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FINAL
Remedial Investigation Report
Operable Unit A
Fort Richardson, Alaska

Volume 1: Report

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Prepared for:

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Acronyms and Abbreviations

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
AEHA	United States Army Environmental Hygiene Agency
ARARs	Applicable, Relevant, and Appropriate Requirements
Army	United States Department of the Army
AST	Aboveground storage tank
AWQC	Alaska Water Quality Criteria
BGS	Below ground surface
BNA	Base/neutral and acid-extractable organic compound
CERCLA	Comprehensive Response, Compensation, and Liability Act
CDD	Chlorinated dibenzo-p-dioxins
CDF	Chlorinated dibenzo furans
CFR	Code of Federal Regulations
Corps	U.S. Army Corps of Engineers, Alaska District
CQAR	Chemical Quality Assurance Report
DoD	United States Department of Defense
DQOs	data quality objectives
DRO	Diesel-range organics
E & E	Ecology and Environment, Inc.
EAFB	Elmendorf Air Force Base
EPA	United States Environmental Protection Agency
FFA	Federal Facilities Agreement
GRO	Gasoline-range organics
HI	Hazard index
IRP	Installation Restoration Program
MCL	Maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	micrograms per liter
MOA	Municipality of Anchorage
MSL	Mean sea level
MQL	Method quantitation limit
NPDL	North Pacific Division Laboratory
NPL	National Priorities List
OSWER	Office of Solid Waste and Emergency Response
OU-A	Operable Unit A
PAH	Polynuclear aromatic hydrocarbon
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PCBs	Polychlorinated biphenyls
POL	Petroleum, oil, and lubricant
POLLDW	Petroleum, Oil, and Lubricant Laboratory Dry Well
ppm	parts per million
PW	U.S. Army Alaska, Public Works

Acronyms and Abbreviations (Cont.)

QA	Quality assurance
QC	Quality control
RBC	Risk-based concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RIR	Remedial Investigation Report
RPD	Relative Percent Difference
RRFTA	Ruff Road Fire Training Area
RRTSL	Roosevelt Road Transmitter Site Leachfield
TBCs	To-be-considered criteria
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TEF	Toxicity equivalency factor
TOC	Total organic carbon
TRPH	Total recoverable petroleum hydrocarbons
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
UST	Underground storage tank
VOCs	Volatile organic compounds

Executive Summary

Pursuant to Contract No. DACA85-93-D-0009, Delivery Order No. 26, a remedial investigation (RI) was conducted at Operable Unit A (OU-A), Fort Richardson, Alaska. The RI was performed on behalf of the United States Army, Alaska (Army), Public Works, through the United States Army Corps of Engineers, Alaska District (Corps). The OU-A RI was conducted from May to October 1995 in accordance with the approved OU-A management plan and applicable requirements in the National Contingency Plan

Fort Richardson was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) in 1994. A Federal Facilities Agreement (FFA) between the Army; the United States Environmental Protection Agency, Region 10 (EPA); and the Alaska Department of Environmental Conservation (ADEC) established the objectives and schedule for investigation and clean-up activities at Fort Richardson, and divided the fort into four operable units. Operable Unit A is composed of three sites: the Roosevelt Road Transmitter Site Leachfield (RRTSL), the Ruff Road Fire Training Area (RRFTA), and the Petroleum, Oil, and Lubricant Laboratory Dry Well (POLLDW).

Roosevelt Road Transmitter Site Leachfield

RRTSL is located north of the main cantonment area of Fort Richardson, and east of Otter Lake. The site consists of a buried cesspool, septic tank, and drain pipes that were used to dispose of septic waste from an underground communications bunker. A previous investigation conducted in 1990 identified the presence of contaminated soil and sludge in the cesspool and septic tank. Contaminants detected included volatile organic compounds (VOCs), base/neutral and acid extractable organic compounds (BNAs), polychlorinated biphenyls (PCBs), and heavy metals. The leachfield was not sampled during the 1990 investigation but was later identified as a potential source of the same contaminants. Surface

and subsurface soil were contaminated in approximately 1978 when dielectric oil containing PCBs leaked from several transformers. Contaminated soil was excavated and removed during remedial actions conducted in 1988 and 1992.

To characterize the nature and extent of contamination at RRTSL during the RI, 21 soil borings and two monitoring wells were installed in and around the leachfield. Sampling efforts included the collection of subsurface soil samples from the borings, groundwater samples from the monitoring wells and an existing on-site well, and soil samples from the cesspool. In addition, a geophysical survey was conducted to confirm the location of underground structures associated with the leachfield, including drains, piping, and a septic tank. A field survey was conducted to map vegetation types and wetland boundaries in support of the ecological risk assessment.

Results of the RI field investigation indicate that extent of contamination at the site is limited to subsurface soils in the area immediately surrounding the RRTSL plumbing system. Contaminants detected during the RI include diesel-range organics (DRO), PCBs, and polynuclear aromatic hydrocarbons (PAHs) in subsurface soils and in the cesspool. No site-related contaminants were detected in groundwater at the site. Subsurface soil contamination (DRO) is present at depths from 5 to 15 feet below ground surface (BGS) in three soil borings within the leachfield. Soil from one boring within the leachfield contained a single PAH compound at a depth of 50 feet BGS, but the presence of this contaminant is not suspected to be indicative of a contaminant source. One boring located near the underground bunker contained trace concentrations of PCBs, but this contamination is likely related to past PCB clean-up operations at the site.

Ruff Road Fire Training Area

RRFTA is located east of the main cantonment area of Fort Richardson, near the east side of Bryant Airfield. The site was formerly used for fire training exercises from approximately 1940 until the 1980s. Training exercises involved applying of fuels and other combustible liquids to the ground surface of an unlined pit, igniting the fuels, and extinguishing the resulting fires with water. The site is an open field which contains no man-made structures. Previous site investigations identified the presence of petroleum hydrocarbons, VOCs, and dioxins in surface and subsurface soils. Groundwater at the site was not characterized prior to the RI. The site was regraded and filled during 1994, which could have distributed contamination to a larger area than previously identified at the site.

To characterize the nature and extent of contamination at RRFTA, 19 soil borings and five monitoring wells were installed for the RI. The sampling effort included the collection of surface soil samples from the former fire training area, subsurface soil samples from soil borings, groundwater samples from the monitoring wells, and surface water and sediment samples from a nearby pond. In addition, a field survey was conducted to map vegetation types and wetland boundaries in support of the ecological risk assessment.

Results of the RI field investigation indicate the presence of contamination in surface soil and subsurface soil. Contaminants detected during the RI include DRO, gasoline range organics (GRO), PAHs, and dioxins. No site related contaminants were detected in groundwater, surface water, or sediment. Surface soil contamination is limited to isolated areas in the present fill surface, but soil contamination is more extensive in the former ground surface soil horizon, which occurs a depths of 1 to 2 feet BGS. Subsurface soil contamination, including fuels and dioxins, extends to a maximum depth of 50 feet BGS, but the most significant levels of contamination in subsurface soils at the site usually occur at depths from 5 to 40 feet BGS. The estimated maximum volume of subsurface soil impacted by petroleum or dioxins at RRFTA is approximately 200,000 cubic yards.

Petroleum Oil and Lubricant Laboratory Dry Well

POLLDW is located approximately 15 feet south of Building 986 within the main cantonment area of Fort Richardson. The site consists of a dry well which is connected to sinks within Building 986, which is the POL laboratory. Operations performed at the POL laboratory include quality assurance analysis of various fuels such as motor gas, aviation fuel, JP-4, and arctic-grade diesel. Previous investigations indicated the presence of fuels, VOCs, BNAs, and heavy metals in sludge and wastewater samples collected from the dry well.

To characterize the nature and extent of contamination at POLLDW, 11 soil borings and five monitoring wells were installed for the RI. Samples were collected from the sludge in the dry well. Subsurface soil samples were collected from borings, and groundwater samples were collected from the monitoring wells. In addition, a field survey was conducted to map vegetation types and wetland boundaries in support of the ecological risk assessment.

Results of the RI field investigation indicate that subsurface soil within a 40-foot radius of the dry well is contaminated with GRO and DRO. One subsurface soil sample collected at a depth of 20 feet BGS contained a concentration of chromium significantly above background concentrations. The subsurface soil contamination is concentrated at depths between 15 and 20 feet BGS, which is the depth of the bottom of the dry well. Petroleum

contamination in subsurface soil was found to a maximum depth of 60 feet BGS in a boring adjacent to the dry well. The estimated maximum volume of contaminated subsurface soil at POLLDW is approximately 3,500 cubic yards. No site-related contaminants were detected in any of the groundwater samples collected at POLLDW.

1 Introduction

On behalf of the U.S. Army Alaska, Public Works (PW), Ecology and Environment, Inc., (E & E) performed a remedial investigation (RI) of Operable Unit A (OU-A) at Fort Richardson, Alaska. The RI was pursuant to the United States Army Corps of Engineers, Alaska District (Corps) Contract No. DACA85-93-D-0009, Delivery Order No. 26. Fort Richardson was placed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List (NPL) in June 1994, and as such, an RI was federally mandated.

All environmental assessment and remedial activities at Fort Richardson are performed in compliance with the requirements of a Federal Facilities Agreement (FFA) between the United States Environmental Protection Agency (EPA), Department of Defense (DoD), and the Alaska Department of Environmental Conservation (ADEC), which details the responsibilities and authorities of all three parties with respect to environmental assessment and remedial requirements. The FFA divides Fort Richardson into four operable units: OU-A, OU-B, OU-C and OU-D. The OU-A portion of Fort Richardson is composed of three sites: the Roosevelt Road Transmitter Site Leachfield (RRTSL), the Ruff Road Fire Training Area (RRFTA), and the Building 986 Petroleum, Oil, and Lubricant (POL) Laboratory Dry Well (POLLDW). RI activities conducted at OU-A were performed in accordance with the FFA, EPA regional guidance, the National Contingency Plan, and the approved OU-A management plan (E & E 1995).

1.1 Site Location and History

Fort Richardson is located within the Municipality of Anchorage (MOA) in south-central Alaska (see Figure 1-1). The three OU-A sites under investigation are located within a 1.5-square-mile area of the main installation (see Figure 1-2). The Fort Richardson military reservation is bound by MOA and Elmendorf Air Force Base (EAFB) to the south and west,

and by Eagle Bay and Knik Arm to the north. The east side of the military reservation is adjacent to Chugach State Park.

Fort Richardson was constructed in 1940 on approximately 162,000 acres, and its primary mission was to defend Alaska against foreign invaders. During World War II, Fort Richardson was an important military staging area and supply center. During the 1950s, its mission was expanded to establish ground and air defense for Alaska, develop cold weather and mountain warfare doctrine, and provide internal security.

In 1950, Fort Richardson was divided between the Army and the Air Force. Thirteen thousand acres were released to the Air Force for the formation of EAFB. The Army established a new cantonment area on the northern portion of Fort Richardson and acquired additional land. Fort Richardson currently uses approximately 56,000 acres to perform its mission, which is to command Army forces in Alaska and to provide the services, facilities, and infrastructure necessary to support the rapid deployment of Army forces from Alaska to the Pacific theater (U.S. Army 1994).

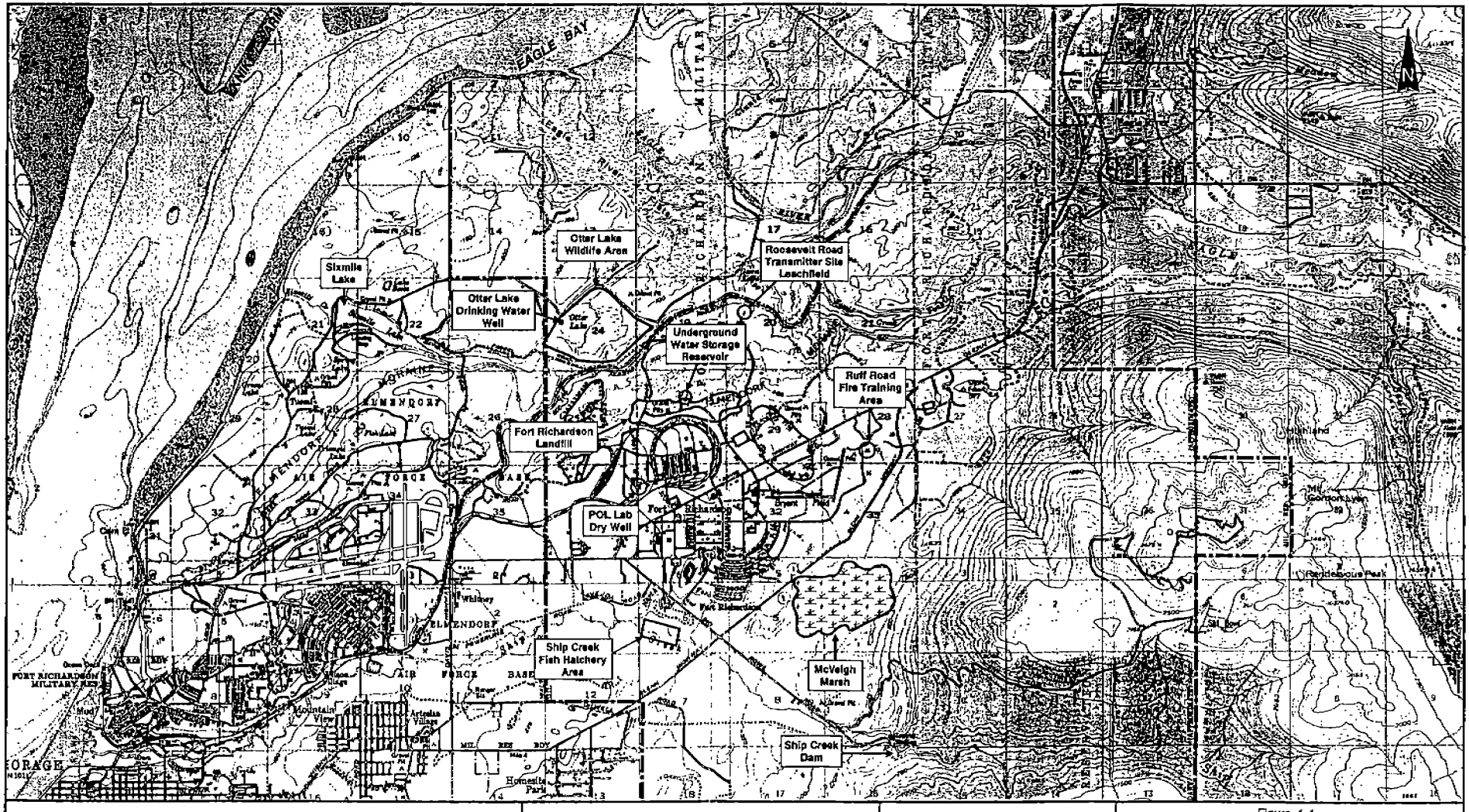
1.2 Purpose and Organization of the Remedial Investigation

The purpose of the RI is to characterize the nature and extent of contamination resulting from historical practices at the OU-A sites; assess the risk posed by on-site contaminants to human health and the environment; and determine whether contaminants have migrated from OU-A sites to groundwater, surface water, or other media of concern. Field activities were performed from May to October 1995. This RI report (RIR) was developed in accordance with the criteria set forth in *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988) and *Data Quality Objectives Process for Superfund, Interim Final Guidance* (EPA 1993).

The RIR is organized into sections that present site background information, RI results, and an interpretation of data obtained during the RI. Section 2 summarizes the regional setting and characteristics of the OU-A sites. Sections 3, 4, and 5 address each of the OU-A sites separately, and include the history, the previous and current investigations, and site-specific physical characteristics; nature and extent of contamination, including analytical results; and contaminant fate and transport processes. Section 6 summarizes the Applicable, Relevant, and Appropriate Requirements (ARARs) associated with the screening criteria used at each OU-A site. The results of the human health and ecological risk assessments associated with OU-A are presented as a separate report.

The following information is presented as appendices to this RIR:

- Photographic documentation of RI field activities (Appendix A);
- Soil boring logs and monitoring well construction diagrams (Appendix B);
- Geotechnical test results for selected soil samples (Appendix C);
- Aquifer test data (Appendix D);
- Chemical Quality Assurance Reports (CQARs) (Appendix E);
- Contaminant characteristics (Appendix F);
- Contaminant fate and transport modeling results (Appendix G); and
- Analytical data tables (Appendix H).



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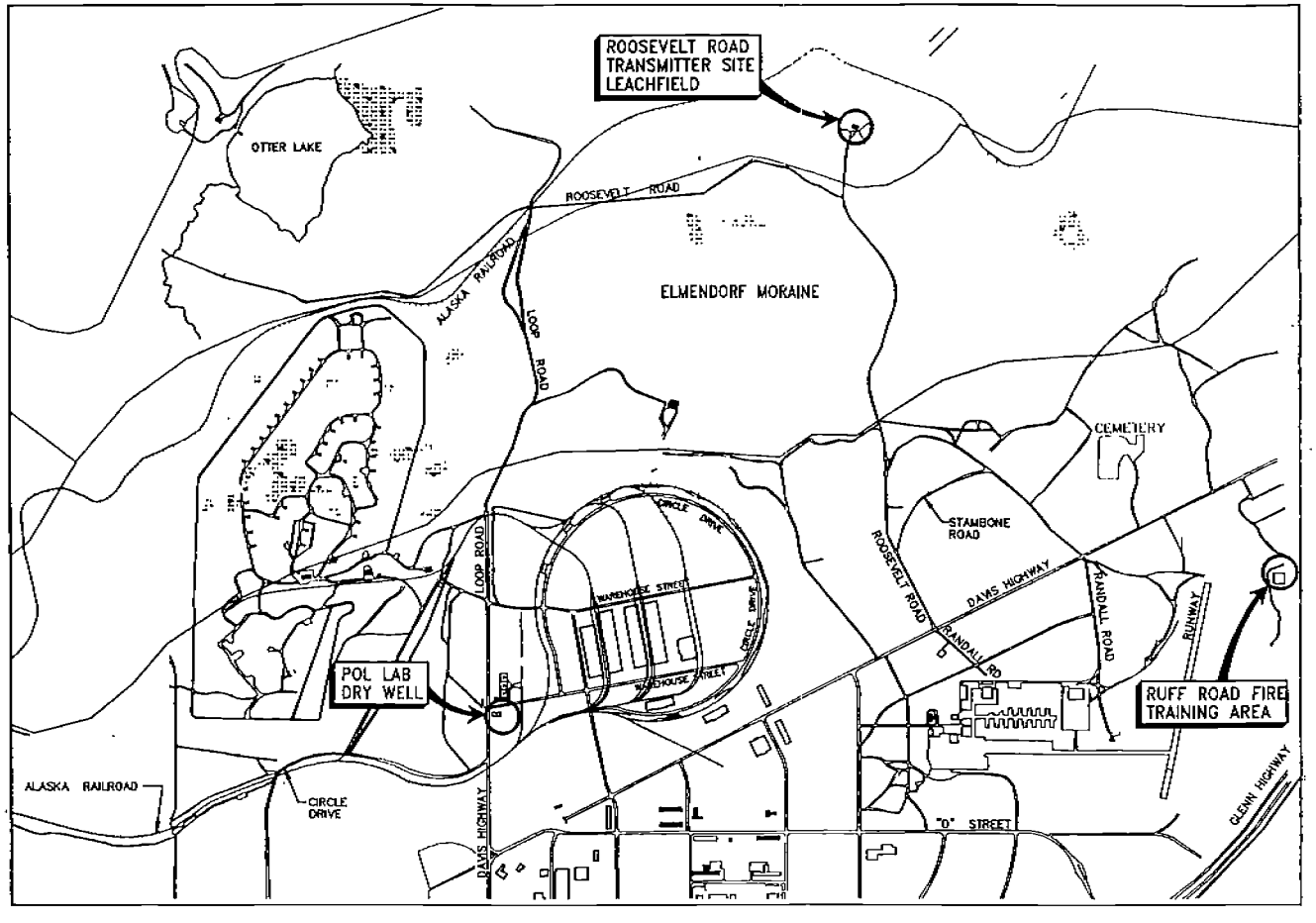
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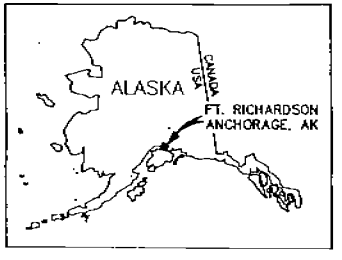
Figure 1-1
SITE VICINITY MAP
OPERABLE UNIT A
FORT RICHARDSON ANCHORAGE ALASKA

Drawn By	Date	TDD/Job No.	Dwg. No.
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0020664



SOURCE: Cederstrom et al. 1964



LOCATION MAP



SCALE IN FEET

0 2000 4000 6000

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U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 1-2
SITE LOCATION MAP
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S012B	3-18-96	

0020665

2 Regional Characteristics

This section describes the physical characteristics of the Fort Richardson area, and summarizes important aspects of the regional climate, geology, hydrogeology, and ecology. Site-specific information is included in Sections 3, 4, and 5.

2.1 Physiographic Setting

Fort Richardson is located within both the Coastal Trough and Pacific Border Range physiographic provinces of Alaska. Portions of Fort Richardson are located within the Cook Inlet-Susitna Lowland section of the Coastal Trough physiographic province, which contains glaciated areas of ground moraines, drumlin fields, eskers, and outwash plains. The Elmendorf Moraine trends northeast-southwest through the central portion of Fort Richardson and reaches elevations of approximately 450 feet above mean sea level (AMSL) (Freethey 1976). Most of Fort Richardson lies less than 500 feet AMSL and has a local relief of 50 to 250 feet. Rolling upland areas near the adjacent Chugach Mountain range rise to elevations of approximately 3,000 feet AMSL. The east-central and southeastern portions of the installation are within the Kenai-Chugach Mountains section of the Pacific Border Range physiographic province (ES & E 1983). The three OU-A sites are located on outwash deposits near the Elmendorf Moraine (see Figure 2-1). RRTSL is just north of the Elmendorf Moraine. RRFTA is located approximately 1 mile south of the Elmendorf Moraine, and POLLDW is 0.75 mile south of the moraine.

The northern and central sections of Fort Richardson, where the OU-A sites are located, feature flat to gently rolling, wooded terrain, including ponds and numerous streams leading from the mountains and uplands westward to Cook Inlet. Drainages flow primarily west-northwest into Knik Arm. However, streams in the southernmost portion of the fort, including Ship Creek, flow through Anchorage before entering Knik Arm (ES & E 1983).

Wetlands are located in the northern portion of the fort. The largest and most ecologically sensitive wetland is Eagle River Flats, a tidal marsh located along the lower

section of Eagle River at Eagle Bay (see Figure 1-1; Appendix A, photo 1). Small inland marshes occur along sections of ponds and streams (ES & E 1983).

2.2 Climate

Climatological information for Fort Richardson was derived from two sets of data (see Tables 2-1 and 2-2). One set of data was collected at EAFB for the period from 1941 to 1987 and published by the Arctic Environmental Information and Data Center (AEIDC) (Leslie 1989), and a second set of data was collected at EAFB for the period from 1983 to 1992 and published by the Air Weather Service (AWS 1992).

Fort Richardson is located in a climatic transition zone between the maritime climate of the coast and the continental climate of Interior Alaska. AEIDC data indicate a mean annual temperature of 35.1°F, and AWS data indicate a mean monthly temperatures of 36°F. AEIDC reports a minimum mean monthly temperature in January of 5.1°F, and AWS reports a maximum mean monthly temperature in July of 65°F. According to both data sets, the mean annual total precipitation was 15.9 inches, with almost half of the precipitation occurring from July through September. The driest period occurs between January and May. AEIDC reports a mean annual snowfall of 70.4 inches (Leslie 1989), and AWC reports a mean annual snowfall of 72.9 inches.

Prevailing airflow originates from the southwest, but northerly winds blow at lower elevations from April to September (see Figure 2-2). Mean wind speeds range from 3.0 to 6.6 knots (AWS 1992; ES & E 1983).

2.3 Regional Geology

Anchorage and the surrounding area lie within a large, northeast trending basin known as the Cook Inlet Forearc Basin. This basin is bounded to the west by the Alaska Range and to the east by the Chugach Mountains, and cut by several major northeast trending faults. In the Fort Richardson vicinity, the major faults are the Border Ranges/Knik Faults and the Eagle River Fault.

Five major Pleistocene glaciations have shaped the Cook Inlet basin: Mount Susitna, Caribou Hills, Eklutna, Knik, and Naptowne (Cederstrom et al. 1964). The Knik Glaciation (approximately 75,000 to 50,000 years ago) and the more recent Naptowne Glaciation (approximately 47,000 to 9,500 years ago) deposited most of the near-surface sediments in the Fort Richardson area. The Pleistocene deposits become thicker as they progress from the

Chugach Mountain front toward Cook Inlet, and they reach an accumulated thickness of approximately 600 feet (Cederstrom et al. 1964).

The Naptowne Glaciation represents the terminal margin of a glacier that once filled Cook Inlet (see Figure 2-3). Remnants of the glaciation include the massive Elmendorf Moraine, alluvial fans, and a large outwash deposit known as the Naptowne outwash (Schmoll and Dobrovolny 1972). The Elmendorf Moraine is composed of poorly sorted, unconsolidated till with boulders, gravel, sand, and silt. The moraine acts as a surface water divide, but not as a groundwater divide.

Sands and gravels of the Naptowne glacial till were transported and sorted by glacial meltwater as it flowed from the source glacier to form the Naptowne outwash deposit. These outwash sediments are more porous, better sorted, and better stratified than the glacial till of the Elmendorf Moraine. In the Anchorage area, the Naptowne outwash sands and gravels range from 0 to more than 50 feet thick, and serve as an unconfined aquifer that is widely used as a drinking water source (see Figure 2-3). Naptowne outwash deposits in the vicinity of OU-A are at least 166 feet thick, with groundwater at depths from 152 to 251 feet AMSL (80 to 160 feet below ground surface [BGS]).

Two sedimentary deposits that result from the Knik Glaciation underlie the Naptowne outwash in the Anchorage area: the Bootlegger Cove formation and the Knik outwash. The Bootlegger Cove formation lies between the Naptowne and Knik outwash units and consists of stratified clay and silt. The Bootlegger Cove formation includes of a wide variety of sediment textures that represent various depositional environments within a glaciomarine-glaciodeltaic system (Ulery and Updike 1983). This formation acts as a confining layer to the underlying aquifer in the Knik outwash sediments. The Bootlegger Cove formation reaches a maximum thickness of approximately 270 feet in downtown Anchorage, becomes thinner as it continues eastward, and becomes nonexistent near the Chugach Mountains (Patrick et al. 1989). Well log data collected in the vicinity of Circle Drive indicate the presence of the Bootlegger Cove formation at a depth of approximately 27 to 175 feet below mean sea level (BMSL) (Cederstrom et al. 1964). The lowermost unit resulting from the Knik Glaciation is the porous Knik outwash sand.

Throughout the Anchorage area, the unconsolidated sediments of the Naptowne and Knik Glaciations overlie low-permeability, Tertiary-age sedimentary bedrock of the Kenai formation (approximately 45 to 2 million years old). In the vicinity of Fort Richardson and eastward to the Chugach Mountains, unconsolidated sediments of the Naptowne and Knik glaciations overlie Mesozoic-age metamorphic bedrock (approximately 245 to 66 million years

old). At the Knik/Border Ranges Faults, the sedimentary rocks of the Kenai formation overlie in fault contact with the metamorphic rocks (see Figure 2-3).

2.4 Regional Hydrogeology

Two major aquifers exist in the Anchorage area that dip westward and extend from the Chugach Mountains across the Anchorage basin (Cederstrom et al. 1964). Most groundwater flows in the Naptowne and Knik glacial outwash sands and gravels. Relatively little groundwater flows in the underlying consolidated bedrock of the Kenai formation and the metamorphic rocks because of their low permeability. Well logs from previous investigations indicate that wells installed in bedrock yield small quantities of water (Cederstrom et al. 1964).

The Naptowne and Knik outwash aquifers are replenished by surface water runoff from the mountains, direct infiltration of precipitation, and percolation from surface waters. Groundwater flows through these deposits into glacial outwash sediments beneath portions of Fort Richardson south of the Elmendorf Moraine (Cederstrom et al. 1964).

The Naptowne outwash deposit contains the major shallow unconfined aquifer in the Anchorage area. This unconfined aquifer provides drinking water to some Anchorage residents that are not connected to the MOA water system. Regionally, groundwater in the unconfined aquifer flows westward from the Chugach Mountains to Knik Arm and Cook Inlet (Patrick et al. 1989). In the vicinity of the RRTSL, the unconfined aquifer was encountered at depths from approximately 152 to 178 feet AMSL (80 to 99 feet BGS). At the RRFTA, the unconfined aquifer was encountered at depths from 232 to 251 feet AMSL (141 to 160 feet BGS). The unconfined aquifer in the vicinity of the POLLDW was encountered at depths of 178 to 181 feet AMSL (112 to 121 feet BGS). According to a local groundwater contour map, the unconfined aquifer in the northern portion of Fort Richardson flows north-northwest with a hydraulic gradient of 0.00167 (Corps 1994).

The Knik glacial outwash deposit contains the major deep confined aquifer, and the Bootlegger Cove clay acts as the aquifer's confining layer. Knik outwash sediments are very porous and contain large volumes of confined groundwater. Numerous Anchorage residents that are not connected to the MOA water system obtain drinking water from this confined aquifer at depths from approximately 100 to 400 feet BGS (Cederstrom et al. 1964).

Neither the Bootlegger Cove clay nor the confined aquifer within the Knik outwash deposit was encountered during OU-A subsurface exploration. The confining Bootlegger Cove formation has not been encountered east of Circle Drive and may thin out near Circle

Drive. The portion of the confined Knik aquifer present beneath the Bootlegger Cove formation in Anchorage may become unconfined in the vicinity of Circle Drive and the area eastward, and it could be hydraulically connected to the Naptowne unconfined aquifer.

2.5 Local Water Supply

MOA draws drinking water from the Ship Creek Dam Reservoir, which is located near the headwaters of Ship Creek, and from the Eklutna Reservoir. Fort Richardson obtains drinking water from the Ship Creek Dam Reservoir and has several emergency supply wells on Ship Creek. Groundwater used for the emergency water supply is obtained from the confined aquifer in the Knik outwash deposit. Water from the Ship Creek Dam Reservoir is also allocated to EAFB. Water storage for Fort Richardson and EAFB is provided by a permanent 2.5-million-gallon underground reservoir in the Elmendorf Moraine and Ship Creek Dam Reservoir. A water treatment plant near the dam processes the drinking water used by Fort Richardson, EAFB, and MOA.

A drinking water well is located at the Otter Lake Recreational facility (see Figure 1-1). The depth and construction of the well are unknown (Corps 1990). However, the well appears to draw water from the confined aquifer (Wilson 1994).

2.6 Surface Water Hydrology

The main surface drainage features on Fort Richardson are Eagle River and Ship Creek (see Figure 1-1). Both originate in the Chugach Mountains and flow westward across the fort into the Knik Arm of Cook Inlet. The Elmendorf Moraine acts as the east-west-trending surface water divide between these drainage features. Eagle River receives turbid glacial meltwater, snowmelt, and surface water runoff, while Ship Creek is sustained by snowmelt and rainwater runoff. The flows of Eagle River and Ship Creek are variable, with maximum runoff occurring in August and June, respectively.

South of the Elmendorf Moraine, several small streams occur in the southern portion of Fort Richardson and flow southward and westward through MOA before entering Knik Arm. North of the moraine, Fossil Creek flows west between Eagle River and the moraine in an ancestral spillway. Otter Lake and Sixmile Lake also occur within this ancestral spillway (see Figure 1-1).

2.7 Demography

With a population of approximately 257,780, Anchorage is the largest city in Alaska and accounts for approximately 40% of the state's total population (DCRA 1995). Fort Richardson houses the United States Army Alaska, Arctic Support Brigade, and is within MOA boundaries. Although Fort Richardson and nearby EAFB are separate entities, area residents regard both as part of a single military presence in the area. Estimates indicate that approximately one-third of assigned military personnel live off post in the Anchorage area. The military population of Fort Richardson is 2,400, while civilian employees and military dependents total approximately 3,700 (Maguire 1996).

2.8 Ecology

The predominant vegetation type at Fort Richardson is varying-aged stands of mixed coniferous and deciduous forest. Five major floristic zones exist at the forest: coastal halophytic, lowland interior forest, subalpine, alpine, and artificially cleared (Lichvar et al. 1995). The dominant vegetative cover at Fort Richardson is a mixed white spruce-paper birch association which covers 40% of the fort.

The diverse plant communities provide habitats for a diverse wildlife population including moose, bear, Dall sheep, swans, and waterfowl. The Fort Richardson area supports a transient moose population of 600 during summer. Bear habitat is abundant. Approximately 15 to 20 black bears dwell in the lowland area of the fort, and brown bears are seen occasionally (WCC 1990a). Approximately 20 Dall sheep migrate into the southeastern portion of Fort Richardson during spring and summer.

Other wildlife species on the fort include ptarmigan, spruce grouse, river otter, beaver, coyote, snowshoe hare, mink, porcupine, weasel, marten, lynx, and fox. During winter, wolves occasionally visit the Eagle River Flats area, which is approximately 0.75 mile north of the RRTSL (WCC 1990a).

A diverse population of waterfowl species uses Fort Richardson as a breeding and migratory staging area, particularly Eagle River Flats, the Otter Lake Wildlife Area, and McVeigh Marsh (ES & E 1983; see Figure 1-1). Otter Lake is approximately 1.5 miles west of the RRTSL.

Eagle River Flats, the largest tidal marsh on Fort Richardson, is located approximately 0.75 mile downgradient of RRTSL. Eagle River Flats serves as a migratory staging ground for trumpeter and whistling swans. Approximately 10% of the North American

trumpeter swan population concentrates on the flats in October, prior to their southward migration (ES & E 1983).

Raptors known to live in or to use the Fort Richardson area include great-horned owls, bald eagles, hawk owls, short-eared owls, and goshawks (WCC 1990a). At least one active bald eagle nest has been reported on the northwest portion of Eagle River Flats (ES & E 1983).

Eagle River and Ship Creek support annual salmon runs of various species. Several trout species and nongame fish species occur in lakes, ponds, and streams. The State of Alaska Department of Fish and Game maintains a fish-rearing (trout and salmon) station adjacent to Ship Creek and the Fort Richardson power plant (WCC 1990a).

No known threatened or endangered plant or animal species reside on the Fort Richardson installation (ES & E 1983; Moran 1995).

Features of ecological significance in the OU-A vicinity are illustrated in Figure 1-1. A complete list of the flora and fauna of the sites is in the ecological risk assessment.

Table 2-1

CLIMATOLOGICAL SUMMARY FOR ELMENDORF AIR FORCE BASE
1941 TO 1987

Temperature (° Fahrenheit)												
	Means			Extremes				Maximum		Minimum		Heat Degree Days
Month	Max	Min	Month	Record High	Calendar Year	Record Low	Calendar Year	Above 70°F	Below 32°F	Below 0°F	Below 32°F	Monthly Mean
January	19.3	5.1	12.3	49	45	-39	75	0.0	26.2	12.0	30.7	1,588.4
February	25.0	9.5	17.3	58	43	-43	47	0.0	20.4	7.6	27.9	1,320.8
March	32.1	15.9	24.0	51	65	-24	46	0.0	14.1	4.0	29.5	1,247.9
April	43.0	27.9	35.5	65	76	-20	44	0.0	2.0	0.1	22.7	883.8
May	54.3	38.6	46.5	80	47	-1	45	0.6	0.1	0.0	3.2	591.4
June	61.5	47.1	54.4	86	69	33	43	2.9	0.0	0.0	0.0	351.7
July	64.6	51.4	58.0	83	52	34	41	5.8	0.0	0.0	0.0	252.8
August	63.1	49.1	56.1	82	68	29	48	3.6	0.0	0.0	0.1	308.6
September	54.8	41.4	48.1	74	57	20	46	0.1	0.0	0.0	2.6	527.0
October	40.0	28.2	34.1	63	66	-10	69	0.0	5.4	0.3	20.6	963.8
November	27.4	15.0	21.2	57	47	-20	48	0.0	20.7	4.4	28.3	1,277.1
December	20.1	7.0	13.6	53	41	-34	61	0.0	26.2	10.1	30.2	1,559.0
	Average	Average	Average	Record		Record		Total No. Days	Total No. Days	Total No. Days	Total	Total
Annual	42.1	28.0	35.1	86		-43		13.0	115.2	38.5	195.8	10,872.3

Key at end of table.

OUA 0020673.1

Table 2-1

CLIMATOLOGICAL SUMMARY FOR ELMENDORF AIR FORCE BASE 1941 TO 1987

Precipitation (Inches)										
				Mean Number of Days Precipitation Exceeded			Snow			
Month	Mean Monthly Total	Max Per Day	Year Max Occurred	0.5"	0.25"	0.1"	Mean Monthly Total	Max Depth	Year Max Occurred	Mean Days 1.0
January	0.94	1.15	1965	0.3	1.3	2.9	10.5	29.0	1956	31.0
February	0.91	1.70	1975	0.2	0.9	3.0	11.0	31.0	1956	28.0
March	0.75	1.32	1979	0.2	0.6	2.5	8.7	27.0	1979	29.0
April	0.62	0.83	1963	0.1	0.6	2.3	5.3	21.0	1975	12.4
May	0.59	0.57	1980	0.1	0.3	2.1	0.4	2.0	1965	0.1
June	1.12	1.31	1962	0.4	1.4	3.3	0.0	—	—	0.0
July	2.11	1.61	1969	1.0	2.6	5.5	0.0	—	—	0.0
August	2.33	1.56	1960	0.9	3.6	6.4	0.0	—	—	0.0
September	2.43	1.67	1951	1.3	2.8	6.6	0.2	1.0	1981	0.0
October	1.64	1.17	1952	0.6	2.1	5.2	7.4	13.0	1983	6.9
November	1.16	1.31	1981	0.4	1.2	3.7	11.3	19.0	1956	21.1
December	1.31	1.27	1955	0.3	1.7	4.4	15.6	30.0	1955	28.9
	Total	Record		Total	Total	Total	Total	Record		Total
Annual	15.92	1.70		6.0	19.1	47.8	70.4	31.0		157.5

Key:

— = Not applicable.
Max = Maximum.
Min = Minimum.

Source: Leslie 1989 (Arctic Environmental Information and Data Center).

OUA 0020673.2

Table 2-2

CLIMATOLOGICAL SUMMARY FOR ELMENDORF AIR FORCE BASE 1983 TO 1992

Temperature (° Fahrenheit)

Month	Means			Extremes		Maximum	Minimum		Heat Degree Days
	Max	Min	Monthly	Record High	Record Low	Above 70°F	Below 0°F	Below 33°F	Monthly Mean
January	20	6	13	49	-38	0	10	31	1,580
February	25	9	17	58	-43	0	7	28	1,329
March	32	16	24	51	-24	0	4	29	1,237
April	43	28	36	65	-20	0	1	22	863
May	54	39	47	80	0	1	0	3	545
June	62	47	55	86	33	3	0	0	296
July	65	52	59	83	34	6	0	0	195
August	63	50	57	82	29	4	0	0.5	253
September	55	42	49	74	20	0.5	0	3	482
October	40	28	34	63	-6	0	0.5	20	924
November	27	14	21	57	-22	0	4	28	1,312
December	20	8	14	53	-34	0	9	31	1,552
	Average	Average	Average	Record	Record	Tot No. of days	Tot No. of days	Total	Total
Annual	42	28	36	86	-43	14.5	35.5	195.5	10,568

OUA 0020673.3

Table 2-2

CLIMATOLOGICAL SUMMARY FOR ELMENDORF AIR FORCE BASE 1983 TO 1992

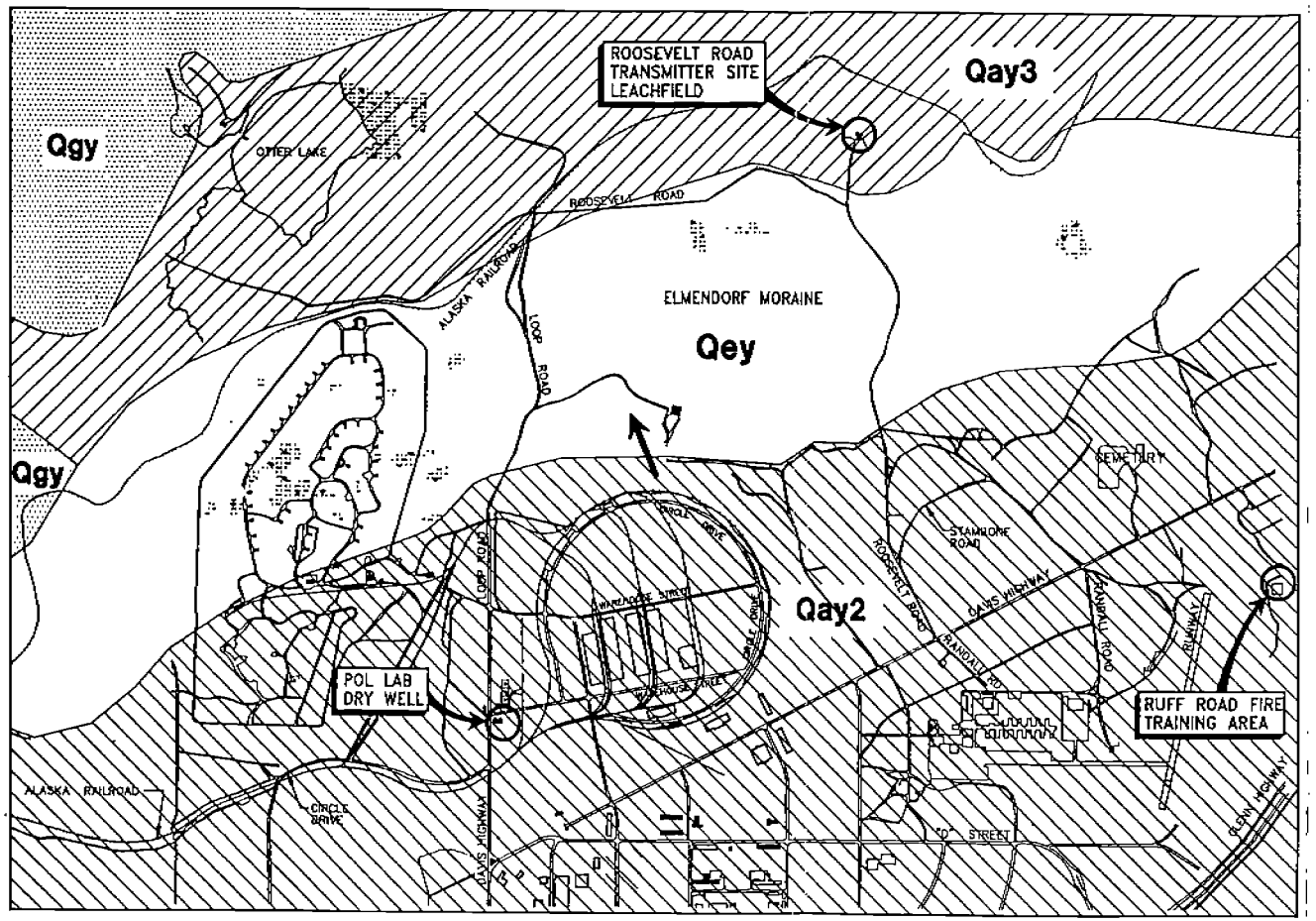
Precipitation (Inches)						
			Mean Number of Days Precipitation Exceeded		Snow	
Month	Mean Monthly Total	Max Day	0.5"	0.01"	Mean Monthly Total	Max Monthly Depth
January	0.91	1.16	1	8	10.8	34.6
February	0.87	1.38	1	7	11.5	40.1
March	0.78	1.90	1	7	9.1	32.7
April	0.59	0.83	0.5	6	5.2	29.6
May	0.56	0.72	0.5	6	0.3	7.8
June	1.13	1.31	1	8	0	0
July	2.02	1.61	1	12	0	0
August	2.41	2.54	1	14	0	0
September	2.58	1.52	1	14	0.2	1.8
October	1.73	1.40	1	11	7.8	27.5
November	1.12	1.58	1	8	11.8	39.6
December	1.32	1.36	1	10	15.7	45.8
	Total	Record	Total	Total	Total	Record
Annual	15.91	2.54	10	111	72.9	45.8

Key:

Max = Maximum.
Min = Minimum.

Source: Air Weather Service 1992, Climatic Brief

OUA 0020674



SOURCE: Cederstrom et al 1964

LEGEND

QUATERNARY DEPOSITS

- Qay3 — YOUNGER OUTWASH – STREAM DEPOSITS: SAND AND GRAVEL.
- Qgy — GROUND MORAINE: GLACIAL TILL AND GLACIOMARINE (SILT AND CLAY) SEDIMENTS.
- Qay2 — OLDER OUTWASH – STREAM DEPOSITS: SAND AND GRAVEL
- Qey — ELMENDORF MORAINE: GLACIAL TILL.

APPROXIMATE DIRECTION OF GROUNDWATER FLOW

N

SCALE IN FEET

0 2000 4000 6000

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U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS ANCHORAGE, ALASKA

Figure 2-1
SURFICIAL GEOLOGIC MAP
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

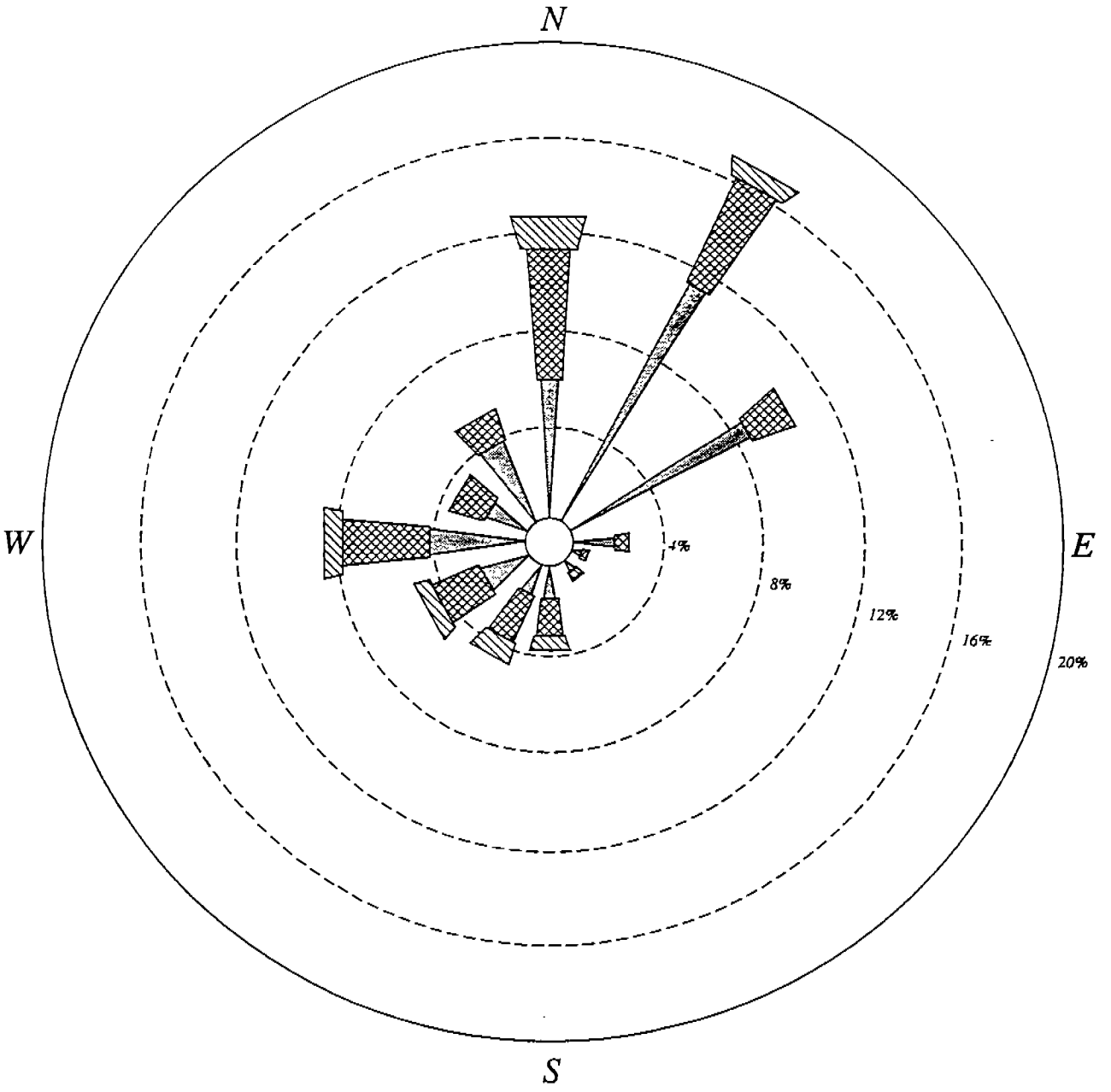
SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S011B	3-18-96	

OUA 0020671

0020675

CORPS OF ENGINEERS U.S. ARMY

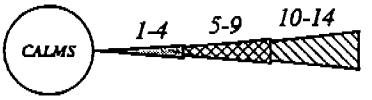
Elmendorf Air Force Base
1983 - 1992



CALM WINDS 0.00%

NOTE: Frequencies indicate direction from which the wind is blowing.

WIND SPEED (KNOTS)



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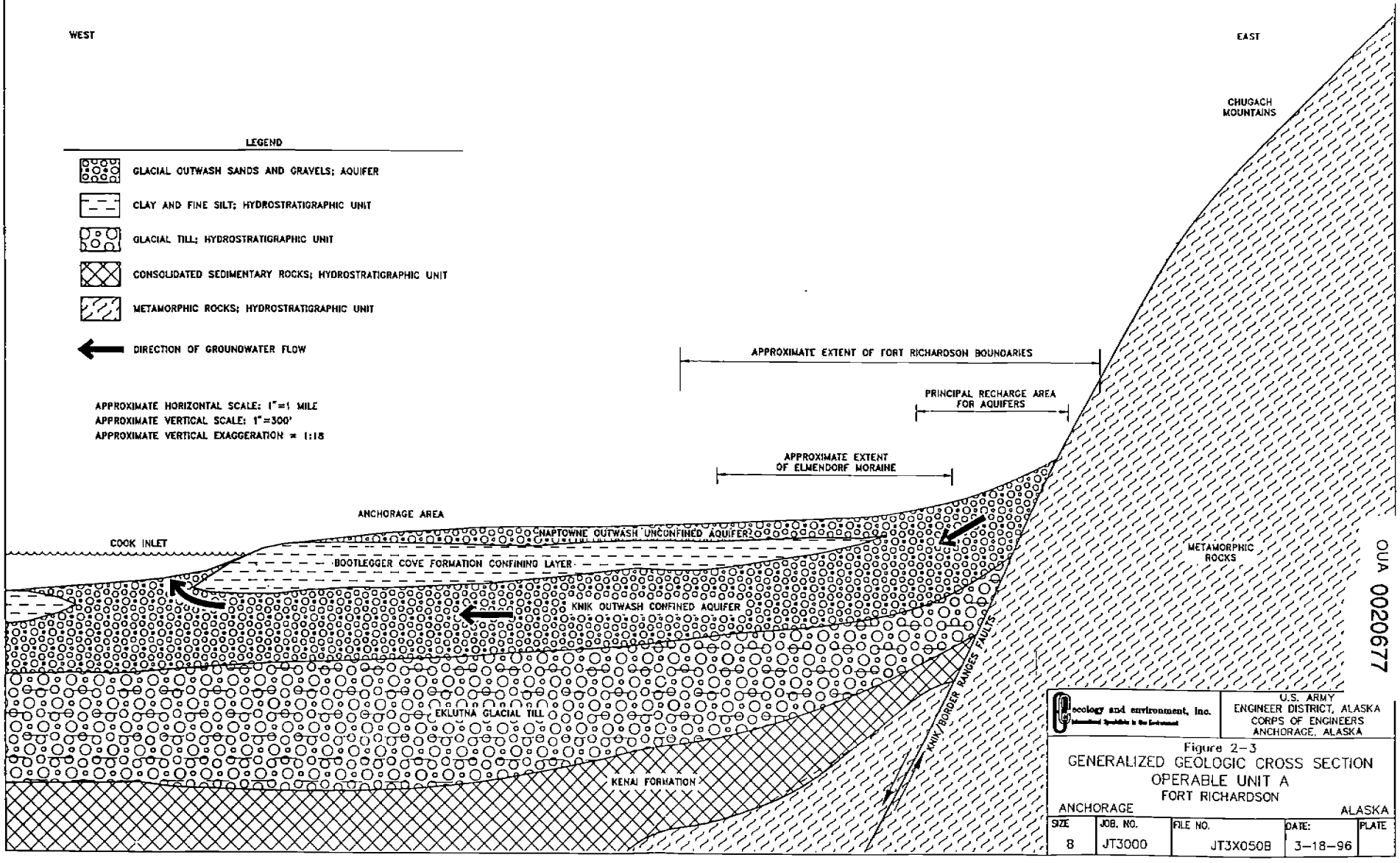
U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 2-2

ELMENDORF AIR FORCE BASE
WIND ROSE FOR 1983-1992
ANCHORAGE, ALASKA

SIZE	JOB NO.	FILE NO.	DATE	PLATE
B	JP3000	JT305022.CDR	96MAR11	

SOURCE: Air Weather Service, 1992



OUA 0020677

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U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 2-3
GENERALIZED GEOLOGIC CROSS SECTION
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
8	JT3000	JT3X050B	3-18-96	

3 Roosevelt Road Transmitter Site Leachfield

3.1 Site Description

The Roosevelt Road Transmitter Site is located within the northwest quarter of Section 20, Township 14 North, Range 2 West of the Seward Meridian (see Figure 1-1). The transmitter facility is located approximately 1 mile north of the main installation, approximately 1,000 feet north of Roosevelt Road, and approximately 1,000 feet south of the Alaska Railroad (see Figure 3-1).

3.1.1 Site History

The Roosevelt Road Transmitter Site was constructed in the early 1940s. The site consisted of an underground, bomb-proof bunker; various support buildings for electrical and communications equipment; storage buildings; and living facilities including housing, recreational buildings, and a mess hall. The transmitter facility was part of the Alaska Communications System, established to provide command and control communications in the event of enemy attacks on Anchorage or Fort Richardson. The underground bunker was built to be a protected, self-supporting structure that could operate if aboveground conditions prohibited normal communication methods, and it contained sanitary facilities, a water supply (well A), and living quarters (E & E 1991a).

The Roosevelt Road Transmitter Site was utilized from World War II through the end of the Korean War. The exact date that operations ended is unknown, but the underground bunker and related facilities were reportedly decommissioned during the mid-1960s. The bunker entrances were sealed in 1978. Vandalism inside the bunker was observed during the late 1980s, indicating that it was not secure at that time. Although the bunker remains, one of the entrances has been demolished and filled with soil, and the other entrance is sealed with an approximately 1-foot-thick concrete slab (E & E 1989; E & E 1994a).

The Roosevelt Road Transmitter Site Leachfield (RRTSL) is associated with the sanitary system facilities at the underground bunker. According to a 1952 building and utility

map of the facility, two sewer lines made of either cast iron or concrete originate from the west side of the bunker and extend westward, presumably in a common trench (see Figure 3-1). The sewer lines diverge approximately 50 feet west of the bunker. According to the drawing, the sewer lines connect to a septic tank and a concrete cesspool that is the nucleus of the leachfield. The septic tank is connected to the cesspool by a 6-inch-diameter pipe. (The location of the septic tank on Figure 3-1 is approximate because it was not located during the 1995 fieldwork.)

During fieldwork, the cesspool was determined to have a 2-foot-diameter opening secured with a concrete cover (E & E 1995; see Appendix A, photo 2). Only a thin layer of soil and leaves was present in the bottom of the cesspool. The leachfield consists of five 6-inch-diameter red clay (terracotta style) drain pipes located approximately 7 feet BGS. The drain pipes extend from the cesspool and are approximately 80 to 100 feet long (E & E 1989; E & E 1991a; U.S. Army 1952).

An undated floor plan of the bunker indicates that the sewer lines originate from a sewerage ejector pit along the west wall. The sewerage ejector pit is assumed to have pumped sewage out of the bunker to the leachfield area. Because the bottom of the cesspool and leachfield were encountered at 7 feet BGS, E & E assumes that the sewer lines and septic tank are buried at a depth of 6 to 10 feet BGS.

The quantity of sewage disposed of through the septic system is unknown. The volumes of contaminated media associated with the RRTSL have not been previously documented.

At least two other sewage disposal systems were present at the Roosevelt Road Transmitter Site. One served the mess hall, and one served the above ground living quarters. As-built drawings of the site indicate that cesspools are associated with these areas, but neither septic tanks nor leachfields appear on the drawings. These sewage systems are not part of OU-A (E & E 1991a).

In approximately 1978, dielectric oils containing polychlorinated biphenyls (PCBs) leaked from several transformers stored in the former transmitter annex building, which was located on the surface adjacent to the underground bunker. The PCB-containing oil seeped into the concrete foundation of the building. The spill was remediated later by washing the concrete foundation of the transmitter annex building with diesel fuel. In 1988, a contractor to the Corps excavated 150 tons of PCB-contaminated soils surrounding the concrete pad (WCC 1990a). Another clean-up effort was conducted in 1992 when at least 600 tons of PCB-contaminated soil was removed (Laidlaw 1992).

3.1.2 Previous Investigations

Three separate investigations have been conducted at the Roosevelt Road Transmitter Site. The investigations were performed to characterize the nature and extent of PCB contamination in surface and subsurface soils (to a depth of 35 feet BGS) adjacent to the transmitter annex foundation, and to determine whether PCB-containing wastes were released inside the underground bunker (see Figure 3-1).

The most recent investigation was performed in 1990 and included a limited characterization of the septic system associated with the RRTSL. One sludge sample and two soil samples (including one quality control [QC] duplicate) were collected from inside the cesspool. The cesspool was reportedly partially excavated to allow sample collection from inside the structure. The cesspool sample was obtained from a layer of sludge on the bottom of the concrete-lined cesspool. Soil samples were obtained from sloughed material in the cesspool. Subsurface soil or groundwater in the vicinity of the RRTSL was not characterized during the investigation (E & E 1991a).

Analytical results from the 1990 investigation indicated the presence of the following: several volatile organic compounds (VOCs); base/neutral and acid-extractable organic compounds (BNAs) including fluoranthene (up to 8,800 μg/kg), chrysene (6,900 μg/kg), and benzo(a)pyrene (5,700 μg/kg); PCBs (up to 5,600 μg/kg); and heavy metals including copper (up to 1,100 mg/kg) and lead (up 1,200 mg/kg). Analysis for fuel was not performed. Table 3-1 summarizes the contaminants and concentrations detected during the 1990 investigation of the RRTSL.

3.2 RI Field Investigations

Based on the results of the previous investigation of the RRTSL cesspool, the OU-A management plan identified site characterization activities to be conducted at RRTSL. The site investigation at RRTSL consisted of the following components:

- Geophysical survey;
- Cesspool investigation
- Subsurface soil investigation;
- Groundwater investigation; and
- Ecological investigation.

Surface soil samples were not collected at RRTSL because potential contaminants would have been discharged to the subsurface through the underground sewer lines, cesspool, septic tank, and leachfield. In addition, previous sampling activities did not indicate the presence of contaminants in surface soils. No surface water or sediment samples were collected because no hydraulic connection was established to any nearby surface water body.

This section describes the specific field investigations conducted at RRTSL in support of the RI. The methods used to perform the field investigation are described in Appendix A of the OU-A management plan (E & E 1995), which was previously submitted to the Corps. No significant deviations were made to the proposed sampling strategy. Table 3-2 provides a summary of the samples collected, sample locations, and the analyses performed.

3.2.1 Geophysical Survey

A geophysical survey was conducted at RRTSL using an electromagnetic conductivity instrument (EM-31) and metal detector to determine the location of the following features:

- The tile drain leachfield;
- The pipelines leading from the bunker to the cesspool and septic tank; and
- Other subsurface obstacles that may not be identified on maps (e.g., utilities, pipelines, etc.).

The objective of locating these structures was to identify the location of buried contaminant sources and to aid in soil boring placement. The as-built drawing of the site was used to determine the area to be surveyed (U.S. Army 1952). The survey area extended westward from the west side of the underground bunker to the end of the leachfield (see Appendix A, photo 3).

The field team visually located the tile drain pipes and the 4-inch steel sewer line from inside the cesspool. Beginning at the cesspool, the team surveyed the approximate locations of the buried tile drains and the septic tank using the EM-31 and a metal detector in an attempt to locate their terminus. Neither instrument detected any anomalies in the subsurface in the vicinity of the tile drains or the septic tank. The metal detector was used in conjunction with a Schonstedt conductive pipe locator to confirm the location of the 4-inch steel sewer line extending southeast from the cesspool to the underground bunker.

The geophysical investigation failed to detect the presence of the buried septic tank (see Figure 3-1). As a result, a back-hoe was used to excavate two trenches in the area where

as-built drawings indicated that the septic tank was buried. Neither trench revealed any features associated with the septic tank (see Appendix A, photo 4).

In summary, the geophysical survey confirmed the location of the main sewer line extending from the bunker to the cesspool. Visual observations were used to estimate the locations of the leachfield drains for soil boring placement. Although the septic tank was not located in the field, as-built drawings were used to estimate its location and to place soil borings in appropriate positions to characterize potential releases from this structure.

3.2.2 Cesspool Sampling

Based on previous investigations, sludge within the cesspool and septic tank was believed to be the main contaminant source at RRTSL. The cesspool did not contain sludge at the time of the field investigation, but a 6-inch layer of soil was present at the bottom. Two soil samples, RRTSL1001SL (QC duplicate RRTSL1002SL and QA duplicate RRTSL-1003SL) and RRTSL1004SL, were collected from the soil in the cesspool to characterize the nature of potential contamination and identify whether the soil is a Resource Conservation and Recovery Act (RCRA) waste. The septic tank was not sampled because the geophysical survey failed to locate this structure.

3.2.3 Subsurface Soil Investigation

Based on results of the 1990 investigation and contaminants detected in sludge from the cesspool, E & E assumed that subsurface soils could be potentially contaminated by petroleum, solvents, PCBs, and heavy metals from the historical disposal of waste products through the septic system. Soil borings were drilled to collect subsurface soil samples to define the nature and extent of subsurface contamination. Soil boring and monitoring well locations are presented in Figure 3-2. (Refer to Appendix B for soil boring logs and monitoring well diagrams.)

The sewer lines were buried to a depth of approximately 7 feet BGS and were expected to be a source of contamination. To determine the nature and extent of contamination originating from leaks in the sewer lines, six borings (AP-3599, AP-3601, AP-3606, AP-3610, AP-3611, and AP-3617) were drilled to a depth of approximately 20 feet BGS along the sewer lines using a hollow-stem auger. Samples were collected at 5-foot intervals to a depth of approximately 20 feet BGS.

Fourteen additional 50-foot soil borings were drilled with a hollow-stem auger in the leachfield and in background locations to characterize contamination and establish background conditions: AP-3598 was drilled adjacent to the 4-inch sewer line; AP-3600 was drilled just

south of the cesspool; AP-3609 was drilled at the approximate location of the septic tank; AP-3602 and AP-3603 were drilled between the leachfield tile drains; and AP-3604, AP-3605, AP-3607, and AP-3608 were drilled at the ends of the leachfield tile drains. AP-3612 through AP-3616 were drilled in areas expected to be topographically upgradient of the leachfield. Soil samples from the 50-foot soil borings were collected at approximately 5-foot intervals to a depth of approximately 20 feet BGS, and at 10-foot intervals from a depth of 20 to 50 feet BGS.

Two monitoring wells, AP-3658 and AP-3659, were installed using the air-rotary drilling method. AP-3658 was installed to a depth of 95 feet BGS at a location hydraulically crossgradient of the leachfield. AP-3659 was installed to a depth of 98 feet at the cesspool. Soil samples from both well borings were collected at 10-foot intervals from 60 feet BGS to the bottom of the borings.

3.2.4 Groundwater Investigation

Based on the permeability of soils at RRTSL, groundwater could have been contaminated by petroleum, solvents, PCBs, and heavy metals from historical disposal of waste products through the septic system. Groundwater samples were collected from both monitoring wells installed for the RI and from Well B, a former water supply well that was modified to be used exclusively for groundwater monitoring purposes (see Table 3-3). Well B is located topographically crossgradient of the leachfield, approximately 1,301 feet west-northwest of AP-3659 (see Figure 3-2; Appendix B, photos 5 and 6).

3.2.5 Ecological Investigation

Field biologists conducted a field survey of the area within a 0.5-mile radius of the site to identify major vegetation cover types and to qualitatively assess the suitability of each cover type for wildlife. Wetland boundaries mapped by USFWS were verified and assessed according to the standard procedures presented in the *Corps of Engineers Wetland Delineation Manual* (Corps 1987).

3.3 Physical Characteristics

3.3.1 Site Geology and Soils

RRTSL is located near the northern margin of the Elmendorf Moraine on the Naptowne outwash deposits. The Naptowne outwash deposits in the site area consist of unconsolidated, well graded gravel, sand, silt, and minor amounts of clay. RRTSL soil

boring logs indicate that the soil consists of dry, massive, very dense, well graded gravel (1-7 cm) and sand, with minor silt and clay (see Appendix B). Gravel and sand grains are angular to sub-angular. Grain-size analysis conducted on subsurface soil samples indicates that on-site soils consist of approximately 67% gravel, 25% sand, and 7% silt and clay (see Appendix C). The total thickness of the Naptowne outwash deposit is unknown at the RRTSL, but based on soil boring logs it extends from the ground surface to at least 153 feet AMSL (98 feet BGS).

Discontinuous sand lenses were encountered at various depths (see Figure 3-3 and Figure 3-4). The sand lenses range from approximately 5 feet to 12 feet deep, but the lateral extent is unknown (see Figure 3-3, Figure 3-4, and Appendix A, photo 7). Detailed descriptions of each soil boring are presented in Appendix B. Geotechnical test results for selected soil samples are presented in Appendix C.

3.3.2 Site Hydrogeology

Groundwater at RRTSL occurs at depths from 88 to 99 feet BGS (approximately 176 to 178 feet AMSL) within a sandy gravel deposit of the Naptowne outwash formation. Observations on the occurrence of groundwater and implied groundwater flow for the site are based on water level measurements from three wells installed at or near RRTSL. Two of these wells, AP-3658 and AP-3659, are located at RRTSL. Well B is located 1,301 feet west-northwest of RRTSL. Water levels for these wells indicate that groundwater generally flows southwest with an estimated gradient of 0.01. This groundwater flow direction represents local conditions and is not consistent with the regional west-northwest groundwater flow (see Figure 3-5).

Groundwater levels in RRTSL wells were monitored monthly from 1995 to February 1996, and the data indicate that water levels in this area are variable. Water levels at RRTSL decreased during this period between 0.42 and 1.52 feet, suggesting that water levels decrease during the late fall and winter months. No significant changes in either the direction or gradient of groundwater flow were evident for the 5-month monitoring period. Water levels are expected to rise with seasonal recharge beginning in spring.

Hydraulic conductivities for the aquifer at RRTSL were estimated through slug tests performed at wells AP-3658 and AP-3659 in October 1995 (see Appendix B, photo 8). A description of slug test analyses analytical data are provided in Appendix D. Results of these analyses show that hydraulic conductivities for the two wells differ by an order of magnitude (0.002 foot per minute [ft/min] at AP-3658, and 0.02 ft/min at AP-3659). This difference could be attributable to varying amounts of fine materials present within the aquifer matrix at these two locations. However, boring log data do not indicate that any significant differences

in aquifer materials were observed during well installation. Regardless, the slug test results in this case are presented as estimates because of the relatively high permeabilities. While slug tests are generally more suited to lower permeability materials, the higher permeabilities calculated from the test data are consistent with values typically associated with sand and gravel aquifers, and consistent with a published report of hydraulic conductivity for the regional aquifer (Patrick et al. 1989).

3.3.3 Site Ecology

RRTSL is located in an undeveloped portion of Fort Richardson. The site is surrounded by white spruce and paper birch forests. Figure 3-6 presents the vegetative cover types found within a 0.5-mile radius of the site. A comprehensive list of the vegetation at the site is in the ecological risk assessment.

A large portion of the site is sparsely vegetated with herbaceous species. Shrubs dominated by cottonwoods and alders surround the developed portion of the site. A paper birch forest is east and south of the site.

The area west of the site between Roosevelt Road and the Alaska Railroad contains a disturbed white spruce forest with portions containing an alder shrub layer. North of the Alaska Railroad is a white spruce/paper birch forest with some pure stands of paper birch.

Wetlands are located within 0.5 mile of the site to the southwest, southeast, and northeast. The southern wetlands are located approximately 0.4 and 0.25 mile from the site in hydraulically cross-gradient locations. Each is isolated and occurs in low-lying areas. No inlets or outlets were observed at these wetlands. The wetlands located north of the site are approximately 0.4 mile from the site and associated with Gwen Lake and an unnamed lake. These wetlands are hydraulically cross gradient from the site. Extensive wetland areas associated with Eagle River Flats are located approximately 1 mile northwest of the site.

The forested areas surrounding RRTSL provide habitat for a diverse mammal and avian population. The open wetlands provide habitat for waterfowl. Unidentified birds and a beaver dam were observed at the unnamed lake during E & E's ecological field survey.

3.4 Analytical Data Quality Assurance

The Quality Assurance/Quality Control (QA/QC) program implemented at OU-A is described in Appendix E. The data quality and data usability for RRTSL are summarized in the following paragraphs.

3.4.1 Off-site Laboratory

The North Pacific Division Laboratory (NPDL) evaluated all analytical data generated by the off-site laboratories for precision, accuracy, representativeness, completeness, and comparability (PARCC). Details of the data validation are presented in the CQARs in Appendix E.

As noted in the CQARs, NPDL concluded that the soil and groundwater data met the QA/QC requirements set forth by the Corp (Corps 1990) and the EPA Functional Guidelines (EPA 1994a; EPA 1994b) and was not adversely affected by the following data qualifications:

- **VOC analysis:** Approximately 1.6% of the results (168 individual analytical results) are considered estimates because surrogate recoveries, holding times, sample preservation, and/or method blanks did not meet established QC criteria.

- **BNA analysis:** Approximately 29% of the results (10 samples) are considered estimates because holding times and/or method blanks did not meet QC criteria.

- **Polynuclear aromatic hydrocarbon (PAH) analysis:** Approximately 17% of the results (1 sample) are considered estimates because matrix spikes did not meet QC criteria.

- **Gasoline-range organic (GRO) analysis:** Approximately 6.5% of the results (11 samples) are considered estimates because matrix spike recoveries and/or sample preservation did not meet QC criteria.

- **Total recoverable petroleum hydrocarbon (TRPH) analysis:** Approximately 18% of the results (29 samples) are considered estimates because method blanks and/or holding times did not meet QC criteria; and

- **Inorganic analysis:** Approximately 3% of the results (138 individual analytical results) are considered estimates because holding times, duplicate analyses, matrix spike recoveries, duplicate relative percent differences (RPDs), and/or method blanks did not meet QC criteria.

E & E chemists used the recommendations in the CQARs and EPA Contract Laboratory Program (CLP) guidelines to assign data qualifiers to the analytical results shown in Table 3-4. The following data qualifiers were applied: Sample concentrations considered to be estimates are flagged "J." Estimated detection limits are flagged "UJ." Results that might be attributed to blank contamination are flagged "B." No results were rejected. Based on the data qualifications applied, the data are not adversely impacted and considered usable for this investigation.

3.4.2 Field Quality Assurance/Quality Control Sample Results

Trip blank and rinsate sample results for RRTSL are presented in Appendix H. Toluene and 1,2-dichloropropane were detected in trip blanks. Acetone, bromodichloromethane, 2-butanone, chloroform, chloromethane, and total xylenes were detected in trip blanks and rinsates. These analytes were attributed to laboratory contamination because they were detected in laboratory method blanks. Because all detected analyte concentrations in the trip blanks and rinsates were within a factor of two of the method quantitation limits (MQLs), the impact on project data quality was considered insignificant. Calcium, magnesium, and sodium were detected in the rinsate sample at concentrations greater than 10 times the MQL. A low potential for cross contamination during sample collection exists because PCBs, GRO, DRO, TRPH, and total organic carbon (TOC) were not detected in the rinsate. For instances in which analytes were not detected in the laboratory blanks, the deionized water used to prepare trip blanks and rinsate samples appears to be the most probable cause of contamination.

Overall, blind duplicate and triplicate data agree and are comparable. For instances in which data did not agree, the discrepancies could not be resolved analytically and are attributed to nonhomogeneous samples.

3.4.3 Analytical Data Quality Objectives Assessment

E & E reviewed the analytical data to determine its ability to meet the data quality objectives (DQOs) identified in the OU-A management plan (E & E 1995). The following data use limitations were identified:

- Analytical results were flagged "J" to indicate that quantitative accuracy is questionable. Although the results are usable, the precise concentration is questionable.

- Analytical resulted were flagged "B" to indicate an estimated detection limit. Such samples are believed to the result of field or laboratory conditions and are not considered to be reflective of actual site conditions. The chemical of concern may or may not be present in these samples, and the result is masked by field or laboratory-introduced contamination by the same chemical of concern.

- Limitations were placed on the usability of $<1\%$ of the VOC data (53 analytes), 4% of the BNA data (87 analytes), 13% of the PAH data (12 analytes), and $<1\%$ of the metals data (28 analytes) because required analytical detection limits were not achieved. The presence or absence of a chemical of concern cannot be confirmed at the action level because the practical quantitation limit was exceeded due to unavoidable matrix effects.

Overall, PARCC parameters were achieved for RRTSL analytical data and the data met the needs for characterization of the extent of contamination and ecological and health and human risk assessment.

3.5 Nature and Extent of Contamination

This section summarizes the types of contaminants detected at RRTSL and the spatial distribution of contaminants detected during the OU-A RI. Tables 3-5, 3-6, and 3-7 summarize the frequency of detection, range, and locations of maximum concentrations of analytes detected in cesspool samples, subsurface soil, and groundwater. (Appendix H contains all of the analytical data for the RRTSL generated during the RI, including detection limits.)

A conservative risk-based screening procedure was used to identify site-related contaminants at RRTSL. (Although this screening procedure is similar to the procedure that was used in the OU-A risk assessment, the screening for the human health risk assessment was conducted independently.) The following screening criteria were applied to the analytical results to identify contaminants:

- **Inorganic analytes:** Inorganic analyte concentrations were identified as contaminants if detected at concentrations exceeding the maximum concentration detected in site-specific background samples or at concentrations exceeding the background concentration reported in the background study for Fort Richardson (E & E 1996).

- **Organic analytes in soil:** Organic analytes in soil were identified as contaminants if detected at concentrations exceeding an excess lifetime cancer risk of 1×10^{-7} or a hazard index (HI) of 0.1 based on EPA Region 3 risk-based concentrations (RBCs) (EPA 1995).

- **DRO and GRO analytes:** DRO and GRO analytes were identified as contaminants if detected at concentrations exceeding Alaska non-UST matrix level A, which corresponds to 100 mg/kg for DRO and 50 mg/kg for GRO (ADEC 1991).

- **Organic analytes in groundwater:** Organic analytes in groundwater were identified as contaminants if detected at concentrations exceeding an excess lifetime cancer risk of 1×10^{-6} or a HI of 0.1, based on EPA Region 3 RBCs (EPA 1995).

The analytes generated by this screening are considered contaminants to determine the nature and extent of contamination at RRTSL and to evaluate risks associated with OU-A. EPA Region 3 RBCs were used as screening criteria for organic anlaytes because they reflect the most current toxicity criteria available (EPA 1994c). No RBCs exist for petroleum

products, so the most conservative levels referenced in *Interim Guidance for Non-UST Contaminated Soil Clean-up Levels* were used as screening criteria for DRO and GRO (ADEC 1991). Background concentrations were used as screening criteria for inorganic elements because they are expected to provide the most site-specific basis for evaluating the significance of inorganic analyte concentrations. Aluminum, calcium, iron, magnesium, potassium, and sodium were eliminated from discussion because they are not associated with toxicity to humans under normal circumstances and are common constituents of uncontaminated soils (EPA 1991).

3.5.1 Cesspool Contamination

Soil within the cesspool contained petroleum hydrocarbons, PCB Aroclor 1260, cyanide, and heavy metals including barium, cadmium, lead, and mercury (see Table 3-5). Petroleum hydrocarbons were detected up to a maximum concentration of 23,000 mg/kg (quantitated as unknown fuel eluting within the residual-range organics). Cyanide was detected at a concentration of 1.2 mg/kg. Although heavy metals are present in the cesspool, none of the Toxicity Characteristic Leaching Procedure (TCLP) analytical results exceeded the RCRA criteria for a toxicity characteristic hazardous waste. Corrosivity and ignitability results for the cesspool samples do not exceed applicable RCRA criteria for hazardous waste.

3.5.2 Subsurface Soil Contamination

Subsurface soils at RRTSL contain the following site-related contaminants: DRO, PCBs, and benzo(a)anthracene (see Table 3-6). VOCs were not detected at concentrations exceeding the screening criteria. Barium, chromium, copper, lead, manganese, vanadium, and zinc were detected at concentrations exceeding screening criteria. However, the maximum detected concentration of these elements was within two times the screening criteria, the frequency of criteria exceedence was less than two for most of these elements, and the maximum detected element concentrations showed no spatial trends. In addition, the maximum lead concentration of 48 mg/kg is well below EPA's screening level of 400 mg/kg for lead (EPA 1994e). For these reasons, inorganic elements in subsurface soil at RRTSL are not considered site-related contaminants in this report. The OU-A risk assessment addresses all positively detected inorganic elements. Figure 3-7 presents the location of soil borings containing site-related contaminants.

DRO was detected at concentrations exceeding the screening criteria of 100 mg/kg in samples collected from three soil borings (AP-3598, AP-3602, and AP-3603) at depths of 5

and 15 feet. Contaminant concentrations ranged from 117 mg/kg at AP-3602 to 470 mg/kg at AP-3598. Subsurface soil samples collected from the surrounding soil borings do not contain DRO at concentrations exceeding the screening criteria, suggesting that lateral and vertical extent of DRO contamination were defined in the RI. The lateral extent of DRO contamination appears to be limited to an area extending northwest from the buried sewer line, which connects the transmitter building and the cesspool, to a portion of the leachfield. The vertical extent of contamination is limited to the area surrounding the sewer line and leachfield drain pipes (6 to 15 feet BGS).

A site-related contaminant, benzo(a)anthracene, was detected at a concentration of 0.32 mg/kg in AP-3598 at 50 feet BGS. Although this contaminant was detected at concentrations exceeding the screening criteria, it was detected in only one sample. The isolated occurrence of this contaminant concentration and the depth at which it was detected indicate that additional contamination is unlikely.

PCB concentrations exceeding the screening criteria of 0.0087 mg/kg were detected at two locations. PCB Aroclor 1260 was found at concentrations of 0.04 mg/kg and 0.2 mg/kg at a depth of 5 feet BGS in soil borings AP-3610 and AP-3617. Both soil borings are located directly west of the underground bunker (see Figure 3-7). The proximity of these sample to the bunker, the shallow depths at which PCBs were detected, and the absence of PCB contamination in subsurface soils elsewhere at RRTSL suggest that this contamination is vertically and laterally limited. These concentrations probably represent residual contamination remaining from remedial activities conducted between 1988 and 1992 at the transmitter annex foundation. Therefore, it is unlikely that this contamination is related to discharges from the leachfield or its associated plumbing.

3.5.3 Groundwater Contamination

No site-related contaminants were detected at concentrations exceeding screening criteria in the RRTSL groundwater samples (see Table 3-7). Methylene chloride was detected in samples collected from two monitoring wells, AP-3659 and Well B, at concentrations exceeding the screening criteria of 4.1 μg/L. These detections are likely results of laboratory contamination. Furthermore, methylene chloride was not detected in overlying subsurface soils and was not identified as a potential site-related contaminant in previous investigations.

3.6 Contaminant Fate and Transport

The physical-chemical characteristics affecting fate and transport of the contaminants detected at RRTSL are provided in Appendix F. The following section discusses the major migration pathways identified in the conceptual site model generated for RRTSL in the OU-A management plan (E & E 1995). Figure 3-8 presents an updated RRTSL conceptual site model based on the results of the RI.

All contamination identified at RRTSL was found in subsurface soil, making the lateral and vertical migration of contaminants through subsurface soil an important secondary release mechanism. The presence of DRO in subsurface soils indicates that these contaminants have dispersed from the leachfield and associated plumbing and have migrated to a depth of 15 feet BGS as observed in soil borings AP-3598 and AP-3603. The limited depth at which DRO was found during the RI suggests that the physical and chemical conditions at this site do not promote migration of this contaminant (see Appendix G).

PCBs were detected at a depth of 5 feet BGS in soil borings AP-3610 and AP-3617. These contaminants are believed to represent residual contamination associated with remedial activities at the transmitter annex foundation performed in 1988, 1991, and 1992. The presence of PCBs at this depth suggests that either contaminated soil was reworked during remedial activities or limited migration through subsurface soils has occurred.

Because VOCs were not detected at high concentrations (i.e., below the screening criteria), volatilization is not a significant contaminant migration pathway at RRTSL. Wind dispersion of contaminants is unlikely because of the subsurface location of the main contaminant source (the leachfield). Groundwater is not a contaminant migration pathway as indicated by the absence of contaminants in the samples collected at this site. Because the suspected releases of wastes from RRTSL occurred more than 30 years ago, any contaminants from these wastes have likely adsorbed to soil and/or degraded. The site is presently in a steady state condition and future migration of contaminants to groundwater is unlikely. Furthermore, contaminants that infiltrate subsurface soil would not be expected to reach groundwater (88 to 99 feet BGS) based on the results of a leaching model applied to the conditions at RRTSL (see Appendix G).

The results of the contaminant transport model for RRTSL suggest that petroleum constituents migrating through subsurface soils for a 90-year period would not reach groundwater at detectable concentrations. However, the modeling performed for RRTSL uses generalized input data and does not account for subsurface anomalies that could increase the

magnitude of vertical contaminant transport such as till fractures, chemical transformation, or periodic increases in soil moisture resulting from precipitation variations or flooding.

3.7 Summary and Conclusions

Sampling conducted during the RI confirmed the presence of several site-related contaminants associated with historical activities conducted at RRTSL. Subsurface soils containing DRO above the level A cleanup matrix level are associated with the cesspool, leachfield, and associated plumbing. The level A cleanup matrix level was used as a conservative screening value. The actual matrix value for this site is level C, which has a DRO cleanup value of 1,000 parts per million (ppm). DRO was not detected above this concentration at RRTSL. PCBs are present near the underground bunker, but the contamination is probably related to previous remedial activities at the transmitter annex foundation. Some inorganic contaminants were detected at concentrations exceeding the screening criteria. While these elements are addressed in the risk assessment, they are not considered site-related contaminants in this report for reasons discussed in Section 3.5.2. Although methylene chloride was detected in two groundwater samples, it is probably related to laboratory contamination. No other site-related contaminants were detected in groundwater samples. The updated conceptual site model presented as Figure 3-8 indicates that many of the potential migration routes and exposure mechanisms postulated during the development of the OU-A management plan are not applicable to current conditions at the RRTSL site.

The extent of PCB contamination at RRTSL is limited to depths ranging from 5 to 15 feet BGS, indicating that a limited amount of subsurface contaminant migration has occurred. While benzo(a)anthracene was detected in a subsurface soil sample at a depth of 50 feet BGS, this isolated occurrence is not indicative of additional contamination in this area. The limited extent and concentration of site-related contaminants associated with subsurface soils or groundwater suggests that contaminant transport mechanisms associated with these media are not migration pathways of concern.

In conclusion, RRTSL contains site-related contaminants in the leachfield cesspool and in subsurface soils. The spatial distribution of contaminants in subsurface soils does not indicate that the leachfield area is homogenously contaminated; rather, isolated locations contain contaminant concentrations slighly exceeding the screening critera. Groundwater is not impacted by site-related contaminants. The most likely pathway for contaminant transport is lateral and vertical migration of contaminants through subsurface soil via infiltration of precipitation and snowmelt. The OU-A risk assessment addresses the potential risks posed by

on-site contaminants to human health and the environment. No further investigations are necessary to determine the need for remedial action at the site.

Table 3-1

SUMMARY OF 1990 ANALYTICAL RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Contaminant	Maximum Concentration	
	Sludge	Soil
Volatile organic compounds (µg/kg)		
Chloroethane	ND	34
1,2-Dichloroethane	ND	1,500
1,2-Dichloroethene	ND	810
1,1-Dichloroethane	ND	19,400
1,1-Dichloroethene	ND	19,320
1,1,1-Trichloroethane	ND	35,800
Trichloroethene	250,000	388,800
Tetrachloroethene	ND	730
cis-1,3-Dichloropropene	ND	46
1,1,2,2-Tetrachloroethane	ND	130
Toluene	9,500	9,800
Ethylbenzene	1,500	260
Xylenes (total)	11,800	10,600
Base/neutral and acid-extractable organic compounds (µg/kg)		
Phenanthrene	13,000	5,900 J
Fluoranthene	7,100	8,800 J
Pyrene	6,700	5,900 J
Benzo(a)anthracene	ND	6,100 J
Chrysene	ND	6,900 J
Bis(2-ethylhexyl)phthalate	ND	3,300 J
Benzo(a)pyrene	ND	5,700 J
4-Methylphenol	65,000	ND
Dibenzofuran	1,100 J	ND
Polychlorinated biphenyls (µg/kg)		
Aroclor 1260	5,600	5,000
Inorganics (mg/kg)		
Antimony	ND	8.2
Arsenic	4.2	10

Key at end of table.

Table 3-1

SUMMARY OF 1990 ANALYTICAL RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Contaminant	Maximum Concentration	
	Sludge	Soil
Barium	320	2,700
Beryllium	1.8	ND
Cadmium	7.5	32
Chromium	46	82
Copper	340	1,100
Lead	800	1,200
Mercury	5.9	110
Nickel	36	44
Selenium	ND	ND
Silver	11	31
Thallium	ND	ND
Zinc	630	2,000

Key:

J = Estimated concentration.
mg/kg = Milligrams per kilogram.
µg/kg = Micrograms per kilogram.
ND = Not detected above detection limit.

Source: E & E 1991a.

