUT225SL A-1 AP-3159 30 K2690-7
Metals: EPA Method 6010[b] except where noted (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[e], 8.4[g]	11	7	--	8	6	--	--
Chromium	39[e], 43.8[g]	34	37	--	36	37	--	--
Lead (Method 7421)	11.7[g], 400[h]	8	8	--	8	6	--	--
PHCs: (mg/Kg)	**Screening Criteria**							
TRPH: Method 418.1[b]	UA	50	20	25	15	26	17	31
GRO: Method 8015M[c]	50-100[f]	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	--	ND(5)
DRO: Method 8100M[c]	100-200[f]	ND(10)	ND(10)	--	11	29	--	ND(10)
VOCs: EPA Method 8010/8020[b] (µg/Kg)	**Screening Criteria**							
Trichlorofluoromethane	2.3E6[e]	ND(50)	ND(50)	--	ND(50)	ND(50)	--	--
Chlorobenzene	1.6E5[e]	ND(50)	ND(50)	--	ND(50)	ND(50)	--	--
Benzene	2,200[e], 100-500[f]	ND(50)	ND(50)	ND(50)	ND(50)	ND(50)	--	--
Toluene	1.6E6[e]	ND(10)	ND(10)	ND(10)	ND(10)	ND(10)	--	--
Ethylbenzene	7.8E5[e]	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	--	--
Total Xylenes	1.6E7[e]	ND(100)	ND(100)	ND(100)	ND(100)	ND(100)	--	--
Chlorinated Pesticides: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
4,4'-DDT	0.19[e]	--	--	--	--	--	--	--
PCBs: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
Aroclor-1254	0.16[e]	ND(1)	ND(1)	ND(1)	ND(1)	ND(1)	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT226SL A-1 AP-3159 35 K2690-8 93RUT227SL	93RUT227SL A-1 AP-3159 35 K2690-9 93RUT226SL	93RUT228SL A-1 AP-3159 40 K2690-10 93RUT229SL	93RUT229SL A-1 AP-3159 40 K2690-11 93RUT228SL	93RUT230SL A-1 AP-3159 45 K2690-12	93RUT231SL A-1 AP-3159 50 K2690-13	93RUT232SL A-2 AP-3160 5 K2717-1
Metals: EPA Method 6010[b] except where noted (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[c], 8.4[g]	4	--	3	--	--	--	5
Chromium	39[f], 43.8[g]	30	--	28	--	--	--	38
Lead (Method 7421)	11.7[g], 400[h]	5	--	5	--	--	--	7
PHCs: (mg/Kg)	**Screening Criteria**							
TRPH: Method 418.1[b]	UA	23	--	24	--	18	23	77
GRO: Method 8015M[c]	50-100[f]	ND(5)	--	ND(5)	--	--	--	ND(5)
DRO: Method 8100M[c]	100-200[f]	19	16	ND(10)	--	--	--	45
VOCs: EPA Method 8010/8020[b] (µg/Kg)	**Screening Criteria**							
Trichlorofluoromethane	2.3E6[c]	ND(50)	--	ND(50)	(ND50)	--	--	ND(50)
Chlorobenzene	1.6E5[c]	ND(50)	--	ND(50)	--	--	--	ND(50)
Benzene	2,200[c], 100-500[f]	ND(50)	--	ND(50)	--	--	--	ND(50)
Toluene	1.6E6[c]	ND(10)	--	ND(10)	--	--	--	ND(100)
Ethylbenzene	7.8E5[c]	ND(100)	--	ND(100)	--	--	--	ND(100)
Total Xylenes	1.6E7[c]	ND(100)	--	ND(100)	--	--	--	ND(100)
Chlorinated Pesticides: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
4,4'-DDT	0.19[c]	--	--	--	--	--	--	--
PCBs: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
Aroclor-1254	0.16[c]	ND(1)	--	ND(1)	--	--	--	ND(1)

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT234SL A-2 AP-3160 10 K2717-2 93RUT235SL	93RUT235SL A-2 AP-3160 10 K2717-3 93RUT234SL	93RUT236SL A-2 AP-3160 15 K2717-4 93RUT237SL	93RUT237SL A-2 AP-3160 15 K2717-5 93RUT236SL	93RUT238SL A-2 AP-3160 20 K2717-6 93RUT239SL	93RUT239SL A-2 AP-3160 20 K2717-7 93RUT238SL	93RUT240SL A-2 AP-3160 25 K2717-8 93RUT241SL
Metals: EPA Method 6010[b] except where noted (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[e], 8.4[g]	6	9Σ	7	--	6	--	7
Chromium	39[e], 43.8[g]	41	45	34	--	41	--	40
Lead (Method 7421)	11.7[g], 400[h]	6	8Σ	8	--	7	--	6
PHCs: (mg/Kg)	**Screening Criteria**							
TRPH: Method 418.1[b]	UA	ND(10)	--	950	--	1,900	2,300	2,500
GRO: Method 8015M[c]	50-100[f]	ND(5)	ND(5)	167	--	151	--	340
DRO: Method 8100M[c]	100-200[f]	ND(10)	--	645	907 α,β	2,600*	--	3,090*
VOCs: EPA Method 8010/8020[b] (µg/Kg)	**Screening Criteria**							
Trichlorofluoromethane	2.3E6[e]	ND(50)	--	ND(50)	--	ND(50)	--	ND(50)
Chlorobenzene	1.6E5[e]	ND(50)	--	ND(50)	--	ND(50)	ND(50)	ND(50)
Benzene	2,200[e], 100-500[f]	ND(50)	--	ND(50)	--	ND(50)	--	ND(50)
Toluene	1.6E6[e]	ND(100)	--	ND(100)	--	ND(100)	ND(100)	ND(100)
Ethylbenzene	7.8E5[e]	ND(100)	--	ND(500)	--	ND(500)	500	ND(500)
Total Xylenes	1.6E7[e]	ND(100)	--	ND(1,000)	--	ND(1,000)	2,500	ND(1,000)
Chlorinated Pesticides: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
4,4'-DDT	0.19[e]	--	--	--	--	--	--	--
PCBs: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
Aroclor-1254	0.16[e]	ND(1)	--	ND(1)	--	ND(1)	ND(1)	ND(1)

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT241SL A-2 AP-3160 25 K2717-9 93RUT240SL	93RUT242SL A-2 AP-3160 30 K2717-10	93RUT243SL A-2 AP-3160 35 K2717-11	93RUT244SL A-2 AP-3160 40 K2717-12	93RUT245SL A-2 AP-3160 45 K2717-13	93RUT246SL A-2 AP-3160 50 K2717-14	93RUT247SL A-3 AP-3161 5 K2737-1
Metals: EPA Method 6010[b] except where noted (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[e], 8.4[g]	--	5	--	--	4	--	6
Chromium	39[e], 43.8[g]	--	32	--	--	43	--	33
Lead (Method 7421)	11.7[g], 400[h]	--	6	--	--	5	--	7
PHCs: (mg/Kg)	**Screening Criteria**							
TRPH: Method 418.1[b]	UA	--	2,100	53	470	86	1,000	ND(10)
GRO: Method 8015M[c]	50-100[f]	--	169	ND(5)	ND(5)	ND(5)	13	ND(5)
DRO: Method 8100M[c]	100-200[f]	--	2,120	75	372	81	605	ND(10)
VOCs: EPA Method 8010/8020[b] (µg/Kg)	**Screening Criteria**							
Trichlorofluoromethane	2.3E6[e]	ND(50)	ND(50)	--	ND(50)	ND(50)	--	ND(50)
Chlorobenzene	1.6E5[e]	--	ND(50)	--	ND(50)	ND(50)	--	ND(50)
Benzene	2,200[e], 100-500[f]	--	ND(50)	--	ND(50)	ND(50)	ND(50)	ND(50)
Toluene	1.6E6[e]	--	ND(100)	--	ND(100)	ND(100)	ND(100)	ND(100)
Ethylbenzene	7.8E5[e]	--	ND(100)	--	ND(100)	ND(100)	ND(100)	ND(100)
Total Xylenes	1.6E7[e]	--	ND(1,000)	--	ND(100)	ND(100)	100	ND(100)
Chlorinated Pesticides: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
4,4'-DDT	0.19[e]	--	--	--	--	--	--	--
PCBs: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
Aroclor-1254	0.16[e]	--	ND(1)	--	ND(1)	ND(1)	--	ND(1)

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT248SL A-3 AP-3161 10 K2737-2	93RUT249SL A-3 AP-3161 15 K2737-3 93RUT250SL	93RUT250SL A-3 AP-3161 15 K2737-4 93RUT249SL	93RUT251SL A-3 AP-3161 20 K2737-5	93RUT267SL A-4 AP-3238 5 178973 178976 93RUT268SL	93RUT268SL A-4 AP-3238 5 178974 178977 93RUT267SL	93RUT269SL A-4 AP-3238 10 178975 178978
Metals: EPA Method 6010[b] except where noted (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[e], 8.4[g]	7	7	6	6	4.2	4.1	3.7
Chromium	39[e], 43.8[g]	40	31	36β	31	47	31	31
Lead (Method 7421)	11.7[g], 400[h]	7	7	6β	7	199Σ	55Σ	4.7Σ
PHCs: (mg/Kg)	**Screening Criteria**							
TRPH: Method 418.1[b]	UA	ND(10)	ND(10)	--	ND(10)	618	1,040	42
GRO: Method 8015M[c]	50-100[f]	ND(5)	ND(5)	ND(5)	ND(5)	ND(1.1)	5.0	ND(1.2)
DRO: Method 8100M[c]	100-200[f]	ND(10)	ND(10)	--	ND(10)	419Σ	184Σ	8.4Σ
VOCs: EPA Method 8010/8020[b] (μg/Kg)	**Screening Criteria**							
Trichlorofluoromethane	2.3E6[e]	ND(50)	ND(50)	--	ND(50)	22,800	61,300	ND(2.4)
Chlorobenzene	1.6E5[e]	ND(50)	ND(50)	--	ND(50)	ND(2.2)	12	ND(2.4)
Benzene	2,200[e], 100-500[f]	ND(50)	ND(50)	--	ND(50)	ND(2.7)	ND(2.7)	ND(3)
Toluene	1.6E6[e]	ND(100)	ND(100)	--	ND(100)	ND(2.7)	ND(2.7)	ND(3)
Ethylbenzene	7.8E5[e]	ND(100)	ND(100)	--	ND(100)	ND(3.3)	ND(3.3)	ND(3.6)
Total Xylenes	1.6E7[c]	ND(100)	ND(100)	--	ND(100)	ND(3.3)	3.8	ND(3.6)
Chlorinated Pesticides: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
4,4'-DDT	0.19[e]	--	--	--	--	0.0060	0.0081	ND(0.003)
PCBs: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
Aroclor-1254	0.16[e]	ND(1)	ND(1)	--	ND(1)	ND(0.055)	0.130	ND(0.055)

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Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT270SL A-4 AP-3238 15 178979	93RUT271SL A-4 AP-3238 20 178980	93RUT272SL A-4 AP-3238 25 178981	93RUT273SL A-5 AP-3239 5 179043 179056	93RUT274SL A-5 AP-3239 10 179044 179057	93RUT275SL A-5 AP-3239 15 179055 179067	93RUT276SL A-5 AP-3239 20 179045 179058 93RUT277SL
Metals: EPA Method 6010[b] except where noted (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[e], 8.4[g]	--	--	--	--	--	--	--
Chromium	39[e], 43.8[g]	--	--	--	--	--	--	--
Lead (Method 7421)	11.7[g], 400[h]	--	--	--	--	--	--	--
PHCs: (mg/Kg)	**Screening Criteria**							
TRPH: Method 418.1[b]	UA	35	29	11	--	--	--	--
GRO: Method 8015M[c]	50-100[f]	--	--	--	ND(1.0)	ND(1.0)	117	180
DRO: Method 8100M[c]	100-200[f]	--	--	--	7.7	63	2,240	2,600
VOCs: EPA Method 8010/8020[b] (µg/Kg)	**Screening Criteria**							
Trichlorofluoromethane	2.3E6[e]	--	--	--	--	--	--	--
Chlorobenzene	1.6E5[e]	--	--	--	--	--	--	--
Benzene	2,200[e], 100-500[f]	--	--	--	ND(2.6)	ND(2.6)	ND(128)	ND(2.8)
Toluene	1.6E6[e]	--	--	--	ND(2.6)	ND(2.6)	ND(128)	ND(2.8)
Ethylbenzene	7.8E5[e]	--	--	--	ND(2.6)	ND(2.6)	ND(128)	ND(2.8)
Total Xylenes	1.6E7[e]	--	--	--	ND(2.6)	ND(2.6)	ND(128)	ND(2.8)
Chlorinated Pesticides: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
4,4'-DDT	0.19[e]	--	--	--	--	--	--	--
PCBs: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
Aroclor-1254	0.16[e]	--	--	--	--	--	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT277SL A-5 AP-3239 20 179046 179059 93RUT276SL	93RUT278SL A-5 AP-3239 25 179047 179060	93RUT279SL A-5 AP-3239 30 179048 179061	93RUT280SL A-5 AP-3239 35 179049 179062	93RUT281SL A-5 AP-3239 40 179050 179063	93RUT282SL A-5 AP-3239 45 179051 179064	93RUT283SL A-5 AP-3239 50 179052 179068
Metals: EPA Method 6010[b] except where noted (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[e], 8.4[g]	--	--	--	--	--	--	--
Chromium	39[e], 43.8[g]	--	--	--	--	--	--	--
Lead (Method 7421)	11.7[g], 400[h]	--	--	--	--	--	--	--
PHCs: (mg/Kg)	**Screening Criteria**							
TRPH: Method 418.1[b]	UA	--	--	--	--	--	--	--
GRO: Method 8015M[c]	50-100[f]	95	95	204	255	106	153	ND(107)
DRO: Method 8100M[c]	100-200[f]	2,180	1,830	4,920	4,140	2,010	3,480	2,960
VOCs: EPA Method 8010/8020[b] (µg/Kg)	**Screening Criteria**							
Trichlorofluoromethane	2.3E6[e]	--	--	--	--	--	--	--
Chlorobenzene	1.6E5[e]	--	--	--	--	--	--	--
Benzene	2,200[e], 100-500[f]	ND(2.8)	ND(2.8)	ND(268)	ND(266)	ND(127)	ND(273)	ND(266)
Toluene	1.6E6[e]	ND(2.8)	ND(2.8)	ND(268)	ND(266)	ND(127)	ND(273)	ND(266)
Ethylbenzene	7.8E5[e]	ND(2.8)	ND(2.8)	ND(268)	ND(266)	ND(127)	ND(273)	ND(266)
Total Xylenes	1.6E7[e]	ND(2.8)	ND(2.8)	ND(268)	ND(266)	ND(127)	ND(273)	ND(266)
Chlorinated Pesticides: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
4,4'-DDT	0.19[e]	--	--	--	--	--	--	--
PCBs: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**							
Aroclor-1254	0.16[e]	--	--	--	--	--	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT284SL A-5 AP-3239 55 179053 179065	93RUT285S L A-5 AP-3239 60 179054 179066	93RUT286S L A-7 AP-3241 10 179216 179222	93RUT287SL A-7 AP-3241 20 179217 179223 93RUT288SL	93RUT288SL A-7 AP-3241 20 179218 179224 93RUT287SL	93RUT289SL A-7 AP-3241 30 179219 179225	93RUT290SL A-7 AP-3241 45 179220 179226	93RUT291L A-7 AP-3241 55 179228 179229
Metals: EPA Method 6010[b] except where noted (mg/Kg)	**Screening Criteria**								
Arsenic (Method 7060)	2.3[c], 8.4[d]	--	--	--	--	--	--	--	--
Chromium	39[e], 43.8[d]	--	--	--	--	--	--	--	--
Lead (Method 7421)	11.7[c], 400[b]	--	--	--	--	--	--	--	--
PHCs: (mg/Kg)	**Screening Criteria**								
TRPH: Method 418.1[b]	UA	--	--	--	--	--	--	--	--
GRO: Method 8015M[c]	50-100[f]	33	64	ND(1.0)	706	404	828	1,370	--
DRO: Method 8100M[c]	100-200[f]	1,270	1,660	11	849**	1,410**	2,010**	2,910**	1,600**
VOCs: EPA Method 8010/8020[b] (µg/Kg)	**Screening Criteria**								
Trichlorofluoromethane	2.3E6[c]	--	--	--	--	--	--	--	--
Chlorobenzene	1.6E5[c]	--	--	--	--	--	--	--	--
Benzene	2,200[a], 100-500[f]	ND(26)	ND(26)	ND(26)	ND(543)	ND(27.3)	ND(538)	ND(527)	ND(50)
Toluene	1.6E6[c]	ND(26)	ND(26)	ND(26)	ND(543)	ND(27.3)	ND(538)	ND(527)	ND(50)
Ethylbenzene	7.8E5[c]	ND(26)	ND(26)	ND(26)	ND(543)	ND(27.3)	ND(538)	ND(527)	ND(50)
Total Xylenes	1.6E7[c]	ND(26)	ND(26)	ND(26)	ND(543)	ND(27.3)	ND(538)	ND(527)	400
Chlorinated Pesticides: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**								
4,4'-DDT	0.19[e]	--	--	--	--	--	--	--	--
PCBs: EPA Method 8080[b] (mg/Kg)	**Screening Criteria**								
Aroclor-1254	0.16[e]	--	--	--	--	--	--	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT292SL A-7 AP-3241 65 179221 179227	93RUT293SL A-6 AP-3240 10 179305 179316 93RUT294SL	93RUT294SL A-6 AP-3240 10 179306 179317 93RUT293SL	93RUT295SL A-6 AP-3240 20 179307 179318	93RUT296SL A-6 AP-3240 30 179308 179319	93RUT297SL A-6 AP-3240 40 179309	93RUT298SL A-6 AP-3240 50 179310 179320	93RUT299SL A-6 AP-3240 54 179311 179321
Metals: EPA Method 6010[b] except where noted (mg/Kg)	Screening Criteria								
Arsenic (Method 7060)	2.3[e], 8.4[g]	--	--	--	--	--	--	--	--
Chromium	39[e], 43.8[g]	--	--	--	--	--	--	--	--
Lead (Method 7421)	11.7[g], 400[h]	--	--	--	--	--	--	--	--
PHCs: (mg/Kg)	Screening Criteria								
TRPH: Method 418.1[b]	UA	--	--	--	--	--	--	--	--
GRO: Method 8015M[c]	50-100[f]	4.4	ND(1.1)	ND(1.1)	45	3.8	ND(1.0)	ND(1.1)	--
DRO: Method 8100M[c]	100-200[f]	564**	37	458	563	237	--	8.9	10
VOCs: EPA Method 8010/8020[b] (µg/Kg)	Screening Criteria								
Trichlorofluoromethane	2.3E6[e]	--	--	--	--	--	--	--	--
Chlorobenzene	1.6E5[e]	--	--	--	--	--	--	--	ND(2.1)
Benzene	2,200[e], 400-500[f]	ND(2.6)	ND(2.7)	ND(2.7)	47	ND(2.6)	ND(2.6)	ND(2.6)	ND(2.6)
Toluene	1.6E6[e]	ND(2.6)	ND(2.7)	ND(2.7)	39	ND(2.6)	ND(2.6)	ND(2.6)	ND(2.6)
Ethylbenzene	7.8E5[e]	ND(2.6)	ND(2.7)	ND(2.7)	ND(27)	ND(2.6)	ND(2.6)	ND(2.6)	ND(3.1)
Total Xylenes	1.6E7[e]	ND(2.6)	ND(2.7)	ND(2.7)	ND(27)	21	ND(2.6)	ND(2.6)	ND(3.1)
Chlorinated Pesticides: EPA Method 8080[b] (mg/Kg)	Screening Criteria								
4,4'-DDT	0.19[e]	--	--	--	--	--	--	--	--
PCBs: EPA Method 8080[b] (mg/Kg)	Screening Criteria								
Aroclor-1254	0.16[e]	--	--	--	--	--	--	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT219SL A-1 AP-3159 5 K2690-1	93RUT220SL A-1 AP-3159 10 K2690-2 93RUT221SL	93RUT221SL A-1 AP-3159 10 K2690-3 93RUT220SL	93RUT222SL A-1 AP-3159 15 K2690-4	93RUT223SL A-1 AP-3159 20 K2690-5	93RUT224SL A-1 AP-3159 25 K2690-6	93RUT225SL A-1 AP-3159 30 K2690-7
SVOCs: EPA Method 8270[b] (mg/Kg)	**Screening Criteria**							
bis(2-Ethylhexyl)phthalate	4.6[c]	--	--	--	--	--	--	--
Anthracene	2.3E6[c]	--	--	--	--	--	--	--
Fluorene	310[c]	--	--	--	--	--	--	--
2-Methylnaphthalene	UA	--	--	--	--	--	--	--
Naphthalene	310[c]	--	--	--	--	--	--	--
Number of TICs	N/A	--	--	--	--	--	--	--
Sum of estimated TIC concentrations	N/A	--	--	--	--	--	--	--
Other: Method D4129-82M[d] (%)	**Screening Criteria**							
Total Organic Carbon	N/A	--	0.12**	--	--	--	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT226SL A-1 AP-3159 35 K2690-8 93RUT227SL	93RUT227SL A-1 AP-3159 35 K2690-9 93RUT226SL	93RUT228SL A-1 AP-3159 40 K2690-10 93RUT229SL	93RUT229SL A-1 AP-3159 40 K2690-11 93RUT228SL	93RUT230SL A-1 AP-3159 45 K2690-12	93RUT231SL A-1 AP-3159 50 K2690-13	93RUT232SL A-2 AP-3160 5 K2717-1
SVOCs: EPA Method 8270[b] (mg/Kg)	**Screening Criteria**							
bis(2-Ethylhexyl)phthalate	4.6[c]	ND(0.3)	ND(0.3)	--	--	--	--	ND(0.3)
Anthracene	2.3E6[d]	ND(0.3)	ND(0.3)	--	--	--	--	ND(0.3)
Fluorene	310[d]	ND(0.3)	ND(0.3)	--	--	--	--	ND(0.3)
2-Methylnaphthalene	UA	ND(0.3)	ND(0.3)	--	--	--	--	ND(0.3)
Naphthalene	310[d]	ND(0.3)	ND(0.3)	--	--	--	--	ND(0.3)
Number of TICs	N/A	0	0	--	--	--	--	0
Sum of estimated TIC concentrations	N/A	0	0	--	--	--	--	0
Other: Method D4129-82M[b] (%)	**Screening Criteria**							
Total Organic Carbon	N/A	--	--	--	--	--	--	0.17**