Table 3-2

SOIL SAMPLE SUMMARY
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft BGS)																						Geotechnical Analyses		
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Dioxin	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/ CN/React./ pH/Corrosivity	TCLP VOC	TCLP Metals	TCLP BNA	Grain Size	Atter. Lim./ Moisture/ Specific Gravity	
RRTSL1001SL	5/22/95	SOIL	Cesspool			PROJ					x		x									x	x	x	x			
RRTSL1002SL	5/22/95	SOIL	Cesspool			QC					x		x									x	x	x	x			
RRTSL1003SL	5/22/95	SOIL	Cesspool			QA					x		x									x	x	x	x			
RRTSL1004SL	5/22/95	SOIL	Cesspool			PROJ					x		x									x	x	x	x			
RRTSL1001SB	5/22/95	SOIL	AP-3598	5	6.5	PROJ	x		x	x		x	x		x													
RRTSL1002SB	5/22/95	SOIL	AP-3598	10	11.5	PROJ	x		x	x		x	x		x													
RRTSL1003SB	5/22/95	SOIL	AP-3598	15	16.5	PROJ	x		x	x		x	x		x													
RRTSL1004SB	5/22/95	SOIL	AP-3598	20	21.5	PROJ	x		x	x		x	x		x													
RRTSL1005SB	5/22/95	SOIL	AP-3598	30	31.5	PROJ	x		x	x		x	x		x													
RRTSL1006SB	5/22/95	SOIL	AP-3598	40	41.5	PROJ	x		x	x		x	x		x												x	x
RRTSL1007SB	5/23/95	SOIL	AP-3598	50	51.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x							
RRTSL1008SB	5/23/95	SOIL	AP-3599	5	6.5	PROJ	x		x	x		x	x		x													
RRTSL1009SB	5/23/95	SOIL	AP-3599	5	6.5	QC	x		x	x		x	x		x													
RRTSL1010SB	5/23/95	SOIL	AP-3599	5	6.5	QA	x		x	x		x	x		x													
RRTSL1011SB	5/23/95	SOIL	AP-3599	10	11.5	PROJ	x		x	x		x	x		x													
RRTSL1012SB	5/23/95	SOIL	AP-3599	15	16.5	PROJ	x		x	x		x	x		x													
RRTSL1013SB	5/23/95	SOIL	AP-3599	20	21.5	PROJ	x		x	x		x	x		x													
RRTSL1014SB	5/24/95	SOIL	AP-3600	5	6.5	PROJ	x		x	x		x	x		x													
RRTSL1015SB	5/24/95	SOIL	AP-3600	10	11.5	PROJ	x		x	x		x	x		x													
RRTSL1016SB	5/24/95	SOIL	AP-3600	15	16.5	PROJ	x		x	x		x	x		x													
RRTSL1017SB	5/24/95	SOIL	AP-3600	20	21.5	PROJ	x		x	x		x	x		x													
RRTSL1018SB	5/24/95	SOIL	AP-3600	30	31.5	PROJ	x		x	x		x	x		x													
RRTSL1019SB	5/24/95	SOIL	AP-3600	40	41.5	PROJ	x		x	x		x	x		x													
RRTSL1020SB	5/24/95	SOIL	AP-3600	50	51.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x							
RRTSL1021SB	5/24/95	SOIL	AP-3601	5	6.5	PROJ	x		x	x		x	x		x													
RRTSL1022SB	5/24/95	SOIL	AP-3601	5	6.5	QC	x		x	x		x	x		x													
RRTSL1023SB	5/24/95	SOIL	AP-3601	5	6.5	QA	x		x	x		x	x		x													
RRTSL1024SB	5/24/95	SOIL	AP-3601	10	11.5	PROJ	x		x	x		x	x		x													

OUA 0020697

Table 3-2

SOIL SAMPLE SUMMARY
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft BGS)																							Geotechnical Analyses	
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Dioxin	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/ CN/React/ pH/Corrosivity	TCLP VOC	TCLP Metals	TCLP BNA	Grain Size	Atter. Lim./ Moisture/ Specific Gravity
RRTSL1025SB	5/24/95	SOIL	AP-3601	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1026SB	5/24/95	SOIL	AP-3601	20	21.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x						
RRTSL1027SB	5/24/95	SOIL	AP-3601	30	31.5	QC	x		x	x		x	x		x	x											
RRTSL1028SB	5/24/95	SOIL	AP-3601	40	41.5	QA	x	x	x	x		x	x		x	x	x	x	x	x	x						
RRTSL1029SB	5/25/95	SOIL	AP-3602	5	6.5	PROJ	x		x	x		x	x		x												
RRTSL1030SB	5/25/95	SOIL	AP-3602	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1031SB	5/25/95	SOIL	AP-3602	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1032SB	5/25/95	SOIL	AP-3602	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1033SB	5/25/95	SOIL	AP-3602	30	31.5	PROJ	x		x	x		x	x		x												
RRTSL1034SB	5/25/95	SOIL	AP-3602	40	41.5	PROJ	x		x	x		x	x		x											x	x
RRTSL1035SB	5/25/95	SOIL	AP-3602	50	51.5	PROJ	x		x	x		x	x		x	x	x	x	x	x	x						
RRTSL1036SB	5/25/95	SOIL	AP-3603	5	6.5	PROJ	x		x	x		x	x		x												
RRTSL1037SB	5/25/95	SOIL	AP-3603	5	6.5	QC	x		x	x		x	x		x												
RRTSL1038SB	5/25/95	SOIL	AP-3603	5	6.5	QA	x		x	x		x	x		x												
RRTSL1039SB	5/25/95	SOIL	AP-3603	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1040SB	5/25/95	SOIL	AP-3603	15	16.5	PROJ	x		x	x		x	x		x											x	x
RRTSL1041SB	5/25/95	SOIL	AP-3603	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1042SB	5/26/95	SOIL	AP-3603	30	31.5	PROJ	x		x	x		x	x		x												
RRTSL1043SB	5/26/95	SOIL	AP-3603	40	41.5	PROJ	x	x	x	x		x	x		x												
RRTSL1044SB	5/26/95	SOIL	AP-3603	50	51.5	PROJ	x		x	x		x	x		x	x	x	x	x	x	x						
RRTSL1045SB	5/26/95	SOIL	AP-3604	5	6.5	PROJ	x		x	x		x	x		x	x	x	x	x	x	x						
RRTSL1046SB	5/26/95	SOIL	AP-3604	5	6.5	QC	x		x	x		x	x		x	x											
RRTSL1047SB	5/26/95	SOIL	AP-3604	5	6.5	QA	x		x	x		x	x		x	x	x	x	x	x	x						
RRTSL1048SB	5/26/95	SOIL	AP-3604	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1049SB	5/26/95	SOIL	AP-3604	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1050SB	5/26/95	SOIL	AP-3604	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1051SB	5/26/95	SOIL	AP-3604	30	31.5	PROJ	x		x	x		x	x		x											x	x
RRTSL1052SB	5/26/95	SOIL	AP-3604	40	41.5	PROJ	x		x	x		x	x		x												

OUA 0020698

Table 3-2

SOIL SAMPLE SUMMARY
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft BGS)																							Geotechnical Analyses	
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Dioxin	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/ CN/React./ pH/Corrosivity	TCLP VOC	TCLP Metals	TCLP BNA	Grain Size	Atter. Lim./ Moisture/ Specific Gravity
RRTSL1053SB	5/26/95	SOIL	AP-3604	50	51.5	PROJ	x		x	x		x	x		x												
RRTSL1054SB	5/30/95	SOIL	AP-3605	5	6.5	PROJ	x		x	x		x	x		x												
RRTSL1055SB	5/30/95	SOIL	AP-3605	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1056SB	5/30/95	SOIL	AP-3605	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1057SB	5/30/95	SOIL	AP-3605	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1058SB	5/30/95	SOIL	AP-3605	30	31.5	PROJ	x		x	x		x	x		x												
RRTSL1059SB	5/30/95	SOIL	AP-3605	40	41.5	PROJ	x		x	x		x	x		x												
RRTSL1060SB	5/30/95	SOIL	AP-3605	50	51.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x					x	x
RRTSL1061SB	5/30/95	SOIL	AP-3606	5	6.5	PROJ	x		x	x		x	x		x												
RRTSL1062SB	5/30/95	SOIL	AP-3606	5	6.5	QC	x		x	x		x	x		x												
RRTSL1063SB	5/30/95	SOIL	AP-3606	5	6.5	QA	x		x	x		x	x		x												
RRTSL1064SB	5/30/95	SOIL	AP-3606	10	11.5	PROJ	x		x	x		x	x		x											x	x
RRTSL1065SB	5/30/95	SOIL	AP-3606	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1066SB	5/30/95	SOIL	AP-3606	20	21.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x						
RRTSL1067SB	5/31/95	SOIL	AP-3607	5	6.5	PROJ	x		x	x		x	x		x												
RRTSL1068SB	5/31/95	SOIL	AP-3607	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1069SB	5/31/95	SOIL	AP-3607	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1070SB	5/31/95	SOIL	AP-3607	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1071SB	5/31/95	SOIL	AP-3607	30	31.5	PROJ	x		x	x		x	x		x												
RRTSL1072SB	5/31/95	SOIL	AP-3607	40	41.5	PROJ	x		x	x		x	x		x												
RRTSL1073SB	5/31/95	SOIL	AP-3607	50	51.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x					x	x
RRTSL1074SB	5/31/95	SOIL	AP-3608	5	6.5	PROJ	x		x	x		x	x		x												
RRTSL1075SB	5/31/95	SOIL	AP-3608	5	6.5	QC	x		x	x		x	x		x												
RRTSL1076SB	5/31/95	SOIL	AP-3608	5	6.5	QA	x		x	x		x	x		x												
RRTSL1077SB	5/31/95	SOIL	AP-3608	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1078SB	5/31/95	SOIL	AP-3608	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1079SB	5/31/95	SOIL	AP-3608	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1080SB	6/1/95	SOIL	AP-3608	30	31.5	PROJ	x		x	x		x	x		x												

OUA 0020699

Table 3-2

SOIL SAMPLE SUMMARY
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft BGS)																							Geotechnical Analyses		
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Dioxin	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/ CN/React./ pH/Corrosivity	TCLP VOC	TCLP Metals	TCLP BNA	Grain Size	Atter. Lim./ Moisture/ Specific Gravity	
RRTSL1081SB	6/1/95	SOIL	AP-3608	40	41.5	PROJ	x		x	x		x	x		x													
RRTSL1082SB	6/1/95	SOIL	AP-3608	50	51.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x							
RRTSL1083SB	6/1/95	SOIL	AP-3608	50	51.5	QC		x								x												
RRTSL1084SB	6/1/95	SOIL	AP-3608	50	51.5	QA	x	x	x	x		x	x		x	x	x	x	x	x	x							
RRTSL1085SB	6/1/95	SOIL	AP-3609	5	6.5	PROJ	x		x	x		x	x		x													
RRTSL1086SB	6/1/95	SOIL	AP-3609	5	6.5	QC	x		x	x		x	x		x													
RRTSL1087SB	6/1/95	SOIL	AP-3609	5	6.5	QA	x		x	x		x	x		x													
RRTSL1088SB	6/1/95	SOIL	AP-3609	10	11.5	PROJ	x		x	x		x	x		x													
RRTSL1089SB	6/1/95	SOIL	AP-3609	15	16.5	PROJ	x		x	x		x	x		x											x	x	
RRTSL1090SB	6/1/95	SOIL	AP-3609	20	21.5	PROJ	x		x	x		x	x		x													
RRTSL1091SB	6/1/95	SOIL	AP-3609	30	31.5	PROJ	x		x	x		x	x		x													
RRTSL1092SB	6/1/95	SOIL	AP-3609	40	41.5	PROJ	x		x	x		x	x		x													
RRTSL1093SB	6/1/95	SOIL	AP-3609	50	51.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x							
RRTSL1094SB	6/2/95	SOIL	AP-3610	5	6.5	PROJ	x		x	x		x	x		x													
RRTSL1095SB	6/2/95	SOIL	AP-3610	5	6.5	QC	x		x	x		x	x		x													
RRTSL1096SB	6/2/95	SOIL	AP-3610	5	6.5	QA	x		x	x		x	x		x													
RRTSL1097SB	6/2/95	SOIL	AP-3610	10	11.5	PROJ	x		x	x		x	x		x													
RRTSL1098SB	6/2/95	SOIL	AP-3610	15	16.5	PROJ	x		x	x		x	x		x											x	x	
RRTSL1099SB	6/2/95	SOIL	AP-3610	20	21.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x							
RRTSL1100SB	6/2/95	SOIL	AP-3611	5	6.5	PROJ	x		x	x		x	x		x													
RRTSL1101SB	6/2/95	SOIL	AP-3611	5	6.5	QC	x		x	x		x	x		x													
RRTSL1102SB	6/2/95	SOIL	AP-3611	5	6.5	QA	x		x	x		x	x		x													
RRTSL1103SB	6/2/95	SOIL	AP-3611	10	11.5	PROJ	x		x	x		x	x		x													
RRTSL1104SB	6/2/95	SOIL	AP-3611	15	16.5	PROJ	x		x	x		x	x		x													
RRTSL1105SB	6/2/95	SOIL	AP-3611	20	21.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x							
RRTSL1106SB	6/3/95	SOIL	AP-3612	5	6.5	PROJ	x		x	x		x	x		x													
RRTSL1107SB	6/3/95	SOIL	AP-3612	10	11.5	PROJ	x		x	x		x	x		x													
RRTS[illegible]08SB	6/3/95	SOIL	AP-3612	10	11.5	QC	x			x		x	x		x													

OUA 0020700

Table 3-2

SOIL SAMPLE SUMMARY
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft BGS)																							Geotechnical Analyses	
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Dioxin	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/ CN/React/ pH/Corrosivity	TCLP VOC	TCLP Metals	TCLP BNA	Grain Size	Atter. Lim./ Moisture/ Specific Gravity
RRTSL1109SB	6/3/95	SOIL	AP-3612	10	11.5	QA	x		x	x		x	x		x												
RRTSL1110SB	6/3/95	SOIL	AP-3612	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1111SB	6/3/95	SOIL	AP-3612	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1112SB	6/3/95	SOIL	AP-3612	30	31.5	PROJ	x	x	x	x		x	x		x	x									x		
RRTSL1113SB	6/3/95	SOIL	AP-3612	40	41.5	PROJ	x		x	x		x	x		x											x	x
RRTSL1114SB	6/3/95	SOIL	AP-3612	50	51.5	PROJ	x		x	x		x	x		x												
RRTSL1115SB	6/5/95	SOIL	AP-3613	5	6.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x					x	x
RRTSL1116SB	6/5/95	SOIL	AP-3613	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1117SB	6/5/95	SOIL	AP-3613	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1118SB	6/5/95	SOIL	AP-3613	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1119SB	6/5/95	SOIL	AP-3613	30	31.5	PROJ	x		x	x		x	x		x												
RRTSL1120SB	6/5/95	SOIL	AP-3613	40	41.5	PROJ	x		x	x		x	x		x												
RRTSL1121SB	6/5/95	SOIL	AP-3613	50	51.5	PROJ	x		x	x		x	x		x												
RRTSL1122SB	6/5/95	SOIL	AP-3614	5	6.5	PROJ	x		x	x		x	x		x												
RRTSL1123SB	6/5/95	SOIL	AP-3614	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1124SB	6/5/95	SOIL	AP-3614	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1125SB	6/5/95	SOIL	AP-3614	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1126SB	6/6/95	SOIL	AP-3614	30	31.5	PROJ	x		x	x		x	x		x												
RRTSL1127SB	6/6/95	SOIL	AP-3614	40	40.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x						
RRTSL1128SB	6/6/95	SOIL	AP-3615	5	6.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x						
RRTSL1129SB	6/6/95	SOIL	AP-3615	5	6.5	QC	x	x	x	x		x	x		x	x											
RRTSL1130SB	6/6/95	SOIL	AP-3615	5	6.5	QA	x	x	x	x		x	x		x	x											
RRTSL1131SB	6/6/95	SOIL	AP-3615	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1132SB	6/6/95	SOIL	AP-3615	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1133SB	6/6/95	SOIL	AP-3615	20	21.5	PROJ	x		x	x		x	x		x												
RRTSL1134SB	6/6/95	SOIL	AP-3615	30	31.5	PROJ	x		x	x		x	x		x												
RRTSL1135SB	6/6/95	SOIL	AP-3615	40	41.5	PROJ	x		x	x		x	x		x												
RRTSL1136SB	6/6/95	SOIL	AP-3615	50	51.5	PROJ	x		x	x		x	x		x												

OUA 0020701

Table 3-2

SOIL SAMPLE SUMMARY
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft BGS)																							Geotechnical Analyses	
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Dioxin	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/ CN/React/ pH/Corrosivity	TCLP VOC	TCLP Metals	TCLP BNA	Grain Size	Atter. Lim./ Moisture/ Specific Gravity
RRTSL1137SB	6/7/95	SOIL	AP-3616	5	6.5	PROJ	x		x	x		x	x		x												
RRTSL1138SB	6/7/95	SOIL	AP-3616	10	11.5	PROJ	x		x	x		x	x		x												
RRTSL1139SB	6/7/95	SOIL	AP-3616	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1140SB	6/7/95	SOIL	AP-3616	20	21.5	PROJ	x		x	x		x	x		x											x	x
RRTSL1141SB	6/7/95	SOIL	AP-3616	30	31.5	PROJ	x		x	x		x	x		x												
RRTSL1142SB	6/7/95	SOIL	AP-3616	40	41.5	PROJ	x		x	x		x	x		x												
RRTSL1143SB	6/7/95	SOIL	AP-3616	50	51.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x						
RRTSL1144SB	6/7/95	SOIL	AP-3617	5	6.5	PROJ	x		x	x		x	x		x												
RRTSL1145SB	6/7/95	SOIL	AP-3617	10	11.5	PROJ	x		x	x		x	x		x											x	x
RRTSL1146SB	6/7/95	SOIL	AP-3617	15	16.5	PROJ	x		x	x		x	x		x												
RRTSL1147SB	6/7/95	SOIL	AP-3617	20	20.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x						
RRTSL001SP	7/12/95	SOIL	STOCKPILE	0	1	PROJ			x	x			x										x	x			
RRTSL002SP	9/21/95	SOIL	STOCKPILE	0	1	PROJ			x	x			x										x	x			
RRTSL1148SB	9/12/95	SOIL	AP-3658	60	61.5	PROJ	x		x	x		x	x		x												
RRTSL1149SB	9/12/95	SOIL	AP-3658	80	81.5	PROJ	x		x	x		x	x		x												
RRTSL1150SB	9/12/95	SOIL	AP-3658	90	91.5	PROJ	x		x	x		x	x		x	x	x	x	x	x	x					x	x
RRTSL1151SB	9/12/95	SOIL	AP-3658	90	91.5	QC	x		x	x		x	x		x	x											
RRTSL1152SB	9/12/95	SOIL	AP-3658	90	91.5	QA	x	x	x	x		x	x		x	x											
RRTSL1153SB	9/14/95	SOIL	AP-3659	60	61.5	PROJ	x						x														
RRTSL1154SB	9/14/95	SOIL	AP-3659	70	71.5	PROJ	x	x	x	x		x	x		x	x	x	x	x	x	x						
RRTSL1155SB	9/14/95	SOIL	AP-3659	70	71.5	QC	x	x	x	x		x	x		x	x											
RRTSL1156SB	9/14/95	SOIL	AP-3659	70	71.5	QA	x	x	x	x		x	x		x	x											
RRTSL1157SB	9/14/95	SOIL	AP-3659	80	81.5	PROJ	x	x	x	x		x	x		x	x										x	x

OUA 0020702

Table 3-2

SOIL SAMPLE SUMMARY
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS) Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Dioxin	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/ CN/React./ pH/Corrosivity	TCLP VOC	TCLP Metals	TCLP BNA	Geotechnical Analyses: Grain Size	Atter. Lim./ Moisture/ Specific Gravity

Key:

Atter. Lim. = Atterburg Limits.
BNA = Base/neutral and acid-extractable organic compounds.
CN = Cyanide.
DRO = Diesel-range organics.
ft. BGS = Feet below ground surface.
GRO = Gasoline-range organics.
Het. Bact. = Heterotrophic bacteria.
PCBs = Polychlorinated biphenyls.
PROJ = Project sample.
QA = Quality assurance sample.
QC = Quality control sample.
TCLP = Toxicity characteristic leaching procedure.
TKN = Total Kjeldahl nitrogen.
TOC = Total organic carbon.
TRPH = Total recoverable petroleum hydrocarbons.
VOC = Volatile organic compounds.
X = Analysis was perormed.

OUA 0020703

Table 3-3

GROUNDWATER SAMPLE SUMMARY
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Type	VOC	BNA	PAH	DRO	GRO	TRPH	PCBs	Total Metals	Dissolved Metals	TOC	Total & Dissolved Anions/Cations	Alkalinity	TDS/TSS	Hardness	Phosphorous	Heterotrophic Bacteria	BOD	Nitrate/Nitrite	Sulfate	Sulfide	Chloride
RRTSL1001GW	9/25/95	WATER	WELL B	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RRTSL1002GW	9/25/95	WATER	WELL B	QC	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
RRTSL1003GW	9/25/95	WATER	WELL B	QA	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x
RRTSL1003WA	9/14/95	WATER	RINSATE	PROJ	x	x		x	x	x	x	x		x											
RRTSL1004GW	9/27/95	WATER	AP-3658	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RRTSL1004WA	9/14/95	WATER	TRIP BLANK	PROJ	x				x																
RRTSL1005GW	9/27/95	WATER	AP-3659	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RRTSL1005WA	9/25/95	WATER	RINSATE	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
RRTSL1006WA	9/25/95	WATER	TRIP BLANK	PROJ	x				x																
RRTSL1007WA	9/25/95	WATER	TRIP BLANK	QA	x				x																
RRTSL1008WA	9/29/95	WATER	TRIP BLANK	PROJ	x				x																
RRTSL1001WA	6/29/95	WATER	RINSATE	PROJ	x	x		x	x	x	x	x		x											
RRTSL1002WA	6/29/95	WATER	TRIP BLANK	PROJ	x				x																

Key:

BNA = Base/neutral and acid-extractable organic compounds.
BOD = Biochemical oxygen demand.
DRO = Diesel-range organics.
GRO = Gasoline-range organics.
PAH = Polynuclear aromatic hydrocarbons.
PCBs = Polychlorinated biphenyls.
PROJ = Project sample.
QA = Quality assurance sample.
QC = Quality control sample.
TDS/TSS = Total dissolved solids/total suspended solids.
TOC = Total organic carbon.
TRPH = Total recoverable petroleum hydrocarbons.

OUA 0020704

VOC = Volatile organic compounds.
X = Analysis was perormed.

Table 3-4

SUMMARY OF QUALIFIED DATA
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95RRTSL-)	Sample Data Qualifiers Applied[a]
VOCs (EPA Method 8260)			
Surrogate recovery	Recoveries were below EPA QC limits	1099SB	J, UJ
Method blanks	Several target analytes were detected in all VOC soil and water laboratory method blanks	1001SB-1026SB, 1029SB-1037SB, 1039SB-1046SB, 1048SB-1075SB, 1077SB-1082SB, 1085SB, 1086SB, 1088SB-1101SB, 1104SB-1151SB, 1153SB-1155SB, 1157SB, 1001GW, 1002GW, 1001WA-1006WA, 1004GW, 1005GW, 1008GW	B
Holding times	Analysis was performed beyond the EPA recommended holding time for soil samples	1099SB, 1155SB	J, UJ
Sample preservation	Cooler temperatures exceeded the EPA recommended preservation temperature (4°C ± 2°C)	1129SB, 1131SB-1136SB, 1001WA, 1002WA	J, UJ
Trip blank	Eight target analytes were detected in trip blank	All samples	B
Rinsate	Six target analytes were detected in rinsate blanks	All samples	B
BNAs (EPA Method 8270)			
Method blank	Di-n-butylphthalate was detected in the soil method blank	1148SB-1151SB	B
Holding times	Analysis was performed beyond the EPA recommended holding time	1001SB, 1002SB, 1004SB, 1154SB, 1155SB, 1157SB	J, UJ
Polynuclear Aromatic Hydrocarbons (EPA Method 8310)			
Matrix spike	Spike recoveries were outside of EPA QC limits	1003GW	J, UJ

Key at end of table.

OUA 0020706

Table 3-4

SUMMARY OF QUALIFIED DATA
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95RRTSL-)	Sample Data Qualifiers Applied[a]
GRO (ADEC modified EPA Method 8015) and Fuel Identification (Corps modified EPA Method 8015)			
Matrix spike	Recoveries were above the ADEC QC limits	1038SB, 1047SB	J
Sample preservation	Cooler temperatures exceeded the EPA recommended preservation temperature (4°C ± 2°C)	1129SB, 1131SB-1136SB, 1001WA, 1002WA	J, UJ
TRPH (EPA Method 418.1)			
Holding time	Analysis was performed beyond the EPA recommended holding time	1001GW, 1002GW, 1004WA, 1005WA	J, UJ
Method blanks	TPH was detected in soil laboratory method blanks	1061SB, 1062SB, 1064SB-1082SB, 1085SB, 1086SB, 1088SB-1093SB	B
Inorganics			
Matrix spike	Antimony spike recoveries were outside of EPA QC limits	All samples	J, UJ
	Selenium spike recoveries were outside of EPA QC limits	1029SB-1037SB, 1039SB-1046SB, 1048SB-1062SB, 1064SB-1075SB, 1077SB-1082SB, 1085SB, 1086SB, 1088SB-1093SB, 1122SB-1129SB, 1131SB-1136SB, 1152SB	J, UJ
	Thallium spike recoveries were below EPA QC limit	1097SB-1101SB, 1103SB-1108SB, 1110SB-11[illegible]1094SB, 1095SB	J, UJ
	Calcium spike recoveries were above EPA QC limit	1029SB-1037SB, 1039SB-1046SB, 1048SB-1060SB	J, UJ
	Sulfide spike recoveries were below EPA QC limit	1001SB, 1002SB, 1004SB	J, UJ

Key at end of table.

Table 3-4

SUMMARY OF QUALIFIED DATA
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95RRTSL-)	Sample Data Qualifiers Applied[a]
Duplicate Analysis	Calcium and magnesium RPDs were outside of EPA QC limits	1153SB-1155SB, 1157SB	J, UJ
Holding Time	Nitrate, phosphorous, sulfide, TDS, and TSS analyses were performed beyond the EPA recommended holding time	1001GW, 1002GW, 1005WA	J, UJ
	Nitrate and phosphorous analyses were performed beyond the EPA recommended holding time	1003GW	J, UJ
Method Blanks	Mercury was detected in the laboratory soil method blank	1110SB, 1113SB-1116SB	B
	Potassium and zinc were detected in the laboratory soil method blank	1001WA	B

[a] = Data qualifiers were determined based on CQAR recommendations and *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA 540/R-94/012, February 1994, and *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94/013, February 1994.

Key:

ADEC = Alaska Department of Environmental Conservation.
B = Detected also in method blank (when less than 10 times the associated method blank concentration).
BNA = Base/neutral and acid-extractable organic compounds.
°C = Degrees Celcius.
CQAR = Chemical Quality Assurance Report.
DRO = Diesel-range organics.
EPA = United States Environmental Protection Agency.
GRO = Gasoline-range organics.
J = Estimated concentration (detected compounds).

OUA 0020708

Table 3-4 (Cont.)

QC = Quality control.
RPD = Relative percent difference.
TDS = Total dissolved solids.
TRPH = Total recoverable petroleum hydrocarbons.
TSS = Total suspended solids.
UJ = Estimated detection limit (nondetected compounds).
VOA = Volatile organic analytes.
VOC = Volatile organic compounds.

OUA 0020709

Table 3-5

SUMMARY OF CESSPOOL SAMPLE RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Analyte	Frequency of Detection	Range of Detected Concentrations	Location and Depth (ft. BGS) of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
Unknown Fuel (mg/kg)	2/2	12,000 - 23,000	23,000	–	NA
PCBs (mg/kg)					
Aroclor 1260	2/2	1.8 - 2.3	CESS	0.0083[a]	2
Inorganics (mg/kg)					
Cyanide	1/2	1.2	CESS	–	NA
TCLP Inorganics (mg/L)					
TCLP Barium	2/2	0.7	CESS	–	NA
TCLP Cadmium	2/2	0.06 - 0.11	CESS	–	NA
TCLP Lead	2/2	0.24 - 0.27	CESS	–	NA
TCLP Mercury	1/2	0.001	CESS	--	NA
Flashpoint (°F)	1/1	200	CESS	–	NA

[a] Risk-based concentration equivalent to a cancer risk of 1 X 10^{-7} or a hazard quotient of 0.1 (EPA 1995).

Key:

-- = No screening concentration exists for analyte.
BGS = Below ground surface.
°F = Degrees Fahrenheit.
mg/kg = Milligrams per kilogram.
mg/L = Milligrams per liter.

OUA 0020710

Table 3-5 (Cont.)

NA = Not applicable.
PCBs = Polychlorinated biphenyls.
TCLP = Toxicity characteristic leaching procedure.

OUA 0020711

Table 3-6

SUMMARY OF SUBSURFACE SOIL SAMPLE RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg, except as noted)

Analyte	Frequency of Detection	Range of Detected Concentrations	Location and Depth (ft. BGS) of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
DRO	47/89	3 - 470	AP-3598 (15 ft.)	100[a]	4
TRPH	50/89	3.3 - 310	AP-3598 (15 ft.)	2,000[a]	0
VOCs					
Acetone	25/36	0.0148 - 1.9	AP-3610 (20 ft.)	780[b]	0
Benzene	5/90	0.00023 - 0.0016	AP-3610 (20 ft.)	2.2[b]	0
2-Butanone	4/90	0.00238 - 0.13	AP-3610 (20 ft.)	4,700[b]	0
n-Butylbenzene	1/64	0.00046	AP-3602 (5 ft.)	--	NA
tert-Butylbenzene	2/88	0.00016 - 0.00026	AP-3602 (5 ft.)	78[b]	0
Carbon Disulfide	4/90	0.00199 - 0.006	AP-3600 (30 ft.)	780[b]	0
Carbon Tetrachloride	2/90	0.00045 - 0.00047	AP-3608 (50 ft.)	0.49[b]	0
Chloroform	18/82	0.00019 - 0.00499	AP-3611 (15 ft.)	10[b]	0
Chloromethane	2/90	0.00117 - 0.00325	AP-3607 (30 ft.)	4.9[b]	0
1,2-Dibromo-3-chloropropane	2/87	0.00049 - 0.00126	AP-3602 (5 ft.)	0.046[b]	0
Dichlorodifluoromethane	2/90	0.0014 - 0.0031	AP-3603 (10 ft.)	1,600[b]	0
1,2-Dichloroethane	5/90	0.00029 - 0.00095	AP-3611 (15 ft.)	0.7[b]	0

Key at end of table.

OUA 0020712

Table 3-6

SUMMARY OF SUBSURFACE SOIL SAMPLE RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg, except as noted)

Analyte	Frequency of Detection	Range of Detected Concentrations	Location and Depth (ft. BGS) of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
Ethylbenzene	40/86	0.00014 - 0.0026	AP-3602 (5 ft.)	780[b]	0
4-Methyl-2-pentanone	13/88	0.00103 - 0.00294	AP-3603 (20 ft.)	--	NA
Methylene Chloride	37/80	0.00129 - 2.51	AP-3659 (60 ft.)	8.5[b]	0
Naphthalene	1/62	0.3	AP-3600 (50 ft.)	310[b]	0
p-Isopropyltoluene	3/88	0.00053 - 1.1	AP-3610 (20 ft.)	--	NA
Styrene	2/89	0.00048 - 0.00091	AP-3605 (15 ft.)	1,600[b]	0
1,1,2,2-Tetrachloroethane	2/90	0.00037 - 0.00053	AP-3601 (10 ft.)	0.32[b]	0
Tetrachloroethene	1/90	0.00045	AP-3598 (15 ft.)	1.2[b]	0
Toluene	37/42	0.00017 - 0.012	AP-3607 (20 ft.)	1,600[b]	0
1,2,3-Trichlorobenzene	1/20	0.00102	AP-3602 (5 ft.)	--	NA
Trichloroethene	34/90	0.00014 - 0.022	AP-3604 (15 ft.)	5.8[b]	0
Trichlorofluoromethane	1/90	0.00086	AP-3607 (30 ft.)	2,300[b]	0
1,2,4-Trimethylbenzene	2/88	0.00049 - 0.00133	AP-3602 (5 ft.)	390[b]	0
1,3,5-Trimethylbenzene	5/87	0.00025 - 0.00212	AP-3611 (5 ft.)	390[b]	0
Xylenes	64/85	0.00059 - 0.015	AP-3602 (5 ft.)	16,000[b]	0

Key at end of table.

OUA 0020713

Table 3-6

SUMMARY OF SUBSURFACE SOIL SAMPLE RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg, except as noted)

Analyte	Frequency of Detection	Range of Detected Concentrations	Location and Depth (ft. BGS) of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
BNAs					
Benzo(a)anthracene	1/16	0.32	AP-3598 (50 ft.)	0.087[b]	1
Bis(2-ethylhexyl)phthalate	4/16	0.08 - 1.24	AP-3659 (70 ft.)	4.6[b]	0
Chrysene	1/16	1.4	AP-3598 (50 ft.)	8.7[b]	0
2-Methylnaphthalene	1/16	0.6	AP-3600 (50 ft.)	310[b]	0
Phenanthrene	1/16	0.46	AP-3598 (50 ft.)	--	NA
Phenol	1/16	0.1	AP-3600 (50 ft.)	4,700[b]	0
Pyrene	1/16	0.5	AP-3598 (50 ft.)	230[b]	0
PCBs					
Aroclor 1260	2/87	0.04 - 0.2	AP-3617	0.0083[b]	2
Inorganics					
Aluminum	89/89	9,250 - 24,100	AP-3599 (15 ft.)	22,400[c]	3
Antimony	18/89	2 - 6	AP-3607 (50 ft.)	7[c]	0
Arsenic	89/89	3 - 11	AP-3608 (15 ft.)	12[c]	0
Barium	89/89	30 - 211	AP-3602 (40 ft.)	154[c]	1

Key at end of table.

OUA 0020714

Table 3-6

SUMMARY OF SUBSURFACE SOIL SAMPLE RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg, except as noted)

Analyte	Frequency of Detection	Range of Detected Concentrations	Location and Depth (ft. BGS) of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
Beryllium	83/89	0.2 - 0.6	AP-3604 (5 ft.)	0.6[c]	0
Cadmium	13/89	0.6 - 0.8	AP-3599 (20 ft.)	12.8[c]	0
Calcium	89/89	1,810 - 20,900	AP-3604 (40 ft.)	19,400[c]	1
Chromium	89/89	20 - 76	AP-3604 (20 ft.)	61.9[c]	1
Cobalt	89/89	8 - 19	AP-3604 (15 ft.)	20.8[c]	0
Copper	89/89	18 - 81	AP-3604 (20 ft.)	54[c]	1
Iron	89/89	20,300 - 44,600	AP-3610 (5 ft.)	41,300[c]	1
Lead	89/89	3 - 48	AP-3617 (5 ft.)	29[c]	2
Magnesium	89/89	3,350 - 20,100	AP-3604 (15 ft.)	28,000[c]	0
Manganese	89/89	272 - 1,070	AP-3610 (5 ft.)	817[c]	5
Mercury	34/89	0.05 - 0.2	AP-3598 (20 ft.)	0.6[c]	0
Nickel	89/89	18 - 134	AP-3604 (15 ft.)	221[c]	0
Potassium	89/89	310 - 1,170	AP-3604 (40 ft.)	1,290[c]	0
Silver	2/89	0.72 - 0.78	AP-3659 (80 ft.)	4.2[c]	0
Sodium	89/89	72 - 450	AP-3604 (15 ft.)	299[c]	1

Key at end of table.

OUA 0020715

Table 3-6

SUMMARY OF SUBSURFACE SOIL SAMPLE RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg, except as noted)

Analyte	Frequency of Detection	Range of Detected Concentrations	Location and Depth (ft. BGS) of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
Thallium	2/89	0.2 - 0.3	AP-3599 (15 ft.)	–	NA
Vanadium	89/89	30 - 86	AP-3610 (5 ft.)	77[c]	2
Zinc	89/89	41 - 203	AP-3604 (10 ft.)	108[c]	1

a Matrix A clean-up levels (ADEC 1991).
b Risk-based concentration equivalent to a cancer risk of 1 X 10^{-7} or a hazard quotient of 0.1 (EPA 1995).
c Maximum background concentration detected in RI background samples or as listed in the Fort Richardson Background Study (E & E 1996).

Key:

– = No screening concentration exists for analyte.
BGS = Below ground surface.
BNA = Base/neutral and acid-extractable organic compounds.
DRO = Diesel-range organics.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
PCBs = Polychlorinated biphenyls.
TRPH = Total recoverable petroleum hydrocarbons.
VOC = Volatile organic compounds.

OUA 0020716

Table 3-7

SUMMARY OF GROUNDWATER SAMPLE RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(µg/L)

Analyte	Frequency of Detection	Range of Concentrations	Location of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
VOCs					
Methylene Chloride	2/2	6.7 - 10.1	AP-3659	4.1[a]	2
Inorganics					
Aluminum	1/2	1,400	AP-3659	3,700[b]	0
Arsenic	1/2	0.7	AP-3659	430[b]	0
Barium	2/2	12 - 32	AP-3659	2,100[b]	0
Barium - filtered	2/2	13 - 23	AP-3659	510[b]	0
Calcium	2/2	48,500 - 67,700	AP-3659	110,000[b]	0
Calcium - filtered	2/2	49,300 - 72,700	AP-3659	117,000[b]	0
Chromium	1/2	5.6	AP-3659	1,900[b]	0
Copper	1/2	5.3	AP-3659	323[b]	0
Iron	2/2	93 - 2,300	AP-3659	6,000[b]	0
Iron - filtered	1/2	58	Well B	–	NA
Lead	1/2	2.3	AP-3659	240[b]	0
Magnesium	2/2	12,500 - 14,800	Well B	20,300[b]	0

Key at end of table.

OUA 0020717

Table 3-7

SUMMARY OF GROUNDWATER SAMPLE RESULTS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(µg/L)

Analyte	Frequency of Detection	Range of Concentrations	Location of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
Magnesium - filtered	2/2	12,900 - 15,500	Well B	20,300[b]	0
Manganese	1/2	86	AP-3659	220[b]	0
Manganese - filtered	1/2	46	AP-3659	81[b]	0
Selenium	1/2	0.7	Well B	–	NA
Selenium - filtered	1/2	0.7	Well B	–	NA
Sodium	2/2	3,400 - 3,500	Well B	4,800[b]	0
Sodium - filtered	2/2	3,600 - 3,700	Well B	4,900[b]	0
Zinc	1/2	16	AP-3659	1,900[b]	0
Zinc - filtered	1/2	7.3	AP-3659	1,300[b]	0

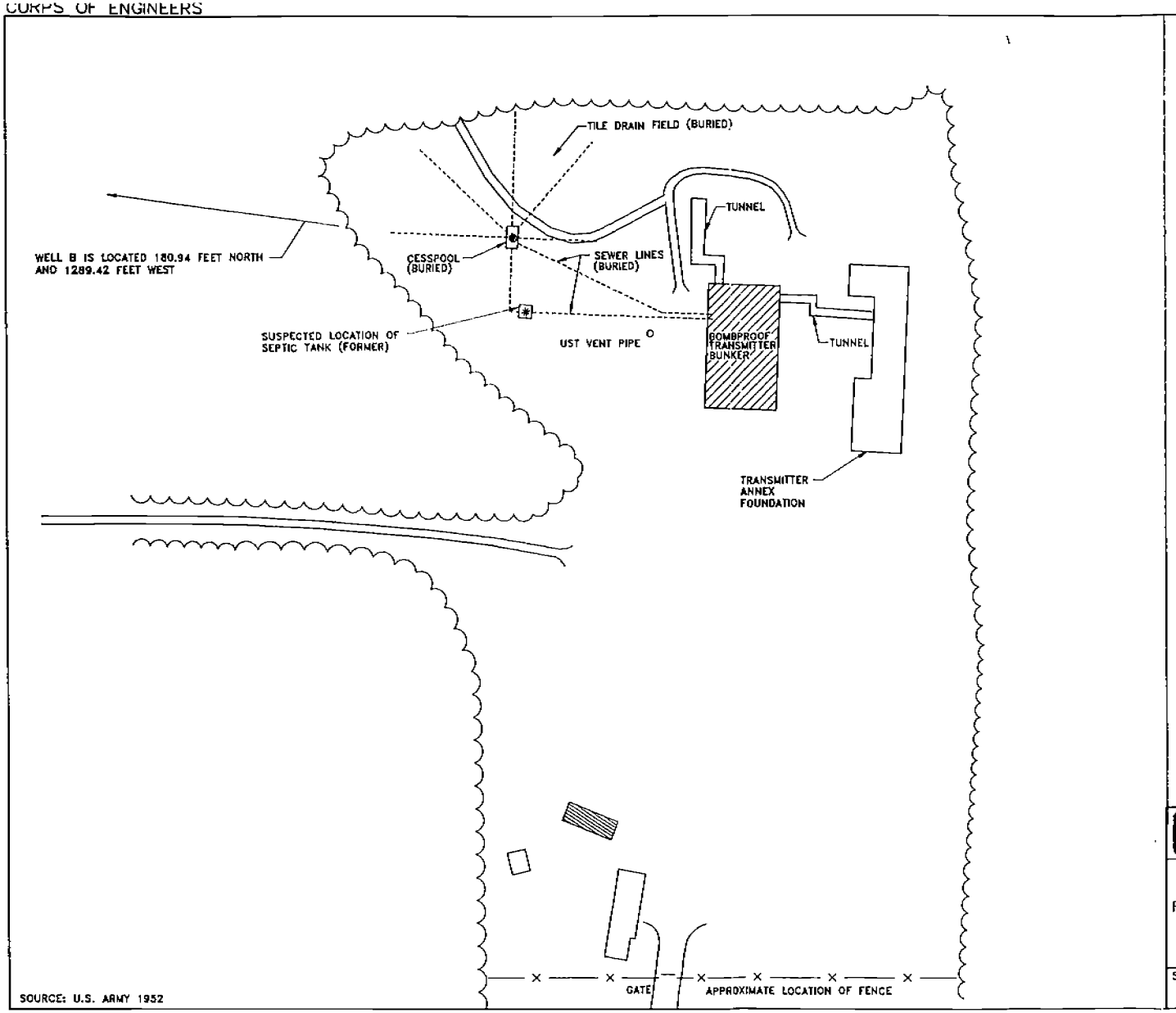
[a] Screening criteria based on Alaska non-UST matrix level A concentrations for petroleum contaminated soil (ADEC 1991).

[b] Screening criteria based on EPA Region 3 risk-based concentrations corresponding to excess lifetime cancer risks of 1 X 10^{-7} or a hazard index of 0.1.

Key:

– = No screening criterion exists for this analyte.
NA = Not applicable.
VOCs = Volatile Organic Compounds.

OUA 0020718



LEGEND

UST UNDERGROUND STORAGE TANK

EDGE OF TREES

N

SCALE IN FEET

0 80 160 240

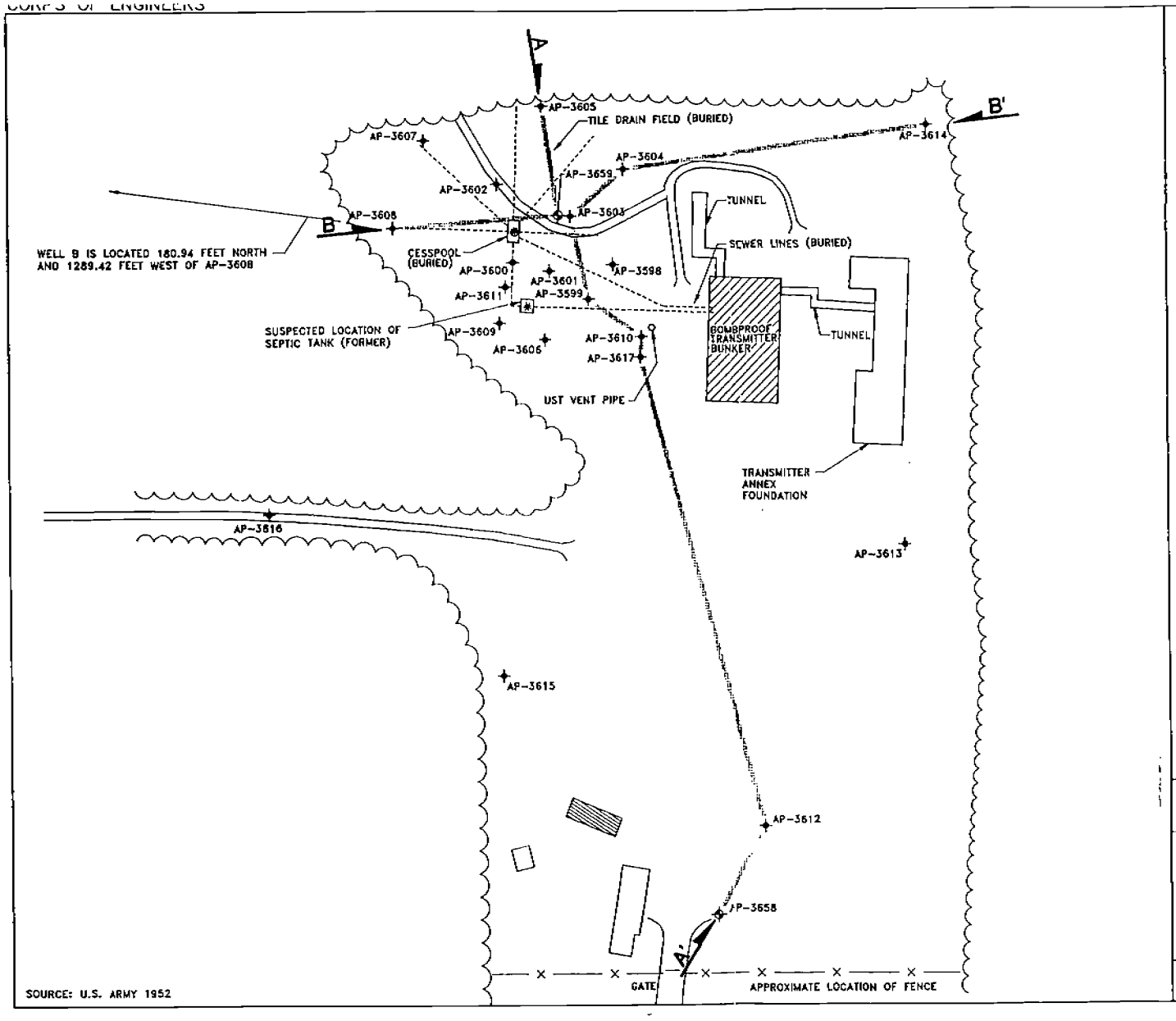
ecology and environment, inc.

U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 3-1
SITE MAP
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S063B	3-18-96	

0020719



LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- UST — UNDERGROUND STORAGE TANK
- B' — CROSS SECTION LOCATION AND DESIGNATION
- EDGE OF TREES

N

SCALE IN FEET

0 80 160 240

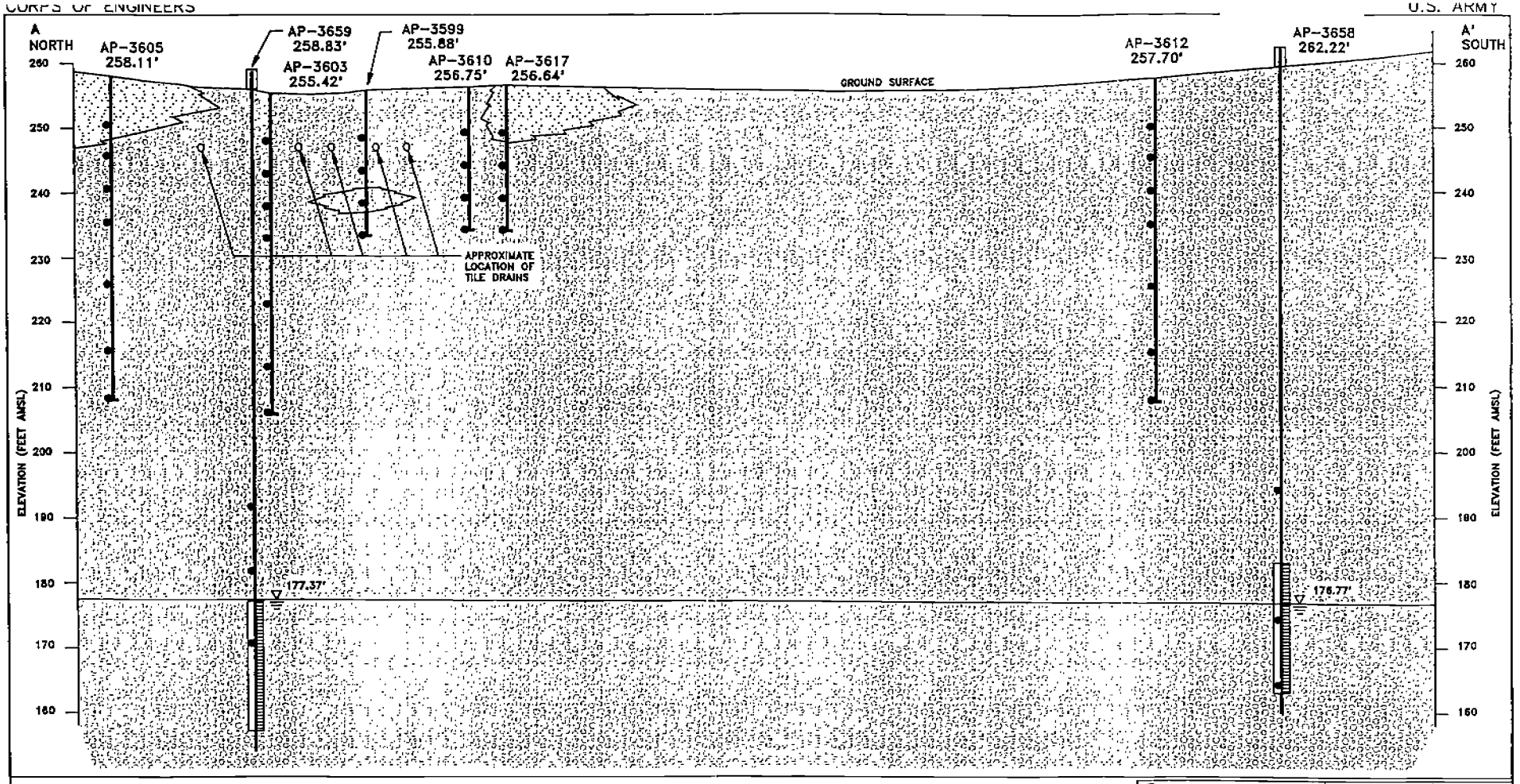
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ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 3-2
SOIL BORING/MONITORING WELL LOCATION MAP AND KEY TO CROSS SECTIONS A-A' AND B-B'
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S007B	3-25-96	

0020720



LEGEND

AMSL	ABOVE MEAN SEA LEVEL
AP-3603	SOIL BORING/MONITORING WELL LOCATION
255.42'	ELEVATION ABOVE MEAN SEA LEVEL
▽	GROUNDWATER TABLE
●	SUBSURFACE SOIL SAMPLE

NAPTOWNE OUTWASH DEPOSITS

- SILTY SAND
- SILTY, SANDY GRAVEL

NOTE:
WATER LEVEL ELEVATIONS MEASURED ON DECEMBER 15, 1995

HORIZONTAL SCALE IN FEET
0 60 120 180

VERTICAL SCALE IN FEET
0 15 30 45

VERTICAL EXAGGERATION 1:4

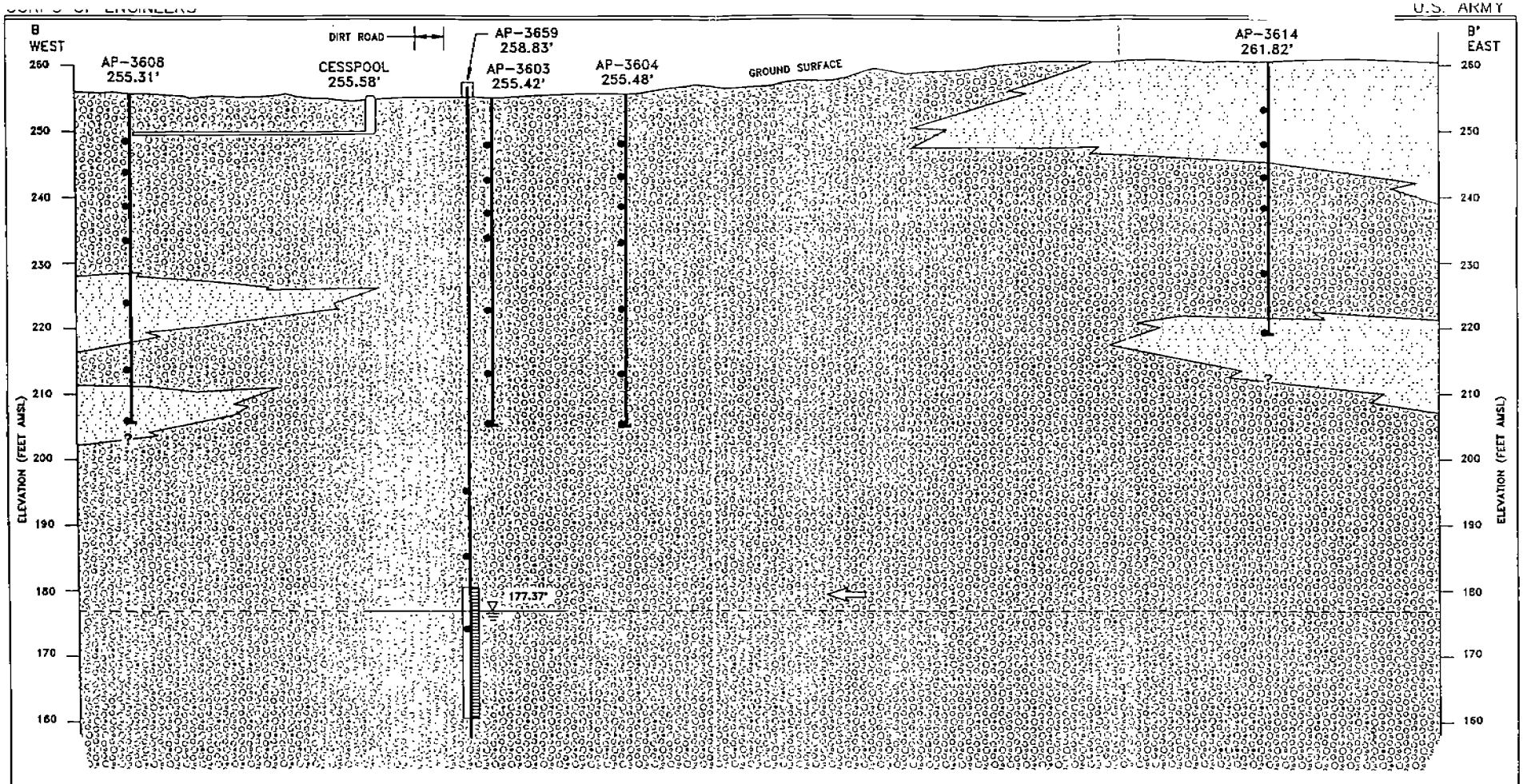
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Figure 3-3
GEOLOGIC CROSS SECTION A-A'
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3X054B	3-18-96	

0020721



LEGEND

AMSL	ABOVE MEAN SEA LEVEL
AP-3604	SOIL BORING/MONITORING WELL LOCATION
255.48'	ELEVATION ABOVE MEAN SEA LEVEL
▽	GROUNDWATER TABLE
●	SUBSURFACE SOIL SAMPLE
⇦	GROUNDWATER FLOW DIRECTION

NAPTOWNE OUTWASH DEPOSITS

- SILTY SAND
- SILTY, SANDY GRAVEL

NOTE:
WATER LEVEL ELEVATIONS MEASURED ON DECEMBER 15, 1995

HORIZONTAL SCALE IN FEET
0 40 80 120

VERTICAL SCALE IN FEET
0 15 30 45

VERTICAL EXAGGERATION 1:2.66

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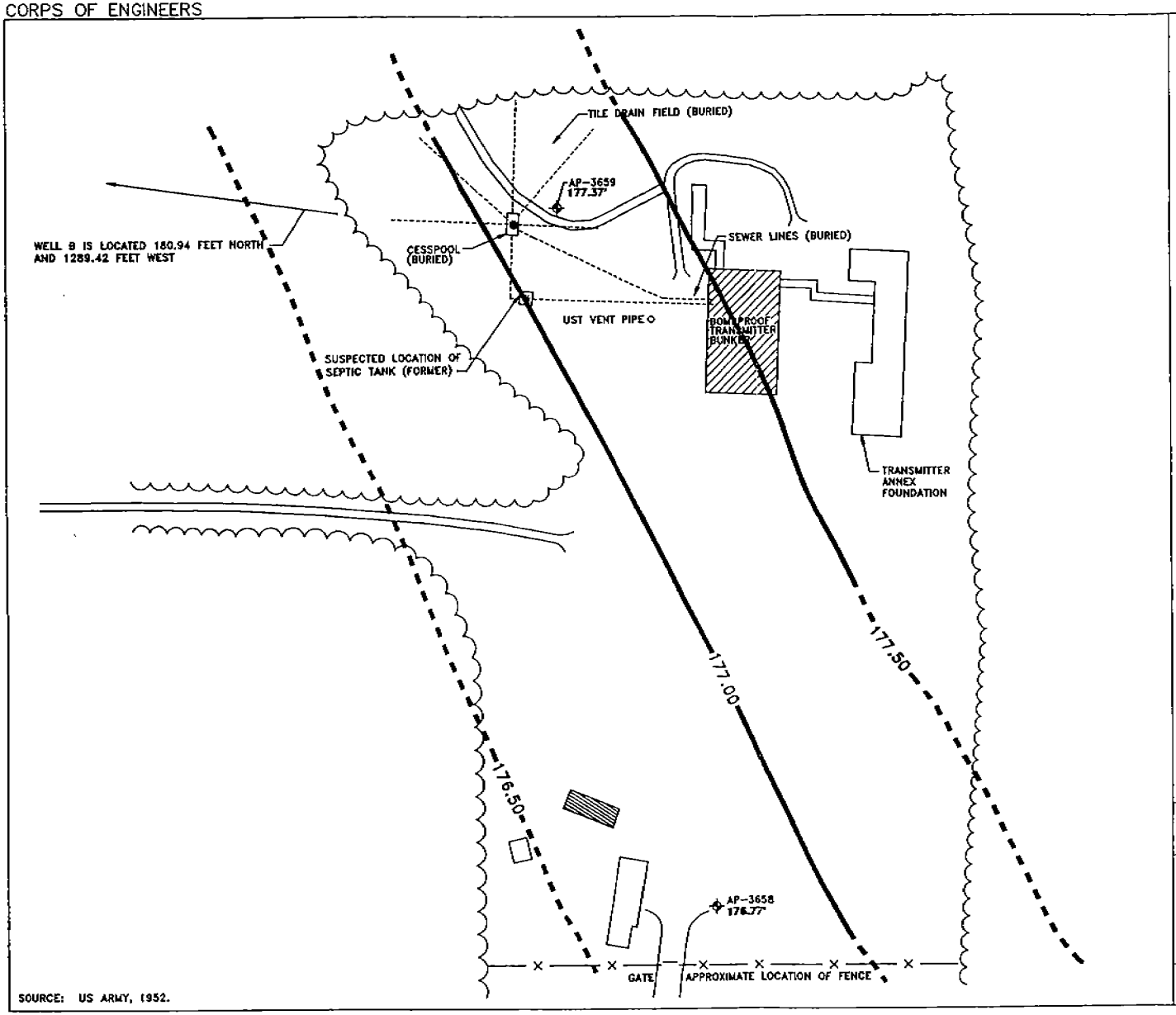
Figure 3-4
GEOLOGIC CROSS SECTION B-B'
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3X053B	3-18-96	

0020722

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

- MONITORING WELL LOCATION
- UST — UNDERGROUND STORAGE TANK
- EDGE OF TREES
- DECEMBER 15, 1995 GROUNDWATER CONTOUR
- 177.00 — GROUNDWATER ELEVATION FEET ABOVE MEAN SEA LEVEL

N

SCALE IN FEET

0 80 160 240

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ANCHORAGE, ALASKA

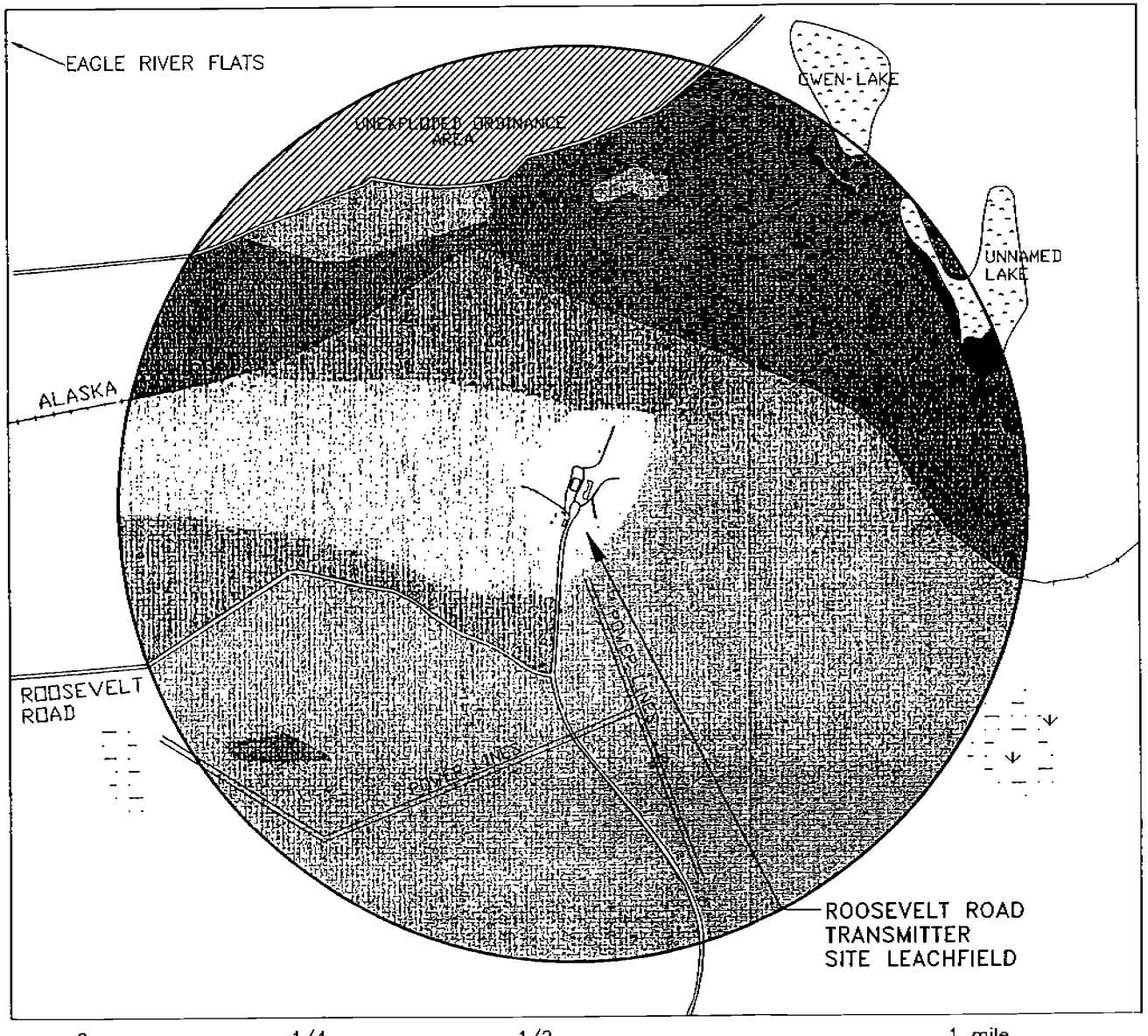
Figure 3-5
GROUNDWATER CONTOUR MAP
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

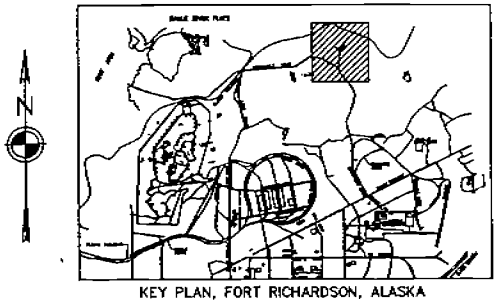
SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S062B	3-18-96	

0020723

CORPS OF ENGINEERS

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KEY PLAN, FORT RICHARDSON, ALASKA

LEGEND

- DISTURBED–HERBACEOUS
- DISTURBED–COTTONWOOD/SHRUB
- DISTURBED–WHITE SPRUCE
- DISTURBED–WHITE SPRUCE/ALDER
- ALDER SHRUB
- QUAKING ASPEN FOREST
- PAPER BIRCH FOREST
- WHITE SPRUCE/PAPER BIRCH FOREST
- GRAMINOID MEADOW
- SWEETGALE–ERICACEOUS SHRUB WETLAND
- PALUSTRINE EMERGENT WETLAND
- BLACK SPRUCE WOODLAND
- SPHAGNUM MOSS–FLOATING BOG MAT
- OPEN WATER WETLAND

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ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 3–6
COVER TYPE MAP
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

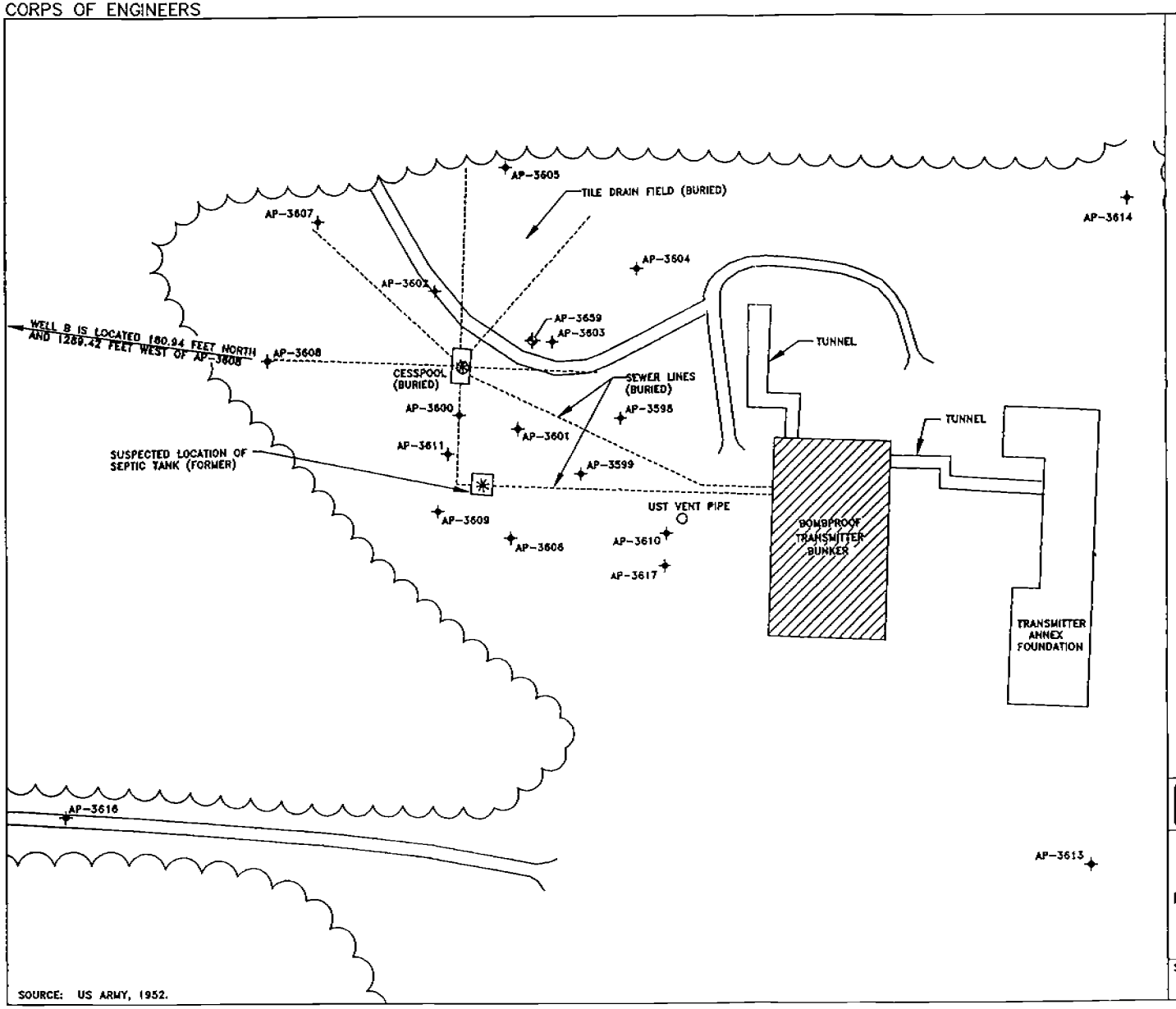
SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3950	ROOSV.DWG	03–26–96	

JT3950/ROOSV.DWG/03-26-96/AUTOCADEDMARTIN/SEATTLEWA.

0020724

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

- MONITORING WELL LOCATION
- NO CONTAMINATION DETECTED IN SUBSURFACE SOIL DURING RI
- CONTAMINATION DETECTED IN SUBSURFACE SOIL DURING RI
- UST — UNDERGROUND STORAGE TANK
- EDGE OF TREES

N

SCALE IN FEET

0 50 100 150

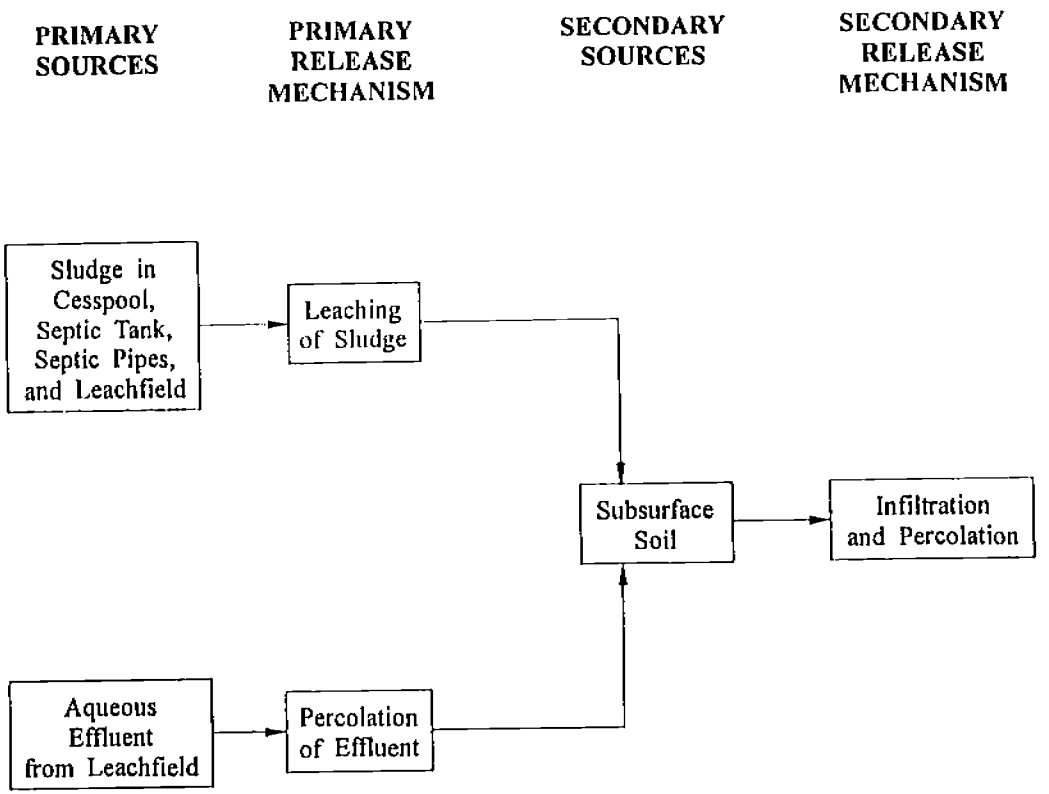
ecology and environment, inc.

U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 3-7
LATERAL EXTENT OF SUBSURFACE SOIL CONTAMINATION
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S013B	3-25-96	

0020725



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Anchorage, Alaska

FORT RICHARDSON
Anchorage, Alaska

OPERABLE UNIT A

FIGURE 3-8
CONCEPTUAL SITE MODEL
CURRENT SITE CONDITIONS
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD

Drawn By:	Date	TDD/Job No.	Dwg. No.
EGM	3-25-96	JT3060	JT3001

OUA 0020726

4 Ruff Road Fire Training Area

4.1 Site Description

The Ruff Road Fire Training Area (RRFTA) is located in the southern portion of Section 28, Township 14 North, Range 2 West of the Seward Meridian (see Figure 1-1). RRFTA is situated among gravel pits east of Bryant Airfield, south of the Davis Highway, and west of the Glenn Highway (see Figure 1-2).

4.1.1 Site History

The fire training area began operations during the initial establishment of the post in approximately 1940, and it was used until the 1980s to conduct exercises for training fire department and rescue crews. The fire training exercises were conducted by saturating unlined excavations with water, pumping fuel into the excavation, and igniting the fuel. Petroleum fuel products burned during the fire training exercises included jet fuel, waste oil, diesel, brake fluid, and solvents. Based on the assumption that 1,500 to 2,300 gallons of combustible material were burned annually at this site, approximately 85,500 gallons of wastes were burned and disposed of at the RRFTA (United States Army Environmental Hygiene Agency [AEHA] 1987).

The RRFTA was an approximately 50-foot-diameter area containing petroleum-stained soils. In 1991, the original road in the area was demolished and the present Ruff Road was constructed (see Figure 4-1). The charred debris associated with the fire training area was removed at that time (E & E 1993).

4.1.2 Previous Investigations

Previous investigations were conducted at RRFTA in 1986, 1989, and from 1991 to 1992. The objectives of these investigations were:

- To determine the presence, extent, and concentration of hazardous contaminants;
- To analyze potential risks posed by contaminants to human health and the environment; and
- To present potential cleanup alternatives for the site.

In 1986, AEHA drilled three soil borings and collected 20 subsurface soil samples at the site. Two soil borings met refusal at 20 feet BGS, and one met refusal at 26 feet BGS. Eight samples were analyzed for VOCs, but VOCs were not detected at concentrations exceeding detection limits. The remaining 12 samples were not analyzed for VOCs because holding times were exceeded (AEHA 1986).

In 1989, as part of the Installation Restoration Program (IRP), 15 soil-gas probes were installed in the area to a depth of 9 feet (WCC 1990c). Benzene, toluene, and xylenes were identified in the soil-gas samples with maximum concentrations of 250 ~~parts per million (ppm)~~, 2,500 ppm, and 1,200 ppm, respectively. Other hydrocarbons were detected (WCC 1990c).

In 1991, as part of a two-phase investigation, E & E collected surface and subsurface soil samples at the fire training area. A composite surface soil sample was collected in triplicate from stained soil near the center of the area. The sample contained lead (80.8 mg/kg to 543 mg/kg), diesel and other fuels in the diesel range (10,000 mg/kg to 20,000 mg/kg), pyrene (not detected to 750 J µg/kg), tetrachloroethene (PCE; 48 µg/kg to 485 µg/kg), toluene (not detected to 732 µg/kg), xylenes (not detected to 1,116 µg/kg), bis(2-ethylhexyl)phthalate (not detected to 4,100 µg/kg), and dioxins (0.0022 µg/kg toxicity equivalent factor [TEF]). Neither pesticides nor PCBs were detected (E & E 1993).

Subsurface soil samples were also collected during the 1991 Phase I effort. Samples were collected from two soil borings at 5-foot intervals from to a depth of 20 feet BGS; one boring was located at the center of the fire training area and one was located in a background location south of the fire training area. The highest VOC concentrations detected in these samples were acetone (283 µg/kg), trichloroethene (TCE; 46 µg/kg), toluene (56 µg/kg), and xylenes (42 µg/kg) (E & E 1993).

E & E conducted the second phase of the investigation in 1992. Twenty-five surface soil samples and approximately 100 subsurface soil samples were collected. No groundwater samples were collected because groundwater was estimated to occur at a depth of 140 feet

BGS (E & E 1993). POL contamination was detected in both subsurface and surface soil samples. Significant levels of dioxins/furans were also encountered in surface soil samples at concentrations up to 45.4 μg/kg. Figures 4-2 and 4-3 present analytical results exceeding ADEC matrix cleanup levels for non-UST petroleum contaminated sites or EPA Region 10 RBCs (E & E 1993).

All 1992 surface and subsurface samples contained total lead, with concentrations ranging from 3.6 to 400 mg/kg. Samples were subsequently analyzed for TCLP lead, but none of the samples contained TCLP lead at concentrations exceeding the toxicity characteristic limit that would require treatment under Title 40, Code of Federal Regulations (CFR) Part 261.24 as a characteristic waste (E & E 1993).

Selected subsurface samples were analyzed for pesticides and PCBs using EPA Method 8080, but PCBs were not detected in the samples. Surface samples were not analyzed for pesticides or PCBs (E & E 1993).

Analytical results from the 1992 investigation confirmed the presence of petroleum contamination in soils at concentrations exceeding ADEC cleanup levels. Contaminants previously detected at levels requiring remediation at the site included benzene, toluene, ethylbenzene, and total xylenes, DRO, and TRPH. In addition, several samples showed dioxin TEFs that exceeded EPA Region 10 RBCs. Based on the results of this investigation, the areal extent of contamination was estimated to be 25,000 square feet, with approximately 35,000 cubic yards of contaminated soil.

4.2 RI Field Investigations

Based on the presence of contamination detected in surface and subsurface soils at RRFTA during previous investigations, the management plan for OU-A (E & E 1995) outlined a field investigation to characterize the nature and extent of contamination. The field investigation at RRFTA consisted of the following five components:

- Surface soil investigation,
- Subsurface soil investigation,
- Groundwater investigation,
- Surface water/sediment investigation, and
- Ecological investigation.

This section describes the specific field investigations conducted at RRFTA in support of the RI. The methods used to perform the investigation are described in Appendix A of the sampling and analysis plan submitted with the OU-A management plan (E & E 1995). Deviations from the proposed surface soil and surface water/sediment investigations are described in Sections 4.2.1 and 4.2.3. Tables 4-1 through 4-4 provide a summary of the sample collection and analyses performed during the RI for soil, groundwater, surface water, and sediment samples.

4.2.1 Surface Soil Investigation

Previous investigations indicate that surface soils are contaminated with petroleum, solvents, residues remaining from their combustion, and dioxins. This contamination is a result of the historical application of the fuels and other combustible materials used during fire training activities at the site.

The surface soil sampling effort at RRFTA was designed to define the nature and lateral extent of contamination. A 300-foot by 300-foot sampling grid was initially established at the site to determine the areal extent of contamination. The grid contained sample nodes placed at 25-foot intervals. Samples were collected from 42 nodes in the area expected to be most contaminated and submitted for field screening analysis (see Appendix A, photo 9). Field screening was performed using an enzyme-linked, immunosorbent assay method to identify petroleum hydrocarbons as diesel (see Table 4-1). Field screening results indicated that most of the samples contained petroleum hydrocarbons concentrations of less than 20 ppm (see Section 4.5.1.1).

During sampling activities, the field team noted that the site appeared to have been regraded since the site visit conducted during the previous summer. In consultation with the Corps, it was concluded that the current surface soil was not representative of soils characterized during the 1992 investigation. (Most surface soil samples collected in 1992 contained DRO concentrations of at least 100 ppm.) Based on this information, E & E and the Corps agreed to modify the surface sampling strategy. The soil sampling program for present surface soils (e.g., the fill surface) was modified to include six samples from randomly selected nodes for full laboratory analyses. Nodes sampled for full laboratory analysis included H-7, I-6, I-13, K-9, L-10, and M-7 (see Figure 4-5). The data generated from these samples would provide information on the types and concentrations of contaminants that exist in the present fill surface soils, and the information would be used to assess the risks associated with the inhalation of dust or ingestion of soil.

To characterize the former ground surface at RRFTA, the sampling strategy was modified to include the collection of shallow subsurface soil samples (1 to 2 feet BGS) using a hydraulic earth drill and hand auger (see Appendix A, photo 10). Forty-two of the 47 nodes in the original grid were sampled using this method (refusal occurred at 5 grid nodes). Samples from the shallow borings were submitted for field screening analyses, and eight of the samples were duplicated for full laboratory analyses. In addition, four samples (X-1 through X-4) from the former ground surface were collected from shallow borings surrounding the grid system to ensure that delineation of contaminated soils was complete (see Figure 4-4).

Five background surface soil samples were collected at the background soil boring locations (AP-3629 through AP-3633) near RRFTA. These locations were not expected to be impacted by potential releases from RRFTA or other past operations.

4.2.2 Subsurface Soil Investigation

The subsurface soil sampling effort at the RRFTA was designed to define the extent of contamination. Nineteen soil borings (AP-3629 through AP-3647) were drilled with a hollow-stem auger to a depth of 50 feet BGS (see Figure 4-6). Soil borings AP-3640 through AP-3642 and AP-3644 were drilled within the area that was reported to have formerly contained stained soil from the fire training area. The remaining 10 borings were drilled around the region of known contamination to further delineate the lateral and vertical extent of contamination. Borings AP-3629 through AP-3633 were drilled at locations assumed to be upgradient of the fire training area to establish background conditions. Soil samples were collected at 5-foot intervals to depths of 20 feet BGS, and at 10-foot intervals from 30 to 50 feet BGS.

4.2.3 Groundwater Investigation

Groundwater was not sampled during previous investigations. However, based on the permeability of soils at RRFTA, groundwater could have been contaminated by petroleum, solvents, combustion residues, and dioxins in water used during fire fighting activities and by the infiltration of precipitation and snowmelt. Five monitoring wells (AP-3653 through AP-3657) were installed using the air-rotary method to depths between approximately 140 and 150 feet BGS (see Figure 4-6; Appendix A, photos 11 and 12).

Well AP-3655 is located within the fire training area. Monitoring well AP-3657 was installed at a location hydraulically downgradient of the fire training area to determine the extent of contamination. AP-3654 and AP-3656 were installed at locations crossgradient to

the source. (AP-3656 is located approximately 125 feet northeast of RRFTA, and AP-3657 is located approximately 300 feet northwest.) Well AP-3653 was installed at a location hydraulically upgradient of the site to establish background subsurface conditions. Soil samples were collected at 10-foot intervals from 60 feet BGS to the bottom of each well boring prior to well development to aid in subsurface soil characterization. Groundwater samples were collected from the RRFTA monitoring wells on two separate occasions: during the RI field investigations in 1995, and in August 1996 to confirm the absence or presence of dioxin congeners detected in the 1995 RI groundwater samples.

4.2.4 Surface Water and Sediment Investigation

Surface water and sediment samples were collected because a wetland was discovered approximately 700 feet southwest of the site. One triplicate sediment sample (RRFTA2002SD, RRFTA2003SD, and RRFTA2004SD) and one collocated surface water triplicate sample (RRFTA2002SW, RRFTA2003SW, and RRFTA2004SW) were collected at the wetland. A background surface water/sediment sample (RRFTA2001SD/RRFTA2001SW) was collected from a gravel pit located approximately 0.6 mile upgradient of the site. The former gravel pit was filled with water and stocked with fish for Fort Richardson personnel. Figure 4-7 presents the surface water/sediment sample locations.

4.2.5 Ecological Investigation

E & E biologists conducted a field survey of the area within a 0.5-mile radius of the site to identify major vegetation cover types and to qualitatively assess the suitability of each cover type for wildlife. Wetland boundaries mapped by USFWS were verified and assessed following standard procedures presented in the *Corps of Engineers Wetland Delineation Manual* (Corps 1987).

4.3 Physical Characteristics

4.3.1 Site Geology

RRFTA is located near the southern margin of the Elmendorf Moraine on Naptowne outwash deposits. The Naptowne outwash deposits in the site area consist of unconsolidated, well graded gravel, sand, silt, and minor amounts of clay. Soil boring logs from RRFTA indicate that soil consists of dry, massive, well graded sandy gravel (1-7 cm) with minor silt and clay (see Appendix B). Gravel and sand grains are angular to sub-angular. Grain-size analysis performed on subsurface soil samples indicates that site soils are composed of

approximately 57% gravel, 34% sand, and 9% silt and clay (see Appendix C). The total thickness of the Naptowne outwash deposit at RRFTA is unknown, but based on soil boring logs, the outwash deposit extends from the ground surface to at least 223 feet AMSL. The Naptowne outwash deposit in borings drilled at RRFTA is approximately 167 feet thick.

Discontinuous sand layers were encountered during drilling at RRFTA at various depths. Sand layers range from approximately 10 to 50 feet thick, and extend laterally for a minimum of 200 feet (see Figures 4-8 and 4-9). Bootlegger Cove clay was encountered at four soil borings and extended from the surface to a maximum thickness of 20 feet. This material is believed to be imported fill because the Bootlegger Cove formation does not overlie Naptowne outwash deposits (Cederstrom et al. 1964).

4.3.2 Site Hydrogeology

Groundwater at RRFTA occurs from 140 to 153 feet BGS (approximately 236 to 250 feet AMSL) and within the unconfined sandy gravel to gravelly sand aquifer previously described. Observations of groundwater flow for the site are based on water levels measured at five monitoring wells installed at RRFTA. These observations indicate that groundwater generally flows westward and has an average horizontal hydraulic gradient from 0.018 to 0.023 (see Figure 4-10). These conditions are consistent with the regional hydrogeologic characteristics described in Section 2.5.

Groundwater levels in RRFTA wells were measured monthly from October 1995 to February 1996. Water level measurements decreased between 2.8 and 7.9 feet during this period, suggesting that water levels decrease during the late fall and winter months. The amount that water levels declined in individual wells increased from east to west (e.g., 2.8 feet at AP-3653, 4.8 feet at AP-3655, and 7.9 feet at AP-3657), indicating that the groundwater gradient to the west increased slightly during this period (see Figure 4-10). However, the direction of groundwater flow does not appear to have changed. Water levels would be expected to rise with seasonal recharge beginning in spring.

Hydraulic conductivity for the aquifer at RRFTA was estimated based on slug tests performed at wells AP-3655 and AP-3656 in October 1995. The slug test data showed an average hydraulic conductivity of 0.04 ft/min in the saturated aquifer (see Appendix D). The slug test results in this case are presented as estimates because of the very high permeabilities observed. While slug tests are generally more suited to lower permeability materials, the high permeabilities calculated from the test data are consistent with values typically associated with sand and gravel aquifers, and consistent with a published report of hydraulic conductivity for the regional aquifer (Patrick et al. 1989).

4.3.3 Site Ecology

RRFTA is located within an area used for gravel excavation, and it is surrounded by relatively undisturbed forested areas. Figure 4-11 presents the vegetative cover types found within a 0.5-mile radius of the site. A list of the vegetation and wildlife at the site is in the ecological risk assessment.

A black spruce forest extends south and immediately north of the site. Immediately west of the site are small alder and quaking aspen patches. Farther west is Bryant Airfield, which consists of airport facility buildings, a runway, and maintained areas of herbaceous vegetation and saplings/shrubs. A mixed white spruce/paper birch forest lies on either side of the Davis Highway, north and west of the maintained area at Bryant Airfield. A disturbed area dominated by cottonwoods and shrubs is west of Bryant Airfield.

The area between the Davis Highway and the site is dominated by a mixed cottonwood/white spruce forest. A black spruce/quaking aspen forest is adjacent to the northeast corner of the site.

A small pond is located approximately 600 feet from the southwest corner of the former fire training area. Frogs were observed in the pond during the field survey, and moose prints surrounded the pond. A former gravel pit is located approximately 0.6 mile south and hydraulically upgradient of the site. The pit has filled with water and it is stocked with fish during the summer.

The forested areas surrounding RRFTA provide habitat for mammals and birds. Evidence of moose was found throughout the forested areas. Squirrels and a spruce grouse were observed during the field survey. Evidence of bears was found on the site, and at least one fox was observed crossing the site on several occasions. The small pond located adjacent to the site is a likely drinking water source for some mammals, but it is probably too small to be considered waterfowl habitat.

4.4 Analytical Data Quality Assurance

The QA/QC program implemented at OU-A is described in Appendix E. The data quality and data usability for RRFTA are summarized in the following paragraphs.

4.4.1 Field Laboratory

On-site field screening was performed to identify petroleum hydrocarbons quantitated in the diesel range. Ninety-eight soil samples were analyzed using immunoassay test kits and EPA Method 4030. E & E chemists evaluated the data generated in the field for PARCC as

listed in the management plan for OU-A (E & E 1995). All data were validated and found acceptable for their intended use. Details of the field laboratory validation are presented in Appendix E.

4.4.2 Off-site Laboratory

NPDL evaluated all analytical data generated by the off-site laboratories for PARCC. Details of the data validation are presented in the CQARs in Appendix E.

As noted in the CQARs, NPDL concluded that the soil and groundwater data met QA/QC requirements set forth by the Corps (Corps 1990) and the EPA Functional Guidelines (EPA 1994) and were not adversely affected by the following data qualifications:

- **VOC analysis:** Approximately 1% of the VOC results (135 individual analytical results) are considered estimates because surrogate recoveries, holding times, and/or method blanks did not meet QC criteria.

- **BNA analysis:** Less than 1% of the BNA results (65 individual analytical results) are considered estimates because holding times and/or method blanks did not meet QC criteria.

- **Dioxin analysis:** Approximately 5% of the dioxin results (172 individual analytical results) are considered estimates because surrogate recoveries, matrix spike recoveries, and/or method blanks, did not meet QC criteria. Less than 1% of the dioxin results (17 individual analytical results) are rejected because surrogate recoveries failed to meet QC criteria.

- **GRO analysis:** Approximately 49% of the GRO results (103 samples) are considered estimates because surrogate recoveries, matrix spike recoveries, and rinsate or method blanks did not meet QC criteria.

- **DRO analysis:** Approximately 47% of the DRO results (119 samples) are considered estimates because holding times, surrogate recoveries, and/or matrix spike recoveries did not meet QC criteria.

- **TRPH analysis:** Approximately 15% of the TRPH results (37 samples) are considered estimates because matrix spike recoveries did not meet QC criteria.

- **Inorganic Analysis:** Approximately 4% of the inorganic results (256 individual analytical results) are considered estimates because holding times and/or matrix spike recoveries did not meet QC criteria.

E & E chemists used the recommendations in the CQARs and EPA CLP guidelines to assign data qualifiers to the analytical results as shown in Table 4-5. The following data

qualifiers were applied: Sample concentrations considered to be estimates are flagged "J." Data results obtained using estimated detection limits are flagged "UJ." Results that may be attributed to blank contamination are flagged "B." Unacceptable results were not reported and numerical values were replaced with the qualifier "R." Based on the qualifications applied, the data are not adversely impacted and considered usable for the purposes of this investigation.

4.4.3 Field Quality Assurance/Quality Control Sample Results

Trip blank and rinsate sample results for RRFTA are presented in Appendix H. Toluene and methylene chloride were detected in the trip blanks. Acetone, toluene, methylene chloride, GRO, TOC, di-n-butylphthalate, butylbenzylphthalate, and OCDD were detected in rinsate and are attributed to laboratory contamination because they were detected in laboratory method blanks. The presence of 1,2-dichloropropane in one trip blank, rinsate, and all groundwater samples associated with a single sample shipment cooler could indicate contamination from an unknown source in the field or laboratory. The absence of all other targeted analytes indicates that the decontamination procedure is adequate for organic analyses. Concentrations of GRO and TOC detected in the rinsates were near the MQLs and did not adversely impact the data. Arsenic, cadmium, calcium, copper, lead, magnesium, potassium, thallium, and zinc were detected in the rinsate samples. For analytes not detected in the laboratory blanks, the deionized water used for rinsate and trip blank preparation appears to be the most probable source of this contamination.

Overall, blind duplicate and triplicate data agree and are comparable. For instances where data did not agree, the discrepancies could not be resolved analytically and are attributed to the submission of nonhomogeneous samples.

4.4.4 Analytical Data Quality Objectives Assessment

E & E reviewed the analytical data to determine its ability to meet the project DQOs identified in the management plan for OU-A (E & E 1995). The following data use limitations were identified:

- Some specific dioxin results were flagged "R," or unusable because they failed to achieve minimum analytical QC criteria. The number of usable data points to assess site conditions was decreased.

- A fraction of data results were flagged "J" to indicate that quantitative accuracy is questionable. Although the results are estimated and are still usable, the accuracy of the precise concentration is questionable.

- Results identifying common laboratory contaminants believed to be the result of field or laboratory contamination were flagged "B." These results are viewed as having an estimated detection limit. The chemical of concern may or may not be present in the sample, but the result could be masked by field or laboratory introduced contamination by the same chemical of concern.

- Limitations were placed on the usability of $<1\%$ VOC data (83 analytes), 1% BNA data (149 analytes), 19% PAH data (24 analytes), and 3% metals data (188 analytes), because required analytical detection limits were not achieved. The presence or absence of a chemical of concern cannot be confirmed at the action level because the practical quantitation limit was elevated above the required action level as a result of unavoidable matrix effects.

Overall, PARCC parameters for OU-A RI analytical data were achieved and the data meet the needs for characterizing the extent of contamination and ecological and health and human risk assessment.

4.5 Nature and Extent of Contamination

This section presents the types and spacial distribution of contaminants detected at RRFTA during the RI. Tables 4-6 through 4-10 summarize the frequency of detection, range, and locations of maximum concentrations of analytes detected in surface soil, subsurface soil, groundwater, surface water, and sediment. Appendix H contains all of the analytical data for RRFTA generated during the RI, including detection limits.

A conservative risk-based screening procedure was used to identify site-related contaminants at RRFTA. (Although this screening procedure is similar to the procedure that will be used in the OU-A risk assessment, contaminants were screened independently for the human health and ecological risk assessments.) The following screening criteria were applied to the analytical results to identify contaminants:

- **Inorganic analytes:** Inorganic analyte concentrations were identified as contaminants if detected at concentrations exceeding the maximum concentration of site-specific background samples or at concentrations exceeding the background levels reported in the background data analysis for Fort Richardson (E & E 1996).

- **Organic analytes in soils:** Organic analytes in soil were identified as contaminants if detected at concentrations exceeding an excess lifetime cancer risk of 1×10^{-7} or a HI of 0.1 based on EPA Region 3 RBCs.

- **DRO and GRO in soil:** DRO and GRO analytes in soil were identified as contaminants if detected at concentrations exceeding Alaska

non-UST matrix Level A, which corresponds to 100 mg/kg for DRO and 50 mg/kg for GRO.

- **Organic analytes in groundwater:** Organic analytes in groundwater were identified as contaminants if detected at concentrations exceeding an excess lifetime cancer risk of 1×10^{-6} or a HI of 0.1 based on EPA Region 3 RBCs.

- **Analytes in surface water:** Analytes in surface water were identified as contaminants if detected at concentrations exceeding Alaska Water Quality Standards (18 AAC 70.020); and

- **Analytes in Sediment:** Analytes in sediment were identified as contaminants if detected at concentrations exceeding applicable sediment toxicity benchmarks to be used in the OU-A ecological risk assessment (EPA 1992; Suter and Mabrey 1994; WDNR 1987; NYSDEC 1993; Environment Canada 1994).

Site-related contaminants identified by these screening criteria will be used to determine the nature and extent of contamination at RRFTA and to evaluate risks associated with OU-A. EPA Region 3 RBCs were used as screening criteria for organic analytes because they reflect the most current toxicity criteria available (EPA 1994c). No RBCs exist for petroleum products, so the most conservative levels referenced in *Interim Guidance for Non-UST Contaminated Soil Clean-up Levels* were used as screening criteria for DRO and GRO (ADEC 1991). Background concentrations were used to screen inorganic elements because these levels are expected to provide the most site-specific basis for evaluating the significance of inorganic analyte concentrations. Aluminum, calcium, iron, magnesium, potassium, and sodium were eliminated from discussion because they are not associated with toxicity to humans under normal circumstances and are common constituents of uncontaminated soils (EPA 1991). Alaska Water Quality Standards and sediment benchmark guidelines were used as screening criteria because they reflect the most appropriate health-based standards for ecological receptors based on toxicological studies.

One exception to the screening rationale used at RRFTA involves the presentation of field analytical screening results for surface soils. The management plan for OU-A presented a strategy to determine the extent of contamination in surface soils by correlating collocated field screening data to off-site laboratory analytical results (E & E 1995). Based on this rationale, all surface soil samples containing positively detected concentrations of petroleum hydrocarbons during field screening analysis will be presented to estimate the presence and extent of other suspected site-related contaminants.

Polychlorinated dioxins/furans, homologues, and congeners determined to be present are reported as a calculated total concentration of 2,3,7,8-tetrachlorodibenzo-p-dioxins (2,3,7,8-TCDD). I-TEFs/89 TEF presented in *Interim Procedures for Estimating Risk Associated with Exposures to Mixtures of Chlorinated Dibenzo-P-Dioxins and Dibenzofurans (CDDs and CDfs)* and the 1989 update (EPA 1989) were used to calculate the total 2,3,7,8-TCDD equivalence value. All dioxins concentrations are expressed as TEF units.

4.5.1 Surface Soil Contamination

As discussed in Section 4.2, two surface soil horizons were characterized during the RI: the present fill surface (0 to 1 feet BGS), and the former ground-surface soils which occur at a depth of 1 to 2 feet below the fill surface.

4.5.1.1 Present Fill Surface Soil

Petroleum hydrocarbons were detected at four separate areas of the fill surface during field screening analyses (see Figure 4-12). The maximum concentration of 318 mg/kg was detected was at grid node L-10. All other areas in which petroleum hydrocarbons were detected contained concentrations of less than 20 mg/kg (I-7, I-9, L-8, and L-11). Petroleum hydrocarbons were detected during field screen on an approximately 3,000-square-foot area of the fill surface (see Figure 4-12).

Laboratory analyses performed on randomly selected samples collected from the present fill surface contained DRO, PAHs (included as BNAs), and dioxins (see Table 4-6). VOCs and heavy metals were not detected at concentrations exceeding screening criteria. Figure 4-12 presents the contaminants identified in the surface fill samples during off-site laboratory analysis.

A statistical analysis of the field screening results and off-site laboratory results for DRO in surface fill was conducted using linear regression. The statistical analysis showed a strong correlation ($r^2=0.7$) between the identification of petroleum hydrocarbons during field screening and the identification of DRO during off-site analysis (see Appendix E). This relationship suggests that the extent of field screening petroleum hydrocarbons illustrated in Figure 4-12 approximates the extent of DRO contamination. In addition, PAHs and dioxins are expected to occur in the soils containing elevated DRO concentrations.

4.5.1.2 Former Ground-Surface Soil

Petroleum hydrocarbons were detected during field screening analysis in the former ground-surface soils in two separate areas (see Figure 4-13). The maximum concentration detected during field screening was 1,300 mg/kg at grid node N-9. Petroleum hydrocarbons were detected at four additional grid node samples during field screening at concentrations exceeding 100 mg/kg (L-9, L-11, M-10 and M-11). Based on these results, an approximately 7,000-square-foot area in the former ground-surface horizon contains petroleum hydrocarbons (see Figure 4-13).

Off-site laboratory analysis performed for selected collocated samples indicates the presence of the following contaminants: DRO, GRO, PAHs, and dioxins (see Table 4-6). VOCs and heavy metals were not detected at concentrations exceeding screening criteria. Aluminum was detected at concentrations exceeding the screening criteria, but it is not attributable to previous site activities. The presence of aluminum could be an anomaly associated with natural variations in the soil. Figure 4-13 includes the contaminants detected in the laboratory samples collected from the former ground-surface soils. Similar to the surface fill, there is a strong correlation between the presence of petroleum hydrocarbons identified during field screening and the presence of DRO identified during off-site laboratory analysis (see Appendix E). Therefore, the extent of DRO contamination in the this soil is probably similar to the extent of petroleum hydrocarbon contamination identified during field screening (see Figure 4-13). In addition, PAHs and dioxins are likely present in the areas of the former ground surface soil containing the highest DRO concentrations.

There is no apparent lateral relationship between contamination in the present fill soils and the former ground surface soils (see Figures 4-12 and 4-13). The contaminants detected in the fill are probably the result of activities conducted at the site after the fill was placed, rather than the result of fire training activities. Anecdotal information indicates that the Army National Guard parked trucks and heavy equipment at the site in 1994. Leaks and/or spills from this equipment could be the source of the contaminants detected in the present fill surface soils.

The 1992 RRFTA investigation characterized the presence of dioxin and petroleum hydrocarbons contamination in surface soil (see Section 4.1.3). The surface soils sampled in 1992 are best represented by the former ground-surface soils sampled during the RI. Laboratory analytical results generated during the RI revealed dioxin concentrations that were similar to dioxin concentrations found in 1992. The maximum concentration of dioxins detected in 1992 was 4.54×10^{-5} mg/kg, and the maximum concentration of dioxins detected during the RI was 2.39×10^{-5}. While concentrations of DRO detected during the 1992

investigation reached 20,000 mg/kg and most of the samples contained DRO concentrations exceeding 100 mg/kg DRO, the highest DRO concentration detected during the RI was significantly lower at 3,400 mg/kg. Figure 4-14 compares the location and extent of contamination identified during the 1992 surface soil investigation to the location and extent of contamination identified during the RI. The reason for the differences in contaminant concentrations has not been confirmed, but the following explanations are possible:

- Filling and re-grading activities conducted at the site between 1994 and 1995 might have dispersed or diluted the contamination detected during the 1992 investigation; and
- Natural degradation or vertical migration of petroleum hydrocarbons might have occurred since 1992, thereby decreasing the contaminant levels detected previously.

Although the extent of DRO and dioxins in surface soil was not completely delineated during the 1992 investigation, the occurrence of contamination appears to be generally consistent with the spatial occurrence of petroleum hydrocarbons identified during field screening of the former ground-surface soil horizon.

4.5.2 Subsurface Soil Contamination

The following contaminants were detected in subsurface soils at RRFTA: DRO, GRO, and dioxins (see Table 4-7). VOCs and BNAs were not detected at concentrations exceeding screening criteria. Several inorganics were detected at concentrations exceeding screening criteria (arsenic, beryllium, chromium, cobalt, nickel, and vanadium), but these analytes are not considered site-related contaminants because neither site history nor previous investigations suggest that they are attributable to site activities. Copper, lead, and zinc were also detected in subsurface samples at concentrations exceeding the screening criteria, and they are potentially attributable to the combustion of fuels/wastes at the site. The levels detected are within one order of magnitude of their respective background concentrations. These contaminants will be addressed in the risk assessment for OU-A.

All subsurface soil samples containing site-related contaminants were collected from a group of soil borings in the central and southwestern portions of the site (see Figure 4-15). However, neither the frequencies of detection nor the concentrations of contaminants detected in subsurface soils shows a distinct spatial trend. Dioxin contamination is most prevalent at depths from 5 to 15 feet BGS in soil borings drilled at the former fire training area. The maximum concentration of dioxins (1.91×10^{-5}) was detected in boring AP-3637 at a depth of

10 feet BGS. DRO and GRO contamination exists between depths of 15 and 50 feet BGS in borings AP-3635 and AP-3643 (see Figures 4-16 and 4-17).

All borings containing site-related contaminants were surrounded by borings that did not contain these contaminants, which indicates that the lateral extent of subsurface soil contamination was delineated during the RI (see Figures 4-15 and 4-16). Soil boring AP-3643 contained GRO (330 mg/kg) at the deepest sampling interval (50 feet BGS), but nearby monitoring well AP-3655 did not contain GRO contamination at a depth of 60 feet BGS. Therefore, the vertical extent of petroleum hydrocarbon contamination is assumed to occur between 50 and 60 feet BGS.

No contamination was detected in any of the subsurface soil samples collected from depths greater than 50 feet BGS during monitoring well installation. The first occurrence of groundwater in the area is at approximately 147 feet BGS. Based on the RI, the maximum volume of contaminated subsurface soil at RRFTA is approximately 200,000 cubic yards.

The 1992 investigation characterized the presence of petroleum hydrocarbons and dioxin in subsurface soil at the site (see Section 4.1.3). Compared to the results of the 1992 investigation, the analytical results from the RI revealed similar concentrations of dioxins and lower concentrations of DRO. VOC concentrations were not similar. However, the lateral extent of subsurface soil contamination detected during the RI is greater than the extent of subsurface contamination characterized in 1992. (Figure 4-18 compares the estimated lateral extent of subsurface soil contamination identified during the two investigations.) The greater area of subsurface soil contamination identified during the RI could be the result of the more comprehensive sampling program, or it could indicate that contaminant migration has occurred through the subsurface soils since 1992.

4.5.3 Groundwater Contamination

Fuels, VOCs, BNAs, and inorganic elements were not detected at concentrations exceeding screening criteria in any of the groundwater samples collected at RRFTA. Dioxins were detected in four of the five monitoring well samples, but none of the TEFs calculated for the detected dioxin congeners exceeded the risk-based screening concentration of 4.5×10^{-7} μg/L (see Table 4-8). The presence of dioxin in the groundwater samples was determined to be questionable because several dioxin congeners detected in the groundwater samples were suspected to be laboratory blank contamination (see Section 4.4). Accordingly, the monitoring wells were resampled during August 1996. Groundwater samples were submitted for dioxin analyses only. No dioxin or furan congeners were detected in the samples. Based on the resampling results, dioxins are not present in RRFTA groundwater.

4.5.4 Surface Water and Sediment

Inorganic elements and dioxins were detected at concentrations exceeding screening criteria in surface water and sediment of the small pond near the site. The maximum concentrations of the inorganic analytes are within one order of magnitude of the background concentrations, and thus are not likely attributable to contaminant migration from the site. Therefore, these analytes are not considered site-related contaminants. Dioxin concentrations in surface water and sediment are similarly slightly elevated above the screening criteria. Although these contaminants are not expected to be a result of previous site activities, they are evaluated in the OU-A risk assessment.

4.6 Contaminant Fate and Transport

The physical-chemical characteristics affecting fate and transport of the contaminants detected at RRFTA are provided in Appendix F. The following section discusses the principal migration pathways identified in the conceptual site models generated for RRFTA in the management plan for OU-A. The RRFTA conceptual site model is presented in Figure 4-19.

Results of the RI indicate that contamination in present in surface soils (fill) at RRFTA, but it is limited to isolated areas. Off-site contaminant transport through surface runoff and wind-blown particulates are potential contaminant migration pathways. However, the low levels of site-related contaminants in the surface water and sediment samples collected at the nearby pond suggest that surface water runoff and particulate transport are not significant contaminant migration pathways at RRFTA.

Most contamination at RRFTA was detected in subsurface soil, and the lateral and vertical migration of contaminants through subsurface soil is an important migration pathway at the site. Petroleum hydrocarbons and dioxin have migrated vertically through subsurface soil to a maximum depth of approximately 50 to 60 feet BGS in the area of soil boring AP-3643 (see Figure 4-16). Although the chemical characteristics of dioxins suggest that they will bind preferentially to soil particles and are generally not mobile in soil, fuels discharged to the ground during fire training activities probably acted as a carrier solvent that mobilized dioxins through subsurface soil to greater depths. In addition, the application of large quantities of water to the ground surface during the fire training activities probably accelerated the downward migration of contaminants into the subsurface at RRFTA.

Contaminant transport modeling was conducted for petroleum constituents in subsurface soils at RRFTA (see Appendix G). The model, which assumes moisture infiltra-

tion rates based solely on average precipitation or a "worst case" scenario (e.g., not added water from fire training activities), suggests that petroleum contaminants will migrate approximately 10 feet vertically from their present location over a 90-year period. Based on the model, groundwater would not likely be impacted by petroleum contamination. Because the presence of dioxins and PAHs is expected to coincide with petroleum contamination (see Section 4.5.1), the same conclusion can be drawn. However, the modeling conducted for RRFTA utilizes generalized input data and does not account for subsurface anomalies that could increase the magnitude of vertical contaminant transport such as fill fractures, chemical transformation, or periodic increases in soil moisture resulting from precipitation variations or flooding.

The subsurface soil contamination detected during the RI is laterally more extensive than the soil contamination detected during the 1992 investigation (see Figure 4-18). This could be a result of the more extensive area investigated during the RI, lateral migration of contaminants through subsurface soil since 1992, or the infiltration of surface runoff, precipitation, and snowmelt.

The absence of dioxin and other site-related contaminants in groundwater indicates that the groundwater pathway at RRFTA is not a contaminant migration pathway of concern (see Section 4.5.3).

4.7 Summary and Conclusions

Historical activities and the results of previous investigations indicate that RRFTA is contaminated with petroleum-related wastes, solvents, and dioxins. The RI confirmed the presence of site-related contaminants in surface soil and subsurface soil. Although contaminant concentrations detected during the RI were similar to or lower than levels detected during previous investigations, a broader extent of contamination was defined during the RI.

Contaminants detected during the RI include DRO, GRO, four PAHs, metals, and dioxins in surface and subsurface soil to a depth of 50 feet BGS. Level A cleanup matrix values were used as a conservative screening tool to evaluate DRO and GRO concentrations. The actual matrix value for this site is level C, which has a DRO cleanup value of 1,000 ppm and a GRO cleanup value of 500 ppm. GRO and DRO concentrations that exceed level C cleanup values are limited to surface soils. Most contamination occurs in subsurface soil in the area of former fire training activities. The PAHs and dioxins are most likely the result of incomplete combustion products from the fire training activities. The regrading and filling that occurred at the site in 1994 buried much of the contamination on the ground surface. In

general, the RI results indicate that contaminant levels decrease with increasing lateral distance and depth from the former fire training area. Contamination is found to 60 feet BGS in subsurface soils; groundwater is found at approximately 147 feet BGS. Given the characteristics of the subsurface soil and the distance to groundwater, contaminants are not anticipated to migrate to groundwater.

The updated conceptual site model for RRFTA indicates that several of the potential contaminant migration routes and exposure mechanisms postulated during the development of the management plan for OU-A (E & E 1995) are not applicable to current site conditions. Based on the results of the RI, neither the volatilization of contaminants to air nor the off-site migration of contaminants through groundwater is affecting the fate and transport of site-related contaminants. Based on current site conditions, the most likely potential exposure routes are associated with dermal contact, ingestion, and inhalation of contaminants in surface and near-surface soils.

In conclusion, RRFTA contains site-related contaminants in the surface, near-surface, and subsurface soils. Groundwater is not impacted by site-related contaminants. The most likely pathways for contaminant transport include lateral and vertical migration of contaminants in subsurface soil with infiltration of precipitation, and windblown transport of contaminants as particulates from surface soils. The OU-A risk assessment addresses the potential risks to human health and the environment posed by on-site contaminants via these pathways.

Table 4-1

FIELD LABORATORY SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type
				Top	Btm	
FLSS2001	6/13/95	SOIL	K9	0	0.5	PROJ
FLSS2002	6/13/95	SOIL	K9	0.5	1	PROJ
FLSS2003	6/13/95	SOIL	J9	0	0.5	PROJ
FLSS2004	6/13/95	SOIL	J9	0.5	1	PROJ
FLSS2005	6/13/95	SOIL	J10	0	0.5	PROJ
FLSS2006	6/13/95	SOIL	K10	0	0.5	PROJ
FLSS2007	6/13/95	SOIL	K11	0	0.5	PROJ
FLSS2008	6/13/95	SOIL	J11	0	0.5	PROJ
FLSS2009	6/13/95	SOIL	I10	0	0.5	PROJ
FLSS2010	6/13/95	SOIL	I11	0	0.5	PROJ
FLSS2011	6/13/95	SOIL	I9	0	0.5	PROJ
FLSS2012	6/13/95	SOIL	I9	0	0.5	QC
FLSS2013	6/13/95	SOIL	L11	0	0.5	PROJ
FLSS2014	6/13/95	SOIL	L10	0	0.5	PROJ
FLSS2015	6/13/95	SOIL	L9	0	0.5	PROJ
FLSS2016	6/13/95	SOIL	L8	0	0.5	PROJ
FLSS2017	6/13/95	SOIL	K8	0	0.5	PROJ
FLSS2018	6/13/95	SOIL	J8	0	0.5	PROJ
FLSS2019	6/13/95	SOIL	J12	0	0.5	PROJ
FLSS2020	6/13/95	SOIL	I8	0	0.5	PROJ
FLSS2021	6/13/95	SOIL	M10	0	0.5	PROJ
FLSS2022	6/13/95	SOIL	K12	0	0.5	PROJ
FLSS2023	6/13/95	SOIL	M10	0	0.5	QC
FLSS2024	6/13/95	SOIL	M11	0	0.5	PROJ
FLSS2025	6/13/95	SOIL	M9	0	0.5	PROJ
FLSS2026	6/13/95	SOIL	M8	0	0.5	PROJ
FLSS2027	6/13/95	SOIL	M7	0	0.5	PROJ
FLSS2028	6/13/95	SOIL	L7	0	0.5	PROJ
FLSS2029	6/13/95	SOIL	K7	0	0.5	PROJ
FLSS2030	6/13/95	SOIL	J7	0	0.5	PROJ
FLSS2031	6/13/95	SOIL	I7	0	0.5	PROJ
FLSS2032	6/13/95	SOIL	H7	0	0.5	PROJ
FLSS2033	6/13/95	SOIL	H8	0	0.5	PROJ
FLSS2034	6/13/95	SOIL	H8	0	0.5	QC
FLSS2035	6/13/95	SOIL	I12	0	0.5	PROJ
FLSS2036	6/13/95	SOIL	I13	0	0.5	PROJ
FLSS2037	6/13/95	SOIL	J13	0	0.5	PROJ
FLSS2038	6/13/95	SOIL	K13	0	0.5	PROJ
FLSS2039	6/13/95	SOIL	L13	0	0.5	PROJ
FLSS2040	6/13/95	SOIL	M13	0	0.5	PROJ
FLSS2041	6/13/95	SOIL	L12	0	0.5	PROJ
FLSS2042	6/13/95	SOIL	M12	0	0.5	PROJ
FLSS2043	6/13/95	SOIL	M6	0	0.5	PROJ
FLSS2044	6/13/95	SOIL	L6	0	0.5	PROJ
FLSS2045	6/13/95	SOIL	K6	0	0.5	PROJ
FLSS2046	6/13/95	SOIL	J6	0	0.5	PROJ
FLSS2047	6/13/95	SOIL	I6	0	0.5	PROJ

Table 4-1

FIELD LABORATORY SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type
				Top	Btm	
FLSS2048	6/21/95	SOIL	M12	1.5	2	PROJ
FLSS2049	6/21/95	SOIL	K9	2	2.5	PROJ
FLSS2050	6/21/95	SOIL	K10	2	2.5	PROJ
FLSS2051	6/21/95	SOIL	I10	2	2.5	PROJ
FLSS2052	6/21/95	SOIL	I11	2	2.5	PROJ
FLSS2053	6/21/95	SOIL	J11	1	1.5	PROJ
FLSS2054	6/21/95	SOIL	M11	1.5	2	PROJ
FLSS2055	6/21/95	SOIL	M10	1	1.5	PROJ
FLSS2056	6/21/95	SOIL	M9	1	1.5	PROJ
FLSS2057	6/21/95	SOIL	M8	1.5	2	PROJ
FLSS2058	6/21/95	SOIL	M7	1.5	2	PROJ
FLSS2059	6/21/95	SOIL	M6	1	1.5	PROJ
FLSS2060	6/21/95	SOIL	M6	1	1.5	QC
FLSS2061	6/21/95	SOIL	L6	1	1.5	PROJ
FLSS2062	6/21/95	SOIL	L7	1	1.5	PROJ
FLSS2063	6/21/95	SOIL	L8	1	1.5	PROJ
FLSS2064	6/21/95	SOIL	L9	1.5	2	PROJ
FLSS2065	6/21/95	SOIL	L10	1	1.5	PROJ
FLSS2066	6/21/95	SOIL	L10	1	1.5	QC
FLSS2067	6/21/95	SOIL	L11	1	1.5	PROJ
FLSS2068	6/21/95	SOIL	L11	1	1.5	QC
FLSS2069	6/21/95	SOIL	L12	1	1.5	PROJ
FLSS2070	6/22/95	SOIL	J13	0.5	1	PROJ
FLSS2071	6/22/95	SOIL	I13	2.5	3	PROJ
FLSS2072	6/22/95	SOIL	I12	2	2.5	QC
FLSS2073	6/22/95	SOIL	I12	2	2.5	PROJ
FLSS2074	6/22/95	SOIL	I8	2	2.5	PROJ
FLSS2075	6/22/95	SOIL	I6	1.5	2	PROJ
FLSS2076	6/22/95	SOIL	I7	2.5	3	PROJ
FLSS2077	6/22/95	SOIL	J9	1	1.5	PROJ
FLSS2078	6/22/95	SOIL	J8	3	3.5	PROJ
FLSS2079	6/22/95	SOIL	J7	2.5	3	PROJ
FLSS2080	6/22/95	SOIL	J6	2.5	3	PROJ
FLSS2081	6/22/95	SOIL	J6	2.5	3	QC
FLSS2082	6/22/95	SOIL	K6	2.5	3	PROJ
FLSS2083	6/22/95	SOIL	K7	0.5	1	PROJ
FLSS2084	6/22/95	SOIL	K8	1	1.5	PROJ
FLSS2085	6/22/95	SOIL	K12	1	1.5	PROJ
FLSS2086	6/22/95	SOIL	N13	0	0.5	PROJ
FLSS2087	6/22/95	SOIL	N11	2.5	3	PROJ
FLSS2088	6/22/95	SOIL	N9	1	1.5	PROJ
FLSS2089	6/27/95	SOIL	N8	1	1.5	PROJ
FLSS2090	6/27/95	SOIL	N7	1	1.5	PROJ
FLSS2091	6/27/95	SOIL	N6	2	2.5	PROJ
FLSS2092	6/27/95	SOIL	O11	2	2.5	PROJ
FLSS2093	6/27/95	SOIL	O10	2	2.5	PROJ
FLSS2094	6/27/95	SOIL	O9	1.5	2	PROJ

Table 4-1

FIELD LABORATORY SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type
				Top	Btm	
FLSS2095	6/27/95	SOIL	O8	2	2.5	PROJ
FLSS2096	6/27/95	SOIL	X1	1.5	2	PROJ
FLSS2097	6/27/95	SOIL	X2	0	0.5	PROJ
FLSS2098	6/27/95	SOIL	X3	1.5	2	PROJ
FLSS2099	6/27/95	SOIL	X4	1.5	2	PROJ

Key:

Btm = Bottom.
ft. BGS = Feet below ground surface.
PROJ = Project sample.
QC = Quality control sample.

Table 4-2

SOIL SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	Field TRPH	VOC	BNA	DRO	GRO	TRPH	Dioxin	Tot. Metals	TCLP VOC and Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Heterotrophic Bacteria	Geotechnical Analyses	
				Top	Bottom																	Grain Size	Atter. Limits, Moisture, and Specific Gravity
RRFTA2001SS	6/19/95	SOIL	K9	0	0.5	PROJ	FLSS2001	x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2002SS	6/19/95	SOIL	K9	0	0.5	QC		x	x	x	x	x	x	x									
RRFTA2003SS	6/19/95	SOIL	K9	0	0.5	QA		x	x	x	x	x	x	x									
RRFTA2004SS	6/19/95	SOIL	L10	0	0.5	PROJ	FLSS2014	x	x	x	x	x	x	x									
RRFTA2005SS	6/19/95	SOIL	M7	0	0.5	PROJ	FLSS2027	x	x	x	x	x	x	x									
RRFTA2006SS	6/19/95	SOIL	H7	0	0.5	PROJ	FLSS2032	x	x	x	x	x	x	x									
RRFTA2007SS	6/19/95	SOIL	I13	0	0.5	PROJ	FLSS2036	x	x	x	x	x	x	x									
RRFTA2008SS	6/19/95	SOIL	I6	0	0.5	PROJ	FLSS2047	x	x	x	x	x	x	x								x	x
RRFTA2009SS	6/19/95	SOIL	AP3629	0	0.5	PROJ				x		x	x	x									
RRFTA2010SS	6/19/95	SOIL	AP3631	0	0.5	PROJ				x		x	x	x		x							
RRFTA2011SS	6/19/95	SOIL	AP3630	0	0.5	PROJ				x		x	x	x		x							
RRFTA2012SS	6/19/95	SOIL	AP3632	0	0.5	PROJ				x		x	x	x		x							
RRFTA2013SS	6/19/95	SOIL	AP3633	0	0.5	PROJ				x		x	x	x		x							
RRFTA2014SS	6/19/95	SOIL	AP3633	0	0.5	QC				x		x	x	x									
RRFTA2015SS	6/19/95	SOIL	AP3633	0	0.5	QA				x		x	x	x									
RRFTA2016SS	6/21/95	SOIL	I11	2	2.5	PROJ	FLSS2052	x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2017SS	6/21/95	SOIL	M11	1.5	2	PROJ	FLSS2054	x	x	x	x	x	x	x									
RRFTA2018SS	6/21/95	SOIL	M8	1.5	2	PROJ	FLSS2057	x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2019SS	6/22/95	SOIL	I12	2	2.5	PROJ	FLSS2072	x	x	x	x	x	x	x									
RRFTA2020SS	6/22/95	SOIL	J8	3	3.5	PROJ	FLSS2078	x	x	x	x	x	x	x									
RRFTA2021SS	6/22/95	SOIL	J8	3	3.5	QA		x	x	x	x	x	x	x									
RRFTA2022SS	6/22/95	SOIL	J8	3	3.5	QC		x	x	x	x	x	x	x									
RRFTA2023SS	6/22/95	SOIL	K8	1	1.5	PROJ	FLSS2084	x	x	x	x	x	x	x									
RRFTA2024SS	6/22/95	SOIL	N11	2.5	3	PROJ	FLSS2087	x	x	x	x	x	x	x									
RRFTA2025SS	6/22/95	SOIL	N9	1	1.5	PROJ	FLSS2088	x	x	x	x	x	x	x									
RRFTA2001SB	6/19/95	SOIL	AP3629	5	6.5	PROJ				x		x		x									
RRFTA2002SB	6/19/95	SOIL	AP3629	10	11.5	PROJ				x		x		x									
RRFTA2003SB	6/19/95	SOIL	AP3629	15	16.5	PROJ				x		x		x		x							

OUA 0020750

Table 4-2

SOIL SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	Field TRPH	VOC	BNA	DRO	GRO	TRPH	Dioxin	Tot. Metals	TCLP VOC and Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Heterotrophic Bacteria	Geotechnical Analyses	
				Top	Bottom																	Grain Size	Atter. Limits, Moisture, and Specific Gravity
RRFTA2004SB	6/19/95	SOIL	AP3629	20	21.5	PROJ				x		x		x									
RRFTA2005SB	6/20/95	SOIL	AP3629	30	31.5	PROJ				x		x		x									
RRFTA2006SB	6/20/95	SOIL	AP3629	30	31.5	QC				x		x		x									
RRFTA2007SB	6/20/95	SOIL	AP3629	30	31.5	QA				x		x		x									
RRFTA2008SB	6/20/95	SOIL	AP3629	40	41.5	PROJ				x		x		x									
RRFTA2009SB	6/20/95	SOIL	AP3629	50	51.5	PROJ				x		x		x									
RRFTA2010SB	6/20/95	SOIL	AP3630	5	6.5	PROJ				x		x		x									
RRFTA2011SB	6/20/95	SOIL	AP3630	10	11.5	PROJ				x		x		x									
RRFTA2012SB	6/20/95	SOIL	AP3630	15	16.5	PROJ				x		x		x									
RRFTA2013SB	6/20/95	SOIL	AP3630	20	21.5	QC				x		x		x		x							
RRFTA2014SB	6/21/95	SOIL	AP3630	30	31.5	QA				x		x		x									
RRFTA2015SB	6/21/95	SOIL	AP3630	40	41.5	PROJ				x		x		x									
RRFTA2016SB	6/21/95	SOIL	AP3630	50	51.5	PROJ				x		x		x		x							
RRFTA2017SB	6/21/95	SOIL	AP3631	5	6.5	PROJ				x		x		x									
RRFTA2018SB	6/21/95	SOIL	AP3631	5	6.5	QC				x		x		x									
RRFTA2019SB	6/21/95	SOIL	AP3631	5	6.5	QA				x		x		x									
RRFTA2020SB	6/21/95	SOIL	AP3631	10	11.5	PROJ				x		x		x									
RRFTA2021SB	6/21/95	SOIL	AP3631	15	16.5	PROJ				x		x		x									
RRFTA2022SB	6/21/95	SOIL	AP3631	20	21.5	PROJ				x		x		x									
RRFTA2023SB	6/21/95	SOIL	AP3631	30	31.5	PROJ				x		x		x									
RRFTA2024SB	6/22/95	SOIL	AP3631	40	41.5	PROJ				x		x		x									
RRFTA2025SB	6/22/95	SOIL	AP3631	50	51.5	PROJ				x		x		x		x							
RRFTA2026SB	6/22/95	SOIL	AP3632	5	6.5	PROJ	FLSS2094	x	x	x	x	x	x	x									
RRFTA2027SB	6/22/95	SOIL	AP3632	10	11.5	PROJ				x		x		x		x							
RRFTA2028SB	6/22/95	SOIL	AP3632	15	16.5	PROJ				x		x		x									
RRFTA2029SB	6/22/95	SOIL	AP3632	20	21.5	PROJ				x		x		x									
RRFTA2030SB	6/22/95	SOIL	AP3632	30	31.5	PROJ				x		x		x									
RRFTA2031SB	6/22/95	SOIL	AP3632	30	31.5	QC				x		x		x									

OUA 0020751

Table 4-2

SOIL SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	Field TRPH	VOC	BNA	DRO	GRO	TRPH	Dioxin	Tot. Metals	TCLP VOC and Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Heterotrophic Bacteria	Geotechnical Analyses	
				Top	Bottom																	Grain Size	Atter. Limits, Moisture, and Specific Gravity
RRFTA2032SB	6/22/95	SOIL	AP3632	30	31.5	QA				x		x		x		x							
RRFTA2033SB	6/22/95	SOIL	AP3632	40	41.5	PROJ				x		x		x									
RRFTA2034SB	6/23/95	SOIL	AP3632	50	51.5	PROJ				x		x		x								x	x
RRFTA2035SB	6/23/95	SOIL	AP3633	5	6.5	PROJ				x		x		x		x							
RRFTA2036SB	6/23/95	SOIL	AP3633	5	6.5	QC				x		x		x		x							
RRFTA2037SB	6/23/95	SOIL	AP3633	5	6.5	QA				x		x		x		x							
RRFTA2038SB	6/23/95	SOIL	AP3633	10	11.5	PROJ				x		x		x									
RRFTA2039SB	6/23/95	SOIL	AP3633	15	16.5	PROJ				x		x		x									
RRFTA2040SB	6/23/95	SOIL	AP3633	20	21.5	PROJ				x		x		x									
RRFTA2041SB	6/23/95	SOIL	AP3633	30	31.5	PROJ				x		x		x									
RRFTA2042SB	6/23/95	SOIL	AP3633	40	41.5	PROJ				x		x		x		x							
RRFTA2043SB	6/23/95	SOIL	AP3633	50	51.5	PROJ				x		x		x								x	x
RRFTA2044SB	6/24/95	SOIL	AP3634	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA2045SB	6/24/95	SOIL	AP3634	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2046SB	6/24/95	SOIL	AP3634	10	11.5	QC		x	x	x	x	x	x	x									
RRFTA2047SB	6/24/95	SOIL	AP3634	10	11.5	QA		x	x	x	x	x	x	x									
RRFTA2048SB	6/24/95	SOIL	AP3634	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2049SB	6/24/95	SOIL	AP3634	20	21.5	PROJ		x	x	x	x	x	x	x									
RRFTA2050SB	6/24/95	SOIL	AP3634	30	31.5	PROJ		x	x	x	x	x	x	x									
RRFTA2051SB	6/24/95	SOIL	AP3634	40	41.5	PROJ		x	x	x	x	x	x	x									
RRFTA2052SB	6/24/95	SOIL	AP3634	50	51.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2053SB	6/26/95	SOIL	AP3635	5	6.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2054SB	6/26/95	SOIL	AP3635	5	6.5	QC		x	x	x	x	x	x	x								x	x
RRFTA2055SB	6/26/95	SOIL	AP3635	5	6.5	QA		x	x	x	x	x	x	x								x	x
RRFTA2056SB	6/26/95	SOIL	AP3635	10	11.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2057SB	6/26/95	SOIL	AP3635	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2058SB	6/26/95	SOIL	AP3635	20	21.5	PROJ		x	x	x	x	x	x	x									
RRFTA2059SB	6/26/95	SOIL	AP3635	30	31.5	PROJ		x	x	x	x	x	x	x									

OUA 0020752

Table 4-2

SOIL SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	Field TRPH	VOC	BNA	DRO	GRO	TRPH	Dioxin	Tot. Metals	TCLP VOC and Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Heterotrophic Bacteria	Geotechnical Analyses	
				Top	Bottom																	Grain Size	Atter. Limits, Moisture, and Specific Gravity
RRFTA2060SB	6/26/95	SOIL	AP3635	40	41.5	PROJ		x	x	x	x	x	x	x									
RRFTA2061SB	6/26/95	SOIL	AP3635	50	51.5	PROJ		x	x	x	x	x	x	x									
RRFTA2062SB	6/26/95	SOIL	AP3636	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA2063SB	6/26/95	SOIL	AP3636	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2064SB	6/26/95	SOIL	AP3636	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2065SB	6/26/95	SOIL	AP3636	15	16.5	QC		x	x	x	x	x	x	x									
RRFTA2066SB	6/26/95	SOIL	AP3636	15	16.5	QA		x	x	x	x	x	x	x									
RRFTA2067SB	6/26/95	SOIL	AP3636	20	21.5	PROJ		x	x	x	x	x	x	x									
RRFTA2068SB	6/27/95	SOIL	AP3636	30	31.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2069SB	6/27/95	SOIL	AP3636	40	41.5	PROJ		x	x	x	x	x	x	x									
RRFTA2070SB	6/27/95	SOIL	AP3636	50	51.5	PROJ		x	x	x	x	x	x	x									
RRFTA2071SB	6/27/95	SOIL	AP3637	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA2072SB	6/27/95	SOIL	AP3637	5	6.5	QC		x	x	x	x	x	x	x									
RRFTA2073SB	6/27/95	SOIL	AP3637	5	6.5	QA		x	x	x	x	x	x	x									
RRFTA2074SB	6/27/95	SOIL	AP3637	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2075SB	6/27/95	SOIL	AP3637	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2076SB	6/27/95	SOIL	AP3637	20	21.5	PROJ		x	x	x	x	x	x	x									
RRFTA2077SB	6/27/95	SOIL	AP3637	30	31.5	PROJ		x	x	x	x	x	x	x									
RRFTA2078SB	6/27/95	SOIL	AP3637	40	41.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2079SB	6/28/95	SOIL	AP3637	50	51.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2080SB	6/28/95	SOIL	AP3638	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA2081SB	6/28/95	SOIL	AP3638	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2082SB	6/28/95	SOIL	AP3638	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2083SB	6/28/95	SOIL	AP3638	20	21.5	PROJ		x	x	x	x	x	x	x									
RRFTA2084SB	6/28/95	SOIL	AP3638	30	31.5	PROJ		x	x	x	x	x	x	x									
RRFTA2085SB	6/28/95	SOIL	AP3638	40	41.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2086SB	6/28/95	SOIL	AP3638	50	51.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFT[illegible]87SB	6/29/95	SOIL	AP3639	5	6.5	PROJ		x	x	x	x	x	x	x									

OUA 0020753

Table 4-2

SOIL SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	Field TRPH	VOC	BNA	DRO	GRO	TRPH	Dioxin	Tot. Metals	TCLP VOC and Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Heterotrophic Bacteria	Geotechnical Analyses	
				Top	Bottom																	Grain Size	Atter. Limits, Moisture, and Specific Gravity
RRFTA2088SB	6/29/95	SOIL	AP3639	10	11.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2089SB	6/29/95	SOIL	AP3639	10	11.5	QC		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2090SB	6/29/95	SOIL	AP3639	10	11.5	QA		x	x	x	x	x	x	x		x							
RRFTA2091SB	6/29/95	SOIL	AP3639	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2092SB	6/29/95	SOIL	AP3639	20	21.5	PROJ		x	x	x	x	x	x	x									
RRFTA2093SB	6/29/95	SOIL	AP3639	30	31.5	PROJ		x	x	x	x	x	x	x									
RRFTA2094SB	6/29/95	SOIL	AP3639	40	41.5	PROJ		x	x	x	x	x	x	x									
RRFTA2095SB	6/29/95	SOIL	AP3639	50	51.5	PROJ		x	x	x	x	x	x	x									
RRFTA2096SB	7/5/95	SOIL	AP3640	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA2097SB	7/5/95	SOIL	AP3640	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2098SB	7/5/95	SOIL	AP3640	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2099SB	7/5/95	SOIL	AP3640	19	23	PROJ		x	x	x	x	x	x	x									
RRFTA2100SB	7/5/95	SOIL	AP3640	19	23	QC		x	x	x	x	x	x	x									
RRFTA2101SB	7/5/95	SOIL	AP3640	19	23	QA		x	x	x	x	x	x	x									
RRFTA2102SB	7/5/95	SOIL	AP3640	30	31.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2103SB	7/5/95	SOIL	AP3640	40	41.5	PROJ		x	x	x	x	x	x	x									
RRFTA2104SB	7/5/95	SOIL	AP3640	50	51.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2106SB	7/5/95	SOIL	AP3641	5	6.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2107SB	7/5/95	SOIL	AP3641	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2108SB	7/5/95	SOIL	AP3641	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2109SB	7/6/95	SOIL	AP3641	20	21.5	PROJ		x	x	x	x	x	x	x									
RRFTA2110SB	7/6/95	SOIL	AP3641	30	31.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2111SB	7/6/95	SOIL	AP3641	40	41.5	PROJ		x	x	x	x	x	x	x									
RRFTA2112SB	7/6/95	SOIL	AP3641	40	41.5	QC		x	x	x	x	x	x	x									
RRFTA2113SB	7/6/95	SOIL	AP3641	40	41.5	QA		x	x	x	x	x	x	x									
RRFTA2114SB	7/6/95	SOIL	AP3641	50	51.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2115SB	7/6/95	SOIL	AP3642	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA2116SB	7/6/95	SOIL	AP3642	10	11.5	PROJ		x	x	x	x	x	x	x									

OUA 0020754

Table 4-2

SOIL SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	Field TRPH	VOC	BNA	DRO	GRO	TRPH	Dioxin	Tot. Metals	TCLP VOC and Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Heterotrophic Bacteria	Geotechnical Analyses	
				Top	Bottom																	Grain Size	Atter. Limits, Moisture, and Specific Gravity
RRFTA2117SB	7/6/95	SOIL	AP3642	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2118SB	7/6/95	SOIL	AP3642	20	21.5	PROJ		x	x	x	x	x	x	x		x							
RRFTA2119SB	7/6/95	SOIL	AP3642	20	21.5	QC		x	x	x	x	x	x	x		x							
RRFTA2120SB	7/6/95	SOIL	AP3642	20	21.5	QA		x	x	x	x	x	x	x		x							
RRFTA2121SB	7/6/95	SOIL	AP3642	30	31.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2122SB	7/6/95	SOIL	AP3642	40	41.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2123SB	7/6/95	SOIL	AP3642	50	51.5	PROJ		x	x	x	x	x	x	x									
RRFTA2124SB	7/6/95	SOIL	AP3642	50	51.5	QC		x	x	x	x	x	x	x									
RRFTA2125SB	7/6/95	SOIL	AP3642	50	51.5	QA		x	x	x	x	x	x	x									
RRFTA2126SB	7/7/95	SOIL	AP3643	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA2127SB	7/7/95	SOIL	AP3643	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2128SB	7/7/95	SOIL	AP3643	15	16.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2129SB	7/7/95	SOIL	AP3643	15	16.5	QC		x	x	x	x	x	x	x									
RRFTA2130SB	7/7/95	SOIL	AP3643	15	16.5	QA		x	x	x	x	x	x	x									
RRFTA2131SB	7/7/95	SOIL	AP3643	20	21.5	PROJ		x	x	x	x	x	x	x									
RRFTA2132SB	7/7/95	SOIL	AP3643	30	31.5	PROJ		x	x	x	x	x	x	x									
RRFTA2133SB	7/7/95	SOIL	AP3643	40	41.5	PROJ		x	x	x	x	x	x	x									
RRFTA2134SB	7/7/95	SOIL	AP3643	50	51.5	PROJ		x	x	x	x	x	x	x									
RRFTA2135SB	7/7/95	SOIL	AP3644	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA2136SB	7/7/95	SOIL	AP3644	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2137SB	7/7/95	SOIL	AP3644	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2138SB	7/7/95	SOIL	AP3644	20	21.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2139SB	7/7/95	SOIL	AP3644	30	31.5	PROJ		x	x	x	x	x	x	x		x							
RRFTA2140SB	7/10/95	SOIL	AP3644	40	41.5	PROJ		x	x	x	x	x	x	x			x	x	x	x	x		
RRFTA2141SB	7/10/95	SOIL	AP3644	40	41.5	QC		x	x	x	x	x	x	x									
RRFTA2142SB	7/10/95	SOIL	AP3644	40	41.5	QA		x	x	x	x	x	x	x									
RRFTA2143SB	7/10/95	SOIL	AP3644	50	51.5	PROJ		x	x	x	x	x	x	x									
RRFTA2144SB	7/10/95	SOIL	AP3645	5	6.5	PROJ		x	x	x	x	x	x	x									

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Table 4-2

SOIL SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	Field TRPH	VOC	BNA	DRO	GRO	TRPH	Dioxin	Tot. Metals	TCLP VOC and Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Heterotrophic Bacteria	Geotechnical Analyses	
				Top	Bottom																	Grain Size	Atter. Limits, Moisture, and Specific Gravity
RRFTA2145SB	7/10/95	SOIL	AP3645	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2146SB	7/10/95	SOIL	AP3645	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2147SB	7/10/95	SOIL	AP3645	20	21.5	PROJ		x	x	x	x	x	x	x									
RRFTA2148SB	7/10/95	SOIL	AP3645	30	31.5	PROJ		x	x	x	x	x	x	x		x							
RRFTA2149SB	7/10/95	SOIL	AP3645	30	31.5	QC		x	x	x	x	x	x	x									
RRFTA2150SB	7/10/95	SOIL	AP3645	30	31.5	QA		x	x	x	x	x	x	x									
RRFTA2151SB	7/10/95	SOIL	AP3645	40	41.5	PROJ		x	x	x	x	x	x	x			x	x	x	x	x	x	x
RRFTA2152SB	7/10/95	SOIL	AP3645	50	51.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2153SB	7/11/95	SOIL	AP3646	10	11.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2154SB	7/11/95	SOIL	AP3646	15	16.5	PROJ		x	x	x	x	x	x	x									
RRFTA2155SB	7/11/95	SOIL	AP3646	20	21.5	PROJ		x	x	x	x	x	x	x		x							
RRFTA2156SB	7/11/95	SOIL	AP3646	20	21.5	QC		x	x	x	x	x	x	x		x							
RRFTA2157SB	7/11/95	SOIL	AP3646	20	21.5	QA		x	x	x	x	x	x	x		x							
RRFTA2158SB	7/11/95	SOIL	AP3646	30	31.5	PROJ		x	x	x	x	x	x	x			x	x	x	x	x	x	x
RRFTA2159SB	7/11/95	SOIL	AP3646	40	41.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2160SB	7/11/95	SOIL	AP3646	50	51.5	PROJ		x	x	x	x	x	x	x									
RRFTA2161SB	7/11/95	SOIL	AP3647	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA2162SB	7/11/95	SOIL	AP3647	10	11.5	PROJ		x	x	x	x	x	x	x									
RRFTA2163SB	7/11/95	SOIL	AP3647	15	16.5	PROJ		x	x	x	x	x	x	x		x							
RRFTA2164SB	7/11/95	SOIL	AP3647	15	16.5	QC		x	x	x	x	x	x	x									
RRFTA2165SB	7/11/95	SOIL	AP3647	15	16.5	QA		x	x	x	x	x	x	x									
RRFTA2166SB	7/11/95	SOIL	AP3647	20	21.5	PROJ		x	x	x	x	x	x	x								x	x
RRFTA2167SB	7/12/95	SOIL	AP3647	30	31.5	PROJ		x	x	x	x	x	x	x			x	x	x	x	x		
RRFTA2168SB	7/12/95	SOIL	AP3647	40	41.5	PROJ		x	x	x	x	x	x	x									
RRFTA2169SB	7/12/95	SOIL	AP3647	50	51.5	PROJ		x	x	x	x	x	x	x									
RRFTA2170SB	7/11/95	SOIL	AP3646	5	6.5	PROJ		x	x	x	x	x	x	x									
RRFTA001SP	7/12/95	SOIL	STOCKPILE	0	1	PROJ				x	x		x		x								
RRFTA002SP	7/12/95	SOIL	STOCKPILE	0	1	QC				x	x		x		x								

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Table 4-2

SOIL SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	Field TRPH	VOC	BNA	DRO	GRO	TRPH	Dioxin	Tot. Metals	TCLP VOC and Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Heterotrophic Bacteria	Geotechnical Analyses	
				Top	Bottom																	Grain Size	Atter. Limits, Moisture, and Specific Gravity
RRFTA003SP	7/12/95	SOIL	STOCKPILE	0	1	QA				x	x		x										
RRFTA004SP	9/21/95	SOIL	STOCKPILE	0	1	PROJ				x	x		x		x								
RRFTA2171SB	8/25/95	SOIL	AP-3653	60	61.5	PROJ		x	x	x	x	x		x									
RRFTA2172SB	8/26/95	SOIL	AP-3653	70	71.5	PROJ		x	x	x	x	x		x									
RRFTA2173SB	8/26/95	SOIL	AP-3653	80	81.5	PROJ		x	x	x	x	x	x	x		x						x	x
RRFTA2174SB	8/26/95	SOIL	AP-3653	80	81.5	QC		x	x	x	x	x	x	x		x							
RRFTA2175SB	8/26/95	SOIL	AP-3653	80	81.5	QA		x	x	x	x	x	x	x		x							
RRFTA2176SB	8/26/95	SOIL	AP-3653	90	91.5	PROJ		x	x	x	x	x		x									
RRFTA2177SB	8/26/95	SOIL	AP-3653	100	101.5	PROJ		x	x	x	x	x		x									
RRFTA2178SB	8/26/95	SOIL	AP-3653	120	121.5	PROJ		x	x	x	x	x		x									
RRFTA2179SB	8/26/95	SOIL	AP-3653	130	131.5	PROJ		x	x	x	x	x		x									
RRFTA2180SB	8/26/95	SOIL	AP-3653	140	141.5	PROJ		x	x	x	x	x		x									
RRFTA2181SB	8/29/95	SOIL	AP-3654	70	71.5	PROJ		x	x	x	x	x		x									
RRFTA2182SB	8/29/95	SOIL	AP-3654	80	81.5	QC		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2182SB	8/29/95	SOIL	AP-3654	80	815	QA																x	x
RRFTA2183SB	8/29/95	SOIL	AP-3654	100	101.5	PROJ		x	x	x	x	x		x									
RRFTA2184SB	8/29/95	SOIL	AP-3654	110	111.5	PROJ		x	x	x	x	x		x									
RRFTA2185SB	8/29/95	SOIL	AP-3654	130	131.5	PROJ		x	x	x	x	x		x									
RRFTA2186SB	8/29/95	SOIL	AP-3654	140	141.5	PROJ		x		x	x												
RRFTA2187SB	8/30/95	SOIL	AP-3655	60	61.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x		
RRFTA2188SB	8/31/95	SOIL	AP-3655	100	101.5	PROJ		x	x	x	x	x		x								x	x
RRFTA2189SB	8/31/95	SOIL	AP-3655	110	111.5	PROJ		x	x	x	x	x		x									
RRFTA2190SB	8/31/95	SOIL	AP-3655	120	121.5	PROJ		x	x	x	x	x		x									
RRFTA2191SB	8/31/95	SOIL	AP-3655	130	131.5	PROJ		x	x	x	x	x		x									
RRFTA2192SB	8/31/95	SOIL	AP-3655	140	141.5	PROJ		x	x	x	x	x	x	x									
RRFTA2193SB	8/31/95	SOIL	AP-3655	140	141.5	QC		x	x	x	x	x	x	x									
RRFTA2194SB	8/31/95	SOIL	AP-3655	140	141.5	QA		x	x	x	x	x	x	x		x							
RRFTA2195SB	8/31/95	SOIL	AP-3655	150	151.5	PROJ		x	x	x	x	x		x									

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Table 4-2

SOIL SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	Field TRPH	VOC	BNA	DRO	GRO	TRPH	Dioxin	Tot. Metals	TCLP VOC and Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Heterotrophic Bacteria	Geotechnical Analyses	
				Top	Bottom																	Grain Size	Atter. Limits, Moisture, and Specific Gravity
RRFTA2196SB	9/3/95	SOIL	AP-3656	60	61.5	PROJ		x	x	x	x	x	x	x		x							
RRFTA2197SB	9/3/95	SOIL	AP-3656	90	91.5	PROJ		x	x	x	x	x		x									
RRFTA2198SB	9/3/95	SOIL	AP-3656	110	111.5	PROJ				x	x												
RRFTA2199SB	9/3/95	SOIL	AP-3656	120	121.5	PROJ		x	x	x	x	x		x									
RRFTA2200SB	9/4/95	SOIL	AP-3656	130	131.5	PROJ		x	x	x	x	x											
RRFTA2201SB	9/4/95	SOIL	AP-3656	150	151.5	PROJ		x	x	x	x	x	x	x		x	x	x	x	x	x	x	x
RRFTA2202SB	9/4/95	SOIL	AP-3656	150	151.5	QC		x	x	x	x	x	x	x		x							
RRFTA2203SB	9/4/95	SOIL	AP-3656	150	151.5	QA		x	x	x	x	x	x	x		x							
RRFTA2204SB	9/8/95	SOIL	AP-3657	60	61.5	PROJ		x	x	x	x	x		x									
RRFTA2205SB	9/8/95	SOIL	AP-3657	80	81.5	PROJ		x	x	x	x	x		x									
RRFTA2206SB	9/8/95	SOIL	AP-3657	110	111.5	PROJ		x	x	x	x	x		x									
RRFTA2207SB	9/9/95	SOIL	AP-3657	130	131.5	PROJ		x	x	x	x	x		x									
RRFTA2208SB	9/9/95	SOIL	AP-3657	150	151.5	PROJ		x	x	x	x	x	x	x		x						x	x
RRFTA2209SB	9/9/95	SOIL	AP-3657	150	151.5	QC		x	x	x	x	x	x	x		x							
RRFTA2210SB	9/9/95	SOIL	AP-3657	150	151.5	QA		x	x	x	x	x	x	x		x							

Key:

Atter. Limits = Atterburg Limits.
BNA = Base/neutral and acid-extractable organic compounds.
DRO = Diesel-range organics.
ft. BGS = Feet below ground surface.
GRO = Gasoline-range organics.
PROJ = Project sample.
QA = Quality assurance sample.
QC = Quality control sample.
TCLP = Toxicity characteristic leaching procedure.

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TKN = Total Kjeldahl nitrogen.
TOC = Total organic carbon.
Tot. Metals = Total metals.
TRPH = Total recoverable petroleum hydrocarbons.
VOC = Volatile organic compounds.
X = Analysis was performed.

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Table 4-3

GROUNDWATER SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Type	VOC	BNA	PAH	DRO	GRO	TRPH	Dioxin	Total Metals	Dissolved Metals	TOC	Total & Dissolved Anions/Cations	Alkalinity	TDS/TSS	Hardness	Phosphorous	Hetertrophic Bacteria	BOD	Nitrate/Nitrite	Sulfate	Sulfide	Chloride
RRFTA2001GW	9/27/95	WATER	AP-3657	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RRFTA2002GW	9/27/95	WATER	AP-3657	QC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RRFTA2003GW	9/27/95	WATER	AP-3657	QA	x	x	x	x	x	x	x	x	x	3	x	x	x	x	x			x	x	x	x
RRFTA2004GW	10/1/95	WATER	AP-3653	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x
RRFTA2005GW	10/1/95	WATER	AP-3654	PROJ	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x
RRFTA2006GW	10/1/95	WATER	AP-3655	PROJ	x	x	x	x	x	x	x	x	x			x	x	x		x	x		x		x
RRFTA2007GW	10/1/95	WATER	AP-3656	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
RRFTA2009GW	10/6/95	WATER	AP-3656	PROJ							x														
RRFTA2002WA	8/29/95	WATER	RINSATE	PROJ	x	x		x	x	x	x	x		x											
RRFTA2004WA	9/26/95	WATER	RINSATE	PROJ	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x
RRFTA2003WA	8/29/95	WATER	TRIP BLANK	PROJ	x				x																
RRFTA2005WA	9/28/95	WATER	TRIP BLANK	QA	x				x																
RRFTA2001WA	6/30/95	WATER	RINSATE	PROJ	x	x		x	x	x	x	x		x											
RRFTA001GW	8/14/96	WATER	AP-3655	PROJ							x														
RRFTA002GW	8/14/96	WATER	AP-3655	QC							x														
RRFTA003GW	8/14/96	WATER	AP-3655	QA							x														
RRFTA004GW	8/15/96	WATER	AP-3656	PROJ							x														
RRFTA005GW	8/15/96	WATER	AP-3654	PROJ							x														
RRFTA006GW	8/15/96	WATER	RINSATE	PROJ							x														
RRFTA007GW	8/15/96	WATER	AP-3657	PROJ							x														
RRFTA008GW	8/16/96	WATER	AP-3653	PROJ							x														

Key:

BNA = Base/neutral and acid-extractable organic compounds.
BOD = Biochemical oxygen demand.
DRO = Diesel-range organics.

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GRO = Gasoline-range organics.
PAH = Polynuclear aromatic hydrocarbons.
PROJ = Project sample.
QA = Quality assurance sample.
QC = Quality control sample.
TDS = Total dissolved solids.
TOC = Total organic carbon.
TRPH = Total recoverable petroleum hydrocarbons.
TSS = Total suspended solids.
VOC = Volatile organic compounds.
X = Analysis was performed.

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Table 4-4

SURFACE WATER/SEDIMENT SAMPLE SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Matrix	Location	Sample Interval (ft BGS)		Type	BNA	DRO	TRPH	Dioxin	Total Metals	TOC	Hardness	Grain Size
				Top	Bottom									
RRFTA2001SW	11/3/95	WATER	BKG			PROJ	x	x		x	x		x	
RRFTA2002SW	11/3/95	WATER	POND1			PROJ				x	x		x	
RRFTA2003SW	11/3/95	WATER	POND1			QC			x				x	
RRFTA2004SW	11/3/95	WATER	POND1			QA	x	x		x	x		x	
RRFTA2001SD	11/3/95	SEDIMENT	BKG	0	1	PROJ	x	x		x	x	x		x
RRFTA2002SD	11/3/95	SEDIMENT	POND1	0	1	PROJ	x	x		x	x	x		x
RRFTA2003SD	11/3/95	SEDIMENT	POND1	0	1	QC	x	x		x	x	x		x
RRFTA2004SD	11/3/95	SEDIMENT	POND1	0	1	QA	x	x		x	x	x		

Key:

BNA = Base/neutral and acid-extractable organic compounds.
DRO = Diesel-range organics.
ft. BGS = Feet below ground surface.
PROJ = Project sample.
QA = Quality assurance sample.
QC = Quality control sample.
TOC = Total organic carbon.
TRPH = Total recoverable petroleum hydrocarbons.
X = Analysis was performed.

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Table 4-5

SUMMARY OF QUALIFIED DATA
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95RRFTA-)	Data Qualifiers Applied[B]
VOCs (EPA Method 8260)			
Surrogate recovery	Recoveries were above EPA QC limits	2017SS, 2025SS, 2045SB, 2046SB, 2046SB(RE), 2048SB, 2050SB, 2051SB, 2051SB(RE), 2052SB, 2052SB(RE), 2053SB, 2055SB, 2056SB, 2056SB(RE), 2058SB, 2059SB, 2067SB, 2068SB, 2070SB, 2072SB, 2076SB, 2086SB, 2089SB, 2091SB-2095SB, 2098SB, 2099SB, 2103SB, 2108SB, 2124SB, 2133SB, 2135SB, 2149SB, 2153SB, 2158SB, 2170SB	J
	Recoveries were below EPA QC limits	2022SS-2024SS, 2122SB, 2134SB, 2051SB, 2060SB, 2063SB, 2064SB, 2075SB, 2077SB, 2081SB, 2083SB	J, UJ
	Recoveries were outside of EPA QC limits	2014SS, 2104SB, 2106SB, 2137SB, 2147SB, 2147SB(RE), 2148SB, 2148SB(RE), 2085SB	J, UJ
Method blanks	19 analytes were detected in VOA method blanks	2003SS, 2007SB, 2015SS, 2019SB, 2021SS, 2032SB, 2037SB, 2047SB, 2055SB, 2066SB, 2073SB, 2090SB, 2101SB, 2113SB, 2120SB, 2125SB, 2130SB, 2142SB, 2150SB, 2157SB, 2165SB, 2003SB, 2171SB-2175SB, 2177SB-2193SB, 2195SB-2202SB, 2204SB-2209SB, 2002WA, 2003WA, 2001GW, 2002GW, 2004GW-2007GW	B
Trip blanks	1,2 Dichloropropane was detected in trip and rinsate blanks	2004GW-2007GW	B (detected compounds)
Rinsate blanks	1,2 Dichloropropane was detected in trip and rinsate blanks	2004GW-2007GW	B (detected compounds)

Key at end of table.

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Table 4-5

SUMMARY OF QUALIFIED DATA
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95RRFTA-)	Data Qualifiers Applied[a]
Holding times	Analysis was performed beyound the EPA recommended holding time	2017SS, 2024SS, 2025SS, 2057SB, 2068SB, 2067SB	J, UJ
BNAs (EPA Method 8270)			
Holding time	Samples were extracted past holding times	2004SD	J, UJ
Method blanks	Di-n-butylphthalate was detected in the method blanks	2001WA, 2001SS, 2002SS, 2004SS-2014SS, 2001SB-2006SB, 2034SB-2036SB, 2038SB-2046SB, 2048SB-2054SB, 2056SB-2058SB, 2087SB-2089SB, 2091SB-2095SB, 2143SB-2149SB, 2151SB-2156SB, 2170SB	B
Dioxins/furans (EPA Method 8290)			
Surrogate recovery	2378-TCDD and 2378-TCDF recoveries were below EPA QC limits	2084SB, 2086SB	J, UJ
	OCDF recoveries were below EPA QC limits	2061SB	J, UJ
	OCDF recoveries were below EPA QC limits	2064SB	R
	12378 PeCDD and 12378 PeCDF recoveries were below EPA QC limits	2147SB, 2152SB	J, UJ
Matrix spike recovery	OCDF recoveries were below EPA QC limits	2158SB-2164SB, 2166SB-2169SB	J, UJ
	123789 HxCDF and 234678 HxCDF recoveries were above EPA QC limits	2158SB-2164SB, 2166SB-2169SB	J

Key at end of table.

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Table 4-5

SUMMARY OF QUALIFIED DATA
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95RRFTA-)	Data Qualifiers Applied[a]
	OCDF and 1234678 HpCDF recoveries were above EPA QC limits	2126SB-2129SB, 2131SB-2141SB	J
Method blanks	OCDF and 1234678 HpCDF were detected in the method blank	2103SB	B
	OCDD, 234678 HxCDF, TCDD, and HxCDF were detected in the method blanks	2187SB, 2192SB, 2193SB, 2196SB, 2201SB, 2202SB	B
	234678HxCDF and PeCDF were detected in the method blank	2001GW, 2002GW, 2004GW-2007GW	B
	OCDD was detected in the method blank	2001SS-2003SS, 2019SS, 2044SB-2046SB, 2048SB-2054SB, 2056SB-2065SB, 2067SB-2072SB, 2074SB-2089SB, 2091SB-2095SB, 2097SB, 2099SB-2103SB, 2107SB-2112SB, 2118SB, 2121SB-2124SB, 2126SB-2129SB, 2131SB-2141SB, 2143SB, 2146SB-2149SB, 2151SB, 2152SB, 2154SB, 2156SB-2164SB, 2166SB-2169SB, A001SP, 2004SD, 2208SB, 2209SB, 2003GW	B
	OCDD, 234678 HxCDF, and total HxCDF were detected in the method blank	2001SW, 2002SW, 2001SD, 2002SD, 2003SD	B
	OCDD, 234678 HxCDF, 1234678 HpCDF, OCDF, total HxCDF and total HpCDF were detected in the method blank	2003SW, 004SP	B
GRO (ADEC-modified EPA Method 8015) and Fuel Identification (Corps-modified EPA Method 8015)			
Surrogate recovery	GRO recoveries were diluted out	2017SS, 2134SB	J, UJ

Key at end of table.

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Table 4-5

SUMMARY OF QUALIFIED DATA
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95RRFTA-)	Data Qualifiers Applied[a]
	GRO recoveries were below ADEC QC limits	2166SB	J, UJ
Matrix spike	GRO recoveries were below the ADEC QC limits	2001WA, 2066SB, 2073SB, 2087SB-2089SB, 2091SB-2095SB	J, UJ
Rinsate blank	GRO was detected in the rinsate blank	All samples	B
Method blanks	GRO was detected in the method blank	2001SS-2003SS, 2006SS-2014SS, 2016SS, 2017SS, 2019SS, 2020SS, 2022SS, 2023SS, 2026SS, 2001SB-2006SB, 2008SB-2018SB, 2020SB-2031SB, 2033SB, 2060SB-2065SB, 2067SB-2072SB, 2074SB-2086SB, 2143SB-2149SB, 2151SB-2156SB, 2170SB	B
DRO (ADEC-modified EPA Method 8100)			
Holding time	Samples were analyzed beyond established holding times	2003GW	J, UJ
Surrogate recovery	Recoveries were diluted out	2016SS-2020SS, 2022SS-2025SS, 2008SB-2031SB	J, UJ
Matrix spike recovery	Recoveries were above ADEC QC limits	2016SS-2020SS, 2022SS-2025SS, 2008SB-2031SB, 2060SB-2065SB, 2067SB-2072SB, 2074SB- 2086SB	J
	Recoveries were above ADEC QC limits	2001SS-2003SS, 2006SS-2014SS, 2001SB-2006SB, 2019SB, 2021SB, 2032SB, 2037SB, 2047SB, 2055SB, 2066SB, 2073SB	J, UJ
TRPH (EPA Method 418.1)			
Holding time	Samples were analyzed beyond established holding times	2004WA, 2001GW, 2002GW, 2004GW-2007GW	J, UJ

Key at end of table.

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Table 4-5

SUMMARY OF QUALIFIED DATA
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95RRFTA-)	Data Qualifiers Applied[a]
Matrix spike recovery	Recoveries were above EPA QC limits	2018SS-2020SS, 2022SS-2025SS, 2020SB-2031SB, 2033SB, 2114SB-2119SB, 2121SB-2124SB	J, UJ
Inorganics			
Holding time	Nitrate, phosphorous, sulfide, TDS, and TSS were analyzed beyond established holding times	2004WA, 2001GW-2003GW	J, UJ
	Nitrate and phosphorous were analyzed beyond established holding times	2004GW-2007GW	J, UJ
Matrix Spike	Antimony spike recoveries were outside of EPA QC limits	2034SB-2036SB, 2038SB-2046SB, 2048SB-2054SB, 2056SB-2059SB, 2001SS-2003SS, 2006SS-2014SS, 2001SB-2006SB, 2008SB-2031SB, 2033SB, 2016SS-2020SS, 2022SS-2025SS, 2120SB, 2125SB, 2130SB, 2142SB, 2126SB-2129SB, 2131SB-2141SB, 2150SB, 2019SB, 2186SB-2193SB, 2195SB-2202SB, 2204SB-2209SB	J, UJ
	Antimony and potassium spike recoveries were outside of EPA QC limits	2194SB-2203SB	J, UJ
	Selenium spike recoveries were outside of EPA QC limits	2194SB	J, UJ
	Antimony and arsenic spike recoveries were outside of EPA QC limits	2171SB-2175SB, 2177SB-2185SB	J, UJ
	Arsenic spike recoveries were above EPA QC limit	2126SB-2129SB, 2131SB-2141SB, 2001SD-2003SD	J

Key at end of table.

OUA 0020767

Table 4-5

SUMMARY OF QUALIFIED DATA
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95RRFTA-)	Data Qualifiers Applied[a]
	Calcium spike recoveries exceeded QC limits	2004SD	J, UJ
	Calcium, potassium, and sodium spike recoveries were above EPA QC limit	2143SB-2149SB, 2151SB-2156SB, 2170SB	J
	Aluminium, chromium, copper, and zinc spike recoveries were above EPA QC limit	2008SB-2031SB, 2033SB, 2016SS-2020SS, 2022SS-2025SS	J
	Aluminium, calcium, potassium, vanadium spike recoveries were above EPA QC limits	2114SB-2119SB, 2121SB-2124SB	J
	Chromium spike recoveries were above EPA QC limits	2026SS, 2060SB-2065SB, 2067SB-2072SB, 2074SB-2086SB	J

[a] = Data qualifiers were determined based on CQAR recommendations and *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA 540/R-94/012, February 1994, and *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94/013, February 1994.

Key:

ADEC = Alaska Department of Environmental Conservation.
B = Detected also in method blank (when less than 10 times the associated method blank concentration).
BNA = Base/neutral and acid-extractable organic compounds.
CQAR = Chemical Quality Assurance Report.
DRO = Diesel-range organics.
EPA = United States Environmental Protection Agency.
GRO = Gasoline-range organics.
J = Estimated concentration (detected compounds).
mg/L = Milligrams per liter.
QC = Quality control.
R = Rejected. Data are unusable.

OUA 0020768

Table 3-4 (Cont.)

RPD = Relative percent difference.
TDS = Total dissolved solids.
TRPH = Total recoverable petroleum hydrocarbons.
TSS = Total suspended solids.
UJ = Estimated detection limit (nondetected compounds).
VOA = Volatile organic analytes.
VOC = Volatile organic compounds.

OUA 0020769

Table 4-6

SUMMARY OF FIELD SCREENING AND LABORATORY RESULTS FOR SURFACE SOIL SAMPLES
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
Petroleum Hydrocarbons, Field Screening	16/74	10.9 - 1,266.9	N9 (1 ft.)	--	NA
DRO	11/11	10 - 3,400	N9 (1 ft.)	100[a]	2
GRO	3/5	2.1 - 1,300	N9 (1 ft.)	50[a]	2
TRPH	11/11	20 - 5,400	M11 (1.5 ft.)	2,000[a]	2
VOCs					
Acetone	5/11	0.022 - 0.07	L10 (0 ft.)	780[b]	0
2-Butanone	1/11	0.0074	L10 (0 ft.)	4,700[b]	0
4-Methyl-2-pentanone	4/11	0.023 - 7.2	M11 (1.5 ft.)	--	NA
Methylene Chloride	3/11	0.0055 - 0.0076	L10 (0 ft.)	8.5[b]	0
Naphthalene	3/22	0.049 - 1.9	N9 (1 ft.)	310[b]	0
o-Xylene	2/11	0.1 - 1.8	N9 (1 ft.)	16,000[b]	0
p-Isopropyltoluene	1/11	0.33	N9 (1 ft.)	--	NA
Toluene	1/11	0.0087	K9 (0 ft.)	1,600[b]	0
1,3,5-Trimethylbenzene	2/11	0.25 - 0.86	N9 (1 ft.)	390[b]	0

Key at end of table.

OUA 0020770

Table 4-6

SUMMARY OF FIELD SCREENING AND LABORATORY RESULTS FOR SURFACE SOIL SAMPLES
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
m- & p-Xylene	1/11	1.5	N9 (1 ft.)	16,000[b]	0
BNAs					
Acenaphthene	2/11	0.12 - 0.16	O9 (1.5 ft.)	470[b]	0
Anthracene	2/11	0.21 - 0.26	O9 (1.5 ft.)	2,300[b]	0
Benzo(a)anthracene	3/11	0.27 - 0.87	O9 (1.5 ft.)	0.087[b]	3
Benzo(a)pyrene	3/11	0.21 - 0.94	O9 (1.5 ft.)	0.0088[b]	3
Benzo(b)fluoranthene	4/11	0.19 - 1.4	O9 (1.5 ft.)	0.087[b]	4
Benzo(g,h,i)perylene	2/11	0.69 - 0.82	O9 (1.5 ft.)	–	NA
Benzo(k)fluoranthene	1/11	0.7	O9 (1.5 ft.)	0.88[b]	0
Chrysene	3/11	0.42 - 1.1	O9 (1.5 ft.)	8.7[b]	0
Fluoranthene	4/11	0.1 - 2.4	O9 (1.5 ft.)	310[b]	0
Fluorene	1/11	0.32	N9 (1 ft.)	310[b]	0
Indeno(1,2,3-cd)pyrene	2/11	0.52 - 0.66	O9 (1.5 ft.)	0.087[b]	2
Phenanthrene	4/11	0.27 - 1.8	O9 (1.5 ft.)	–	NA
Pyrene	4/11	0.11 - 2.3	O9 (1.5 ft.)	230[b]	0

Key at end of table.

OUA 0020771

Table 4-6

SUMMARY OF FIELD SCREENING AND LABORATORY RESULTS FOR SURFACE SOIL SAMPLES
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
Dioxins, TEF	11/11	7.25×10^{-9} - 2.39×10^{-5}	M11 (1.5 ft.)	4.3×10^{-7}[b]	4
Inorganics					
Aluminum	11/11	11,000 - 20,000	O9 (1.5 ft.)	19,000[c]	1
Antimony	4/11	0.58 - 1.9	L10 (0 ft.)	--	NA
Arsenic	11/11	2.6 - 4.6	I6 (0 ft.)	13[c]	0
Barium	11/11	64 - 360	L10 (0 ft.)	130[c]	1
Beryllium	4/11	0.31 - 0.4	K9 (0 ft.)	0.52[c]	0
Cadmium	11/11	0.074 - 3.8	L10 (0 ft.)	12.8[c]	0
Calcium	11/11	2,100 - 4,500	O9 (1.5 ft.)	3,600[c]	1
Chromium	11/11	21 - 37	L10 (0 ft.)	58[c]	0
Cobalt	11/11	8.5 - 14	O9 (1.5 ft.)	17[c]	0
Copper	11/11	18 - 100	L10 (0 ft.)	54[c]	2
Iron	11/11	18,000 - 30,000	K9 (0 ft.)	33,000[c]	0
Lead	11/11	6.6 - 94	L10 (0 ft.)	27[c]	2

Key at end of table.

OUA 0020772

Table 4-6

SUMMARY OF FIELD SCREENING AND LABORATORY RESULTS FOR SURFACE SOIL SAMPLES
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
Magnesium	11/11	4,700 - 7,100	L10 (0 ft.)	7,500[c]	0
Manganese	11/11	370 - 760	K9 (0 ft.)	770[c]	0
Mercury	7/11	0.082 - 0.11	N9 (1 ft.)	0.6[c]	0
Nickel	11/11	20 - 35	K9 (0 ft.)	49[c]	0
Potassium	11/11	230 - 780	L10 (0 ft.)	420[c]	4
Selenium	1/11	0.23	I6 (0 ft.)	2.5[c]	0
Sodium	11/11	91 - 450	K9 (0 ft.)	420[c]	3
Thallium	1/11	0.52	I6 (0 ft.)	0.68[c]	0
Vanadium	11/11	27 - 61	O9 (1.5 ft.)	64[c]	0
Zinc	11/11	47 - 210	L10 (0 ft.)	108[c]	2

[a] Screening criteria based on Alaska non-UST matrix level A concentrations for petroleum-contaminated soil (ADEC 1991).
[b] Screening criteria based on EPA Region 3 risk-based concentration corresponding to excess lifetime cancer risk of 1×10^{-7} or a hazard index of 0.1 (EPA 1995).
[c] Screening criteria based on the maximum concentrations detected in site-specific background samples or background levels listed in the Background Data Analysis Report, Fort Richardson (E & E 1996).

Key:

– = No screening concentration exists for analyte.
BNA = Base/neutral and acid-extractable organic compounds.
DRO = Diesel-range organics.

OUA 0020773

Table 4-6 (Cont.)

ft. BGS = Feet below ground surface.
GRO = Gasoline-range organics.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
PCBs = Polychlorinated biphenyls.
TEF = Toxicity equivalency factor.
TRPH = Total recoverable petroleum hydrocarbons.
VOCs = Volatile organic compounds.

OUA 0020774

Table 4-7

SUMMARY OF SUBSURFACE SOIL RESULTS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
DRO	73/113	1 - 610	AP-3635 (20 ft.)	100[a]	5
GRO	28/82	0.28 - 420	AP-3635 (20 ft.)	50[a]	4
TRPH	83/111	9.3 - 3,000	AP-3635 (30 ft.)	2,000[a]	1
VOCs					
Acetone	54/112	0.016 - 1.9	AP-3655 (100 ft.)	780[b]	0
Benzene	1/112	0.0075	AP-3635 (50 ft.)	2.2[b]	0
2-Butanone	3/112	0.0074 - 0.013	AP-3642 (30 ft.)	4,700[b]	0
n-Butylbenzene	2/112	0.14 - 0.51	AP-3643 (50 ft.)	--	NA
sec-Butylbenzene	2/112	0.055 - 0.25	AP-3643 (50 ft.)	78[b]	0
1,2-Dichloroethane	1/112	0.007	AP-3642 (30 ft.)	0.7[b]	0
cis-1,2-Dichloroethene	2/112	0.006 - 0.011	AP-3642 (30 ft.)	78[b]	0
Ethylbenzene	5/112	0.0072 - 0.6	AP-3643 (50 ft.)	780[b]	0
2-Hexanone	2/112	0.24 - 3.6	AP-3643 (50 ft.)	--	NA
Isopropylbenzene	2/112	0.049 - 0.31	AP-3643 (50 ft.)	310[b]	0
4-Methyl-2-pentanone	10/112	0.0054 - 5.2	AP-3643 (50 ft.)	--	NA

Key at end of table.

OUA 0020775

Table 4-7

SUMMARY OF SUBSURFACE SOIL RESULTS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
Methylene Chloride	21/112	0.0054 - 0.0175	AP-3657 (150 ft.)	8.5[b]	0
Naphthalene	6/224	0.0079 - 1.4	AP-3635 (20 ft.)	310[b]	0
o-Xylene	2/112	0.25 - 1.7	AP-3643 (50 ft.)	16,000[b]	0
p-Isopropyltoluene	6/112	0.021 - 0.72	AP-3643 (50 ft.)	--	NA
n-Propylbenzene	2/112	0.067 - 0.38	AP-3643 (50 ft.)	--	NA
Tetrachloroethene	2/112	0.0052 - 0.0065	AP-3643 (15 ft.)	1.2[b]	0
Toluene	4/112	0.0091 - 0.028	AP-3646 (10 ft.)	1,600[b]	0
Trichloroethene	12/112	0.0054 - 0.024	AP-3644 (15 ft.)	5.8[b]	0
1,2,4-Trimethylbenzene	3/112	0.007 - 1.4	AP-3643 (40 ft.)	390[b]	0
1,3,5-Trimethylbenzene	1/111	0.94	AP-3643 (50 ft.)	390[b]	0
m- & p-Xylene	8/112	0.0057 - 1	AP-3643 (50 ft.)	16,000[b]	0
BNAs					
Acenaphthene	1/112	0.093	AP-3635 (20 ft.)	470[b]	0
Benzyl butyl phthalate	10/112	0.079 - 0.41	AP-3634 (30 ft.)	1,600[b]	0
Bis(2-ethylhexyl)phthalate	9/112	0.121 - 0.428	AP-3655 (140 ft.)	4.6[b]	0

Key at end of table.

OUA 0020776

Table 4-7

SUMMARY OF SUBSURFACE SOIL RESULTS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
Di-*n*-butyl phthalate	53/97	0.14 - 3.2	AP-3634 (15 ft.)	–	NA
Fluoranthene	1/112	0.12	AP-3634 (5 ft.)	310[b]	0
2-Methylnaphthalene	2/112	0.096 - 0.1	AP-3643 (40 ft.)	310[b]	0
Pyrene	1/112	0.1	AP-3634 (5 ft.)	230[b]	0
Dioxins, TEF	58/100	1.54×10^{-9} - 1.91×10^{-5}	AP-3637 (10 ft.)	4.3×10^{-7}[b]	9
Inorganics					
Aluminum	111/111	8,100 - 23,000	N11 (2.5 ft.)	23,000[c]	0
Antimony	49/110	0.45 - 2.9	AP-3655 (130 ft.)	3.3[c]	0
Arsenic	110/110	2.1 - 17	AP-3645 (20 ft.)	14[c]	1
Barium	111/111	25.1 - 120	AP-3635 (5 ft.)	154[c]	0
Beryllium	21/111	0.22 - 0.45	AP-3635 (5 ft.)	0.38[c]	2
Cadmium	94/110	0.075 - 3.7	N11 (2.5 ft.)	12.8[c]	0
Calcium	111/111	2,700 - 14,100	AP-3657 (110 ft.)	12,000[c]	3
Chromium	111/111	15 - 69	AP-3637 (5 ft.)	58[c]	1

Key at end of table.

OUA 0020777

Table 4-7

SUMMARY OF SUBSURFACE SOIL RESULTS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
Cobalt	111/111	7.7 - 18	AP-3637 (40 ft.)	16[c]	2
Copper	111/111	17 - 230	N11 (2.5 ft.)	54[c]	4
Iron	111/111	16,000 - 40,000	AP-3637 (40 ft.)	38,000[c]	1
Lead	110/110	4.2 - 59	N11 (2.5 ft.)	29[c]	1
Magnesium	111/111	5,400 - 15,000	AP-3640 (40 ft.)	11,200[c]	5
Manganese	111/111	300 - 960	AP-3635 (5 ft.)	1,200[c]	0
Mercury	60/111	0.072 - 0.15	AP-3643 (40 ft.)	0.67[c]	0
Nickel	111/111	18 - 79	AP-3640 (40 ft.)	63[c]	2
Potassium	111/111	340 - 1,700	AP-3643 (20 ft.)	930[c]	5
Selenium	1/110	0.1	AP-3656 (90 ft.)	2.5[c]	0
Silver	17/111	0.75 - 1.2	AP-3656 (150 ft.)	4.2[c]	0
Sodium	110/111	47 - 240	AP-3643 (20 ft.)	450[c]	0
Thallium	7/110	0.25 - 0.59	AP-3637 (30 ft.)	0.66[c]	0
Vanadium	111/111	25 - 71	AP-3637 (40 ft.)	67[c]	1
Zinc	111/111	41 - 240	N11 (2.5 ft.)	110[c]	2

Key at end of table.

OUA 0020778

[a] Screening criteria based on Alaska non-UST matrix level A concentrations for petroleum-contaminated soil (ADEC 1991).
[b] Screening criteria based on EPA Region 3 risk-based concentration corresponding to excess lifetime cancer risk of 1×10^{-7} or a hazard index of 0.1 (EPA 1995).
[c] Screening criteria based on the maximum concentrations detected in site-specific background samples or background levels listed in the Background Data Analysis Report, Fort Richardson (E & E 1996).

Key:

– = No screening concentration exists for analyte.
BNA = Base/neutral and acid-extractable organic compounds.
DRO = Diesel-range organics.
ft. BGS = Feet below ground surface.
GRO = Gasoline-range organics.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
PCBs = Polychlorinated biphenyls.
TEF = Toxicity equivalency factor.
TRPH = Total recoverable petroleum hydrocarbons.
VOCs = Volatile organic compounds.

OUA 0020779

Table 4-8

SUMMARY OF GROUNDWATER SAMPLE RESULTS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(µg/L)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft./BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
VOC					
Methylene chloride	2/3	2.6 - 12	AP-3657[a]	4.1	1
Dioxins, TEF[b]	2/3	2.9×10^{-7} - 3.612×10^{-7} 1.84×10^{-8} - 3.12×10^{-8}	AP-3655[a]	4.5E-07	0
Inorganics					
Aluminum	3/3	110 - 240	AP-3656[c]	6,000	0
Arsenic	3/3	0.6 - 1	AP-3657[c]	430	0
Arsenic - filtered	3/3	0.5 - 0.8	AP-3657[c]	9.9	0
Barium	3/3	14	AP-3655[c]	2,100	0
Barium - filtered	3/3	13	AP-3655[c]	510	0
Calcium	3/3	36,500 - 39,200	AP-3655[c]	50,500	0
Calcium - filtered	3/3	39,000 - 40,900	AP-3655[c]	50,800	0
Iron	3/3	210 - 380	AP-3656[c]	11,700	0
Iron - filtered	1/3	79	AP-3657[c]	--	NA
Lead	2/3	2.2 - 2.9	AP-3656[c]	240	0

Key at end of table.

OUA 0020780

Table 4-8

SUMMARY OF GROUNDWATER SAMPLE RESULTS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(µg/L)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft./BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
Magnesium	3/3	5,400 - 5,600	AP-3655[c]	9,800	0
Magnesium - filtered	3/3	5,600 - 5,900	AP-3655[c]	7,200	0
Manganese	2/3	7.4 - 10	AP-3656[c]	270	0
Sodium	3/3	2,500 - 2,700	AP-3657[c]	2,900	0
Sodium - filtered	3/3	2,500 - 2,800	AP-3656[c]	2,900	0
Zinc	1/3	7.2	AP-3656[c]	1,900	0

[a] Screening criteria based on EPA Region 3 risk-based concentrations corresponding to excess lifetime cancer risk of 1×10^{-6} or an hazard index of 0.1.

[b] Positive dioxin detections were from 1995 remedial investigation samples. The 1996 resampling results included no positive detections of dioxins in any of the Ruff Road Fire Training Area monitoring wells.

[c] Screening criteria based on concentrations detected in site specific background samples or background levels listed in the Background Data Analysis Report, Fort Richardson (E & E 1996).

Key:

ft. BGS = Feet below ground surface.
µg/L = Micrograms per liter.
TEF = Toxicity equivalency factor.
VOCs = Volatile organic compounds.

OUA - 0020781

Table 4-9

SUMMARY OF SURFACE WATER SAMPLE RESULTS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Analyte	Frequency of Detection	Range of Concentrations	Location of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
Dioxins, TEF (mg/L)	1/1	1.0971×10^{-6}	POND1	4.5E-07[a]	1
Inorganics (mg/L)					
Aluminum	1/1	3,300	POND1	1,700[a]	1
Arsenic	1/1	3	POND1	1.7[a]	1
Barium	1/1	54	POND1	24[a]	1
Calcium	1/1	39,700	POND1	52,600[a]	0
Copper	1/1	6.9	POND1	–	NA
Iron	1/1	5,500	POND1	4,300[a]	1
Lead	1/1	2.8	POND1	3[a]	0
Magnesium	1/1	8,900	POND1	8,400[a]	1
Manganese	1/1	1,000	POND1	350[a]	1
Potassium	1/1	2,100	POND1	–	NA
Sodium	1/1	3,800	POND1	3,300[a]	1
Vanadium	1/1	9.3	POND1	5.1[a]	1
Zinc	1/1	20	POND1	20[a]	0

Key at end of table.

OUA 0020782

Table 4-9 (Cont.)

[a] Screening criteria based on Alaska Water Quality Standards (18 AAC 70.020).

Key:

mg/L = Milligrams per liter.
NA = Not applicable.
TEF = Toxicity equivalency factor.
-- = No screening criterion available for analyte.

OUA 0020783

Table 4-10

SUMMARY OF SEDIMENT SAMPLE RESULTS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Analyte	Frequency of Detection	Range of Concentrations	Location of Maximum Concentration	Screening Concentration[a]	Number of Samples Exceeding Screening Concentration
DRO	1/1	14	POND1	100	0
Dioxins, TEF (mg/kg)	1/1	6.32E-08	POND1	4.3E-07	0
Inorganics (mg/kg)					
Aluminum	1/1	14,500	POND1	10,100	1
Arsenic	1/1	8.5	POND1	3.8	1
Barium	1/1	80.8	POND1	36.7	1
Beryllium	1/1	0.39	POND1	0.28	1
Calcium	1/1	3,540	POND1	4,470	0
Chromium	1/1	27.8	POND1	20.5	1
Cobalt	1/1	12.1	POND1	9.1	1
Copper	1/1	21.5	POND1	20.3	1
Iron	1/1	25,200	POND1	17,800	1
Lead	1/1	9.8	POND1	9.7	1
Magnesium	1/1	6,160	POND1	6,060	1
Manganese	1/1	504	POND1	372	1
Nickel	1/1	27.6	POND1	27.6	0

Key at end of table.

OUA 0020784

Table 4-10

SUMMARY OF SEDIMENT SAMPLE RESULTS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

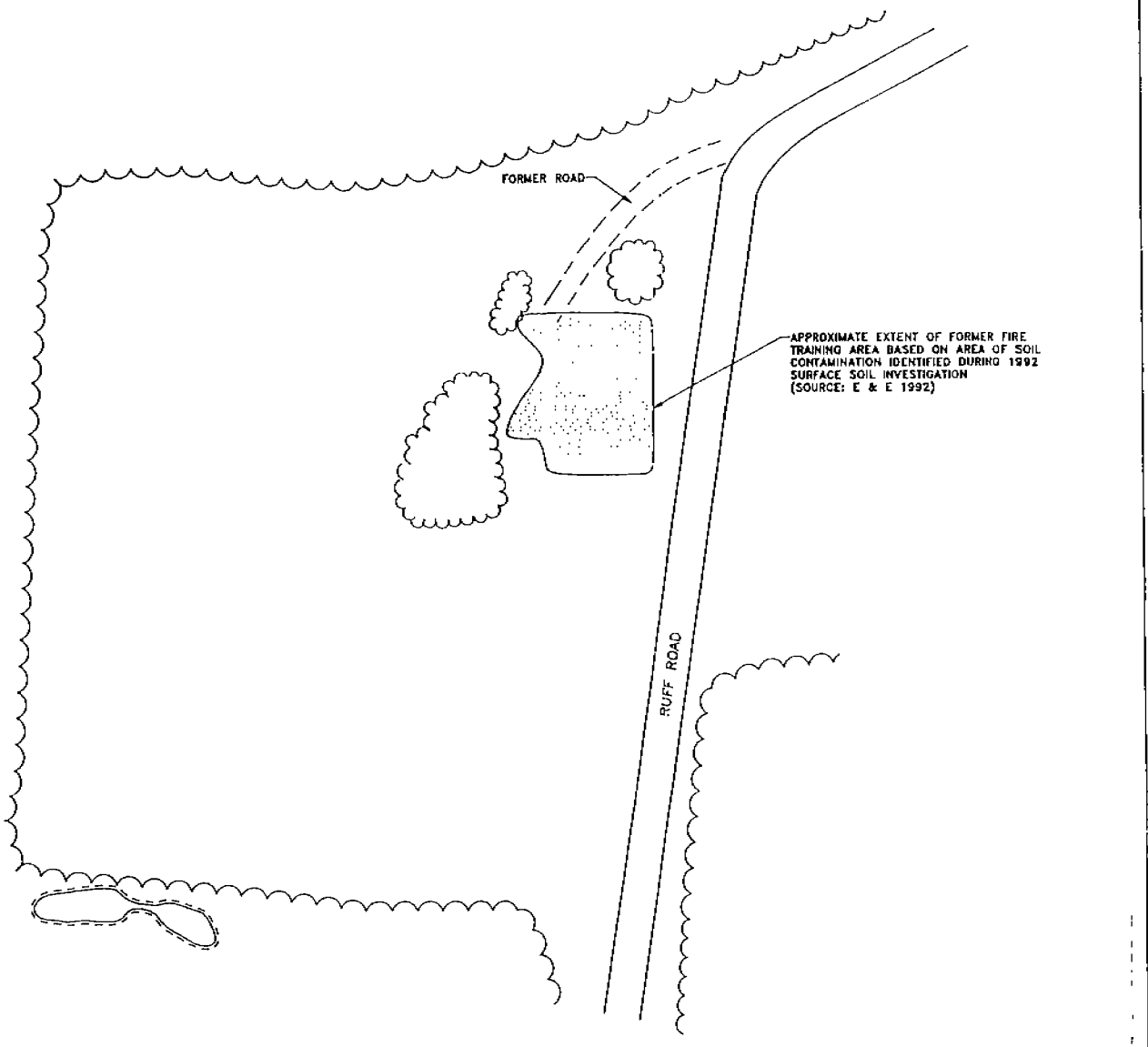
Analyte	Frequency of Detection	Range of Concentrations	Location of Maximum Concentration	Screening Concentration[a]	Number of Samples Exceeding Screening Concentration
Potassium	1/1	343	POND1	518	0
Selenium	1/1	0.26	POND1	0.13	1
Silver	1/1	1.7	POND1	1.3	1
Sodium	1/1	101	POND1	137	0
Vanadium	1/1	47.3	POND1	34.2	1
Zinc	1/1	56.8	POND1	40.5	1

[a] Screening criteria based on concentrations established as ecological toxicity benchmarks for sediments (EPA 1992; Suter and Mabry 1994; WDNR 1987; NYSDEC 1993; Environment Canada 1994).

Key:

DRO = Diesel-range organics.
mg/kg = Milligrams per kilogram.
TEF = Toxicity equivalency factor.

OUA 0020785



LEGEND

EDGE OF TREES

POND

N

SCALE IN FEET

0 100 200 300

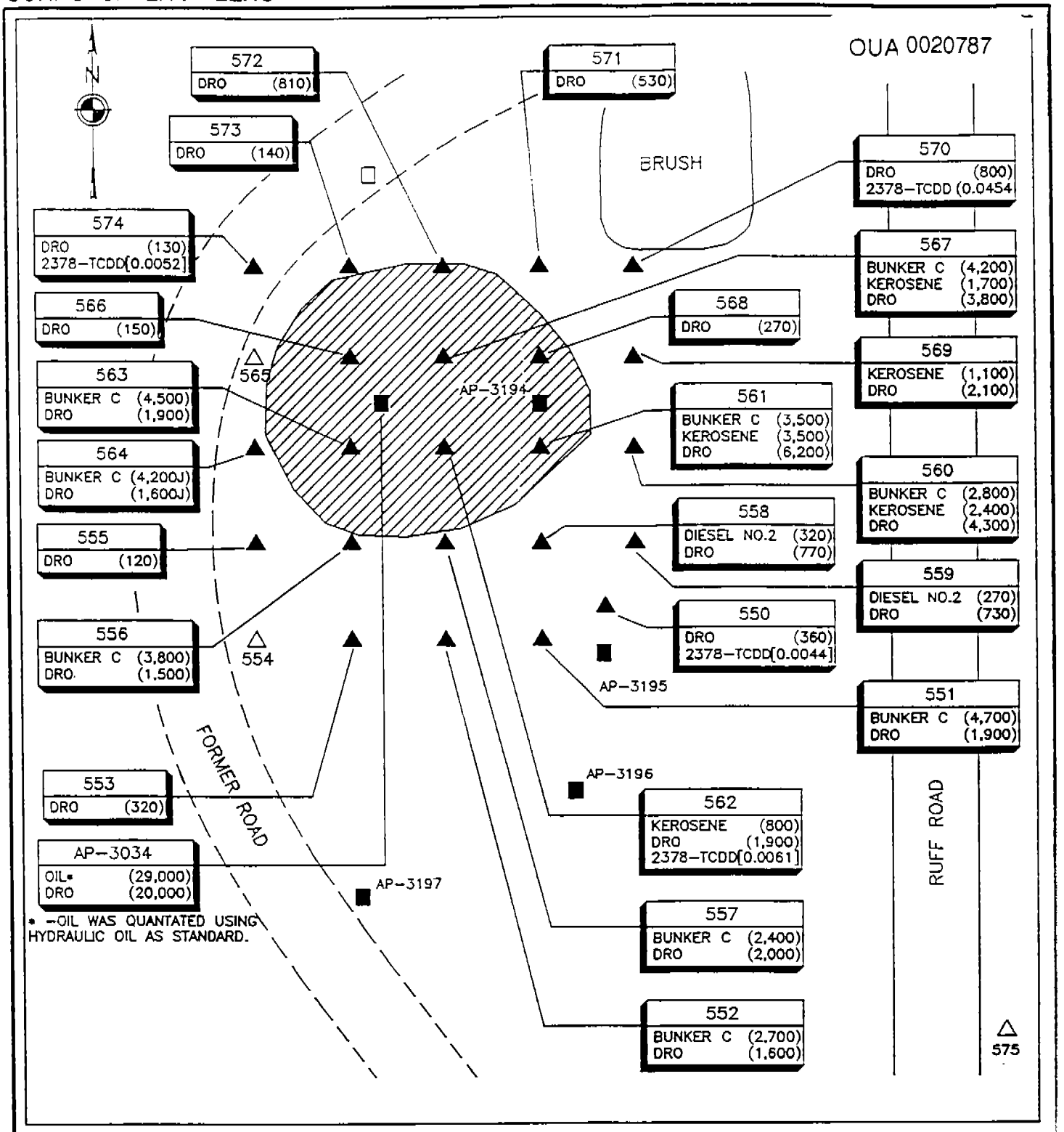
ecology and environment, inc.

U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4-1
SITE MAP
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO	DATE:	PLATE
B	JT3000	JTJS001B	3-26-96	

0020786



LEGEND

- Area of stained soil.
- △ 1992 Surface soil samples with no contamination exceeding regulatory clean up levels.
- ▲ 1992 Surface soil sample locations with contamination exceeding regulatory levels.
- □ 1992 Boring locations with no contamination exceeding regulatory levels.
- ■ 1992 Boring locations with contamination exceeding regulatory cleanup levels. (See figure 4-3).
- (215) Concentration in mg/kg.
- [0.045] Concentration in mg/kg.

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International Specialists in the Environment

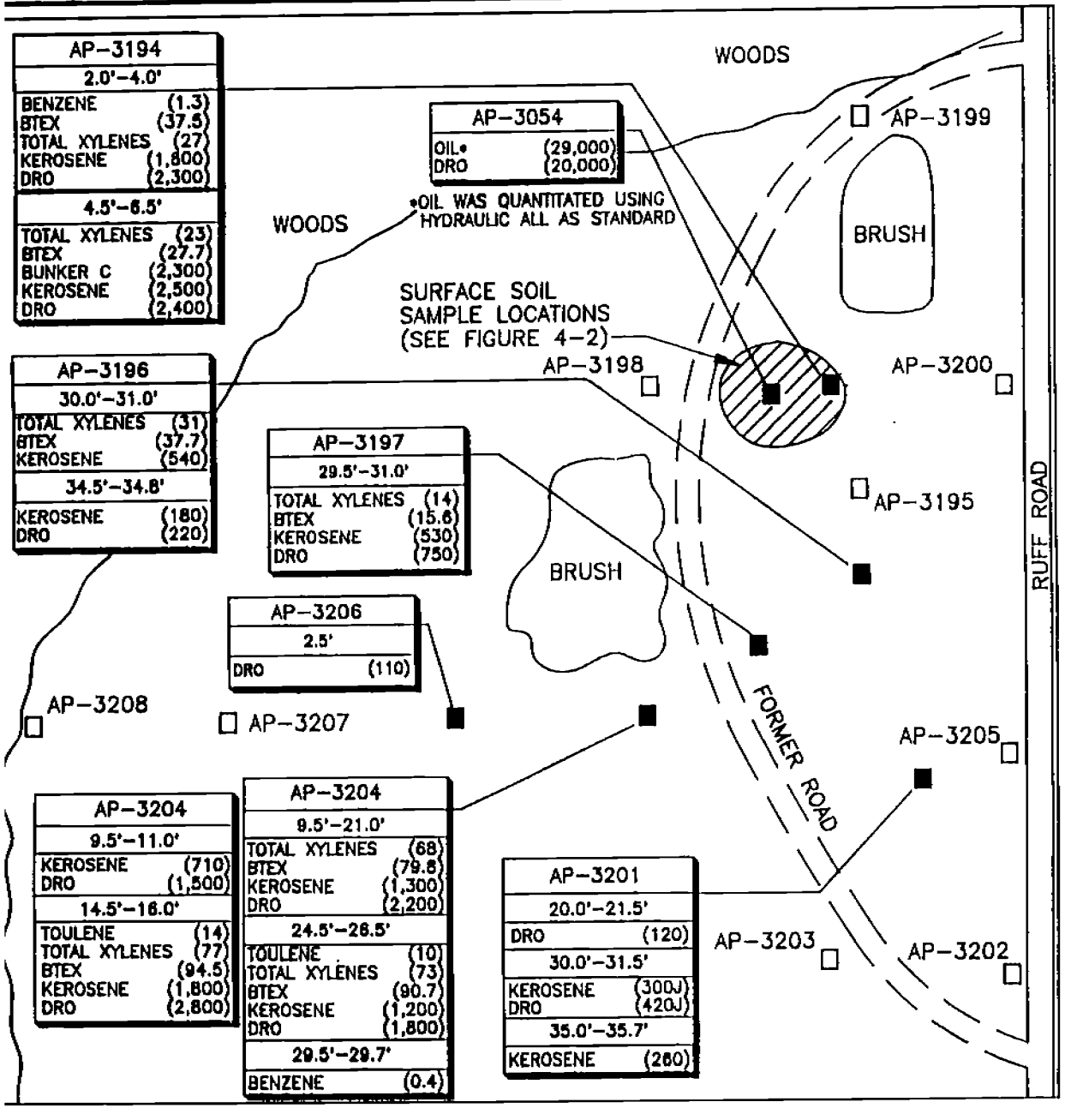
U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4-2
1992 SOIL SAMPLES
EXCEEDING REGULATORY CLEANUP LEVELS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S003A	3-18-96	

ORPS OF ENGINEERS

U.S. ARMY



N

LEGEND

Area of stained soil.

1992 Boring locations with no contamination exceeding regulatory cleanup levels.

1992 Boring locations with contamination exceeding regulatory cleanup levels.

(68) Concentration in mg/kg.