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT234SL A-2 AP-3160 10 K2717-2 93RUT235SL	93RUT235SL A-2 AP-3160 10 K2717-3 93RUT234SL	93RUT236SL A-2 AP-3160 15 K2717-4 93RUT237SL	93RUT237SL A-2 AP-3160 15 K2717-5 93RUT236SL	93RUT238SL A-2 AP-3160 20 K2717-6 93RUT239SL	93RUT239SL A-2 AP-3160 20 K2717-7 93RUT238SL	93RUT240SL A-2 AP-3160 25 K2717-8 93RUT241SL
SVOCs: EPA Method 8270[b] (mg/Kg	**Screening Criteria**							
bis(2-Ethylhexyl)phthalate	4.6[c]	--	--	ND(0.3)	--	--	--	--
Anthracene	2.3E6[c]	--	--	ND(0.3)	--	--	--	--
Fluorene	310[c]	--	--	ND(0.3)	--	--	--	--
2-Methylnaphthalene	UA	--	--	ND(0.3)	--	--	--	--
Naphthalene	310[c]	--	--	ND(0.3)	--	--	--	--
Number of TICs	N/A	--	--	20	--	--	--	--
Sum of estimated TIC concentrations	N/A	--	--	26.4	--	--	--	--
Other: Method D4129-82M[b] (%)	**Screening Criteria**							
Total Organic Carbon	N/A	--	--	0.15**	--	--	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT241SL A-2 AP-3160 25 K2717-9 93RUT240SL	93RUT242SL A-2 AP-3160 30 K2717-10	93RUT243SL A-2 AP-3160 35 K2717-11	93RUT244SL A-2 AP-3160 40 K2717-12	93RUT245SL A-2 AP-3160 45 K2717-13	93RUT246SL A-2 AP-3160 50 K2717-14	93RUT247SL A-3 AP-3161 5 K2737-1
SVOCs: EPA Method 8270[b] (mg/Kg)	**Screening Criteria**							
bis(2-Ethylhexyl)phthalate	4.6[c]	--	--	--	--	--	--	--
Anthracene	2.3E6[c]	--	--	--	--	--	--	--
Fluorene	310[c]	--	--	--	--	--	--	--
2-Methylnaphthalene	UA	--	--	--	--	--	--	--
Naphthalene	310[c]	--	--	--	--	--	--	--
Number of TICs	N/A	--	--	--	--	--	--	--
Sum of estimated TIC concentrations	N/A	--	--	--	--	--	--	--
Other: Method D4129-82M[d] (%)	**Screening Criteria**							
Total Organic Carbon	N/A	--	--	--	--	--	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT248SL A-3 AP-3161 10 K2737-2	93RUT249SL A-3 AP-3161 15 K2737-3 93RUT250SL	93RUT250SL A-3 AP-3161 15 K2737-4 93RUT249SL	93RUT251SL A-3 AP-3161 20 K2737-5	93RUT267SL A-4 AP-3238 5 178973 178976 93RUT268SL	93RUT268SL A-4 AP-3238 5 178974 178977 93RUT267SL	93RUT269SL A-4 AP-3238 10 178975 178978
SVOCs: EPA Method 8270[b] (mg/Kg)	**Screening Criteria**							
bis(2-Ethylhexyl)phthalate	4.6[c]	--	ND(0.3)	--	--	0.210	ND(0.358)	--
Anthracene	2.3E6[c]	--	ND(0.3)	--	--	ND(0.364)	ND(0.358)	--
Fluorene	310[c]	--	ND(0.3)	--	--	ND(0.364)	ND(0.358)	--
2-Methylnaphthalene	UA	--	ND(0.3)	--	--	ND(0.364)	ND(0.358)	--
Naphthalene	310[c]	--	ND(0.3)	--	--	ND(0.364)	ND(0.358)	--
Number of TICs	N/A	--	0	--	--	20	0	--
Sum of estimated TIC concentrations	N/A	--	0	--	--	11.2	0	--
Other: Method D4129-82M[d] (%)	**Screening Criteria**							
Total Organic Carbon	N/A	0.17**	--	--	--	0.88	0.75	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT270SL A-4 AP-3238 15 178979	93RUT271SL A-4 AP-3238 20 178980	93RUT272SL A-4 AP-3238 25 178981	93RUT273SL A-5 AP-3239 5 179043 179056	93RUT274SL A-5 AP-3239 10 179044 179057	93RUT275SL A-5 AP-3239 15 179055 179067	93RUT276SL A-5 AP-3239 20 179045 179058 93RUT277SL
SVOCs: EPA Method 8270[b] (mg/Kg)	**Screening Criteria**							
bis(2-Ethylhexyl)phthalate	4.6[c]	--	--	--	--	--	ND(0.352)	--
Anthracene	2.3E6[c]	--	--	--	--	--	ND(0.352)	--
Fluorene	310[c]	--	--	--	--	--	0.256	--
2-Methylnaphthalene	UA	--	--	--	--	--	ND(0.352)	--
Naphthalene	310[c]	--	--	--	--	--	ND(0.352)	--
Number of TICs	N/A	--	--	--	--	--	19	--
Sum of estimated TIC concentrations	N/A	--	--	--	--	--	13.6	--
Other: Method D4129-82M[d] (%)	**Screening Criteria**							
Total Organic Carbon	N/A	--		--	--	--	0.34	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT277SL A-5 AP-3239 20 179046 179059 93RUT276SL	93RUT278SL A-5 AP-3239 25 179047 179060	93RUT279SL A-5 AP-3239 30 179048 179061	93RUT280SL A-5 AP-3239 35 179049 179062	93RUT281SL A-5 AP-3239 40 179050 179063	93RUT282SL A-5 AP-3239 45 179051 179064	93RUT283SL A-5 AP-3239 50 179052 179068
SVOCs: EPA Method 8270[b] (mg/Kg)	**Screening Criteria**							
bis(2-Ethylhexyl)phthalate	4.6[c]	--	--	--	--	--	--	ND(0.348)
Anthracene	2.3E6[c]	--	--	--	--	--	--	1.160
Fluorene	310[c]	--	--	--	--	--	--	1.010
2-Methylnaphthalene	UA	--	--	--	--	--	--	5.280
Naphthalene	310[c]	--	--		--	--	--	0.982
Number of TICs	N/A	--	--	--	--	--	--	20
Sum of estimated TIC concentrations	N/A	--	--	--	--	--	--	38.7
Other: Method D4129-82M[d] (%)	**Screening Criteria**							
Total Organic Carbon	N/A	--	--	--	--	--	--	0.32

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT284SL A-5 AP-3239 55 179053 179065	93RUT285SL A-5 AP-3239 60 179054 179066	93RUT286SL A-7 AP-3241 10 179216 179222	93RUT287SL A-7 AP-3241 20 179217 179223 93RUT288SL	93RUT288SL A-7 AP-3241 20 179218 179224 93RUT287SL	93RUT289SL A-7 AP-3241 30 179219 179225	93RUT290S L A-7 AP-3241 45 179220 179226	93RUT291SL A-7 AP-3241 55 179228 179229
SVOCs: EPA Method 8270[b] (mg/Kg)	**Screening Criteria**								
bis(2-Ethylhexyl)phthalate	4.6[c]	--	--	--	--	--	--	--	--
Anthracene	2.3E6[c]	--	--	--	--	--	--	--	--
Fluorene	310[c]	--	--	--	--	--	--	--	--
2-Methylnaphthalene	UA	--	--	--	--	--	--	--	--
Naphthalene	310[c]	--	--	--	--	--	--	--	--
Number of TICs	N/A	--	--	--	--	--	--	--	--
Sum of estimated TIC concentrations	N/A	--	--	--	--	--	--	--	--
Other: Method D4129-82M[d] (%)	**Screening Criteria**								
Total Organic Carbon	N/A	--	--	--	0.42	0.32	--	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Sample Number: HLA Boring Number: USACE Boring Number: Depth (feet): Laboratory Sample Number: Associated Duplicate Sample:		93RUT292SL A-7 AP-3241 65 179221 179227	93RUT293SL A-6 AP-3240 10 179305 179316 93RUT294SL	93RUT294SL A-6 AP-3240 10 179306 179317 93RUT293SL	93RUT295SL A-6 AP-3240 20 179307 179318	93RUT296SL A-6 AP-3240 30 179308 179319	93RUT297SL A-6 AP-3240 40 179309	93RUT298SL A-6 AP-3240 50 179310 179320	93RUT299SL A-6 AP-3240 54 179311 179321
SVOCs: EPA Method 8270[b] (mg/Kg)	**Screening Criteria**								
bis(2-Ethylhexyl)phthalate	4.6[c]	--	--	--	ND(0.364)	--	--	--	--
Anthracene	2.3E6[c]	--	--	--	ND(0.364)	--	--	--	--
Fluorene	310[c]	--	--	--	ND(0.364)	--	--	--	--
2-Methylnaphthalene	UA	--	--	--	ND(0.364)	--	--	--	--
Naphthalene	310[c]	--	--	--	ND(0.364)	--	--	--	--
Number of TICs	N/A	--	--	--	18	--	--	--	--
Sum of estimated TIC concentrations	N/A	--	--	--	42.8	--	--	--	--
Other: Method D4129-82M[d] (%)	**Screening Criteria**								
Total Organic Carbon	N/A	--	--	--	0.25	--	--	--	--

Table D-16 (Cont'd)
Analytes Detected in HLA's Soil Borings, Building 45-590[a]

Notes:

[a] Data obtained from HLA 1994a.
[b] Unless otherwise noted, analytical method is from U.S. Environmental Protection Agency, SW-846, edition 4, 1990.
[c] Alaska Department of Environmental Conservation modification.
[d] American Society of Testing and Materials (ASTM) method.
[e] Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for Soil (EPA 1995b).
[f] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[g] Screening criteria 95 percent upper tolerance limit background concentrations (E&E 1996).
[h] Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

Shaded values exceed screening criteria.

Data Qualifiers:

* = Result is from analysis of a diluted sample.
** = U.S. Army Corps of Engineers' (USACE's) Chemical Quality Assurance Report (CQAR) recommends considering analytical result an estimate due to lack of matrix spike or laboratory control recoveries.
α = The surrogate for this sample was diluted out; therefore, the quality of the data could not be concluded.
β = USACE's CQAR recommends considering analytical result an estimate due to relative percent difference failures.
Σ = USACE's CQAR recommends considering analytical result an estimate due to matrix spike or matrix spike duplicate recoveries outside acceptance criteria.

Key:

-- = Analysis not performed.
% = Percent by weight.
DRO = Diesel-range organics.
GRO = Gasoline-range organics.
mg/Kg = Milligrams per kilogram.
N/A = Not applicable.
ND = None detected at or above the method reporting limit (method reporting limit is listed in parentheses).
PCBs = Polychlorinated biphenyls.
PHCs = Petroleum hydrocarbons
TICs = Tentatively identified compounds.
TRPH = Total recoverable petroleum hydrocarbons.
UA = Unavailable.
μg/Kg = Micrograms per kilogram.
VOCs = Volatile organic compounds.