0 20 40 80 120

SCALE : FEET

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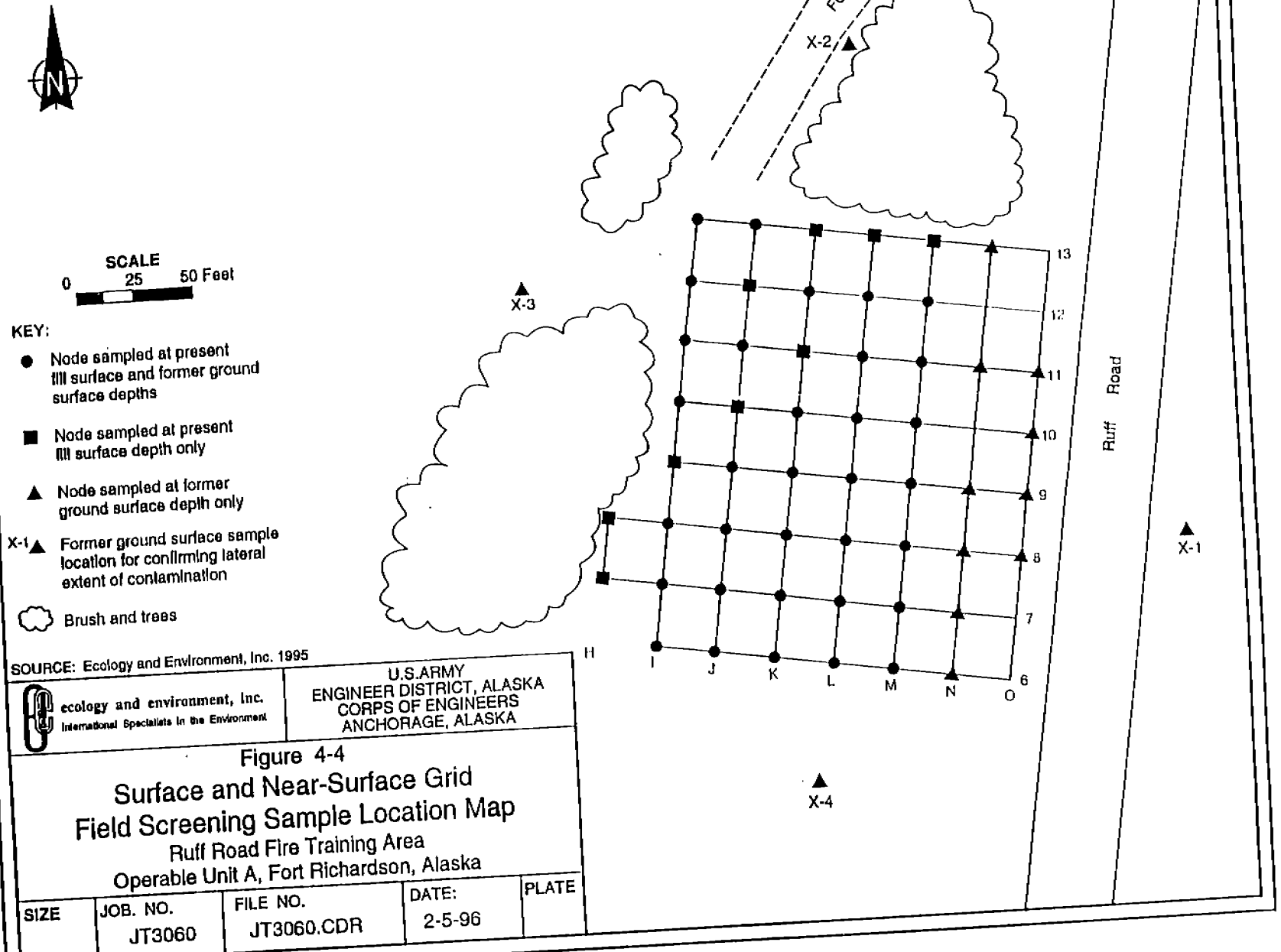
U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4-3
1992 SUBSURFACE SOIL SAMPLES
EXCEEDING REGULATORY CLEANUP LEVELS
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A

ANCHORAGE FORT RICHARDSON ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
A	JT3000	JT3S002A	3-18-96	

OUA 0020788



SOURCE: Ecology and Environment, Inc. 1995

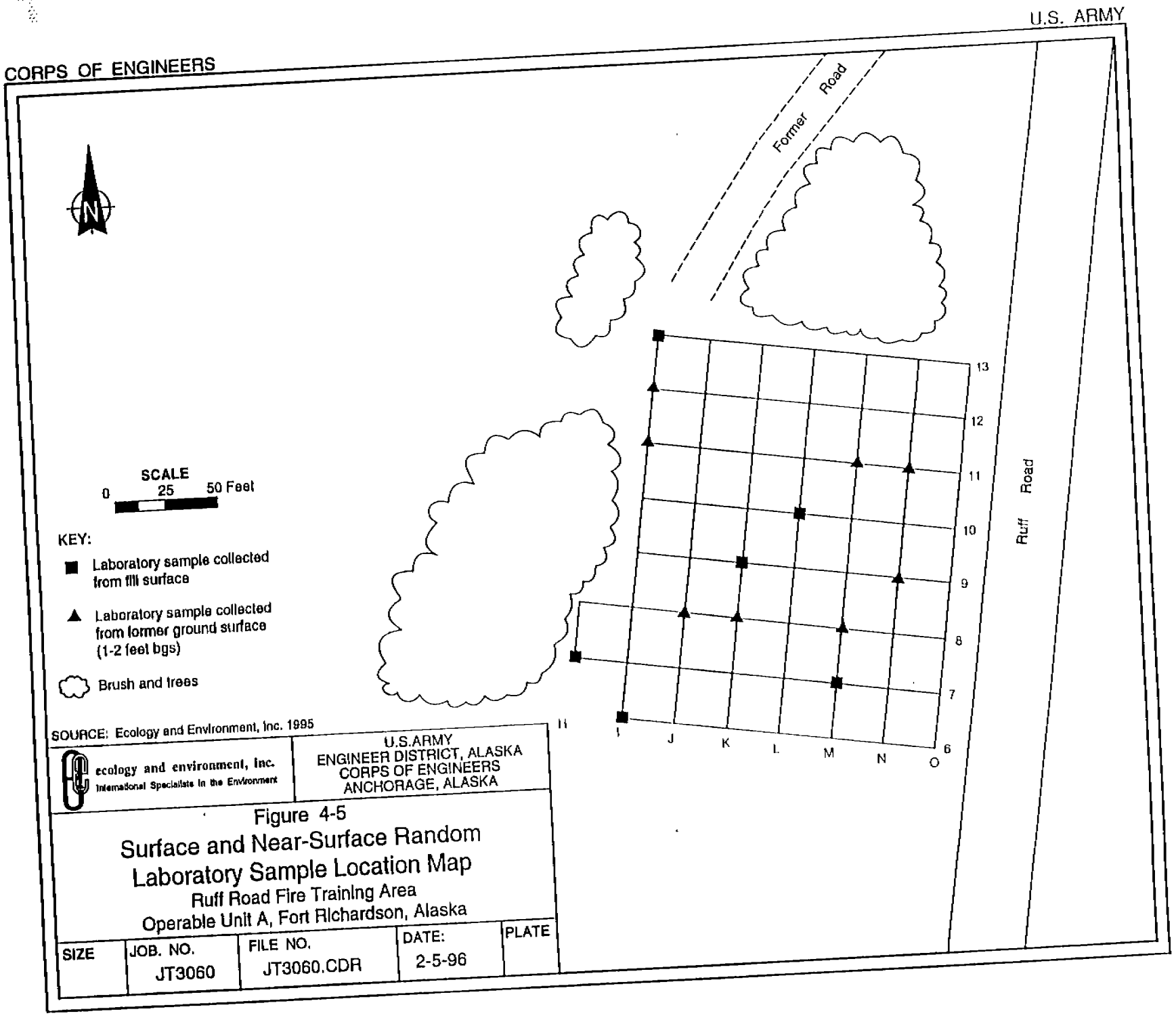
ecology and environment, Inc.
International Specialists in the Environment

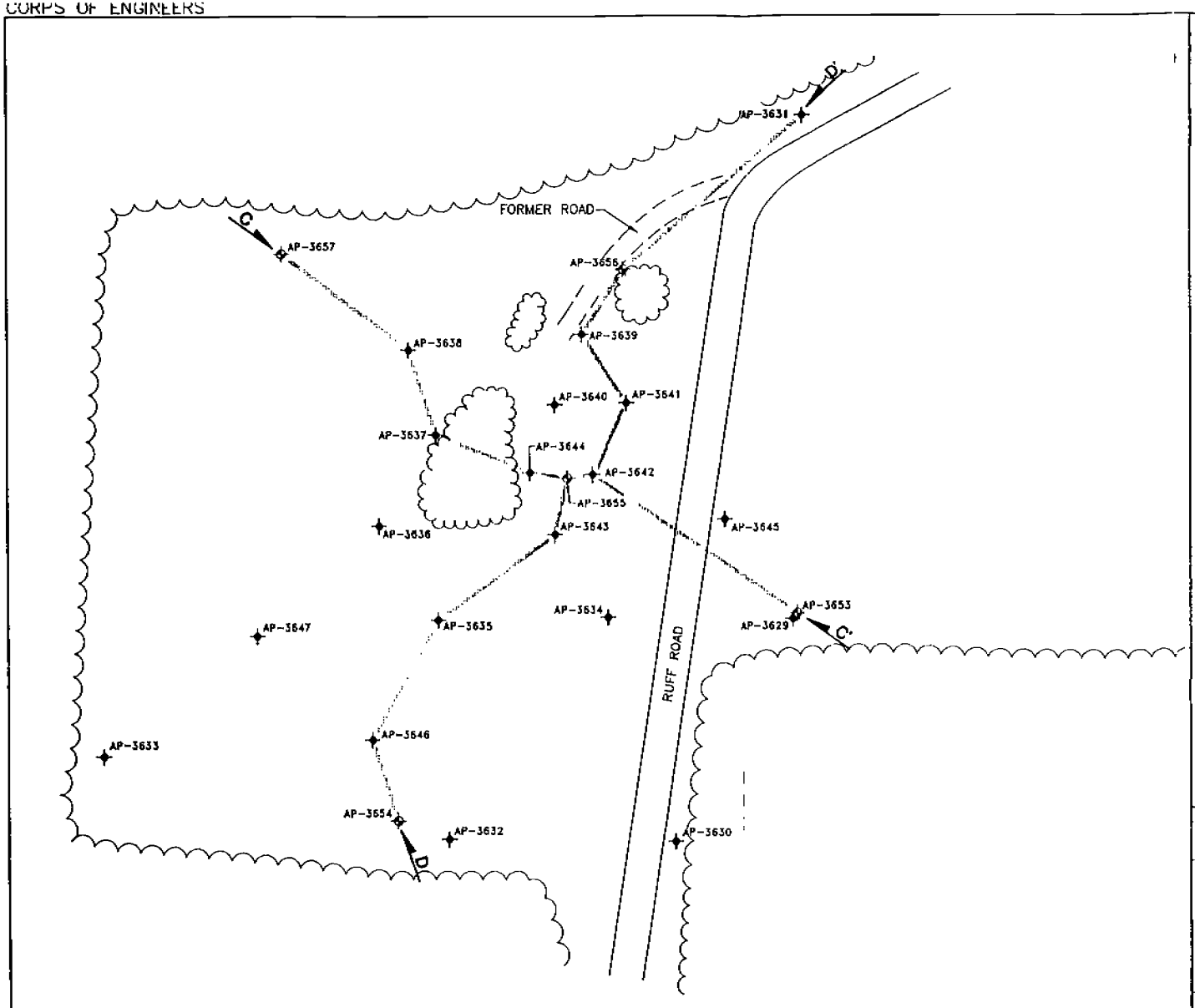
U.S.ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4-4
Surface and Near-Surface Grid
Field Screening Sample Location Map
Ruff Road Fire Training Area
Operable Unit A, Fort Richardson, Alaska

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
	JT3060	JT3060.CDR	2-5-96	

OUA 0020789


U.S. ARMY
CORPS OF ENGINEERS
Former Road
Ruff Road
N
SCALE
0 25 50 Feet
KEY:
Laboratory sample collected from fill surface
Laboratory sample collected from former ground surface (1-2 feet bgs)
Brush and trees
SOURCE: Ecology and Environment, Inc. 1995
I J K L M N O
13 12 11 10 9 8 7 6
ecology and environment, Inc.
International Specialists in the Environment
U.S.ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA
Figure 4-5
Surface and Near-Surface Random
Laboratory Sample Location Map
Ruff Road Fire Training Area
Operable Unit A, Fort Richardson, Alaska
SIZE
JOB. NO. JT3060
FILE NO. JT3060.CDR
DATE: 2-5-96
PLATE



LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- EDGE OF TREES
- C' CROSS SECTION LOCATION AND DESIGNATION

N

SCALE IN FEET

0 100 200 300

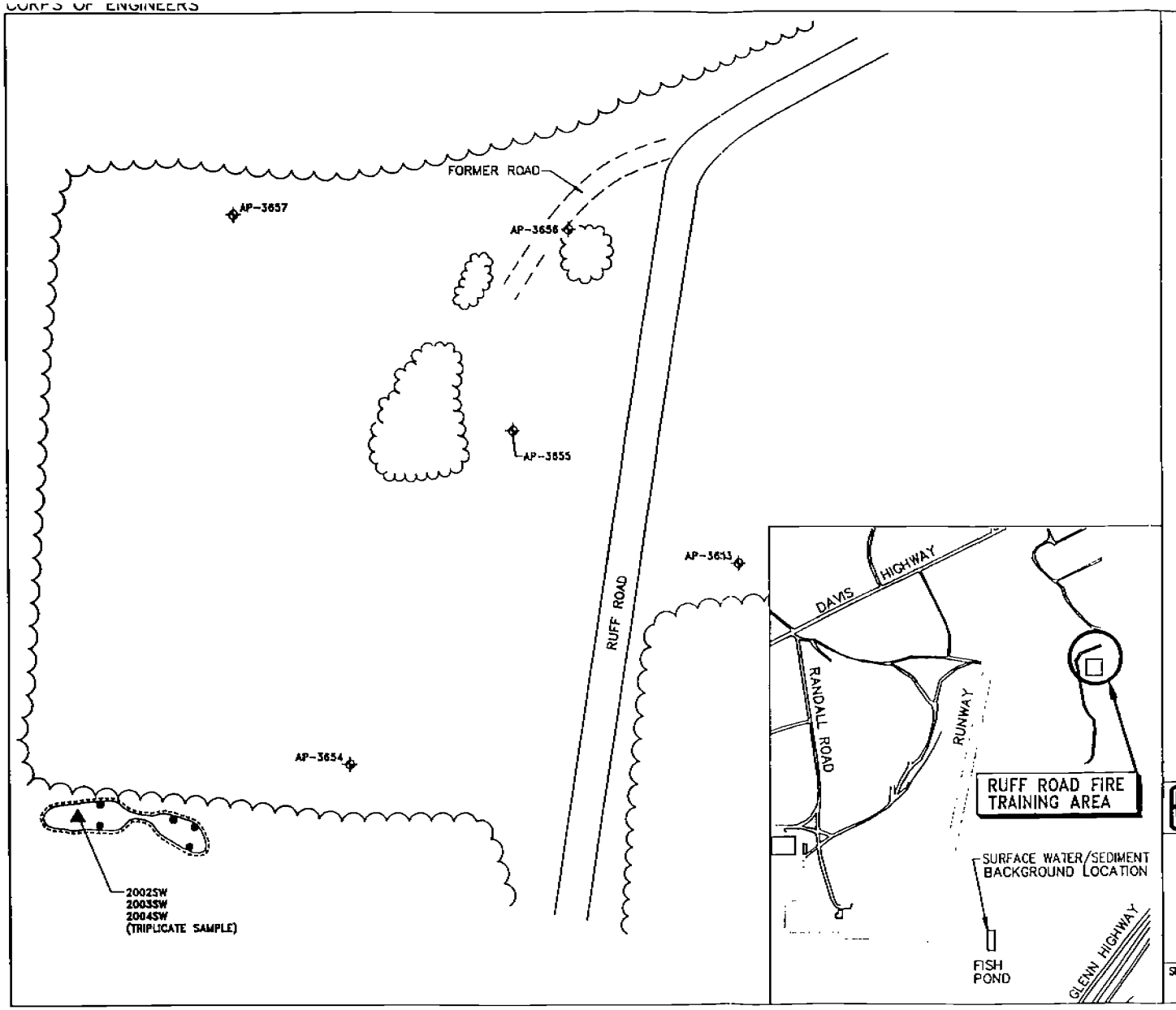
ecology and environment, inc.
International Specialists in the Environment

U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4-6
SOIL BORING/MONITORING WELL LOCATION MAP
AND KEY TO CROSS SECTIONS C-C' AND D-D'
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S010B	3-26-96	

0020791



LEGEND

- MONITORING WELL LOCATION
- SURFACE WATER SAMPLE LOCATION
- SEDIMENT SAMPLE ALIQUOT LOCATION
- EDGE OF TREES
- POND

NOTE:
FIVE ALIQUOTS WERE COLLECTED FROM THE FORMER QUARRY/ POND AREA FOR SAMPLES 2002SD, 2003SD, AND 2004SD.

N

SCALE IN FEET
0 100 200 300

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CORPS OF ENGINEERS
ANCHORAGE, ALASKA

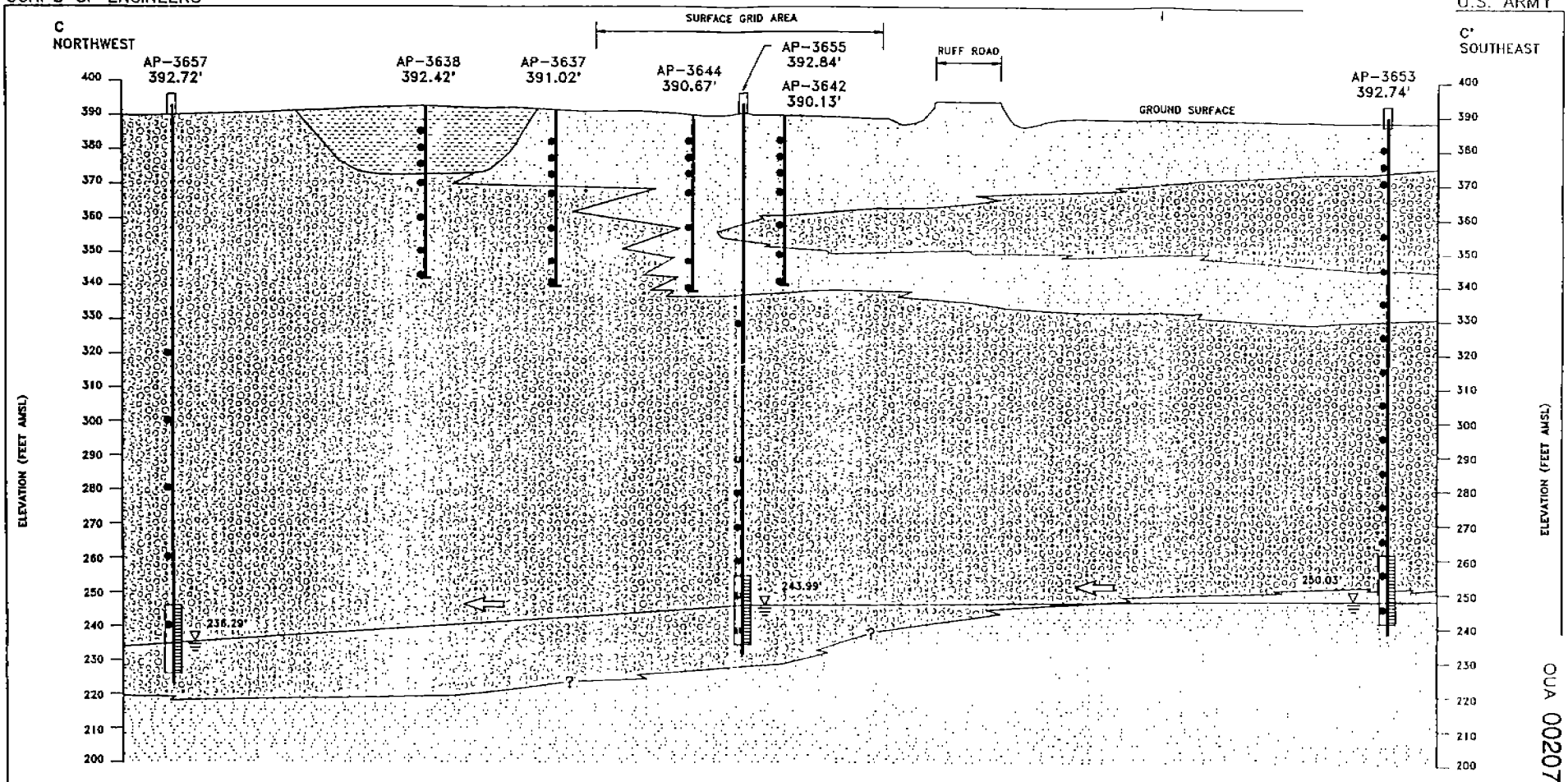
Figure 4-7
SURFACE WATER AND SEDIMENT
SAMPLE LOCATION MAP
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S014B	3-26-96	

OUA 0020792

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

AMSL	ABOVE MEAN SEA LEVEL
AP-3655	SOIL BORING/MONITORING WELL LOCATION
392.84'	ELEVATION ABOVE MEAN SEA LEVEL
▽	GROUNDWATER TABLE
●	SUBSURFACE SOIL SAMPLE
⇦	DIRECTION OF GROUNDWATER FLOW

NAPTOWNE OUTWASH DEPOSITS

- SILTY SAND
- SILTY, SANDY GRAVEL
- FILL CLAY

NOTE:

1. WATER LEVEL ELEVATIONS MEASURED ON DECEMBER 15, 1995

HORIZONTAL SCALE IN FEET

0 60 120 180

VERTICAL SCALE IN FEET

0 30 60 90

VERTICAL EXAGGERATION 1:2

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U.S. ARMY ENGINEER DISTRICT, AL CORPS OF ENGINEERS ANCHORAGE, ALASKA

Figure 4-8

GEOLOGIC CROSS SECTION C-C'

RUFF ROAD FIRE TRAINING AREA

OPERABLE UNIT A

FORT RICHARDSON

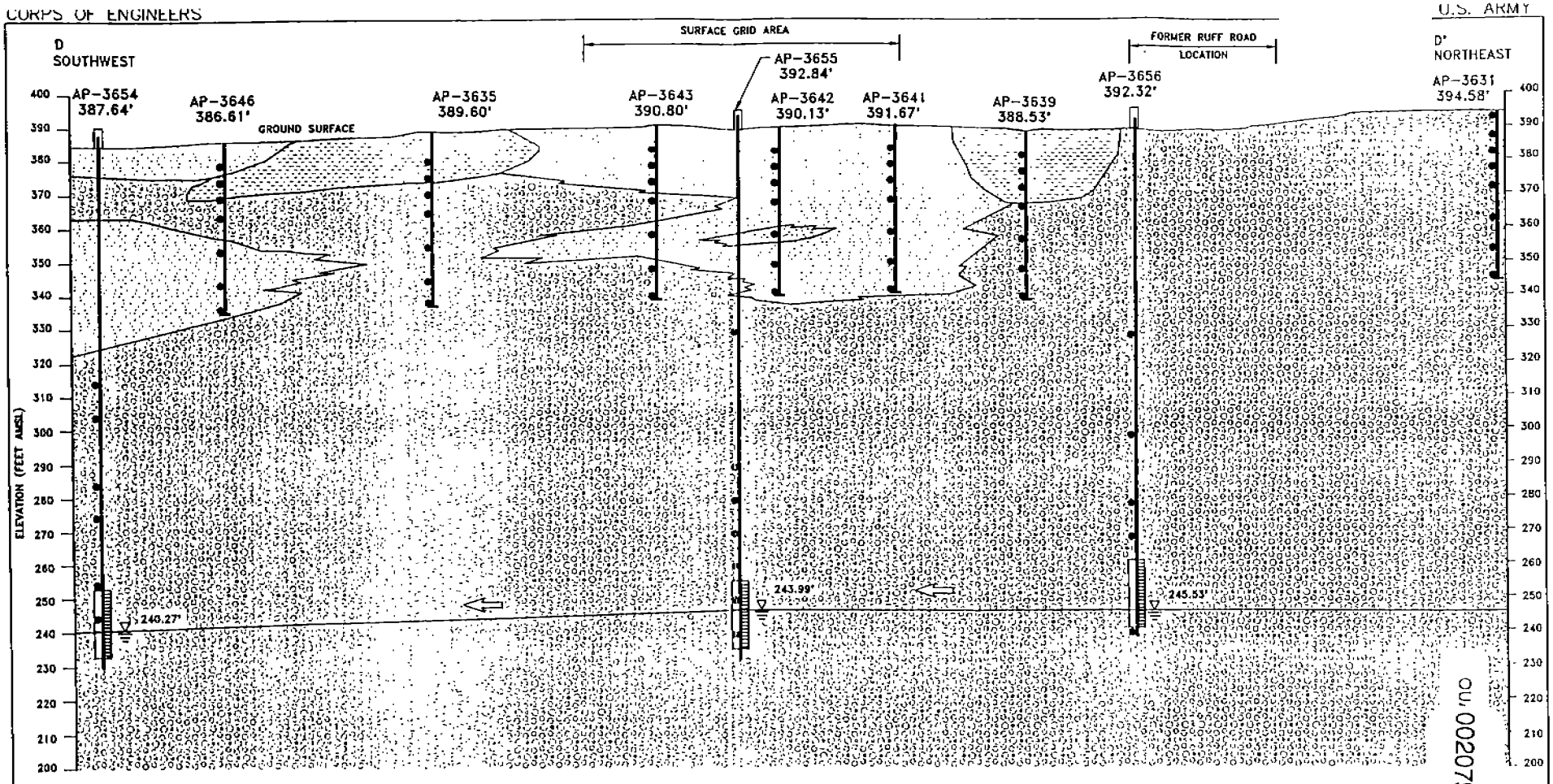
ANCHORAGE ALASKA

SIZE	JOB. NO	FILE NO	DATE	PLATE
B	JT3000	JT3X055B	3-26-96	

OUA 0020793

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

AMSL	ABOVE MEAN SEA LEVEL
AP-3655	SOIL BORING/MONITORING WELL LOCATION
392.84'	ELEVATION ABOVE MEAN SEA LEVEL
▽	GROUNDWATER TABLE
●	SUBSURFACE SOIL SAMPLE
⇦	DIRECTION OF GROUNDWATER FLOW

NAPTOWNE OUTWASH DEPOSITS

- SILTY SAND
- SILTY, SANDY GRAVEL
- FILL CLAY

NOTES:

1. WATER LEVEL ELEVATIONS MEASURED ON DECEMBER 15, 1995

HORIZONTAL SCALE IN FEET

0 30 60 90

VERTICAL SCALE IN FEET

0 60 120 180

VERTICAL EXAGGERATION 1:2

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International Specialists in the Environment

ENGINEER ASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4-9

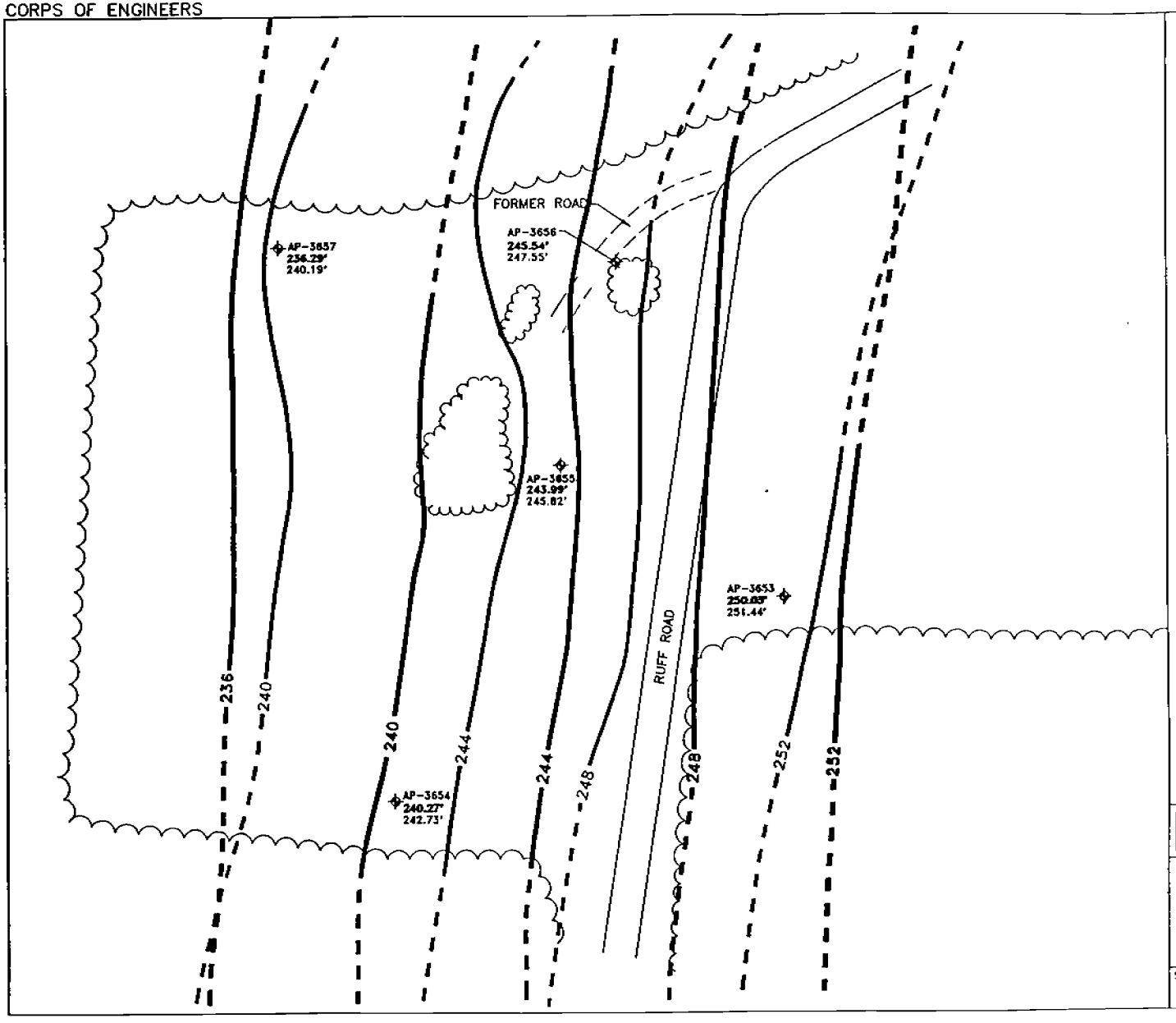
GEOLOGIC CROSS SECTION D-D'
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO	DATE:	PLATE
B	JT3000	JT3X0568	3-26-96	

OU 0020794

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

- MONITORING WELL LOCATION
- EDGE OF TREES
- DECEMBER 15, 1995 GROUNDWATER CONTOUR
- OCTOBER 24, 1995 GROUNDWATER CONTOUR
- 251.44 GROUNDWATER ELEVATION FEET ABOVE MEAN SEA LEVEL

N

SCALE IN FEET

0 100 200 300

ecology and environment, inc.

U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

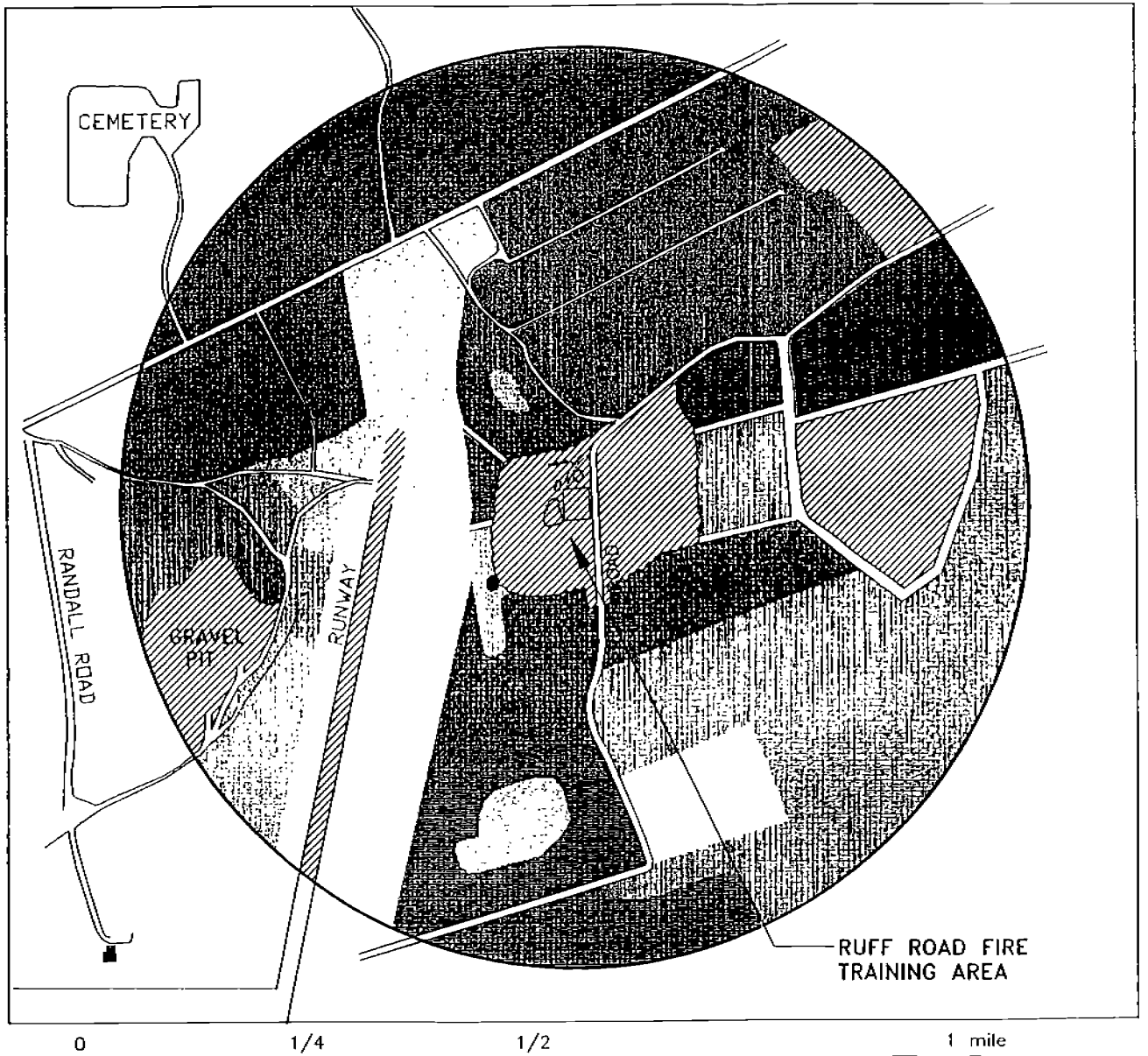
Figure 4-10
GROUNDWATER CONTOUR MAP
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

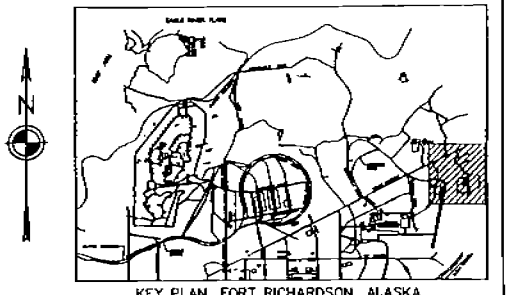
SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S060B	3-26-96	

OUA 0020795

CORPS OF ENGINEERS

U.S. ARMY





KEY PLAN, FORT RICHARDSON, ALASKA

LEGEND

- DISTURBED–HERBACEOUS
- DISTURBED–SAPLING SHRUB
- DISTURBED–COTTONWOOD/SHRUB
- DISTURBED–COTTONWOOD
- DISTURBED–COTTONWOOD/WHITE SPRUCE
- PAPER BIRCH FOREST
- QUAKING ASPEN FOREST
- ALDER SHRUB
- BLACK SPRUCE/QUAKING ASPEN
- WHITE SPRUCE/PAPER BIRCH FOREST
- BLACK SPRUCE FOREST/EARLY SUCCESSIONAL
- BLACK SPRUCE FOREST/MATURE
- OPEN WATER
- WHITE SPRUCE/QUAKING ASPEN FOREST
- CLEARED OR DISTURBED AREA

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International Specialists in the Environment

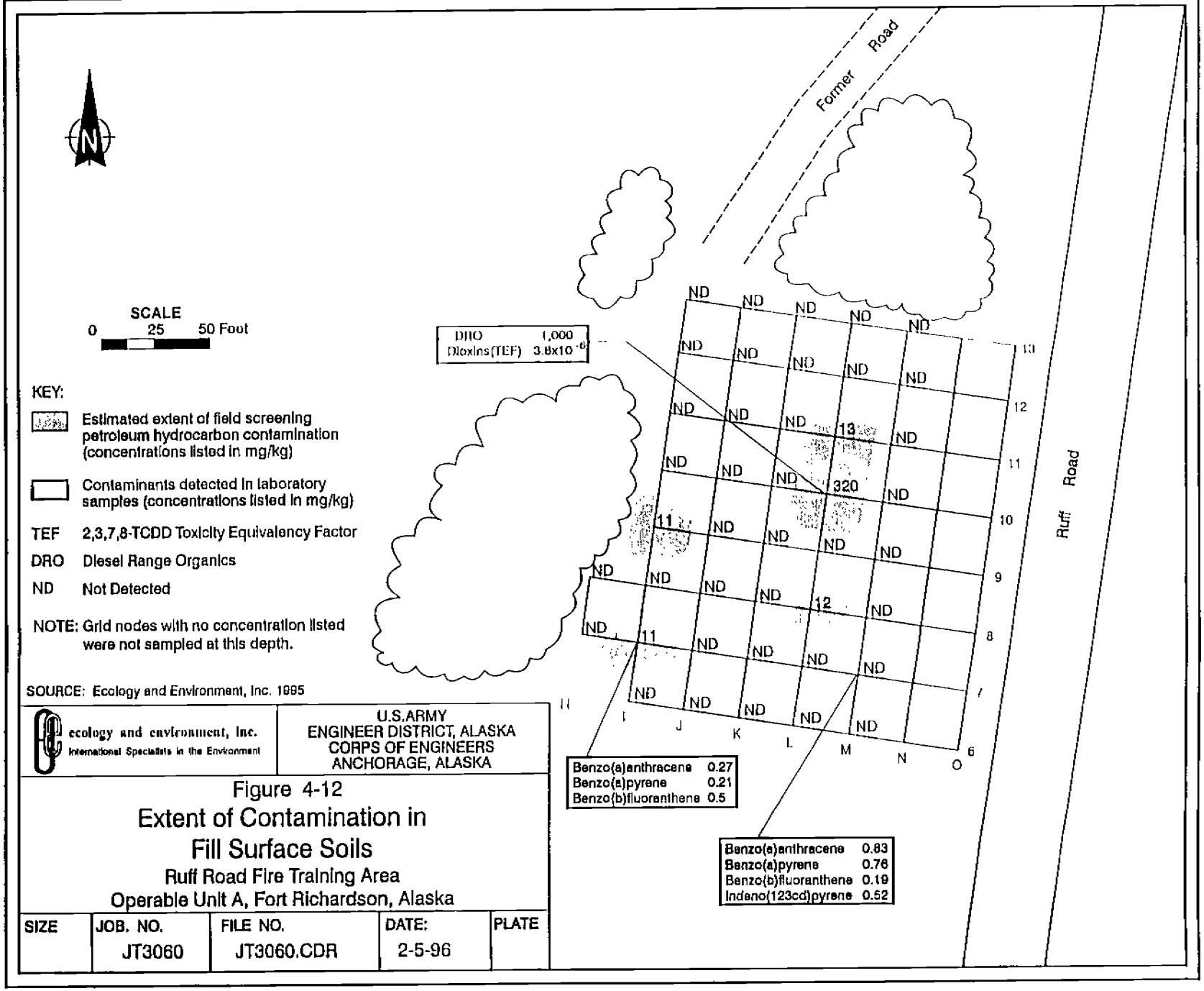
U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4–11
COVER TYPE MAP
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO	DATE	PLATE
B	JT3950	RUFFRD.DWG	03–26–96	

JT3050/RUFFRD.DWG/10-02-95

OUA 0020796



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ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

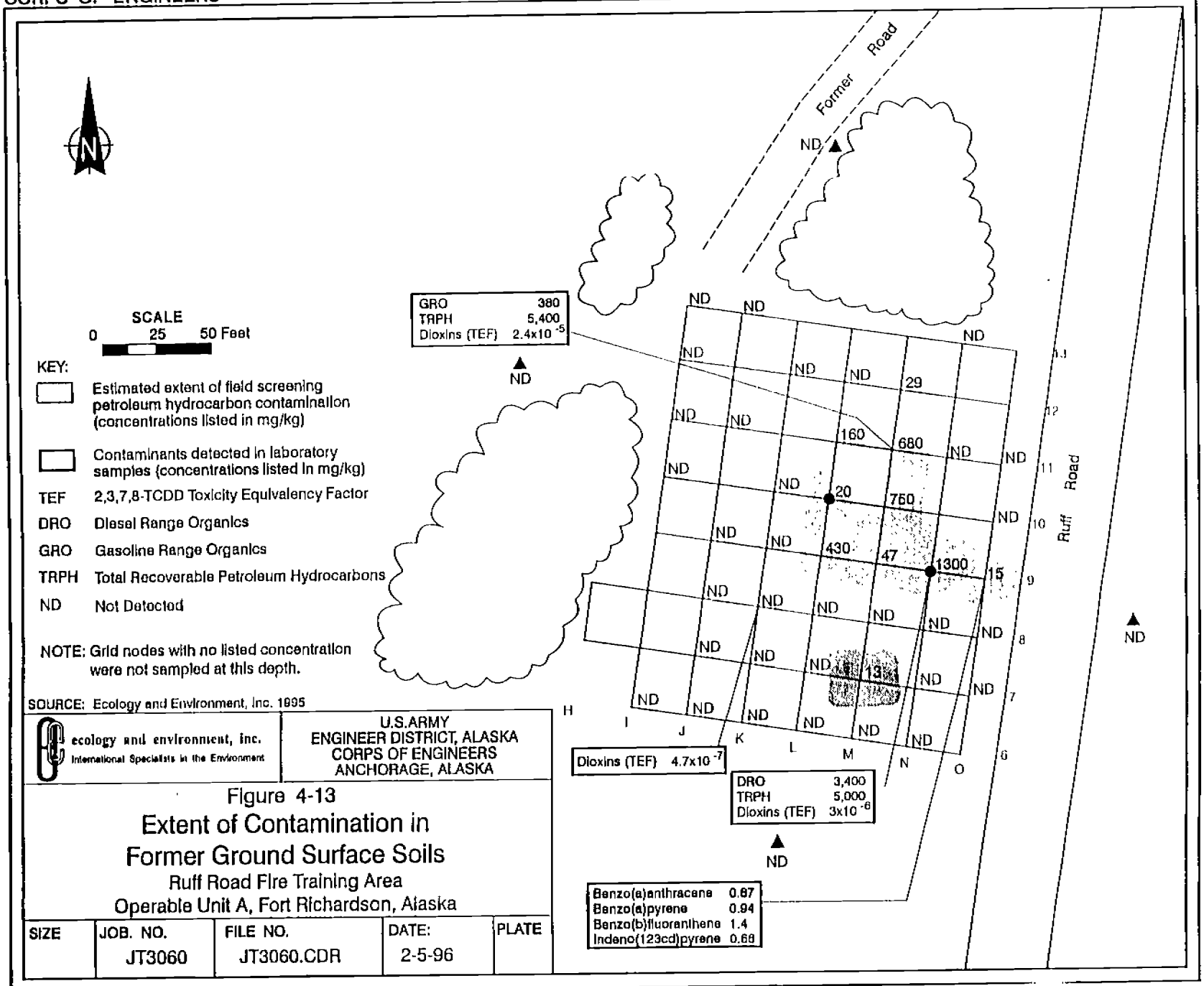
Figure 4-12
Extent of Contamination in
Fill Surface Soils
Ruff Road Fire Training Area
Operable Unit A, Fort Richardson, Alaska

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
	JT3060	JT3060.CDR	2-5-96	

OUA-0020797

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U.S. ARMY



ecology and environment, inc.
International Specialists in the Environment

U.S.ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4-13

Extent of Contamination in Former Ground Surface Soils

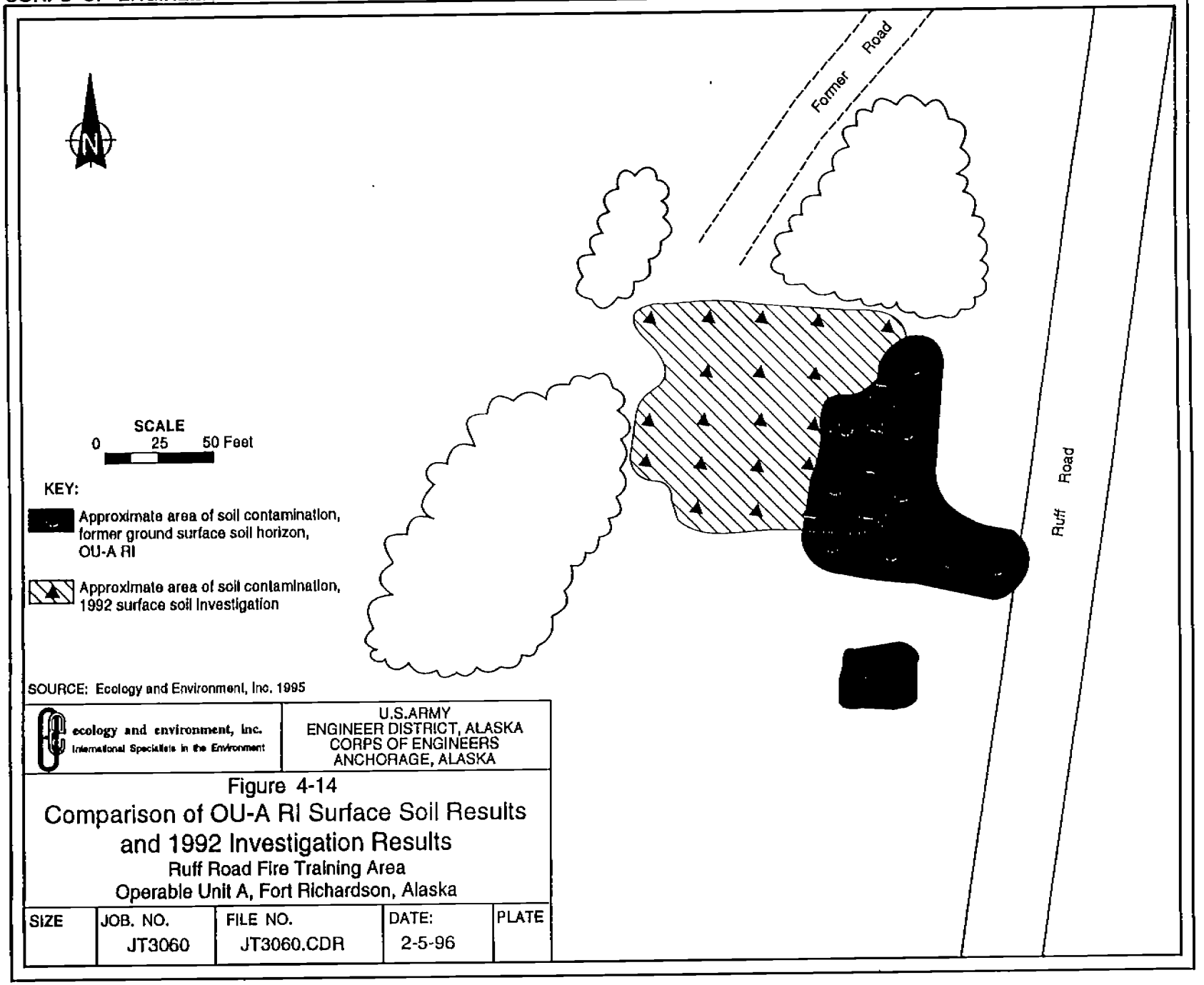
Ruff Road Fire Training Area

Operable Unit A, Fort Richardson, Alaska

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
	JT3060	JT3060.CDR	2-5-96	

CORPS OF ENGINEERS

U.S. ARMY



SOURCE: Ecology and Environment, Inc. 1995

ecology and environment, inc. International Specialists in the Environment	U.S.ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS ANCHORAGE, ALASKA

Figure 4-14

Comparison of OU-A RI Surface Soil Results and 1992 Investigation Results

Ruff Road Fire Training Area

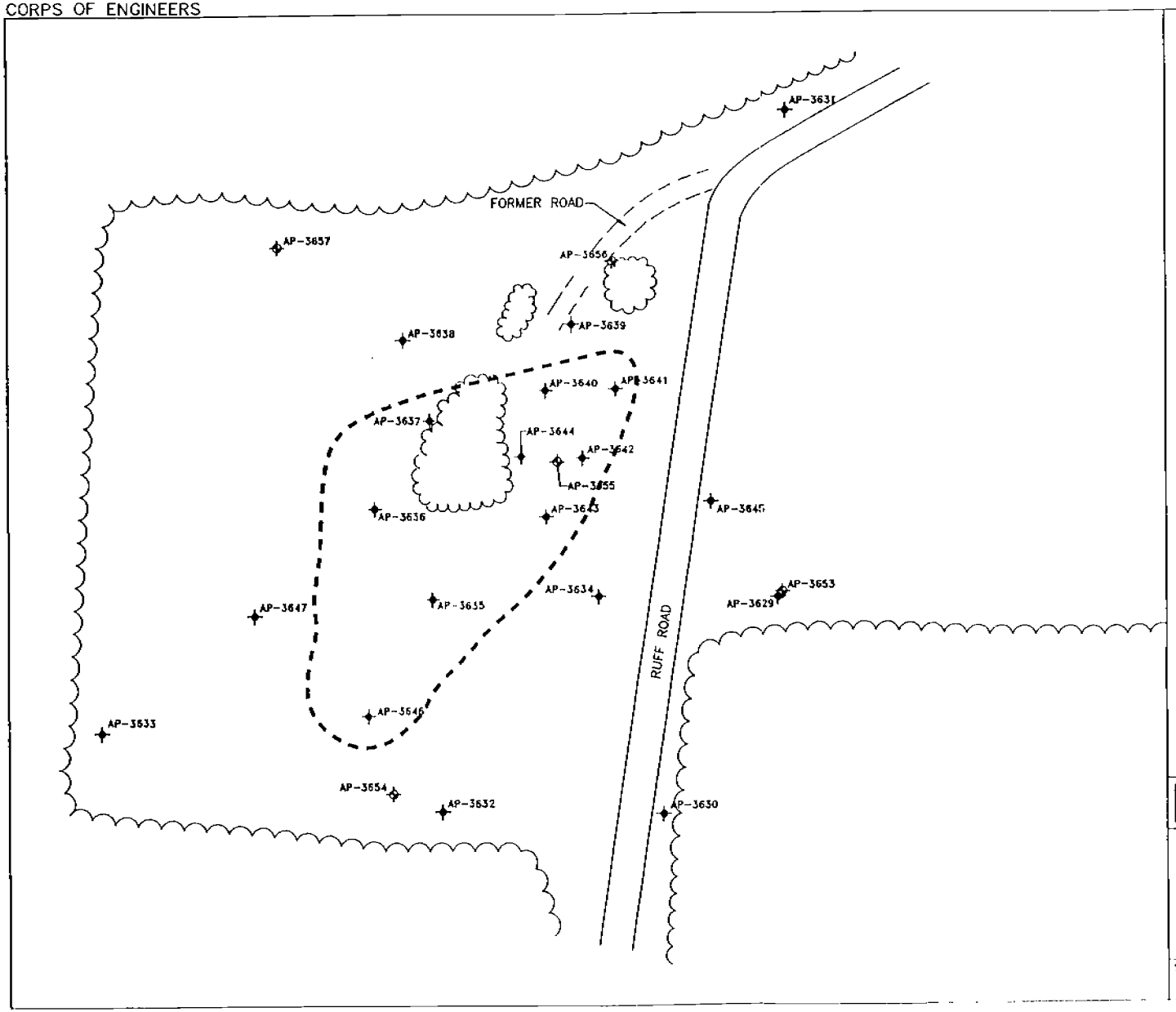
Operable Unit A, Fort Richardson, Alaska

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
	JT3060	JT3060.CDR	2-5-96	

OUA 0020799

CORPS OF ENGINEERS

U.S ARMY



LEGEND

- MONITORING WELL LOCATION
- EDGE OF TREES
- NO CONTAMINATION DETECTED IN SUBSURFACE SOIL
- CONTAMINATION DETECTED IN SUBSURFACE SOIL
- ESTIMATED AREA OF SUBSURFACE SOIL CONTAMINATION

N

SCALE IN FEET

0 100 200 300

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U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4-15
LATERAL EXTENT OF SUBSURFACE SOIL CONTAMINATION
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON

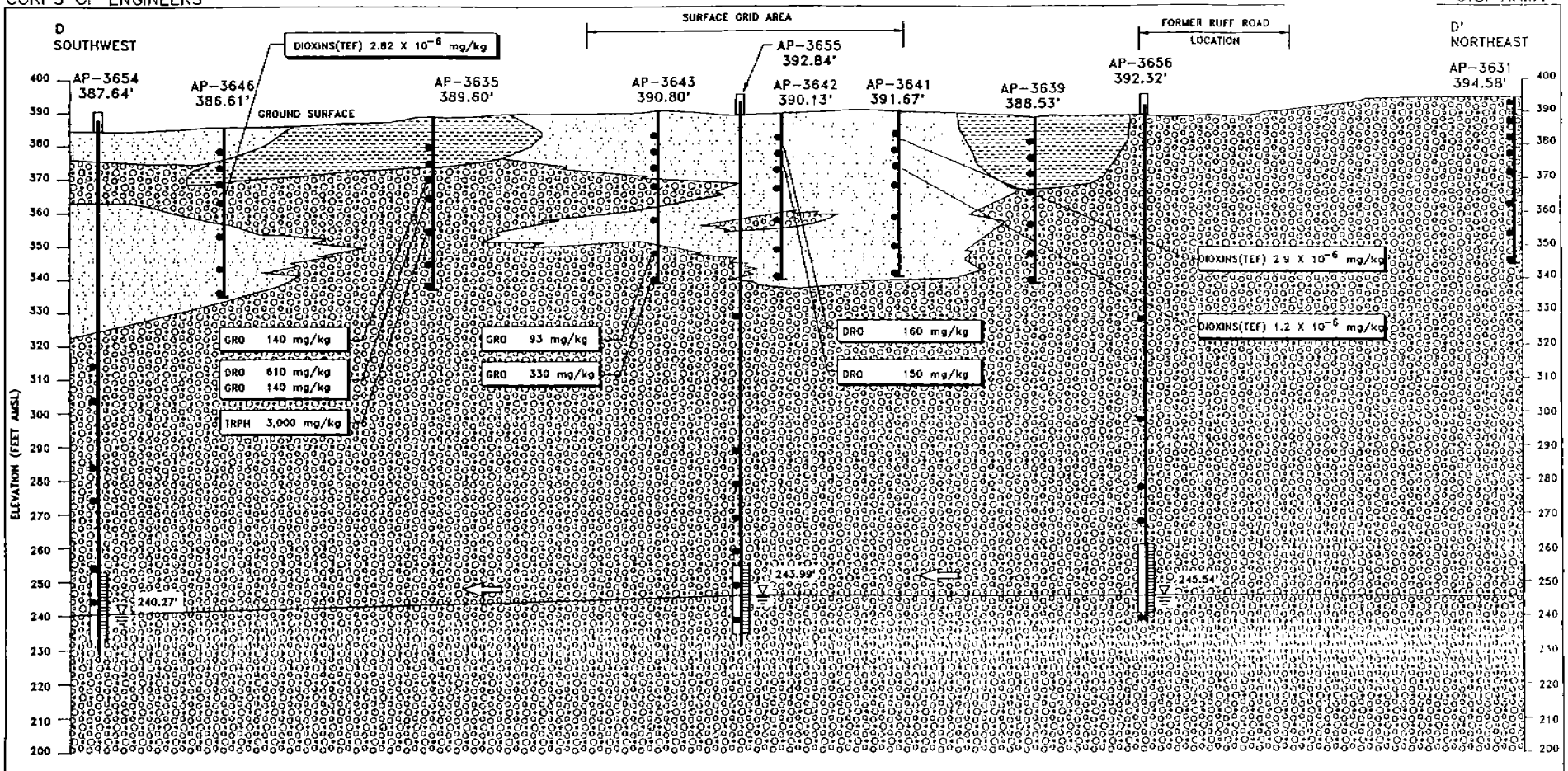
ANCHORAGE ALAS

SIZE	JOB. NO	FILE NO	DATE	PLATE
B	JT.5000	JT5000B3	5-26-96	

OUA 0020800

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

TEF	TOXICITY EQUIVALENCY FACTOR
AMSL	ABOVE MEAN SEA LEVEL
AP-3655	SOIL BORING/MONITORING WELL LOCATION
392.84'	ELEVATION ABOVE MEAN SEA LEVEL
▽	GROUNDWATER TABLE
•	SUBSURFACE SOIL SAMPLE
⇦	DIRECTION OF GROUNDWATER FLOW

NAPTOWNE OUTWASH DEPOSITS

- SILTY SAND
- SILTY, SANDY GRAVEL
- FILL-CLAY

NOTE:

WATER LEVEL ELEVATIONS MEASURED ON DECEMBER 15, 1995

HORIZONTAL SCALE IN FEET

0 60 120 180

VERTICAL SCALE IN FEET

0 30 60 90

VERTICAL EXAGGERATION 1:2

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U.S. ARMY ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 4-16

CROSS SECTION D-D'
SUBSURFACE SOIL CONTAMINATION
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON

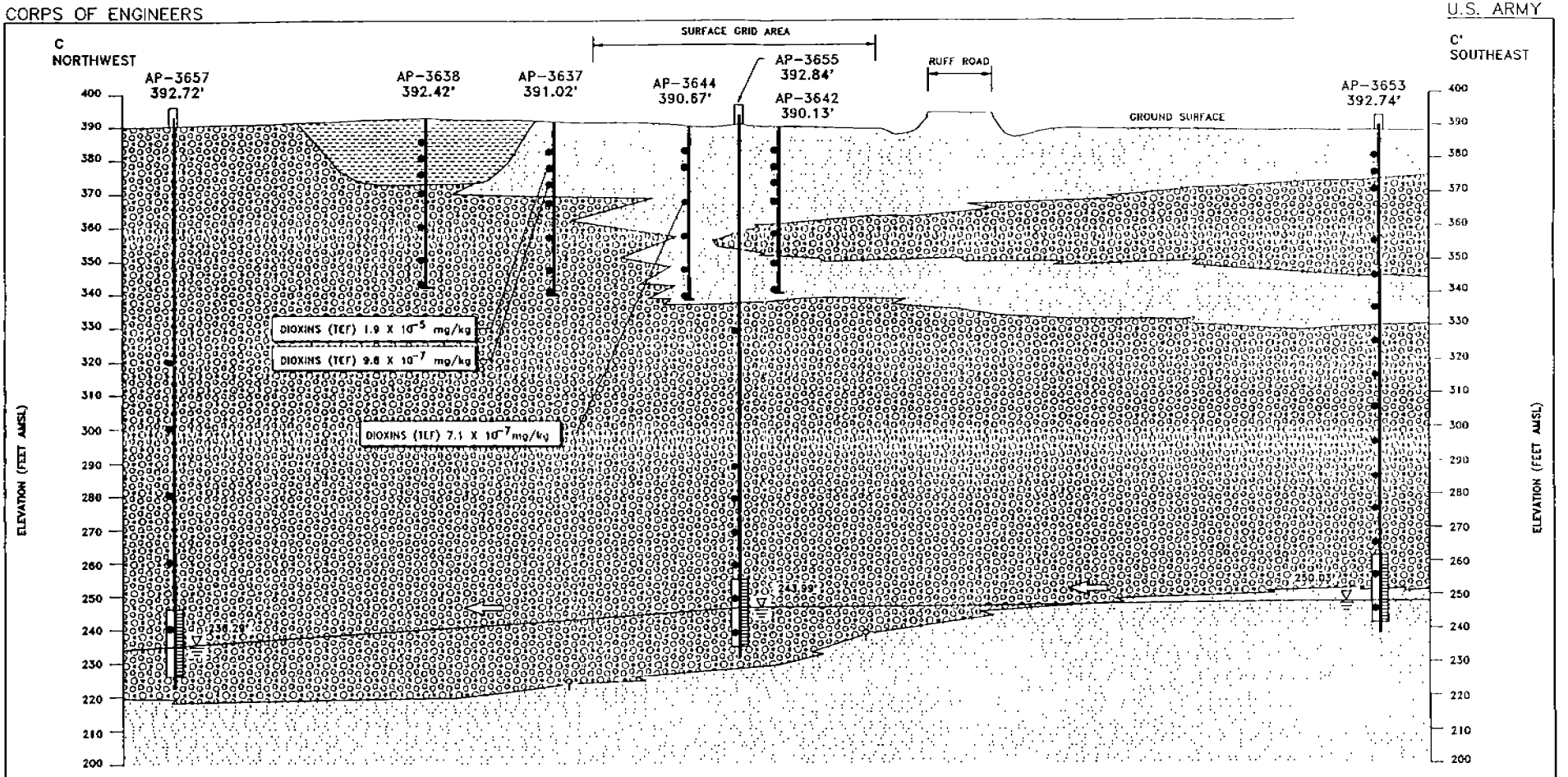
ANCHORAGE ALASKA

SIZE	JOB. NO	FILE NO	DATE	PL
B	JT3000	JT3X059B	3-26-96	

OUA 0020801

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

TEF	TOXICITY EQUIVALENCY FACTOR
AMSL	ABOVE MEAN SEA LEVEL
AP-3655	SOIL BORING/MONITORING WELL LOCATION
392.84'	ELEVATION ABOVE MEAN SEA LEVEL
▽	GROUNDWATER TABLE
●	SUBSURFACE SOIL SAMPLE
⇦	DIRECTION OF GROUNDWATER FLOW

NAPTOWNE OUTWASH DEPOSITS

- SILTY SAND
- SILTY, SANDY GRAVEL
- FILL - CLAY

NOTE:

WATER LEVEL ELEVATIONS MEASURED ON DECEMBER 15, 1995

HORIZONTAL SCALE IN FEET

0 60 120 180

VERTICAL SCALE IN FEET

0 30 60 90

VERTICAL EXAGGERATION 1:2

ecology and environment, inc.

U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

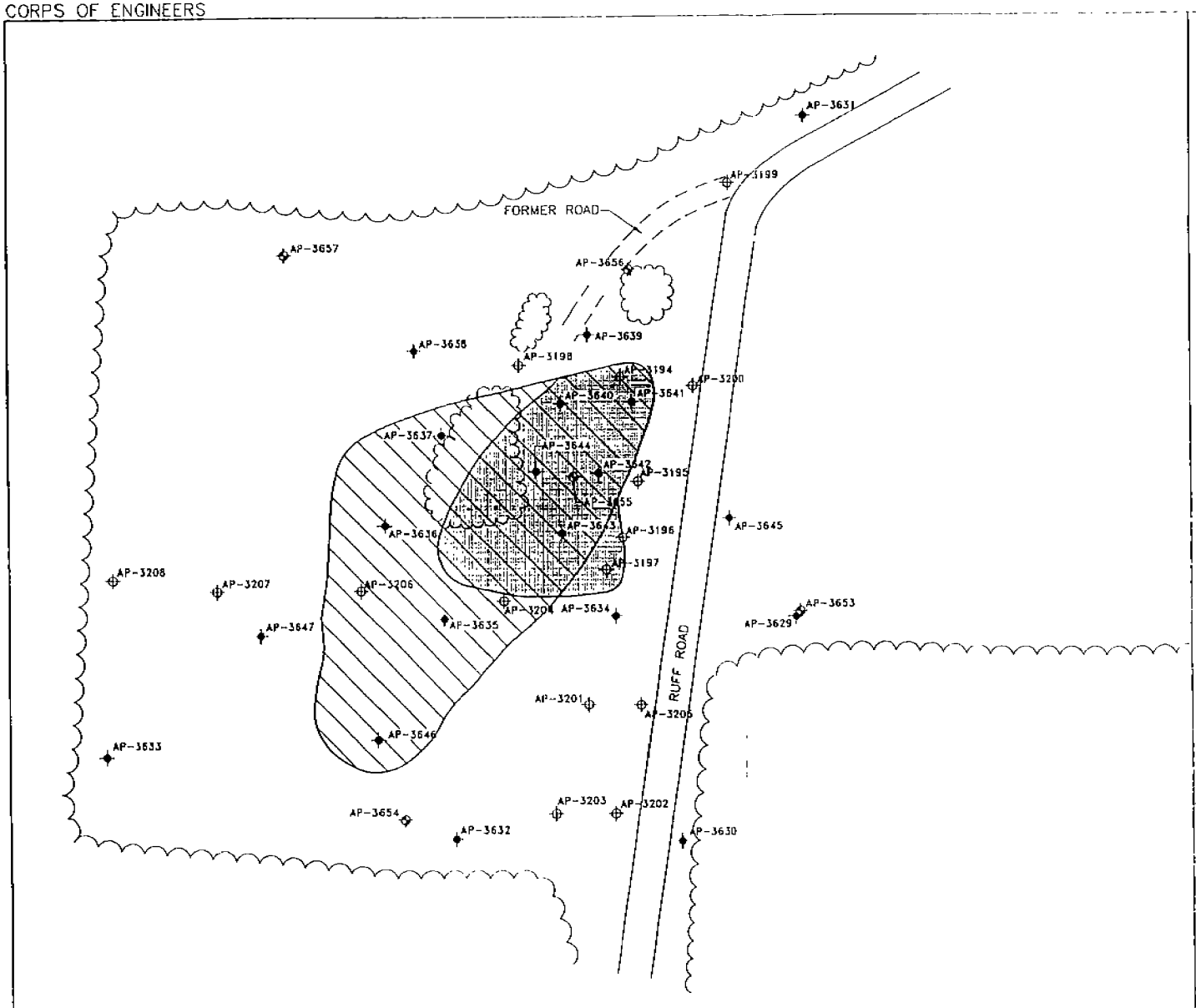
Figure 4-17
CROSS SECTION C-C'
SUBSURFACE SOIL CONTAMINATION
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO	FILE NO	DATE:	PLA
B	JT3000	JT3X057B	3-26-96	

OUA 0020802

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

- MONITORING WELL LOCATION
- 1995 RI SOIL BORING LOCATION
- AP-3199 1992 SITE INVESTIGATION SOIL BORING LOCATION
- EDGE OF TREES
- ESTIMATED LATERAL EXTENT OF SUBSURFACE SOIL CONTAMINATION OU-A RI
- ESTIMATED LATERAL EXTENT OF SUBSURFACE SOIL CONTAMINATION 1992 INVESTIGATION

N

SCALE IN FEET

0 100 200 3

ecology and environment, inc

U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS ANCHORAGE, ALASKA

Figure 4-18

COMPARISON OF RI AND 1992 INVESTIGATION SUBSURFACE SOIL RESULTS

RUFF ROAD FIRE TRAINING AREA

OPERABLE UNIT A

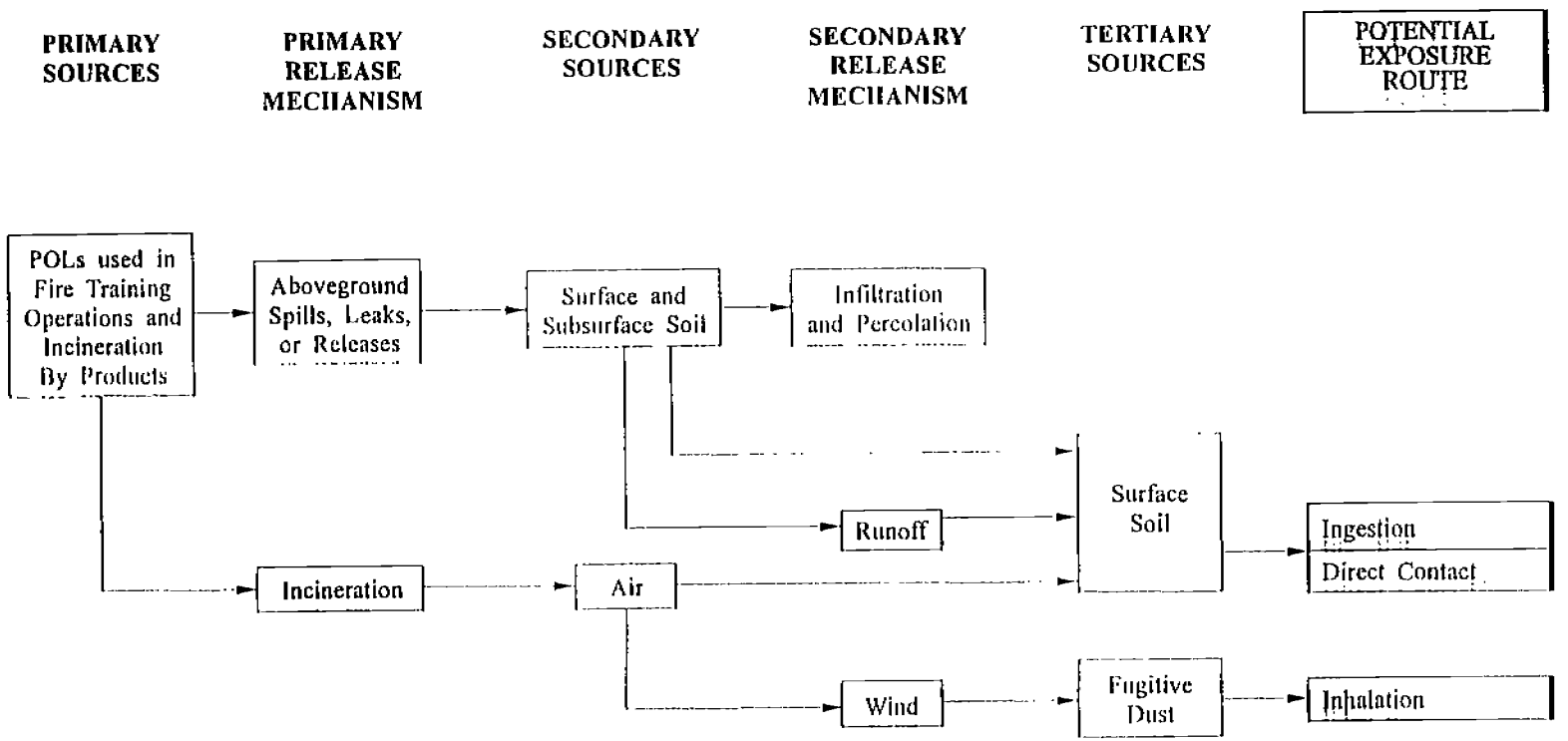
FORT RICHARDSON

ALASKA

SIZE	JOB NO.	FILE NO	DATE	PLATE
B	JT3000	JT3S004B	3-26-96	

ANCHORAGE

OUA 0020803



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International Specialists in the Environment
Anchorage, Alaska

FORT RICHARDSON
Anchorage, Alaska

Figure 4-19
CONCEPTUAL SITE MODEL
OF CURRENT CONDITIONS
RUFF ROAD FIRE TRAINING AREA

Drawn By:	Date	TDD/Job No.	Dwg. No.
EGM	3-25-96	JT3060	JT3001

OUA 0020804

5 Petroleum, Oil, and Lubricant Laboratory Dry Well

5.1 Site Description and History

The Petroleum, Oil, and Lubricant Laboratory Dry Well (POLLDW) is adjacent to Building 986, which is located in the northwest quarter of Section 31, Township 14 North, Range 2 West of the Seward Meridian, within the boundaries of the Fort Richardson installation (see Figure 1-1). Building 986 is just southeast of the intersection of Loop Road and Warehouse Street (see Figure 1-2).

POLLDW is located approximately 15 feet south of Building 986 (see Figure 5-1). The well opening is approximately 4 feet in diameter, with a concrete collar and a metal and plywood cover (see Appendix A, photo 13). Construction specifications and dimensions of the dry well are unavailable, but laboratory personnel have indicated that one sink in the laboratory is plumbed directly to the dry well. The dry well has been used since the 1950s, but the quantity of waste discharged to POLLDW from the laboratory has not been documented (E & E 1994b).

Operations performed at the POL laboratory include QA analysis of various fuels such as motor gas, aviation fuel, JP-4, and arctic-grade diesel. The fuels are analyzed for specific gravity, particulate matter, flash point, and freeze point. An extensive list of chemicals and reagents has been used at the POL laboratory to test fuels (see Table 5-1).

An 800-gallon underground storage tank (UST) was located north of Building 986 until 1992 (see Figure 5-1). The tank received the same laboratory waste as the dry well. The Corps drilled eight soil borings around the tank in 1991 as part of the removal effort. Several soil samples collected from the borings indicated the presence of petroleum hydrocarbons at depths of 10 to 20 feet BGS. Following removal of the tank in 1992, soil samples were collected from the excavation floor. GRO, BNAs, and lead were not detected in any of the samples, but DRO and TRPH were detected in all of the samples. DRO was detected at concentrations up to 89 mg/kg, and TRPH was detected at concentrations up to 134 mg/kg. Based on these results, the tank excavation was backfilled with clean fill and closed in

accordance with the clean-up standards set forth in 18 AAC 78.300 and the permanent closure standards set forth in 18 AAC 78.085 (Oil Spill Consultants 1994). Because the tank was closed according to applicable regulations, the tank and any potentially contaminated soils associated with it have not been considered as part of OU-A.

5.1.1 Previous Investigations

The Corps conducted an investigation at POLLDW in November 1992 to determine the presence and extent of contaminants in the well. During the investigation, approximately 18 inches of water and 6 to 8 inches of sludge were observed in the well at a depth of approximately 15 feet BGS. Because water from the POL laboratory drains into the dry well, the water in the dry well was determined not to be groundwater.

Sludge samples collected during the investigation were reported to contain approximately 80% water. Analytical results indicated that the water and sludge contained VOCs, BNAs, petroleum hydrocarbons, and heavy metals including arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver (Corps 1993). The analytes detected at the highest concentrations included 4-isopropyltoluene (360,000 µg/kg), m&p-xylene (840,000 µg/kg), naphthalene (290,000 µg/kg), 1,2,4-trimethylbenzenes (490,000 µg/kg), barium (6,920) mg/kg), chromium (4,590 mg/kg), lead (9,220 mg/kg), mercury (317 mg/kg), and silver (1,510 mg/kg). Table 5-2 summarizes the analytes detected during the 1992 investigation.

In September and October 1993, the Corps installed two monitoring wells, AP-3233 and AP-3235, approximately 1,000 feet north of Building 986 at the fuel tank farm. Groundwater was encountered at a depth of approximately 115 BGS in both wells. Two other monitoring wells, AP-3020 and AP-3022, were installed approximately 30 feet west of POLLDW. Well AP-3020 was screened from 10.5 to 20.5 feet BGS, and AP-3022 was screened from 13.3 to 23.3 feet BGS (see Figure 5-2). Groundwater samples have not been collected from these wells because they have been consistently dry (Wilson 1994; Corps 1994).

5.2 RI Field Investigations

Based on the analytical results obtained from previous investigations, the OU-A management plan outlined a field investigation to characterize the nature and extent of contamination originating from POLLDW (E & E 1995). The field investigation performed in support of the RI consisted of the following four components:

- Sludge investigation,
- Subsurface soil investigation,
- Groundwater investigation, and
- Ecological investigation.

Surface soil samples were not collected because contaminants in the dry well would have been discharged to the subsurface, and previous sampling activities did not indicate the presence of contaminants in surface soils. Neither surface water nor sediment samples were collected because no hydraulic connection was established to any nearby surface water body.

Sections 5.2.1 through 5.2.4 describe each component of the field investigation conducted at POLLDW. The methodologies used during the investigation were described in Appendix A of the management plan for OU-A, which was previously submitted to the Corps (E & E 1995). No significant deviations were made to the proposed sampling strategy. Table 5-3 summarizes the soil and sludge sample collection effort, and Table 5-4 summarizes the groundwater sample collection effort.

5.2.1 Sludge Investigation

Previous investigations indicated that sludge in the dry well contains petroleum, spent reagents, solvents, heavy metals, and waste solutions, and represents the contaminant source at POLLDW. Sludge samples were collected by E & E in 1995 to determine whether the sludge could be characterized as RCRA waste and to confirm previous analytical results. One triplicate sludge sample (POLLDW3001SG) was collected from the laboratory dry well (see Table 5-3; Appendix A, photos 14 and 15).

5.2.2 Subsurface Soils

POLLDW was constructed to dispose of waste into nearby subsurface soils; therefore, subsurface soils were presumed to be contaminated by petroleum, spent reagents, solvents, heavy metals, and waste solutions from historical operations at the POL laboratory. Eleven soil borings were drilled with a hollow-stem auger to delineate the extent of contamination and establish background conditions. Ten soil borings (AP-3618 through AP-3623 and AP-3625 through AP-3628) were drilled to an approximate depth of 50 feet BGS, and one boring (AP-3624) was drilled to an approximate depth of 70 feet BGS (see Figure 5-2). Borings AP-3618 and AP-3621 were drilled within approximately 100 feet east and west of the dry well, respectively. Boring AP-3619 was drilled approximately 20 feet northwest of the dry

well (see Appendix A, photos 15 and 16). Borings AP-3620 and AP-3622 were drilled within 100 feet south of the dry well. Boring AP-3628 was drilled on the north side of Building 986, and borings AP-3623 through AP-3627 were drilled southeast of the site in locations to establish background conditions. Soil samples were collected at 5-foot intervals from the surface to a depth of 20 feet BGS, and at 10-foot intervals from a depth of 30 feet to the bottom of the boring (see Table 5-3; Appendix A, photo 17).

Borings AP-3648 through AP-3652 were installed using the air-rotary drilling method to a depth of approximately 120 feet BGS (see Appendix B, photos 18-19). Monitoring wells were installed at these boreholes later for the groundwater investigation. Boring AP-3648 was drilled immediately adjacent to the dry well to determine the nature and vertical extent of contamination. Boring AP-3649 was drilled north of Warehouse Street from Building 986, and AP-3652 was drilled west of Loop Road to determine the extent of potential contamination. Borings AP-3650 and AP-3651 were drilled at locations southeast of the site to establish background conditions. Soil samples were collected at 10-foot intervals from 60 feet BGS to the bottom of the boring (see Table 5-3).

5.2.3 Groundwater

Monitoring wells were installed at borings AP-3648 through AP-3652. Groundwater samples were collected to determine whether wastes discharged to subsurface soils by POLLDW had impacted groundwater (see Table 5-5). Well AP-3648 is adjacent to the dry well, well AP-3649 is crossgradient of the dry well, and AP-3652 is hydraulically downgradient of the dry well (see Figure 5-2). Well AP-3651 is located hydraulically upgradient of the site. AP-3650 is located hydraulically crossgradient of the site.

5.2.4 Ecological Investigation

E & E biologists conducted a field survey of the area within a 0.5-mile radius of POLLDW to identify major vegetation cover types, and to qualitatively assess the suitability of each cover type for wildlife. Wetland boundaries previously mapped by USFWS were verified and assessed according to the standard procedures presented in the *Corps of Engineers Wetland Delineation Manual* (Corps 1987).

5.3 Physical Characteristics

5.3.1 Site Geology

POLLDW is located near the southern margin of the Elmendorf Moraine on Naptowne outwash deposits. The Naptowne outwash deposits in the site area consist of well graded gravel with sand, and minor amounts of clay and silt. Soil boring logs from POLLDW indicate that the soil consists of dry, massive, very dense, well graded gravel (1-7 cm) and sand, with minor clay and silt (see Appendix B). Gravel and sand grains are angular to sub-angular. Grain-size analysis conducted on subsurface soil samples indicate that site soils contain approximately 60% gravel, 32% sand, and 8% clay and silt (see Appendix C). Discontinuous silty sand lenses were encountered at all depths during drilling activities at POLLDW. Sandy gravel layers range from approximately 10 to 50 feet thick and extend laterally for a minimum of 700 feet (see Figures 5-3 and 5-4). Gravelly sand layers range from 7 to 70 feet thick and extend laterally for a minimum of 700 feet (see Figures 5-3 and 5-4). The total thickness of the Naptowne outwash deposit at POLLDW is unknown, but based on soil boring logs, it extends to a depth of at least to 265 feet AMSL.

5.3.2 Site Hydrogeology

Groundwater at POLLDW occurs primarily within a silty sand bed of the Naptowne outwash formation at depths from 113 to 122 feet BGS (approximately 177 to 181 feet AMSL). Based on water level measurements obtained from five wells installed at the POLLDW (AP-3648 through AP-3652), groundwater generally flows west with an average gradient from 0.001 to 0.006 (see Figure 5-5). These conditions are consistent with the regional hydrogeologic characteristics described in Section 2.5.

Groundwater levels in wells AP-3648 through AP-3652 were measured monthly from October 1995 to February 1996. Water level measurements decreased during this period between 2.71 and 3.20 feet, suggesting that water levels decrease during the late fall and winter months. The similar change in water levels among these wells indicates that neither the direction nor gradient of groundwater flow changed significantly during this period.

Hydraulic conductivity for the saturated aquifer at POLLDW was estimated based on the results of slug tests performed at wells AP-3648, AP-3649, and AP-3652 in October 1995 (see Appendix A, photo 20). Slug test data showed an average hydraulic conductivity of 0.02 ft/min at the site, indicating that the hydraulic conductivity does not change significantly across the site (see Appendix D). The slug test results in this case are presented as estimates because of the very high permeabilities observed. While slug tests are generally more suited

to lower permeability materials, the high permeabilities calculated from the test data are consistent with values typically associated with sandy aquifers, and they are consistent with a published report of hydraulic conductivity for the regional aquifer (Patrick et al. 1989).

5.3.3 Site Ecology

POLLDW is located in a partially developed portion of the Fort Richardson main installation. Patches of developed/disturbed areas and forests in different successional stages surround the site. Figure 5-6 presents the vegetative cover types found within a 0.5-mile radius of the site. A list of the vegetation at the site is in the ecological risk assessment.

White spruce/black cottonwood, quaking aspen/white spruce forests, and a military playing field are located south and east of POLLDW. Developed areas intermixed with a paper birch forest, a disturbed black cottonwood/alder shrub patch, a balsam poplar forest, and disturbed herbaceous patches are found north and east of the site. A white spruce/paper birch forest and a disturbed-cottonwood shrub patch are north of the northern section of Warehouse Street and east of Loop Road. Small developed areas are located west of the site, but most of the area is heavily vegetated with black spruce and white spruce/quaking aspen forests and a large disturbed cottonwood/shrub patch.

The undeveloped areas surrounding POLLDW provide habitat for mammals and birds. Evidence of moose and squirrels was observed during the field survey.

No known wetlands occur within a 0.5-mile radius of Building 986.

5.4 Analytical Data Quality Assurance

The QA/QC program implemented at OU-A is described in Appendix E. The data quality and data usability for POLLDW are summarized in the following paragraphs.

5.4.1 Off-Site Laboratory

NPDL evaluated all analytical data generated by the off-site laboratories for PARCC. Details of the data validation are presented in the CQARs included in Appendix E.

As noted in the CQARs, NPDL concluded that the soil and groundwater data for POLLDW met QA/QC requirements set forth by the Corps (1990) and EPA's functional guidelines (EPA 1994e) and were not affected adversely by the following data qualifications:

- **VOC analysis:** Approximately 1% of the VOC results (two samples) are rejected because internal standard recoveries failed to meet QC criteria. Approximately 1% of the VOC results (111 individual

analytical results) are considered estimates because surrogate recoveries, holding times, and/or method blanks did not meet QC criteria.

- **BNA analysis:** Less than 1% of the BNA results (three individual analytical results) are considered estimates because method blanks did not meet QC criteria.

- **PAH analysis:** Approximately 12% of the PAH results (one sample) are considered estimates because surrogate recoveries did not meet QC criteria.

- **PCB analysis:** Approximately 19% of the PCB results (four individual analytical results) are considered estimates because surrogate recoveries and/or matrix spike recoveries did not meet QC criteria.

- **GRO analysis:** Approximately 40% of the GRO results (63 samples) are considered estimates because surrogate recoveries, matrix spike recoveries, holding times, and/or method blanks did not meet QC criteria.

- **DRO analysis:** Approximately 8% of the DRO results (12 samples) are considered estimates because surrogate recoveries and/or matrix spike recoveries did not meet QC criteria.

- **TRPH analysis:** Approximately 18% of the TRPH results (27 samples) are considered estimates because matrix spike recoveries did not meet QC criteria.

- **Inorganic analysis:** Approximately 7% of the inorganic results (246 individual analytical results) are considered estimates because matrix spike recoveries did not meet QC criteria.

E & E chemists used the recommendations in the CQAR and EPA CLP guidelines to assign data qualifiers to the analytical results as shown in Table 5-5. The following data qualifiers were applied: Sample concentrations considered to be estimates are flagged "J." Estimated detection limits are flagged "UJ." Results that might be attributed to blank contamination are flagged "B." Unacceptable results were not reported and numerical values were replaced with the qualifier "R." Based on the data qualifications applied, the data are not adversely impacted and considered usable for the purpose of this investigation.

5.4.2 Field Quality Assurance/Quality Control Sample Results

Trip blank and rinsate sample results for POLLDW are presented in Appendix H. Methylene chloride and toluene were detected in laboratory trip blanks and rinsates. Both were attributed to laboratory contamination because they were detected in the laboratory method blanks. The presence of 1,2-dichloropropane in one trip blank, rinsate, and all

groundwater samples associated with a single sample shipment indicate contamination from an unknown source in the field or laboratory.

Lead, alkalinity, and total phosphorous were detected in the rinsate samples at concentrations near or at the MQL. A low potential for cross contamination during sample collection exists because PCBs, GRO, DRO, TRPH, and TOC were not detected in the rinsate. For analytes not detected in the laboratory blanks, the deionized water used to prepare trip blanks and rinsate planks appears to be the most probable cause of this contamination.

Overall, blind duplicate and triplicate data agree and are comparable. For instances in which data did not agree, the discrepancies could not be resolved analytically and are attributed to nonhomogeneous samples.

5.4.3 Data Quality Objectives Assessment

E & E reviewed the analytical data to determine its ability to meet the project data quality objectives identified in the management plan for OU-A (E & E 1995). The following use limitations were identified:

- Specific VOC results were flagged "R," or unusable, because they failed to achieve minimum analytical QC criteria. The number of usable data points to assess site conditions was decreased.

- A fraction of the data results were flagged "J" to indicate that quantitative accuracy is questionable. Although these results are usable, the accuracy of the precise concentration is questionable.

- Results identifying the laboratory contaminant, and the chloroform and methylene chloride groundwater data not otherwise qualified because they are associated with common laboratory contamination, were flagged "B." These results are viewed as having an estimated detection limit. The chemical of concern may or may not be present in the sample, and the result is masked by field or laboratory-introduced contamination by the same chemical of concern.

- Limitations were placed on the qualitative accuracy of $< 1\%$ of the VOC data (51 analytes), 30% of the BNA data (1,040 analytes), 19% of the PAH data (24 analytes), and 3% of the inorganic data (118 analytes) because required analytical detection limits were not achieved. The presence or absence of a chemical of concern cannot be confirmed for these results because the practical quantitative limit was elevated above the required action level as a result of unavoidable matrix effects.

Overall, PARCC parameters were achieved for POLLDW analytical data and their intended use.

5.5 Nature and Extent of Contamination

This section presents the types and spatial distribution of contaminants detected at POLLDW during the RI. Tables 5-6, 5-7, and 5-8 summarize the frequency of detection, range, and locations of maximum concentrations of analytes detected in sludge, subsurface soil, and groundwater at POLLDW. (Appendix H contains all analytical data generated during the OU-4 RI, including detection limits.)

A conservative risk-based screening procedure was used to select site-related contaminants at POLLDW. (Although this screening procedure is similar to the procedure that will be used in the OU-A risk assessment, the contaminant screening for the human health and ecological risk assessments was conducted independently.) The following screening criteria were applied to the to the analytical results to identify contaminants:

- **Inorganic analytes in soil and groundwater:** Inorganic analytes were identified as contaminants if detected at concentrations exceeding the maximum concentration in site-specific background samples or at concentrations exceeding the background levels reported in the background data analysis report for Fort Richardson (E & E 1996).

- **Organic analytes in soil:** Organic analytes in soil were identified as contaminants if detected at concentrations exceeding an excess lifetime cancer risk of 1×10^{-7} or a HI of 0.1 based on EPA Region 3 RBCs (EPA 1995).

- **DRO and GRO analytes in soil:** DRO and GRO analytes in soil were identified as contaminants if detected at concentrations exceeding Alaska non-UST matrix Level A, which corresponds to 100 mg/kg for DRO and 50 mg/kg for GRO (ADEC 1991).

- **Organic analytes in groundwater:** Organic analytes in groundwater were identified as contaminants if detected at concentrations exceeding an excess lifetime cancer risk of 1×10^{-6} or a HI of 0.1, based on EPA Region 3 RBCs (EPA 1995).

The site-related contaminants identified by these screening criteria will be used to determine the nature and extent of contamination at POLLDW and to evaluate risks associated with OU-A. EPA Region 3 RBCs were used as screening criteria for organic analytes because they reflect the most current toxicity criteria available (EPA 1994c). No RBCs exist for petroleum products, so the most conservative levels referenced in *Interim Guidance for Non-UST Contaminated Soil Clean-up Levels* were used as screening criteria (ADEC 1991). Background concentrations were used as screening criteria for inorganic elements because they are expected to provide the most site-specific basis for evaluating the significance of

inorganic analyte concentrations. Aluminum, calcium, iron, magnesium, potassium, and sodium were eliminated from the following discussion because these elements are not associated with toxicity to humans under normal circumstances and are common constituents of uncontaminated soils (EPA 1991).

5.5.1 Dry Well Sludge Contamination

Sludge samples collected from within the dry well were submitted for TCLP analysis. The samples contained petroleum hydrocarbons as kerosene (67,000 mg/kg), cyanide (6.8 mg/kg) and five heavy metals: barium, chromium, lead, silver, and mercury (see Table 5-6). Neither VOCs nor BNAs were detected in the TCLP analysis. Although heavy metals are present, none of the TCLP analytical results exceeded the RCRA criteria for toxicity characteristic hazardous waste. However, a duplicate sludge sample contained a TCLP lead concentration of 5.4 mg/L, which exceeds the RCRA criteria of 5.0 mg/L for the lead toxicity characteristic. Results of the corrosivity and ignitability test results indicate that the sludge does not meet applicable RCRA criteria for these hazardous waste characteristics.

As previously discussed, sludge from the dry well was sampled by the Corps in 1992, and VOCs, BNAs, fuels, and metals were detected (see Table 5-2). Because only TCLP and fuel identification analyses were performed as part of the RI, the results are not directly comparable. However, the absence of detectable concentrations of VOCs and BNAs during the TCLP analyses suggests that degradation and volatilization might have occurred during the intervening three-year period.

5.5.2 Subsurface Soil Contamination

Subsurface soils at POLLDW contained the following site-related contaminants: DRO, GRO, chromium, mercury, and silver (see Table 5-7). Although antimony, calcium, cobalt, magnesium, nickel, potassium, and vanadium were detected at concentrations exceeding the contaminant screening criteria, these analytes are not considered contaminants associated with the dry well based on its site history and previous investigations (E & E 1994b; Corps 1993). Lead was detected at a concentration of 64 mg/kg, which exceeds the contaminant screening criterion of 52 mg/kg, but this slightly elevated concentration is probably the result of geologic variations in the soil and is well below EPA's screening level of 400 mg/kg for lead (EPA 1994e). VOCs and BNAs were not detected at concentrations exceeding the screening criteria.

Mercury was detected in samples collected from AP-3618 at depths of 5 feet BGS (2.2 mg/kg) and 10 feet BGS (0.96 mg/kg). Mercury was also detected in a sample collected

from AP-3622 at 30 feet BGS (0.62 mg/kg). Silver was detected at a depth 40 feet BGS in borings AP-3620 (2.4 mg/kg) and AP-3621 (4.9 mg/kg), and at a depth of 50 feet BGS (12 mg/kg) in boring AP-3620. Although mercury and silver are constituents of the reagents used at the POL laboratory, their distribution does not suggest that their presence is associated with discharges from the dry well. That is, both metals are found in isolated locations at a distance and not in continuous gradient from the dry well, suggesting that these metals do not originate from discharges from the dry well.

Subsurface soil samples containing site-related contaminants (DRO, GRO, and chromium) were collected from borings AP-3619, AP-3620, and monitoring well AP-3648. All of these locations are within a 40-foot radius of the dry well (see Figure 5-7). Because none of the samples collected from borings or wells surrounding these locations contained contamination, the lateral extent of subsurface soil contamination appears to have been delineated during the RI.

The highest DRO and GRO concentrations in subsurface soil were detected in samples collected from borings AP-3619 and AP-3620 at a depth of 15 BGS, which matches the depth of the bottom of the dry well (see Figure 5-8). DRO was detected at a depth of 20 feet BGS in both of these soil borings, but samples collected from these wells at a depth of 30 feet BGS did not contain site-related contaminants. One subsurface soil sample collected from well AP-3648 at a depth of 60 feet BGS contained DRO at a concentration of 140 mg/kg. The presence of DRO at this depth may be related to discharge from the dry well, or it may be a result of other factors including drilling cross-contamination or naturally occurring DRO-like compounds. No other contaminant was detected in POLLDW subsurface soil below a depth of 60 feet BGS. The first occurrence of groundwater is at 120 feet BGS. The estimated area of petroleum-contaminated subsurface soil surrounding the dry well is approximately 3,500 cubic yards.

Chromium contamination was detected in only one sample. The sample was collected from boring AP-3619 at a depth of 15 feet BGS. Therefore, the volume of chromium-contaminated soil cannot be estimated.

5.5.3 Groundwater Contamination

Site-related contaminants were not detected in groundwater samples collected from monitoring wells at POLLDW (see Table 5-9). Although chloroform and methylene chloride were detected in groundwater samples, these analytes were not considered site-related contaminants because they are laboratory contaminants associated with the sample analysis performed for this project. Moreover, neither chloroform nor methylene chloride was

detected in sludge or subsurface soil samples collected at POLLDW. Manganese was detected at concentrations exceeding the screening criteria, but manganese is not considered a site-related contaminant based on results of previous investigations (see Section 5.1). The presence of manganese in the groundwater samples is likely attributable to naturally occurring minerals in groundwater at the site.

5.6 Contaminant Fate and Transport

The physical-chemical characteristics affecting fate and transport of the contaminants detected in sludge and subsurface soil at POLLDW are provided in Appendix F. The following section discusses the major migration pathways identified in the conceptual site model generated for POLLDW in the OU-A management plan (E & E 1995). An updated POLLDW conceptual site model is illustrated in Figure 5-9.

Lateral and vertical migration of contaminants through subsurface soil is the most important migration pathway at POLLDW. Petroleum hydrocarbons have migrated vertically to a maximum depth of 60 feet BGS, but the most significant subsurface soil contamination occurs at a depth of 15 feet BGS, which is the same depth as the dry well bottom. This indicates that vertical transport of contaminants has not occurred extensively through subsurface soil. No site-related contaminants were detected in groundwater. This further substantiates that vertical migration of contaminants is limited. Based on results obtained during the RI, lateral contaminant migration has been restricted to an area within an approximate 40-foot radius of the dry well.

Contaminant transport modeling was performed for petroleum constituents in subsurface soils at POLLDW (see Appendix G). The model suggests that petroleum contaminants would migrate approximately 11 feet vertically from their present location during a 90-year period. Because the distance between the deepest soil contamination at POLLDW and the groundwater table is approximately 40 feet, the likelihood of groundwater contamination caused by contaminants leached from subsurface soil is low. However, the contaminant transport model created for POLLDW soils is based on general input data that does not account for subsurface anomalies that could increase the magnitude of vertical contaminant transport such as till fractures, chemical transformation or periodic increases in soil moisture resulting from variations in precipitation or flooding.

Based on the results of the RI, groundwater has not been impacted from site-related contaminants at POLLDW. Therefore, groundwater does not appear to act as a migration pathway.

5.7 Summary and Conclusions

Petroleum constituents are the primary contaminants at POLLDW, and this contamination is limited to a 1,600-square-foot area surrounding the dry well at depths of 15 to 20 feet BGS. Level A cleanup matrix values were used as a conservative screening tool to evaluate DRO and GRO contamination. The actual matrix score for this site is level C, which has a DRO cleanup value of 1,000 ppm and a GRO cleanup value of 500 ppm. These levels are exceeded in subsurface soils. Heavy metals contaminants are present in subsurface soil, but with the exception of chromium, their isolated occurrence at a distance from the main contamination area suggests that they are not related to discharges from the dry well. Groundwater, located at approximately 120 feet BGS in the vicinity of the POLLDW, does not contain site-related contamination. Given the nature of the subsurface material contaminants in the subsurface soils and the distance to groundwater, the contaminants are not likely to migrate to groundwater.

The updated conceptual site model indicates that many of the potential contaminant migration routes and exposure mechanisms postulated during the development of the management plan for OU-A (E & E 1995) are not applicable to current conditions at POLLDW (see Figure 5-9). Based on the results of the RI, neither volatilization of contaminants to air nor particulate transport of contaminants by wind is a release mechanism. Additionally, neither groundwater nor air represents a potential exposure route associated with site-related contaminants.

In conclusion, POLLDW contains site-related contaminants in subsurface soils. The zone of subsurface soil contamination is approximately 3,500 cubic yards of soil surrounding the dry well discharge level at 20 feet BGS. Groundwater has not been impacted by site-related contaminants. The most likely pathway for contaminant transport is lateral and vertical migration of contaminants with infiltration of precipitation and snowmelt. The OU-A risk assessment addresses the potential risks posed by on-site contaminants to human health and the environment. No further investigations are necessary to determine the need for remedial action at the site.

Table 5-1

POL LABORATORY CHEMICAL REAGENTS

Non-petroleum Reagents
Sodium dichromate
Potassium dichromate
Potassium chromate
Potassium ferricyanide
Mercury
Mercuric iodide
Manganese dioxide
Lead oxide
Lead nitrate
Lead monoxide
Silver nitrate
Lead acetate
Cupric sulfate
Barium chloride
Barium hydroxide
Petroleum Reagents
Kerosene
BPNAP Jet A, Jet A-1
Fuel oil No. 2
JP-4
Fuel oil No. 1
Diesel fuel oil No. 2-D
Fuel oil No. 5
Fuel oil No. 6
Carbon tetrachloride

Key:

POL = Petroleum, oil, and lubricants.

Source: E & E 1994b.

Table 5-2

BUILDING 986 POL LABORATORY DRY WELL
1992 INVESTIGATION
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Analyte	Maximum Concentration in Water	Maximum Concentration in Sludge
VOCs	(µg/L)	(µg/kg)
sec-Butylbenzene	ND	90,000
n-Butylbenzene	ND	150,000
Chloroform	2.3	ND
1,2,-Dichlorobenzene	3.5	4,400
1,4-Dichlorobenzene	1.0	ND
Ethylbenzene	5.6	180,000
Hexachloro-butadiene	ND	52,000
Isopropylbenzene	1.8	18,000
4-Isopropyltoluene	63.0	360,000
4-Methyl-2-pentanone	ND	19,000
Naphthalene	8.1	220,000
n-Propylbenzene	1.8	28,000
Toluene	1.6	180,000
1,2,4-Trimethylbenzene	47.0	490,000
1,3,5-Trimethylbenzene	10	42,000
m&p-Xylene	19.0	840,000
o-Xylene	13.00	32,000
BNAs	(µg/L)	(µg/kg)
Di-n-octyl phthalate	370	16,900
Butylbenzylphthalate	370	16,900
1,2-Dichorlobenzene	650	34,100
2-Methylnaphthalene	660	720,00
Phenanthrene	ND	28,700
Naphthalene	120	290,000

Key at end of table.

Table 5-2

BUILDING 986 POL LABORATORY DRY WELL
1992 INVESTIGATION
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Analyte	Maximum Concentration in Water	Maximum Concentration in Sludge
Fuels	**(mg/L)**	**(mg/kg)**
Jet fuel	120,000	120,000
Diesel fuel No. 2	110,00	19,000
Heavy fuel	380,000	73,000
Other (30-weight motor oil)	76,000	5,170
Metals	**(mg/L)**	**(mg/kg)**
Arsenic	0.027	3.4
Barium	18.2	6,920
Cadmium	0.070	6.6
Chromium	4.2	4,590
Lead	17.1	9,220
Mercury	0.938	317
Selenium	ND	4.2
Silver	0.68	1,510

Key:

BNAs = Base/neutral and acid extractable organic compounds.
µg/kg = Micrograms per kilogram.
µg/L = Micrograms per liter.
mg/kg = Milligrams per kilogram.
mg/L = Milligrams per liter.
ND = Not detected.
POL = Petroleum, oil, and lubricants.
VOCs = Volatile organic compounds.

Source: Corps 1993.