Table D-17
Analytes Detected in EMCON's Soil Borings, Building 45-590[a]

USACE Boring Number: Sample Number:[b] Depth (feet): Associated Duplicate Sample:		AP-3384 229SL 30	AP-3384 235SL 60 236SL	AP-3384 236SL 60 235SL	AP-3385 243SL 30	AP-3386 221SL 60 222SL	AP-3386 222SL 65 221SL	AP-3387 333SL 5 334SL	AP-3387 334SL 5 333SL
PHCs: (mg/Kg)	**Screening Criteria**								
GRO (Method 8015M[a])	50-100[h]	14(5)	8(5)	ND(1)	270(5)	6(5)	8(5)	372(5)	214(55)
DRO (Method 8100M[a])	100-200[h]	7,100(50)	405(10)	216(21)	4,400(10)	768(10)	186(10)	1,590(50)	1,180(43)
VOCs: EPA Method 8260[c] (µg/Kg)	**Screening Criteria**								
Acetone	7.8E5[g]	ND(12,500)	52(50)	20(10)	ND(12,500)	ND(50)	ND(50)	ND(12,000)	ND(50)
Methylene Chloride	8500[g]	ND(2,500)	ND(10)	5.7(5.2)	ND(2,500)	ND(10)	ND(10)	ND(2,500)	ND(25)
o-Xylene	1.6E7[g]	NA	NA	ND(5.2)	ND(5,000)	ND(20)	NA	NA	ND(25)
1,2,4-Trimethylbenzene	3.9E5[g]	ND(5,000)	ND(20)	ND(5.2)	ND(5,000)	ND(20)	ND(20)	ND(5,000)	ND(25)
1,3,5-Trimethylbenzene	3.9E5[g]	ND(5,000)	ND(20)	ND(5.2)	ND(5,000)	ND(20)	ND(20)	ND(5,000)	ND(25)
Naphthalene	3.1E5[g]	ND(5,000)	ND(20)	ND(5.2)	ND(5,000)	ND(20)	ND(20)	ND(5,000)	644(25)
sec-Butylbenzene	7.8E4[g]	ND(5,000)	ND(20)	ND(5.2)	ND(5,000)	ND(20)	ND(20)	ND(5,000)	ND(25)
p-Isopropyltoluene	UA	NA	NA	ND(5.2)	NA	NA	NA	ND(5,000)	279(25)
Isopropylbenzene	UA	ND(5,000)	ND(20)	ND(5.2)	ND(5,000)	ND(20)	ND(20)	ND(5,000)	ND(25)
n-Propylbenzene	UA	ND(5,000)	ND(20)	ND(5.2)	ND(5,000)	ND(20)	ND(20)	ND(5,000)	107(25)
Trichloroethane	1100[g]	NA	NA	NA	NA	NA	NA	ND(1,200)	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	1E8[g]	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	7.8E5[g]	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1.6E7[g]	NA	NA	NA	NA	NA	NA	NA	NA
Total BTEX	1.5E4[h]	NA	NA	NA	NA	NA	NA	NA	NA
Metals: EPA Method 6010 except where noted[c] (mg/Kg)	**Screening Criteria**								
Arsenic (Method 7060)	2.3[g], 6.4[i]	NA	NA	NA	NA	NA	NA	NA	NA
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[g], 2.2[i]	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	39[g], 43.8[i]	NA	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA	NA	NA

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Table D-17 (Cont'd)
Analytes Detected in EMCON's Soil Borings, Building 45-590[a]

USACE Boring Number: Sample Number:[b] Depth (feet): Associated Duplicate Sample:		AP-3387 336SL 25 337SL	AP-3387 337SL 25 336SL	AP-3387 343SL 65	AP-3387 345SL 95	AP-3387 801SL 104	AP-3387 347SL 105	AP-3388 348SL 26	AP-3388 349SL 30
PHCs: (mg/Kg)	**Screening Criteria**								
GRO (Method 8015M[e])	50-100[h]	133(5)	173(5)	ND(5)	ND(5)	NA	381(5)	296(5)	ND(5)
DRO (Method 8100M[e])	100-200[h]	2,200(10	1,370(50)	895(10)	3,300(10)	2,340(10)	1,810(10)	2,200(10)	183(10)
VOCs: EPA Method 8260[c] (µg/Kg)	**Screening Criteria**								
Acetone	7.8E5[g]	ND(12,000)	ND(12,000)	ND(6,200)	ND(12,000)	NA	ND(13,000)	ND(13,000)	ND(50)
Methylene Chloride	8500[g]	ND(2,500)	ND(2,500)	ND(1,200)	ND(2,500)	NA	ND(2,600)	ND(2,600)	ND(10)
o-Xylene	1.6E7[g]	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	3.9E5[g]	ND(5,000)	ND(5,000)	ND(2,500)	ND(5,000)	NA	ND(5,200)	ND(5,100)	ND(20)
1,3,5-Trimethylbenzene	3.9E5[g]	ND(5,000)	ND(5,000)	ND(2,500)	ND(5,000)	NA	ND(5,200)	ND(5,100)	ND(20)
Naphthalene	3.1E5[g]	ND(5,000)	ND(5,000)	ND(2,500)	ND(5,000)	NA	ND(5,200)	ND(5,100)	ND(20)
sec-Butylbenzene	7.8E4[g]	ND(5,000)	ND(5,000)	ND(2,500)	ND(5,000)	NA	ND(5,200)	ND(5,100)	ND(20)
p-Isopropyltoluene	UA	ND(5,000)	ND(5,000)	ND(2,500)	ND(5,000)	NA	ND(5,200)	ND(5,100)	ND(20)
Isopropylbenzene	UA	ND(5,000)	ND(5,000)	ND(2,500)	ND(5,000)	NA	ND(5,200)	ND(5,100)	ND(20)
n-Propylbenzene	UA	ND(5,000)	ND(5,000)	ND(2,500)	ND(5,000)	NA	ND(5,200)	ND(5,100)	ND(20)
Trichloroethane	1100[g]	ND(5,000)	ND(1,200)	ND(620)	ND(1,200)	NA	ND(1,300)	ND(1,300)	ND(5)
1,1,2-Trichloro-1,2,2-Trifluoroethane	1E8[g]	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	7.85[g]	NA	NA	NA	NA	1,670(50)	NA	NA	NA
Total Xylenes	1.6E7[g]	NA	NA	NA	NA	1,810(50)	NA	NA	NA
Total BTEX	1.5E4[h]	NA	NA	NA	NA	19,770	NA	NA	NA
Metals: EPA Method 6010 except where noted[c] (mg/Kg)	**Screening Criteria**								
Arsenic (Method 7060)	2.3[g], 8.4[i]	NA	NA	NA	NA	NA	NA	NA	NA
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[g], 2.2[i]	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	39[g], 43.8[i]	NA	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA	NA	NA

Table D-17 (Cont'd)
Analytes Detected in EMCON's Soil Borings, Building 45-590[a]

USACE Boring Number: Sample Number:[b] Depth (feet): Associated Duplicate Sample:		AP-3388 350SL 80	AP-3439[e] 393SL 100	AP-3440[f] 408SL 30	AP-3440[f] 409SL 40	AP-3440[f] 410SL 50	AP-3440[f] 411SL 60	AP-3440[f] 413SL 80	VW-1 414SL 30 814/914SL
PHCs: (mg/Kg)	**Screening Criteria**								
GRO (Method 8015M[d])	50-100[h]	ND(5)	ND(1.1)	NA	NA	ND(1)	ND(1)	ND(1.1)	NA
DRO (Method 8100M[d])	100-200[h]	6(10)	217(43)	ND(4.2)	12(4.2)	NA	ND(4.2)	ND(4.2)	4,130(220)
VOCs: EPA Method 8260[c] (µg/Kg)	**Screening Criteria**								
Acetone	7.8E5[g]	ND(50)	ND(11)	NA	NA	ND(10)	ND(10)	ND(11)	NA
Methylene Chloride	8500[g]	ND(10)	6.5(5.5)	NA	NA	ND(5.3)	ND(5.3)	ND(5.4)	NA
o-Xylene	1.6E7[g]	NA	ND(5.5)	NA	NA	ND(5.3)	ND(5.3)	ND(5.4)	NA
1,2,4-Trimethylbenzene	3.9E5[g]	ND(20)	ND(5.5)	NA	NA	ND(5.3)	ND(5.3)	ND(5.4)	NA
1,3,5-Trimethylbenzene	3.9E5[g]	ND(20)	ND(5.5)	NA	NA	ND(5.3)	ND(5.3)	ND(5.4)	NA
Naphthalene	3.1E5[g]	ND(20)	ND(5.5)	NA	NA	ND(5.3)	ND(5.3)	ND(5.4)	NA
sec-Butylbenzene	7.8E4[g]	ND(20)	ND(5.5)	NA	NA	ND(5.3)	ND(5.3)	ND(5.4)	NA
p-Isopropyltoluene	UA	ND(20)	ND(5.5)	NA	NA	ND(5.3)	ND(5.3)	ND(5.4)	NA
Isopropylbenzene	UA	ND(20)	ND(5.5)	NA	NA	ND(5.3)	ND(5.3)	ND(5.4)	NA
n-Propylbenzene	UA	ND(20)	ND(5.5)	NA	NA	ND(5.3)	ND(5.3)	ND(5.4)	NA
Trichloroethane	1100[g]	ND(5)	NA	NA	NA	12(5.3)	16(5.3)	13(5.4)	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	1E8[g]	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	7.8E5[g]	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1.6E7[g]	NA	NA	NA	NA	NA	NA	NA	NA
Total BTEX	1.5E4[h]	NA	NA	NA	NA	NA	NA	NA	NA
Metals: EPA Method 6010 except where noted[c] (mg/Kg)	**Screening Criteria**								
Arsenic (Method 7060)	2.3[g], 8.4[i]	NA	NA	NA	NA	NA	NA	NA	NA
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[g], 2.2[i]	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	39[g], 43.8[i]	NA	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA	NA	NA

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Table D-17 (Cont'd)
Analytes Detected in EMCON's Soil Borings, Building 45-590[a]

USACE Boring Number: Sample Number:[b] Depth (feet): Associated Duplicate Sample:		VW-1 814SL 30 414SL	VW-1 914SL 30 414SL	VW-1 415SL 80	MPA 416SL 35	MPA 417SL 75	MPB 418SL 35	MPB 419SL 75	MPC 420SL 12
PHCs: (mg/Kg)	**Screening Criteria**								
GRO (Method 8015M[d])	50-100[h]	NA	NA	NA	NA	NA	NA	NA	488(110)
DRO (Method 8100M[d])	100-200[h]	4,370(220	1,400(220)	1,530(220)	7,170(220)	100(42)	4.9(4.2)	ND(4.1)	158(42)
VOCs: EPA Method 8260[c] (µg/Kg)	**Screening Criteria**								
Acetone	7.8E5[g]	NA	NA	NA	NA	NA	NA	NA	ND(110)
Methylene Chloride	8500[g]	NA	NA	NA	NA	NA	NA	NA	ND(53)
o-Xylene	1.6E7[g]	NA	NA	NA	NA	NA	NA	NA	191(53)
1,2,4-Trimethylbenzene	3.9E5[g]	NA	NA	NA	NA	NA	NA	NA	1,490(53)
1,3,5-Trimethylbenzene	3.9E5[g]	NA	NA	NA	NA	NA	NA	NA	2,230(53)
Naphthalene	3.1E5[g]	NA	NA	NA	NA	NA	NA	NA	329(53)
sec-Butylbenzene	7.8E4[g]	NA	NA	NA	NA	NA	NA	NA	159(53)
p-Isopropyltoluene	UA	NA	NA	NA	NA	NA	NA	NA	350(53)
Isopropylbenzene	UA	NA	NA	NA	NA	NA	NA	NA	127(53)
n-Propylbenzene	UA	NA	NA	NA	NA	NA	NA	NA	276(53)
Trichloroethane	1100[g]	NA	NA	NA	NA	NA	NA	NA	371(106)
1,1,2-Trichloro-1,2,2-Trifluoroethane	1E8[g]	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	7.85[g]	NA	NA	NA	NA	NA	NA	NA	NA
Total Xylenes	1.6E7[g]	NA	NA	NA	NA	NA	NA	NA	NA
Total BTEX	1.5E4[h]	NA	NA	NA	NA	NA	NA	NA	NA
Metals: EPA Method 6010 except where noted[c] (mg/Kg)	**Screening Criteria**								
Arsenic (Method 7060)	2.3[g], 8.4[i]	NA	NA	NA	NA	NA	NA	NA	6(0.5)
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA	NA	53(2)
Cadmium	3.9[g], 2.2[i]	NA	NA	NA	NA	NA	NA	NA	3.6(2)
Chromium	39[g], 43.8[i]	NA	NA	NA	NA	NA	NA	NA	37(2)
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA	NA	7.5(0.2)

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Table D-17 (Cont'd)
Analytes Detected in EMCON's Soil Borings, Building 45-590[a]

USACE Boring Number: Sample Number:[e] Depth (feet): Associated Duplicate Sample:		MPD 421SL 12	MPD 422SL 18	MW-4 452SB 15-17	MW-4 453SB 50-52 454SB	MW-4 454SB 50-52 453SB	MW-4 456SB 102
PHCs: (mg/Kg)	**Screening Criteria**						
GRO (Method 8015M[d])	50-100[h]	NA	NA	ND(1)	ND(1)	ND(1)	ND(1.1)
DRO (Method 8100M[d])	100-200[h]	6.2(4.3)	ND(4.2)	19(4.1)	ND(4.2)	25(4.2)	12(4.4)
VOCs: EPA Method 8260[c] (µg/Kg)	**Screening Criteria**						
Acetone	7.8E5[g]	NA	NA	ND(10)	ND(10)	ND(10)	13(11)
Methylene Chloride	8500[g]	NA	NA	ND(5.2)	ND(5.2)	ND(5.2)	ND(5.5)
o-Xylene	1.6E7[g]	NA	NA	ND(5.2)	ND(5.2)	ND(5.2)	ND(5.5)
1,2,4-Trimethylbenzene	3.9E5[g]	NA	NA	ND(5.2)	ND(5.2)	ND(5.2)	ND(5.5)
1,3,5-Trimethylbenzene	3.9E5[g]	NA	NA	ND(5.2)	ND(5.2)	ND(5.2)	ND(5.5)
Naphthalene	3.1E5[g]	NA	NA	ND(5.2)	ND(5.2)	ND(5.2)	ND(5.5)
sec-Butylbenzene	7.8E4[g]	NA	NA	ND(5.2)	ND(5.2)	ND(5.2)	ND(5.5)
p-Isopropyltoluene	UA	NA	NA	ND(5.2)	ND(5.2)	ND(5.2)	ND(5.5)
Isopropylbenzene	UA	NA	NA	ND(5.2)	ND(5.2)	ND(5.2)	ND(5.5)
n-Propylbenzene	UA	NA	NA	ND(5.2)	ND(5.2)	ND(5.2)	ND(5.5)
Trichloroethane	1100[g]	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-Trifluoroethane	1E8[g]	NA	NA	NA	NA	NA	NA
Ethylbenzene	7.85[g]	NA	NA	NA	NA	NA	NA
Total Xylenes	1.6E7[g]	NA	NA	NA	NA	NA	NA
Total BTEX	1.5E4[h]	NA	NA	NA	NA	NA	NA
Metals: EPA Method 6010 except where noted[c] (mg/Kg)	**Screening Criteria**						
Arsenic (Method 7060)	2.3[g], 8.4[i]	NA	NA	NA	NA	NA	NA
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA
Cadmium	3.9[g], 2.2[i]	NA	NA	NA	NA	NA	NA
Chromium	39[g], 43.8[i]	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA

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Table D-17 (Cont'd)
Analytes Detected in EMCON's Soil Borings, Building 45-590[a]

Notes:

[a] Data obtained from EMCON 1994b. Release Investigation Report and Corrective Action Plan, Building 45-590, Fort Richardson.
[b] Sample number prefixes of 93FRU or 94FRU have been omitted for brevity.
[c] Unless otherwise noted, analytical method is from U.S. Environmental Protection Agency, SW-846, edition 4, 1990.
[d] Alaska Department of Environmental Conservation modification.
[e] EMCON boring FRU-60/MW-2.
[f] EMCON boring FRU-61/MW-3.
[g] Screening criteria one-tenth of the EPA Region 3 risk-based concentrations for soil (EPA 1995a).
[h] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[i] Screening criteria 95 percent upper tolerance level background concentrations (E&E 1996).
[j] EPA's cleanup standard for lead in soil (Wilkening 1995).

Shaded values exceed screening criteria.

Key:

BTEX = Benzene, toluene, ethylbenzene, and xylenes.
DRO = Diesel range organics.
GRO = Gasoline range organics.
mg/Kg = Milligrams per kilogram.
NA = Not analyzed.
ND = Not detected above the reporting limit shown in parentheses.
PHCs = Petroleum hydrocarbons.
UA = Unavailable.
µg/Kg = Micrograms per kilogram.
VOCs = Volatile organics compounds.

Table D-18
Volatile Organic Compounds Detected in Groundwater Samples, Building 45-590

Monitoring Well Number	Sample Date	Sample Number	EPA Method Numbers (8240/8260) VOC Concentration (µg/L)			
			Tetrachloroethene (PCE)	Acetone	Chloroform	Methyl-isobutyl Ketone
AP3387[a]	4/7/94	94FRU354WT	8.3(0.5)	4(2)	0.5(0.5)	3(2)
AP3387[b]	12/1/94	94FRU557WG	11(5)	ND(10)	ND(5)	ND(10)
AP3387[f]	1/30/95	94FRPL13WA	13(5)	ND(100)	ND(5)	NA
AP3387[d]	3/14/95	95FRU567WG	14(2)	ND(10)	ND(2)	ND(10)
AP3439[a]	6/16/94	94FRU404WT	7.2(1)	ND(1)	ND(1)	ND(1)
AP3439[b]	11/30/94	94FRU553WG	10(5)	ND(10)	ND(5)	ND(10)
AP3439 (Duplicate)[b]	11/30/94	94FRU554WG	9.9(5)	ND(10)	ND(5)	ND(10)
AP3439 (Split)[c]	11/30/94	94FRU555WG	11(5)	ND(100)	ND(5)	ND(50)
AP3439[f]	1/30/95	94FRPL15WA	11(5)	ND(100)	ND(5)	NA
AP3439[d]	3/14/95	95FRU563WG	9(2)	ND(10)	ND(2)	ND(10)
AP3439 (Duplicate)[d]	3/14/95	95FRU565WG	10(2)	ND(10)	ND(2)	ND(10)
AP3439 (Split)[e]	3/14/95	95FRU564WG	9.8(0.7)	ND(10)	ND(0.8)	NA
AP3440[a]	7/7/94	94FRU450WA	6.4(5)	ND(1)	ND(1)	ND(1)
AP3440[b]	12/1/94	94FRU556WG	9.3(5)	ND(10)	ND(5)	ND(10)
AP3440[f]	1/30/95	94FRPL14WA	11(5)	ND(100)	ND(5)	NA
AP3440[d]	3/14/95	95FRU566WG	12(2)	ND(10)	ND(2)	ND(10)
AP3441[a]	7/26/94	94FRU457WG	ND(1)	ND(1)	1.3(1)	ND(1)
AP3441[b]	11/30/94	94FRU552WG	ND(5)	ND(10)	ND(5)	ND(10)
AP3441[d]	3/13/95	95FRU562WG	ND(2)	ND(10)	3(2)	ND(10)
Screening Criteria			5[g]	3,700[h]	100[f,g], 0.15[h]	2,900[h]

Table D-18 (Cont'd)
Volatile Organic Compounds Detected in Groundwater Samples, Building 45-590

Notes:
[a] Project laboratories April through August 1994 (CAS Kelso, NET Pacific).
[b] Project laboratory November and December 1994 (NET Pacific).
[c] QA laboratory November and December 1994 (CAS Kelso).
[d] Project laboratory March 1995 (CAS Anchorage).
[e] Value indicates sum of concentration of bromodichloromethane, dibromochloromethane, bromoform, and chloroform.
[f] Sample collected by USACE (1995). All others collected by EMCON (1995d).
[g] Screening criteria Maximum Contaminant Levels (EPA 1995a).
[h] Screening criteria EPA Region 3 risk-based concentrations (EPA 1995b).
Reporting limits indicated by parentheses.
Shaded values exceed screening criteria.

Key:
NA = Not analyzed.
ND = Not detected above reporting limits.
µg/L = Micrograms per liter.
VOC = Volatile Organic Compound.

Table D-19
Metals Detected in Groundwater Samples, Building 45-590

Monitoring Well Number	Sample Date	Sample Number	EPA Method Number							
			7060	6010A	6010A	6010A	7421	7470	7740	6010A
			Total Metals (mg/L)							
			Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver
AP3387[a]	4/7/94	94FRU354WT	0.015(0.005)	0.14(0.005)	ND(0.003)	0.029(0.005	0.014(0.002)	ND(0.0005)	ND(0.005)	ND(0.01)
AP3387[b]	12/1/94	94FRU557WG	ND(0.005)	ND(0.02)	ND(0.02)	ND(0.02)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.02)
AP3387[d]	3/14/95	95FRU567WG	ND(0.005)	0.012(0.005)	ND(0.01)	ND(0.01)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.01)
AP3439[a]	6/16/94	94FRU404WT	ND(0.005)	0.02(0.02)	ND(0.02)	ND(0.02)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.02)
AP3439[b]	11/30/94	94FRU553WG	ND(0.005)	ND(0.02)	ND(0.02)	ND(0.02)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.02)
AP3439 (Duplicate)[b]	11/30/94	94FRU554WG	ND(0.005)	ND(0.02)	ND(0.02)	ND(0.02)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.02)
AP3439 (Split)[c]	11/30/94	94FRU555WG	ND(0.005)	0.008(0.005)	ND(0.003)	ND(0.005)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.01)
AP3439[d]	3/14/95	95FRU563WG	ND(0.05)	0.008(0.005)	ND(0.01)	ND(0.01)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.01)
AP3439 (Duplicate)[d]	3/14/95	95FRU565WG	ND(0.005)	0.008(0.005)	ND(0.01)	ND(0.01)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.01)
AP3439 (Split)[e]	3/14/95	95FRU564WG	ND(0.005)	ND(0.02)	ND(0.02)	ND(0.02)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.02)
AP3440[a]	7/7/94	94FRU450WA	ND(0.003)	ND(0.02)	ND(0.02)	ND(0.02)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.02)
AP3440[b]	12/1/94	94FRU556WG	ND(0.005)	ND(0.02)	ND(0.02)	ND(0.02)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.02)
AP3440[d]	3/14/95	95FRU566WG	ND(0.005)	0.012(0.005)	ND(0.01)	ND(0.01)	ND(0.002)	ND(0.0005)	ND(0.005)	ND(0.01)
AP3441[a]	7/26/94	94FRU457WG	NA	NA	NA	NA	NA	NA	NA	NA
AP3441[b]	11/30/94	94FRU552WG	0.43(0.005)	2.1(0.02)	<0.06(0.02)	1.9(0.02)	0.24(0.002)	.0057(0.0005)	ND(0.005)	ND(0.02)
AP3441[d]	3/13/95	94FRU562WG	0.215(0.005)	0.917(0.005)	ND(0.01)	0.38(0.01)	0.077(0.002)	.0019(0.0005)	ND(0.005)	ND(0.01)
MCL[f]			0.05	2.0	0.005	0.1		0.002	0.05	N/A
Action Levels							0.015[f]			

[a] Project laboratories April through August 1994 (CAS Kelso, NET Pacific).
[b] Project laboratory November and December 1994 (NET Pacific).
[c] QA laboratory November and December 1994 (CAS Kelso).
[d] Project laboratory March 1995 (CAS Anchorage).
[e] QA laboratory March 1995 (NPDL and NET Pacific).
[f] ADEC 1989.