Table 5-3

SOIL AND SLUDGE SAMPLE SUMMARY
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft. BGS)																							Geotechnical Analyses		
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/CN/ Reactivity/pH/ Corrosivity	TCLP VOC	TCLP Metal	TCLP BNA	Grain Size	Atter. Limits Moisture	Specific Gravity
POLLDW3001SG	6/9/95	SLUDGE	DRY WELL			PROJ					x		x								x	x	x	x			
POLLDW3002SG	6/9/95	SLUDGE	DRY WELL			QC					x		x								x	x	x	x			
POLLDW3003SG	6/9/95	SLUDGE	DRY WELL			QA					x		x								x	x	x	x			
POLLDW3001SB	6/8/95	SOIL	AP-3618	5	6.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x					x		x
POLLDW3002SB	6/8/95	SOIL	AP-3618	5	6.5	QC	x	x	x	x		x		x	x												
POLLDW3003SB	6/8/95	SOIL	AP-3618	5	6.5	QA	x	x	x	x		x		x	x												
POLLDW3004SB	6/8/95	SOIL	AP-3618	10	11.5	PROJ	x		x	x		x		x													
POLLDW3005SB	6/8/95	SOIL	AP-3618	15	16.5	PROJ	x		x	x		x		x													
POLLDW3006SB	6/8/95	SOIL	AP-3618	20	21.5	PROJ	x		x	x		x		x													
POLLDW3007SB	6/8/95	SOIL	AP-3618	30	31.5	PROJ	x		x	x		x		x													
POLLDW3008SB	6/8/95	SOIL	AP-3618	40	41.5	PROJ	x		x	x		x		x													
POLLDW3009SB	6/8/95	SOIL	AP-3618	50	51.5	PROJ	x		x	x		x		x													
POLLDW3010SB	6/8/95	SOIL	AP-3619	5	6.5	PROJ	x		x	x		x		x													
POLLDW3011SB	6/8/95	SOIL	AP-3619	10	11.5	PROJ	x		x	x		x		x													
POLLDW3012SB	6/8/95	SOIL	AP-3619	15	16.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x							
POLLDW3013SB	6/9/95	SOIL	AP-3619	20	21.5	PROJ	x		x	x		x		x													
POLLDW3014SB	6/9/95	SOIL	AP-3619	30	31.5	PROJ	x		x	x		x		x													
POLLDW3015SB	6/9/95	SOIL	AP-3619	40	41.5	PROJ	x		x	x		x		x													
POLLDW3016SB	6/9/95	SOIL	AP-3619	50	51.5	PROJ	x		x	x		x		x													
POLLDW3017SB	6/9/95	SOIL	AP-3620	5	6.5	PROJ	x		x	x		x		x													
POLLDW3018SB	6/9/95	SOIL	AP-3620	10	11.5	PROJ	x		x	x		x		x													
POLLDW3019SB	6/9/95	SOIL	AP-3620	10	11.5	QC	x		x	x		x		x													
POLLDW3020SB	6/9/95	SOIL	AP-3620	10	11.5	QA	x		x	x		x		x													
POLLDW3021SB	6/9/95	SOIL	AP-3620	15	16.5	PROJ	x	x	x	x		x		x	x												
POLLDW3022SB	6/9/95	SOIL	AP-3620	20	21.5	PROJ	x		x	x		x		x													
POLLDW3023SB	6/9/95	SOIL	AP-3620	30	31.5	PROJ	x		x	x		x		x													
POLLDW3024SB	6/12/95	SOIL	AP-3620	40	41.5	PROJ	x		x	x		x		x													
POLLDW3025SB	6/12/95	SOIL	AP-3620	50	51.5	PROJ	x		x	x		x		x													

OUA 0020822

Table 5-3

SOIL AND SLUDGE SAMPLE SUMMARY
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft. BGS)																						Geotechnical Analyses			
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/CN/ Reactivity/pH/ Corrosivity	TCLP VOC	TCLP Metal	TCLP BNA	Grain Size	Atter. Limits	Moisture	Specific Gravity
POLLDW3026SB	6/12/95	SOIL	AP-3620	50	51.5	QC	x		x	x		x		x														
POLLDW3027SB	6/12/95	SOIL	AP-3620	50	51.5	QA	x		x	x		x		x														
POLLDW3028SB	6/12/95	SOIL	AP-3621	5	6.5	PROJ	x		x	x		x		x														
POLLDW3029SB	6/12/95	SOIL	AP-3621	10	11.5	PROJ	x		x	x		x		x														
POLLDW3030SB	6/12/95	SOIL	AP-3621	15	16.5	PROJ	x		x	x		x		x														
POLLDW3031SB	6/12/95	SOIL	AP-3621	20	21.5	PROJ	x		x	x		x		x														
POLLDW3032SB	6/12/95	SOIL	AP-3621	30	31.5	PROJ	x		x	x		x		x														
POLLDW3033SB	6/12/95	SOIL	AP-3621	40	41.5	PROJ	x		x	x		x		x														
POLLDW3034SB	6/12/95	SOIL	AP-3621	50	51.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x								
POLLDW3035SB	6/13/95	SOIL	AP-3622	5	6.5	PROJ	x		x	x		x		x														
POLLDW3036SB	6/13/95	SOIL	AP-3622	10	11.5	PROJ	x		x	x		x		x														
POLLDW3037SB	6/13/95	SOIL	AP-3622	15	16.5	PROJ	x		x	x		x		x														
POLLDW3038SB	6/13/95	SOIL	AP-3622	20	21.5	PROJ	x		x	x		x		x														
POLLDW3039SB	6/13/95	SOIL	AP-3622	30	31.5	PROJ	x	x	x	x		x		x	x													
POLLDW3040SB	6/13/95	SOIL	AP-3622	30	31.5	QC	x	x	x	x		x		x	x													
POLLDW3041SB	6/13/95	SOIL	AP-3622	30	31.5	QA	x		x	x		x		x		x	x	x	x	x								
POLLDW3042SB	6/13/95	SOIL	AP-3622	40	41.5	PROJ	x		x	x		x		x		x	x	x	x	x								
POLLDW3043SB	6/13/95	SOIL	AP-3622	50	51.5	PROJ	x		x	x		x		x											x		x	
POLLDW3044SB	6/13/95	SOIL	AP-3623	5	6.5	PROJ	x		x	x		x		x														
POLLDW3045SB	6/13/95	SOIL	AP-3623	10	11.5	PROJ	x		x	x		x		x														
POLLDW3046SB	6/13/95	SOIL	AP-3623	10	11.5	QC	x		x	x		x		x														
POLLDW3047SB	6/13/95	SOIL	AP-3623	10	11.5	QA	x		x	x		x		x														
POLLDW3048SB	6/13/95	SOIL	AP-3623	15	16.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x								
POLLDW3049SB	6/14/95	SOIL	AP-3623	20	21.5	PROJ	x		x	x		x		x														
POLLDW3050SB	6/14/95	SOIL	AP-3623	30	31.5	PROJ	x		x	x		x		x											x			
POLLDW3051SB	6/14/95	SOIL	AP-3623	40	41.5	PROJ	x		x	x		x		x														
POLLDW3052SB	6/14/95	SOIL	AP-3623	50	51.5	PROJ	x		x	x		x		x														
POLLDW3053SB	6/14/95	SOIL	AP-3624	5	6.5	PROJ			x	x		x		x														

OUA 0020823

Table 5-3

SOIL AND SLUDGE SAMPLE SUMMARY
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft. BGS)																							Geotechnical Analyses			
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/CN/ Reactivity/pH/ Corrosivity	TCLP VOC	TCLP Metal	TCLP BNA	Grain Size	Atter. Limits	Moisture	Specific Gravity
POLLDW3054SB	6/14/95	SOIL	AP-3624	10	11.5	PROJ	x		x	x		x		x															
POLLDW3055SB	6/14/95	SOIL	AP-3624	15	16.5	PROJ	x		x	x		x		x															
POLLDW3056SB	6/14/95	SOIL	AP-3624	20	21.5	PROJ	x		x	x		x		x															
POLLDW3057SB	6/14/95	SOIL	AP-3624	30	31.5	PROJ	x		x	x		x		x												x		x	
POLLDW3058SB	6/15/95	SOIL	AP-3624	40	41.5	PROJ	x		x	x		x		x															
POLLDW3059SB	6/15/95	SOIL	AP-3624	50	51.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x									
POLLDW3060SB	6/15/95	SOIL	AP-3624	50	51.5	QC	x		x	x		x		x															
POLLDW3061SB	6/15/95	SOIL	AP-3624	50	51.5	QA	x		x	x		x		x															
POLLDW3062SB	6/15/95	SOIL	AP-3624	60	61.5	PROJ	x		x	x		x		x															
POLLDW3063SB	6/15/95	SOIL	AP-3624	70	71.5	PROJ	x		x	x		x		x															
POLLDW3064SB	6/15/95	SOIL	AP-3625	5	6.5	PROJ	x		x	x		x		x															
POLLDW3065SB	6/15/95	SOIL	AP-3625	10	11.5	PROJ	x		x	x		x		x															
POLLDW3066SB	6/15/95	SOIL	AP-3625	15	16.5	PROJ	x		x	x		x		x															
POLLDW3067SB	6/15/95	SOIL	AP-3625	20	21.5	PROJ	x		x	x		x		x												x		x	
POLLDW3068SB	6/15/95	SOIL	AP-3625	30	31.5	PROJ	x		x	x		x		x															
POLLDW3069SB	6/16/95	SOIL	AP-3625	40	41.5	PROJ	x		x	x		x		x															
POLLDW3070SB	6/16/95	SOIL	AP-3625	50	51.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x						x		x	
POLLDW3071SB	6/16/95	SOIL	AP-3626	5	6.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x									
POLLDW3072SB	6/16/95	SOIL	AP-3626	10	11.5	PROJ	x		x	x		x		x															
POLLDW3073SB	6/16/95	SOIL	AP-3626	15	16.5	PROJ	x		x	x		x		x															
POLLDW3074SB	6/16/95	SOIL	AP-3626	20	21.5	PROJ	x		x	x		x		x															
POLLDW3075SB	6/16/95	SOIL	AP-3626	30	31.5	PROJ	x		x	x		x		x															
POLLDW3076SB	6/16/95	SOIL	AP-3626	40	41.5	PROJ	x		x	x		x		x															
POLLDW3077SB	6/16/95	SOIL	AP-3626	50	51.5	PROJ	x		x	x		x		x															
POLLDW3078SB	6/19/95	SOIL	AP-3627	5	6.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x									
POLLDW3079SB	6/19/95	SOIL	AP-3627	5	6.5	QC	x	x	x	x		x		x	x	x	x	x	x	x									
POLLDW3080SB	6/19/95	SOIL	AP-3627	5	6.5	QA	x	x	x	x		x		x	x											x		x	
POLLDW3081SB	6/19/95	SOIL	AP-3627	10	11.5	PROJ	x		x	x		x		x															

OUA 0020824

Table 5-3

SOIL AND SLUDGE SAMPLE SUMMARY
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft. BGS)																							Geotechnical Analyses			
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/CN/ Reactivity/pH/ Corrosivity	TCLP VOC	TCLP Metal	TCLP BNA	Grain Size	Atter. Limits Moisture	Specific Gravity
POLLDW3082SB	6/19/95	SOIL	AP-3627	15	16.5	PROJ	x		x	x		x		x													
POLLDW3083SB	6/19/95	SOIL	AP-3627	20	21.5	PROJ	x		x	x		x		x													
POLLDW3084SB	6/19/95	SOIL	AP-3627	30	31.5	PROJ	x		x	x		x		x													
POLLDW3085SB	6/19/95	SOIL	AP-3627	40	41.5	PROJ	x		x	x		x		x													
POLLDW3086SB	6/19/95	SOIL	AP-3627	50	51.5	PROJ	x		x	x		x		x													
POLLDW3087SB	6/30/95	SOIL	AP-3628	5	6.5	PROJ	x		x	x		x		x											x	x	
POLLDW3088SB	6/30/95	SOIL	AP-3628	10	11.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x							
POLLDW3089SB	6/30/95	SOIL	AP-3628	10	11.5	QC	x	x	x	x		x		x	x										x	x	
POLLDW3090SB	6/30/95	SOIL	AP-3628	10	11.5	QA	x	x	x	x		x		x	x												
POLLDW3091SB	6/30/95	SOIL	AP-3628	15	16.5	PROJ	x		x	x		x		x													
POLLDW3092SB	6/30/95	SOIL	AP-3628	20	21.5	PROJ	x		x	x		x		x													
POLLDW3093SB	6/30/95	SOIL	AP-3628	30	31.5	PROJ	x		x	x		x		x													
POLLDW3094SB	6/30/95	SOIL	AP-3628	40	41.5	PROJ	x		x	x		x		x													
POLLDW3095SB	6/30/95	SOIL	AP-3628	50	51.5	PROJ	x		x	x		x		x													
POLLDW001SP	7/12/95	STOCKPILE	STOCKPILE	0	1	PROJ			x	x												x	x				
POLLDW002SP	9/21/95	SOIL	STOCKPILE			PROJ			x	x												x	x				
POLLDW3096SB	8/14/95	SOIL	AP-3648	60	61.5	PROJ/QA	x		x	x		x		x											x	x	
POLLDW3097SB	8/15/95	SOIL	AP-3648	80	81.5	PROJ	x		x	x		x		x													
POLLDW3098SB	8/15/95	SOIL	AP-3648	90	91.5	PROJ	x		x	x		x		x													
POLLDW3099SB	8/16/95	SOIL	AP-3648	100	101.5	PROJ	x		x	x		x		x													
POLLDW3100SB	8/16/95	SOIL	AP-3648	110	111.5	PROJ	x		x	x		x		x											x	x	
POLLDW3101SB	8/16/95	SOIL	AP-3648	120	121.5	PROJ/QA	x	x	x	x		x		x	x	x	x	x	x	x							
POLLDW3102SB	8/16/95	SOIL	AP-3648	120	121.5	PROJ	x	x	x	x		x		x													
POLLDW3103SB	8/16/95	SOIL	AP-3648	120	121.5	QA	x		x	x		x		x													
POLLDW3104SB	8/17/95	SOIL	AP-3649	60	61.5	PROJ	x		x	x		x		x													
POLLDW3105SB	8/18/95	SOIL	AP-3649	70	71.5	PROJ	x		x	x		x		x											x	x	
POLLDW3106SB	8/18/95	SOIL	AP-3649	80	81.5	PROJ/QA	x		x	x		x		x													
POLLDW3107SB	8/18/95	SOIL	AP-3649	100	101.5	PROJ	x		x	x		x		x													

OUA - 0020825

Table 5-3

SOIL AND SLUDGE SAMPLE SUMMARY
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft. BGS)																						Geotechnical Analyses			
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/CN/ Reactivity/pH/ Corrosivity	TCLP VOC	TCLP Metal	TCLP BNA	Grain Size	Atter. Limits	Moisture	Specific Gravity
POLLDW3108SB	8/18/95	SOIL	AP-3649	110	111.5	PROJ	x		x	x		x		x														
POLLDW3109SB	8/18/95	SOIL	AP-3649	120	121.5	PROJ	x	x	x	x		x		x	x	x	x	x	x	x								
POLLDW3110SB	8/18/95	SOIL	AP-3649	120	121.5	PROJ	x	x	x	x		x		x	x													
POLLDW3111SB	8/18/95	SOIL	AP-3649	120	121.5	QA	x		x	x		x		x	x													
POLLDW3112SB	8/20/95	SOIL	AP-3650	60	61.5	PROJ	x		x	x		x		x														
POLLDW3113SB	8/20/95	SOIL	AP-3650	70	71.5	PROJ	x		x	x		x		x														
POLLDW3114SB	8/20/95	SOIL	AP-3650	80	81.5	PROJ	x		x	x		x		x														
POLLDW3115SB	8/20/95	SOIL	AP-3650	90	91.5	PROJ	x																					
POLLDW3116SB	8/20/95	SOIL	AP-3650	100	101.5	PROJ	x		x	x		x		x														
POLLDW3117SB	8/20/95	SOIL	AP-3650	110	111.5	PROJ	x		x	x		x		x														
POLLDW3118SB	8/20/95	SOIL	AP-3650	120	121.5	PROJ/QA	x	x	x	x		x		x	x	x	x	x	x	x					x		x	
POLLDW3119SB	8/20/95	SOIL	AP-3650	120	121.5	PROJ	x	x	x	x		x		x	x													
POLLDW3120SB	8/20/95	SOIL	AP-3650	120	121.5	QA	x		x	x		x		x	x													
POLLDW3121SB	8/23/95	SOIL	AP-3651	60	61.5	PROJ	x		x	x		x		x														
POLLDW3122SB	8/23/95	SOIL	AP-3651	70	71.5	PROJ	x		x	x		x		x														
POLLDW3123SB	8/23/95	SOIL	AP-3651	80	81.5	PROJ	x		x	x		x		x														
POLLDW3124SB	8/23/95	SOIL	AP-3651	90	91.5	PROJ	x		x	x		x		x														
POLLDW3125SB	8/22/95	SOIL	AP-3651	100	101.5	PROJ/QA	x		x	x		x		x											x		x	
POLLDW3126SB	8/23/95	SOIL	AP-3651	110	111.5	PROJ	x		x	x		x		x														
POLLDW3127SB	8/23/95	SOIL	AP-3651	120	121.5	PROJ	x	x	x	x		x		x	x		x	x										
POLLDW3128SB	8/23/95	SOIL	AP-3651	120	121.5	PROJ	x	x	x	x		x		x	x													
POLLDW3129SB	8/22/95	SOIL	AP-3651	12	121.5	QA	x	x	x	x		x		x	x													
POLLDW3130SB	8/23/95	SOIL	AP-3652	60	61.5	PROJ	x		x	x		x		x														
POLLDW3131SB	8/24/95	SOIL	AP-3652	70	71.5	PROJ	x		x	x		x		x														
POLLDW3132SB	8/24/95	SOIL	AP-3652	70	71.5	PROJ	x		x	x		x		x														
POLLDW3133SB	8/24/95	SOIL	AP-3652	70	71.5	QA	x	x	x	x		x		x														
POLLDW3134SB	8/24/95	SOIL	AP-3652	80	81.5	PROJ/QA	x	x	x	x		x		x	x	x	x	x	x	x					x		x	
POLLDW3135SB	8/24/95	SOIL	AP-3652	90	91.5	PROJ	x		x	x		x		x														

OUA 0020826

Table 5-3

SOIL AND SLUDGE SAMPLE SUMMARY
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

				Sample Interval (ft. BGS)																					Geotechnical Analyses			
Sample ID	Date	Matrix	Location	Top	Bottom	Type	VOC	BNA	DRO	GRO	Fuel ID	TRPH	PCBs	Total Metals	TOC	Alkalinity	TKN	Phosphorous	pH	Het. Bact	Flashpoint/CN/ Reactivity/pH/ Corrosivity	TCLP VOC	TCLP Metal	TCLP BNA	Grain Size	Atter. Limits	Moisture	Specific Gravity
POLLDW3136SB	8/24/95	SOIL	AP-3652	110	111.5	PROJ	x		x	x		x		x														
POLLDW3137SB	8/24/95	SOIL	AP-3652	120	121.5	PROJ	x		x	x		x		x														

Key:

Atter. Limits = Atterburg Limits.
BNA = Base/neutral and acid-extractable organic compounds.
CN = Cyanide.
DRO = Diesel-range organics.
ft. BGS = Feet below ground surface.
GRO = Gasoline-range organics.
Het. Bact. = Heterotrophic bacteria.
PCBs = Polychlorinated biphenyls.
POL = Petroleum, oil, and lubricants.
PROJ = Project sample.
QA = Quality assurance sample.
QC = Quality control sample.
TCLP = Toxicity characteristic leaching procedure.
TKN = Total Kjeldahl nitrogen.
TOC = Total organic carbon.
TRPH = Total recoverable petroleum hydrocarbons.
VOC = Volatile organic compounds.
X = Analysis was perormed.

OUA 0020827

Table 5-4

GROUNDWATER SAMPLE SUMMARY
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample ID	Date	Location	Type	VOC	BNA	PAH	DRO	GRO	TRPH	Total Metals	Dissolved Metals	TOC	Total and Dissolved Anions/Cations	Alkalinity	TDS/TSS	Hardness	Phosphorous	Heterotrophic Bacteria	BOD	Nitrate/Nitrite	Sulfate	Sulfide	Chloride
POLLDW3001GW	9/29/95	AP-3648	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
POLLDW3002GW	9/29/95	AP-3648	QC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
POLLDW3003GW	9/29/95	AP-3648	QA	x	x		x	x	x	x		x											
POLLDW3003WA	8/22/95	RINSATE	PROJ	x	x		x	x	x	x		x											
POLLDW3004GW	10/1/95	AP-3649	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
POLLDW3004WA	8/22/95	TRIP BLANK	PROJ	x				x															
POLLDW3005GW	10/1/95	AP-3651	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
POLLDW3005WA	9/29/95	RINSATE	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
POLLDW3006GW	10/1/95	AP-3650	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
POLLDW3006WA	9/29/95	TRIP BLANK	PROJ	x	x	x	x	x	x														
POLLDW3007GW	10/1/95	AP-3652	PROJ	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
POLLDW3007WA	9/26/95	TRIP BLANK	QA	x			x	x	x														
POLLDW3001WA	6/30/95	RINSATE	PROJ	x	x		x	x	x	x		x											
POLLDW3002WA	6/30/95	TRIP BLANK	PROJ	x				x															

Key:

BNA = Base/neutral and acid-extractable organic compounds.
BOD = Biochemical oxygen demand.
DRO = Diesel-range organics.
GRO = Gasoline-range organics.
PAH = Polynuclear aromatic hydrocarbons.
POL = Petroleum, oil, and lubricants.
PROJ = Project sample.
QA = Quality assurance sample.
QC = Quality control sample.
TDS/TSS = Total dissolved solids/total suspended solids.

OUA 0020828

TOC = Total organic carbon.
TRPH = Total recoverable petroleum hydrocarbons.
VOC = Volatile organic compounds.
X = Analysis was performed.

Table 5-5

SUMMARY OF QUALIFIED DATA
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95POLLDW-)	Data Qualifiers Applied[a]
VOC (EPA Method 8260)			
Surrogate recovery	Recoveries were above EPA QC limits	3001SB, 3008SB, 3017SB(RE), 3021SB, 3026SB, 3029SB, 3030SB, 3032SB, 3033SB, 3036SB, 3037SB, 3069SB, 3072SB, 3074SB, 3076SB, 3077SB, 3092SB	J, UJ
	Recoveries were below EPA QC limits	3004SB, 3009SB, 3010SB, 3014SB, 3015SB, 3018SB, 3019SB, 3022SB, 3023SB, 3057SB, 3059SB, 3075SB(RE), 3093SB-3095SB	J, UJ
	Recoveries were outside of EPA QC limits	3011SB-3013SB, 3016SB, 3025SB, 3028SB, 3028SB(RE), 3034SB, 3062SB, 3070SB, 3075SB	J, UJ
Method blanks	Methylene chloride was detected in VOA method blanks	3041SB, 3047SB, 3061SB, 3080SB, 3003WA - 3007WA, 3001GW, 3002GW, 3004GW, 3006GW	B
	Methylene chloride, acetone, and 2-butanone were detected in VOA method blanks	3096SB - 3110SB, 3112SB - 3119SB, 3121SB - 3128SB, 3130SB - 3132SB, 3134SB - 3137SB	B
	Chloroform was detected in VOA method blanks	3003SB	B
Trip blanks	1,2 Dichloropropane was detected in trip and rinsate blanks	3001GW, 3002GW, 3004GW, 3005GW, 3006GW, 3007GW, 3005WA, 3006WA	B
Rinsate blanks	1,2 Dichloropropane was detected in trip and rinsate blanks	3001GW, 3002GW, 3004GW, 3005GW, 3006GW, 3007GW, 3005WA, 3006WA	B

Key at end of table.

OUA 0020830

Table 5-5

SUMMARY OF QUALIFIED DATA
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95POLLDW-)	Data Qualifiers Applied[a]
Holding times	Analysis was performed after the EPA recommended holding time	3001SB, 3002SB, 3011SB, 3011SB(RE), 3012SB, 3017SB(RE), 3028SB(RE), 3059SB(RE), 3062SB(RE), 3069SB(RE), 3070SB(RE), 3075SB(RE), 3092SB(RE)-3094SB(RE), 3021SB	J, UJ
Internal standard	Recoveries were outside of EPA QC limits	3017SB, 3028SB	R
BNA (EPA Method 8270)			
Method blanks	Di-n-butylphthalate was detected in the soil method blank	3021SB, 3034SB, 3001WA	B
PAH (EPA Method 8310)			
Surrogate recovery	Recoveries were below EPA QC limits	3005GW	J, UJ
PCBs (EPA Method 8080)			
Surrogate recovery	Recoveries were below EPA QC limits	3001SG, 3002SG	J, UJ
Matrix spike recovery	Recoveries were below EPA QC limits	3001SG, 3002SG	J, UJ
GRO (ADEC modified EPA Method 8015) and Fuel Identification (Corps modified EPA Method 8015)			
Surrogate recovery	GRO recoveries were diluted out	3012SB, 3021SB	J, UJ
	GRO recoveries were below ADEC QC limits	3092SB-3094SB	J, UJ
	FIQ recoveries were diluted out	3003SG	J, UJ
Matrix spike	GRO recoveries were below the ADEC QC limits	3087SB-3095SB	J, UJ

Key at end of table.

Table 5-5

SUMMARY OF QUALIFIED DATA
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95POLLDW-)	Data Qualifiers Applied[a]
	FIQ recoveries were diluted out	3003SG	J, UJ
Method blanks	GRO was detected in the method blank	3001SB-3011SB, 3013SB-3016SB, 3058SB-303086SB,	B
Holding times	Analysis was performed 8 days after the recommended holding time for GRO	3092SB-3094SB	J, UJ
DRO (ADEC modified EPA Method 8100)			
Surrogate recovery	Recoveries were diluted out	3012SB, 3013SB, 3021SB	J, UJ
Matrix spike recovery	Recoveries were above ADEC QC limits	3087SB-3095SB	J, UJ
TRPH (EPA Method 418.1)			
Holding time	Samples were analyzed beyond established holding times	3121SB-3128SB	J, UJ
Method blank	TRPH was detected in method blanks	3096SB-3102SB, 3114SB, 3104SB-3107SB, 3001GW, 3002GW, 3005WA, 3004GW-3007GW	B
Matrix spike recovery	Recoveries were above EPA QC limits	3087SB-3095SB	J, UJ
Inorganics			
Holding time	Nitrate and phosphorous samples were analyzed beyond established holding times	3001GW - 3007GW, 3005 WA	J, UJ
	TDS was analyzed beyond established holding times	3007GW	J, UJ
Matrix spike recovery	Cyanide and sulfide spike recoveries were below EPA QC limits	3001SG, 3002SG	J, UJ

Key at end of table.

OUA0020832

Table 5-5

SUMMARY OF QUALIFIED DATA
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

QC Procedure	Problem Encountered	Affected Samples (95POLLDW-)	Data Qualifiers Applied[a]
	Cyanide spike recoveries were above EPA QC limits	3003SG	J, UJ
	Mercury spike recoveries were below EPA QC limit	3001SB-3016SB	J, UJ
	Mercury spike recoveries were above EPA QC limit	3001SG, 3002SG	J, UJ
	Chromium spike recoveries were above EPA QC limit	3001SB-3016SB	J, UJ
	Antimony spike recoveries were outside of EPA QC limits	3001SB-3037SB, 3058SB-3095SB, 3101SB, 3104SB-3107SB, 3114SB-3119SB, 3121SB-3128SB, 3130SB-3132SB, 3134SB-3137SB	J, UJ
	Antimony and silver spike recoveries were outside of EPA QC limits	3096SB-3102SB, 3108SB-3110SB, 3112SB, 3113SB	J, UJ
	Calcium spike recoveries were below EPA QC limits	3003SB, 3020SB, 3027SB	J, UJ
	Calcium spike recoveries were above EPA QC limits	3017SB-3057SB, 3061SB, 3087SB-3095SB	J, UJ
	Magnesium and vanadium spike recoveries were above EPA QC limits	3087SB-3095SB	J, UJ
	Potassium spike recoveries were above EPA QC limits	3058SB-3077SB	J, UJ

[a] = Data qualifiers were determined based on CQAR recommendations and *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA 540/R-94/012, February 1994, and *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-94/013, February 1994.

Key:

ADEC = Alaska Department of Environmental Conservation.
B = Detected also in method blank (when less than 10 times the associated method blank concentration).
BNA = Base/neutral and acid-extractable organic compounds.

OUA 0020833

Table 5-5 (Cont.)

CQAR = Chemical Quality Assurance Report.
DRO = Diesel-range organics.
EPA = United States Environmental Protection Agency.
FIQ = Fuel identification.
GRO = Gasoline-range organics.
J = Estimated concentration (detected).
POL = Petroleum, oil, and lubricants.
QC = Quality control.
R = Rejected. Data are unusable.
TDS = Total dissolved solids.
TRPH = Total recoverable petroleum hydrocarbons.
UJ = Estimated detection limit (nondetected).
VOA = Volatile organic analytes.
VOC = Volatile organic compounds.

OUA 0020834

Table 5-6

SUMMARY OF SLUDGE SAMPLE RESULTS
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Analyte	Frequency of Detection	Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
Inorganics (µg/L)				
TCLP Barium	1/1	4,500	--	NA
TCLP Chromium	1/1	240	--	NA
TCLP Lead	1/1	4,600	--	NA
TCLP Mercury	1/1	875	--	NA
TCLP Silver	1/1	240	--	NA
Cyanide (mg/kg)	1/1	6.8	--	NA
Fuel ID (mg/kg)				
Kerosene	1/1	67,000	--	NA
Corrosivity (mm/yr)	1/1	0.0007	--	NA

Key:

-- = No screening criterion exists for analyte.
J = Estimated.
µg/L = Micrograms per liter.
mg/kg = Milligrams per kilogram.
mm/yr = Millimeters per year.
NA = Not applicable.
POL = Petroleum, oil, and lubricants.
TCLP = Toxicity characteristic leaching procedure.

OUA 0020835

Table 5-7

SUMMARY OF SUBSURFACE SOIL SAMPLE RESULTS
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
DRO	55/66	2 - 1,800	AP-3619 (15 ft.)	100[a]	6
GRO	8/56	0.34 - 650	AP-3619 (15 ft.)	50[a]	3
TRPH	31/66	9.4 - 1,100	AP-3620 (15 ft.)	2,000[a]	0
VOCs					
Acetone	8/62	0.022 - 0.27	AP-3628 (40 ft.)	780[b]	0
Benzene	1/64	0.0068	AP-3619 (20 ft.)	2.2[b]	0
2-Butanone	1/64	0.012	AP-3619 (10 ft.)	4,700[b]	0
4-Chlorotoluene	1/64	0.031	AP-3620 (15 ft.)	--	NA
1,2-Dichloroethane	1/64	0.007	AP-3620 (50 ft.)	0.7[b]	0
Ethylbenzene	1/64	0.031	AP-3619 (15 ft.)	780[b]	0
2-Hexanone	1/64	0.025	AP-3620 (20 ft.)	--	NA
4-Methyl-2-pentanone	5/64	0.03 - 61	AP-3619 (15 ft.)	--	NA
Methylene Chloride	4/54	0.0058 - 0.013	AP-3652 (80 ft.)	8.5[b]	0
Naphthalene	5/73	0.0059 - 0.6	AP-3619 (15 ft.)	310[b]	0
o-Xylene	1/64	0.34	AP-3619 (15 ft.)	16,000[b]	0

Key at end of table.

OUA 0020836

Table 5-7

SUMMARY OF SUBSURFACE SOIL SAMPLE RESULTS
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
p-Isopropyltoluene	3/64	0.027 - 1	AP-3619 (15 ft.)	--	NA
Tetrachloroethene	2/64	0.028 - 0.8	AP-3620 (15 ft.)	1.2[b]	0
1,2,4-Trimethylbenzene	1/64	0.047	AP-3620 (20 ft.)	390[b]	0
1,3,5-Trimethylbenzene	2/64	0.047 - 1.3	AP-3619 (15 ft.)	390[b]	0
m- & p-Xylene	1/64	0.016	AP-3620 (20 ft.)	16,000[b]	0
BNAs					
Bis(2-ethylhexyl)phthalate	2/9	0.37 - 1.1	AP-3622 (30 ft.)	4.6[b]	0
Di-n-butyl phthalate	1/8	0.74	AP-3620 (15 ft.)	--	NA
2-Methylnaphthalene	2/9	1.9 - 2.7	AP-3620 (15 ft.)	310[b]	0
Phenanthrene	2/9	0.17 - 0.18	AP-3619 (15 ft.)	--	NA
Inorganics					
Aluminum	66/66	5,700 - 21,000	AP-3621 (5 ft.)	27,000[c]	0
Antimony	25/66	0.46 - 5.4	AP-3648 (80 ft.)	0.5[c]	22
Arsenic	66/66	1.2 - 6.1	AP-3648 (80 ft.)	16[c]	0
Barium	66/66	20.9 - 120	AP-3621 (5 ft.)	744[c]	0

Key at end of table.

OUA 0020837

Table 5-7

SUMMARY OF SUBSURFACE SOIL SAMPLE RESULTS
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
Beryllium	23/66	0.11 - 0.33	AP-3648 (80 ft.)	0.38[c]	0
Cadmium	42/66	0.051 - 0.27	AP-3619 (10 ft.)	12.8[c]	0
Calcium	66/66	2,500 - 13,600	AP-3648 (80 ft.)	13,000[c]	2
Chromium	66/66	12 - 120	AP-3619 (15 ft.)	69[c]	1
Cobalt	66/66	6.2 - 36	AP-3620 (50 ft.)	21[c]	1
Copper	66/66	15 - 44.4	AP-3648 (120 ft.)	54[c]	0
Iron	66/66	14,000 - 31,000	AP-3648 (120 ft.)	43,000[c]	0
Lead	66/66	2.7 - 64	AP-3621 (5 ft.)	52[c]	1
Magnesium	66/66	4,400 - 55,000	AP-3620 (50 ft.)	24,000[c]	1
Manganese	66/66	335 - 880	AP-3619 (30 ft.)	910[c]	0
Mercury	37/66	0.066 - 2.2	AP-3618 (5 ft.)	0.6[c]	3
Nickel	66/66	18 - 280	AP-3620 (50 ft.)	170[c]	1
Potassium	66/66	280 - 962	AP-3648 (80 ft.)	950[c]	1
Selenium	16/66	0.055 - 0.25	AP-3649 (80 ft.)	2.5[c]	0
Silver	3/66	2.4 - 12	AP-3620 (50 ft.)	4.2[c]	2

Key at end of table.

OUA 0020838

Table 5-7

SUMMARY OF SUBSURFACE SOIL SAMPLE RESULTS
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(mg/kg)

Analyte	Frequency of Detection	Range of Concentrations	Location and Depth of Maximum Concentration (ft. BGS)	Screening Concentration	Number of Samples Exceeding Screening Concentration
Sodium	64/66	52 - 315	AP-3648 (60 ft.)	400[c]	0
Thallium	9/66	0.11 - 0.66	AP-3618 (15 ft.)	2.3[c]	0
Vanadium	66/66	22 - 78.8	AP-3648 (80 ft.)	77[c]	1
Zinc	66/66	36 - 67	AP-3619 (10 ft.)	108[c]	0

a Screening criteria based on Alaska non-UST matrix level A concentrations for petroleum-contaminated soil (ADEC 1991).

b Screening criteria based on EPA Region 3 risk-based concentrations corresponding to excess lifetime cancer risks of 1×10^{-7} or a hazard index of 0.1 (EPA 1995).

c Screening criteria based on the maximum concentrations detected in site-specific background samples or background levels listed in the Background Data Analysis Report, Fort Richardson (E & E 1996).

Key:

– = No screening concentration exists for analyte.
ft. BGS = Feet below ground surface.
BNAs = Base/neutral and acid-extractable organic compounds.
DRO = Diesel-range organics.
mg/kg = Milligrams per kilogram.
NA = Not applicable.
PCBs = Polychlorinated biphenyls.
POL = Petroleum, oil, and lubricants.
TRPH = Total recoverable petroleum hydrocarbons.
VOCs = Volatile organic compounds.

OUA 0020839

Table 5-8

SUMMARY OF GROUNDWATER SAMPLE RESULTS
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(µg/L)

Analyte	Frequency of Detection	Range of Detected Concentrations	Location of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
VOCs					
Chloroform	2/4	3.2 - 11.8	AP-3648	0.15[a]	2
Methylene chloride	1/2	5.6	AP-3652	4.1[a]	1
Inorganics					
Aluminum	3/4	330 - 1,100	AP-3650	1,100[b]	0
Arsenic	2/4	0.8 - 1.2	AP-3648	430[b]	0
Arsenic - filtered	1/4	0.5	AP-3648	9.9[b]	0
Barium	4/4	17 - 35	AP-3650	2,100[b]	0
Barium - filtered	4/4	17 - 28	AP-3650	510[b]	0
Calcium	4/4	49,800 - 119,000	AP-3650	86,800[b]	1
Calcium - filtered	4/4	52,200 - 122,000	AP-3650	90,600[b]	1
Chromium	1/4	5	AP-3650	1,900[b]	0
Copper	1/4	6.5	AP-3650	323[b]	0
Iron	4/4	67 - 2,100	AP-3650	2,000[b]	1
Lead	3/4	1.1 - 1.5	AP-3648	240[b]	0

Key at end of table.

OUA 0020840

Table 5-8

SUMMARY OF GROUNDWATER SAMPLE RESULTS
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(µg/L)

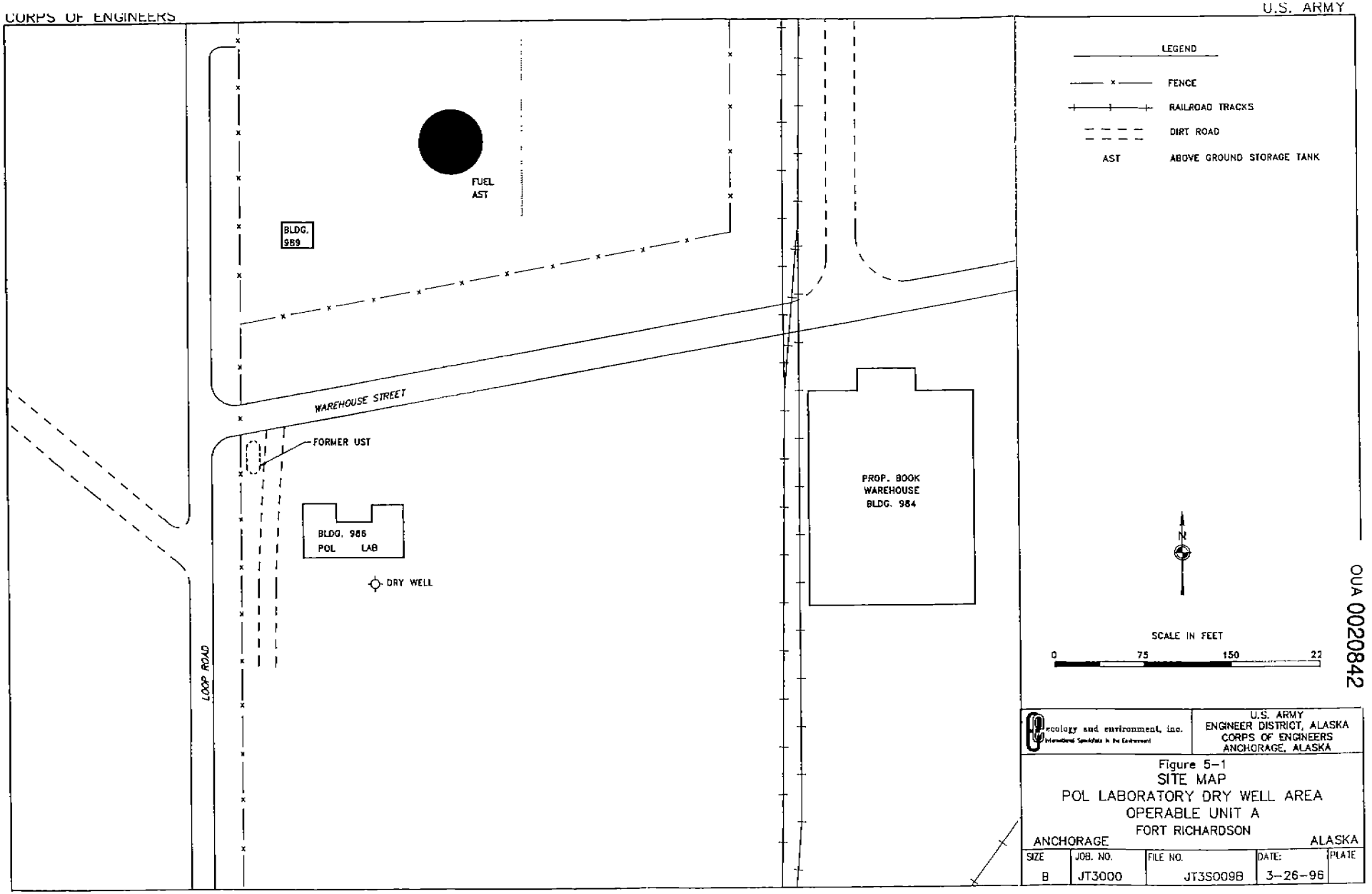
Analyte	Frequency of Detection	Range of Detected Concentrations	Location of Maximum Concentration	Screening Concentration	Number of Samples Exceeding Screening Concentration
Magnesium	4/4	6,300 - 13,100	AP-3650	12,000[b]	1
Magnesium - filtered	4/4	6,600 - 13,100	AP-3650	12,100[b]	1
Manganese	4/4	15 - 120	AP-3650	79[b]	1
Manganese - filtered	4/4	10 - 47	AP-3650	11[b]	3
Potassium - filtered	1/4	1,700	AP-3650	–	NA
Selenium	1/4	1	AP-3648	–	NA
Sodium	4/4	2,500 - 3,600	AP-3650	3,300[b]	2
Sodium - filtered	4/4	2,600 - 3,600	AP-3649	3,400[b]	2
Zinc	3/4	12 - 15	AP-3650	1,900[b]	0
Zinc - filtered	2/4	5.9 - 6.3	AP-3652	1,300[b]	0

a Screening criteria based on EPA Region 3 risk-based concentrations corresponding to excess lifetime cancer risk of 1×10^{-6} or a hazard index of 0.1.
b Screening criteria based on the maximum concentration detected in site-specific background samples or background levels listed in the Background Data Analysis Report, Fort Richardson (E & E 1996).

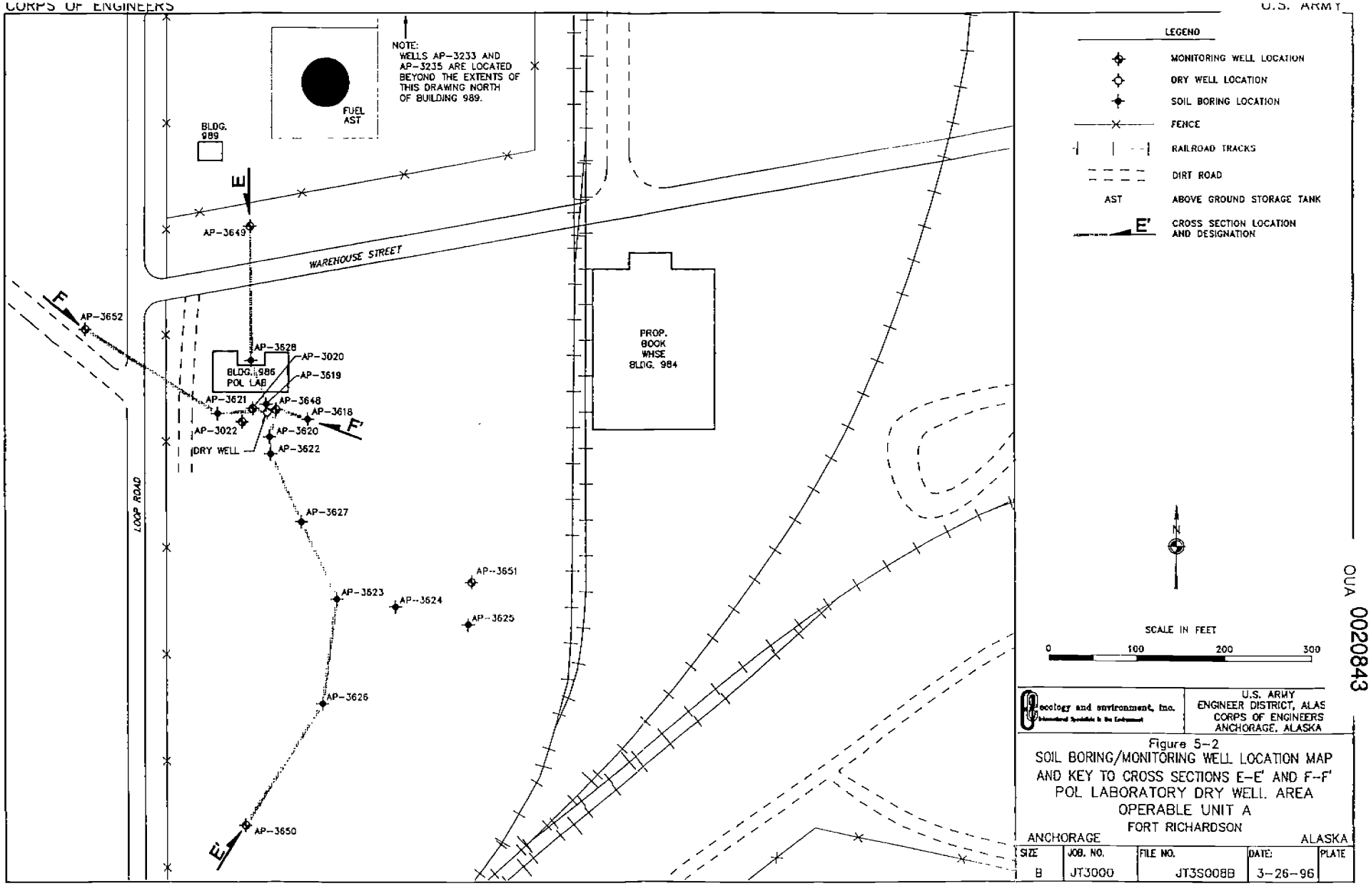
Key:

– = No screening concentration exists for analyte.
NA = Not applicable.
µg/L = Micrograms per liter.
POL = Petroleum, oil, and lubricants.
VOCs = Volatile organic compounds.

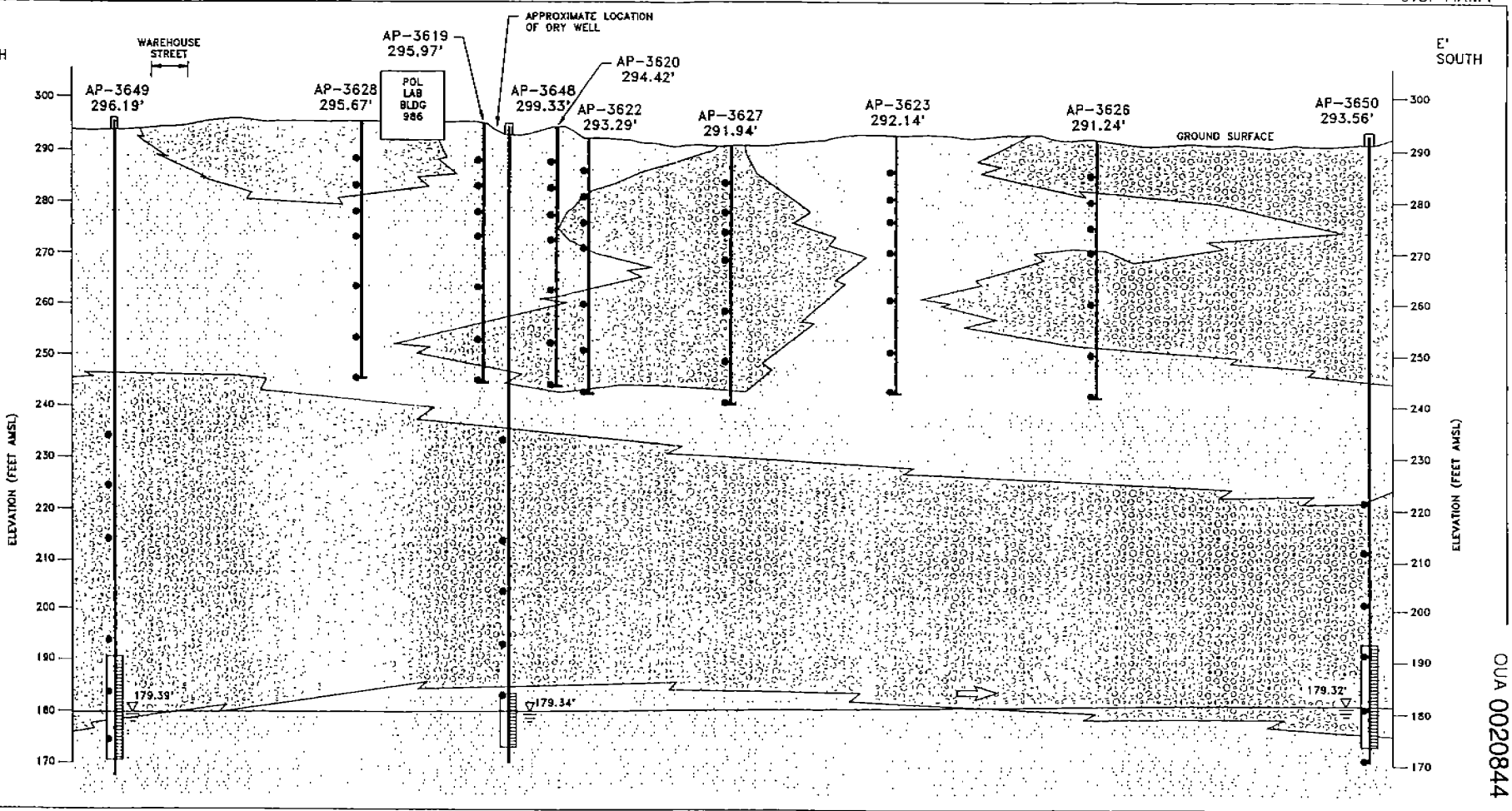
OUA 002084


CORPS OF ENGINEERS
U.S. ARMY
LEGEND
FENCE
RAILROAD TRACKS
DIRT ROAD
AST
ABOVE GROUND STORAGE TANK
FUEL
AST
BLDG.
989
WAREHOUSE STREET
FORMER UST
PROP. BOOK
WAREHOUSE
BLDG. 984
BLDG. 986
POL LAB
DRY WELL
LOOP ROAD
N
SCALE IN FEET
0
75
150
22
ecology and environment, inc.
U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA
Figure 5-1
SITE MAP
POL LABORATORY DRY WELL AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE
ALASKA
SIZE
B
JOB. NO.
JT3000
FILE NO.
JT3S009B
DATE:
3-26-96
PLATE

OUA 0020842


CORPS OF ENGINEERS
U.S. ARMY
NOTE:
WELLS AP-3233 AND AP-3235 ARE LOCATED BEYOND THE EXTENTS OF THIS DRAWING NORTH OF BUILDING 989.
FUEL AST
BLDG. 989
E
AP-3649
WAREHOUSE STREET
E
AP-3652
AP-3628
AP-3020
BLDG. 986 POL LAB
AP-3619
AP-3621
AP-3648
AP-3618
F'
AP-3022
AP-3620
DRY WELL
AP-3622
LOOP ROAD
AP-3627
AP-3651
AP-3623
AP-3624
AP-3625
AP-3626
E'
AP-3650
PROP. BOOK WHSE BLDG. 984
LEGEND
MONITORING WELL LOCATION
DRY WELL LOCATION
SOIL BORING LOCATION
FENCE
RAILROAD TRACKS
DIRT ROAD
AST
ABOVE GROUND STORAGE TANK
E'
CROSS SECTION LOCATION AND DESIGNATION
N
SCALE IN FEET
0
100
200
300
ecology and environment, inc.
U.S. ARMY
ENGINEER DISTRICT, ALAS
CORPS OF ENGINEERS
ANCHORAGE, ALASKA
Figure 5-2
SOIL BORING/MONITORING WELL LOCATION MAP
AND KEY TO CROSS SECTIONS E-E' AND F-F'
POL LABORATORY DRY WELL AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE
ALASKA
SIZE
B
JOB. NO.
JT3000
FILE NO.
JT3S008B
DATE:
3-26-96
PLATE

OUA 0020843



LEGEND

AMSL	ABOVE MEAN SEA LEVEL
AP-3649	SOIL BORING/MONITORING WELL LOCATION
296.19'	ELEVATION ABOVE MEAN SEA LEVEL
▽	GROUNDWATER TABLE
•	SUBSURFACE SOIL SAMPLE INTERVAL
⇦	DIRECTION OF GROUNDWATER FLOW

NAPTOWNE OUTWASH DEPOSITS

- SILTY SAND
- SILTY, SANDY GRAVEL

NOTE:
WATER LEVEL ELEVATIONS MEASURED ON DECEMBER 15, 1995

HORIZONTAL SCALE IN FEET
0 60 120 180

VERTICAL SCALE IN FEET
0 20 40 60

VERTICAL EXAGGERATION 1:3

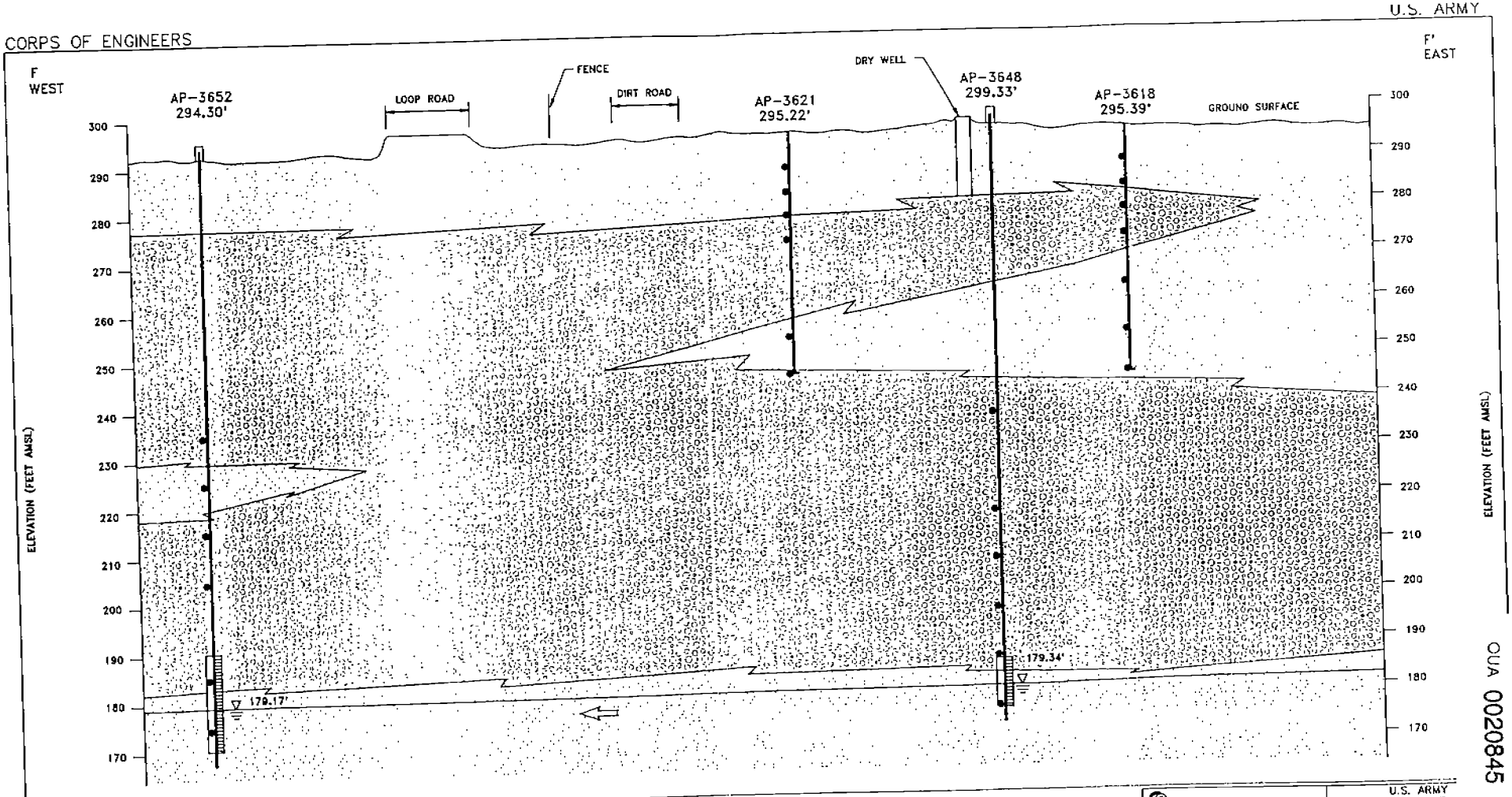
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CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 5-3
GEOLOGIC CROSS SECTION E-E'
POL LABORATORY DRY WELL AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO	DATE:	PLATE
B	JT3000	JT3X051B	3-25-96	

OUA 0020844



LEGEND

AMSL	ABOVE MEAN SEA LEVEL
AP-3618	SOIL BORING/MONITORING WELL LOCATION
295.39'	ELEVATION ABOVE MEAN SEA LEVEL
▽	GROUNDWATER TABLE
●	SUBSURFACE SOIL SAMPLE INTERVAL
⇦	DIRECTION OF GROUNDWATER FLOW

NAPTOWNE OUTWASH DEPOSITS

- SILTY SAND
- SILTY, SANDY GRAVEL

NOTE:
WATER LEVEL ELEVATIONS MEASURED ON DECEMBER 15, 1995

HORIZONTAL SCALE IN FEET
0 30 60 90

VERTICAL SCALE IN FEET
0 20 40 60

VERTICAL EXAGGERATION 1:1.5

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CORPS OF ENGINEERS
ANCHORAGE, ALASKA

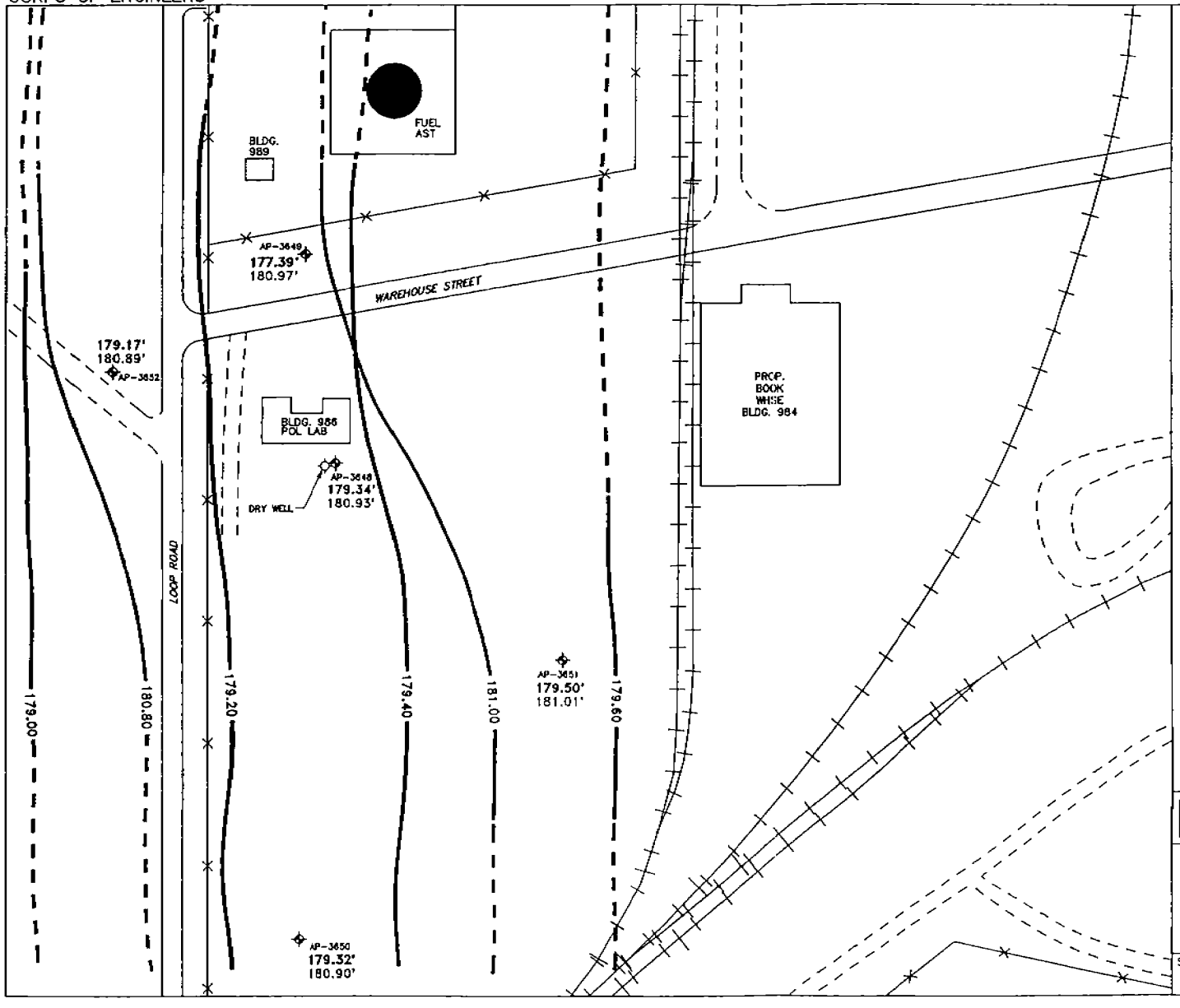
Figure 5-4
GEOLOGIC CROSS SECTION F-F'
POL LABORATORY DRY WELL AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE	PLATE
B	JT3000	JT3X052B	3-25-96	

OUA 0020845

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LEGEND

- MONITORING WELL LOCATION
- DRY WELL LOCATION
- FENCE
- RAILROAD TRACKS
- DIRT ROAD
- AST — ABOVE GROUND STORAGE TANK
- DECEMBER 15, 1995 GROUNDWATER CONTOUR
- OCTOBER 24, 1995 GROUNDWATER CONTOUR
- 181.01 — GROUNDWATER ELEVATION FEET ABOVE MEAN SEA LEVEL

N

SCALE IN FEET

0 100 200 300

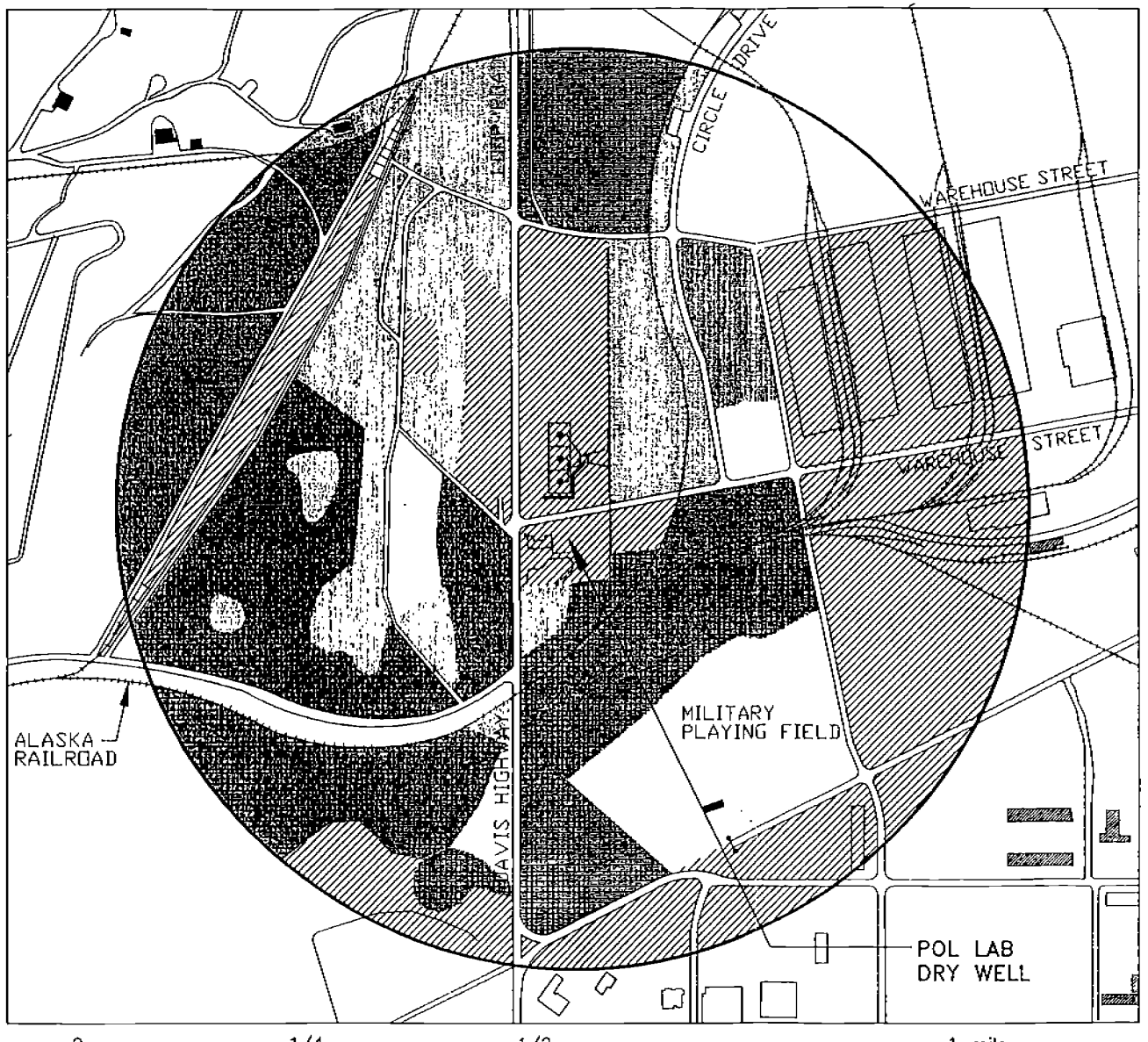
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International Specialists in the Environment

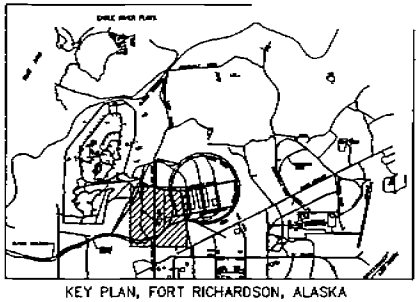
U.S. ARMY
ENGINEER DISTRICT, ALAS...
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 5-5
GROUNDWATER CONTOUR MAP
POL LABORATORY DRY WELL AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S061B	3-18-96	

CUA 0020846





KEY PLAN, FORT RICHARDSON, ALASKA

LEGEND

- DISTURBED–HERBACEOUS
- DISTURBED–COTTONWOOD/ SHRUB
- MOWED AREA
- WHITE SPRUCE/BLACK COTTONWOOD FOREST
- BALSAM POPLAR FOREST
- QUAKING ASPEN FOREST
- WHITE SPRUCE/QUAKING ASPEN FOREST
- ALDER SHRUB
- PAPER BIRCH FOREST
- WHITE SPRUCE/PAPER BIRCH FOREST
- BLACK COTTONWOOD STAND
- BLACK SPRUCE FOREST
- BUILDINGS, RAILROAD TRACKS, CONCRETE STRUCTURES

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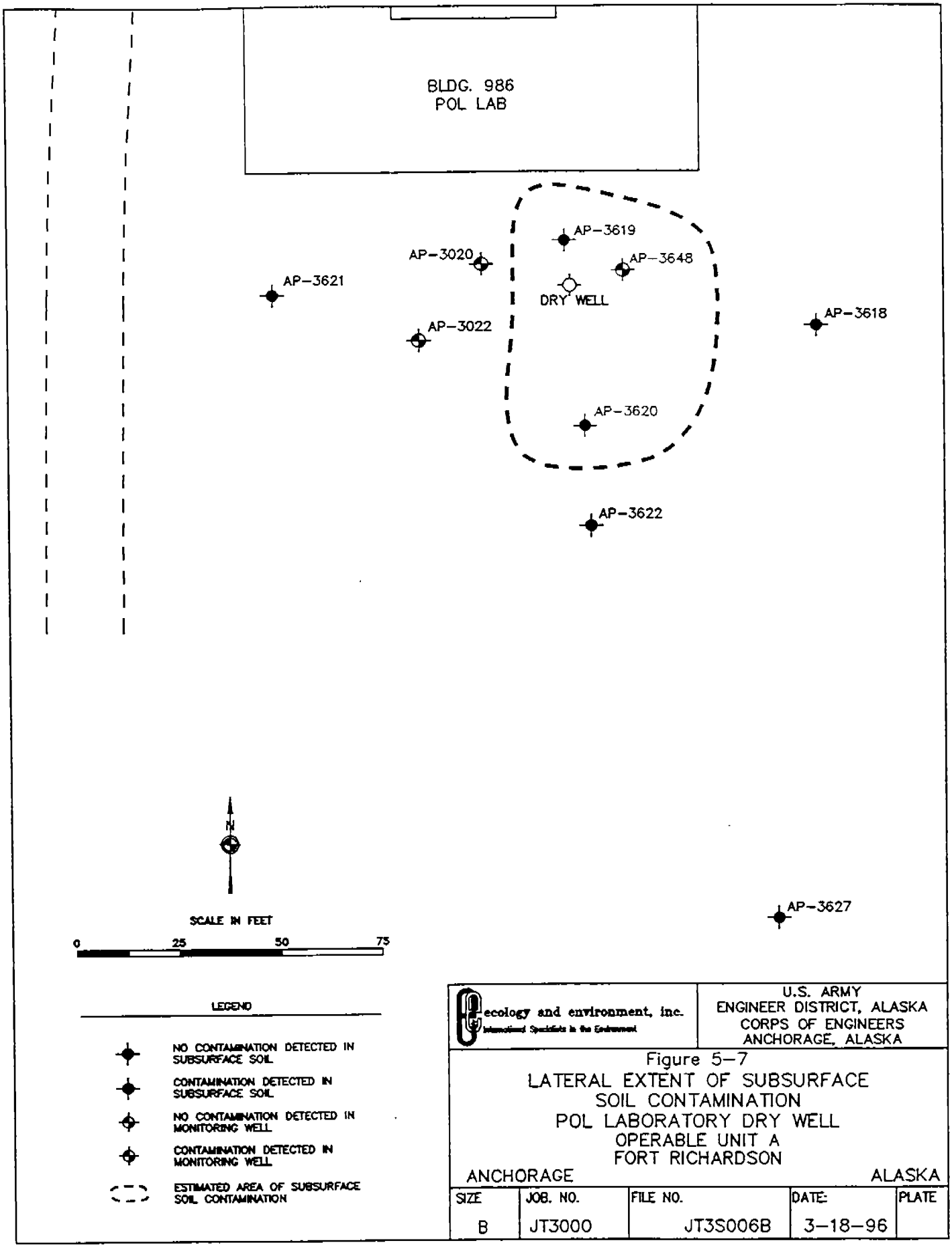
U.S. ARMY ENGINEER DISTRICT, ALASKA CORPS OF ENGINEERS ANCHORAGE, ALASKA

Figure 5–6
COVER TYPE MAP
POL LAB DRY WELL
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE, ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3950	POLLAB.DWG	03–26–96	

OUA 0020847

JT3050/POLLAB.DWG/03-11-96/AUTOCADEDMARTIN/SEATTLEWA.



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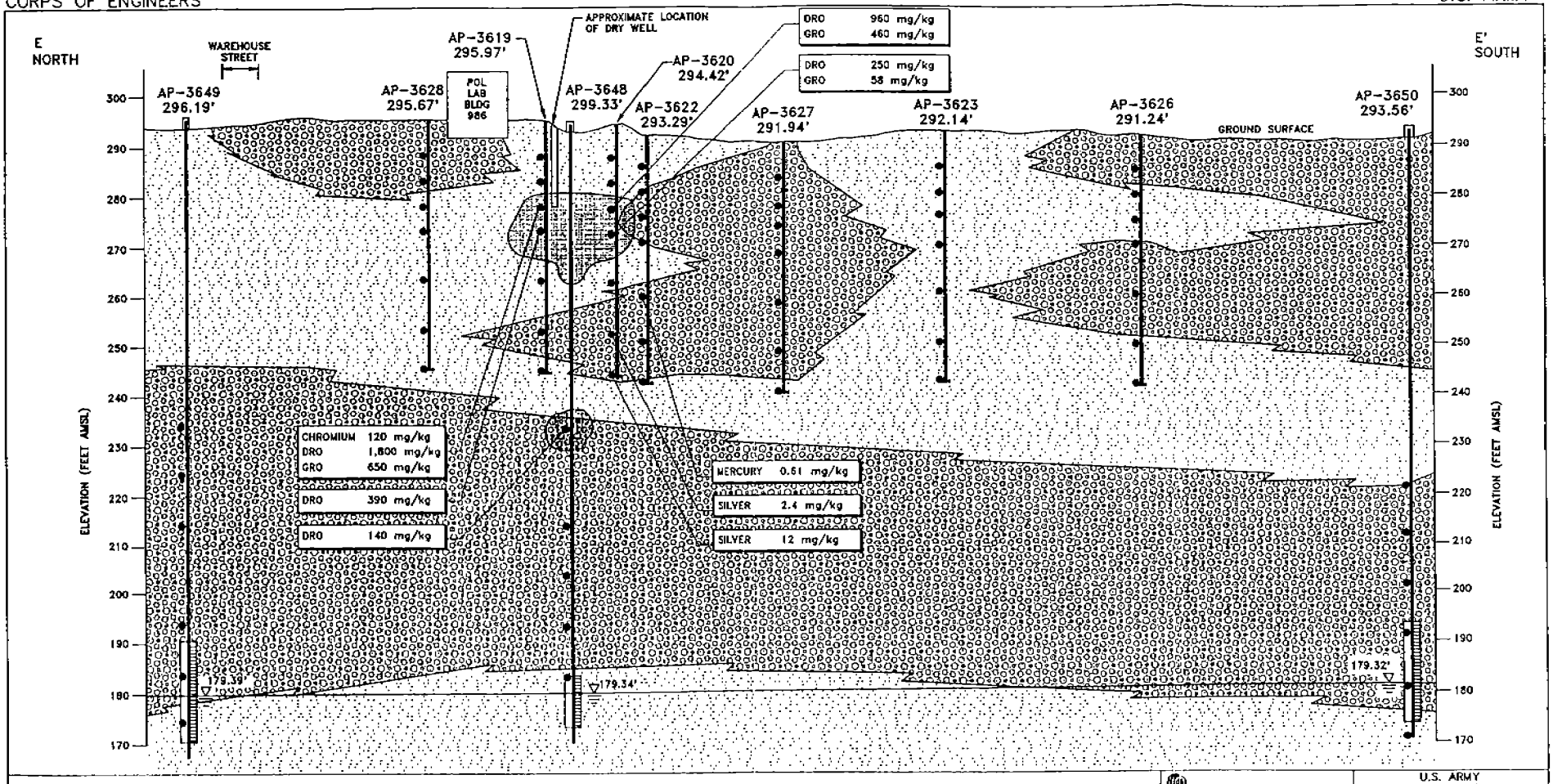
U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 5-7
LATERAL EXTENT OF SUBSURFACE SOIL CONTAMINATION
POL LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3S006B	3-18-96	

CORPS OF ENGINEERS

U.S. ARMY



LEGEND

AMSL	ABOVE MEAN SEA LEVEL
AP-6991	SOIL BORING/MONITORING WELL LOCATION
1982.9'	ELEVATION ABOVE MEAN SEA LEVEL
▽	GROUNDWATER TABLE
●	SUBSURFACE SOIL SAMPLE

NAPTOWNE OUTWASH DEPOSITS

- SILTY SAND
- SILTY, SANDY GRAVEL
- APPROXIMATE EXTENT OF CONTAMINATION BASED ON SOIL AND/OR GROUNDWATER SAMPLES EXCEEDING REGULATORY GUIDANCE LEVELS.

NOTES:
1. GROUNDWATER FLOW DIRECTION NOT SHOWN DUE TO GROUNDWATER GRADIENT IS APPROXIMATELY PARALLEL TO CROSS SECTION DIRECTION.
2. WATER LEVEL ELEVATIONS MEASURED ON DECEMBER 15, 1995

HORIZONTAL SCALE IN FEET
0 60 120 180

VERTICAL SCALE IN FEET
0 20 40 60

VERTICAL EXAGGERATION 1:3

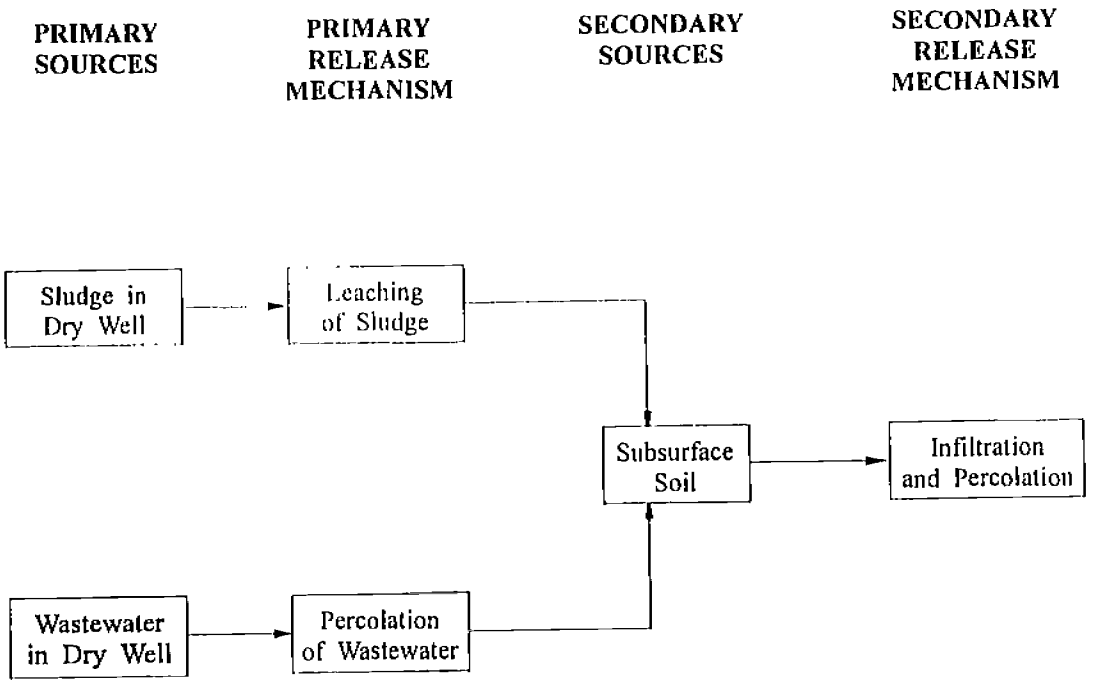
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U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 5-8
CROSS SECTION E-E'
SUBSURFACE SOIL CONTAMINATION
POL LABORATORY DRY WELL AREA
OPERABLE UNIT A
FORT RICHARDSON
ANCHORAGE ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JT3000	JT3X058B	3-18-96	

OUA 0020849



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Anchorage, Alaska

FORT RICHARDSON
Anchorage, Alaska

Figure 5-9
CONCEPTUAL SITE MODEL
OF CURRENT CONDITIONS
POL LABORATORY DRY WELL - OPERABLE UNIT A

Drawn By:	Date	TDD/Job No.	Dwg. No.
EGM	3-25-96	JT3060	JT3001

OUA 0020850

6 Chemical-Specific Applicable or Relevant and Appropriate Requirements and To-Be-Considered Criteria

Chemical-specific ARARs and TBCs associated with contaminants detected at OU-A are discussed below. Action- and location-specific ARARs will be presented in the OU-A feasibility study.

A preliminary list of chemical-specific ARARs and TBCs was developed during the preparation of the OU-A management plan based on previous investigations, but the list has been modified since that time. Some of the substances identified in previous investigations were not detected during the RI field investigation, and some previously undetected substances were identified. Tables 6-1 and 6-2 present an updated list of chemical-specific ARARs and TBCs for analytes detected in groundwater and soil at concentrations exceeding the screening criteria.

No analytes were detected in sediment or surface water at concentrations exceeding the screening criteria. As discussed in Sections 3.5, 4.5, and 5.5, the screening criteria used to identify site-related contaminants were derived from conservative risk assumptions. These risk assumptions will be used in the human health and ecological risk assessments to determine whether risks exist at the OU-A sites. ARARs are presented here because either ARARs or site-specific risk concentrations will be used as remedial action objectives in the feasibility study.

The State of Alaska was authorized to implement the state's drinking water program; therefore, state maximum contaminant levels (MCLs) for drinking water are cited as ARARs for groundwater instead of federal MCLs (the state and federal MCLs are identical). The Alaska Water Quality Standards (AWQC) (18 AAC 70) are also cited as chemical-specific ARARs and included in Table 6-1.

The only federal chemical-specific ARAR for soil contamination is associated with PCBs. Consequently, state guidance documents were used to determine appropriate ARARs for soil contaminants for which no federal or state chemical-specific ARARs exist. The State

of Alaska Oil and Hazardous Substances Pollution Control regulations (18 AAC 75) require that anyone discharging a hazardous substance to land or waters must report it immediately to the State of Alaska. In addition, the discharge must be cleaned up to ADEC's satisfaction. Because 18 AAC 75 provides the regulatory basis for the cleanup of non-UST petroleum contamination in soils, it must be considered as a TBC (ADEC 1991). This guidance states that soils contaminated by hazardous substances, other than crude oil or refined petroleum fuel products, must be cleaned to background levels or to levels shown through a contaminant leaching assessment to not pose a risk to potential surface receptors or groundwater. EPA-generated RBCs are included as TBCs.

Table 6-1

CHEMICAL-SPECIFIC ARARS AND TBCS FOR CONTAMINANTS IN GROUNDWATER OPERABLE UNIT A FORT RICHARDSON, ALASKA (mg/L)

Constituent	State ARARs[a]	TBCs
Aluminum	0.2[a]	37[b]
Iron	0.3[a]	11[b], 1.0[d]
Manganese	0.05[a]	0.18[b]
Dioxin (2,3,7,8-TCDD)	3×10^{-8}[c]	4.3×10^{-10}[b], 1×10^{-8}[d]

a 18 AAC 80.070(b) secondary maximum contaminant levels.

b Risk-based concentrations equivalent to a cancer risk of 1×10^{-6} or a hazard quotient of 1 (United States Environmental Protection Agency 1995)

c 18 Alaska Administrative Code 80.070 maximum contaminant levels.

d Alaska Department of Environmental Conservation, 1991, *Alaska Water Quality Standards Workbook.*

Key:

ARARs = Applicable or relevant and appropriate requirements.
mg/L = Milligrams per liter.
TBC = To-be-considered criteria.

Table 6-2

CHEMICAL-SPECIFIC ARARS AND TBCS FOR CONTAMINANTS IN SOIL OPERABLE UNIT A FORT RICHARDSON, ALASKA (mg/kg)

Constituent	Site	State ARARs[a]	TBCs
Diesel Range Organics (DRO)	RRTSL, RRFTA, POLLDW		100 - 2,000[a]
Gasoline Range Organics (GRO)	RRFTA, POLLDW		50 - 1,000[a]
Residual Range Petroleum Hydrocarbons	RRFTA		2,000[a]
Benzo(a)anthracene	RRFTA		0.88[b], background or contaminant leaching assessmentd
Benzo(a)fluoranthene	RRFTA		0.88[b], background or contaminant leaching assessment[d]
Benzo(a)pyrene	RRFTA		0.088[b], background or contaminant leaching assessment[d]
Indeno(1,2,3-c,d)pyrene	RRFTA		0.88[b], background or contaminant leaching assessment[d]
Chromium	RRFTA		390[b], background or contaminant leaching assessment[d]
Polychlorinated biphenyls (PCBs)	RRTSL		0.083[b,c]
Dioxin (2,3,7,8-TCDD)	RRFTA		4×10^{-6}[,b], background or contaminant leaching assessment[d]

a Interim Guidance for Non-Underground Storage Tank Soil Cleanup Levels, Guidance No. 001, Revision No. 1, July 17, 1991.

b Risk-based concentrations equivalent to a cancer risk of 1×10^{-6} or a hazard quotient of 0.1 (United States Environmental Protection Agency 1995)

c 40 CFR 761.120 PCB Spill Cleanup Policy. The cleanup goal for soil in an unrestricted area is 10 parts per million (ppm), and 25 ppm in a restricted area.

d Interim Guidance for Non-USTs Contaminated Soil Cleanup Levels, July 17, 1991. "Soils contaminated by hazardous substances other than crude oil or refined petroleum fuel products must be cleaned to background levels or levels that shown through a contaminant leaching assessment to not lead to groundwater contamination through leaching nor pose a risk to potential surface receptors.

Key:

ARARs = Applicable or relevant and appropriate requirements.
mg/kg = Milligrams per kilogram.
POLLDW = Petroleum, Oil, and Lubricant Laboratory Dry Well.
RRFTA = Ruff Road Fire Training Area.
RRTSL = Roosevelt Road Transmitter Site Leachfield.
TBCs = To-be-considered criteria.

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A Photographic Documentation

Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 1

Subject: Eagle River Flats where it enters Eagle Bay.

Photographer: Charlie Karustis

Date/Time: 8/14/95 10:28

Direction: North



Photo Number: 2

Subject: Cesspool opening at RRTSL site.

Photographer: Brad Ackman

Date/Time: 5/18/95 11:30

Direction: Not Applicable



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 3

Subject: E & E field team member conducting EM-31 survey over suspected septic tank area at RRTSL site.

Photographer: Brad Ackman

Date/Time: 5/18/95 1030

Direction: North



Photo Number: 4

Subject: Backhoe constructing a trench over the suspected septic tank area at RRTSL site.

Photographer: Bill Richards

Date/Time: 5/23/95 1045

Direction: North



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 5

Subject: Well house B located west-northwest of RRTSL site.

Photographer: Brad Ackman

Date/Time: 9/25/95 1300

Direction: North

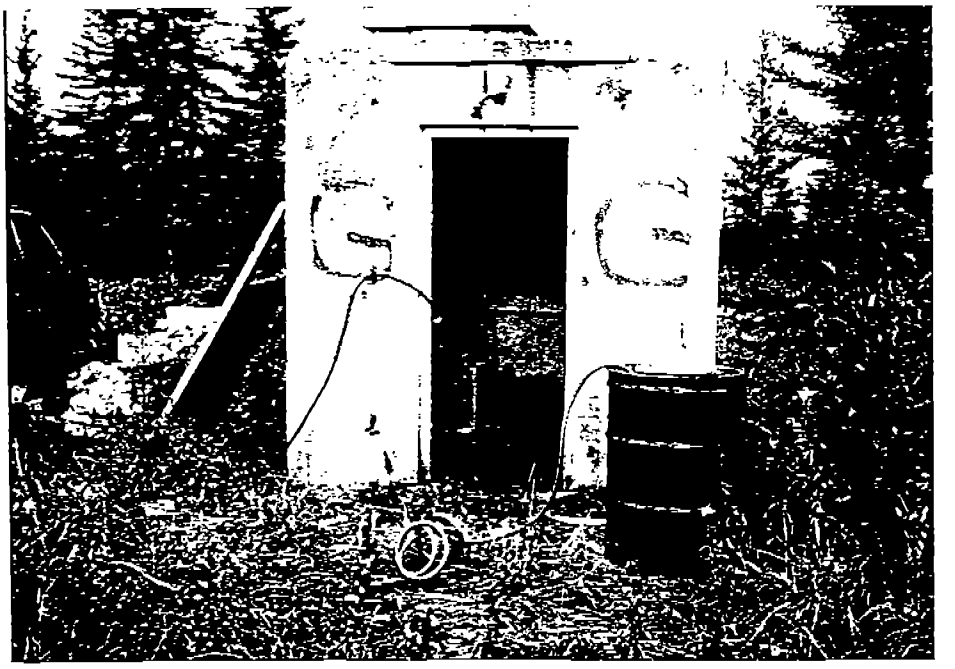


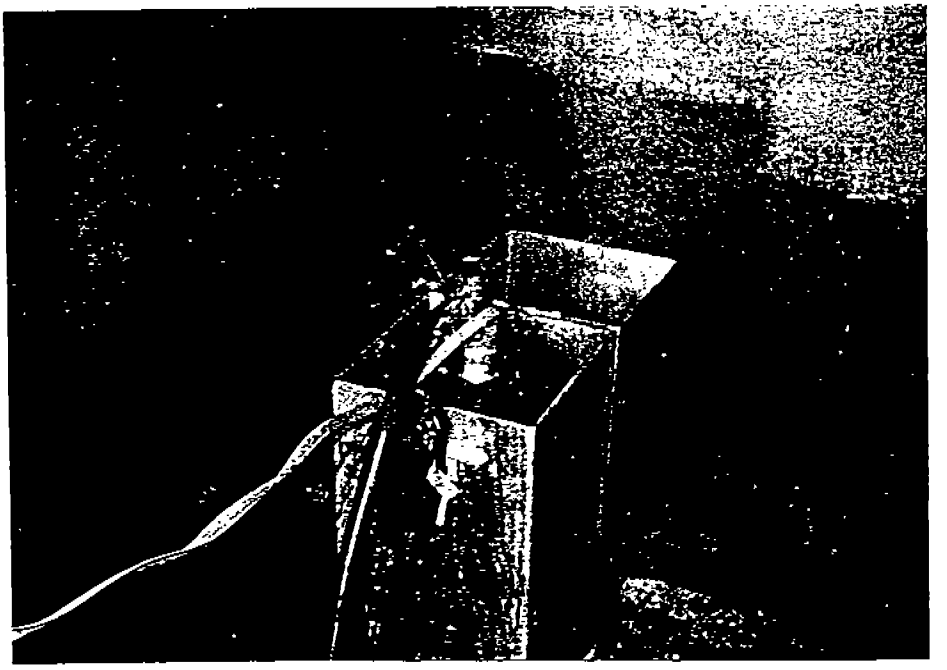
Photo Number: 6

Subject: Conducting groundwater sampling at Well B.

Photographer: Brad Ackman

Date/Time: 9/25/95 1500

Direction: Not applicable.



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

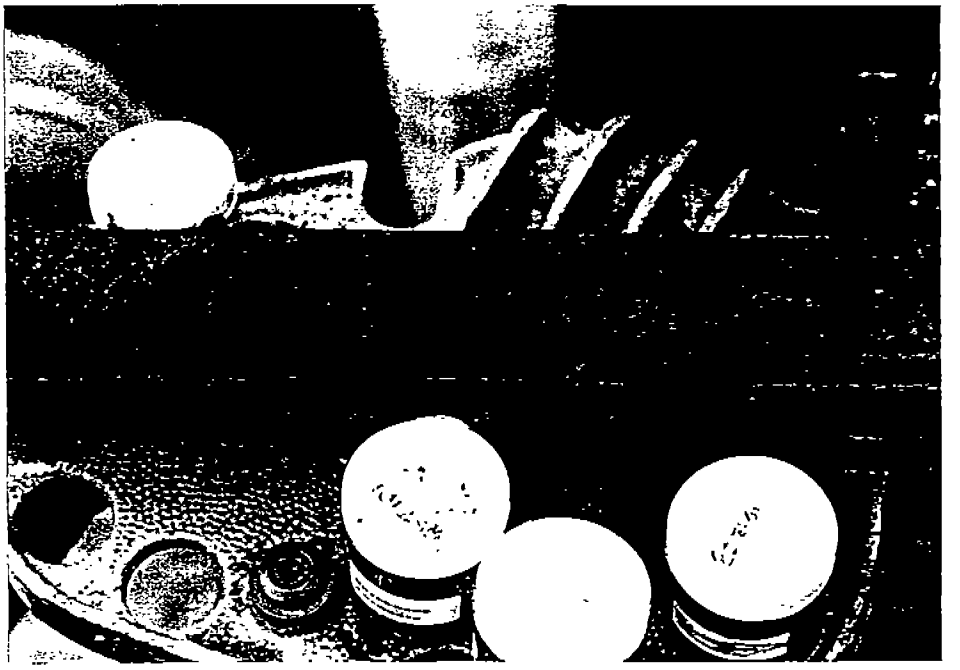
Photo Number: 7

Subject: Brown clay layer encountered at 15 feet below ground surface in boring AP-3599 at RRTSL site. Soil sample 95RRTSL1012SL collected from this location.

Photographer: Brad Ackman

Date/Time: 5/23/95 1520

Direction: Not applicable.



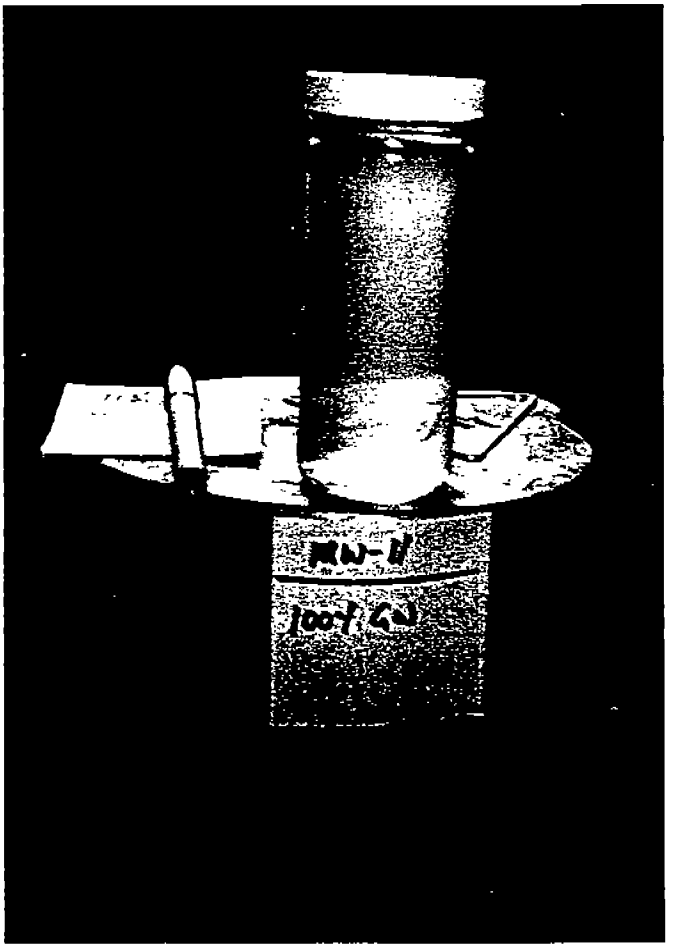


Photo Number: 8

Subject: Groundwater sample 95RRTSL1004GW collected from Well AP-3658 at RRTSL site.

Photographer: Brad Ackman

Date/Time: 9/27/95 1620

Direction: Not applicable.

Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 9

Subject: E & E field team conducting surface soil grid sampling at RRFTA site.

Photographer: Louise Flynn

Date/Time: 6/21/95

Direction: Northwest

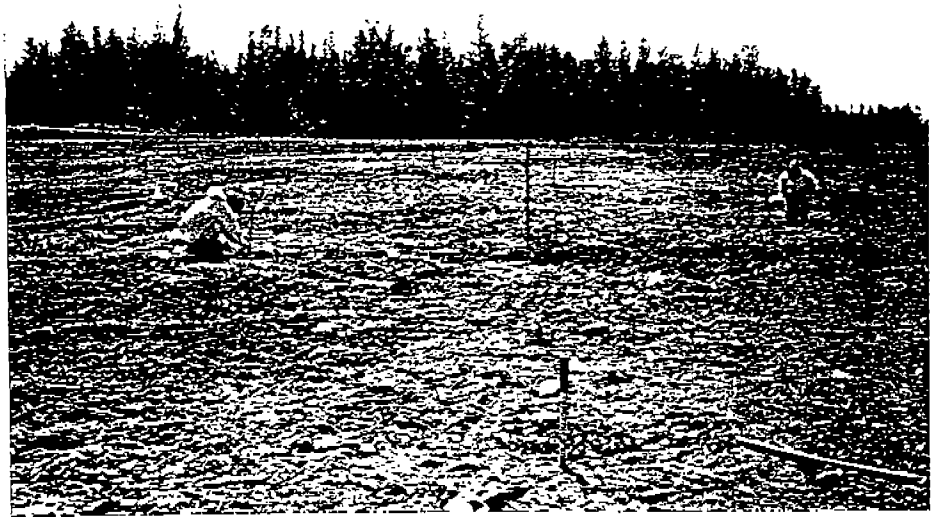


Photo Number: 10

Subject: E & E field team conducting subsurface soil exploration with Little Beaver equipment at RRFTA site.