Reporting limits indicated by parentheses.
Shaded values exceed MCL or action level.
MCL = Maximum Contaminant Levels.
ND = Not detected above reporting limits.
NA = Not analyzed.
mg/L = Milligrams per liter.

Table D-20
Petroleum Hydrocarbons Detected in Groundwater Samples, Building 45-590

Monitoring Well Number	Sample Date	Sample Number	EPA Method Numbers	
			8015M	8100M
			Petroleum Hydrocarbons (µg/L)	
			GRO	DRO
AP3387[a]	4/7/94	94FRU354WT	82(50)	7,960(10)
AP3387[b]	12/1/94	94FRU557WG	ND(50)	250(100)
AP3387[f]	1/30/95	94FRPL13WA	120(100)	2,000(100)
AP3387[d]	3/14/95	95FRU567WG	ND(50)	200(100)
AP3439[a]	6/16/94	94FRU404WT	ND(50)	140(100)
AP3439[b]	11/30/94	94FRU553WG	ND(50)	ND(100)
AP3439 (Duplicate)[b]	11/30/94	94FRU554WG	ND(50)	ND(100)
AP3439 (Split)[c]	11/30/94	94FRU555WG	ND(50)	ND(100)
AP3439[f]	1/30/95	94FRPL15WA	ND(100)	210(100)
AP3439[d]	3/14/95	95FRU563WG	ND(50)	ND(100)
AP3439 (Duplicate)[d]	3/14/95	95FRU565WG	ND(50)	ND(100)
AP3439 (Split)[e]	3/14/95	94FRU564WG	ND(50)	ND(100)
AP3440[a]	7/7/94	94FRU450WA	ND(50)	170(100)
AP3440[b]	12/1/94	94FRU556WG	ND(50)	ND(100)
AP3440[f]	1/30/95	94FRPL14WA	ND(100)	330(100)
AP3440[d]	3/14/95	95FRU566WG	ND(50)	ND(100)
AP3441[a]	7/26/94	94FRU457WG	ND(50)	300(100)
AP3441[b]	11/30/94	94FRU552WG	ND(50)	140(100)
AP3441[d]	3/13/95	95FRU562WG	ND(50)	ND(100)
Screening criteria (Alaska Water Quality Criteria, 18 AAC 70)			15	15

[a] Project laboratories April through August 1994 (CAS Kelso, NET Pacific).
[b] Project laboratory November and December 1994 (NET Pacific).
[c] QA laboratory November and December 1994 (CAS Kelso).
[d] Project laboratory March 1995 (CAS Anchorage).
[e] QA laboratory March 1995 (NPDL and NET Pacific).
[f] Sample collected by USACE (USACE 1995); all others collected by EMCON (EMCON 1995d).

Reporting limits indicated by parentheses.
Shaded values exceed screening criteria.
EPA = U.S. Environmental Protection Agency; DRO = gasoline-range organic; GRO = gasoline-range organic; ND = Not detected above reporting limits.

Table D-21
Analytes Detected in USACE's Former UST Excavation Soil Borings, Building 726

USACE Boring Number:		AF 3464							
Sample Number:[a] Depth (feet): Associated Duplicate Sample:		001SL 0.5-1.5	002SL 0.5-1.5 001SL	003SL 0.5-1.5 001SL	004SL 5-7	005SL 10	006SL 15-17	007SL 20-22	008SL 25-27
PHCs (mg/Kg)	**Screening Criteria**								
GRO (Method 8015M[c])	500[i]	NA	NA	NA	NA	NA	NA	NA	90
DRO (Method 8100M[c])	1,000[i]	87	57	131[d]	ND(4.2)	NA	ND(4.3)	ND(4.3)	72
VOCs: EPA Method 8260[b] (µg/Kg)	**Screening Criteria**								
Methylene Chloride	8,500[h]	NA	NA	NA	ND(5)	ND(5)	ND(5)	ND(5)	5J[e]
1,2,4-Trimethylbenzene	3.9E5[h]	NA	NA	NA	ND(5)	ND(5)	ND(5)	ND(5)	34
1,3,5-Trimethylbenzene	3.9E5[h]	NA	NA	NA	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
sec Butylbenzene	7.8E4[h]	NA	NA	NA	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
4-Isopropyltoluene	UA	NA	NA	NA	ND(5)	ND(5)	ND(5)	ND(5)	17
n-Butylbenzene	UA	NA	NA	NA	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
Tetrachloroethene (PCE)	1,200[h]	NA	NA	NA	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
Trichlorofluoromethane	2.3E6[h]	NA	NA	NA	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
Metals: EPA Method 6010, except where noted[b] (mg/Kg)	**Screening Criteria**								
Arsenic (Method 7060)	2.3[h], 8.4[j]	7.4	6.0	7	NA	NA	NA	NA	NA
Barium	550[h], 89.2[j]	37.3	39.8	40	NA	NA	NA	NA	NA
Cadmium	3.9[h]	ND(0.31)	0.34	ND(1)	NA	NA	NA	NA	NA
Chromium	39[h], 43.8[j]	30.7	30.6	36	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[j],400[k]	14.8	14.0	ND(5)	NA	NA	NA	NA	NA
Selenium (Method 7740)	39[h]	0.061	ND(0.052)	ND(1)	NA	NA	NA	NA	NA

Table D-21 (Cont'd)
Analytes Detected in USACE's Former UST Excavation Soil Borings, Building 726

USACE Boring Number:		AP-3464							AP-3465
Sample Number:[a] Depth (feet): Associated Duplicate Sample:		011SL 30-32	012SL 30-32 011SL	013SL 30-32 011SL	014SL 35-37	017SL 40-42	018SL 45-47	019SL 50-52	025SL 15-17
PHCs (mg/Kg)	Screening Criteria								
GRO (Method 8015M[c])	500[i]	33	330	190[f,g]	ND(5)	NA	NA	NA	ND(5)
DRO (Method 8100M[c])	1,000[i]	29	NA	NA	6.2	ND(4.3)	NA	ND(4.2)	11
VOCs: EPA Method 8260[b] (µg/Kg)	Screening Criteria								
Methylene Chloride	8,500[h]	ND(5)	ND(5)	ND(10)	ND(6)	ND(5)	ND(5)	ND(5)	ND(5)
1,2,4-Trimethylbenzene	3.9E5[h]	9	ND(5)	ND(20)	4J[e]	ND(5)	ND(5)	ND(5)	ND(5)
1,3,5-Trimethylbenzene	3.9E5[h]	2J[e]	ND(5)	ND(20)	2J[e]	ND(5)	ND(5)	ND(5)	ND(5)
sec-Butylbenzene	7.8E4[h]	ND(5)	ND(5)	ND(20)	ND(6)	ND(5)	ND(5)	ND(5)	ND(5)
4-Isopropyltoluene	UA	ND(5)	ND(5)	ND(20)	ND(6)	ND(5)	ND(5)	ND(5)	ND(5)
n-Butylbenzene	UA	ND(5)	ND(5)	ND(20)	ND(6)	ND(5)	ND(5)	ND(5)	ND(5)
Tetrachloroethene (PCE)	1,200[h]	ND(5)	ND(5)	ND(5)	ND(6)	ND(5)	ND(5)	ND(5)	2J[e]
Trichlorofluoromethane	2.3E6[h]	ND(5)	ND(5)	ND(5)	ND(6)	ND(5)	ND(5)	ND(5)	ND(5)
Metals: EPA Method 6010, except where noted[b] (mg/Kg)	Screening Criteria								
Arsenic (Method 7060)	2.3[h], 8.4[j]	7.3	NA	NA	NA	NA	NA	NA	NA
Barium	550[h], 89.2[j]	37.7	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[h]	ND(0.32)	NA	NA	NA	NA	NA	NA	NA
Chromium	39[h], 43.8[j]	26.2	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[j], 400[k]	12.8	NA	NA	NA	NA	NA	NA	NA
Selenium (Method 7740)	39[h]	ND(0.053)	NA	NA	NA	NA	NA	NA	NA

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Table D-21 (Cont'd)
Analytes Detected in USACE's Former UST Excavation Soil Borings, Building 726

USACE Boring Number:		AP-3465							
Sample Number[a] Depth (feet): Associated Duplicate Sample:		026SL 17-19	027SL 20-22	028SL 25-27	029SL 31-33	030SL 35-37	031SL 35-37 030SL	032SL 35-37 030SL	033SL 42-44
PHCs (mg/Kg)	**Screening Criteria**								
GRO (Method 8015M[c])	500[i]	ND(5)	NA	780	1,900	4,000	NA	NA	ND(5)
DRO (Method 8100M[c])	1,000[i]	NA	740	24	740	97	140	26[d]	ND(4.2)
VOCs: EPA Method 8260[b] (µg/Kg)	**Screening Criteria**								
Methylene Chloride	8,500[h]	ND(5)	ND(670)	ND(660)	ND(680)	ND(27)	NA	NA	ND(5)
1,2,4-Trimethylbenzene	3.9E5[h]	ND(5)	17,000	3,700	1,400	ND(27)	NA	NA	ND(5)
1,3,5-Trimethylbenzene	3.9E5[h]	ND(5)	8,200	2,600	2,100	ND(27)	NA	NA	ND(5)
sec-Butylbenzene	7.8E4[h]	ND(5)	1,800	ND(660)	ND(680)	ND(27)	NA	NA	ND(5)
4-Isopropyltoluene	UA	ND(5)	6,500	2,100	2,300	ND(27)	NA	NA	ND(5)
n-Butylbenzene	UA	ND(5)	3,100	680	680	ND(27)	NA	NA	ND(5)
Tetrachloroethene (PCE)	1,200[h]	5J[e]	ND(670)	ND(660)	ND(680)	ND(27)	NA	NA	ND(5)
Trichlorofluoromethane	2.3E6[h]	ND(5)	ND(670)	ND(660)	ND(680)	ND(27)	NA	NA	ND(5)
Metals: EPA Method 6010, except where noted[b] (mg/Kg)	**Screening Criteria**								
Arsenic (Method 7060)	2.3[h], 8.4[j]	NA	5.0	NA	NA	NA	NA	NA	4.2
Barium	550[h], 89.2[j]	NA	43.4	NA	NA	NA	NA	NA	38.9
Cadmium	3.9[h]	NA	0.36	NA	NA	NA	NA	NA	0.43
Chromium	39[h], 43.8[j]	NA	30.9	NA	NA	NA	NA	NA	26.2
Lead (Method 7421)	11.7[j], 400[k]	NA	14.5	NA	NA	NA	NA	NA	13.8
Selenium (Method 7740)	39[h]	NA	ND(0.054)	NA	NA	NA	NA	NA	ND(0.053)

Table D-21 (Cont'd)
Analytes Detected in USACE's Former UST Excavation Soil Borings, Building 726