Photographer: Louise Flynn

Date/Time: 6/27/95

Direction: Northeast



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

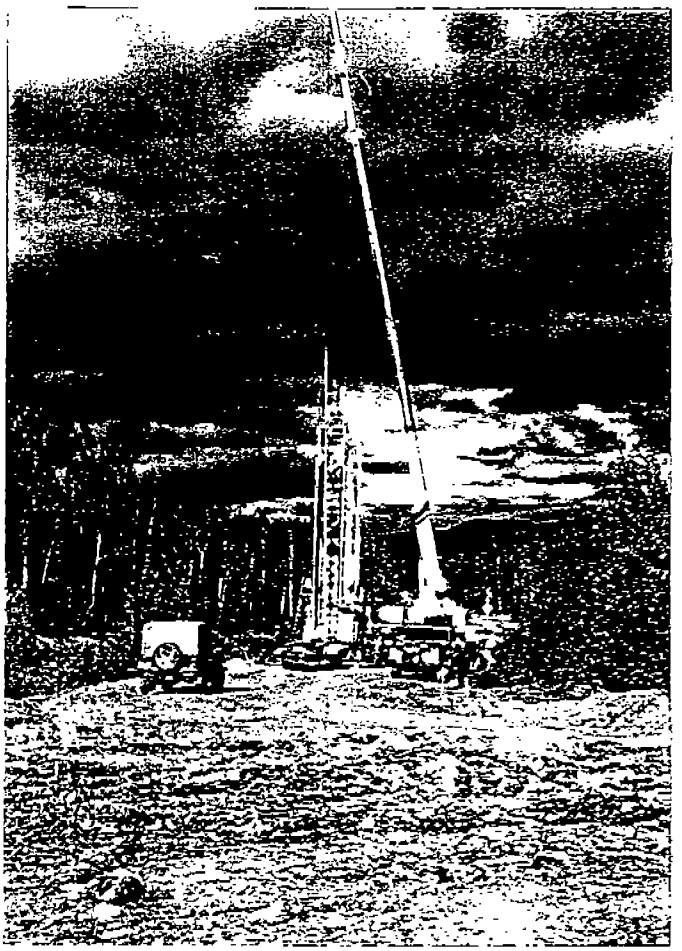


Photo Number: 11
Subject: Installing monitoring well AP-3656 at RRFTA site.
Photographer: Brad Ackman
Date/Time: 9/3/95 1830
Direction: North

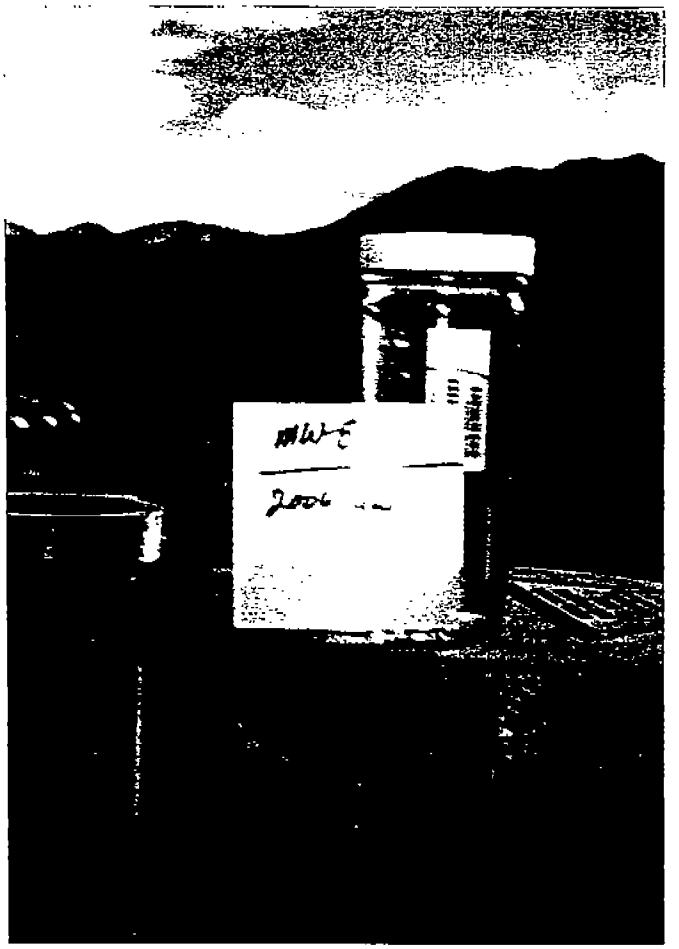


Photo Number: 12
Subject: Collection of groundwater sample 95RRFTA2006GW from Well AP-3655 at RRFTA site.
Photographer: Brad Ackman
Date/Time: 10/1/95 1000
Direction: Not applicable.

Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 13

Subject: Dry well opening at POLLDW site.

Photographer: Bill Richards

Date/Time: 6/9/95 1105

Direction: Not applicable.



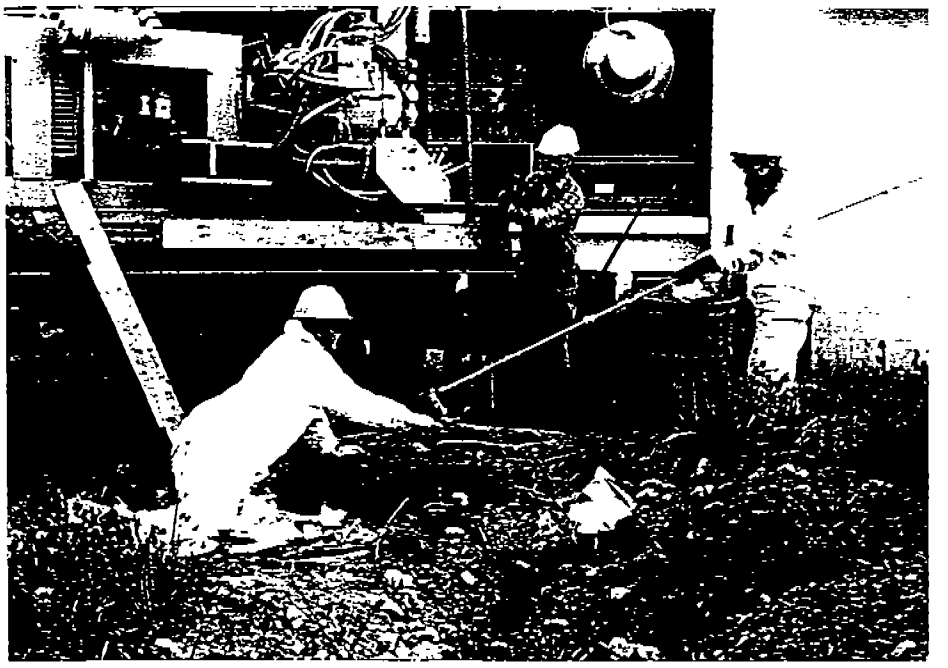
Photo Number: 14

Subject: E & E field team collecting sludge sample from dry well at POLLDW site. Drilling AP-3619 in background.

Photographer: Bill Richards

Date/Time: 6/9/95 1100

Direction: North



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 15
Subject: Composite sludge sample collection from POLLDW.
Photographer: Bill Richards
Date/Time: 6/9/95 1220
Direction: Not applicable.

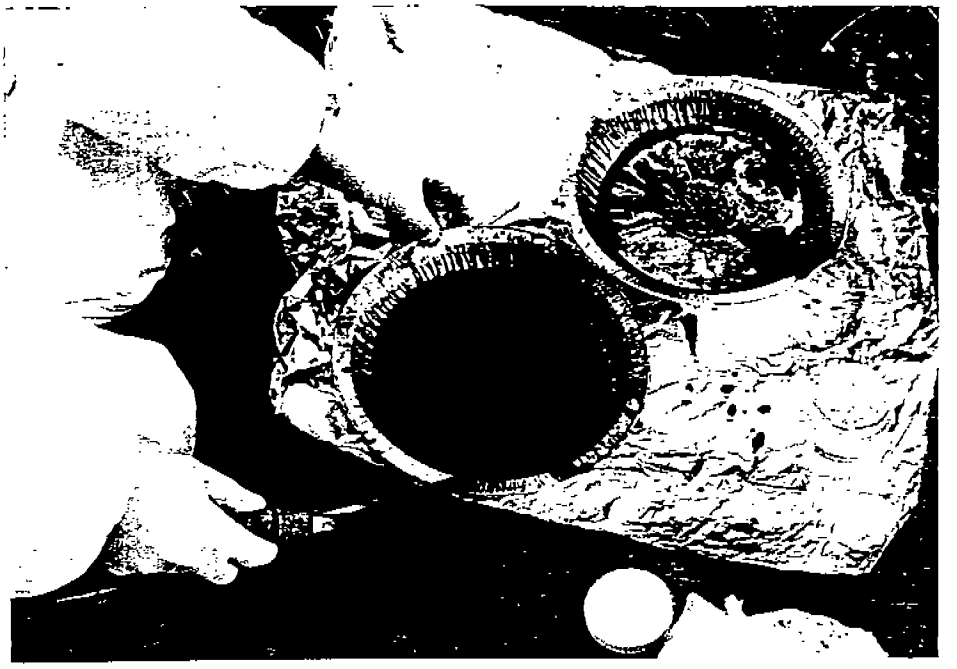
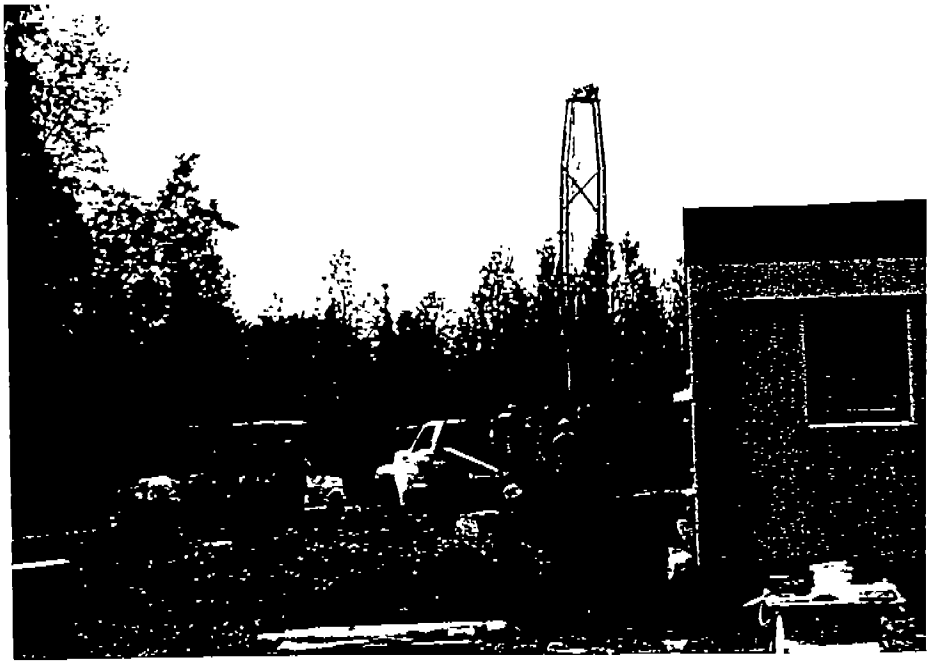


Photo Number: 16
Subject: Drilling at AP-3619 on south side of POL lab.
Photographer: Bill Richards
Date/Time: 6/9/95 1000
Direction: West



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 17

Subject: Soil sample 95POLLDW3069SB is collected from AP-3625 at a depth of 40 feet below ground surface (POLLDW site).

Photographer: Brad Ackman

Date/Time: 6/16/95 0910

Direction: Not applicable.

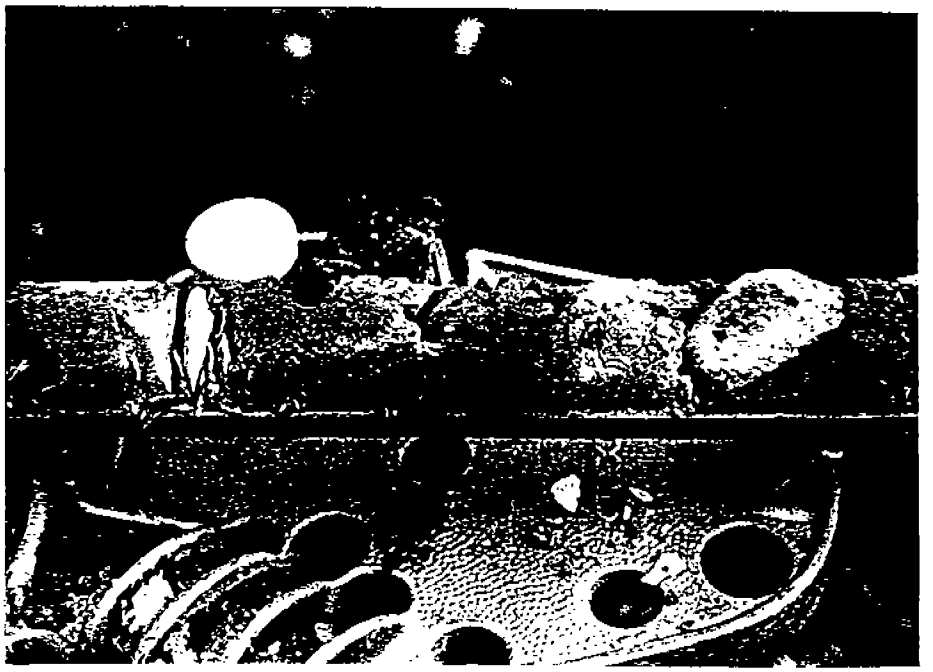


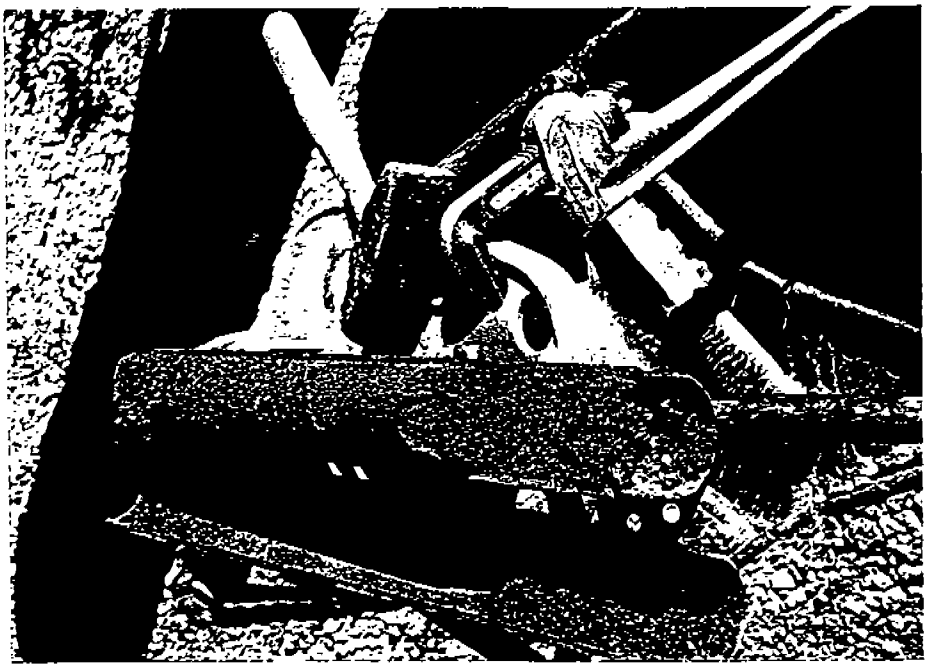
Photo Number: 18

Subject: Soil sample is collected from AP-3648 at a depth of 120 feet below ground surface (POLLDW site).

Photographer: Brad Ackman

Date/Time: 8/16/95 1430

Direction: Not applicable.



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

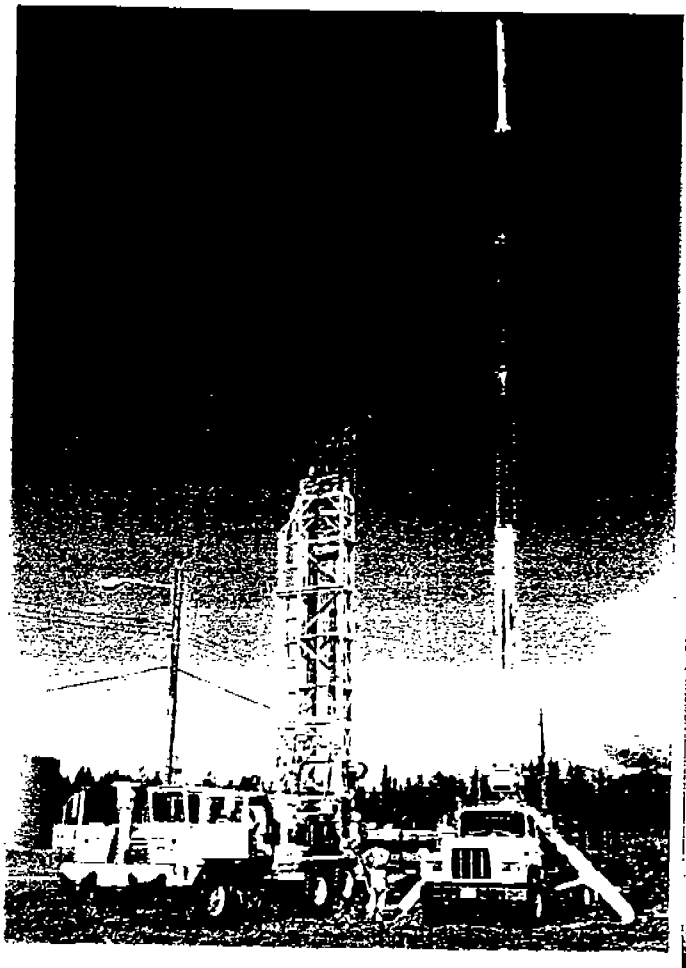
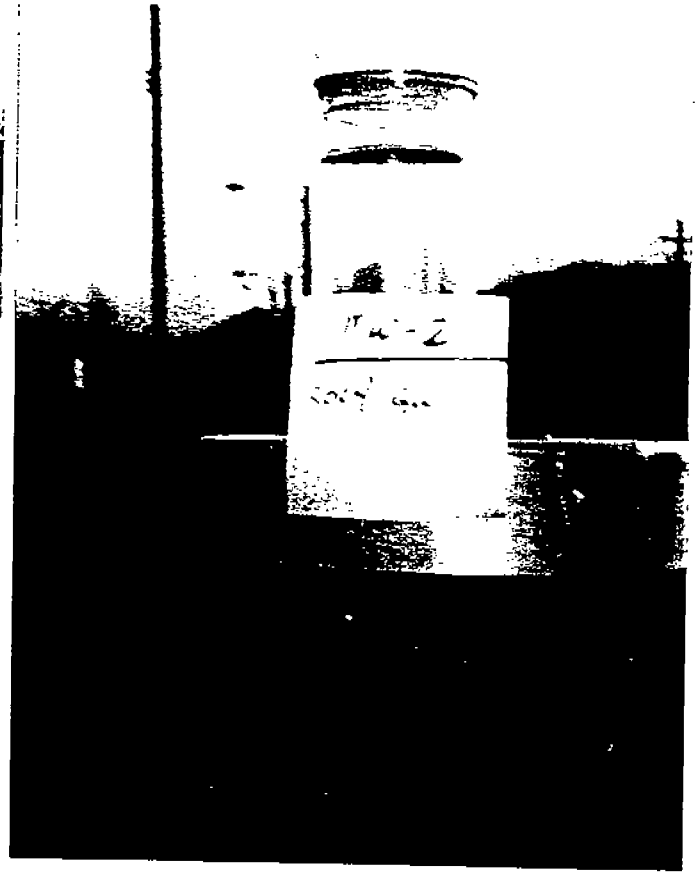


Photo Number: 19
Subject: Using air rotary drilling equipment at AP-3649 (POLLDW site).
Photographer: Brad Ackman
Date/Time: 8/17/95 1730
Direction: Northwest

Photo Number: 20
Subject: Groundwater sample 95POLLDW3004GW is collected from Well AP-3649 at POLLDW site.
Photographer: Brad Ackman
Date/Time: 10/1/95 1115
Direction: Not applicable.



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 21

Subject: Temporary contaminated soil stockpile pit at RRFTA site.

Photographer: Bill Richards

Date/Time: 7/12/95 1306

Direction: Northwest

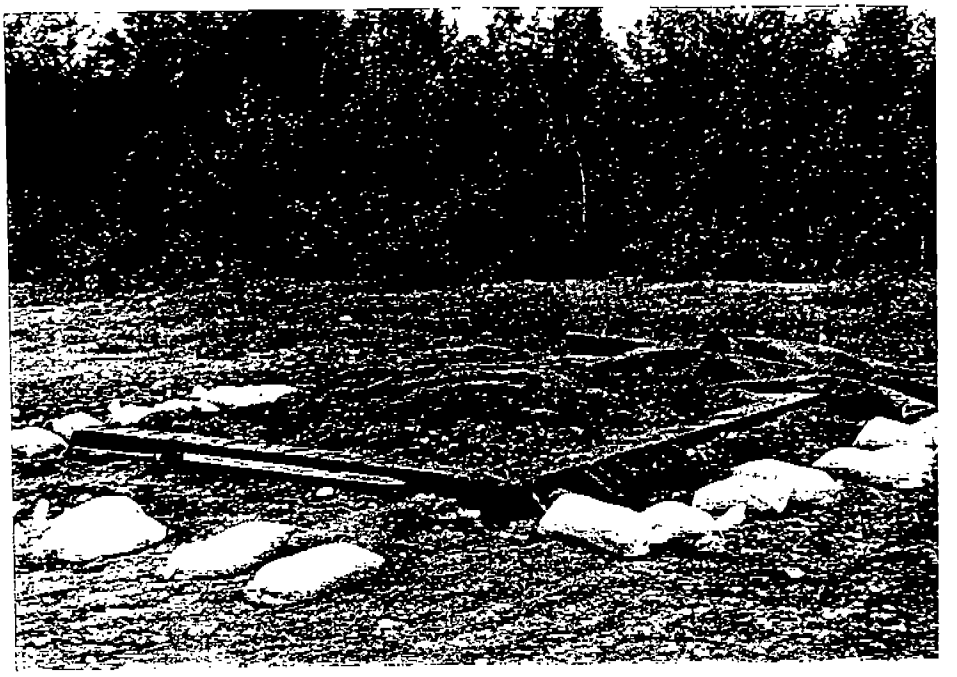


Photo Number: 22

Subject: Installation of groundwater sampling equipment. Generator-powered Grundfos pump used to purge monitoring wells.

Photographer: Brad Ackman

Date/Time: 9/27/95 1500

Direction: Not applicable.



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 23

Subject: Monitoring well construction consists of stainless steel, prepack well screens attached to PVC riser.

Photographer: Brad Ackman

Date/Time: 8/25/95 1520

Direction: Not applicable.

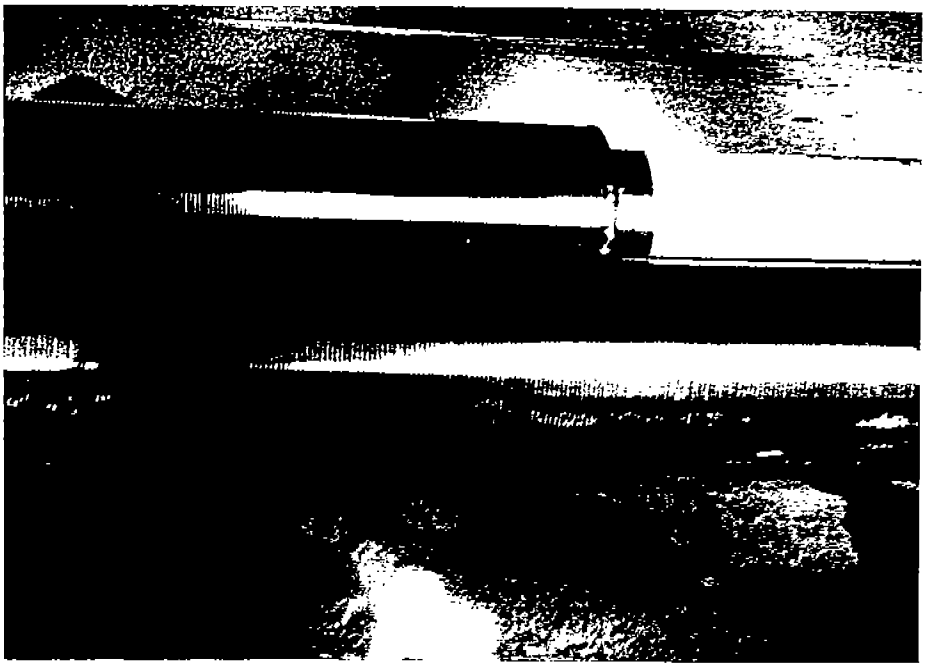


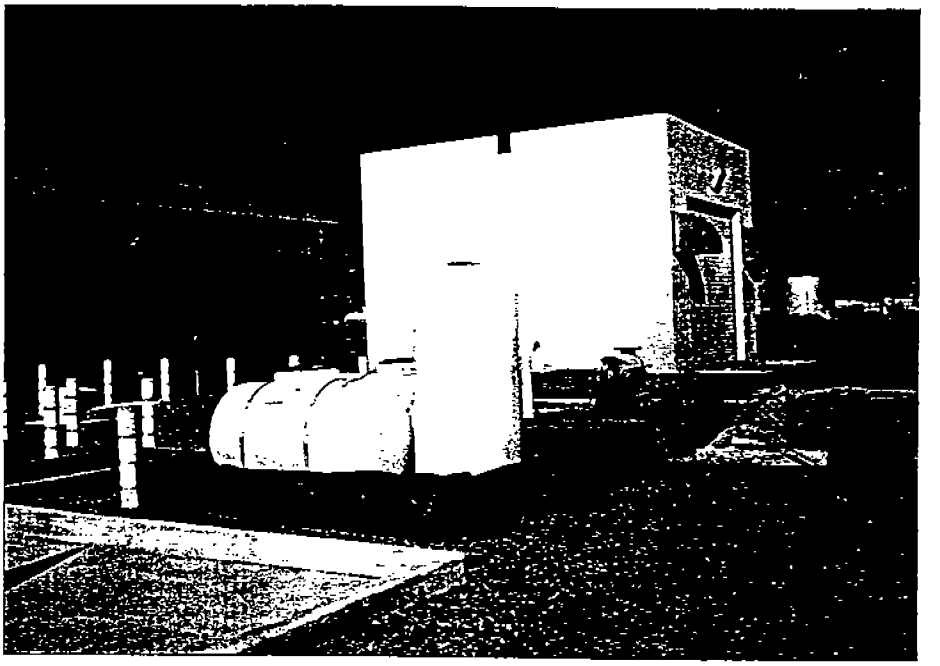
Photo Number: 24

Subject: Baker tanks used for temporary storage of decontamination water and monitoring well development fluids.

Photographer: Brad Ackman

Date/Time: 9/21/95 1210

Direction: Northwest



Ecology and Environment, Inc.

PHOTOGRAPHIC RECORD

SITE NAME: Operable Unit A
SITE LOCATION: Fort Richardson, Alaska
JOB NUMBER: JT3000

Photo Number: 25

Subject: Drilling decontamination area set up at POLLDW site.

Photographer: Brad Ackman

Date/Time: 9/21/95 1215

Direction: North



B Soil Boring Logs and Monitoring Well Construction Diagram

Roosevelt Road Transmitter Site
Leachfield

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 129,260.17 E: 132,247.98

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-1 RRTSL
HOLE NO. (permanent): AP-3598

NAME OF DRILLER: Hughes Drilling Co./ Gary Wilson

WEATHER: 45 F, cloudy, light wind.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 5/22/95
DATE HOLE FINISHED: 5/22/95

ELEV. TOP OF HOLE: 255.64

INSPECTOR: Brad Ackman

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255									
1									
2									
3									
4									
5									
250			No data	No data	GW	5.0'-7.0' Dark brown, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.=4 cm, moist, no hydrocarbon odor, no sheen.	1001SB		No data
6									
7									
8									
9									
10									
245			10/14/ 9/6	50	GW	10.0'-12.0' Brownish-gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.=6 cm, moist, no hydrocarbon odor, no sheen.	1002SB		No data
11									
12									
13									
14									
15									
240			9/27/ 21/20	50	GM	15.0'-17.0' Light gray, silty GRAVEL, 60% gravel, 30% silt and clay, 10% sand, max.=6 cm, dry, no hydrocarbon odor, no sheen.	1003SB		No data
16									
17.5									

USCOE-8

HOLE NO. (field): SB-1 RRTSL
HOLE NO. (permanent): AP-3598

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (P
18.5								
19.5								
235 20.5		3/6/5/6	80	GC	20.0'-22.0' Light gray, clayey GRAVEL, 85% gravel, 10% clay, 5% sand, max.=6 cm, rounded to subrounded, no hydrocarbon odor, no sheen.	1004SB		No data
21.5								
22.5								
23.5								
24.5								
230 25.5								
26.5								
27.5								
28.5								
29.5								
225 30.5		10/23/18/30	100	GW	30.0'-32.0' Medium brown, sandy GRAVEL, 40% gravel, 30% sand, 30% silt and clay, max.=6 cm, moist, no hydrocarbon odor, no sheen.	1005SB		No data
31.5								
32.5								
33.5								
34.5								
220 35.5								
36.5								
37.5								
38.5								
40								

USCOR-6

HOLE NO. (field): SB-1 RRTSL
HOLE NO. (permanent): AP-3598

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
215 41		16/22/18/26	100	GM	40.0'-42.0' Medium brown to gray, silty GRAVEL, 60% gravel, 30% silt and clay, 10% sand, max. =6cm, moist, no hydrocarbon odor, no sheen.	1006SB		No data
42								
43								
44								
45								
210 46								
47								
48		17/29/38/24	100	GW	48.0'-50.0' Medium brown to gray, silty GRAVEL, 60% gravel, 20% silt and clay, 20% sand, max.=6 cm, moist, no hydrocarbon odor, no sheen.	1007SB		0
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
205 51								
52								
53								
54								
55								
200 56								
57								
58								
59								
60								
195 61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 2
	LOCATION COORD N: 129,232.77	E: 132,227.98
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-2 RRTSL HOLE NO. (permanent): AP-3599	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 44 F, calm, steady rain.

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole (X) Churn Drill ( )	300 pounds	6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
22 ft.	(X) MSL _____	Truck Mounted CME-75

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 5/23/95 DATE HOLE FINISHED: 5/23/95
4	3" O.D. Split Spoon	NA ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
255.88	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255 1 2 3 4 5									
250 6 7			No data	No data	GW	Medium brown, sandy GRAVEL, 40% gravel, 30% sand, 30% silt and clay, max.=6 cm, moist, no hydrocarbon odor, no sheen.	1008SB 1009SB 1010SB		0
8 9 10									
245 11 12			1/23/ 13/17	50	GW	10.0'-12.0' Medium gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.=6 cm, moist, no hydrocarbon odor, no sheen.	1011SB		0
13 14 15									
240 16 17.5			2/2/7/8	100	SM	15.0'-17.0' Light brown, sandy SILT, 65% silt and clay, 25% sand, 10% gravel, max.=1 cm, moist, no hydrocarbon odor, no sheen.	1012SB		0

USCOR-6

HOLE NO. (field): SB-2 RRTSL
HOLE NO. (permanent): AP-3599

PROJECT: OU-A Fort Richardson

SHEET # 2 of 2

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (PPM)
18.5								
19.5								
20.5		7/12/25/32	60	GW	20.0'-22.0' Light gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.=6 cm, moist, no hydrocarbon odor, no sheen.	1013SB		0
235 21.5								
22.5					Bottom of exploration at 22.0'. Soil boring abandoned at 22.0'.			
23.5								
24.5								
25.5								
230 26.5								
27.5								
28.5								
29.5								
30.5								
225 31.5								
32.5								
33.5								
34.5								
35.5								
220 36.5								
37.5								
38.5								
40								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 129,262.08	E: 132,167.07
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-3 RRTSL HOLE NO. (permanent): AP-3600	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 42 F, calm, heavy rain.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 5/24/95 DATE HOLE FINISHED: 5/24/95
ELEV. TOP OF HOLE 255.48	INSPECTOR Brad Ackman	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255									
1									
2									
3									
4									
5									
250			No data	100	SW	5.0'–7.0' Medium brown, gravelly SAND, 60% sand, 25% gravel, 15% silt and clay, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	1014SB		0
6									
7									
8									
9									
10									
245			10/10/12/8	100	GW	10.0'–12.0' Medium brown, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1015SB		1
11									
12									
13									
14									
15									
240			6/8/17/21	80	GW	15.0'–17.0' Medium brown, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.=6 cm, moist, no hydrocarbon odor, no sheen.	1016SB		0
16									
17.5									

USCOR-6

HOLE NO. (field): SB-3 RRTSL HOLE NO. (permanent): AP-3600	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	PID (ppm)
18.5								
19.5								
-2350 20.5		10/12/13/21	80	GM	20.0'-22.0' Brown-gray, silty GRAVEL, 50% gravel, 40% silt and clay, 10% sand, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1017SB		0
21.5								
22.5								
23.5								
24.5								
-2300 25.5								
26.5								
27.5								
28.5								
29.5								
-2250 30.5		12/22/26/18	100	GM	30.0'-32.0' Brown-gray, silty GRAVEL, 60% gravel, 25% silt and clay, 15% sand, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1018SB		0
31.5								
32.5								
33.5								
34.5								
-2200 35.5								
36.5								
37.5								
38.5								
40								

USCOR-6

HOLE NO. (field): SB-3 RRTSL
HOLE NO. (permanent): AP-3600

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
215 / 41		32/17/27/31	100	SW	40.0'-42.0' Brown, gravelly SAND, 40% sand, 30% gravel, 30% silt and clay, max.= 6 cm, moist to wet, no hydrocarbon odor, no sheen.	1019SB		0
42								
43								
44								
45								
210 / 46								
47								
48		23/29/42/50	100	GM	48.0'-50.0' Brown-gray, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1020SB		0
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
205 / 51								
52								
53								
54								
55								
200 / 56								
57								
58								
59								
60								
195 / 61								
62.5								

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 2
	LOCATION COORD N: 129,255.23	E: 132,196.47
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-4 RRTSL HOLE NO. (permanent): AP-3601	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 42 F, calm, heavy rain.

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole (X) Churn Drill ( )	300 pounds	6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
22 ft.	(X) MSL _____	Truck Mounted CME-75

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 5/24/95 DATE HOLE FINISHED: 5/24/95
4	3" O.D. Split Spoon	NA ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
255.62	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255									
1									
2									
3									
4									
5			No data	100	SM	5.0'-7.0' FILL-Brown, sandy SILT, 40% silt and clay, 30% sand, 30% gravel, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1021SB 1022SB 1023SB		0
250 6									
7									
8									
9									
10			6/12/ 7/4	100	SM	10.0'-12.0' FILL-Brown, sandy SILT, 40% silt and clay, 30% sand, 30% gravel, moist, no hydrocarbon odor, no sheen.	1024SB		0
245 11									
12									
13									
14									
15			11/12/ 18/22	80	GM	15.0'-17.0' Brown-gray, silty GRAVEL, 60% gravel, 25% silt and clay, 15% sand, max.= 6 cm, dry to moist, no hydrocarbon odor, no sheen.	1025SB		0
240 16									
17.5									

USCOM-6

HOLE NO. (field): SB-4 RRTSL HOLE NO. (permanent): AP-3601	PROJECT: OU-A Fort Richardson	SHEET # 2 of 2

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	
18.5								
19.5								
235 20.5		13/24/32/19	100	GM	20.0'-22.0' Brown-gray, silty GRAVEL, 60% gravel, 25% silt and clay, 15% sand, dry to moist, no hydrocarbon odor, no sheen.	1026SB 1027SB 1028SB		0
21.5								
22.5					Bottom of exploration at 22.0'. Soil boring abandoned at 22.0'.			
23.5								
24.5								
230 25.5								
26.5								
27.5								
28.5								
29.5								
225 30.5								
31.5								
32.5								
33.5								
34.5								
220 35.5								
36.5								
37.5								
38.5								
40								

USCOR-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 129,324.32 E: 132,154.72

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-5 RRTSL
HOLE NO. (permanent): AP-3602

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 48 F, overcast, light rain, calm.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 5/25/95
DATE HOLE FINISHED: 5/25/95

ELEV. TOP OF HOLE: 255.60

INSPECTOR: Brad Ackman

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255									
1									
2									
3									
4									
5									
250			No data	100	SM	5.0'-7.0' Dark brown, silty SAND, 40% sand, 30% silt and clay, 30% gravel, max.= 7 cm, moist, no hydrocarbon odor, no sheen.	1029SB		0
6									
7									
8									
9									
10									
245			6/11/ 10/13	100	SM	10.0'-12.0' Dark brown, silty SAND, 40% sand, 30% silt and clay, 30% gravel, max.= 7 cm, moist, no hydrocarbon odor, no sheen.	1030SB		1
11									
12									
13									
14									
15									
240			18/25/ 21/23	80	GM	15.0'-17.0' Brown-gray, silty GRAVEL, 60% gravel, 20% silt and clay, 20% sand, max.= 6 cm, moist to dry, no hydrocarbon odor, no sheen.	1031SB		0
16									
17.5									

USCOR-6

HOLE NO. (field): SB-5 RRTSL
HOLE NO. (permanent): AP-3602

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
19.5							
235 20.5		5/7/ 15/16	100	GM	20.0'-22.0' Brown-gray, silty GRAVEL, 60% gravel, 20% silt and clay, 20% sand, max.= 6 cm, moist to dry, no hydrocarbon odor, no sheen.	1032SB	0
21.5							
22.5							
23.5							
24.5							
230 25.5							
26.5							
27.5							
28.5							
29.5							
225 30.5		16/19/ 21/19	80	GM	30.0'-32.0' Brown-gray, silty GRAVEL, 60% gravel, 20% silt and clay, 20% sand, moist to dry, no hydrocarbon odor, no sheen.	1033SB	0
31.5							
32.5							
33.5							
34.5							
220 35.5							
36.5							
37.5							
38.5							
40							

USCOR-6

HOLE NO. (field): SB-5 RRTSL HOLE NO. (permanent): AP-3602	PROJECT: OU-A Fort Richardson	SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
215 41		9/21/ 52/31	100	GW	40.0'–42.0' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1034SB		0
42 43 44 45 210 46 47								
48 49		4/11/ 28/25	100	GM	48.0'–50.0' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1035SB		0
50 205 51 52 53 54 55 200 56 57 58 59 60 195 61 62.5					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			

USCOR-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 129,298.59 E: 132,213.62

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-6 RRTSL
HOLE NO. (permanent): AP-3603

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 48 F, overcast, light rain, calm.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL ____

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 05/25/95
DATE HOLE FINISHED: 05/25/95

ELEV. TOP OF HOLE: 255.42

INSPECTOR: Brad Ackman

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255	(permafrost) (groundwater)							
1								
2								
3								
4								
5		No data	100	GM	5.0'-7.0' Dark brown, silty GRAVEL, 40% gravel, 30% silt and clay , 30% sand, max.= 10 cm, moist, no hydrocarbon odor, no sheen.	1036SB 1037SB 1038SB		1
250 6								
7								
8								
9								
10		18/19/19/32	100	GM	10.0'-12.0' Dark brown-gray, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, moist, no hydrocarbon odor, no sheen.	1039SB		0
245 11								
12								
13								
14								
15		23/19/28/38	100	GW	15.0'-17.0' Dark brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1040SB		0
240 16								
17.5								

USCOR-6

HOLE NO. (field): SB-6 RRTSL HOLE NO. (permanent): AP-3603	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	ES
18.5								
19.5								
235 20.5		38/17/17/20	100	GW	20.0'–22.0' Dark brown–gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1041SB		0
21.5								
22.5								
23.5								
24.5								
230 25.5								
26.5								
27.5								
28.5								
29.5								
225 30.5		12/34/30/23	100	GW	30.0'–32.0' Dark brown–gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	1042SB		0
31.5								
32.5								
33.5								
34.5								
220 35.5								
36.5								
37.5								
38.5								
40								

USCOM-6

HOLE NO. (field): SB-6 RRTSL
HOLE NO. (permanent): AP-3603

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
215 / 41		9/32/27/36	80	GW	40.0'–42.0' Dark brown–gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	1043SB		0
42								
43								
44								
45 / 210								
46								
47								
48		14/29/33/32	100	GW	48.0'–50.0' Dark brown–gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, moist, no hydrocarbon odor, no sheen.	1044SB		0
49								
50 / 205					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
55 / 200								
56								
57								
58								
59								
60 / 195								
61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 129,335.68 E: 132,256.83

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-7 RRTSL
HOLE NO. (permanent): AP-3604

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 47 F, overcast, strong wind.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL _____

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 5/26/95
DATE HOLE FINISHED: 5/26/95

ELEV. TOP OF HOLE: 255.48

INSPECTOR: Brad Ackman

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255									
1									
2									
3									
4									
5									
250			No data	100	GW	5.0'-7.0' Dark brown, sandy GRAVEL, 40% gravel, 40% sand, 20% silt and clay, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	1045SB 1046SB 1047SB		0
6									
7									
8									
9									
10									
245			12/21/31/15	100	GW	10.0'-12.0' Dark brown-gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1048SB		0
11									
12									
13									
14									
15									
240			27/59/33/32	50	GW	15.0'-17.0' Dark brown-gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1049SB		0
16									
17.5									

USCOM-6

HOLE NO. (field): SB-7 RRTSL
HOLE NO. (permanent): AP-3604

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FIR (p
18.5								
19.5								
2352 20.5		7/10/ 11/17	100	GW	20.0'–22.0' Dark brown–gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, moist, no hydrocarbon odor, no sheen.	1050SB		0
21.5								
22.5								
23.5								
24.5								
2302 25.5								
26.5								
27.5								
28.5								
29.5								
2258 30.5		9/20/ 31/36	80	GW	30.0'–32.0' Dark brown–gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, moist, no hydrocarbon odor, no sheen.	1051SB		0
31.5								
32.5								
33.5								
34.5								
2208 35.5								
36.5								
37.5								
38.5								
40								

USCOR-6

HOLE NO. (field): SB-7 RRTSL
HOLE NO. (permanent): AP-3604

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
215 / 41		17/24/23/25	100	GW	40.0'–42.0' Dark brown–gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, moist, no hydrocarbon odor, no sheen.	1052SB		0
42								
43								
44								
45 / 210								
46								
47								
48		10/18/38/75	100	GW	48.0'–50.0' Brown–light gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, moist to dry, no hydrocarbon odor, no sheen.	1053SB		0
49								
50 / 205					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
55 / 200								
56								
57								
58								
59								
60 / 195								
61								
62.5								

USCOM-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 129,386.76	E: 132,190.74
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-8 RRTSL HOLE NO. (permanent): AP-3605	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 45 F, calm, overcast.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 5/30/95 DATE HOLE FINISHED: 5/30/95
ELEV. TOP OF HOLE 258.11	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
255 3									
4									
5			No data	100	SM	5.0'-7.0' FILL-Brown, sandy SILT, 40% silt, 30% sand, 30% gravel, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	1054SB		0
6									
7									
250 8									
9									
10			5/7/10/8	100	GM	10.0'-12.0' Brown, silty GRAVEL, 40% gravel, 30% silt and clay, 20% sand, pea gravel, loose, dry, no hydrocarbon odor, no sheen.	1055SB		0
11									
12									
245 13									
14									
15			9/18/6/11	100	GW	15.0'-17.0' Brown, sandy GRAVEL, 45% gravel, 35% sand, 20% silt and clay, max.=>6 cm, loose, dry, no hydrocarbon odor, no sheen.	1056SB		0
16									
17.5									

USCOM-6

HOLE NO. (field): SB-8 RRTSL HOLE NO. (permanent): AP-3605	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (P
240 18.5								
19.5								
20.5		18/15/16/17	100	GC	20.0'-22.0' Tan, gravelly CLAY, 60% clay, 30% gravel, 10% sand, max.=>6 cm, tight, moist, no hydrocarbon odor, no sheen.	1057SB		0
21.5								
22.5								
235 23.5								
24.5								
25.5								
26.5								
27.5								
230 28.5								
29.5								
30.5		13/11/12/16	100	GC	30.0'-32.0' Tan-brown, gravelly CLAY, 40% clay, 30% gravel, 30% sand, max.= 6 cm, no hydrocarbon odor, no sheen.	1058SB		0
31.5								
32.5								
225 33.5								
34.5								
35.5								
36.5								
37.5								
220 38.5								
40								

USCOR-8

HOLE NO. (field): SB-8 RRTSL
HOLE NO. (permanent): AP-3605

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		18/15/11/13	100	GW	40.0'-42.0' Tan-brown, sandy GRAVEL, 50% gravel, 40% sand, 10% clay, max.= 6 cm, tight, moist, no hydrocarbon odor, no sheen.	1059SB		0
42								
215 43								
44								
45								
46								
47								
210 48		19/22/25/24	100	GW	48.0'-50.0' Brown, sandy GRAVEL, 45% gravel, 30% sand, 25% silt and clay, tight, moist, no hydrocarbon odor, no sheen.	1060SB		0
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
205 53								
54								
55								
56								
57								
200 58								
59								
60								
61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 2
	LOCATION COORD N: 129,200.50	E: 132,192.63
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-9 RRTSL HOLE NO. (permanent): AP-3606	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 45 F, calm, overcast.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 8" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 22 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 4	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 5/30/95 DATE HOLE FINISHED: 5/30/95
ELEV. TOP OF HOLE 255.70	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RECOVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PROJECT	FIELD	FID (ppm)
255									
1									
2									
3									
4									
5									
250			No data	100	GM	5.0'-7.0' Brown, gravelly SILT, 60% silt, 20% gravel, 20% sand, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	1061SB 1062SB 1063SB		0
6									
7									
8									
9									
10									
245			7/12/9/10	100	GW	10.0'-12.0' Brown, sandy GRAVEL, 40% gravel, 40% sand, 20% clay, pea gravel, max.= 6 cm, loose, dry, no hydrocarbon odor, no sheen.	1064SB		0
11									
12									
13									
14									
15									
240			8/13/11/10	100	GW	15.0'-17.0' Brown, sandy GRAVEL, 60% gravel, 30% sand, 10% silt and clay, no hydrocarbon odor, no sheen.	1065SB		0
16									
17.5									

USCOR-6

HOLE NO. (field): SB-9 RRTSL HOLE NO. (permanent): AP-3606	PROJECT: OU-A Fort Richardson	SHEET # 2 of 2

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
18.5								
19.5								
20.5 (235)		13/30/32/33	100	GM	20.0'-22.0' Brown-light gray, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, tight, moist, no hydrocarbon odor, no sheen.	1086SB		0
21.5								
22.5					Bottom of exploration at 22.0'. Soil boring abandoned at 22.0'.			
23.5								
24.5								
25.5 (230)								
26.5								
27.5								
28.5								
29.5								
30.5 (225)								
31.5								
32.5								
33.5								
34.5								
35.5 (220)								
36.5								
37.5								
38.5								
40								

USCOR-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 129,359.38 E: 132,095.69

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-10 RRTSL

HOLE NO. (permanent): AP-3607

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 45 F, overcast, calm

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 8

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 5/31/95
DATE HOLE FINISHED: 5/31/95

ELEV. TOP OF HOLE: 259.27

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1	(permafrost) (groundwater)							
2								
3								
4								
255								
5		No data	100	SM	5.0'-7.0' Brown, sandy SILT and CLAY, 60% silt and clay, 20% sand , 20% gravel, max.= 3 cm, loose, dry, no hydrocarbon odor, no sheen.	1087SB		0
6								
7								
8								
9								
250								
10		No data	100	GM	10.0'-12.0' Brown, gravelly SILT and CLAY, 50% silt and clay, 30% gravel, 20% sand, max.= 3 cm, loose, dry, no hydrocarbon odor, no sheen.	1088SB		0
11								
12								
13								
14								
245								
15		8/8/9/12	100	GM	15.0'-17.0' Brown, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, subangular, tight, dry, no hydrocarbon odor, no sheen.	1089SB		0
16								
17.5								

USCOM-6

HOLE NO. (field): SB-10 RRTSL HOLE NO. (permanent): AP-3607	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
240 19.5							
20.5		8/11/13/15	100	GM	20.0'-22.0' Tan-brown, silty GRAVEL, 55% gravel, 45% silt and clay, poorly sorted, subangular, max.=>6 cm, tight, dry to moist, no hydrocarbon odor, no sheen.	1070SB	0
21.5							
22.5							
23.5							
235 24.5							
25.5							
26.5							
27.5							
28.5							
230 29.5							
30.5		9/12/28/22	100	GM	30.0'-32.0' Brown-tan, clayey GRAVEL, 40% gravel, 40% clay, 20% coarse sand, poorly sorted, max. >6 cm, tight, dry, moist to dry, no hydrocarbon odor, no sheen.	1071SB	0
31.5							
32.5							
33.5							
225 34.5							
35.5							
36.5							
37.5							
38.5							
220 40							

USCOR-6

HOLE NO. (field): SB-10 RRTSL
HOLE NO. (permanent): AP-3607

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		20/18/ 11/17	0		No sample recovery.			
42								
43		No data	80	GM	42.5'-44.5' Brown-tan, clayey GRAVEL, 50% gravel, 40% clay, 10% coarse sand, poorly sorted, moist, no hydrocarbon odor, no sheen.	1072SB		0
44 (215)								
45								
46								
47								
48		9/14/ 23/21	100	GM	48.0'-50.0' Brown-tan, clayey GRAVEL, 60% gravel, 30% clay, 10% sand, poorly sorted, moist-wet clay lenses, no hydrocarbon odor, no sheen.	1073SB		0
49 (210)								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54 (205)								
55								
56								
57								
58								
59 (200)								
60								
61								
62.5								

USCOR-8

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 129,289.38 E: 132,070.09

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-11 RRTSL
HOLE NO. (permanent): AP-3608

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 45 F, calm, overcast.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL ____

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 5/31/95
DATE HOLE FINISHED: 5/31/95

ELEV. TOP OF HOLE: 255.31

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255									
1									
2									
3									
4									
5									
250			No data	100	GC	5.0'-7.0' Redish-brown, clayey GRAVEL, 60% gravel, 30% clay, 10% sand, poorly sorted, moist to wet clay lenses, no hydrocarbon odor, no sheen.	1074SB 1075SB 1076SB		No data
6									
7									
8									
9									
10									
245			9/7/5/9	100	GM	10.0'-12.0' Brown, gravelly SILT, 50% silt, 30% gravel, 20% sand, pea gravel, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	1077SB		No data
11									
12									
13									
14									
15									
240			5/9/11/12	80	GW	15.0'-17.0' Brown-gray, sandy GRAVEL, 40% gravel, 30% sand, 30% silt and clay, angular-subangular, max.= 4 cm, tight, dry, no hydrocarbon odor, no sheen.	1078SB		No data
16									
17.5									

USCOR-8

HOLE NO. (field): SB-11 RRTSL
HOLE NO. (permanent): AP-3808

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (p
18.5								
19.5								
235 20.5		11/27/ 42/44	100	GM	20.0'-22.0' Brown-gray, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, subangular, max.= >6 cm, tight, moist, no hydrocarbon odor, no sheen.	1079SB		No data
21.5								
22.5								
23.5								
24.5								
230 25.5								
26.5								
27.5								
28.5								
29.5								
225 30.5		17/45/ 40/52	100	SW	30.0'-32.0' Brown-gray, gravelly SAND, 40% coarse to fine sand, 40% gravel, 20% silt and clay, poorly sorted, max.= 3 cm, dry, no hydrocarbon odor, no sheen.	1080SB		No data
31.5								
32.5								
33.5								
34.5								
220 35.5								
36.5								
37.5								
38.5								
40								

USCOM-6

HOLE NO. (field): SB-11 RRTSL
HOLE NO. (permanent): AP-3608

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
215 / 41		10/22/27/28	100	GW	40.0'–42.0' Brown-gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, poorly sorted, max.= 3 cm, moist, no hydrocarbon odor, no sheen.	1081SB		No data
42								
43								
44								
210 / 45								
46								
47								
48		12/22/47/62	100	SW	48.0'–50.0' Brown-gray, gravelly SAND, 50% coarse to fine sand, 30% gravel, 20% silt and clay, sandy layer at 49.0'–49.5 with trace coal, angular, max.= 3 cm, poorly sorted, no hydrocarbon odor, no sheen.	1082SB 1083SB 1084SB		No data
49								
205 / 50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
200 / 55								
56								
57								
58								
59								
195 / 60								
61								
62.5								

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 129,213.86	E: 132,158.13
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-12 RRTSL HOLE NO. (permanent): AP-3609	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 45 F, overcast, calm.

TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75

TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.	DATE HOLE STARTED: 6/01/95 DATE HOLE FINISHED: 6/01/95
ELEV. TOP OF HOLE 255.67	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel	CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255									
1									
2									
3									
4									
5			No data	100	SM	5.0'–7.0' Brown, silty SAND, 70% sand, 20% silt, 10% gravel, max.= 4 cm, angular to subrounded, loose, dry, no hydrocarbon odor, no sheen.	1085SB 1086SB 1087SB		No data
250 6									
7									
8									
9									
10			No data	100	SM	10.0'–12.0' Brown, silty SAND, 60% sand, 25% silt, 15% gravel, angular to subrounded, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	1088SB		No data
245 11									
12									
13									
14									
15			12/14/17/19	100	SW	15.0'–17.0' Light brown, gravelly SAND, 40% sand, 40% gravel, 20% silt, tight, dry, no hydrocarbon odor, no sheen.	1089SB		No data
240 16									
17.5									

HOLE NO. (field): SB-12 RRTSL
HOLE NO. (permanent): AP-3609

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (PI
18.5								
19.5								
235 20.5		9/8/ 7/10	100	SM	20.0'–22.0' Brown, silty SAND, 40% sand, 40% silt and clay, 20% gravel, max.= 3 cm, moist, no hydrocarbon odor, no sheen.	BS0801		No data
21.5								
22.5								
23.5								
24.5								
230 25.5								
26.5								
27.5								
28.5								
29.5								
225 30.5		21/27/ 21/62	100	SW	30.0'–32.0' Brown–gray, gravelly SAND, 40% sand, 40% gravel, 20% silt and clay, max.= 5 cm, angular, dry, no hydrocarbon odor, no sheen.	BS1001		No data
31.5								
32.5								
33.5								
34.5								
220 35.5								
36.5								
37.5								
38.5								
40								

HOLE NO. (field): SB-12 RRTSL
HOLE NO. (permanent): AP-3609

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
215 / 41		8/12/17/24	100	SW	40.0'–42.0' Gray-brown, gravelly SAND, 60% sand, 20% gravel, 20% silt and clay, poorly sorted, wet zone at 41.0'–41.4', denser zone beneath wet zone, no hydrocarbon odor, no sheen.	1002SB		No data
42								
43								
44								
45								
210 / 46								
47								
48		9/38/36/26	100	SW	48.0'–50.0' Gray-brown, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, angular, moist, no hydrocarbon odor, no sheen.	1003SB		No data
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
205 / 51								
52								
53								
54								
55								
200 / 56								
57								
58								
59								
60								
195 / 61								
62.5								

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 2
	LOCATION COORD N: 129,202.37	E: 132,270.95
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-13 RRTSL HOLE NO. (permanent): AP-3610	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 45 F, overcast, calm.

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole (X) Churn Drill ( )	300 pounds	6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
22 ft.	(X) MSL _____	Truck Mounted CME-75

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 6/02/95 DATE HOLE FINISHED: 6/02/95
4	3" O.D. Split Spoon	NA ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
256.75	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255									
250			No data	100	GW	5.0'-7.0' Dark brown, sandy GRAVEL, 45% gravel, 40% sand, 15% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1094SB 1095SB 1096SB		0
245			No data	100	GW	10.0'-12.0' Dark brown, sandy GRAVEL, 45% gravel, 40% sand, 15% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1097SB		0

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HOLE NO. (field): SB-13 RRTSL
HOLE NO. (permanent): AP-3610

PROJECT: OU-A Fort Richardson

SHEET # 2 of 2

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	
15								
16		6/12/ 7/15	75	GW	15.0'–17.0' Redish brown, sandy GRAVEL, 45% gravel, 40% sand, 15% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1098SB	0	
240 17								
18								
19								
20		8/13/ 6/5	100	GW	20.0'–22.0' Brown, sandy GRAVEL, 45% gravel, 40% sand, 15% silt and clay, moist, no hydrocarbon odor, no sheen.	1099SB	0	
235 22					Bottom of exploration at 22.0'. Soil boring abandoned at 22.0'.			
23								
24								
25								
26								
230 27								
28								
29								
30								
31								
225 32								

USCOR-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 2

LOCATION COORD N: 129,242.66 E: 132,161.15

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-14 RRTSL

HOLE NO. (permanent): AP-3611

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 45 F, overcast, calm.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 8" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 22 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL ( )

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 4

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 8/02/95
DATE HOLE FINISHED: 8/02/95

ELEV. TOP OF HOLE: 255.80

INSPECTOR: Brad Ackman

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255 / 1	(permafrost) (groundwater)							
2								
3								
4								
5		No data	100	SW	5.0'-7.0' Dark brown, gravelly SAND, 50% sand, 40% gravel, 10% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1100SB 1101SB 1102SB		0
250 / 6								
7								
8								
9								
10		No data	100	SW	10.0'-12.0' Dark brown, gravelly SAND, 50% sand, 40% gravel, 10% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1103SB		0
245 / 11								
12								
13								
14								

USCOE-6

HOLE NO. (field): SB-14 RRTSL
HOLE NO. (permanent): AP-3611

PROJECT: OU-A Fort Richardson

SHEET # 2 of 2

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID
15								
-240 16		6/12/ 7/15	80	SW	15.0'-17.0' Dark brown, gravelly SAND, 50% sand, 40% gravel, 10% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1104SB		0
17								
18								
19								
20								
-235 21		8/13/ 6/5	100	SW	20.0'-22.0' Dark brown, gravelly SAND, 50% sand, 40% gravel, 10% silt and clay, moist, no hydrocarbon odor, no sheen.	1105SB		0
22					Bottom of exploration at 22.0'. Soil boring abandoned at 22.0'.			
23								
24								
25								
-230 26								
27								
28								
29								
30								
-225 31								
32								

USCOM-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 128,814.72	E: 132,369.05
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-15 RRTSL HOLE NO. (permanent): AP-3612	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 50 F, clear, calm.
Test Pit ( ) TYPE OF HOLE Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 6/03/95 DATE HOLE FINISHED: 6/03/95
ELEV. TOP OF HOLE 257.70	INSPECTOR Brad Ackman	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
255 3									
4									
5									
6			No data	100	GW	5.0'–7.0' Dark brown, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= >6 cm, moist, no hydrocarbon odor, no sheen.	1106SB		0
7									
250 8									
9									
10									
11			No data	100	GW	10.0'–12.0' Dark brown, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= >6 cm, moist, no hydrocarbon odor, no sheen.	1107SB 1108SB 1109SB		0
12									
245 13									
14									
15									
16			8/10/ 23/18	100	GW	15.0'–17.0' Brown-gray, sandy GRAVEL, 50% gravel, 45% sand, 5% silt and clay, max.= 3 cm, moist to wet, no hydrocarbon odor, no sheen.	1110SB		0
17.5									

USCOM-8

HOLE NO. (field): SB-15 RRTSL
HOLE NO. (permanent): AP-3612

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
240							
18.5							
19.5							
20.5		9/18/ 20/26	100	GW	20.0'-22.0' Brown-gray, sandy GRAVEL, 50% gravel, 45% sand, 5% silt and clay, max.= 3 cm, moist, no hydrocarbon odor, no sheen.	1111SB	0
21.5							
22.5							
235							
23.5							
24.5							
25.5							
26.5							
27.5							
230							
28.5							
29.5							
30.5		24/36/ 60/58	100	GW	30.0'-32.0' Brown-gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1112SB	0
31.5							
32.5							
225							
33.5							
34.5							
35.5							
36.5							
37.5							
220							
38.5							
40							

USCOR-6

HOLE NO. (field): SB-15 RRTSL
HOLE NO. (permanent): AP-3612

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		14/39/44/12	100	GW	40.0'-42.0' Brown-gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1113SB		0
42								
215								
43								
44								
45								
46								
47								
210								
48		16/23/48/14	100	GW	48.0'-50.0' Brown-gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1114SB		0
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
205								
53								
54								
55								
56								
57								
200								
58								
59								
60								
61								
62.5								

USCOR-8

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 129,036.97 E: 132,483.04

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-16 RRTSL
HOLE NO. (permanent): AP-3613

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 55 F, overcast, 10 mph wind

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 8/05/95
DATE HOLE FINISHED: 8/05/95

ELEV. TOP OF HOLE: 254.54

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
3									
4									
250									
5									
			No data	100	SM	5.0'-7.0' Brown, silty SAND, 50% sand, 30% silt and clay, 20% gravel, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	1115SB		0
6									
7									
8									
9									
245									
10									
			No data	100	GM	10.0'-12.0' Brown, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1116SB		0
11									
12									
13									
14									
240									
15									
			8/21/ 23/18	100	GM	15.0'-17.0' Brown, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1117SB		0
16									
17.5									

USCOM-6

HOLE NO. (field): SB-16 RRTSL HOLE NO. (permanent): AP-3613	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RECOVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PROJECT	FIELD
18.5							
235 19.5							
20.5		25/20/35/30	100	GM	20.0'-22.0' Brown, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, moist, no hydrocarbon odor, no sheen.	1116SB	0
21.5							
22.5							
23.5							
230 24.5							
25.5							
26.5							
27.5							
28.5							
225 29.5							
30.5		14/25/33/39	100	GW	30.0'-32.0' Brown, sandy GRAVEL, 40% gravel, 40% sand, 20% silt and clay, poorly sorted, max.= >6 cm, dry to moist, no hydrocarbon odor, no sheen.	1119SB	0
31.5							
32.5							
33.5							
220 34.5							
35.5							
36.5							
37.5							
38.5							
215 40							

HOLE NO. (field): SB-16 RRTSL HOLE NO. (permanent): AP-3613	PROJECT: OU-A Fort Richardson	SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		28/33/31/32	100	GW	40.0'-42.0' Brown, sandy GRAVEL, 40% gravel, 40% sand, 20% silt and clay, poorly sorted, max.= >8 cm, dry to moist, no hydrocarbon odor, no sheen.	1120SB		0
42								
43								
44								
210								
45								
46								
47								
48		21/16/18/23	100	GW	48.0'-50.0' Brown, sandy GRAVEL, 40% gravel, 40% sand, 20% silt and clay, poorly sorted, max.= >6 cm, dry to moist, no hydrocarbon odor, no sheen.	1121SB		0
49								
205								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
200								
55								
56								
57								
58								
59								
195								
60								
61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 129,370.38	E: 132,502.21
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-17 RRTSL HOLE NO. (permanent): AP-3614	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 55 F, overcast, 10 mph wind.

TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger	
TOTAL DEPTH OF HOLE 41 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75	
TOTAL # OF SAMPLES 6	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.	DATE HOLE STARTED: 6/05/95 DATE HOLE FINISHED: 6/05/95
ELEV. TOP OF HOLE 261.82	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel	CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permatrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
260									
255			No data	100	SM	5.0'–7.0' Brown, silty SAND, 50% sand, 30% silt, 20% gravel, poorly sorted, max.= 4 cm, dry, no hydrocarbon odor, no sheen.	1122SB		0
250			No data	100	SW	10.0'–12.0' Brown, gravelly SAND, 40% sand, 40% gravel, 20% silt and clay, poorly sorted, max.= >6 cm, loose, dry, no hydrocarbon odor, no sheen.	1123SB		0
245			No data	100	GM	15.0'–17.0' Brown, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, poorly sorted, subangular, max.= >6 cm, no hydrocarbon odor, no sheen.	1124SB		0
17.5									

USCOE-8

HOLE NO. (field): SB-17 RRTSL
HOLE NO. (permanent): AP-3614

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
19.5							
20.5		No data	100	GM	20.0'–22.0' Brown, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, poorly sorted, subangular max.= >6 cm, no hydrocarbon odor, no sheen.	1125SB	0
21.5 240							
22.5							
23.5							
24.5							
25.5							
26.5 235							
27.5							
28.5							
29.5							
30.5		32/53/ 33/23	100	GM	30.0'–32.0' Brown-tan, silty GRAVEL, 40% gravel, 30% silt and clay, 30% sand, poorly sorted, max.= >6 cm, tight, dry, no hydrocarbon odor, no sheen.	1126SB	0
31.5 230							
32.5							
33.5							
34.5							
35.5							
36.5 225							
37.5							
38.5							
40							

USCOR-8

HOLE NO. (field): SB-17 RRTSL
HOLE NO. (permanent): AP-3614

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		150	50	SW	No sample recovered. Refusal-Drillers continued drilling with split spoon inside of augers until 41.0' refusal. Sample recovered from split spoon sampler-Gray, gravelly SAND, 40% sand, 30% gravel, 30% silt and clay, poorly sorted, max.= >6 cm, loose, dry, no hydrocarbon odor, no sheen.	1127SB		0
220 42					Bottom of exploration at 41.0'. Soil boring abandoned at 41.0'.			
43								
44								
45								
46								
215 47								
48								
49								
50								
51								
210 52								
53								
54								
55								
56								
205 57								
58								
59								
60								
61								
200 62.5								

USCOR-8

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 128,933.86 E: 132,157.85

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-18 RRTSL
HOLE NO. (permanent): AP-3615

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 55 F, overcast, 10 mph wind

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 6/06/95
DATE HOLE FINISHED: 6/06/95

ELEV. TOP OF HOLE: 257.57

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
255									
3									
4									
5									
6			No data	100	SM	5.0'-7.0' Brown, silty fine SAND, 40% fine sand, 40% silt, 20% gravel, rounded, max.= 6 cm, loose, no hydrocarbon odor, no sheen.	1128SB 1129SB 1130SB		0
7									
250									
8									
9									
10			No data	100	SM	10.0'-12.0' Brown, silty fine SAND, 40% fine sand, 40% silt, 20% gravel, rounded, max.= 6 cm, loose, no hydrocarbon odor, no sheen.	1131SB		0
11									
12									
245									
13									
14									
15									
16			19/18/ 20/23	100	SW	15.0'-17.0' Brown, gravelly coarse SAND, 45% coarse sand, 35% gravel, 20% silt and clay, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	1132SB		0
17.5									

USCOR-6

HOLE NO. (field): SB-18 RRTSL
HOLE NO. (permanent): AP-3615

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
240							
18.5							
19.5							
20.5		18/24/30/32	100	SW	20.0'–22.0' Brown, gravelly coarse SAND, 45% coarse sand, 35% gravel, 20% silt and clay, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	1133SB	0
21.5							
235 22.5							
23.5							
24.5							
25.5							
26.5							
230 27.5							
28.5							
29.5							
30.5		19/51/56/36	100	GC	30.0'–32.0' Brown–tan, clayey GRAVEL, 45% gravel, 30% clay, 25% sand, poorly sorted, max.= >6 cm, tight, moist, no hydrocarbon odor, no sheen.	1134SB	0
31.5							
225 32.5							
33.5							
34.5							
35.5							
36.5							
220 37.5							
38.5							
40							

USCOR-8

HOLE NO. (field): SB-18 RRTSL
HOLE NO. (permanent): AP-3615

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		18/32/20/12	100	GC	40.0'-42.0' Brown-tan, clayey GRAVEL, 45% gravel, 30% clay, 25% sand, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	1135SB		0
42								
215								
43								
44								
45								
46								
47								
210								
48		7/38/27/26	100	SC	48.0'-50.0' Brown-tan, clayey SAND, 40% sand, 30% clay, 30% gravel, poorly sorted, max.= >6 cm, tight, dry, no hydrocarbon odor, no sheen.	1136SB		0
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
205								
53								
54								
55								
56								
57								
200								
58								
59								
60								
61								
62.5								

USCOR-8

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 129,061.84	E: 131,969.00
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-19 RRTSL HOLE NO. (permanent): AP-3616	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 55 F, overcast, 10 mph wind

TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75

TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.	DATE HOLE STARTED: 6/07/95 DATE HOLE FINISHED: 6/07/95
ELEV. TOP OF HOLE 256.68	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel	CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255									
250			No data	100	SM	5.0'–7.0' Brown, silty SAND, 60% fine sand, 30% silt, 10% gravel, rounded, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	1137SB		0
245			No data	100	SM	10.0'–12.0' Brown, silty SAND, 60% fine sand, 30% silt, 10% gravel, rounded, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	1138SB		0
240			11/27/ 34/41	70	GW	15.0'–17.0' Brown, sandy GRAVEL, 40% gravel, 40% sand, 20% silt and clay, max.= 4 cm, rounded to subrounded, tight, dry, no hydrocarbon odor, no sheen.	1139SB		0
17.5									

USCOM-6

HOLE NO. (field): SB-19 RRTSL
HOLE NO. (permanent): AP-3618

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	
18.5								
19.5								
20.5		9/10/15/23	100	SW	20.0'-22.0' Brown, gravelly SAND, 70% sand, 23% gravel, 7% silt, very well sorted, bedded sand and pea gravel, rounded, loose, dry, no hydrocarbon odor, no sheen.	1140SB	0	
235 21.5								
22.5								
23.5								
24.5								
25.5								
230 26.5								
27.5								
28.5								
29.5								
30.5		21/29/34/23	100	GM	30.0'-32.0' Brown-tan, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	1141SB	0	
225 31.5								
32.5								
33.5								
34.5								
35.5								
220 36.5								
37.5								
38.5								
40								

USCOR-8

HOLE NO. (field): SB-19 RRTSL HOLE NO. (permanent): AP-3618	PROJECT: OU-A Fort Richardson	SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		12/23/25/27	100	GM	40.0'–42.0' Brown–tan, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	1142SB		0
215 42								
43								
44								
45								
46								
210 47								
48		17/17/19/20	100	GM	48.0'–50.0' Brown–tan, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	1143SB		0
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
205 52								
53								
54								
55								
56								
200 57								
58								
59								
60								
61								
195 62.5								

USCOR-8

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 2

LOCATION COORD N: 129,186.26 E: 132,270.08

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-20 RRTSL
HOLE NO. (permanent): AP-3617

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 55 F, overcast, 10 mph wind

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 22 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 4

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 6/07/95
DATE HOLE FINISHED: 6/07/95

ELEV. TOP OF HOLE: 256.64

INSPECTOR: Jackie Oonley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1–2–3–4–	(permafrost) (groundwater)							
255								
5–		No data	100	SM	5.0'–7.0' Brown, silty SAND, 60% fine sand, 30% silt, 10% gravel, loose, dry, no hydrocarbon odor, no sheen.	1144SB		0
6–								
250								
7–								
8–								
9–								
10–		No data	100	GW	10.0'–12.0' Brown, sandy GRAVEL, 50% pea gravel, 40% sand, 10% silt, rounded, max.= 2 cm, loose, dry, no hydrocarbon odor, no sheen.	1145SB		0
11–								
245								
12–								
13–								
14–								
15–		12/19/13/15	100	GC	15.0'–17.0' Brown, clayey GRAVEL, 40% gravel, 30% clay, 30% sand, max.= 6 cm, tight, moist, no hydrocarbon odor, no sheen.	1146SB		0
16–								
240								
17.5								

USCOR-6

HOLE NO. (field): SB-20 RRTSL HOLE NO. (permanent): AP-3617	PROJECT: OU-A Fort Richardson	SHEET # 2 of 2

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
19.5							
20.5		17/13/14/16	100	GC	20.0'-22.0' Brown, clayey GRAVEL, 60% gravel. 30% clay, 10% sand, no hydrocarbon odor, no sheen.	1147SB	0
235 21.5							
22.5					Bottom of exploration at 22.0'. Soil boring abandoned at 22.0'.		
23.5							
24.5							
25.5							
230 26.5							
27.5							
28.5							
29.5							
30.5							
225 31.5							
32.5							
33.5							
34.5							
35.5							
220 36.5							
37.5							
38.5							
40							

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 4
	LOCATION COORD N: 128,744.31	E: 132,330.30
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): MW-11 RRTSL HOLE NO. (permanent): AP-3658	NAME OF DRILLER Tester Drilling Co./Tim Tester	WEATHER 45 F, light rain, calm

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole ( ) Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
94.6 ft.	(X) MSL _____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 9/11/95 DATE HOLE FINISHED: 9/11/95
4	3" O.D. Split Spoon	84.5ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
262.22	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1	(permafrost) (groundwater)							
260 2								
3								
4								
5								
6								
255 7								
8								
9								
10								
11								
250 12								
13								
14								
15								
16								
245 17								
18								
19								
20								
21								

USCOR-4

HOLE NO. (field): MW-11 RRTSL HOLE NO. (permanent): AP-3658	PROJECT: OU-A Fort Richardson	SHEET # 2 of 4

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
240 22							
23							
24							
25							
26							
235 27							
28							
29							
30							
31							
230 32							
33							
34							
35							
36							
225 37							
38							
39							
40							
41							
220 42							
43							
44							
45							
46							
215 47							
48							

USCOR-6

HOLE NO. (field): MW-11 RRTSL
HOLE NO. (permanent): AP-3658

PROJECT: OU-A Fort Richardson

SHEET # 3 of 4

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
49								
50								
51								
210 52								
53								
54								
55								
56								
205 57								
58		16/38/14	60	GW	58.0'-59.5' Gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1148SB		2
59								
60								
61								
200 62								
63								
64								
65								
66								
195 67								
68		No data	0		68.0'-70.0' No sample recovery.			
69								
70								
71								
190 72								
73								
74								
75								

USCOR-6

HOLE NO. (field): MW-11 RRTSL
HOLE NO. (permanent): AP-3658

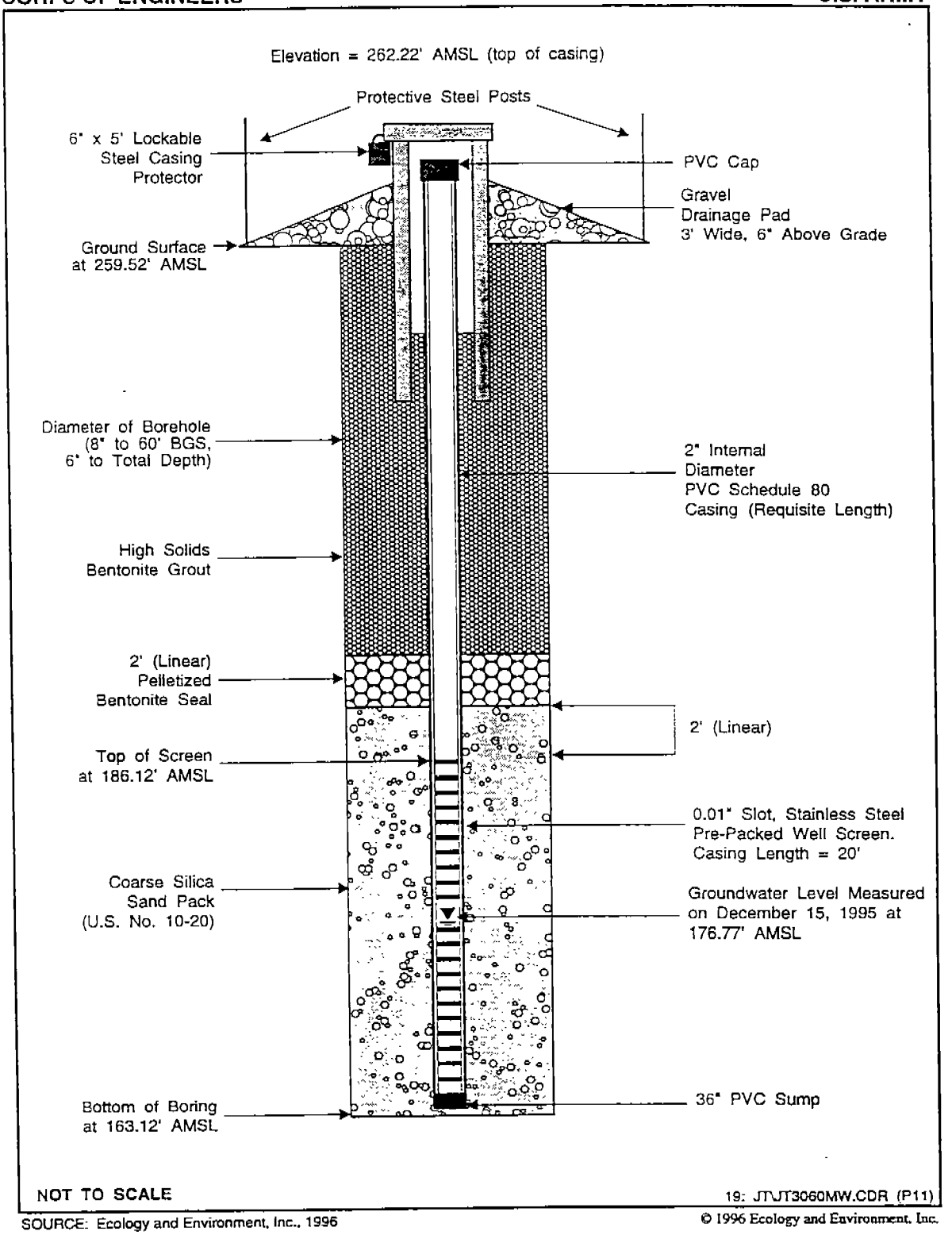
PROJECT: OU-A Fort Richardson

SHEET # 4 of 4

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
76							
185 77							
78		32/34/16	50	GW	78.0'–79.5' Gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1149SB	0
79							
80							
81							
180 82							
83							
84	▽						
85							
86							
175 87							
88		No data	No data	GW	88.0'–90.0' Gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	1150SB 1151SB 1152SB	0
89							
90					Bottom of exploration at 90.0'. Monitoring well installed at 94.6' below ground surface.		
91							
170 92							
93							
94							
95							
96							
165 97							
98							
99							
100							
101							
102							

USCOE-6

CORPS OF ENGINEERS U.S. ARMY



SOURCE: Ecology and Environment, Inc., 1996

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ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
AP-3658 MONITORING WELL CONSTRUCTION DIAGRAM

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 4
	LOCATION COORD N: 129,299.38	E: 132,203.83
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): MW-12 RRTSL HOLE NO. (permanent): AP-3659	NAME OF DRILLER Tester Drilling Co./Tim Tester	WEATHER 33 F, clear, calm

TYPE OF HOLE			HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( )	Auger Hole ( )	Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
97.8 ft.	(X) MSL ____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 9/13/95 DATE HOLE FINISHED: 9/13/95
4	3" O.D. Split Spoon	80.8ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
258.83	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1	(permafrost) (groundwater)							
2								
3								
255 4								
5								
6								
7								
8								
250 9								
10								
11								
12								
13								
245 14								
15								
16								
17								
18								
240 19								
20								
21								

USCOM-8

HOLE NO. (field): MW-12 RRTSL HOLE NO. (permanent): AP-3659	PROJECT: OU-A Fort Richardson	SHEET # 2 of 4

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	
22								
23								
235 24								
25								
26								
27								
28								
230 29								
30								
31								
32								
33								
225 34								
35								
36								
37								
38								
220 39								
40								
41								
42								
43								
215 44								
45								
46								
47								
48								

HOLE NO. (field): MW-12 RRTSL
HOLE NO. (permanent): AP-3659

PROJECT: OU-A Fort Richardson

SHEET # 3 of 4

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
210 49								
50								
51								
52								
53								
205 54								
55								
56								
57								
58					58.0'-60.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, moist, no hydrocarbon odor, no sheen.	1153SB		0
200 59		17/19/28	40	GW				
60								
61								
62								
63								
195 64								
65								
66								
67								
68					68.0'-70.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, moist, no hydrocarbon odor, no sheen.	1154SB 1155SB 1156SB		0
190 69		No data	No data	GW				
70								
71								
72								
73								
185 74								
75								

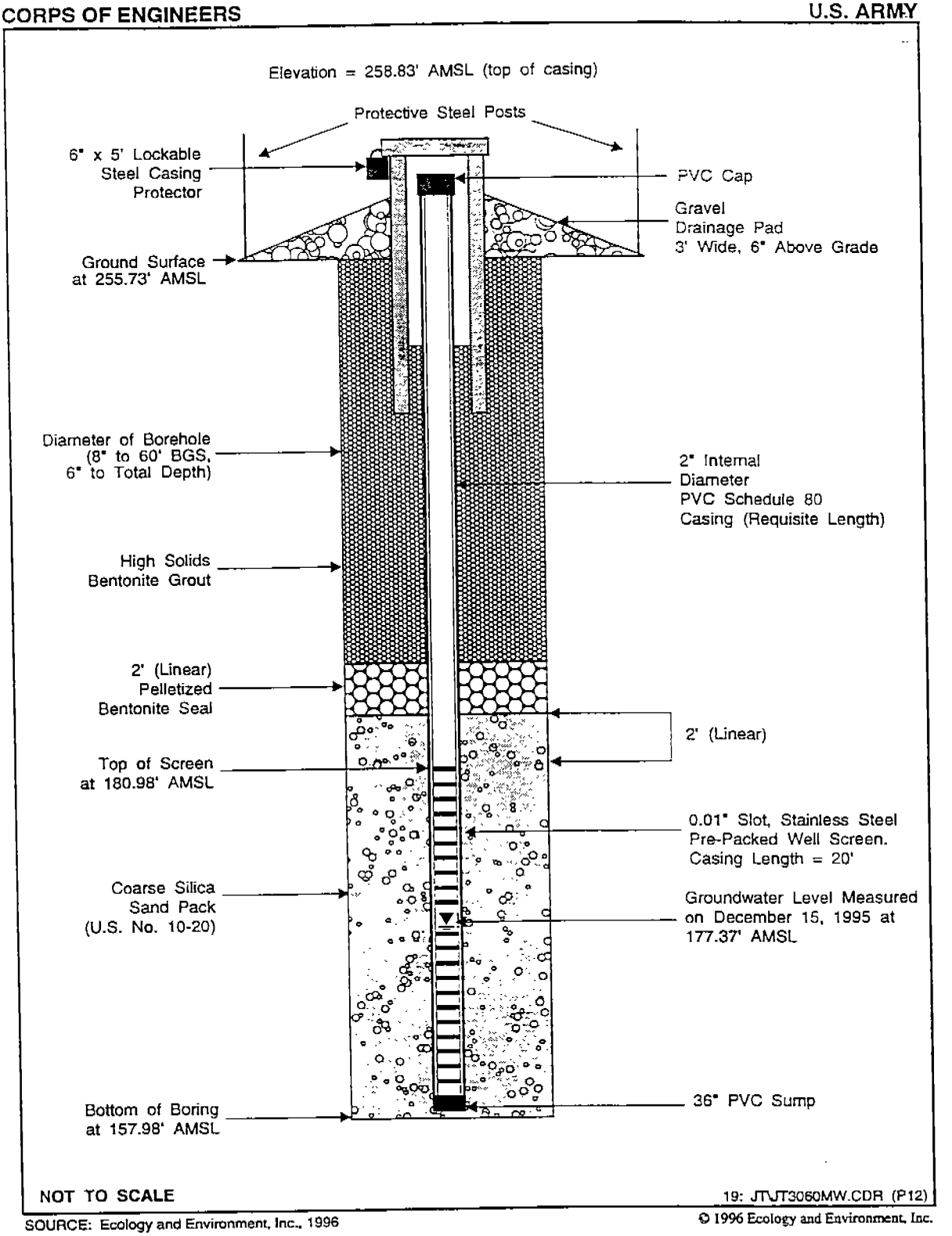
USCOR-8

HOLE NO. (field): MW-12 RRTSL HOLE NO. (permanent): AP-3659	PROJECT: OU-A Fort Richardson	SHEET # 4 of 4

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (P
76								
77								
78								
180 79		17/29/33	20	GM	78.0'-81.0' Brownish gray, silty GRAVEL, 60% gravel, 25% silt and clay, 15% sand, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	1157SB		0
80		18/7/29	40					
81	▼				Bottom of exploration at 81.0'. Monitoring well installed at 97.75' below ground surface.			
82								
83								
175 84								
85								
86								
87								
88								
170 89								
90								
91								
92								
93								
165 94								
95								
96								
97								
98								
160 99								
100								
101								
102								

USCOR-6

CORPS OF ENGINEERS U.S. ARMY



SOURCE: Ecology and Environment, Inc., 1996

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ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
AP-3659 MONITORING WELL CONSTRUCTION DIAGRAM

Ruff Road Fire Training Area

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,355.92	E: 139,350.75
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-31 RRFTA HOLE NO. (permanent): AP-3629	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 65 F, cloudy.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 06/19/95 DATE HOLE FINISHED: 06/19/95
ELEV. TOP OF HOLE 389.55	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
3									
4									
385									
5									
6			No data	100	SW	5.0'-7.0' Brown-tan, gravelly SAND, 50% fine sand, 30% gravel, 20% silt, max.= 3 cm, subangular, elongated to rounded, very dry, no hydrocarbon odor, no sheen.	2001SB		0
7									
8									
9									
380									
10									
11			5/17/21/13	100	SW	10.0'-12.0' Brown-tan, gravelly SAND, 50% fine sand, 30% gravel, 20% silt, max.= 3 cm, subangular, elongated to rounded, dry, no hydrocarbon odor, no sheen.	2002SB		0
12									
13									
14									
375									
15									
16			5/16/27/19	100	GC	15.0'-17.0' Brown-tan, gravelly CLAY, 50% clay and silt, 30% gravel, 20% sand, max.= >6 cm, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	2003SB		No data
17.5									

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HOLE NO. (field): SB-31 RRFTA
HOLE NO. (permanent): AP-3629

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
370 19.5							
20.5		13/19/21/27	100	GC	20.0'-22.0' Brown-tan, gravelly CLAY, 50% clay and silt, 30% gravel, 20% sand, max.= >6 cm, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	2004SB	No data
21.5							
22.5							
23.5							
365 24.5							
25.5							
26.5							
27.5							
28.5							
360 29.5							
30.5		6/20/95	100	GC	30.0'-31.5' Brown-tan, gravelly CLAY, 50% clay, 30% gravel, 20% sand, max.= >6 cm, rounded, well sorted, tight, moist, no hydrocarbon odor, no sheen.	2005SB 2006SB 2007SB	No data
31.5							
32.5							
33.5							
355 34.5							
35.5							
36.5							
37.5							
38.5							
350 40							

HOLE NO. (field): SB-31 RRFTA
HOLE NO. (permanent): AP-3629

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		27/37/46	100	GC	40.0'-41.5' Brown-tan, gravelly CLAY, 50% clay, 30% gravel, 20% sand, max.= >6 cm, rounded, well sorted, tight, moist, no hydrocarbon odor, no sheen.	2008SB		No data
42								
43								
44								
-345								
45								
46								
47								
48								
49		23/46/50	100	SW	48.5'-50.0' Brown, SAND, 70% sand, 20% clay, 10% gravel, max.= >6 cm, rounded, well sorted, tight, moist, no hydrocarbon odor, no sheen.	2009SB		No data
-340								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
-335								
55								
56								
57								
58								
59								
-330								
60								
61								
62.5								

USCOM-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 121,141.66 E: 139,234.46

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-32 RRFTA
HOLE NO. (permanent): AP-3630

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 65 F, partly sunny.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL _____

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 6/20/95
DATE HOLE FINISHED: 6/20/95

ELEV. TOP OF HOLE: 389.94

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1						0.0'–2.0' Driller reports organic layer to 2.0' below ground surface.			
2									
3									
4									
385 5			No data	100	GM	5.0'–6.5' Brown, gravelly SILT, 40% silt, 30% pea gravel, 30% sand, max.= 3 cm, loose, dry, no hydrocarbon odor, no sheen.	2010SB		No data
6									
7									
8									
9									
380 10			No data	100	GM	10.0'–11.5' Brown, gravelly SILT, 40% silt, 30% pea gravel, 30% sand, max.= 3 cm, loose, dry, no hydrocarbon odor, no sheen.	2011SB		No data
11									
12									
13									
14									
375 15			9/27/24	100	GM	15.0'–16.5' Brown, gravelly SILT and CLAY, 40% silt and clay, 30% gravel, 30% sand, max.= 5 cm, rounded, tight, moist, no hydrocarbon odor, no sheen.	2012SB		No data
16									
17.5									

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HOLE NO. (field): SB-32 RRFTA HOLE NO. (permanent): AP-3630	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
19.5							
-370							
20.5		No data	100	GM	20.0'-21.5' Brown, gravelly SILT and CLAY, 40% silt and clay, 30% gravel, 30% sand, max.= 5 cm, rounded, tight, moist, no hydrocarbon odor, no sheen.	2013SB	No data
21.5							
22.5							
23.5							
24.5							
-365							
25.5							
26.5							
27.5							
28.5							
29.5							
-360							
30.5		19/42/43	100	GM	30.0'-31.5' Brown, silty GRAVEL, 65% gravel, 20% silt and clay, 15% sand, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2014SB	0
31.5							
32.5							
33.5							
34.5							
-355							
35.5							
36.5							
37.5							
38.5							
40							
-350							

USCOR-6

HOLE NO. (field): SB-32 RRFTA
HOLE NO. (permanent): AP-3630

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		46/29/44	100	GM	40.0'–41.5' Brown, silty GRAVEL, 65% gravel, 20% silt and clay, 15% sand, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2015SB		0
42								
43								
44								
345 45								
46								
47								
48								
49		8/28/14	100	GM	48.5'–50.0' Brown, silty GRAVEL, 65% gravel, 20% silt and caly, 15% sand, moist, no hydrocarbon odor, no sheen.	2016SB		0
340 50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
335 55								
56								
57								
58								
59								
330 60								
61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,842.62	E: 139,360.42
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-33 RRFTA HOLE NO. (permanent): AP-3631	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 55 F, overcast, calm.

TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75

TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.	DATE HOLE STARTED: 6/21/95 DATE HOLE FINISHED: 6/21/95
ELEV. TOP OF HOLE 394.58	INSPECTOR Brad Ackman	CHIEF SOILS SECTION Jerry Raychel	CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
3									
4									
390									
5			No data	100	GW	5.0'-6.5' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 5 cm, dry, no hydrocarbon odor, no sheen.	2017SB 2018SB 2019SB		0
6									
7									
8									
9									
385									
10			18/28/28	100	GW	10.0'-11.5' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 5 cm, dry, no hydrocarbon odor, no sheen.	2020SB		0
11									
12									
13									
14									
380									
15			9/12/24	100	GW	15.0'-16.5' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, dry, no hydrocarbon odor, no sheen.	2021SB		0
16									
17.5									

USCOR-6

HOLE NO. (field): SB-33 RRFTA
HOLE NO. (permanent): AP-3631

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
375 19.5							
20.5		13/23/28	100	GW	20.0'-21.5' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, dry, no hydrocarbon odor, no sheen.	2022SB	0
21.5							
22.5							
23.5							
370 24.5							
25.5							
26.5							
27.5							
28.5							
365 29.5							
30.5		16/32/18	100	GW	30.0'-31.5' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, dry, no hydrocarbon odor, no sheen.	2023SB	0
31.5							
32.5							
33.5							
360 34.5							
35.5							
36.5							
37.5							
38.5							
355 40							

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HOLE NO. (field): SB-33 RRFTA
HOLE NO. (permanent): AP-3831

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		16/29/23	100	GW	40.0'-41.5' Brown-gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2024SB		0
42								
43								
44								
-350								
45								
46								
47								
48								
49		17/29/39	100	GW	48.5'-50.0' Brown-gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2025SB		0
-345								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
-340								
55								
56								
57								
58								
59								
-335								
60								
61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,144.09	E: 139,011.81
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-34 RRFTA HOLE NO. (permanent): AT-3632	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 55 F, overcast, calm.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 6/22/95 DATE HOLE FINISHED: 6/22/95
ELEV. TOP OF HOLE 385.09	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
385									
1									
2									
3									
4									
380 5									
6			No data	100	GW	5.0'–6.5' Brown–gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	2026SB		0
7									
8									
9									
375 10									
11			No data	100	GW	10.0'–11.5' Brown–gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	2027SB		0
12									
13									
14									
370 15									
16			18/29/33	100	GM	15.0'–16.5' Brown–gray, gravelly SILT and CLAY, 50% silt and clay, 30% gravel, 20% sand, max.= 4 cm, no hydrocarbon odor, no sheen.	2028SB		0
17.5									

USCOM-6

HOLE NO. (field): SB-34 RRFTA
HOLE NO. (permanent): AT-3632

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (pp
18.5								
19.5								
365								
20.5		17/27/47	100	GW	20.0'-21.5' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2029SB		0
21.5								
22.5								
23.5								
24.5								
360								
25.5								
26.5								
27.5								
28.5								
29.5								
355								
30.5		17/21/37	100	GC	30.0'-31.5' Tan, clayey GRAVEL, 50% gravel, 50% clay, poorly sorted, max.= 4 cm, tight, moist, no hydrocarbon odor, no sheen.	2030SB 2031SB 2032SB		0
31.5								
32.5								
33.5								
34.5								
350								
35.5								
36.5								
37.5								
38.5								
40								

USCOR-6

HOLE NO. (field): SB-34 RRFTA
HOLE NO. (permanent): AT-3632

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
345								
41		29/46/50	100	GC	40.0'-41.5' Tan, clayey GRAVEL, 50% gravel, 50% clay, poorly sorted, max.= 4 cm, tight, moist, no hydrocarbon odor, no sheen.	2033SB		0
42								
43								
44								
340 45								
46								
47								
48								
49		13/23/42	100	GW	48.5'-50.0' Tan, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, no hydrocarbon odor, no sheen.	2034SB		0
335 50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
330 55								
56								
57								
58								
59								
325 60								
61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 121,223.76 E: 138,688.30

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-35 RRFTA
HOLE NO. (permanent): AP-3633

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 50 F, heavy rain.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL _____

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 6/23/95
DATE HOLE FINISHED: 6/23/95

ELEV. TOP OF HOLE: 386.37

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
385									
5			No data	100	SW	5.0'-6.5' Brown, SAND, 70% sand, 20% gravel, 10% silt and clay, max.= 3 cm, dry, no hydrocarbon odor, no sheen.	2035SB 2036SB 2037SB		10
380									
10			No data	100	SW	10.0'-11.5' Brown, SAND, 70% sand, 20% gravel, 10% silt and clay, max.= 3 cm, dry, no hydrocarbon odor, no sheen, methane odor, minor decaying wood.	2038SB		500
375									
15			1/23/36	100	GC	15.0'-16.5' Brown, clayey GRAVEL, 50% gravel, 30% clay, 20% sand, max.= 5 cm, no hydrocarbon odor, no sheen.	2039SB		400
370									
17.5									

USCOM-8

HOLE NO. (field): SB-35 RRFTA
HOLE NO. (permanent): AP-3633

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (pp
18.5								
19.5								
20.5		19/31/33	100	GC	20.0'-21.0' Brown, clayey GRAVEL, 50% gravel, 30% clay, 20% sand, max.= 5 cm, no hydrocarbon odor, no sheen.	2040SB		4
365 21.5								
22.5								
23.5								
24.5								
25.5								
360 26.5								
27.5								
28.5								
29.5								
30.5		14/23/27	100	GC	30.0'-31.5' Brown, clayey GRAVEL, 50% gravel, 30% clay, 20% sand, max.= 5 cm, no hydrocarbon odor, no sheen.	2041SB		3
355 31.5								
32.5								
33.5								
34.5								
35.5								
350 36.5								
37.5								
38.5								
40								

USCOM-6

HOLE NO. (field): SB-35 RRFTA
HOLE NO. (permanent): AP-3633

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		22/50/13	100	GC	40.0'-41.5' Brown, clayey GRAVEL, 50% gravel, 30% clay, 20% sand, max.= 5 cm, no hydrocarbon odor, no sheen.	2042SB		5
-345								
42								
43								
44								
45								
46								
-340								
47								
48								
49		18/37/43	100	GC	48.5'-50.0' Brown, clayey GRAVEL, 50% gravel, 30% clay, 20% sand, max.= 5 cm, no hydrocarbon odor, no sheen.	2043SB		2
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
-335								
52								
53								
54								
55								
56								
-330								
57								
58								
59								
60								
61								
-325								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,357.76	E: 139,169.18
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-36 RRFTA HOLE NO. (permanent): AP-3634	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 50 F, cloudy, showers.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 6/24/95 DATE HOLE FINISHED: 6/24/95
ELEV. TOP OF HOLE 389.34	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
3									
4									
385									
5			No data	100	GM	5.0'-7.0' Brown, gravelly SILT, 50% silt, 30% gravel, 20% sand, max.= 2 cm, pea gravel, rounded, well sorted, dry, no hydrocarbon odor, no sheen.	2044SB		0
6									
7									
8									
9									
380									
10			17/20/24/29	100	GC	10.0'-12.0' Light brown, SILT and CLAY, 70% silt and clay, 20% pea gravel, 10% sand, max.= 1 cm, pea gravel, rounded, well sorted dry, no hydrocarbon odor, no sheen.	2045SB 2046SB 2047SB		0
11									
12									
13									
14									
375									
15			18/24/36/31	100	GC	15.0'-17.0' Light brown, SILT and CLAY, 70% silt and clay, 20% fine sand, 10% gravel, max.= 2 cm, subangular, dry, no hydrocarbon odor, no sheen.	2048SB		1
16									
17.5									

USCOR-6

HOLE NO. (field): SB-36 RRFTA
HOLE NO. (permanent): AP-3634

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (pp
18.5								
370 19.5								
20.5		17/18/ 37/35	100	GC	20.0'-22.0' Tan-brown, gravelly SILT and CLAY, 60% silt and clay, 30% gravel, 10% sand, max= >6 cm, subangular, poorly sorted, moist, no hydrocarbon odor, no sheen.	2040SB		6
21.5								
22.5								
23.5								
365 24.5								
25.5								
26.5								
27.5								
28.5								
360 29.5								
30.5		9/21/ 19/37	100	GC	30.0'-32.0' Grayish-brown, gravelly CLAY, 50% clay, 30% gravel, 20% sand, max.= >6 cm, subangular, poorly sorted, moist, no hydrocarbon odor, no sheen.	2050SB		30
31.5								
32.5								
33.5								
355 34.5								
35.5								
36.5								
37.5								
38.5								
350 40								

USCOM-6

HOLE NO. (field): SB-36 RRFTA
HOLE NO. (permanent): AP-3634

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		23/100/ 34/33	100	GC	40.0'-42.0' Grayish-brown, gravelly CLAY, 50% clay, 30% gravel, 20% sand, max.= >6 cm, subangular, poorly sorted, moist, no hydrocarbon odor, no sheen.	2051SB		No data
42								
43								
44								
-345								
45								
46								
47								
48		8/15/ 23/61	100	GC	48.0'-50.0' Grayish-brown, gravelly CLAY, 50% clay, 30% gravel, 20% sand, subangular, poorly sorted, moist, no hydrocarbon odor, no sheen.	2052SB		8
49								
-340								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
-335								
55								
56								
57								
58								
59								
-330								
60								
61								
62.5								

USCOE-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,355.07	E: 139,001.48
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-37 RRFTA HOLE NO. (permanent): AP-3635	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, sunny.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 6/26/95 DATE HOLE FINISHED: 6/26/95
ELEV. TOP OF HOLE 389.60	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RECOVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PROJECT	FIELD	FID (ppm)
385									
5			No data	100	CL	5.0'–7.0' Gray, FILL–CLAY, 80% clay, 10% fine sand, 10% gravel, max.= 1 cm, rounded, very well sorted, tight, moist, no hydrocarbon odor, no sheen, plastic odor.	2053SB 2054SB 2055SB		3
380									
10			6/15/ 9/20	100	CL	10.0'–12.0' Gray, FILL–CLAY, 80% clay, 10% fine sand, 10% gravel, max.= 1 cm, rounded, very well sorted, tight, moist, no hydrocarbon odor, no sheen, plastic odor.	2056SB		40
375						14.0' Driller reports bottom of fill at 14.0' below ground surface.			
15			9/17/ 27/41	100	GC	15.0'–17.0' Gray-brown, gravelly SILT and CLAY, 50% silt and clay, 30% gravel, 20% sand, max.= >6 cm, subangular, poorly sorted, tight, moist, strong hydrocarbon odor, no sheen.	2057SB		200
17.5									

USCOM-6

HOLE NO. (field): SB-37 RRFTA
HOLE NO. (permanent): AP-3635

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
18.5								
-370 19.5								
20.5		10/18/24/39	100	GC	20.0'-22.0' Gray-brown, gravelly SILT and CLAY, 50% silt and clay, 30% gravel, 20% sand, max.= >6 cm, subangular, poorly sorted, tight, moist, strong hydrocarbon odor, no sheen.	2058SB		300
21.5								
22.5								
23.5								
-365 24.5								
25.5					OVA=200 ppm in cuttings. OVA=3 ppm in breathing zone.			
26.5								
27.5								
28.5								
-360 29.5								
30.5		14/33/45/48	100	GC	30.0'-32.0' Gray-brown, gravelly SILT and CLAY, 50% silt and clay, 30% gravel, 20% sand, poorly sorted, tight, moist, hydrocarbon odor, no sheen.	2059SB		100
31.5								
32.5								
33.5								
-355 34.5								
35.5								
36.5								
37.5								
38.5								
-350 40								

USCOR-6

HOLE NO. (field): SB-37 RRFTA
HOLE NO. (permanent): AP-3635

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		13/29/35/53	100	GC	40.0'-42.0' Gray-brown, gravelly SILT and CLAY. 50% silt and clay, 30% gravel, 20% sand, poorly sorted, tight, moist, slight hydrocarbon odor, no sheen.	2060SB		200
42								
43								
44								
-345								
45								
46								
47								
48		15/42/45/41	100	GC	48.0'-50.0' Gray-brown, gravelly SILT and CLAY. 50% silt and clay, 30% gravel, 20% sand, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	2061SB		5
49								
-340								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
-335								
55								
56								
57								
58								
59								
-330								
60								
61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,445.56	E: 138,943.02
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-38 RRFTA HOLE NO. (permanent): AP-3636	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, sunny.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 6/26/95 DATE HOLE FINISHED: 6/26/95
ELEV. TOP OF HOLE 390.34	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
390									
1									
2									
3									
4									
5									
385			No data	100	SM	5.0'-7.0' Brown-gray, sandy SILT, 60% silt and clay, 20% sand, 20% gravel, dry, no hydrocarbon odor, no sheen.	2062SB		0
6									
7									
8									
9									
10									
380			No data	100	SM	10.0'-12.0' Brown-gray, sandy SILT, 60% silt and clay, 20% sand, 20% gravel, dry, no hydrocarbon odor, no sheen.	2063SB		1
11									
12									
13									
14									
15									
375			No data	No data	SM	15.0'-17.0' Brown-gray, sandy SILT, 60% silt and clay, 20% sand, 20% gravel, dry, no hydrocarbon odor, no sheen.	2064SB 2065SB 2066SB		1
16									
17.5									

USCOR-6

HOLE NO. (field): SB-38 RRFTA
HOLE NO. (permanent): AP-3636

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
18.5								
19.5								
370 20.5		12/22/ 36/42	100	SW	20.0'-22.0' Brown-gray, gravelly SAND, 50% sand, 25% gravel, 25% silt, moist, no hydrocarbon odor, no sheen.	2067SB		No data
21.5								
22.5								
23.5								
24.5								
365 25.5								
26.5								
27.5								
28.5								
29.5								
360 30.5		14/20/ 25/29	100	GC	30.0'-32.0' Brown-tan, gravelly SILT and CLAY, 60% silt and clay, 40% gravel, minor medium sand, tight, moist, no hydrocarbon odor, no sheen.	2068SB		50
31.5								
32.5								
33.5								
34.5								
355 35.5								
36.5								
37.5					37.0' Driller reports drilling through silt bed, hydrocarbon odor. OVA=400 ppm in cuttings. OVA=0 ppm in breathing zone.			
38.5								
40								

USCOR-4

HOLE NO. (field): SB-38 RRFTA
HOLE NO. (permanent): AP-3636

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
350 / 41		13/37/27/66	100	GC	40.0'–42.0' Brown-tan, gravelly SILT and CLAY, 60% silt and clay, 40% gravel, minor medium sand, tight, moist, hydrocarbon odor, no sheen.	2069SB		200
42								
43								
44								
345 / 45								
46								
47								
48		11/27/23/27	100	GC	48.0'–50.0' Brown-tan, gravelly SILT and CLAY, 60% silt and clay, 40% gravel, minor medium sand, tight, moist, no hydrocarbon odor, no sheen.	2070SB		15
49								
340 / 50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
335 / 55								
56								
57								
58								
59								
330 / 60								
61								
62.5								

USCOM-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,533.40	E: 138,999.74
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-39 RRFTA HOLE NO. (permanent): AP-3637	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, sunny.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 6/27/95 DATE HOLE FINISHED: 6/27/95
ELEV. TOP OF HOLE 391.02	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
390 1									
2									
3									
4									
5			No data	100	SM	5.0'-7.0' Brown, sandy SILT, 40% silt and clay, 30% fine sand, 30% gravel, max.= 4 cm, subangular, poorly sorted, dry, no hydrocarbon odor, no sheen.	2071SB 2072SB 2073SB		<1
385 6									
7									
8									
9									
10			No data	100	SM	10.0'-12.0' Brown, sandy SILT, 40% silt and clay, 30% fine sand, 30% gravel, max.= 4 cm, subangular, poorly sorted, dry, no hydrocarbon odor, no sheen.	2074SB		1.4
380 11									
12									
13									
14									
15			9/13/ 19/27	100	SM	15.0'-17.0' Brown, sandy SILT, 40% silt and clay, 30% fine sand, 30% gravel, max.= 4 cm, subangular, poorly sorted, dry, no hydrocarbon odor, no sheen.	2075SB		<1
375 16									
17.5									

USCOE-6

HOLE NO. (field): SB-39 RRFTA
HOLE NO. (permanent): AP-3637

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (pp
18.5								
19.5								
20.5		8/18/ 28/48	100	GC	20.0'-22.0' Tan, gravelly CLAY, 50% clay, 40% gravel, 10% sand, max.= >6 cm, rounded, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	2076SB		20
370								
21.5								
22.5								
23.5								
24.5								
25.5								
365								
26.5								
27.5								
28.5								
29.5								
30.5		7/27/ 41/90	100	GC	30.0'-32.0' Tan, gravelly CLAY, 50% clay, 40% gravel, 10% sand, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	2077SB		1
360								
31.5								
32.5								
33.5								
34.5								
35.5								
355								
36.5								
37.5								
38.5								
40								

USCOR-6

HOLE NO. (field): SB-39 RRFTA
HOLE NO. (permanent): AP-3637

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
350 41		7/43/57/54	100	GC	40.0'–42.0' Tan, gravelly CLAY, 50% clay, 40% gravel, 10% sand, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	2078SB		2
42								
43								
44								
45								
345 46								
47								
48		23/54/85/90	100	GW	48.0'–50.0' Brown, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, no hydrocarbon odor, no sheen.	2079SB		No data
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
340 51								
52								
53								
54								
55								
335 56								
57								
58								
59								
60								
330 61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 121,615.09 E: 138,972.94

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-40 RRFTA
HOLE NO. (permanent): AP-3638

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 60 F, sunny.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 6/28/95
DATE HOLE FINISHED: 6/28/95

ELEV. TOP OF HOLE: 392.42

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
390									
5			No data	100	CL	5.0'-7.0' Brown, FILL-SILT and CLAY, 70% silt and clay, 20% sand, 10% gravel, max.= 3 cm, moist, no hydrocarbon odor, no sheen.	2080SB		0
385									
10			No data	100	CL	10.0'-12.0' Brown, FILL-SILT and CLAY, 70% silt and clay, 20% sand, 10% gravel, minor small pieces of wood, max.= 3 cm, moist, no hydrocarbon odor, no sheen.	2081SB		No data
380									
15			No data	100	CL	15.0'-17.0' Brown, FILL-SILT and CLAY, 70% silt and clay, 20% sand, 10% gravel, max.= 3 cm, moist, no hydrocarbon odor, no sheen, methane odor.	2082SB		No data
375 17.5									

USCOR-6

HOLE NO. (field): SB-40 RRFTA
HOLE NO. (permanent): AP-3638

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
18.5								
19.5								
20.5		12/26/37/28	100	GW	20.0'-22.0' Dark brown, sandy GRAVEL, 40% gravel, 30% coarse sand, 30% silt and clay, max.= 6 cm, no hydrocarbon odor, no sheen.	2083SB		No data
21.5								
370 22.5								
23.5								
24.5								
25.5								
26.5								
365 27.5								
28.5								
29.5								
30.5		10/17/27/63	100	GW	30.0'-32.0' Dark brown, sandy GRAVEL, 40% gravel, 30% coarse sand, 30% silt and clay, max.= 6 cm, no hydrocarbon odor, no sheen.	2084SB		No data
31.5								
360 32.5								
33.5								
34.5								
35.5								
36.5								
355 37.5								
38.5								
40								

USCOR-8

HOLE NO. (field): SB-40 RRFTA
HOLE NO. (permanent): AP-3638

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		24/47/ 54/48	100	GW	40.0'-42.0' Dark brown, sandy GRAVEL. 40 % gravel, 30% coarse sand, 30% silt and clay, max.= 6 cm, no hydrocarbon odor, no sheen.	2085SB		No data
42 -350								
43								
44								
45								
46								
47 -345								
48		12/35/ 21/24	100	GW	48.0'-50.0' Dark brown, sandy GRAVEL. 40% gravel, 30% coarse sand, 30% silt and clay, max.= 6 cm, no hydrocarbon odor, no sheen.	2086SB		No data
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52 -340								
53								
54								
55								
56								
57 -335								
58								
59								
60								
61								
62.5 -330								

USCOM-8

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,630.29	E: 139,143.29
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-41 RRFTA HOLE NO. (permanent): AP-3639	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, sunny.

TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
ELEV. TOP OF HOLE 388.53	INSPECTOR Brad Ackman	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DATE HOLE STARTED: 6/29/95
DATE HOLE FINISHED: 6/29/95

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1	(permafrost)							
2								
3								
385								
4								
5					See AP-3638 for soil descriptions.			
6		No data	100			208TSB		No data
7								
8								
380								
9								
10						208BSB 208DSB 209DSB		
11		No data	100					No data
12								
13								
375								
14								
15						209ISB		
16		No data	100					No data
17.5								

USCOR-6

HOLE NO. (field): SB-41 RRFTA HOLE NO. (permanent): AP-3639	PROJECT: CU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (pp
370 18.5								
19.5								
20.5		10/24/ 26/29	100			2092SB		No data
21.5								
22.5								
365 23.5								
24.5								
25.5								
26.5								
27.5								
360 28.5								
29.5								
30.5		17/26/ 19/25	100			2093SB		30
31.5								
32.5								
355 33.5								
34.5								
35.5								
36.5								
37.5								
350 38.5								
40								

USCOR-6

HOLE NO. (field): SB-41 RRFTA
HOLE NO. (permanent): AP-3639

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		11/25/31/27	100			2094SB		7
42								
43								
345								
44								
45								
46								
47								
48		18/71/94/75	100	GM	48.0'-50.0' Brown-gray, silty GRAVEL, 50% gravel, 30% silt and clay, 20% sand, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	2095SB		0
340								
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
335								
54								
55								
56								
57								
58								
330								
59								
60								
61								
62.5								

USCOE-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,563.25	E: 139,116.67
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-43 RRFTA HOLE NO. (permanent): AP-3640	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, cloudy.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 8	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 7/05/95 DATE HOLE FINISHED: 7/05/95
ELEV. TOP OF HOLE 390.89	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
390 1 2 3 4 5									
385 6 7			No data	100	SW	5.0'-7.0' Brown, gravelly SAND, 40% fine sand, 30% gravel, 30% silt, max.= 3 cm, subangular, poorly sorted, loose, dry, no hydrocarbon odor, no sheen.	2096SB		0
8 9 10									
380 11 12 13 14			No data	100	SW	10.0'-12.0' Brown, gravelly SAND, 40% fine sand, 30% gravel, 30% silt, max.= 3 cm, subangular, poorly sorted, loose, dry, no hydrocarbon odor, no sheen.	2097SB		5
375 15 16 17.5			12/19/ 22/28	100	GC	15.0'-17.0' Brown-tan, gravelly SILT and CLAY, 50% silt and clay, 30% gravel, 20% sand, max.= 4 cm, rounded, elongated and spherical, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	2098SB		25

USCOR-6

HOLE NO. (field): SB-43 RRFTA
HOLE NO. (permanent): AP-3640

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (pp
18.5								
19.5		38/69/35	100	GW	19.0'-23.0' Brown-gray, sandy GRAVEL, 40% gravel, 35% sand, 25% silt and clay, max.= >6 cm, subrounded, poorly sorted, moist, no hydrocarbon odor, no sheen.	2099SB 2100SB 2101SB		0
20.5								
-370								
21.5		47/65/41	100					
22.5								
23.5								
24.5								
25.5								
-365								
26.5								
27.5								
28.5								
29.5								
30.5		11/28/19/22	100	SW	30.0'-30.5' Brown, silty SAND, no fuel staining. 30.5'-32.0' Gray fuel stained, gravelly SAND, 50% sand, 25% gravel, 25% silt and clay, max.= >6 cm, rounded, poorly sorted, moist, diesel odor, no sheen.	2102SB		56
-360								
31.5								
32.5								
33.5								
34.5								
35.5								
-355								
36.5								
37.5								
38.5								
40								

USCOR-0

HOLE NO. (field): SB-43 RRFTA
HOLE NO. (permanent): AP-3640

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
350 41		21/22/34/27	100	SW	40.0'-42.0' Gray fuel stained, gravelly SAND, 50% sand, 25% gravel, 25% silt and clay, max.= 4 cm, subangular to rounded, poorly sorted, loose, moist, slight hydrocarbon odor, no sheen.	2103SB		25
42								
43								
44								
45								
345 46								
47								
48		22/37/24/28	100	SW	48.5'-50.0' Gray fuel stained, gravelly SAND, 50% sand, 25% gravel, 25% silt and clay, max.= 4 cm, poorly sorted, loose, moist, slight diesel odor, no sheen.	2104SB		No data
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
340 51								
52								
53								
54								
55								
335 56								
57								
58								
59								
60								
330 61								
62.5								

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,564.51	E: 139,187.40
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-44 RRFTA HOLE NO. (permanent): AP-3641	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, cloudy.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 8	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 7/05/95 DATE HOLE FINISHED: 7/05/95
ELEV. TOP OF HOLE 391.67	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
390									
385			No data	100	SW	5.0'-7.0' Brown, gravelly SAND, 50% sand, 30% gravel, 20% silt, max.= 4 cm, poorly sorted, loose, dry, no hydrocarbon odor, no sheen.	2106SB		2
380			No data	100	SW	10.0'-12.0' Brown FILL-gravelly SAND, 60% sand, 30% gravel, 10% silt, poorly sorted, dry, no hydrocarbon odor, no sheen.	2107SB		5
375			11/18/12/13	100	SW	15.0'-17.0' Brown-tan, gravelly SAND, 60% sand, 30% gravel, 10% silt, max.= 3 cm, poorly sorted, dry, no hydrocarbon odor, no sheen.	2108SB		0
17.5									

USCOM-6

HOLE NO. (field): SB-44 RRFTA
HOLE NO. (permanent): AP-3641

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (pp
18.5								
19.5								
20.5		19/21/ 23/23	100	SM	20.0'–22.0' Gray, silty SAND, 60% sand, 30% silt, 10% gravel, max.= >6 cm, well sorted, moist, slight diesel odor, no sheen.	2108SB		15
370 21.5								
22.5								
23.5								
24.5								
25.5								
365 26.5								
27.5								
28.5								
29.5								
30.5		14/19/ 69/38	100	SM	30.0'–32.0' Gray, silty SAND, 60% sand, 30% silt, 10% gravel, max.= >6 cm, well sorted, moist, no hydrocarbon odor, no sheen.	2110SB		50
360 31.5								
32.5								
33.5								
34.5								
35.5								
355 36.5								
37.5								
38.5		22/24/ 36/28	100	SM	38.0'–41.5' Gray, silty SAND, 60% sand, 30% silt, 10% gravel, max.= >6 cm, well sorted, moist, no hydrocarbon odor, no sheen.	2111SB 2112SB 2113SB		8.2
40								

USCOR-6

HOLE NO. (field): SB-44 RRFTA
HOLE NO. (permanent): AP-3641

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		36/67/42	100	SM		2111SB 2112SB 2113SB		8.2
-350 42								
43								
44								
45								
46								
-345 47								
48		16/26/29/48	100	SM	48.0'-50.0' Gray, silty SAND, 60% sand, 30% silt, 10% gravel, well sorted, moist, no hydrocarbon odor, no sheen.	2114SB		No data
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
-340 52								
53								
54								
55								
56								
-335 57								
58								
59								
60								
61								
-330 62.5								

USCOR-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 121,496.13 E: 139,153.68

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-45 RRFTA
HOLE NO. (permanent): AP-3642

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 60 F, sunny.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 9

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 7/06/95
DATE HOLE FINISHED: 7/06/95

ELEV. TOP OF HOLE: 390.13

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
390									
1									
2									
3									
4									
385 5			No data	100	SM	5.0'-7.0' Brown, silty SAND, 50% fine sand, 30% silt, 20% gravel, poorly sorted, loose, dry, no hydrocarbon odor, no sheen, organic odor. OVA inoperable.	2115SB		No data
6									
7									
8									
9									
380 10			No data	100	SW	10.0'-12.0' Brown, gravelly SAND, 50% sand, 30% gravel, 20% silt, max.= 5 cm, pea gravel, rounded, elongated, no hydrocarbon odor, no sheen, organic odor. OVA inoperable.	2116SB		No data
11									
12									
13									
14									
375 15			1/1/1/2	50	SP	15.0'-17.0' Gray-brown, SAND, 80% medium sand, 20% silt, very well sorted, moist to wet, slight hydrocarbon odor, no sheen, sulfidic odor. OVA inoperable.	2117SB		No data
16									
17.5									

USCOE-6

HOLE NO. (field): SB-45 RRFTA
HOLE NO. (permanent): AP-3642

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (pp
18.5								
19.5								
370 20.5		18/22/32/79	75	SW	20.0'-24.0' Gray-brown, gravelly SAND, 40% sand, 40% pea gravel, 20% silt, rounded, poorly sorted, moist, no hydrocarbon odor, no sheen. OVA inoperable.	2118SB 2119SB 2120SB		No data
21.5								
22.5		17/37/47/37	80					
23.5								
24.5								
365 25.5								
26.5								
27.5								
28.5								
29.5								
360 30.5		5/17/19/21	100	GC	30.0'-32.0' Gray-greenish, clayey GRAVEL, 40% gravel, 30% clay, 30% medium sand, max.= >6 cm, subangular, poorly sorted, tight, moist, no hydrocarbon odor, no sheen. OVA inoperable.	2121SB		No data
31.5								
32.5								
33.5								
34.5								
355 35.5								
36.5								
37.5								
38.5								
40								

USCOR-6

HOLE NO. (field): SB-45 RRFTA
HOLE NO. (permanent): AP-3642

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
350								
41		9/23/ 20/18	100	SM	40.0'–42.0' Gray, silty SAND, 60% sand, 20% silt, 20% gravel, max.= 2 cm, subrounded, well sorted, slight hydrocarbon odor, no sheen. OVA inoperable.	2122SB		No data
42								
43								
44								
345 45								
46					46.0'–50.0' Gray, silty SAND, 60% sand, 20% silt, 20% gravel, max.= 2 cm, subrounded, well sorted, slight hydrocarbon odor, no sheen. OVA inoperable.	2123SB 2124SB 2125SB		
47		9/51/ 47/71	100					
48				SM				No data
49		42/47/ 67/66	100					
340 50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
335 55								
56								
57								
58								
59								
330 60								
61								
62.5								

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,437.66	E: 139,116.74
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-46 RRFTA HOLE NO. (permanent): AP-3643	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, cloudy, light wind, showers.

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole (X) Churn Drill ( )	300 pounds	6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
50 ft.	(X) MSL _____	Truck Mounted CME-75

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 7/07/95 DATE HOLE FINISHED: 7/07/95
8	3" O.D. Split Spoon	NA ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
390.80	Rob McGrath	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
390									
1									
2									
3									
4									
5			No data	100	SW	5.0'-7.0' Brown, gravelly SAND, 60% sand, 30% gravel, 10% silt, max.= 2 cm, poorly sorted, dry, no hydrocarbon odor, no sheen.	2126SB		0
385									
6									
7									
8									
9									
10									
380			No data	100	SW	10.0'-12.0' Brown, gravelly SAND, 60% sand, 30% gravel, 10% silt, max.= 2 cm, poorly sorted, dry, no hydrocarbon odor, no sheen.	2127SB		5
11									
12									
13						13.0'-17.0' Brown-gray, gravelly SAND, 50% sand, 30% gravel, 20% silt, max.= 4 cm, poorly sorted, dry, no hydrocarbon odor, no sheen.			
14			11/21/28/23	100					
15					SW		2128SB 2129SB 2130SB		0
375									
16			18/24/27/43	100					
17.5									

USCOR-6

HOLE NO. (field): SB-46 RRFTA HOLE NO. (permanent): AP-3643	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (pi
18.5								
19.5								
20.5 (370)		27/100/ 69/33	100	GW	20.0'–22.0' Brown, sandy GRAVEL, 50% gravel, 45% sand, 5% silt, max.= 6 cm, poorly sorted, no hydrocarbon odor, no sheen.	2131SB		
21.5								
22.5								
23.5								
24.5								
25.5 (365)								
26.5								
27.5								
28.5								
29.5								
30.5 (360)		23/27/ 28/34	100	SW	30.0'–32.0' Brown–gray, gravelly SAND, 60% sand, 30% gravel, 10% silt, max.= 4 cm, poorly sorted, no hydrocarbon odor, no sheen.	2132SB		70
31.5								
32.5								
33.5								
34.5								
35.5 (355)								
36.5								
37.5								
38.5								
40								

USCS-6

HOLE NO. (field): SB-46 RRFTA
HOLE NO. (permanent): AP-3643

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
350 41		23/17/14/21	100	GW	40.0'-42.0' Brown-gray, sandy GRAVEL, 40% gravel, 40% sand, 20% silt, max.= 4 cm, poorly sorted, moist, hydrocarbon odor, hydrocarbon stained, no sheen.	2133SB		>1000
42								
43								
44								
45								
345 46								
47								
48		15/38/50/45	100	GW	48.0'-50.0' Brown-gray, sandy GRAVEL, 45% gravel, 35% sand, 20% silt, max.= 4 cm, poorly sorted, moist, strong gasoline odor, hydrocarbon stained, no sheen.	2134SB		>1000
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
340 51								
52								
53								
54								
55								
335 56								
57								
58								
59								
60								
330 61								
62.5								

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,497.94	E: 139,092.26
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-47 RRFTA HOLE NO. (permanent): AP-3644	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, cloudy, light wind, showers.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL ____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 8	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 7/07/95 DATE HOLE FINISHED: 7/07/95
ELEV. TOP OF HOLE 390.67	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
390									
1									
2									
3									
4									
5									
385			No data	100	SM	5.0'–7.0' Brown, silty SAND, 60% fine sand, 30% silt, 10% gravel, max.= 3 cm, well sorted, dry, no hydrocarbon odor, no sheen.	2135SB		1
6									
7									
8									
9									
10									
380			No data	100	SM	10.0'–12.0' Brown, silty SAND, 50% fine sand, 30% silt, 20% gravel, max.= 3 cm, well sorted, dry, no hydrocarbon odor, no sheen.	2136SB		0.8
11									
12									
13									
14									
15									
375			19/25/37/20	100	SW	15.0'–17.0' Brown, gravelly SAND, 40% sand, 40% gravel, 20% silt, max.= >6 cm, poorly sorted, moist, no hydrocarbon odor, no sheen.	2137SB		1
16									
17.5									

USCOM-6

HOLE NO. (field): SB-47 RRFTA
HOLE NO. (permanent): AP-3644

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (p
18.5								
19.5								
20.5 (370)		27/32/19/26	100	SW	20.0'–22.0' Brown-gray, gravelly SAND, 60% sand, 30% gravel, 10% silt, max.= >6 cm, well sorted, moist, no hydrocarbon odor, no sheen.	2138SB		2
21.5								
22.5								
23.5								
24.5								
25.5 (365)								
26.5								
27.5								
28.5								
29.5								
30.5 (360)		No data	No data	SW	30.0'–32.0' Brown-gray, gravelly SAND, 60% sand, 30% gravel, 10% silt, max.= >6 cm, well sorted, moist, no hydrocarbon odor, no sheen. OVA inoperable.	2139SB		No data
31.5								
32.5								
33.5								
34.5								
35.5 (355)								
36.5								
37.5								
38.5		43/40/36/48	100	SW	38.0'–42.0' Brown-gray, gravelly SAND, 60% sand, 30% gravel, 10% silt, max.= 4 cm, poorly sorted, dry, gasoline odor, no sheen. OVA inoperable.	2140SB 2141SB 2142SB		N... data
40								

USCOR-6

HOLE NO. (field): SB-47 RRFTA HOLE NO. (permanent): AP-3644	PROJECT: OU-A Fort Richardson	SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
350 41		28/36/27/31	100	SW		2140SB 2141SB 2142SB		No data
42 43 44 45 345 46 47								
48		77/57/53/77	100	SW	48.0'–50.0' Brown-gray, gravelly SAND, 60% sand, 30% gravel, 10% silt, max.= 4 cm, poorly sorted, wet, slight gasoline odor, no sheen. OVA inoperable.	2143SB		No data
49 50 340 51 52 53 54 55 335 56 57 58 59 60 330 61 62.5					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			

USCOR-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 121,451.80 E: 139,283.61

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-48 RRFTA

HOLE NO. (permanent): AP-3645

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 60 F, sunny.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 8

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 7/10/95
DATE HOLE FINISHED: 7/10/95

ELEV. TOP OF HOLE: 390.58

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
390 / 1 / 2 / 3 / 4 / 5	(permafrost) (groundwater)							
385 / 6		No data	100	SM	5.0'-7.0' Brown-tan, silty SAND, 60% fine sand, 25% silt, 15% pea gravel, max.= 4 cm, subangular, poorly sorted, dry, no hydrocarbon odor, no sheen. OVA inoperable.	2144SB		No data
7 / 8 / 9 / 10								
380 / 11		No data	100	SM	10.0'-12.0' Brown-tan, silty SAND, 60% fine sand, 25% silt, 15% gravel, max.= 4 cm, subangular, poorly sorted, dry, no hydrocarbon odor, no sheen. OVA inoperable.	2145SB		No data
12 / 13 / 14 / 15								
375 / 16		16/25/ 26/27	100	SW	15.0'-17.0' Gray-brown, gravelly SAND, 60% coarse-medium sand, 25% gravel, 15% silt, poorly sorted, moist, no hydrocarbon odor, no sheen. OVA inoperable.	2146SB		No data
17.5								

USCOM-6

HOLE NO. (field): SB-48 RRFTA
HOLE NO. (permanent): AP-3645

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
19.5							
20.5 (372)		11/22/ 26/50	100	SW	20.0'–22.0' Gray-brown, gravelly SAND, 60% coarse-medium sand, 25% gravel, 15% silt, max.= >6 cm, poorly sorted, moist, no hydrocarbon odor, no sheen. OVA inoperable.	2147SB	No data
21.5							
22.5							
23.5							
24.5							
25.5 (365)							
26.5							
27.5							
28.5		27/26/ 24/31	100	SW	28.0'–32.0' Gray, gravelly SAND, 60% coarse sand, 30% gravel, 10% silt, poorly sorted, moist, no hydrocarbon odor, no sheen. OVA inoperable.	2148SB 2149SB 2150SB	No data
29.5							
30.5 (360)		9/49/ 100	50				
31.5							
32.5							
33.5							
34.5							
35.5 (355)							
36.5							
37.5							
38.5							
40							

USCOR-6

HOLE NO. (field): SB-48 RRFTA HOLE NO. (permanent): AP-3645	PROJECT: OU-A Fort Richardson	SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
350 41		22/31/ 38/31	100	SW	40.0'-42.0' Gray, gravelly SAND, 60% coarse sand, 30% gravel, 10% silt, poorly sorted, moist, no hydrocarbon odor, no sheen. OVA inoperable.	2151SB		No data
42								
43								
44								
45								
345 46								
47								
48		10/42/ 26/30	100	SW	48.0'-50.0' Gray, gravelly SAND, 60% coarse sand, 30% gravel, 10% silt, poorly sorted, moist, no hydrocarbon odor, no sheen, petroleum odor in borehole. OVA inoperable.	2152SB		No data
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
340 51								
52								
53								
54								
55								
335 56								
57								
58								
59								
60								
330 61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,239.46	E: 138,935.61
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-49 RRFTA HOLE NO. (permanent): AP-3646	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, cloudy.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 8	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 7/11/95 DATE HOLE FINISHED: 7/11/95
ELEV. TOP OF HOLE 386.61	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
385 / 1–4	(permafrost) (groundwater)							
5–6		No data	100	SM	5.0'–7.0' Brown, silty SAND, 60% fine sand, 35% silt, 5% pea gravel, max.= 1 cm, rounded, well sorted, no hydrocarbon odor, no sheen.	2170SB		0
380 / 7–9								
10–11		No data	100	OL	10.0'–12.0' FILL–Black SILT, 95% silt, 5% gravel, roots and twigs common, very well sorted, moist, no hydrocarbon odor, no sheen, plastic odor.	2163SB		80
375 / 12–14								
15–16		4/11/ 37/31	100	OL	15.0'–16.0' FILL–Black SILT, 95% silt, 5% gravel, roots and twigs common, very well sorted, moist, no hydrocarbon odor, no sheen.	2154SB		11
370 / 17.5				GW	16.0'–17.0' Brown, sandy GRAVEL, 60% gravel, 40% sand, max.= 2 cm, subangular, no hydrocarbon odor, no sheen.			

USCOR-6

HOLE NO. (field): SB-49 RRFTA
HOLE NO. (permanent): AP-3646

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
18.5		9/24/46/49	100	GW	18.0'-22.0' Brown, sandy GRAVEL, 50% gravel, 30% sand, 20% silt, poorly sorted, moist, no hydrocarbon odor, no sheen.	2155SB 2156SB 2157SB		100
19.5								
20.5		11/32/37/35	100					
365 21.5								
22.5								
23.5								
24.5								
25.5								
360 26.5								
27.5								
28.5								
29.5								
30.5		11/32/35/35	100	SW	30.0'-32.0' Brown-gray, gravelly SAND, 65% sand, 25% gravel, 10% silt, max.= 6 cm, poorly sorted, dry, no hydrocarbon odor, no sheen.	2158SB		2
355 31.5								
32.5								
33.5								
34.5								
35.5								
350 36.5								
37.5								
38.5								
40								

USCOM-6

HOLE NO. (field): SB-49 RRFTA HOLE NO. (permanent): AP-3646	PROJECT: OU-A Fort Richardson	SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		7/23/35/32	100	SW	40.0'–42.0' Brown-gray, gravelly SAND, 65% sand, 25% gravel, 10% silt, max.= 6 cm, poorly sorted, dry, no hydrocarbon odor, no sheen.	2150SB		100
345								
42								
43								
44								
45								
46								
340								
47								
48		22/48/49/52	100	SW	48.0'–50.0' Brown-gray, gravelly SAND, 65% sand, 25% gravel, 10% silt, max.= 6 cm, poorly sorted, dry, no hydrocarbon odor, no sheen.	2160SB		100
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
335								
52								
53								
54								
55								
56								
330								
57								
58								
59								
60								
61								
325								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 121,339.40	E: 138,820.78
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-50 RRFTA HOLE NO. (permanent): AP-3647	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, sunny.

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole (X) Churn Drill ( )	300 pounds	6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
50 ft.	(X) MSL _____	Truck Mounted CME-75

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 7/11/95 DATE HOLE FINISHED: 7/11/95
8	3" O.D. Split Spoon	NA ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
388.10	Jackie Donley	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
385 3	(permafrost) (groundwater)	No data	100	SW	5.0'–7.0' Brown, gravelly SAND, 50% sand, 30% gravel, 20% silt, max.= 4 cm, poorly sorted, moist, no hydrocarbon odor, no sheen.	2161SB		50
380 8								
10		No data	100	GM	10.0'–12.0' Brown, silty GRAVEL, 40% gravel, 30% silt, 30% sand, max.= 4 cm, poorly sorted, no hydrocarbon odor, no sheen, methane odor.	2162SB		80
375 13		2/8/8/20 6/15/16/27	100	GM/SW	15.0'–17.0' Brown, silty GRAVEL and gravelly SAND, 60% sand, 30% gravel, 10% silt, max.= 4 cm, moist to dry, no hydrocarbon odor, no sheen.	2163SB 2164SB 2165SB		80
17.5								

USCOR-6

HOLE NO. (field): SB-50 RRFTA HOLE NO. (permanent): AP-3647	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
370 18.5							
19.5							
20.5		12/29/31/43	100	SW	20.0'-22.0' Gray-brown, gravelly SAND, 60% sand, 30% gravel, 10% silt, poorly sorted, dry, no hydrocarbon odor, no sheen.	2166SB	No data
21.5							
22.5							
365 23.5							
24.5							
25.5							
26.5							
27.5							
360 28.5							
29.5							
30.5		22/53/36/27	100	GW	30.0'-32.0' Gray, sandy GRAVEL, 60% gravel, 25% coarse sand, 15% silt and clay, max.= >6 cm, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	2167SB	2
31.5							
32.5							
355 33.5							
34.5							
35.5							
36.5							
37.5							
350 38.5							
40							

USCOR-8

HOLE NO. (field): SB-50 RRFTA
HOLE NO. (permanent): AP-3847

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		12/31/36/43	100	GW	40.0'-42.0' Gray, sandy GRAVEL, 50% gravel, 35% coarse sand, 15% silt and clay, max.= 4 cm, rounded, tight, moist, no hydorcarbon odor, no sheen.	2168SB		18
42								
345 43								
44								
45								
46								
47								
340 48		37/41/46/53	100	SW	48.0'-50.0' Gray, gravelly SAND, 65% medium sand, 20% gravel, 15% silt and clay, loose, no hydrocarbon odor, no sheen, sweet odor.	2169SB		480
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
335 53								
54								
55								
56								
57								
330 58								
59								
60								
61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 6
	LOCATION COORD N: 121,361.22	E: 139,355.32
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): MW-6 RRFTA HOLE NO. (permanent): AP-3653	NAME OF DRILLER Tester Drilling Co./Tim Tester	WEATHER 50 F, overcast, north wind

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole ( ) Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
150.0ft.	(X) MSL _____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 8/25/95 DATE HOLE FINISHED: 8/25/95
9	3" O.D. Split Spoon	141.2ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
392.74	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
390 3									
4									
5									
6									
7									
385 8									
9									
10									
11									
12									
380 13									
14									
15									
16									
17									
375 18									
19									
20									
21									
22									
370 23									
24									
25									
26									
27									
365 28									

USCOR-6

HOLE NO. (field): MW-6 RRFTA
HOLE NO. (permanent): AP-3653

PROJECT: OU-A Fort Richardson

SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RECOVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (D
29								
30								
31								
32								
360 33								
34								
35								
36								
37								
355 38								
39								
40								
41								
42								
350 43								
44								
45								
46								
47								
345 48								
49								
50								
51								
52								
340 53								
54								
55								
56								
57								
335 58		24/19/ 37/32	100	GW	58.0'-60.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	217SB		0
59								
60								
61								
62								
330 63								
64								

USCOR-6

HOLE NO. (field): MW-6 RRFTA
HOLE NO. (permanent): AP-3653

PROJECT: OU-A Fort Richardson

SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
65								
66								
67								
325 68								
69		29/31/17/6	50	GW	68.0'-70.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2172SB		0
70								
71								
72								
320 73								
74								
75								
76								
77								
315 78								
79		20/31/29/17	100	GW	78.0'-80.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2173SB 2174SB 2175SB		0
80								
81								
82								
310 83								
84								
85								
86								
87								
305 88								
89		17/29/36/14	80	GW	88.0'-90.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2176SB		0
90								
91								
92								
300 93								
94								
95								
96								
97								
295 98								
99		2/29/13/15	50	GW	98.0'-100.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2177SB		0
100								

USCOR-6

HOLE NO. (field): MW-6 RRFTA
HOLE NO. (permanent): AP-3653

PROJECT: OU-A Fort Richardson

SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
101							
102							
290 103							
104							
105							
106							
107							
285 108					108.0'–110.0' No sample recovery.		
109		16/29/39/39	10				No data
110							
111							
112							
280 113							
114							
115							
116							
117							
275 118							
119		34/42/17/21	80	GM	118.0'–120.0' Brownish gray, silty GRAVEL, 60% gravel, 25% silt and clay, 15% sand, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2178SB	0
120							
121							
122							
270 123							
124							
125							
126							
127							
265 128							
129		29/17/16/13	No data	GM	128.0'–130.0' Brownish gray, silty GRAVEL, 60% gravel, 25% silt and clay, 15% sand, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2179SB	No data
130							
131							
132							
260 133							
134							
135							
136							

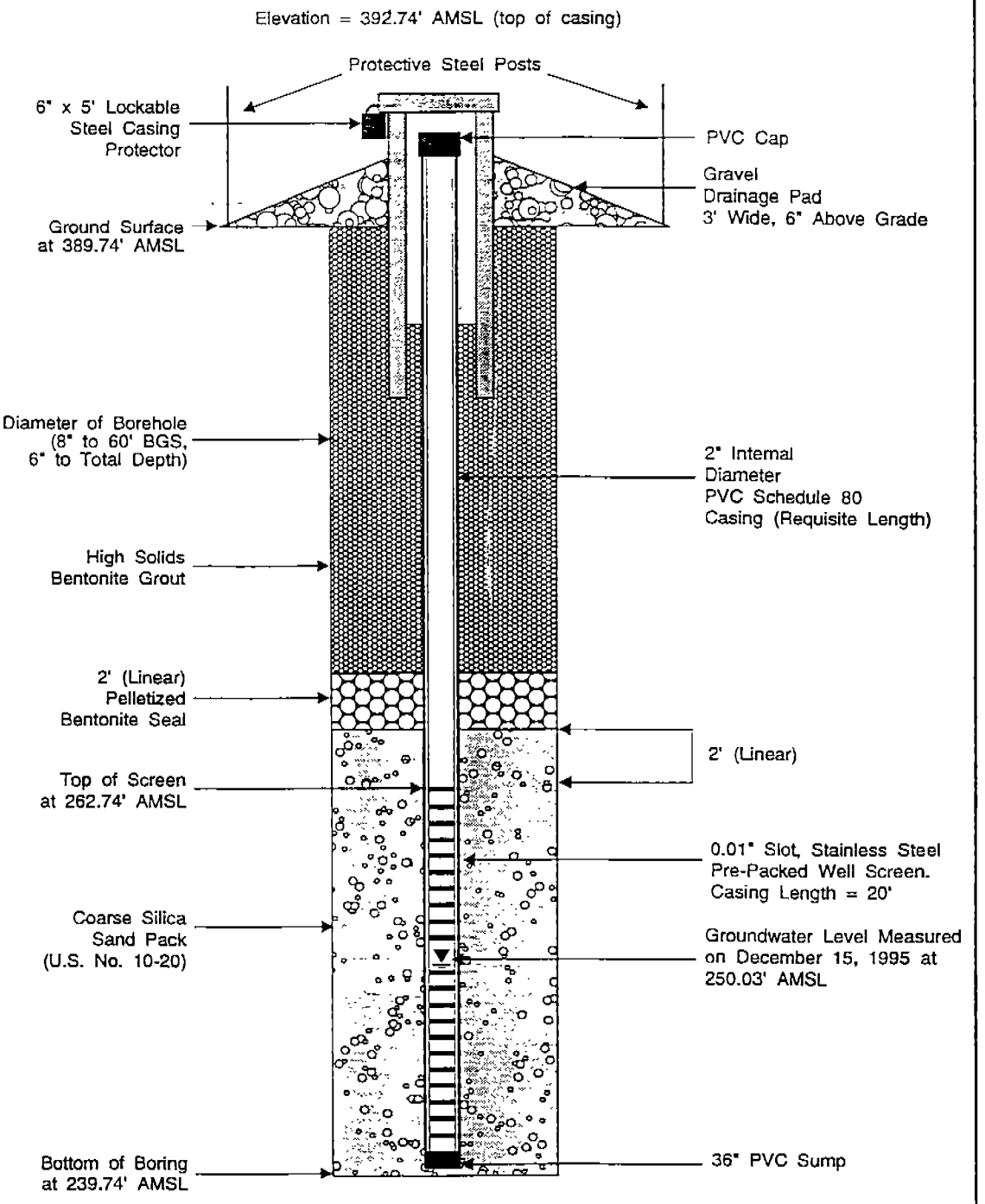
USCOR-6

HOLE NO. (field): MW-6 RRFTA HOLE NO. (permanent): AP-3653	PROJECT: OU-A Fort Richardson	SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
137								
255 138		31/39/42/47	100	SW	138.0'-140.0' Grayish brown, gravelly SAND, 45% sand, 40% gravel, 15% silt and clay, max.= 4 cm, saturated, no hydrocarbon odor, no sheen.	2180SB		0
139								
140					Bottom of exploration at 140.0'. Monitoring well installed at 150.0' below ground surface.			
141	▽							
142								
250 143								
144								
145								
146								
147								
245 148								
149								
150								
151								
152								
240 153								
154								
155								
156								
157								
235 158								
159								
160								
161								
162								
230 163								
164								
165								
166								
167								
225 168								
169								
170								
171								
172								

USCOR-6

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SOURCE: Ecology and Environment, Inc., 1996

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RUFF ROAD FIRE TRAINING AREA
AP-3653 MONITORING WELL CONSTRUCTION DIAGRAM

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 5
	LOCATION COORD N: 121,162.20	E: 138,961.33
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): MW-7 RRFTA HOLE NO. (permanent): AP-3654	NAME OF DRILLER Tester Drilling Co./Tim Tester	WEATHER 50 F, overcast, calm

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole ( ) Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
153.9ft.	(X) MSL _____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 8/28/95 DATE HOLE FINISHED: 8/28/95
9	3" O.D. Split Spoon	144.3ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
387.64	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
385									
380									
375									
370									
365									

HOLE NO. (field): MW-7 RRFTA HOLE NO. (permanent): AP-3654	PROJECT: OU-A Fort Richardson	SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	P (D
29								
30								
31								
32								
355 33								
34								
35								
36								
37								
350 38								
39								
40								
41								
42								
345 43								
44								
45								
46								
47								
340 48								
49								
50								
51								
52								
335 53								
54								
55								
56								
57								
330 58					58.0'-60.0' No sample recovery.			
59		No data	0					
60								
61								
62								
325 63								
64								

HOLE NO. (field): MW-7 RRFTA
HOLE NO. (permanent): AP-3654

PROJECT: OU-A Fort Richardson

SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
65								
66								
67								
-320 68								
68		23/16/ 29/32	60	GW	68.0'–70.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2181SB		0
69								
70								
71								
72								
-315 73								
74								
75								
76								
77								
-310 78								
78		42/18/ 33/12	50	GW	78.0'–80.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2182SB		0
79								
80								
81								
82								
-305 83								
84								
85								
86								
87								
-300 88								
88		No data	0		88.0'–90.0' No sample recovery.			
89								
90								
91								
92								
-295 93								
94								
95								
96								
97								
-290 98								
98		29/31/ 24/18	50	GW	98.0'–100.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2183SB		0
99								
100								

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HOLE NO. (field): MW-7 RRFTA
HOLE NO. (permanent): AP-3654

PROJECT: OU-A Fort Richardson

SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (P
285 / 101								
102								
103								
104								
105								
106								
107								
280 / 108		18/6/ 34/72	80	GW	108.0'-110.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2184SB		0
109								
110								
111								
112								
275 / 113								
114								
115								
116								
117								
270 / 118		No data	0		118.0'-120.0' No sample recovery.			
119								
120								
121								
122								
265 / 123								
124								
125								
126								
127								
260 / 128		28/29/ 37/39	50	GW	128.0'-130.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2185SB		0
129								
130								
131								
132								
255 / 133								
134								
135								
136								

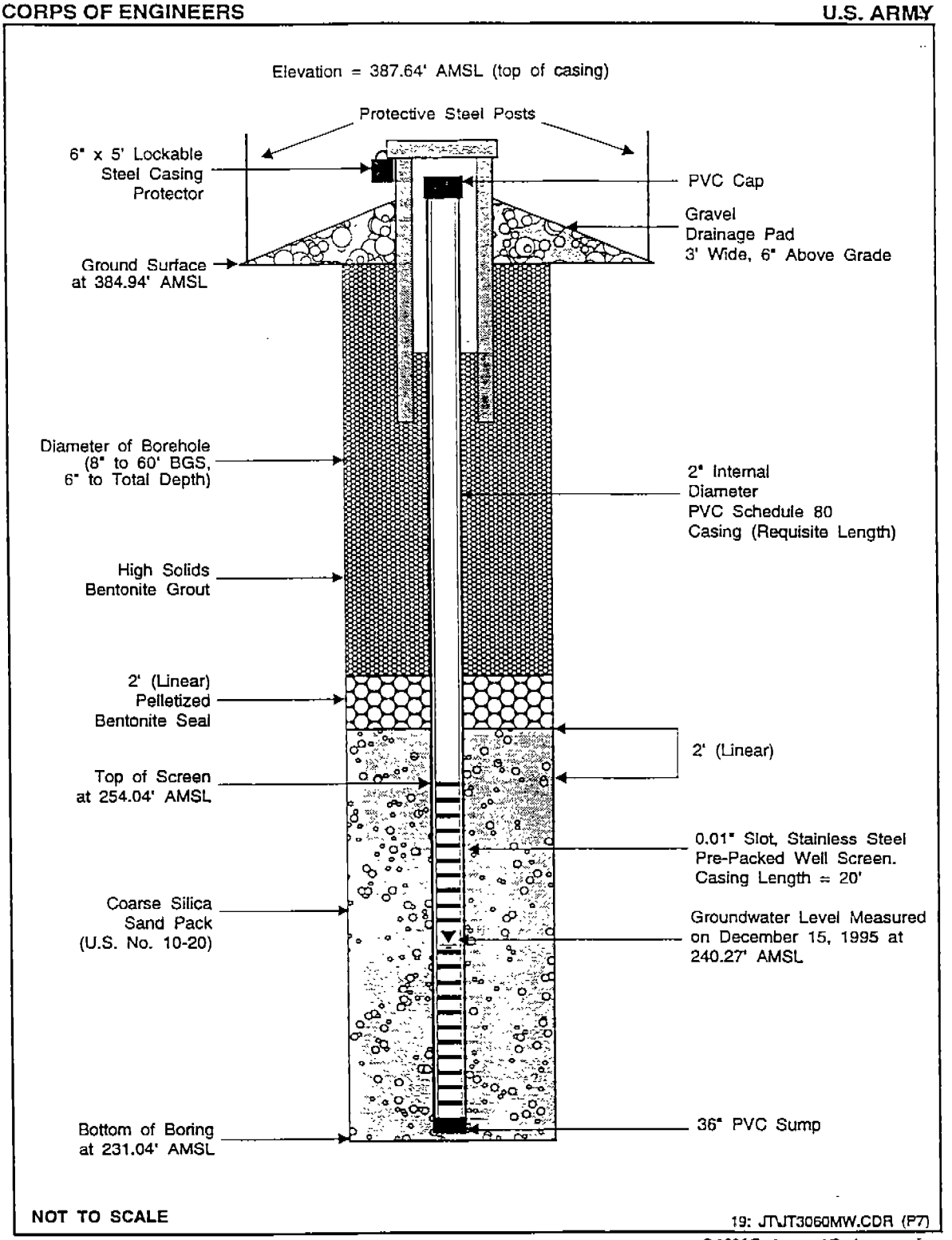
USCOR-6

HOLE NO. (field): MW-7 RRFTA HOLE NO. (permanent): AP-3654	PROJECT: OU-A Fort Richardson	SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
137								
-250 138								
139		17/29/24/18	50	GW	138.0'–140.0' Brownish gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 4 cm, saturated, no hydrocarbon odor, no sheen.	2186SB		150
140								
141					Bottom of exploration at 140.0'. Monitoring well installed at 153.9' below ground surface.			
142								
-245 143								
144	▽							
145								
146								
147								
-240 148								
149								
150								
151								
152								
-235 153								
154								
155								
156								
157								
-230 158								
159								
160								
161								
162								
-225 163								
164								
165								
166								
167								
-220 168								
169								
170								
171								
172								

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SOURCE: Ecology and Environment, Inc., 1996

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RUFF ROAD FIRE TRAINING AREA
AP-3654 MONITORING WELL CONSTRUCTION DIAGRAM

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 5
	LOCATION COORD N: 121,492.67	E: 139,128.63
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): MW-8 RRFTA HOLE NO. (permanent): AP-3655	NAME OF DRILLER Tester Drilling Co./Tim Tester	WEATHER 45 F, overcast, light rain, calm

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole ( ) Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
157.5ft.	(X) MSL _____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 8/30/95 DATE HOLE FINISHED: 8/30/95
12	3" O.D. Split Spoon	146.7ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
392.84	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
390 3									
4									
5									
6									
7									
385 8									
9									
10									
11									
12									
380 13									
14									
15									
16									
17									
375 18									
19									
20									
21									
22									
370 23									
24									
25									
26									
27									
365 28									

HOLE NO. (field): MW-8 RRFTA
HOLE NO. (permanent): AP-3655

PROJECT: OU-A Fort Richardson

SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (pi
29								
30								
31								
32								
360 33								
34								
35								
36								
37								
355 38								
39								
40								
41								
42								
350 43								
44								
45								
46								
47								
345 48								
49								
50								
51								
52								
340 53								
54								
55								
56								
57								
335 58								
59		36/17/ 41/29	60	GW	58.0'–60.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2187SB		20
60								
61								
62								
330 63								
64								

USCOR-6

HOLE NO. (field): MW-8 RRFTA
HOLE NO. (permanent): AP-3855

PROJECT: OU-A Fort Richardson

SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
65								
66								
67								
-325 68								
69		No data	0		68.0'-70.0' No sample recovery.			
70								
71								
72								
-320 73								
74								
75								
76								
77								
-315 78								
79		No data	0		78.0'-80.0' No sample recovery.			
80								
81								
82								
-310 83								
84								
85								
86								
87								
-305 88								
89		No data	0		88.0'-90.0' No sample recovery.			
90								
91								
92								
-300 93								
94								
95								
96								
97								
-295 98								
99		18/26/34	20	GW	98.0'-102.5' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2186SB		90
100		10/14/39	40					

USCOR-6

HOLE NO. (field): MW-8 RRFTA
HOLE NO. (permanent): AP-3655

PROJECT: OU-A Fort Richardson

SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FI (p
101		10/14/39	40	GW		218SB		90
102		27/16/42	20					
290 103								
104								
105								
106								
107								
285 108					108.0'–110.0' Brownish gray, sandy GRAVEL, 60%			
109		43/19/27/16	30	GW	gravel, 20% sand, 20% silt and clay, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	219SB		20
110								
111								
112								
280 113								
114								
115								
116								
117								
275 118					118.0'–119.5' Brownish gray, sandy GRAVEL, 60%			
119		41/48/16	70	GW	gravel, 20% sand, 20% silt and clay, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	220SB		15
120								
121								
122								
270 123								
124								
125								
126								
127								
265 128					128.0'–130.0' Brownish gray, sandy GRAVEL, 60%			
129		17/29/39/16	50	GW	gravel, 20% sand, 20% silt and clay, max.= 5 cm, moist, no hydrocarbon odor, no sheen.	219SB		20
130								
131								
132								
260 133								
134								
135								
136								

USCOR-8

HOLE NO. (field): MW-8 RRFTA
HOLE NO. (permanent): AP-3655

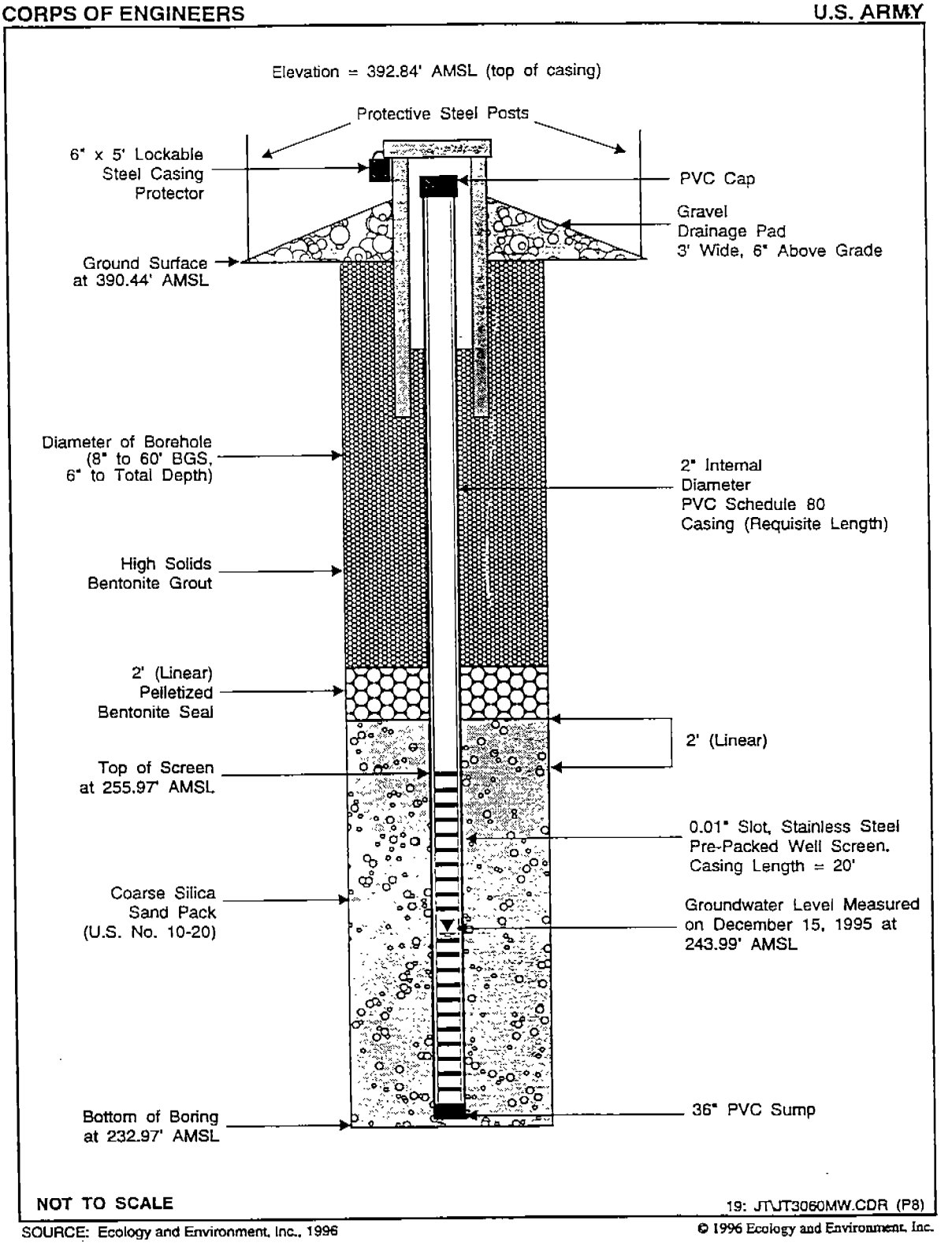
PROJECT: OU-A Fort Richardson

SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
137								
255 138								
139		No data	No data	GW	138.0'–140.0' Brownish gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 4 cm, moist to saturated, no hydrocarbon odor, no sheen.	2192SB 2193SB 2194SB		5
140								
141								
142								
250 143								
144								
145								
146								
147	▼							
245 148								
149		23/19/ 30/29	80	GW	148.0'–150.0' Brownish gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 2 cm, saturated, no hydrocarbon odor, no sheen.	2195SB		2
150								
151					Bottom of exploration at 150.0'. Monitoring well installed at 157.47' below ground surface.			
152								
240 153								
154								
155								
156								
157								
235 158								
159								
160								
161								
162								
230 163								
164								
165								
166								
167								
225 168								
169								
170								
171								
172								

USCOM-6

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SOURCE: Ecology and Environment, Inc., 1996

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RUFF ROAD FIRE TRAINING AREA
AP-3655 MONITORING WELL CONSTRUCTION DIAGRAM

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 5
	LOCATION COORD N: 121,693.85	E: 139,184.73
	DRILLING AGENCY OTHER ⊠	USACE ( )
HOLE NO. (field): MW-9 RRFTA HOLE NO. (permanent): AP-3656	NAME OF DRILLER Tester Drilling Co./Mark Eskeldson	WEATHER 52 F, clear, southeast wind

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole ( ) Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
147.6ft.	(X) MSL _____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 9/03/95 DATE HOLE FINISHED: 9/03/95
10	3" O.D. Split Spoon	145 ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
392.32	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
390									
3									
4									
5									
6									
7									
385									
8									
9									
10									
11									
12									
380									
13									
14									
15									
16									
17									
375									
18									
19									
20									
21									
22									
370									
23									
24									
25									
26									
27									
365									
28									

USCOR-6

HOLE NO. (field): MW-9 RRFTA
HOLE NO. (permanent): AP-3656

PROJECT: OU-A Fort Richardson

SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	
29								
30								
31								
360 32								
33								
34								
35								
36								
355 37								
38								
39								
40								
41								
350 42								
43								
44								
45								
46								
345 47								
48								
49								
50								
51								
340 52								
53								
54								
55								
56								
335 57								
58		31/39/17/18	75	GW	58.0'–60.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2196SB		2
59								
60								
61								
330 62								
63								
64								

USCOR-6

HOLE NO. (field): MW-9 RRFTA
HOLE NO. (permanent): AP-3656

PROJECT: OU-A Fort Richardson

SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
65								
66								
325 67								
68								
		76/82/10	0		68.0'-69.5' No sample recovery.			
69								
70								
71								
320 72								
73								
74								
75								
76								
315 77								
78								
		42/18	0		78.0'-79.0' No sample recovery.			
79								
80								
81								
310 82								
83								
84								
85								
86								
305 87								
88								
		22/18/19	75	GW	88.0'-89.5' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	2107SB		0
89								
90								
91								
300 92								
93								
94								
95								
96								
295 97								
98								
		38/42/16	0		98.0'-99.5' No sample recovery.			
99								
100								

USCOM-8

HOLE NO. (field): MW-9 RRFTA HOLE NO. (permanent): AP-3656	PROJECT: OU-A Fort Richardson	SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	
101								
290 102								
103								
104								
105								
106								
285 107								
108		16/10/29	20	GW	108.0'–109.5' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	2198SB		0
109								
110								
111								
280 112								
113								
114								
115								
116								
275 117								
118		18/43/49/47	50	GW	118.0'–120.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	2199SB		0
119								
120								
121								
270 122								
123								
124								
125								
126								
265 127								
128		18/36/47	20	GW	128.0'–129.5' Brownish gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	2200SB		0
129								
130								
131								
260 132								
133								
134								
135								
136								

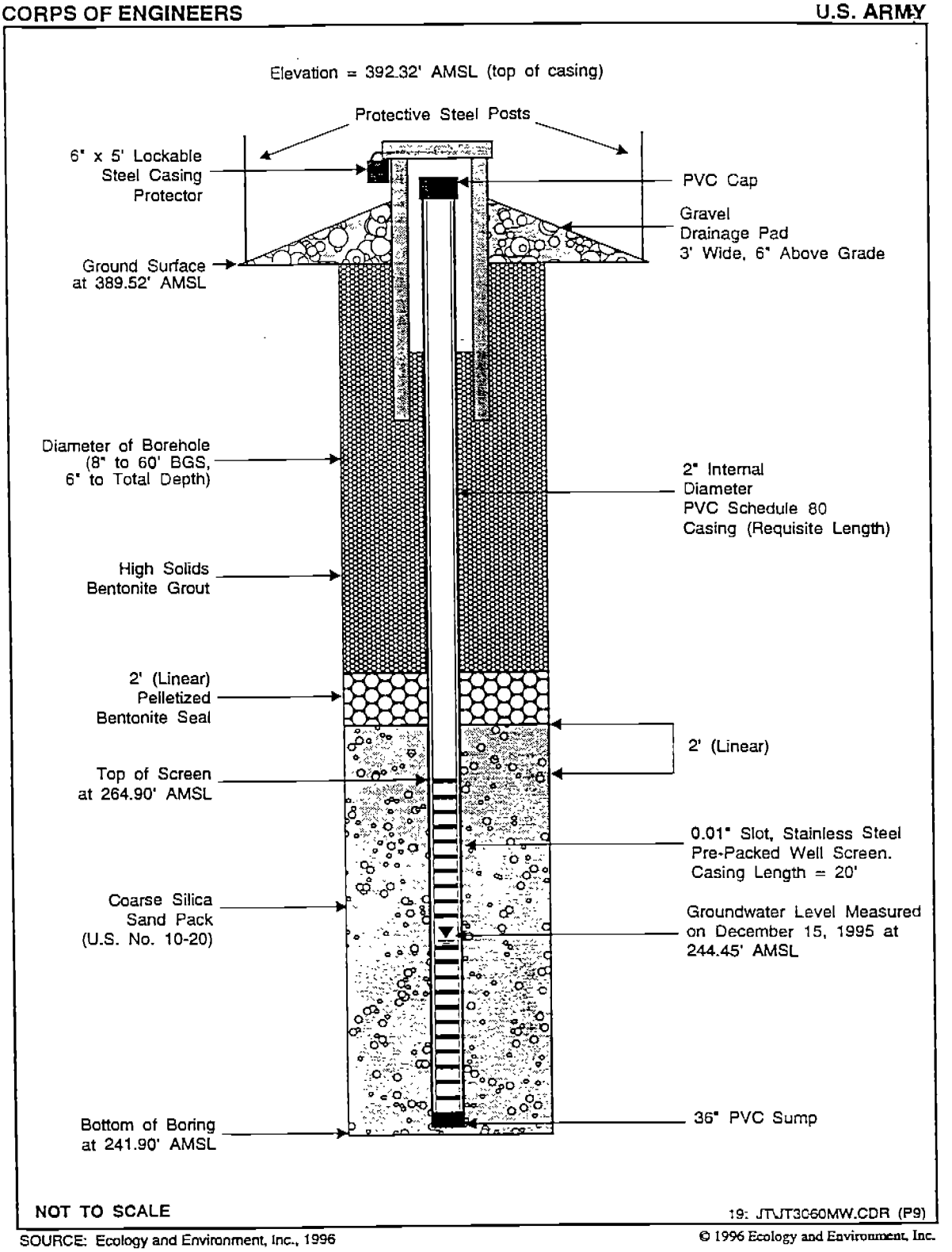
USCOR-6

HOLE NO. (field): MW-9 RRFTA HOLE NO. (permanent): AP-3656	PROJECT: OU-A Fort Richardson	SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255 137								
138		No data	0		138.0'–140.0' No sample recovery.			
139								
140								
141								
250 142								
143								
144								
145	▼							
146								
245 147								
148		No data	No data	GW	148.0'–150.0' Dark gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= 3 cm, saturated, no hydrocarbon odor, no sheen.	2201SB 2202SB 2203SB		0
149								
150					Bottom of exploration at 150.0'. Monitoring well installed at 147.62' below ground surface.			
151								
240 152								
153								
154								
155								
156								
235 157								
158								
159								
160								
161								
230 162								
163								
164								
165								
166								
225 167								
168								
169								
170								
171								
172								

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SOURCE: Ecology and Environment, Inc., 1996

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RUFF ROAD FIRE TRAINING AREA
AP-3656 MONITORING WELL CONSTRUCTION DIAGRAM

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 5
	LOCATION COORD N: 121,708.99	E: 138,845.79
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): MW-10 RRFTA HOLE NO. (permanent): AP-3657	NAME OF DRILLER Tester Drilling Co./Tim Tester	WEATHER 45 F, heavy rain, south wind

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole ( ) Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
166.6ft.	(X) MSL ____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 9/08/95 DATE HOLE FINISHED: 9/08/95
10	3" O.D. Split Spoon	151.8ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
392.72	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
390 3									
4									
5									
6									
7									
385 8									
9									
10									
11									
12									
380 13									
14									
15									
16									
17									
375 18									
19									
20									
21									
22									
370 23									
24									
25									
26									
27									
365 28									

USCOR-6

HOLE NO. (field): MW-10 RRFTA
HOLE NO. (permanent): AP-3657

PROJECT: OU-A Fort Richardson

SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
29							
30							
31							
32							
360 33							
34							
35							
36							
37							
355 38							
39							
40							
41							
42							
350 43							
44							
45							
46							
47							
345 48							
49							
50							
51							
52							
340 53							
54							
55							
56							
57							
335 58		33/29/ 26	50	GW	58.0'–59.5' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2204SB	5
59							
60							
61							
62							
330 63							
64							

USCOR-6

HOLE NO. (field): MW-10 RRFTA HOLE NO. (permanent): AP-3657	PROJECT: OU-A Fort Richardson	SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
65								
66								
67								
-325 68								
69		No data	0		68.0'-70.0' No sample recovery.			
70								
71								
72								
-320 73								
74								
75								
76								
77								
-315 78								
79		19/26/34	40	GW	78.0'-79.5' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2205SB		5
80								
81								
82								
-310 83								
84								
85								
86								
87								
-305 88								
89		No data	0		88.0'-90.0' No sample recovery.			
90								
91								
92								
-300 93								
94								
95								
96								
97								
-295 98								
99		No data	0		98.0'-100.0' No sample recovery.			
100								

USCOR-6

HOLE NO. (field): MW-10 RRFTA
HOLE NO. (permanent): AP-3657

PROJECT: OU-A Fort Richardson

SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	R (D
101								
102								
290 103								
104								
105								
106								
107								
285 108		3/13/29/18	60	GW	108.0'-110.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2206SB		0
109								
110								
111								
112								
280 113								
114								
115								
116								
117								
275 118		No data	0		118.0'-120.0' No sample recovery.			
119								
120								
121								
122								
270 123								
124								
125								
126								
127								
265 128		36/18/18	80	GW	128.0'-129.5' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	2207SB		0
129								
130								
131								
132								
260 133								
134								
135								
136								

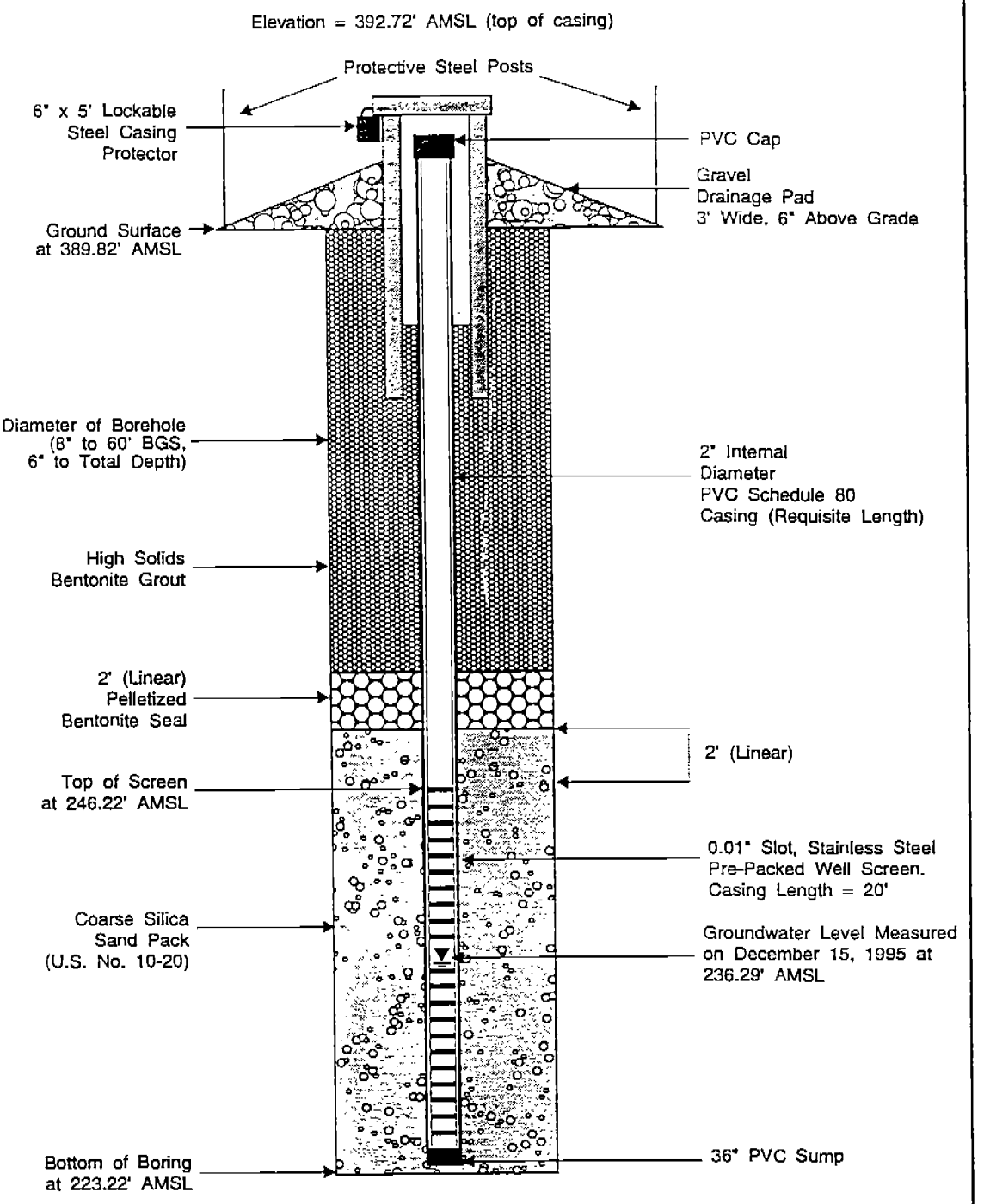
USCOR-8

HOLE NO. (field): MW-10 RRFTA HOLE NO. (permanent): AP-3657	PROJECT: OU-A Fort Richardson	SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
137								
255 138					138.0'–140.0' No sample recovery.			
139		No data	0					
140								
141								
142								
250 143								
144								
145								
146								
147								
245 148								
149		No data	No data	GW	148.0'–150.0' Brownish gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 3 cm, moist to saturated, no hydrocarbon odor, no sheen.	2208SB 2209SB 2210SB		1
150								
151					Bottom of exploration at 150.0'. Monitoring well installed at 166.6' below ground surface.			
152	▼							
240 153								
154								
155								
156								
157								
235 158								
159								
160								
161								
162								
230 163								
164								
165								
166								
167								
225 168								
169								
170								
171								
172								

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RUFF ROAD FIRE TRAINING AREA
AP-3657 MONITORING WELL CONSTRUCTION DIAGRAM

POL Laboratory Dry Well

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 119,309.59 E: 126,494.00

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-21 POLLDW
HOLE NO. (permanent): AP-3618

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 50 F, cloudy.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL ( )

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 6/08/95
DATE HOLE FINISHED: 6/08/95

ELEV. TOP OF HOLE: 295.39

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
295									
1									
2									
3									
4									
5									
290									
6			No data	100	SM	5.0'–7.0' Brown, silty SAND, 60% fine sand, 30% silt, 10% gravel, rounded, max.= 4 cm, well sorted, loose, dry, no hydrocarbon odor, no sheen.	3001SB 3002SB 3003SB		0
7									
8									
9									
10									
285									
11			No data	100	SM	10.0'–12.0' Brown, silty SAND, 60% fine sand, 30% silt, 10% gravel, rounded, max.= 4 cm, well sorted, loose, dry, no hydrocarbon odor, no sheen.	3004SB		0
12									
13									
14									
15									
280									
16			7/18/ 61/31	100	GW	15.0'–17.0' Brown, sandy GRAVEL, 40% gravel, 30% sand, 30% tan clay, rounded, max.= >6 cm, poorly sorted, tight, moist, no hydrocarbon odor, no sheen, trace coal.	3005SB		0
17.5									

USCOE-6

HOLE NO. (field): SB-21 POLLOW
HOLE NO. (permanent): AP-3618

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	
18.5								
19.5								
275 20.5		7/11/12/16	100	GW	20.0'–22.0' Brown, sandy GRAVEL, 40% gravel, 30% sand, 30% clay, rounded, max.= >6 cm, poorly sorted, tight, moist, no hydrocarbon odor , no sheen.	3006SB		0
21.5								
22.5								
23.5								
24.5								
270 25.5								
26.5								
27.5								
28.5								
29.5								
265 30.5		11/25/20/33	100	SW	30.0'–32.0' Brown–gray, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, rounded to angular, max.= >6 cm, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	3007SB		0
31.5								
32.5								
33.5								
34.5								
260 35.5								
36.5								
37.5								
38.5								
40								

HOLE NO. (field): SB-21 POLLDW HOLE NO. (permanent): AP-3618	PROJECT: OU-A Fort Richardson	SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255 / 41		7/11/17/20	100	SW	40.0'–42.0' Brown-gray, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	3008SB		0
42								
43								
44								
45 / 250								
46								
47								
48		12/19/24/47	100	SW	48.0'–50.0' Brown-gray, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	3009SB		0
49								
50 / 245					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
55 / 240								
56								
57								
58								
59								
60 / 235								
61								
62.5								

USCOM-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 119,326.41 E: 126,445.33

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-22 POLLOW
HOLE NO. (permanent): AP-3619

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 50 F, cloudy.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 8

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 6/08/95
DATE HOLE FINISHED: 6/08/95

ELEV. TOP OF HOLE: 295.97

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
295 1									
2									
3									
4									
5									
290 6			No data	100	SM	5.0'–7.0' Brown, silty SAND, 50% fine sand, 40% silt, 10% pea gravel, rounded, max.=4 cm, loose, dry, no hydrocarbon odor, no sheen.	3010SB		0
7									
8									
9									
10									
285 11			No data	100	SM	10.0'–12.0' Brown, silty SAND, 50% fine sand, 40% silt, 10% gravel, rounded, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	3011SB		0
12									
13									
14									
15									
280 16			12/11/9/10	50	SW	15.0'–19.0' Gray, gravelly SAND, 40% sand, 40% gravel, 20% silt and clay, fuel stained, loose, wet with fuel, very strong diesel odor, fuel sheen.	3012SB		>1000
17.5				100					>1000

USCOR-8

HOLE NO. (field): SB-22 POLLDW
HOLE NO. (permanent): AP-3619

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUNDWATER	BLOW COUNTS	% RECOVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PROJECT	FIELD
18.5		12/10/15/17	100	SW		3012SB	>1000
19.5							
20.5		15/24/26/15	80	SW	20.0'-22.0' Gray, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, poorly sorted, loose, dry, strong hydrocarbon odor, no sheen.	3013SB	200
-275							
21.5							
22.5							
23.5							
24.5							
25.5							
-270							
26.5							
27.5							
28.5							
29.5							
30.5		11/21/21/20	100	SW	30.0'-32.0' Gray, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, poorly sorted, tight, dry, medium hydrocarbon odor, no sheen.	3014SB	40
-265							
31.5							
32.5							
33.5							
34.5							
35.5							
-260							
36.5							
37.5							
38.5							
40							

USCOR-6

HOLE NO. (field): SB-22 POLLOW
HOLE NO. (permanent): AP-3619

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255 41		7/19/ 36/33	80	SW	40.0'–42.0' Brown, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, poorly sorted, max.= >8 cm, tight, dry, no hydrocarbon odor, no sheen.	3015SB		9
42								
43								
44								
45								
250 46								
47								
48		7/60/ 21/23	60	SW	48.0'–50.0' Brown, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, max.= >6 cm, tight, dry, no hydrocarbon odor, no sheen.	3016SB		11
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
245 51								
52								
53								
54								
55								
240 56								
57								
58								
59								
60								
235 61								
62.5								

USCOM-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 119,289.73	E: 126,449.14
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-23 POLLOW HOLE NO. (permanent): AP-3620	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 65 F, sunny.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL ———	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 6/09/95 DATE HOLE FINISHED: 6/09/95
ELEV. TOP OF HOLE 294.42	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
290									
5			No data	100	SM	5.0'–7.0' Brown, silty SAND, 50% sand, 25% silt, 25% gravel, rounded, max.= 4 cm, loose, dry, poorly sorted, no hydrocarbon odor, no sheen.	3017SB		0
285									
10			No data	100	SM	10.0'–12.0' Brown, silty SAND, 50% sand, 25% silt, 25% gravel, rounded, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	3018SB 3019SB 3020SB		0
280									
15			8/15/15/24	80	SW	15.0'–17.0' Gray-green, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, wet with fuel, strong diesel odor, fuel sheen.	3021SB		>1000
17.5									

USCOR-6

HOLE NO. (field): SB-23 POLLDW
HOLE NO. (permanent): AP-3620

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
275 19.5							
20.5		9/11/14/17	80	SM	20.0'-22.0 Gray-brown, silty SAND, 50% sand, 30% silt and clay, 20% gravel, coal seam at 20.5', moist, slight hydrocarbon odor, no sheen.	3022SB	40
21.5							
22.5							
23.5							
270 24.5							
25.5							
26.5							
27.5							
28.5							
265 29.5							
30.5		9/17/16/12	100	SW	30.0'-32.0' Brown, gravelly SAND, 50% sand, 30% gravel, 20% silt and clay, max.= >6 cm, tight, dry, no hydrocarbon odor, no sheen.	3023SB	0
31.5							
32.5							
33.5							
260 34.5							
35.5							
36.5							
37.5							
38.5							
255 40							

HOLE NO. (field): SB-23 POLLOW
HOLE NO. (permanent): AP-3620

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		12/29/30/33	75	GW	40.0'–42.0' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	3024SB		0
42								
43								
44								
250								
45								
46								
47								
48		16/29/42/38	100	GW	48.0'–50.0' Brown-gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	3025SB 3026SB 3027SB		0
49								
245								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
240								
55								
56								
57								
58								
59								
235								
60								
61								
62.5								

USCOR-8

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 119,315.92	E: 126,388.88
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-24 POLLOW HOLE NO. (permanent): AP-3621	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 55 F, clear, calm.

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole (X) Churn Drill ( )	300 pounds	6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
50 ft.	(X) MSL _____	Truck Mounted CME-75

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 6/12/95 DATE HOLE FINISHED: 6/12/95
7	3" O.D. Split Spoon	NA ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
295.22	Jackie Donley	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
295									
1									
2									
3									
4									
290 5									
6			No data	100	SM	5.0'–7.0' Brown, silty SAND, 50% fine sand, 50% silt, loose, dry, no hydrocarbon odor, no sheen.	3028SB		0
7									
8									
9									
285 10									
11			No data	100	SM	10.0'–12.0' Brown, silty SAND, 50% fine sand, 40% silt, 10% gravel, loose, dry, no hydrocarbon odor, no sheen.	3029SB		0
12									
13									
14									
280 15									
16			43/14/ 45/10	100	SM	15.0'–17.0' Brown, silty SAND, 50% fine sand, 40% silt, 10% gravel, loose, dry, no hydrocarbon odor, no sheen.	3030SB		0
17.5									

USCOM-6

HOLE NO. (field): SB-24 POLLOW HOLE NO. (permanent): AP-3621	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
19.5							
275 20.5		11/37/24/22	100	SM	20.0'-22.0' Brown, silty SAND, 50% fine sand, 40% silt, 10% gravel, loose, dry, no hydrocarbon odor, no sheen.	3031SB	0
21.5							
22.5							
23.5							
24.5							
270 25.5							
26.5							
27.5							
28.5							
29.5							
265 30.5		12/17/18/24	100	GW	30.0'-32.0' Brown, sandy GRAVEL, 50% gravel, 25% fine sand, 25% silt, tight, moist, poorly sorted, no hydrocarbon odor, no sheen.	3032SB	0
31.5							
32.5							
33.5							
34.5							
260 35.5							
36.5							
37.5							
38.5							
40							

USCOM-6

HOLE NO. (field): SB-24 POLLDW
HOLE NO. (permanent): AP-3621

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255 / 41		9/26/ 36/21	100	SC	40.0'-42.0' Brown, clayey SAND, 60% medium sand, 30% clay, 10% gravel, max.= >6 cm, tight, moist, well sorted, no hydrocarbon odor, no sheen.	3033SB		0
42								
43								
44								
250 / 45								
46								
47								
48					48.0'-50.0' Brown, clayey SAND, 60% medium sand, 30% clay, 10% gravel, max.= >6 cm, tight, moist, well sorted, no hydrocarbon odor, no sheen.	3034SB		0
49		16/34/ 33/29	100	SC				
245 / 50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
54								
240 / 55								
56								
57								
58								
59								
235 / 60								
61								
62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 119,270.18	E: 126,450.33
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-25 POLLOW HOLE NO. (permanent): AP-3622	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 65 F, partly sunny.
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 8	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 6/13/95 DATE HOLE FINISHED: 6/13/95
ELEV. TOP OF HOLE 293.29	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
290 3									
4									
5									
6			10/15/17/14	100	SW	5.0'–7.0' Brown, gravelly SAND, 40% fine sand, 40% gravel, 20% silt, rounded, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	3035SB		0
7									
285 8									
9									
10									
11			9/18/16/12	100	GM	10.0'–12.0' Brown, sandy GRAVEL, 40% gravel, 30% fine sand, 30% silt, rounded, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	3036SB		0
12									
280 13									
14									
15									
16			19/47/43/36	100	GC	15.0'–17.0' Brown, clayey GRAVEL, 40% gravel, 40% clay, 20% coarse sand, rounded, max.= >6 cm, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	3037SB		0
17.5									

USCOR-6

HOLE NO. (field): SB-25 POLLOW
HOLE NO. (permanent): AP-3622

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID
275 18.5								
19.5								
20.5		9/17/19/18	100	GC	20.0'-22.0' Brown, clayey GRAVEL, 40% gravel, 40% clay, 20% coarse sand, rounded, max.= >6 cm, poorly sorted. tight, dry, no hydrocarbon odor, no sheen.	3038SB		10
21.5								
22.5								
270 23.5								
24.5								
25.5								
26.5								
27.5								
265 28.5								
29.5								
30.5		10/19/16/31	100	GC	30.0'-34.0' Brown, clayey GRAVEL, 40% gravel, 40% clay, 20% coarse sand, tight, dry, no hydrocarbon odor, no sheen.	3039SB 3040SB 3041SB		20
31.5								
32.5		20/17/19/22	100					
260 33.5								
34.5								
35.5								
36.5								
37.5								
255 38.5								
40								

USCOM-5

HOLE NO. (field): SB-25 POLLDW
HOLE NO. (permanent): AP-3622

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		9/17/17/23	100	GC	40.0'–42.0' Brown, gravelly CLAY, 40% clay, 30% gravel, 30% sand, rounded, max.= >6 cm, tight, moist, no hydrocarbon odor, no sheen.	3042SB		80
42								
43								
250								
44								
45								
46								
47								
48								
245								
49		20/19/19/17	100	SP	48.0'–50.0' Brown, SAND, 70% medium sand, 20% gravel, 10% silt, rounded, spherical, max.= 2 cm, very well sorted, loose, moist, no hydrocarbon odor, no sheen.	3043SB		4
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
53								
240								
54								
55								
56								
57								
58								
235								
59								
60								
61								
62.5								

USCOM-6

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson — SHEET # 1 of 3
LOCATION COORD N: 119,104.96 E: 126,527.36
DRILLING AGENCY OTHER (X) USACE ( )
HOLE NO. (field): SB-26 POLLDW
HOLE NO. (permanent): AP-3623
NAME OF DRILLER: Hughes Drilling Co./Gary Wilson
WEATHER: 65 F, partly sunny.
TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )
HAMMER WEIGHT: 300 pounds
SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE: 50 ft.
DATUM FOR ELEVATION SHOWN: (X) MSL
TYPE OF EQUIPMENT: Truck Mounted CME-75
TOTAL # OF SAMPLES: 7
TYPE OF SAMPLES: 3" O.D. Split Spoon
DEPTH TO GROUNDWATER: NA ft.
DATE HOLE STARTED: 6/13/95
DATE HOLE FINISHED: 6/13/95
ELEV. TOP OF HOLE: 292.14
INSPECTOR: Jackie Donley
CHIEF SOILS SECTION: Jerry Raychel
CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
290									
5			5/7/12/11	100	SM	5.0'–7.0' Brown, silty SAND, 50% fine sand, 40% silt, 10% gravel, loose, dry, no hydrocarbon odor, no sheen.	3044SB		0
285									
10			9/8/16/13	100	SM	10.0'–12.0' Brown, silty SAND, 50% fine sand, 40% silt, 10% gravel, loose, dry, no hydrocarbon odor, no sheen.	3045SB 3046SB 3047SB		1
280									
15			10/23/46/18	80	SW	15.0'–17.0' Brown, gravelly SAND, 40% sand, 40% gravel, 20% silt, loose, dry, no hydrocarbon odor, no sheen.	3048SB		2
275 17.5									

USCOR-6

HOLE NO. (field): SB-26 POLLDW
HOLE NO. (permanent): AP-3623

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
19.5							
20.5		9/14/ 21/17	90	SW	20.0'--22.0' Brown, gravelly SAND, 40% sand, 40% gravel, 20% tan clay, trace coal present, tight, dry, poorly sorted, no hydrocarbon odor, no sheen.	3040SB	6
21.5							
270 22.5							
23.5							
24.5							
25.5							
26.5							
265 27.5							
28.5							
29.5							
30.5		9/21/ 19/17	100	SW	30.0'--32.0' Brown, gravelly SAND, 40% sand, 40% gravel, 20% clay, tight, dry, poorly sorted, no hydrocarbon odor, no sheen.	3050SB	1
31.5							
260 32.5							
33.5							
34.5							
35.5							
36.5							
255 37.5							
38.5							
40							

USCOM-6

HOLE NO. (field): SB-26 POLLDW
HOLE NO. (permanent): AP-3623

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		6/12/ 18/14	100	SW	40.0'-42.0' Brown-gray, gravelly SAND, 70% sand, 20% gravel, 10% silt, rounded, max.= 4 cm, well sorted, loose, moist, no hydrocarbon odor, no sheen.	3051SB		7
-250 42								
43								
44								
45								
46								
-245 47								
48		17/41/ 38/22	100	SM	48.0'-50.0' Brown, silty SAND, 50% medium sand, 30% silt, 20% gravel, max.= >6 cm, loose, moist, no hydrocarbon odor, no sheen.	3052SB		5
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
-240 52								
53								
54								
55								
56								
-235 57								
58								
59								
60								
61								
-230 62.5								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 4
	LOCATION COORD N: 119,096.56	E: 126,595.62
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-27 POLLDW HOLE NO. (permanent): AP-3624	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 60 F, partly cloudy.

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole (X) Churn Drill ( )	300 pounds	6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
70 ft.	(X) MSL _____	Truck Mounted CME-75

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 6/14/95 DATE HOLE FINISHED: 6/14/95
10	3" O.D. Split Spoon	NA ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
292.11	Jackie Donley	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
290 2									
3									
4									
5									
6			No data	100	SW	5.0'-7.0' Brown, gravelly SAND, 40% sand, 30% gravel, 30% silt and clay, max.= 4 cm, moist to dry, no hydrocarbon odor, no sheen.	3053SB		0
285 7									
8									
9									
10									
11			12/11/13/17	100	SW	10.0'-12.0' Brown, gravelly SAND, 40% sand, 30% gravel, 30% silt and clay, moist to dry, no hydrocarbon odor, no sheen.	3054SB		0
280 12									
13									
14									
15									
16			9/12/16/22	100	GC	15.0'-17.0' Tan, gravelly CLAY, 45% clay, 40% gravel, 15% sand, tight, moist, poorly sorted, no hydrocarbon odor, no sheen.	3055SB		2
275 17.5									

USCOM-6

HOLE NO. (field): SB-27 POLLDW HOLE NO. (permanent): AP-3624	PROJECT: OU-A Fort Richardson	SHEET # 2 of 4

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	F (ppm)
18.5					18.0' Driller reports diesel odor. Diesel odor in cuttings OVA=2 ppm.			
19.5								
20.5		10/42/17/11	100	GC	20.0'–22.0' Tan gravelly CLAY, 60% clay, 20% gravel, 20% sand, tight, moist, no hydrocarbon odor, no sheen.	3056SB		60
21.5								
270								
22.5								
23.5								
24.5								
25.5								
26.5								
265								
27.5								
28.5								
29.5								
30.5		10/16/17/20	100	GW	30.0'–32.0' Brown, sandy GRAVEL, 40% gravel, 40% sand, 20% silt and clay, max.= >6 cm, loose, moist, no hydrocarbon odor, no sheen.	3057SB		200
31.5								
260								
32.5								
33.5								
34.5								
35.5								
36.5								
255								
37.5								
38.5								
40								

USCOM-6

HOLE NO. (field): SB-27 POLLDW
HOLE NO. (permanent): AP-3624

PROJECT: OU-A Fort Richardson

SHEET # 3 of 4

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		7/18/ 19/22	100	SC	40.0'-42.0' Brown, clayey GRAVEL, 40% gravel, 40% clay, 20% sand, tight, moist, no hydrocarbon odor, no sheen.	3058SB		1
-250 42								
43								
44								
45					45.0' Driller reports sickening sweet smell as rods are inserted into augers. OVA in cuttings 20 ppm, OVA in breathing zone 40 ppm.			
46								
-245 47								
48					48.0'-52.0' Gray, SAND, 80% sand, 10% gravel, 10% silt, max.= 4 cm, very well sorted, loose, moist, no hydrocarbon odor, no sheen.	3059SB 3060SB 3061SB		20
49		9/27/ 19/15	100	SP				
50								
51		17/10/ 22/16	100					
-240 52								
53								
54								
55								
56								
-235 57								
58								
59		15/20/ 27/41	100	SW	58.0'-60.0' Gray, gravelly SAND, 50% sand, 30% gravel, 20% silt, max.= 8 cm, well sorted, loose, dry, no hydrocarbon odor, no sheen.	3062SB		40
60								
61								
-230 62.5								

USCOM-6

HOLE NO. (field): SB-27 FOLLOW
HOLE NO. (permanent): AP-3624

PROJECT: OU-A Fort Richardson

SHEET # 4 of 4

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID
63.5								
64.5								
65.5								
66.5								
225								
67.5								
68.5		20/18/ 26/27	100	GW	68.0'–70.0' Brown, sandy GRAVEL, 50% gravel, 30% sand, 20% silt, loose, dry, no hydrocarbon odor, no sheen.	3063SB		70
69.5								
70.5					Bottom of exploration at 70.0'. Soil boring abandoned at 70.0'.			
71.5								
220								
72.5								
73.5								
74.5								
75.5								
76.5								
215								
77.5								
78.5								
79.5								
80.5								
81.5								
210								
82.5								
83.5								
85								

USCOR-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 119,076.35	E: 136,679.20
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-28 POLLOW HOLE NO (permanent): AP-3625	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 50 F, partly cloudy.