USACE Boring Number:		AP-3465	AP-3466						
Sample Number:[a] Depth (feet): Associated Duplicate Sample:		034SL 48-50	038SL 0.5-1.5	039SL 5-7	043SL 16-17	044SL 20-22	045SL 20-22 044SL	046SL 20-22 044SL	047SL 25-27
PHCs (mg/Kg)	**Screening Criteria**								
GRO (Method 8015M[c])	500[i]	NA	NA	NA	NA	NA	NA	NA	5,000
DRO (Method 8100M[c])	1,000[i]	NA	31	17	NA	260	NA	NA	NA
VOCs: EPA Method 8260[b] (µg/Kg)	**Screening Criteria**								
Methylene Chloride	8.5E4[h]	ND(5)	ND(26)	ND(5)	ND(660)	ND(680)	ND(680)	ND(13,000)	ND(660)
1,2,4-Trimethylbenzene	3.9E5[h]	ND(5)	ND(26)	ND(5)	2,300	2,900	4,700	ND(26,000)	10,800
1,3,5-Trimethylbenzene	3.9E5[h]	ND(5)	ND(26)	ND(5)	ND(660)	ND(680)	ND(680)	ND(26,000)	6,000
sec-Butylbenzene	7.8E4[h]	ND(5)	ND(26)	ND(5)	ND(660)	ND(680)	ND(680)	ND(26,000)	ND(660)
4-Isopropyltoluene	UA	ND(5)	ND(26)	ND(5)	ND(660)	ND(680)	4,600	ND(26,000)	5,300
n-Butylbenzene	UA	ND(5)	ND(26)	ND(5)	1,000	1,200	2,000	ND(26,000)	2,100
Tetrachloroethene (PCE)	1,200[h]	ND(5)	ND(26)	ND(5)	ND(660)	ND(680)	ND(680)	ND(6,500)	ND(660)
Trichlorofluoromethane	2.3E6[h]	ND(5)	ND(26)	ND(5)	ND(660)	ND(680)	ND(680)	ND(6,500)	ND(660)
Metals: EPA Method 6010, except where noted[a] (mg/Kg)VOCs:	**Screening Criteria**								
Arsenic (Method 7060)	2.3[h], 8.4[j]	NA	NA	NA	NA	NA	NA	NA	NA
Barium	550[h], 89.2[i]	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[h]	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	39[h], 43.8[i]	NA	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[k]	NA	NA	NA	NA	NA	NA	NA	NA
Selenium (Method 7740)	39[h]	NA	NA	NA	NA	NA	NA	NA	NA

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Table D-21 (Cont'd)
Analytes Detected in USACE's Former UST Excavation Soil Borings, Building 726

USACE Boring Number:		AP-3466							
Sample Number:[a] Depth (feet): Associated Duplicate Sample:		048SL 25-27 047SL	050SL 30-32	051SL 35-37	052SL 40-42	053SL 40-42 052SL	054SL 40-42 052SL	055SL 45-57	056SL 50-52
PHCs (mg/Kg)	Screening Criteria								
GRO (Method 8015M[c])	500[d]	8,400	NA	4,000	NA	NA	NA	NA	6.1
DRO (Method 8100M[c])	1,000[d]	NA	710	NA	19	12	ND(10)	NA	ND(4.2)
VOCs: EPA Method 8260[b] (µg/Kg)	Screening Criteria								
Methylene Chloride	8,500[h]	NA	ND(690)	ND(690)	ND(5)	NA	NA	6	ND(5)
1,2,4-Trimethylbenzene	3.9E5[h]	NA	9,300	ND(690)	ND(5)	NA	NA	ND(5)	ND(5)
1,3,5-Trimethylbenzene	3.9E5[h]	NA	ND(690)	ND(690)	ND(5)	NA	NA	ND(5)	ND(5)
sec-Butylbenzene	7.8E4[h]	NA	ND(690)	ND(690)	ND(5)	NA	NA	ND(5)	ND(5)
4-Isopropyltoluene	UA	NA	5,900	1,200	ND(5)	NA	NA	ND(5)	ND(5)
n-Butylbenzene	UA	NA	2,000	2,000	ND(5)	NA	NA	ND(5)	ND(5)
Tetrachloroethene (PCE)	1,200[h]	NA	ND(690)	ND(690)	ND(5)	NA	NA	ND(5)	ND(5)
Trichlorofluoromethane	2.3E6[h]	NA	ND(690)	ND(690)	ND(5)	NA	NA	ND(5)	ND(5)
Metals: EPA Method 6010, except where noted[b] (mg/Kg)	Screening Criteria								
Arsenic (Method 7060)	2.3[h], 8.4[j]	NA	5.2	NA	NA	NA	NA	NA	6.5
Barium	550[h], 89.2[j]	NA	36.2	NA	NA	NA	NA	NA	37.5
Cadmium	3.9[h]	NA	ND(0.33)	NA	NA	NA	NA	NA	ND(0.31)
Chromium	39[h], 43.8[j]	NA	30.2	NA	NA	NA	NA	NA	20.8
Lead 2.3[h], 8.4[j](Method 7421)	11.7[j], 400[k]	NA	23.2	NA	NA	NA	NA	NA	12.2
Selenium (Method 7740)	39[h]	NA	0.087	NA	NA	NA	NA	NA	0.067

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Table D-21 (Cont'd)
Analytes Detected in USACE's Former UST Excavation Soil Borings, Building 726

Notes:

[a] Sample number prefixes of 94FRPL have been omitted for brevity.
[b] Unless otherwise noted, analytical method is from U.S. Environmental Protection Agency (EPA), SW-846, edition 4, 1990.
[c] Alaska Department of Environmental Conservation (ADEC) modification.
[d] Quantified as diesel but not typical diesel chromatogram.
[e] J indicates estimated value. Analyte detected less than the practical quantitation limit.
[f] Quantified as gasoline but not typical gasoline chromatogram.
[g] Sample analyzed 1 day past recommended holding time.
[h] Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for Soil (EPA 1995b).
[i] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[j] Screening criteria 95 percent upper tolerance level background concentrations (E&E 1996).
[k] Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

Shaded values exceed screening criteria.

Data obtained from USACE 1995, Preliminary Source Evaluation, Fort Richardson Laundry Facility, Building 726, July.

Key:

DRO = Diesel range organics.
GRO = Gasoline range organics.
mg/Kg = Milligrams per kilogram.
NA = Not analyzed.
ND = Not detected above the reporting limit shown in parentheses.
PHCs = Petroleum hydrocarbons.
UA = Unavailable.
µg/Kg = Micrograms per kilogram.
UST = Underground storage tank.
VOCs = Volatile organic compounds.

Table D-22
Analytes Detected in USACE's Monitoring Well Soil Borings, Building 726

USACE Boring Number:		AP-3407						
Sample Number:[a]		060SL	061SL	062SL	063SL	064SL	065SL	066SL
Depth (feet):		18.5	29	29	29	38.5	49	58
Associated Duplicate Sample:[a]				061SL	061SL			
PHCs: (mg/Kg)	**Screening Criteria**							
GRO (Method 8015M[c])	500[h]	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
DRO (Method 8100M[c])	1,000[h]	ND(4.2)	ND(4.2)	ND(10)	ND(4.2)	ND(4.2)	ND(4.6)	ND(4.7)
VOCs: EPA Method 8260[b] (µg/Kg)	**Screening Criteria**							
Methylene Chloride	8.500[g]	ND(0.78)	ND(0.78)	ND(50)	ND(0.78)	ND(0.77)	ND(0.85)	ND(0.87)
Tetrachloroethene (PCE)	1,200[g]	ND(0.83)	ND(0.83)	ND(50)	ND(0.83)	ND(0.82)	ND(0.91)	ND(0.93)
Trichlorofluoromethane	2.3E6[g]	ND(0.71)	ND(0.71)	ND(100)	ND(0.71)	ND(0.70)	ND(0.77)	ND(0.79)
Metals: EPA Method 6010 except where noted[b] (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[g], 8.4[i]	NA	NA	NA	NA	NA	NA	NA
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[g]	NA	NA	NA	NA	NA	NA	NA
Chromium	39[g], 43.8[i]	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA	NA
Selenium (Method 7740)	39[g]	NA	NA	NA	NA	NA	NA	NA

Table D-22 (Cont'd)
Analytes Detected in USACE's Monitoring Well Soil Borings, Building 726

USACE Boring Number:		AP-3467			AP-3468			
Sample Number:[a] Depth (feet): Associated Duplicate Sample:[a]		067SL 69	071SL 79	073SL 94	076SL 20	078SL 30	087SL 45	089SL 50
PHCs: (mg/Kg)	**Screening Criteria**							
GRO (Method 8015M[c])	500[h]	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
DRO (Method 8100M[c])	1,000[h]	ND(4.8)	ND(4.4)	62[d]	86[e]	11[e]	ND(4.1)	ND(4.3)
VOCs: EPA Method 8260[b] (µg/Kg)	**Screening Criteria**							
Methylene Chloride	8,500[g]	ND(0.88)	ND(0.82)	ND(50)	ND(50)	ND(50)	6.4[c]	6.6[d]
Tetrachloroethene (PCE)	1,200[g]	ND(0.94)	ND(0.88)	ND(50)	ND(50)	ND(50)	ND(0.81)	ND(0.84)
Trichlorofluoromethane	2.3E6[g]	ND(0.80)	ND(0.74)	ND(100)	60[d]	90[d]	ND(0.69)	ND(0.71)
Metals: EPA Method 6010 except where noted[b] (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[g], 8.4[i]	NA	NA	NA	NA	NA	NA	NA
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[g]	NA	NA	NA	NA	NA	NA	NA
Chromium	39[g], 43.8[j]	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA	NA
Selenium (Method 7740)	39[g]	NA	NA	NA	NA	NA	NA	NA

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Table D-22 (Cont'd)
Analytes Detected in USACE's Monitoring Well Soil Borings, Building 726

USACE Boring Number:		AP-34[illegible]						
Sample Number:[a] Depth (feet): Associated Duplicate Sample:[a]		090SL 50 089SL	091SL 50 089SL	092SL 60	096SL 70	097SL 80	098SL 90	099SL 100
PHCs: (mg/Kg)	Screening Criteria							
GRO (Method 8015M[c])	500[b]	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
DRO (Method 8100M[c])	1,000[h]	ND(10)	ND(4.2)	ND(4.2)	ND(4.1)	ND(4.2)	ND(4.2)	ND(4.1)
VOCs: EPA Method 8260[b] (µg/Kg)	Screening Criteria							
Methylene Chloride	8,500[g]	ND(50)	ND(0.78)	6.6[d]	ND(0.76)	6.9[d]	5.7[d]	ND(0.76)
Tetrachloroethene (PCE)	1,200[g]	ND(50)	ND(0.83)	ND(0.83)	ND(0.81)	ND(0.82)	ND(0.83)	ND(0.81)
Trichlorofluoromethane	2.3E6[g]	ND(100)	ND(0.71)	ND(0.71)	ND(0.69)	ND(0.70)	ND(0.71)	ND(0.69)
Metals: EPA Method 6010 except where noted[b] (mg/Kg)	Screening Criteria							
Arsenic (Method 7060)	2.3[g], 8.4[i]	NA	NA	NA	NA	NA	NA	NA
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[g]	NA	NA	NA	NA	NA	NA	NA
Chromium	39[g], 43.8[i]	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA	NA
Selenium (Method 7740)	39[g]	NA	NA	NA	NA	NA	NA	NA

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Table D-22 (Cont'd)
Analytes Detected in USACE's Monitoring Well Soil Borings, Building 726

USACE Boring Number:		AP-3468		AP-3469				
Sample Number:[a]		102SL	104SL	105SL	106SL	107SL	110SL	111SL
Depth (feet):		110	12	20	20	20	32	42
Associated Duplicate Sample:[a]					105SL	105SL		
PHCs: (mg/Kg)	**Screening Criteria**							
GRO (Method 8015M[c])	500[h]	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
DRO (Method 8100M[c])	1,000[h]	ND(5)	ND(4.3)	12	10	ND(4.3)	ND(4.2)	ND(4.3)
VOCs: EPA Method 8260[b] (µg/Kg)	**Screening Criteria**							
Methylene Chloride	8,500[g]	7.7[e]	ND(0.80)	ND(0.80)	ND(50)	ND(0.80)	ND(0.80)	ND(0.78)
Tetrachloroethene (PCE)	1,200[g]	ND(0.99)	ND(0.86)	ND(0.85)	ND(50)	ND(0.85)	ND(0.86)	ND(0.83)
Trichlorofluoromethane	2.3E6[g]	ND(0.84)	ND(0.73)	ND(0.72)	ND(100)	ND(0.72)	ND(0.73)	ND(0.71)
Metals: EPA Method 6010 except where noted[b] (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[g], 8.4[i]	NA	NA	NA	NA	NA	NA	NA
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[g]	NA	NA	NA	NA	NA	NA	NA
Chromium	39[g], 43.8[i]	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA	NA
Selenium (Method 7740)	39[g]	NA	NA	NA	NA	NA	NA	NA

Table D-22 (Cont'd)
Analytes Detected in USACE's Monitoring Well Soil Borings, Building 726

USACE Boring Number:		AP-3469						
Sample Number:[a] Depth (feet): Associated Duplicate Sample:[a]		113SL 52	114SL 52 113SL	115SL 52 113SL	117SL 75	119SL 85	120SL 95	124SL 106
PHCs: (mg/Kg)	**Screening Criteria**							
GRO (Method 8015M[c])	500[h]	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
DRO (Method 8100M[c])	1,000[h]	ND(4.1)	12[f]	ND(4.2)	5.6	10	11	7.5
VOCs: EPA Method 8260[b] (µg/Kg)	**Screening Criteria**							
Methylene Chloride	8,500[g]	ND(0.76)	ND(50)	ND(0.78)	ND(0.88)	ND(0.89)	ND(0.91)	ND(0.84)
Tetrachloroethene (PCE)	1,200[g]	1.5	50	3.5	ND(0.94)	ND(0.95)	ND(0.98)	ND(0.90)
Trichlorofluoromethane	2.3E6[g]	ND(0.69)	ND(100)	ND(0.71)	ND(0.80)	ND(0.81)	ND(0.83)	ND(0.76)
Metals: EPA Method 6010 except where noted[b] (mg/Kg)	**Screening Criteria**							
Arsenic (Method 7060)	2.3[g], 8.4[i]	NA	NA	NA	NA	NA	NA	NA
Barium	550[g], 89.2[i]	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.9[g]	NA	NA	NA	NA	NA	NA	NA
Chromium	39[g], 43.8[i]	NA	NA	NA	NA	NA	NA	NA
Lead (Method 7421)	11.7[i], 400[j]	NA	NA	NA	NA	NA	NA	NA
Selenium (Method 7740)	39[g]	NA	NA	NA	NA	NA	NA	NA

Table D-22 (Cont'd)
Analytes Detected in USACE's Monitoring Well Soil Borings, Building 726

Notes:

[a] Sample number prefixes of 94FRPL have been omitted for brevity.
[b] Unless otherwise noted, analytical method is from U.S. Environmental Protection Agency (EPA), SW-846, edition 4, 1990.
[c] Alaska Department of Environmental Conservation (ADEC) modification.
[d] Contaminant found in method blank.
[e] Quantified as diesel but not typical diesel chromatogram.
[f] Sample contains non-fuel components excluded from quantification.
[g] Screening criteria one-tenth of the EPA Region 3 Risk-Based Concentrations for Soil (EPA 1995b).
[h] Screening criteria ADEC UST soil cleanup levels (ADEC 1995).
[i] Screening criteria 95 percent upper tolerance limit background concentrations (E&E 1996).
[j] Screening criteria EPA's cleanup standard for lead in soil (Wilkening 1995).

Data obtained from USACE 1995.

Key:

DRO = Diesel Range Organics.
GRO = Gasoline Range Organics.
mg/Kg = Milligrams per kilogram.
NA = Not analyzed.
ND = Not detected above the reporting limit shown in parentheses.
PHCs = Petroleum hydrocarbons.
UST = Underground storage tank.
µg/Kg = Micrograms per kilogram.
VOCs = Volatile Organic Compounds.

Table D-23
Analytes Detected in Groundwater, Building 726[a]

Well Number: Sample Number[b] Sample Date:		AP-3467 101WA 1/26/95	AP-3468 108WA 1/27/95	AP-3469 105WA 1/27/95	AP-3469 106WA (Duplicate) 1/27/95	AP-3469 107WA (Duplicate) 1/27/95
PHCs: (µg/L)	**Screening Criteria**					
DRO (EPA Method 8100M)	15[c]	460[e]	200[e]	240[e]	ND(100)	2,100[e]
TPH (EPA Method 418.1)	15[c]	2,300	ND(200)	ND(200)	ND(500)	9,900
VOCs: EPA Method 8260 (µg/L)	**Screening Criteria**					
Tetrachloroethene	5[d]	ND(5)	ND(5)	ND(5)	ND(2)	ND(5)

Notes:

[a] USACE 1995.
[b] Sample prefixes 94FRPL omitted for brevity.
[c] Screening criteria Alaska Water Quality Criteria, 18 AAC 70 (ADEC 1989).
[d] Screening criteria Maximum Contaminant Level (EPA 1995a).
[e] Quantified as diesel range organics but not typical diesel chromatogram.

Key:

DRO = Diesel range hydrocarbons.
ND = Not detected at method reporting limit shown in parentheses.
TPH = Total Petroleum Hydrocarbons.
VOC = Volatile organics.

Table D-24
Summary of Analytes Detected in Soil, Building 796[a]

Location:			SS 1		SS 2			SB AP 3511				
Sample Depth (feet):			2.5-3.5		2.5-3	4		0-8		10-12	12-14	
Sample ID:			94B79601SL	94B79602SL	94B79603SL	94B79604SL	94B79605SL	94B79606SL	94B79607SL	94B79608SL	94B79609SL	94B79610SL
Laboratory Code:			K946524-001	K946524-002	K946524-003	K946565-001	K946565-002	K946693-008	K946693-009	K946693-010	K946693-011	K946693-012
Date Collected:			10/18/94	10/18/94	10/18/94	10/19/94	10/19/94	10/25/94	10/25/94	10/25/94	10/25/94	10/25/94
PHCs: (mg/Kg)	Screening Criteria	MRL										
DRO (Method 8100M)	100-200[c]	10	364	302	ND	ND	ND	NA	NA	NA	ND	12
TPH (Method 418.1)	UA	10	240	730	14	ND	ND	NA	NA	NA	14	21
Organochlorine Pesticides: Method 8080 (mg/Kg)	Screening Criteria	MRL										
4,4'-DDT	0.19[b]	0.1	NA	NA	NA	ND	ND	NA	NA	NA	ND	ND
VOCs: Method 8260 (µg/Kg)	Screening Criteria	MRL										
Acetone	7.8E5[b]	50	ND	55	ND	ND	ND	ND	ND	ND	NA	NA
Chloroform	10,000[b]	5	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Carbon Tetrachloride	490[b]	5	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Trichloroethene (TCE)	5,800[b]	5	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Toluene	1.6E6[b]	5	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Total Xylenes	1.6E7[b]	5	5	ND	ND	ND	ND	ND	ND	ND	NA	NA
1,2,4-Trichlorobenzene	78,000[b]	20	20	25	ND	ND	ND	ND	ND	ND	NA	NA

Table D-24 (Cont'd)
Summary of Analytes Detected in Soil, Building 796[a]

Location			SS 1		SS 2			SB AP 3511				
Sample Depth (feet)			2.5-3.5		2.5-3	4		0-9		10-12	12-14	
Sample ID Laboratory Code Date Collected:			94B79601SL K946524-001 10/18/94	94B79602SL K946524-002 10/18/94	94B79603SL K946524-003 10/18/94	94B79604SL K946565-001 10/19/94	94B79605SL K946565-002 10/19/94	94B79606SL K946693-008 10/25/94	94B79607SL K946693-009 10/25/94	94B79608SL K946693-010 10/25/94	94B79609SL K946693-011 10/25/94	94B79610SL K946693-012 10/25/94
Total Metals: Method 6010 except where noted (mg/Kg)	**Screening Criteria**	**MRL**										
Arsenic (Method 7060)	23[c], 8.4[f]	1	8	7	7	6	6	NA	NA	7	7	8
Barium	550[b], 89.2[d]	1	52	56	32	27	26	NA	NA	59	64	54
Chromium	39[b], 43.8[d]	2	37	37	31	28	20	NA	NA	129	48	48
Lead (Method 7421)	400[e], 11.7[f]	1	45	164	6	7	6	NA	NA	357	37	44
Nickel	160[c], 51.5[d]	10	52	56	56	51	36	NA	NA	13	25	23
Other Analyses	**Screening Criteria**	**MRL**										
pH (units)	UA	N/A	4.73	5.2	6.1	6.09	6.29	NA	NA	NA	6.80	6.91
Redox Potential (mV)	UA	N/A	290	270	240	310	270	NA	NA	NA	NA	NA
Sulfate (mg/Kg)	UA	3	2,100	3,500	55	48	18	NA	NA	200	580	540

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34000

Table D-24 (Cont'd)
Summary of Analytes Detected in Soil, Building 796[a]

Location:			SB AP 3511			SB AP 3512				
Sample Depth (feet):			14-16		16-18	0-2	7-9	9-11	15-17	17-19
Sample ID:			94B79611SL	94B79612SL	94B79613SL	94B79614SL	94B79616SL	94B79617SL	94B79618SL	94B79619SL
Laboratory Code:			K946693-013	K946693-014	K946693-001	K946693-002	K946693-004	K946693-005	K946693-006	K946693-007
Date Collected:			10/25/94	10/25/94	10/25/94	10/25/94	10/25/94	10/25/94	10/25/94	10/25/94
PHCs: (mg/Kg)	**Screening Criteria**	**MRL**								
DRO (Method 8100M)	100-200[c]	10	ND	NA	ND	ND	NA	ND	ND	ND
TPH (Method 418.1)	UA	10	16	NA	11	950	ND	ND	ND	ND
Organochlorine Pesticides: Method 8080 (mg/Kg)	**Screening Criteria**	**MRL**								
4,4'-DDT	0.19[b]	0.1	ND	NA	ND	0.01	NA	ND	ND	ND
VOCs: Method 8260 (µg/Kg)	**Screening Criteria**	**MRL**								
Acetone	7.8E5[b]	50	ND	NA	ND	ND	ND	ND	65	83
Chloroform	10,000[b]	5	ND	NA	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	490[b]	5	ND	NA	ND	ND	ND	ND	ND	ND
Trichloroethene (TCE)	5,800[b]	55	8	NA	ND	ND	ND	ND	ND	ND
Toluene	1.6E6[b]	55	ND	NA	ND	ND	ND	ND	ND	ND
Total Xylenes	1.6E7[b]	55	ND	NA	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	78,000[b]	20	ND	NA	ND	ND	ND	ND	ND	ND