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole (X) Churn Drill ( )	300 pounds	6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
50 ft.	(X) MSL _____	Truck Mounted CME-75

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 8/15/95 DATE HOLE FINISHED: 6/15/95
7	3" O.D. Split Spoon	NA ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
293.15	Jackie Donley	Jerry Paychel	Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1								
290 3								
4								
5								
		7/11/ 19/22	100	GM	5.0'-7.0' Brown, silty GRAVEL, 40% gravel, 40% silt, 20% sand, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	3064SB		7
7								
285 8								
9								
10								
		8/12/ 13/13	100	GM	10.0'-12.0' Brown, silty GRAVEL, 40% gravel, 40% silt, 20% sand, max.= 4 cm, loose, dry, no hydrocarbon odor, no sheen.	3065SB		10
12								
280 13								
14								
15								
		8/18/ 25/31	100	GC	15.0'-17.0' Brown, clayey GRAVEL, 40% gravel, 40% clay, 20% sand, max.= 4 cm, tight, dry, no hydrocarbon odor, no sheen.	3066SB		20
16								
17.5								

USCOR-6

HOLE NO. (field): SB-28 POLLOW
HOLE NO. (permanent): AP-3625

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
275 18.5							
19.5							
20.5		9/17/ 22/23	100	SW	20.0'–22.0' Brown, gravelly SAND, 50% sand, 30% gravel, 20% silt, max.= >6 cm, loose, dry, no hydrocarbon odor, no sheen.	3067SB	5
21.5							
22.5							
270 23.5							
24.5							
25.5							
26.5							
27.5							
265 28.5							
29.5							
30.5		17/20/ 10/16	100	SW	30.0'–32.0' Brown, gravelly SAND, 50% sand, 30% gravel, 20% silt, loose, dry, no hydrocarbon odor, no sheen.	3068SB	7
31.5							
32.5							
260 33.5							
34.5							
35.5							
36.5							
37.5							
255 38.5							
40							

USCOR-6

HOLE NO. (field): SB-28 POLLOW
HOLE NO. (permanent): AP-3625

PROJECT: OU-A Fort Richardson

SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		12/18/17/19	100	GW	40.0'-42.0' Brown, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	3069SB		2.6
42								
250 43								
44								
45								
46								
47								
245 48		7/33/37/46	100	GW	48.0'-50.0' Brown, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	3070SB		10
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
51								
52								
240 53								
54								
55								
56								
57								
235 58								
59								
60								
61								
62.5								

USCOM-4

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 118,986.31 E: 126,510.66

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-29 POLLDW

HOLE NO. (permanent): AP-3626

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 50 F, partly cloudy.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL ____

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 6/16/95
DATE HOLE FINISHED: 6/16/95

ELEV. TOP OF HOLE: 291.24

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
290 1									
2									
3									
4									
5									
285 6			No data	100	GM	5.0'-7.0' Brown, silty GRAVEL, 50% gravel, 30% silt, 20% fine sand, poorly sorted, tight, dry, no hydrocarbon odor, no sheen.	3071SB		1
7									
8									
9									
10									
280 11			No data	100	SM	10.0'-12.0' Brown, silty SAND, 35% sand, 35% silt and clay, 30% gravel, max.= 6 cm, moist to dry, no hydrocarbon odor, no sheen.	3072SB		0
12									
13									
14									
15									
275 16			19/26/33/24	100	SM	15.0'-17.0' Brown, silty SAND, 35% sand, 35% silt and clay, 30% gravel, max.= 6 cm, moist to dry, no hydrocarbon odor, no sheen.	3073SB		0
17.5									

USCOM-6

HOLE NO. (field): SB-29 POLLDW HOLE NO. (permanent): AP-3626	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
19.5							
20.5		26/13/ 15/20	100	GW	20.0'-22.0' Brown-gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	3074SB	1
270 21.5							
22.5							
23.5							
24.5							
25.5							
265 26.5							
27.5							
28.5							
29.5							
30.5		18/19/ 26/33	100	GW	30.0'-32.0' Brown-gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	3075SB	1
260 31.5							
32.5							
33.5							
34.5							
35.5							
255 36.5							
37.5							
38.5							
40							

USCOR-6

HOLE NO. (field): SB-29 POLLOW HOLE NO. (permanent): AP-3626	PROJECT: OU-A Fort Richardson	SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41 (250)		26/27/21/17	100	SW	40.0'–42.0' Gray-brown, gravelly SAND, 60% coarse sand, 20% gravel, 20% silt, moist, no hydrocarbon odor, no sheen.	3076SB		1
42								
43								
44								
45								
46 (245)								
47								
48								
49		17/41/38/27	100	SW	48.0'–50.0' Gray-brown, gravelly SAND, 60% sand, 20% gravel, 20% silt, moist, no hydrocarbon odor, no sheen.	3077SB		3.5
50								
51 (240)					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
52								
53								
54								
55								
56 (235)								
57								
58								
59								
60								
61 (230)								
62.5								

USCOR-8

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 3

LOCATION COORD N: 119,192.53 E: 126,486.24

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): SB-30 POLLDW

HOLE NO. (permanent): AP-3627

NAME OF DRILLER: Hughes Drilling Co./Gary Wilson

WEATHER: 60 F, clear, calm.

TYPE OF HOLE: Test Pit ( ) Auger Hole (X) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" I.D. Hollow Stem Auger

TOTAL DEPTH OF HOLE: 50 ft.

DATUM FOR ELEVATION SHOWN: (X) MSL ____

TYPE OF EQUIPMENT: Truck Mounted CME-75

TOTAL # OF SAMPLES: 7

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: NA ft.

DATE HOLE STARTED: 6/19/95
DATE HOLE FINISHED: 6/19/95

ELEV. TOP OF HOLE: 291.94

INSPECTOR: Jackie Donley

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER (permanent)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
290 2									
3									
4									
5									
6			No data	100	GW	5.0'-7.0' Brown, sandy GRAVEL, 40% gravel, 40% sand, 20% silt and clay, max.= 5 cm, dry, no hydrocarbon odor, no sheen.	3078SB 3079SB 3080SB		0
285 7									
8									
9									
10									
11			No data	100	GW	10.0'-12.0' Brown, sandy GRAVEL, 40% gravel, 40% sand, 20% silt and clay, max.= 5 cm, dry, no hydrocarbon odor, no sheen.	3081SB		0
280 12									
13									
14									
15									
16			14/28/16/24	100	GW	15.0'-17.0' Brown, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	3082SB		1
275 17.5									

USCOE-6

HOLE NO. (field): SB-30 POLLDW HOLE NO. (permanent): AP-3627	PROJECT: OU-A Fort Richardson	SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
18.5							
19.5							
20.5		14/19/14/15	100	GW	20.0'-22.0' Brown, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	3083SB	1
21.5							
270							
22.5							
23.5							
24.5							
25.5							
26.5							
265							
27.5							
28.5							
29.5							
30.5		20/28/20/15	100	GW	30.0'-32.0' Brown, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, moist, no hydrocarbon odor, no sheen.	3084SB	1
31.5							
260							
32.5							
33.5							
34.5							
35.5							
36.5							
255							
37.5							
38.5							
40							

USCOM-8

HOLE NO. (field): SB-30 POLLEN
HOLE NO. (permanent): AP-3627
PROJECT: OU-A Fort Richardson
SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
41		17/19/10/12	90	GW	40.0'-42.0' Brown, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, moist, no hydrocarbon odor, no sheen.	3085SB		0
-250 42								
43								
44								
45								
46								
-245 47								
48								
49		17/37/37/42	100	SW	48.0'-50.0' Brown, SAND, 70% medium sand, 20% silt, 10% gravel, max.= 3 cm, rounded, spherical, well sorted, moist, no hydrocarbon odor, no sheen.	3086SB		.5
50								
51					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
-240 52								
53								
54								
55								
56								
-235 57								
58								
59								
60								
61								
-230 62.5								

USCOM-6

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 3
	LOCATION COORD N: 119,364.74	E: 126,427.46
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): SB-42 POLLOW HOLE NO. (permanent): AP-3628	NAME OF DRILLER Hughes Drilling Co./Gary Wilson	WEATHER 50 F, rain, no wind
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" I.D. Hollow Stem Auger
TOTAL DEPTH OF HOLE 50 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted CME-75
TOTAL # OF SAMPLES 7	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER NA ft.
		DATE HOLE STARTED: 6/30/95 DATE HOLE FINISHED: 6/30/95
ELEV. TOP OF HOLE 295.67	INSPECTOR Jackie Donley	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
295 / 1	(permafrost) (groundwater)							
2								
3								
4								
5								
290 / 6		No data	100	GM	5.0'-7.0' Brown, silty GRAVEL, 60% gravel, 30% silt, 10% sand, max.= 4 cm, rounded, loose, dry, no hydrocarbon odor, no sheen.	3087SB		0
7								
8								
9								
10								
285 / 11		No data	100	GM	10.0'-12.0' Brown, silty GRAVEL, 60% gravel, 30% silt, 10% sand, max.= 4 cm, rounded, loose, dry, no hydrocarbon odor, no sheen.	3088SB 3089SB 3090SB		0
12								
13								
14								
15								
280 / 16		No data	100	SM	15.0'-17.0' Brown-tan, sandy SILT and CLAY, 40% silt and clay, 30% sand, 30% gravel, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	3091SB		0
17.5								

HOLE NO. (field): SB-42 POLLDW
HOLE NO. (permanent): AP-3628

PROJECT: OU-A Fort Richardson

SHEET # 2 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	
18.5								
19.5								
275 20.5		19/20/16/13	100	SM	20.0'-22.0' Brown-tan, sandy SILT and CLAY, 40% silt and clay, 30% sand, 30% gravel, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	3092SB		50
21.5								
22.5								
23.5								
24.5								
270 25.5								
26.5								
27.5								
28.5								
29.5								
265 30.5		20/20/17/13	100	SM	30.0'-32.0' Brown-tan, sandy SILT and CLAY, 40% silt and clay, 30% sand, 30% gravel, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	3093SB		20
31.5								
32.5								
33.5								
34.5								
260 35.5								
36.5								
37.5								
38.5								
40								

USCOM-6

HOLE NO. (field): SB-42 POLLOW HOLE NO. (permanent): AP-3628	PROJECT: OU-A Fort Richardson	SHEET # 3 of 3

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
255 41		13/24/27/17	100	SM	40.0'–42.0' Brown-tan, sandy SILT and CLAY, 40% silt and clay, 30% sand, 30% gravel, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	3094SB		6
42								
43								
44								
45								
250 46								
47								
48		17/15/19/20	100	SM	48.0'–50.0' Brown-tan, sandy SILT and CLAY, 40% silt and clay, 30% sand, 30% gravel, poorly sorted, tight, moist, no hydrocarbon odor, no sheen.	3095SB		No data
49								
50					Bottom of exploration at 50.0'. Soil boring abandoned at 50.0'.			
245 51								
52								
53								
54								
55								
240 56								
57								
58								
59								
60								
235 61								
62.5								

USCOR-8

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION
U.S. ARMY ENGINEER DISTRICT, ALASKA
EXPLORATION LOG

PROJECT: OU-A Fort Richardson | SHEET # 1 of 5

LOCATION COORD N: 119,320.48 E: 126,456.66

DRILLING AGENCY OTHER (X) USACE ( )

HOLE NO. (field): MW-1 POLLDW
HOLE NO. (permanent): AP-3648

NAME OF DRILLER: Tester Drilling Co./Mark Eskeldson

WEATHER: 55 F, cloudy, light south wind

TYPE OF HOLE: Test Pit ( ) Auger Hole ( ) Churn Drill ( )

HAMMER WEIGHT: 300 pounds

SIZE AND TYPE OF BIT: 6" and 8" rotary

TOTAL DEPTH OF HOLE: 123.4ft.

DATUM FOR ELEVATION SHOWN: (X) MSL _____

TYPE OF EQUIPMENT: Truck Mounted Air Rotary

TOTAL # OF SAMPLES: 8

TYPE OF SAMPLES: 3" O.D. Split Spoon

DEPTH TO GROUNDWATER: 118.8ft.

DATE HOLE STARTED: 8/14/95
DATE HOLE FINISHED: 8/14/95

ELEV. TOP OF HOLE: 296.33

INSPECTOR: Brad Ackman

CHIEF SOILS SECTION: Jerry Raychel

CHIEF GEOTECHNICAL BRANCH: Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
295	(permafrost) (groundwater)							
290								
285								
280								

USCOR-6

HOLE NO. (field): MW-1 POLLDW
HOLE NO. (permanent): AP-3648

PROJECT: OU-A Fort Richardson

SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
275							
22							
23							
24							
25							
26							
270							
27							
28							
29							
30							
31							
265							
32							
33							
34							
35							
36							
260							
37							
38							
39							
40							
41							
255							
42							
43							
44							
45							
46							
250							
47							
48							

HOLE NO. (field): MW-1 POLLOW
HOLE NO. (permanent): AP-3648

PROJECT: OU-A Fort Richardson

SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
49								
50								
51 (245)								
52								
53								
54								
55								
56 (240)								
57								
58								
59		10/20/18/18	100	GP	58.0'-60.0' Brownish gray, GRAVEL, 90% gravel, 10% sand and silt, max.= 3 cm, moist, no hydrocarbon odor, no sheen.	3096SB		0
60								
61 (235)								
62								
63								
64								
65								
66 (230)								
67								
68					68.0'-70.0' No sample recovered.			
69		36/72/87	0					No data
70								
71 (225)								
72								
73								
74								
75								

USCOM-6

HOLE NO. (field): MW-1 POLLOW HOLE NO. (permanent): AP-3648	PROJECT: OU-A Fort Richardson	SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	
76								
-220								
77								
78								
79		32/29/46/36	50	GW	78.0'-80.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	3097SB		2
80								
81								
-215								
82								
83								
84								
85								
86								
-210								
87								
88								
89		14/8/10/21	50	GW	88.0'-90.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	3098SB		1
90								
91								
-205								
92								
93								
94								
95								
96								
-200								
97								
98								
99		17/38/42/45	80	GW	98.0'-100.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, elongated, lenticular, dry, no hydrocarbon odor, no sheen.	3099SB		0
100								
101								
-195								
102								

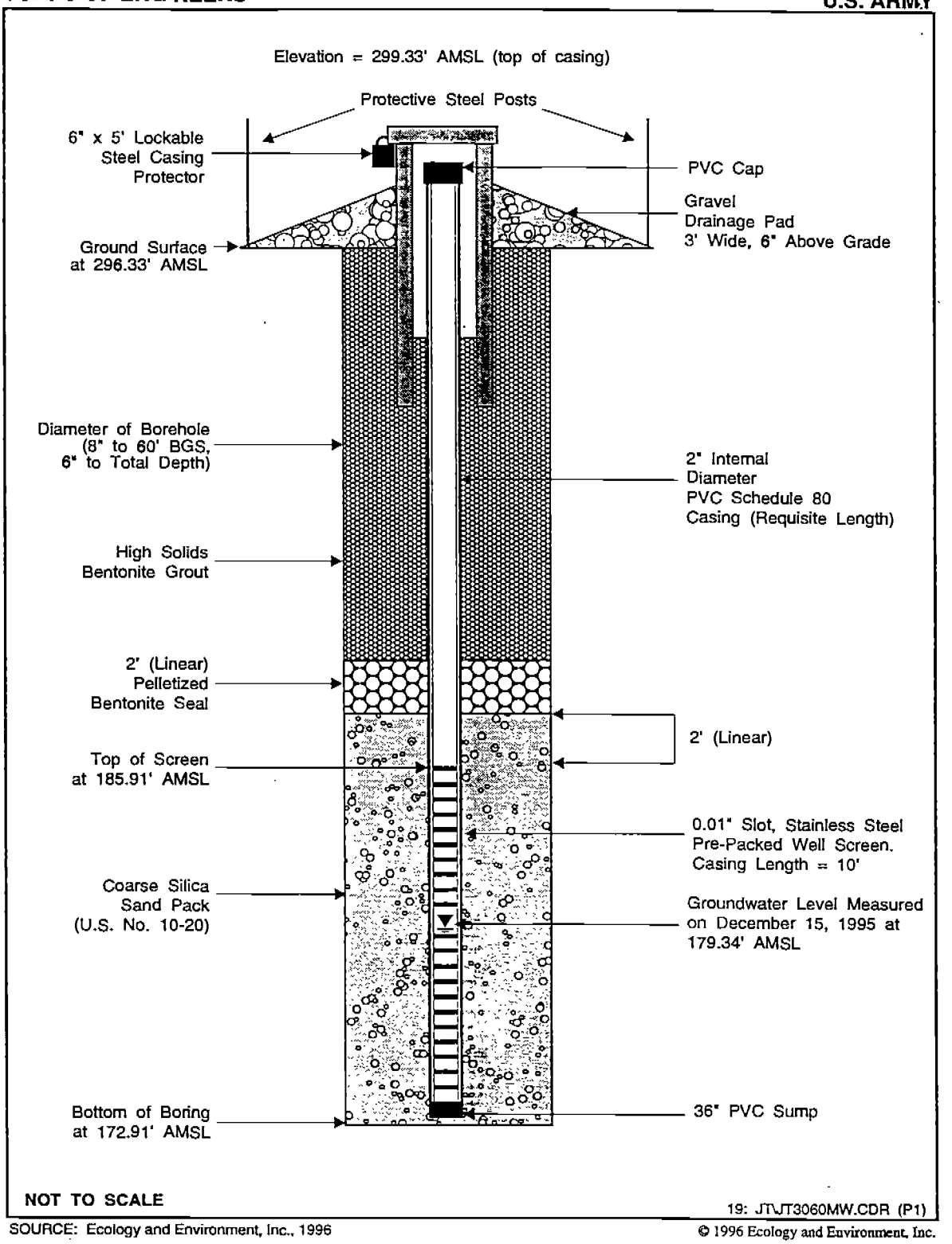
USCOM-8

HOLE NO. (field): MW-1 POLLDW HOLE NO. (permanent): AP-3648	PROJECT: OU-A Fort Richardson	SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
103								
104								
105								
190 106								
107								
108								
109		52/58/35/61	100	GW	108.0'–110.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	3100SB		0
110								
185 111								
112								
113								
114								
115								
180 116								
117								
118								
119	▼	8/10/9/16	100	SP	118.0'–122.0' Dark brown, SAND, 80% sand, 10% gravel, 10% silt, max.= 2 cm, saturated, no hydrocarbon odor, no sheen.	3101SB 3102SB 3103SB		5
120								
175 121		4/6/2/9	100					
122					Bottom of exploration at 122.0'. Monitoring well installed at 123.42' below ground surface.			
123								
124								
125								
170 126								
127								
128								
129								

USCOR-6

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PETROLEUM, OIL, LUBRICANT LABORATORY DRY WELL SITE
AP-3648 MONITORING WELL CONSTRUCTION DIAGRAM

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 5
	LOCATION COORD N: 119,529.86	E: 126,426.33
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): MW-2 POLLDW HOLE NO. (permanent): AP-3649	NAME OF DRILLER Tester Drilling Co./Mark Eskeldson	WEATHER 60 F, clear, moderate west wind

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole ( ) Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
128.6ft.	(X) MSL ____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 8/17/95 DATE HOLE FINISHED: 8/17/95
8	3" O.D. Split Spoon	115.6ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
296.19	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
295 1									
2									
3									
4									
5									
290 6									
7									
8									
9									
10									
285 11									
12									
13									
14									
15									
280 16									
17									
18									
19									
20									
21									

USCOR-6

HOLE NO. (field): MW-2 POLLDW HOLE NO. (permanent): AP-3649	PROJECT: OU-A Fort Richardson	SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
275							
22							
23							
24							
25							
270 26							
27							
28							
29							
30							
285 31							
32							
33							
34							
35							
260 36							
37							
38							
39							
40							
255 41							
42							
43							
44							
45							
250 46							
47							
48							

USCOM-6

HOLE NO. (field): MW-2 POLLDW
HOLE NO. (permanent): AP-3649

PROJECT: OU-A Fort Richardson

SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
49								
50								
245 51								
52								
53								
54								
55								
240 56								
57								
58		10/45/ 18/12	100	GW	58.0'-60.0' Brownish gray, GRAVEL, 60% gravel and rock, 20% sand, 20% silt and clay, max.= 6 cm, moist, no hydorcarbon odor, no sheen.	3104SB		1
59								
60								
235 61								
62								
63								
64								
65								
230 66								
67								
68		18/22/ 26/25	80	GW	68.0'-70.0' Brownish gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	3105SB		2
69								
70								
225 71								
72								
73								
74								
75								

USCOR-6

HOLE NO. (field): MW-2 POLLOW
HOLE NO. (permanent): AP-3649

PROJECT: OU-A Fort Richardson

SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
220 76							
77							
78					78.0'–80.0' Brownish gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	3106SB	0
79		12/13/19/29	100	GW			
80							
215 81							
82							
83							
84							
85							
210 86							
87							
88					88.0'–90.0' No sample recovery.		
89		No data	0	No data			No data
90							
205 91							
92							
93							
94							
95							
200 96							
97							
98					98.0'–100.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry to slightly moist, no hydrocarbon odor, no sheen.	3107SB	1
99		14/23/29/17	50	GW			
100							
195 101							
102							

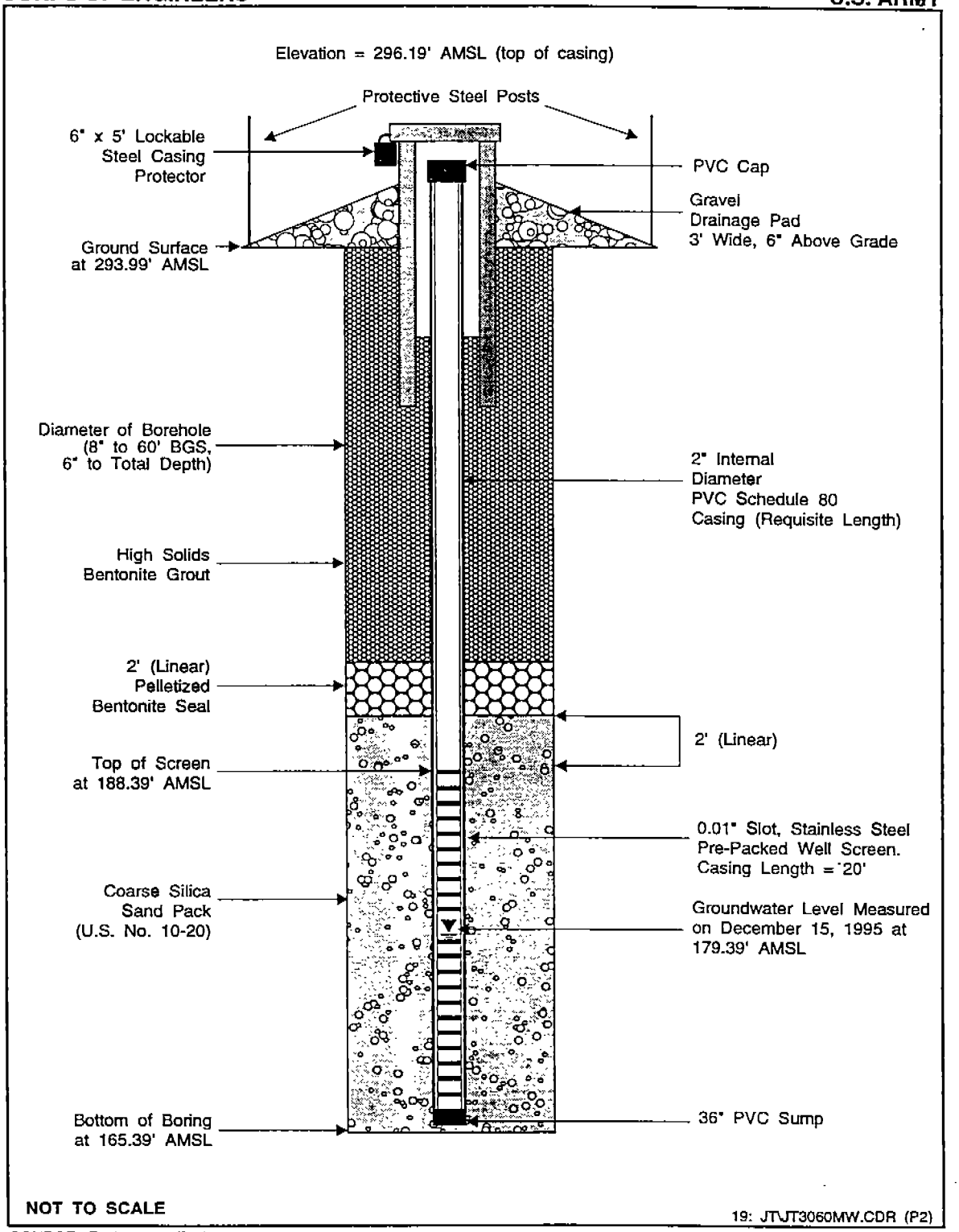
USCOM-6

HOLE NO. (field): MW-2 POLLDW HOLE NO. (permanent): AP-3649	PROJECT: OU-A Fort Richardson	SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
103								
104								
105								
190 106								
107								
108					108.0'–110.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, dry, no hydrocarbon odor, no sheen.			
109		26/31/31/4	80	GW		3108SB		3
110								
185 111								
112								
113								
114								
115	▽							
180 116								
117								
118								
119		27/4 6/3	100	SP	118.0'–122.0' Dark brown, gravelly SAND, 50% sand, 40% gravel, 10% silt and clay, max.= 3 cm, saturated, no hydrocarbon odor, no sheen.	3108SB 3110SB 3111SB		0
120								
175 121		14/12 19/21	80					
122					Bottom of exploration at 122.0'. Monitoring well installed at 128.6' below ground surface.			
123								
124								
125								
170 126								
127								
128								
129								

USCOM-6

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PETROLEUM, OIL, LUBRICANT LABORATORY DRY WELL SITE
AP-3649 MONITORING WELL CONSTRUCTION DIAGRAM

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 5
	LOCATION COORD N: 118,848.65	E: 126,420.24
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): MW-3 POLLDW HOLE NO. (permanent): AP-3650	NAME OF DRILLER Tester Drilling Co./Tim Tester	WEATHER 55 F, clear, calm

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole ( ) Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
119.1 ft.	(X) MSL _____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 8/19/95 DATE HOLE FINISHED: 8/19/95
8	3" O.D. Split Spoon	112.9ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
293.56	Jackie Donley	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER (permafrost)	GROUND-WATER (groundwater)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1									
2									
3									
290									
4									
5									
6									
7									
8									
285									
9									
10									
11									
12									
13									
280									
14									
15									
16									
17									
18									
275									
19									
20									
21									

USCOR-6

HOLE NO. (field): MW-3 POLLDW HOLE NO. (permanent): AP-3650	PROJECT: OU-A Fort Richardson	SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
22							
23							
270							
24							
25							
26							
27							
28							
265							
29							
30							
31							
32							
33							
260							
34							
35							
36							
37							
38							
255							
39							
40							
41							
42							
43							
250							
44							
45							
46							
47							
48							

USCOR-8

HOLE NO. (field): MW-3 POLLDW HOLE NO. (permanent): AP-3650	PROJECT: OU-A Fort Richardson	SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
-245 49 50 51 52 53 -240 54 55 56 57 58 -235 59 60 61 62 63 -230 64 65 66 67 68 -225 69 70 71 72 73 -220 74 75								
		17/12/13/20	80	SW	58.0'-60.0' Brownish gray, gravelly SAND, 60% sand, 20% gravel, 20% silt and clay, max.= >6 cm, well sorted, moist, no hydrocarbon odor, no sheen.	3112SB		0
		19/48/65/73	90	GW	68.0'-70.0' Brownish gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= 4 cm, rounded, poorly sorted, moist, no hydrocarbon odor, no sheen.	3113SB		0.2

USCOM-6

HOLE NO. (field): MW-3 POLLDW
HOLE NO. (permanent): AP-3650

PROJECT: OU-A Fort Richardson

SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
76							
77							
78							
215		5/18/ 25/50	50	GW	78.0'-80.0' Brownish gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= 4 cm, rounded, poorly sorted, moist, no hydrocarbon odor, no sheen.	3114SB	1
79							
80							
81							
82							
83							
210							
84							
85							
86							
87							
88		8/19/ 200	20	GP	88.0'-89.5' Brownish gray, GRAVEL, 90% gravel and rock, 10% sand, dry, no hydrocarbon odor, no sheen.	3115SB	1
205							
89							
90							
91							
92							
93							
200							
94							
95							
96							
97							
98		5/19/ 58/67	80	GW	98.0'-100.0' Grayish brown, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= >6 cm, poorly sorted, no hydrocarbon odor, no sheen.	3116SB	0.4
195							
99							
100							
101							
102							

USCOR-6

HOLE NO. (field): MW-3 POLLDW
HOLE NO. (permanent): AP-3650

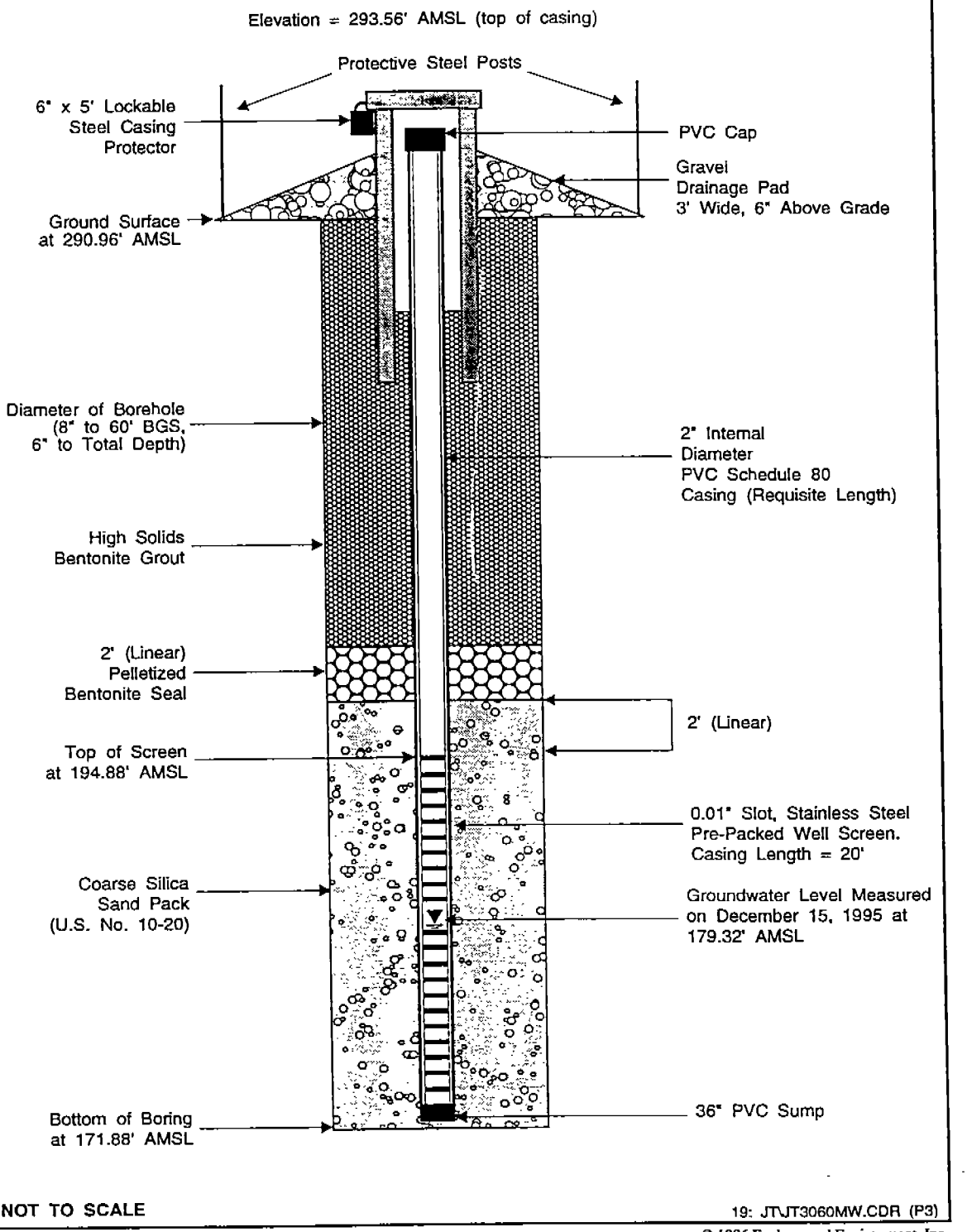
PROJECT: OU-A Fort Richardson

SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
103 / 190 / 104 / 105 / 106 / 107								
108 / 185 / 109		8/22/ 51/43	80	GW	108.0'–110.0' Grayish brown, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= >6 cm, poorly sorted, no hydrocarbon odor, no sheen.	3117SB		7
110 / 111 / 112 / 113 / 180 / 114 / 115 / 116 / 117	▼							
118 / 175 / 119		20/20/ 50/75	80	SP	118.0'–122.0' Dark brown, SAND, 80% sand, 10% gravel, 10% silt, max.= 4 cm, rounded, well sorted, saturated, no hydrocarbon odor, no sheen.	3118SB 3119SB 3120SB		0.2
120 / 121		35/19/ 27/61	80					0.6
122 / 123 / 170 / 124 / 125 / 126 / 127 / 128 / 165 / 129					Bottom of exploration at 122.0'. Monitoring well installed at 119.08' below ground surface.			

USCOM-6

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SOURCE: Ecology and Environment, Inc., 1996

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PETROLEUM, OIL, LUBRICANT LABORATORY DRY WELL SITE
AP-3650 MONITORING WELL CONSTRUCTION DIAGRAM

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU A Eielson Station	SHEET # 1 of 5
	LOCATION COORD N. 99,124.39	E. 126,683.02
	DRILLING AGENCY OTHER (X) USACE ( )	
HOLE NO. (field): MW-4 POLLOW HOLE NO. (permanent): AP-3651	NAME OF DRILLER Tester Drilling Co./Tim Tester	WEATHER 52 F, partly cloudy, calm
TYPE OF HOLE Test Pit ( ) Auger Hole ( ) Churn Drill ( )	HAMMER WEIGHT 300 pounds	SIZE AND TYPE OF BIT 6" and 8" rotary
TOTAL DEPTH OF HOLE 128.1 ft.	DATUM FOR ELEVATION SHOWN (X) MSL _____	TYPE OF EQUIPMENT Truck Mounted Air Rotary
TOTAL # OF SAMPLES 8	TYPE OF SAMPLES 3" O.D. Split Spoon	DEPTH TO GROUNDWATER 115.0 ft.
DATE HOLE STARTED: 8/21/95 DATE HOLE FINISHED: 8/21/95		
ELEV. TOP OF HOLE 295.65	INSPECTOR Brad Ackman	CHIEF SOILS SECTION Jerry Raycher
CHIEF GEOTECHNICAL BRANCH Del Thomas		

DEPTH IN FEET	GROUND-WATER (encountered)	GROUND-WATER (measured)	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
295 1 2 3 4 5 290 6 7 8 9 10 285 11 12 13 14 15 280 16 17 18 19 20 275 21									

USCOM-6

HOLE NO. (field): MW-4 POLLDW
HOLE NO. (permanent): AP-3651

PROJECT OU-A Fort Richardson

SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID
22								
23								
24								
25								
270								
26								
27								
28								
29								
30								
265								
31								
32								
33								
34								
35								
260								
36								
37								
38								
39								
40								
255								
41								
42								
43								
44								
45								
250								
46								
47								
48								

USCOR-6

HOLE NO. (field): MW-4 POLLDW
HOLE NO. (permanent): AP-3651

PROJECT: OU-A Fort Richardson

SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
49								
50								
245 51								
52								
53								
54								
55								
240 56								
57								
58		22/18/17/34	80	GW	58.0'–60.0' Brownish gray, GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	3121SB		0
59								
60								
235 61								
62								
63								
64								
65								
230 66								
67								
68		44/13/29/17	50	GW	68.0'–70.0' Brownish gray, GRAVEL, 60% gravel, 20% sand, 20% silt, max.= 4–6 cm, moist, no hydrocarbon odor, no sheen.	3122SB		No data
69								
70								
225 71								
72								
73								
74								
75								

USCOR-6

HOLE NO. (field): MW-4 POLLOW
HOLE NO. (permanent): AP-3651

PROJECT: OU-A Fort Richardson

SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
220 / 76							
77							
78		12/12/29/34	50	GW	78.0'–80.0' Brownish gray, GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4–6 cm, moist, no hydrocarbon odor, no sheen.	3123SB	1
79							
80 / 215							
81							
82							
83							
84							
85							
210 / 86							
87							
88		12/12/39/34	50	GW	88.0'–90.0' Brownish gray, GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4–6 cm, moist, no hydrocarbon odor, no sheen.	3124SB	0
89							
90 / 205							
91							
92							
93							
94							
95							
200 / 96							
97							
98		36/26/17/29	80	GW	98.0'–100.0' Brownish gray, GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4–6 cm, moist, no hydrocarbon odor, no sheen.	3125SB	0
99							
100 / 195							
101							
102							

HOLE NO. (field): MW-4 POLLDW
HOLE NO. (permanent): AP-3651

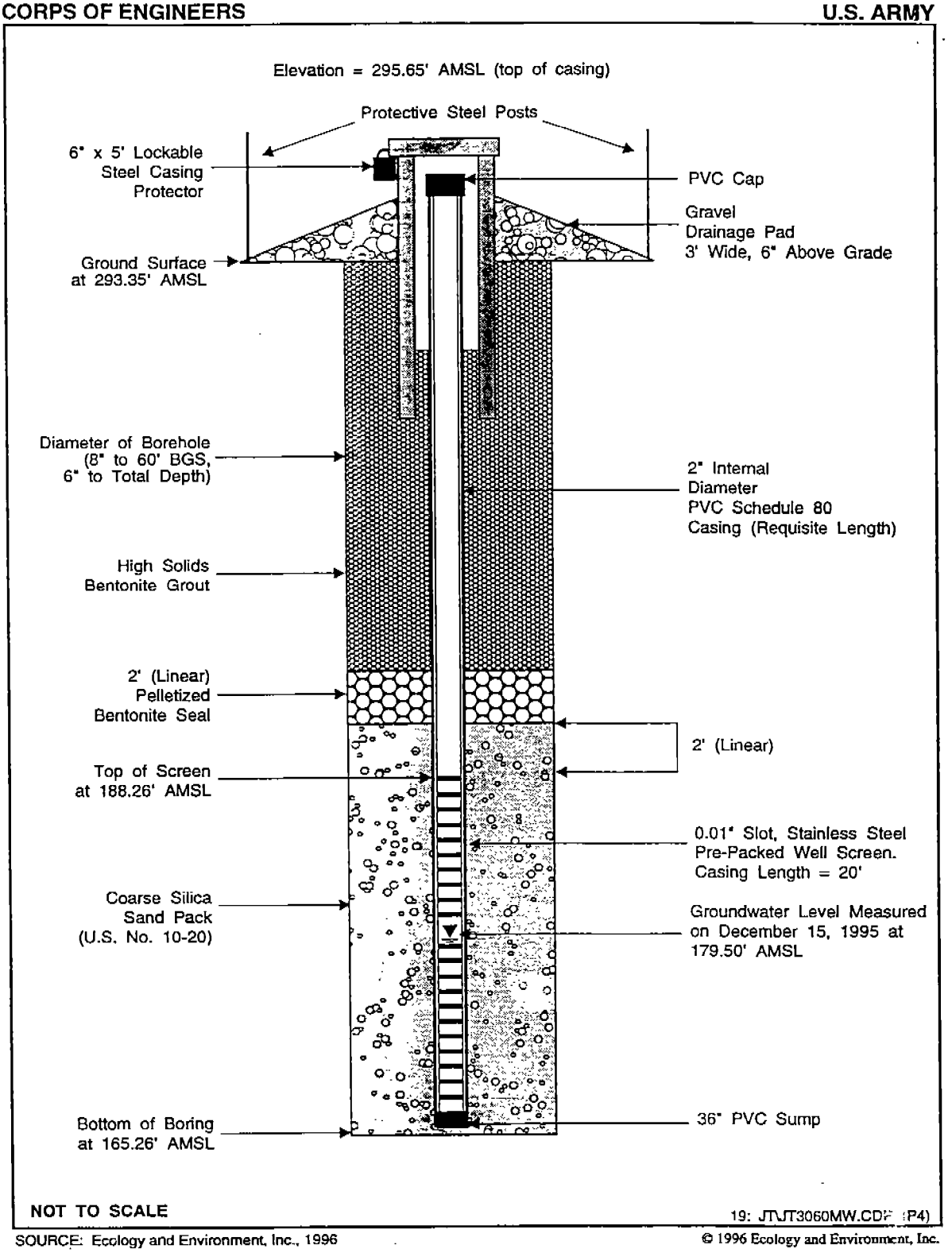
PROJECT: OU-A Fort Richardson

SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
103								
104								
105								
190 106								
107								
108								
109		28/24/17/15	80	GW	108.0'–110.0' Brownish gray, sandy GRAVEL, 50% gravel, 30% sand, 20% silt and clay, minor peat and coal, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	3126SB		0
110								
185 111								
112								
113								
114								
115	▽							
180 116								
117								
118								
119		6/4/4/7	80		118.0'–122.0' Dark brownish gray, SAND, 80% sand, 10% gravel, 10% silt and clay, max.= 1 cm, saturated, no hydrocarbon odor, no sheen.	3127SB 3128SB 3129SB		0
120				SP				
175 121		12/13/8/6	90					
122					Bottom of exploration at 122.0'. Monitoring well installed at 128.09' below ground surface.			
123								
124								
125								
170 126								
127								
128								
129								

USCOR-8

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SOURCE: Ecology and Environment, Inc., 1996

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PETROLEUM, OIL, LUBRICANT LABORATORY DRY WELL SITE
AP-3651 MONITORING WELL CONSTRUCTION DIAGRAM

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: OU-A Fort Richardson	SHEET # 1 of 5
	LOCATION COORD N: 119,412.10	E: 126,235.93
	DRILLING AGENCY OTHER (X)	USACE ( )
HOLE NO. (field): MW-5 POLLOW HOLE NO. (permanent): AP-3652	NAME OF DRILLER Tester Drilling Co./Tim Tester	WEATHER 65 F, clear, calm

TYPE OF HOLE	HAMMER WEIGHT	SIZE AND TYPE OF BIT
Test Pit ( ) Auger Hole ( ) Churn Drill ( )	300 pounds	6" and 8" rotary

TOTAL DEPTH OF HOLE	DATUM FOR ELEVATION SHOWN	TYPE OF EQUIPMENT
128.1 ft.	(X) MSL _____	Truck Mounted Air Rotary

TOTAL # OF SAMPLES	TYPE OF SAMPLES	DEPTH TO GROUNDWATER	DATE HOLE STARTED: 8/23/95 DATE HOLE FINISHED: 8/23/95
7	3" O.D. Split Spoon	113.7 ft.	

ELEV. TOP OF HOLE	INSPECTOR	CHIEF SOILS SECTION	CHIEF GEOTECHNICAL BRANCH
294.30	Brad Ackman	Jerry Raychel	Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
1	(permafrost) (groundwater)							
2								
3								
4 / 290								
5								
6								
7								
8								
9 / 285								
10								
11								
12								
13								
14 / 280								
15								
16								
17								
18								
19 / 275								
20								
21								

USCOR-6

HOLE NO. (field): MW-5 POLLDW
HOLE NO. (permanent): AP-3652

PROJECT: OU-A Fort Richardson

SHEET # 2 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
22							
23							
270 24							
25							
26							
27							
28							
265 29							
30							
31							
32							
33							
260 34							
35							
36							
37							
38							
255 39							
40							
41							
42							
43							
250 44							
45							
46							
47							
48							

USCOR-6

HOLE NO. (field): MW-5 POLLDW
HOLE NO. (permanent): AP-3652

PROJECT: OU-A Fort Richardson

SHEET # 3 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
245 49								
50								
51								
52								
53								
240 54								
55								
56								
57								
58		18/34/35/21	60	GW	58.0'-60.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 6 cm, dry, no hydrocarbon odor, no sheen.	3130SB		2
235 59								
60								
61								
62								
63								
230 64								
65								
66								
67								
68		4/8/7/13	100	SP	68.0'-70.0' Brown, SAND, 85% sand, 10% gravel, 5% silt and clay, max.= 2 cm, moist, no hydrocarbon odor, no sheen.	3131SB 3132SB 3133SB		0
225 69								
70								
71								
72								
73								
220 74								
75								

USCOR-6

HOLE NO. (field): MW-5 POLLDW
HOLE NO. (permanent): AP-3652

PROJECT: OU-A Fort Richardson

SHEET # 4 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD
76							
77							
78							
79 (215)		15/12/13/8	50	GW	78.0'–80.0' Brownish gray, sandy GRAVEL, 50% gravel, 40% sand, 10% silt and clay, max.= 6 cm, moist, no hydrocarbon odor, no sheen.	3134SB	0
80							
81							
82							
83							
84 (210)							
85							
86							
87							
88							
89 (205)		24/16/19/23	50	GW	88.0'–90.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	3135SB	0
90							
91							
92							
93							
94 (200)							
95							
96							
97							
98							
99 (195)		No data	0		98.0'–100.0' No sample recovery.		
100							
101							
102							

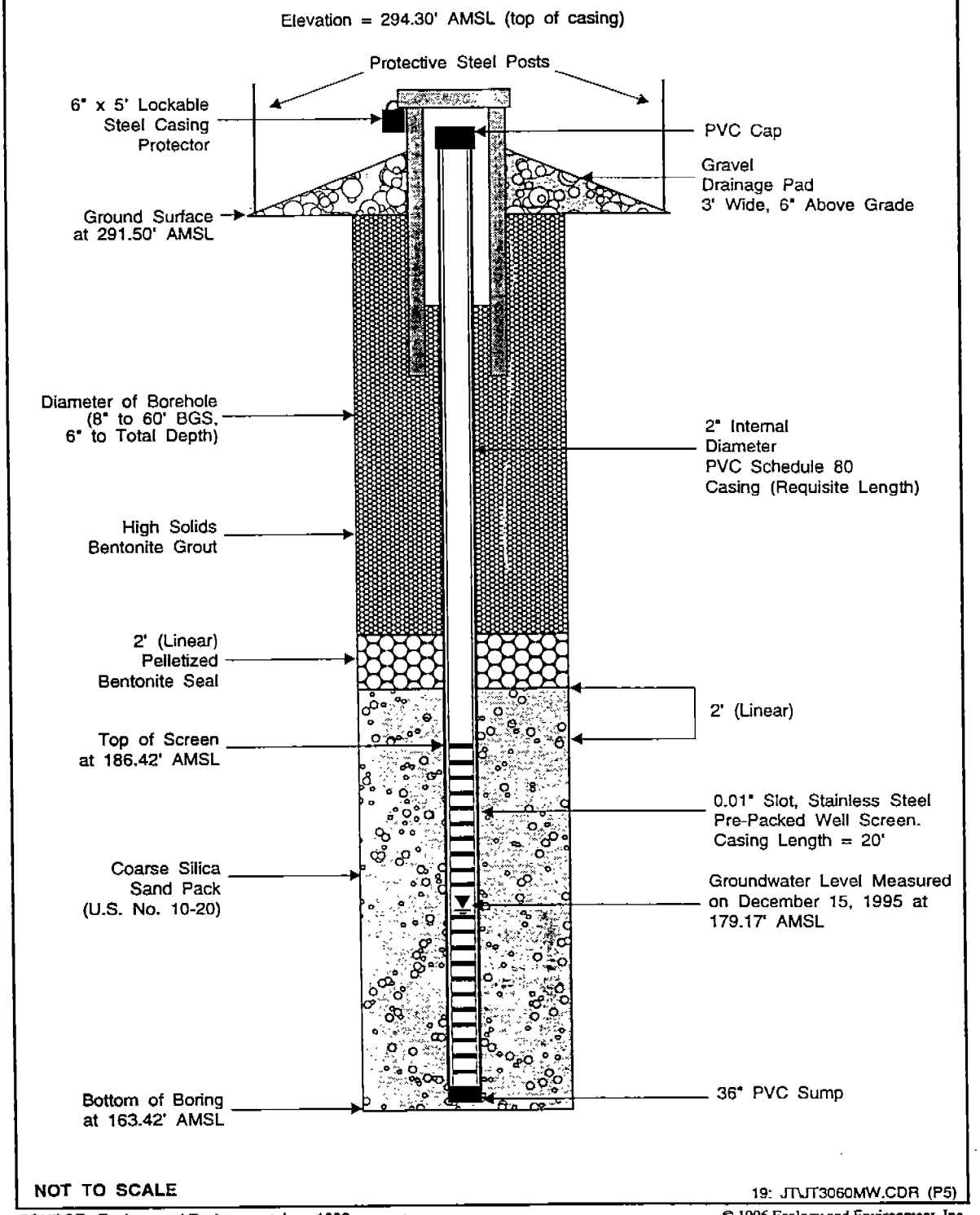
USCOR-6

HOLE NO. (field): MW-5 POLLOW HOLE NO. (permanent): AP-3652	PROJECT: OU-A Fort Richardson	SHEET # 5 of 5

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RE-COVERY	SOIL CLASS	DESCRIPTION AND REMARKS	PRO-JECT	FIELD	FID (ppm)
103								
190 104								
105								
106								
107								
108		10/14/19/8	75	GW	108.0'–110.0' Brownish gray, sandy GRAVEL, 60% gravel, 20% sand, 20% silt and clay, max.= 4 cm, moist, no hydrocarbon odor, no sheen.	3136SB		0
185 109								
110								
111								
112								
113								
180 114	▽							
115								
116								
117								
118								
175 119		8/9/14/27	100	SW	118.0'–120.0' Brownish gray, gravelly SAND, 45% sand, 40% gravel, 15% silt and clay, max.= 2 cm, satruated, no hydrocarbon odor, no sheen.	3137SB		0
120					Bottom of exploration at 120.0'. Monitoring well installed at 128.08' below ground surface.			
121								
122								
123								
170 124								
125								
126								
127								
128								
129								

USCOR-6

CORPS OF ENGINEERS U.S. ARMY



SOURCE: Ecology and Environment, Inc., 1996

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PETROLEUM, OIL, LUBRICANT LABORATORY DRY WELL SITE
AP-3652 MONITORING WELL CONSTRUCTION DIAGRAM

OUA 0021093

C

C Geotechnical Sample Results

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM ROAD
TROUTDALE, OREGON 97060-9508

REPLY TO
ATTENTION OF:

July 20, 1995

Bill Richards
Ecology and Environment, Inc.
840 K Street, Suite 100
Anchorage, Alaska 99501

Mr. Richards:

1. Enclosed is report of mechanical analysis for 12 soil samples submitted from the Ft. Richardson OUA-Roosevelt Road Transmitter Site project sampled by Ecology and Environment, Inc. Included are:

a) Enclosure 1, Summary of Water Content, Specific Gravity and Soil Classification.

b) Enclosures 2 through 13. Report of Particle Size Analysis and Classification Tests, one for each sample submitted.

2. Tests on all samples were performed by Advanced Soil Mechanics, Mt. Vernon, Washington.

3. This completes all physical analysis requested to date for this project.

Sincerely,

FOR: JAMES K. HINDS, PE
Deputy Director
North Pacific Division Laboratory

Enclosures

CENPD-ET-EN-L (95-271)

FT. RICHARDSON OUA - ROOSEVELT ROAD TRANSMITTER SITE
Ft. Richardson, Alaska

Summary of Water Content and Soil Classification

Sample Location	Sample No.	Depth, ft.	Water Content, %	Specific Gravity	Soil Classification ASTM D-2487	Frost Classification TM5-818-2
95-RRTSL	1006-SB	40.0	5.86	2.76	GW-GC	S1
95-RRTSL	1017-SB	20.0	5.17	2.68	GM	F1
95-RRTSL	1023-SB	5.0	4.71	2.64	GP-GM	S1
95-RRTSL	1034-SB	40.0	3.02	2.79	GW	S1
95-RRTSL	1040-SB	15.0-20.0	3.50	2.58	GW	PFS
95-RRTSL	1051-SB	15.0-20.0	3.19	2.62	GP-GC	S1
95-RRTSL	1060-SB	50.0	5.14	2.61	GC	S1
95-RRTSL	1098-SB	15.0-20.0	7.20	2.54	GP-GM	S1
95-RRTSL	1114-SB	50.0	4.19	2.74	GW	PFS
95-RRTSL	1116-SB	10.0	3.64	2.60	GP-GM	S1
95-RRTSL	1140-SB	--	9.50	2.79	SP-SM	S2
95-RRTSL	1145-SB	--	4.40	2.78	GW	PFS

North Pacific Division Laboratory no. 5256, samples received 15 Jun 95.

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FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: **95-RRTSL** Sample: **1006-SB** Depth: **40'** Lab No.: 27101

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	189.00	90.6
1 In.	579.00	71.3
3/4 In.	766.00	62.0
1/2 In.	919.00	54.4
3/8 In.	1093.00	45.7
No. 4	1346.00	33.2
No. 10	1566.00	22.2
Pan	2014.00	0.0
No. 16	24.70	17.7
No. 30	53.40	12.3
No. 50	73.20	8.7
No. 100	83.50	6.7
No. 200	89.40	5.6
Pan	119.80	0.0

---------- Hydrometer Analysis ----------

Sample Weight:119.8 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	26.0	0.0465	4.9
3	20.0	24.0	0.0272	4.5
10	20.0	22.0	0.0151	4.1
100	20.0	18.5	0.0063	3.5
200	20.0	16.5	0.0045	3.1

D85: 33.9 D60: 17.2 D50: 10.9 D30: 3.83 D15: 0.85 D10: 0.40 mm

Cu: 43.5 Cc: 2.16

Liquid Limit: 25.2 Plasticity Index: 10.9

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 66.8% Sand: 27.6% Fines: 5.6%

---------- ASTM D 2487 Classification ----------

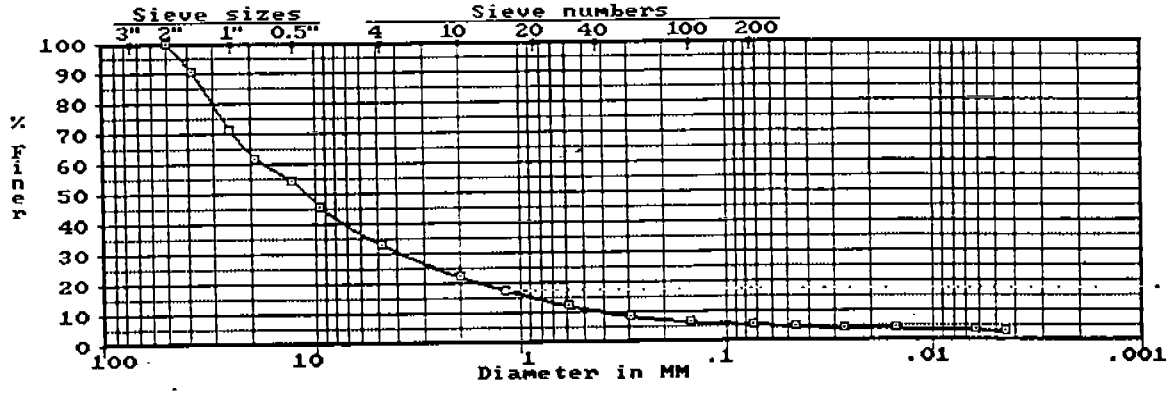
GW-GC Well-graded GRAVEL with clay and sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 4.3 Frost Classification: S1

---------- Comments ----------

- WATER CONTENT = 5.86%
- SPECIFIC GRAVITY = 2.76



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FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: **95-RRTSL** Sample: **1017-SB** Depth: **20'** Lab No.: 27102

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	246.00	86.2
1 In.	838.00	52.9
3/4 In.	986.00	44.6
1/2 In.	1055.00	40.7
3/8 In.	1138.00	36.1
No. 4	1295.00	27.2
No. 10	1372.00	22.9
Pan	1780.00	0.0
No. 16	9.80	21.0
No. 30	19.80	19.0
No. 50	27.70	17.5
No. 100	36.30	15.8
No. 200	50.30	13.1
Pan	116.90	0.0

---------- Hydrometer Analysis ----------

Sample Weight:116.9 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	40.0	0.0418	7.9
3	20.0	33.0	0.0255	6.5
10	20.0	28.0	0.0145	5.5
100	20.0	19.5	0.0063	3.9
200	20.0	16.5	0.0045	3.3

D85: 37.6 D60: 27.8 D50: 23.6 D30: 6.13 D15: 0.11 D10: .053 mm

Cu: 100+ Cc: 25.4

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 72.8% Sand: 14.1% Fines: 13.1%

---------- ASTM D 2487 Classification ----------

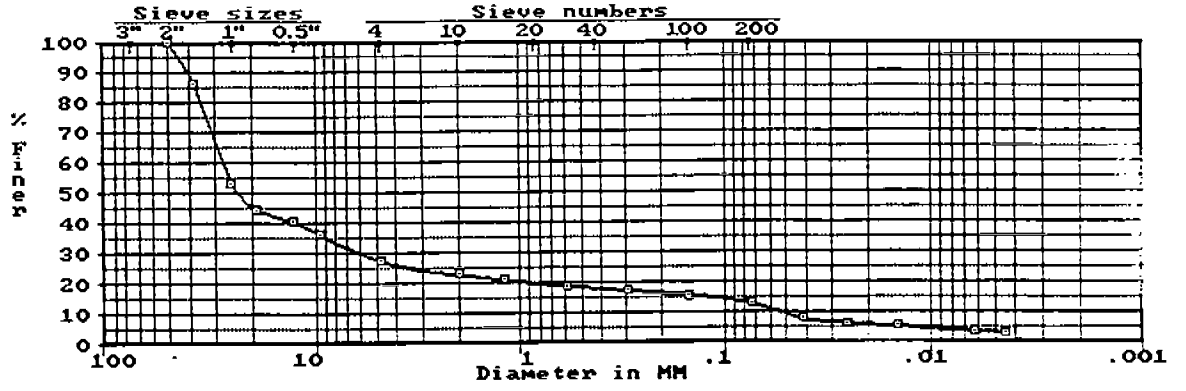
GM Silty GRAVEL

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 6.0 Frost Classification: **F1**

---------- Comments ----------

- WATER CONTENT = 5.17%
- SPECIFIC GRAVITY = 2.68



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FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: **95-RRTSL** Sample: **1023-SB** Depth: 5' Lab No.: 27103

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	130.00	92.7
1 In.	653.00	63.4
3/4 In.	804.00	54.9
1/2 In.	941.00	47.2
3/8 In.	1095.00	38.6
No. 4	1309.00	26.5
No. 10	1471.00	17.5
Pan	1782.00	0.0
No. 16	20.50	14.4
No. 30	42.20	11.2
No. 50	59.70	8.6
No. 100	71.70	6.9
No. 200	79.50	5.7
Pan	118.10	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 118.1 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	28.0	0.0459	4.2
3	20.0	25.0	0.0270	3.7
10	20.0	21.0	0.0152	3.1
100	20.0	15.5	0.0064	2.3
200	20.0	13.5	0.0046	2.0

D85: 34.2 D60: 23.2 D50: 14.7 D30: 6.13 D15: 1.33 D10: 0.44 mm

Cu: 52.7 Cc: 3.69

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 73.5% Sand: 20.8% Fines: 5.7%

---------- ASTM D 2487 Classification ----------

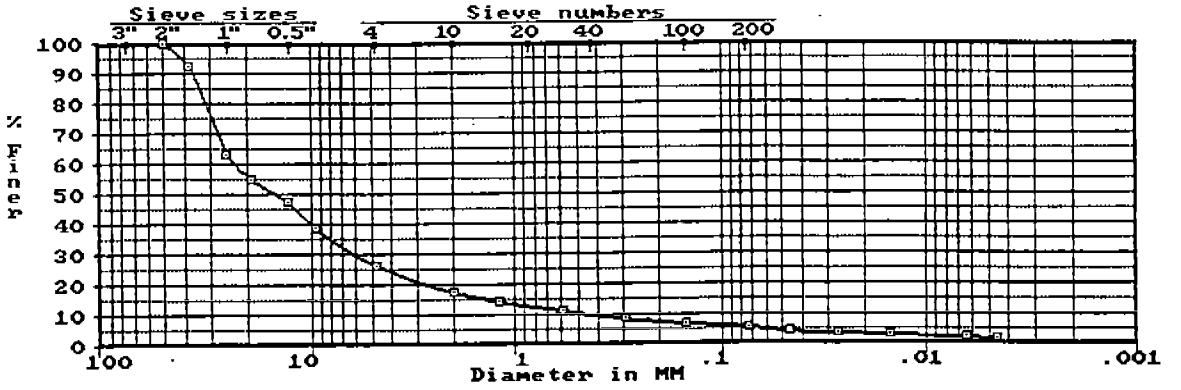
GP-GM Poorly graded GRAVEL with silt and sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 3.4 Frost Classification: **S1**

---------- Comments ----------

- WATER CONTENT = 4.71%
- SPECIFIC GRAVITY = 2.64



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FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: **95-RRTSL** Sample: **1034-SB** Depth: **40'** Lab No.: 27104

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	234.00	90.4
1 In.	736.00	70.0
3/4 In.	1023.00	58.2
1/2 In.	1280.00	47.8
3/8 In.	1410.00	42.4
No. 4	1674.00	31.7
No. 10	1951.00	20.4
Pan	2450.00	0.0
No. 16	29.70	16.5
No. 30	66.80	11.7
No. 50	98.90	7.5
No. 100	114.00	5.6
No. 200	121.80	4.5
Pan	156.80	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 156.8 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	28.0	0.0459	3.7
3	20.0	26.0	0.0268	3.4
10	20.0	24.0	0.0149	3.2
100	20.0	20.5	0.0062	2.7
200	20.0	18.5	0.0045	2.4

D85: 34.1 D60: 20.0 D50: 14.1 D30: 4.25 D15: 0.96 D10: 0.46 mm

Cu: 43.7 Cc: 1.97

Liquid Limit: 21.6 Plasticity Index: 8.8

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 68.3% Sand: 27.2% Fines: 4.5%

---------- ASTM D 2487 Classification ----------

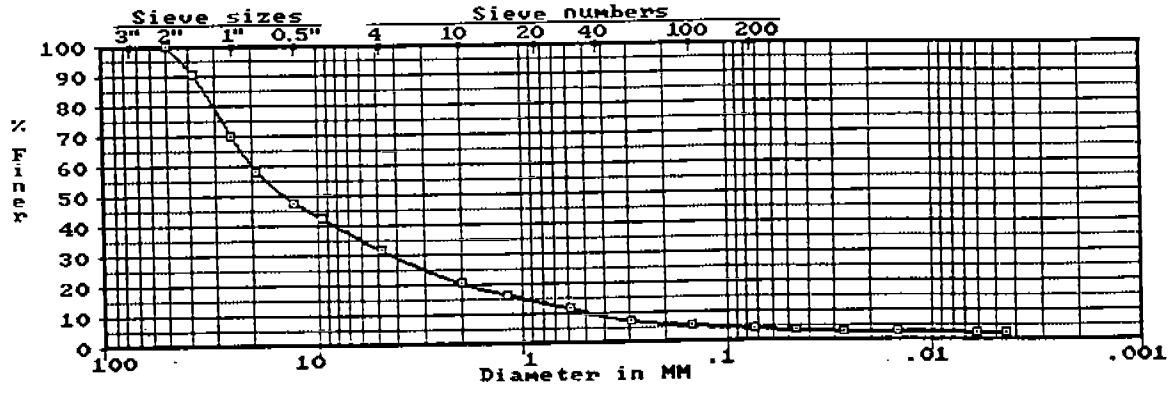
GW Well-graded GRAVEL with sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 3.3 Frost Classification: **S1**

---------- Comments ----------

- WATER CONTENT = 3.02%
- SPECIFIC GRAVITY = 2.73



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FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: **95-RRTSL** Sample: **1040-SB** Depth: **15-20'** Lab No.: 27105

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	257.00	82.0
1.5 In.	380.00	73.4
1 In.	688.00	51.9
3/4 In.	773.00	45.9
1/2 In.	853.00	40.3
3/8 In.	902.00	36.9
No. 4	1017.00	28.9
No. 10	1148.00	19.7
Pan	1430.00	0.0
No. 16	24.20	16.0
No. 30	52.90	11.6
No. 50	74.20	8.3
No. 100	89.40	6.0
No. 200	97.80	4.7
Pan	128.30	0.0

---------- Hydrometer Analysis ----------

Sample Weight:128.3 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	22.0	0.0477	3.4
3	20.0	20.0	0.0279	3.1
10	20.0	18.0	0.0155	2.8
100	20.0	14.5	0.0065	2.3
200	20.0	12.5	0.0046	2.0

D85: 54.3 D60: 29.7 D50: 23.7 D30: 5.24 D15: 1.02 D10: 0.43 mm

Cu: 68.5 Cc: 2.13

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 71.1% Sand: 24.2% Fines: 4.7%

---------- ASTM D 2487 Classification ----------

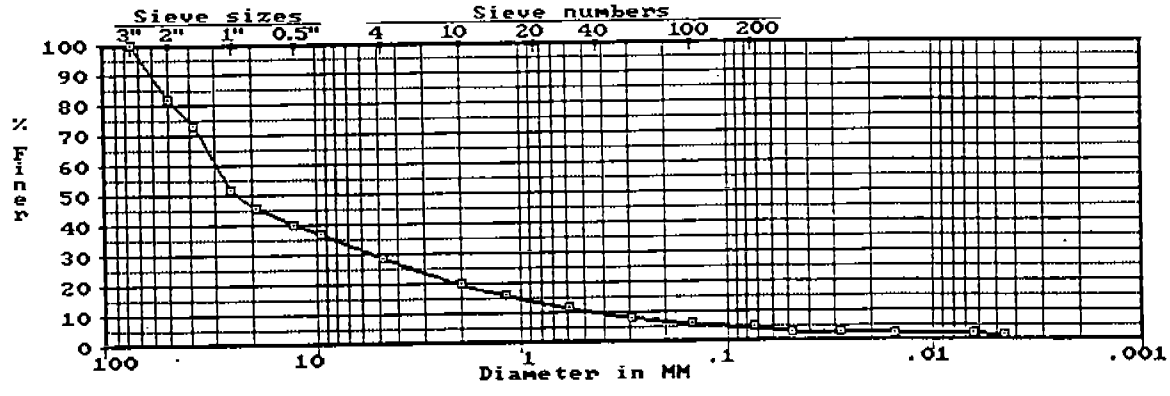
GW Well-graded GRAVEL with sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 2.9 Frost Classification: **PFS**

---------- Comments ----------

- WATER CONTENT = 3.50%
- SPECIFIC GRAVITY = 2.58



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FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: **95-RRTSL** Sample: **1051-SB** Depth: **15-20'** Lab No.: 27106

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	419.00	82.9
1.5 In.	606.00	75.2
1 In.	838.00	65.7
3/4 In.	1205.00	50.7
1/2 In.	1458.00	40.3
3/8 In.	1583.00	35.2
No. 4	1785.00	27.0
No. 10	1980.00	19.0
Pan	2444.00	0.0
No. 16	21.40	15.8
No. 30	49.90	11.6
No. 50	68.50	8.8
No. 100	79.40	7.2
No. 200	86.60	6.1
Pan	127.80	0.0

---------- Hydrometer Analysis ----------

Sample Weight:127.8 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	31.[illegible]	0.0442	4.9
3	20.0	30.0	0.0261	4.5
10	20.0	27.0	0.0171	4.0
100	20.0	23.5	0.0061	3.5
200	20.0	21.5	0.0044	3.2

D85: 53.4 D60: 22.8 D50: 18.7 D30: 6.36 D15: 1.04 D10: 0.41 mm

Cu: 55.0 Cc: 4.28

Liquid Limit: 23.5 Plasticity Index: 11.0

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 73.0% Sand: 20.9% Fines: 6.1%

---------- ASTM D 2487 Classification ----------

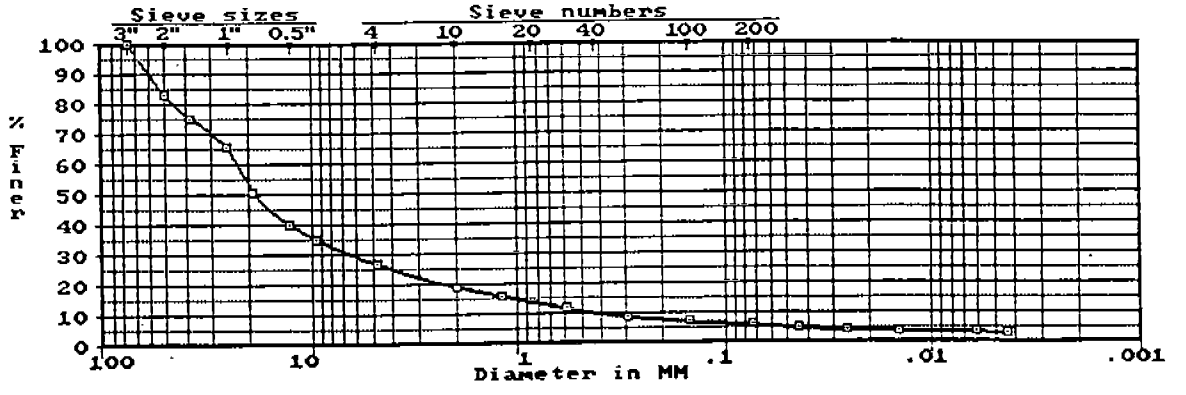
GP-GC Poorly graded GRAVEL with clay and sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 4.3 Frost Classification: **S1**

---------- Comments ----------

- WATER CONTENT = 3.19%
- SPECIFIC GRAVITY = 2.62



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: **95-RRTSL** Sample: **1060-SB** Depth: **50'** Lab No.: 27107

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	369.00	81.4
1 In.	616.00	69.0
3/4 In.	719.00	63.8
1/2 In.	828.00	58.3
3/8 In.	894.00	54.9
No. 4	1091.00	45.0
No. 10	1275.00	35.7
Pan	1984.00	0.0
No. 16	13.20	32.5
No. 30	32.40	27.8
No. 50	54.40	22.4
No. 100	71.50	18.2
No. 200	84.00	15.2
Pan	146.10	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 146.1 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	24.5	0.0470	6.1
3	20.0	19.5	0.0280	4.8
10	20.0	17.5	0.0155	4.4
100	20.0	14.0	0.0065	3.5
200	20.0	11.5	0.0046	2.9

D85: 40.3 D60: 14.6 D50: 6.74 D30: 0.81 D15: .073 D10: .057 mm

Cu: 100+ Cc: 0.78

Liquid Limit: 21.4 Plasticity Index: 8.3

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 55.0% Sand: 29.8% Fines: 15.2%

---------- ASTM D 2487 Classification ----------

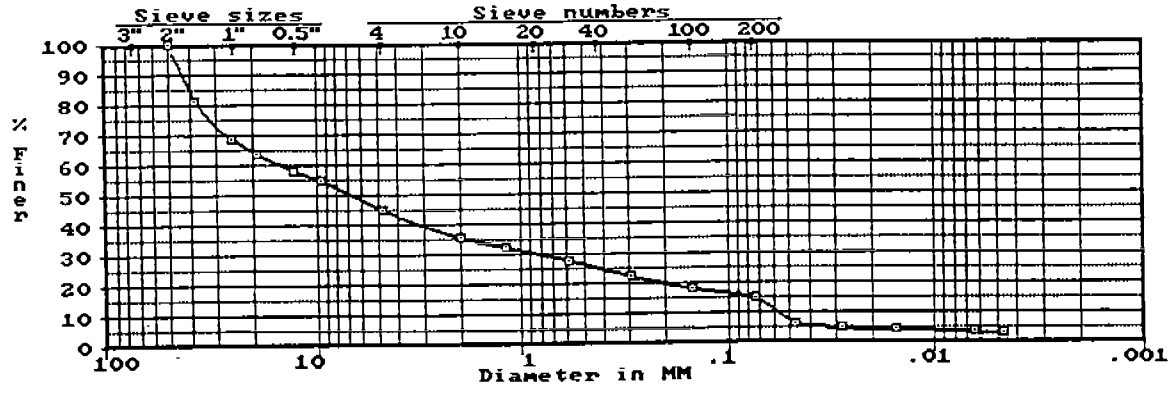
GC Clayey GRAVEL with sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 4.5 Frost Classification: **S1**

---------- Comments ----------

- WATER CONTENT = 5.14%
- SPECIFIC GRAVITY = 2.61



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FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: **95-RRTSL** Sample: **1098-SB** Depth: **15-20'** Lab No.: 27108

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	236.00	90.0
1.5 In.	236.00	90.0
1 In.	514.00	78.2
3/4 In.	810.00	65.7
1/2 In.	1063.00	55.0
3/8 In.	1219.00	48.4
No. 4	1484.00	37.2
No. 10	1713.00	27.5
Pan	2362.00	0.0
No. 16	20.70	23.5
No. 30	49.40	18.0
No. 50	74.70	13.1
No. 100	89.50	10.2
No. 200	98.50	8.5
Pan	142.60	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 142.6 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	31.0	0.0449	6.0
3	20.0	25.0	0.0270	4.9
10	20.0	21.0	0.0152	4.1
100	20.0	15.0	0.0064	3.0
200	20.0	13.0	0.0046	2.6

D85: 30.7 D60: 15.7 D50: 10.2 D30: 2.61 D15: 0.40 D10: 0.14 mm

Cu: 100+ Cc: 3.18

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 62.8% Sand: 28.7% Fines: 8.5%

---------- ASTM D 2487 Classification ----------

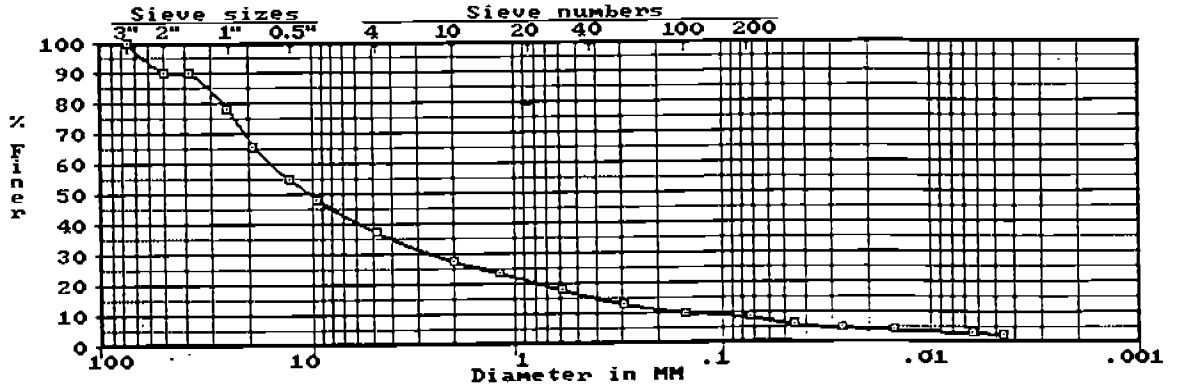
GP-GM Poorly graded GRAVEL with silt and sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 4.4 Frost Classification: **S1**

---------- Comments ----------

- WATER CONTENT = 7.20%
- SPECIFIC GRAVITY = 2.54



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: **95-RRTSL** Sample: **1114-SB** Depth: **50'** Lab No.: 27109

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	221.00	88.4
1 In.	418.00	78.1
3/4 In.	495.00	74.1
1/2 In.	664.00	65.2
3/8 In.	802.00	58.0
No. 4	1112.00	41.7
No. 10	1433.00	24.9
Pan	1908.00	0.0
No. 16	66.20	16.3
No. 30	120.70	9.3
No. 50	147.30	5.8
No. 100	158.30	4.4
No. 200	164.60	3.6
Pan	192.40	0.0

---------- Hydrometer Analysis ----------

Sample Weight:192.4 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	21.0	0.0480	2.8
3	20.0	19.0	0.0281	2.5
10	20.0	17.0	0.0156	2.2
100	20.0	16.0	0.0064	2.1
200	20.0	14.0	0.0046	1.9

D85: 34.1 D60: 10.3 D50: 6.84 D30: 2.66 D15: 1.06 D10: 0.65 mm

Cu: 15.9 Cc: 1.06

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 58.3% Sand: 38.1% Fines: 3.6%

---------- ASTM D 2487 Classification ----------

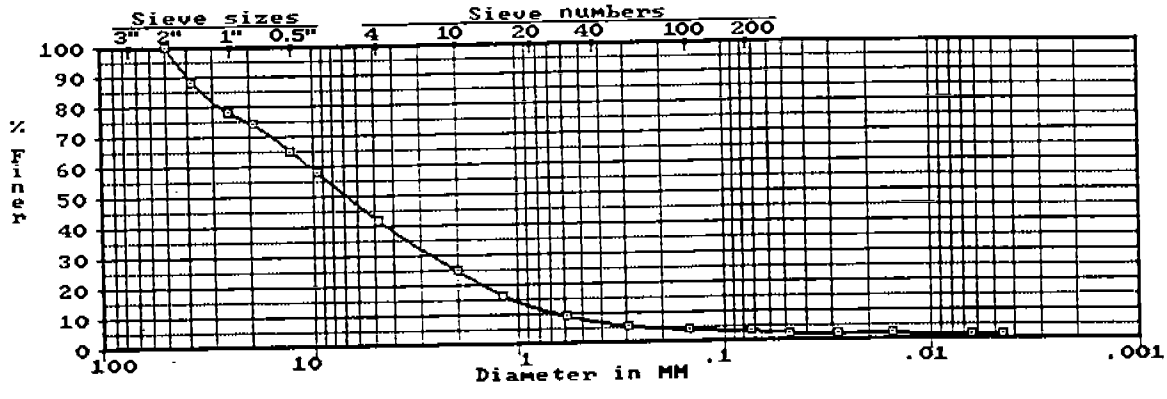
GW Well-graded GRAVEL with sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 2.3 Frost Classification: **PFS**

---------- Comments ----------

- WATER CONTENT = 4.19%
- SPECIFIC GRAVITY = 2.74



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT RICH OUA ROOSEVELT ROAD XMITTER 95-271

Boring: 95-RRTSL Sample: 1116-SB Depth: 10' Lab No.: 27110

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	132.00	94.7
3/4 In.	436.00	82.4
1/2 In.	839.00	66.1
3/8 In.	1166.00	52.8
No. 4	1624.00	34.3
No. 10	1882.00	23.9
Pan	2472.00	0.0
No. 16	11.50	21.5
No. 30	27.50	18.3
No. 50	45.80	14.6
No. 100	60.00	11.7
No. 200	69.80	9.7
Pan	117.80	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 117.8 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	31.0	0.0449	6.3
3	20.0	26.0	0.0268	5.3
10	20.0	21.0	0.0152	4.3
100	20.0	17.0	0.0064	3.5
200	20.0	13.0	0.0046	2.7

D85: 20.2 D60: 11.1 D50: 8.78 D30: 3.67 D15: 0.32 D10: .080 mm

Cu: 100+ Cc: 15.0

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 65.7% Sand: 24.6% Fines: 9.7%

---------- ASTM D 2487 Classification ----------

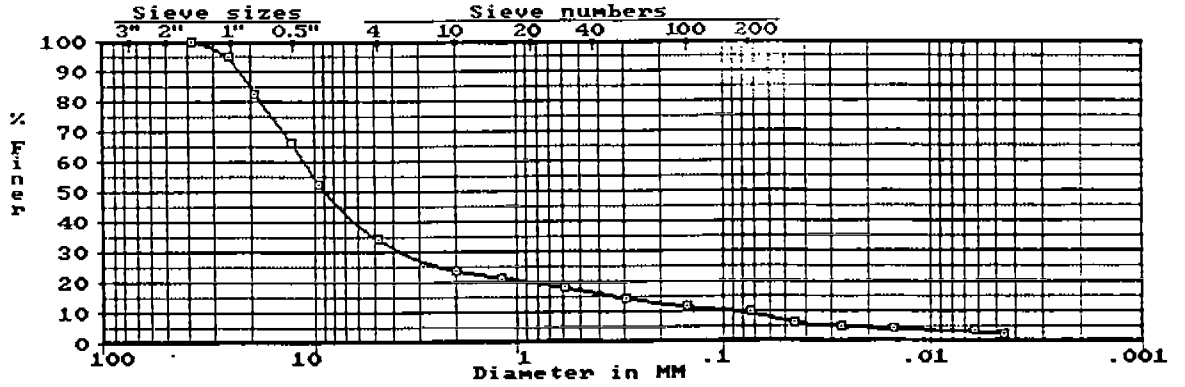
GP-GM Poorly graded GRAVEL with silt and sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 4.8 Frost Classification: **S1**

---------- Comments ----------

- WATER CONTENT = 3.64%
- SPECIFIC GRAVITY = 2.60



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUD-TRANSMITTER SITE 95-271

Boring: **95 RRTSL** Sample: **1140 SB** Depth: ? Lab No.: 27111

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	0.00	100.0
3/4 In.	116.00	91.4
1/2 In.	232.00	82.8
3/8 In.	316.00	76.6
No. 4	528.00	60.9
No. 10	758.00	43.9
Pan	1352.00	0.0
No. 16	27.30	35.5
No. 30	64.50	24.0
No. 50	102.00	12.4
No. 100	114.50	8.6
No. 200	118.60	7.3
Pan	142.30	0.0

---------- Hydrometer Analysis ----------

Sample Weight: 142.3 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	21.0	0.0480	6.6
3	20.0	19.0	0.0281	6.0
10	20.0	17.0	0.0156	5.3
100	20.0	15.0	0.0064	4.7
200	20.0	14.0	0.0046	4.4

D85: 14.2 D60: 4.57 D50: 2.79 D30: 0.84 D15: 0.35 D10: 0.22 mm

Cu: 21.1 Cc: 0.72

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 39.1% Sand: 53.6% Fines: 7.3%

---------- ASTM D 2487 Classification ----------

SP-SM Poorly graded SAND with silt and gravel

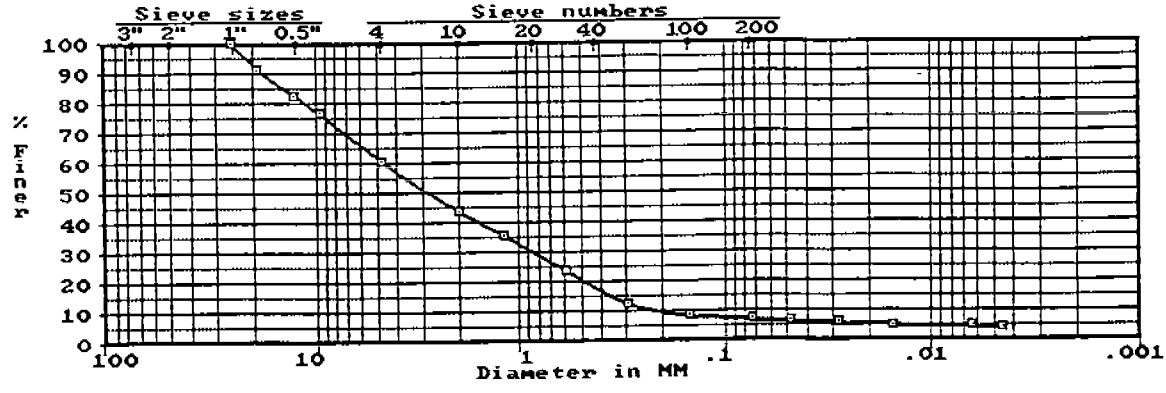
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 5.6 Frost Classification: **S2**

---------- Comments ----------

WATER CONTENT: 9.5%

SPECIFIC GRAVITY: 2.79



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUD-TRANSMITTER SITE 95-271

Boring: 95 RRTSL Sample: 1145 SB Depth: ? Lab No.: 27112

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	644.00	68.2
1 In.	826.00	59.2
3/4 In.	952.00	53.0
1/2 In.	1144.00	43.5
3/8 In.	1306.00	35.5
No. 4	1492.00	26.4
No. 10	1682.00	17.0
Pan	2026.00	0.0
No. 16	18.00	14.0
No. 30	43.50	9.9
No. 50	64.00	6.6
No. 100	75.70	4.6
No. 200	81.30	3.7
Pan	104.20	0.0

---------- Hydrometer Analysis ----------

Sample Weight:104.2 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	17.0	0.0493	2.8
3	20.0	15.0	0.0288	2.5
10	20.0	12.0	0.0160	2.0
100	20.0	9.0	0.0067	1.5
200	20.0	8.0	0.0047	4

D85: 44.6 D60: 26.3 D50: 16.7 D30: 6.73 D15: 1.44 D10: 0.60 mm

Cu: 43.9 Cc: 2.87

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 73.6% Sand: 22.7% Fines: 3.7%

---------- ASTM D 2487 Classification ----------

GW Well-graded GRAVEL with sand

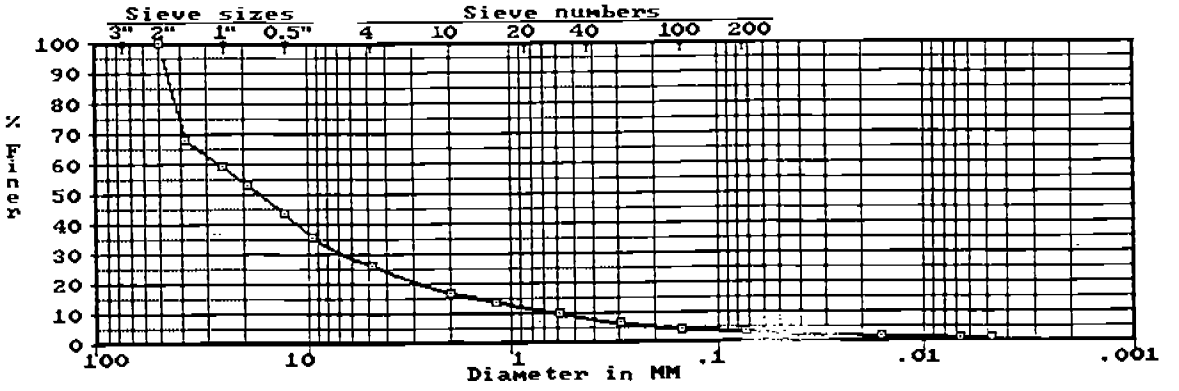
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 2.2 Frost Classification: PFS

---------- Comments ----------

WATER CONTENT: 4.4%

SPECIFIC GRAVITY: 2.78



DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM ROAD
TROUTDALE, OREGON 97060-9508

REPLY TO
ATTENTION OF:

8-Aug-95

Ecology and Environment, Inc.
ATTN: Stewart Richards
840 K Street, Suite 100
Anchorage, Alaska 99501

Mr. Richards:

1. Enclosed is report of mechanical analysis for 16 soil samples submitted from the Ft. Richardson-Ruff Road Fire Training Area project sampled by Ecology and Environment, Inc. from 23 June through 11 July, 1995 Included are:

a) Enclosure 1, Summary of Water Content, Specific Gravity and Soil Classification.

b) Enclosures 2 through 17, Report of Particle Size Analysis and Classification Tests, one for each sample submitted.

2. Tests on all samples were performed by Advanced Soil Mechanics, Mt. Vernon, Washington.

3. This completes all physical analysis requested to date for this project.

Sincerely,

Enclosures

JAMES K. HINDS, PE
Deputy Director
North Pacific Division Laboratory

CENPD-ET-P-L (95-272)

FT. RICHARDSON - RUFF ROAD FIRE TRAINING AREA
Ft. Richardson, Alaska

Summary of Water Content, Specific Gravity and Soil Classification

Sample Id.		Water	Specific	Soil Classification	Frost Classification
Location	Number	Content, %	Gravity	ASTM D 2487	TM 5-818
95-RRFTA	2008-SS	4.7	2.64	SM	F2
95-RRFTA	2034-SB	6.4	2.65	GW-GC	F1
95-RRFTA	2043-SB	6.6	2.55	GP-GC	F1
95-RRFTA	2048-SB	3.6	2.59	SC-SM	F2
95-RRFTA	2055-SB	23.4	2.61	CL	F4
95-RRFTA	2079-SB	5.5	2.38	GP-GC	F1
95-RRFTA	2085-SB	5.3	2.77	GW-GC	S1
95-RRFTA	2104-SB	6.4	2.54	SC	F2
95-RRFTA	2110-SB	7.1	2.78	SW-SC	S2
95-RRFTA	2114-SB	6.4	2.50	SW-SC	F2
95-RRFTA	2122-SB	6.5	2.57	SC	F2
95-RRFTA	2138-SB	4.5	2.71	GW-GM	S1
95-RRFTA	2152-SB	3.6	2.64	GW-GM	S1
95-RRFTA	2153-SB	22.5	2.74	SM	F4
95-RRFTA	2159-SB	4.6	2.72	GP-GC	F1
95-RRFTA	2166-SB	4.5	2.69	GP-GM	S1

CENPD laboratory numbers 5268, 5274, 5275 and 5280, samples received 28 June - 20 July, 1995.

* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: **95-RRFTA** Sample: **2008-SS** Depth: -- Lab No.: 27216

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	146.00	90.3
3/4 In.	162.00	89.2
1/2 In.	222.00	85.2
3/8 In.	312.00	79.2
No. 4	430.00	71.4
No. 10	540.00	64.0
Pan	1502.00	0.0
No. 16	7.70	59.8
No. 30	16.40	55.0
No. 50	24.30	50.7
No. 100	33.70	45.5
No. 200	42.30	40.8
Pan	116.30	0.0

---------- Hydrometer Analysis ----------

Sample Weight:116.3 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	28.0	0.0459	15.5
3	20.0	24.0	0.0272	13.4
10	20.0	19.0	0.0154	10.6
100	20.0	13.0	0.0065	7.4
200	20.0	10.0	0.0047	5.7

D85: 12.6 D60: 1.21 D50: 0.27 D30: .061 D15: .040 D10: .013 mm

Cu: 93.0 Cc: 0.23

Liquid Limit: 23.0 Plasticity Index: 2.3

Fines Type Used for Classification: ML, SILT

Gravel: 28.6% Sand: 30.6% Fines: 40.8%

---------- ASTM D 2487 Classification ----------

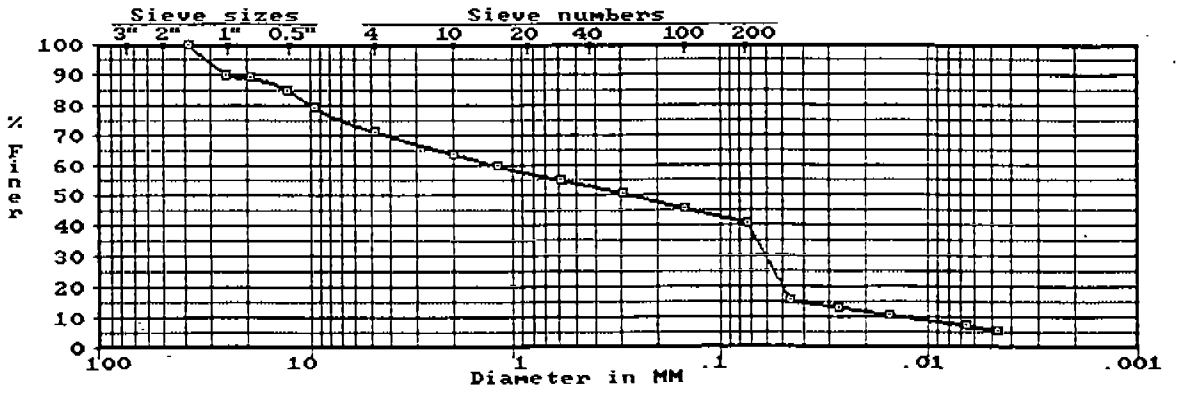
SM Silty SAND with gravel

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 11.9 Frost Classification: **F2**

---------- Comments ----------

- WATER CONTENT = 4.7%
- SPECIFIC GRAVITY = 2.64



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: 95 RRFTA Sample: 2034 - SB Depth: 50' Lab No.: 27201

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	86.00	95.1
1 In.	290.00	83.4
3/4 In.	430.00	75.4
1/2 In.	586.00	66.5
3/8 In.	760.00	56.5
No. 4	990.00	43.4
No. 10	1198.00	31.5
Pan	1749.00	0.0
No. 16	31.20	24.6
No. 30	62.00	17.8
No. 50	89.80	11.7
No. 100	101.50	9.1
No. 200	106.60	7.9
Pan	142.50	0.0

Hydrometer Analysis

Sample Weight: 142.5 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	33.0	0.0442	[illegible]
3	20.0	30.0	0.0261	[illegible]
10	20.0	28.0	0.0145	
100	20.0	24.0	0.0061	
200	20.0	22.0	0.0044	

D85: 26.7 D60: 10.5 D50: 7.15 D30: 1.79 D15: 0.44 D10: 0.21 mm

Cu: 51.2 Cc: 1.49

Liquid Limit: 22.4 Plasticity Index: 10.4

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 56.6% Sand: 35.5% Fines: 7.9%

ASTM D 2487 Classification

GW-GC Well-graded GRAVEL with clay and sand

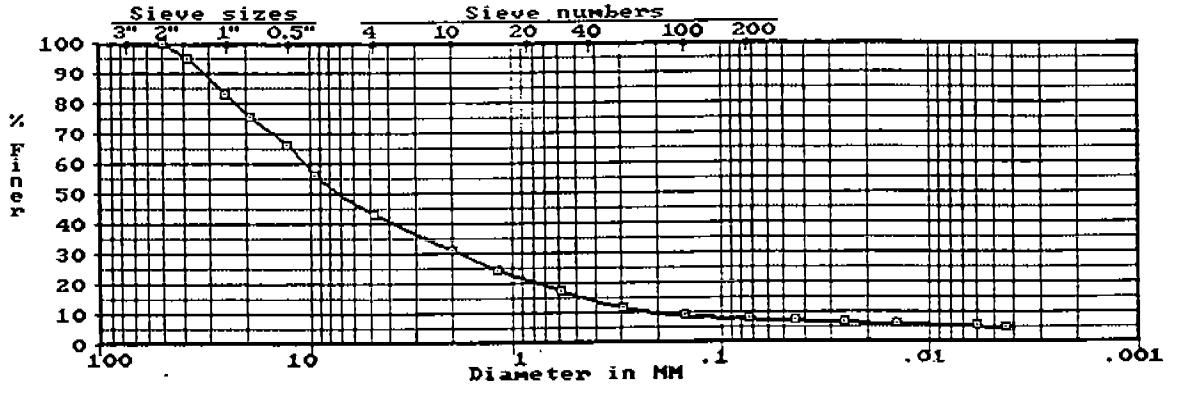
TM 5-818-2 Frost Classification

Percent finer than 0.02 mm: 6.5 Frost Classification: F1

Comments

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.65



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: 95 RRFTA Sample: 2043 - SB Depth: 50' Lab No.: 27202

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	412.00	71.8
1 In.	488.00	66.6
3/4 In.	508.00	65.2
1/2 In.	540.00	63.0
3/8 In.	596.00	59.2
No. 4	770.00	47.2
No. 10	952.00	34.7
Pan	1459.00	0.0
No. 16	17.60	27.8
No. 30	32.40	21.9
No. 50	44.10	17.3
No. 100	52.30	14.1
No. 200	57.70	11.9
Pan	87.80	0.0

---------- Hydrometer Analysis ----------

Sample Weight:87.8 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	26.0	0.0465	10.4
3	20.0	23.0	0.0274	9.2
10	20.0	21.0	0.0152	8.4
100	20.0	17.0	0.0064	6.9
200	20.0	15.0	0.0046	6.1

D85: 43.9 D60: 10.0 D50: 5.56 D30: 1.41 D15: 0.19 D10: .040 mm

Cu: 100+ Cc: 4.99

Liquid Limit: 22.3 Plasticity Index: 9.6

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 52.8% Sand: 35.3% Fines: 11.9%

---------- ASTM D 2487 Classification ----------

GP-GC Poorly graded GRAVEL with clay and sand

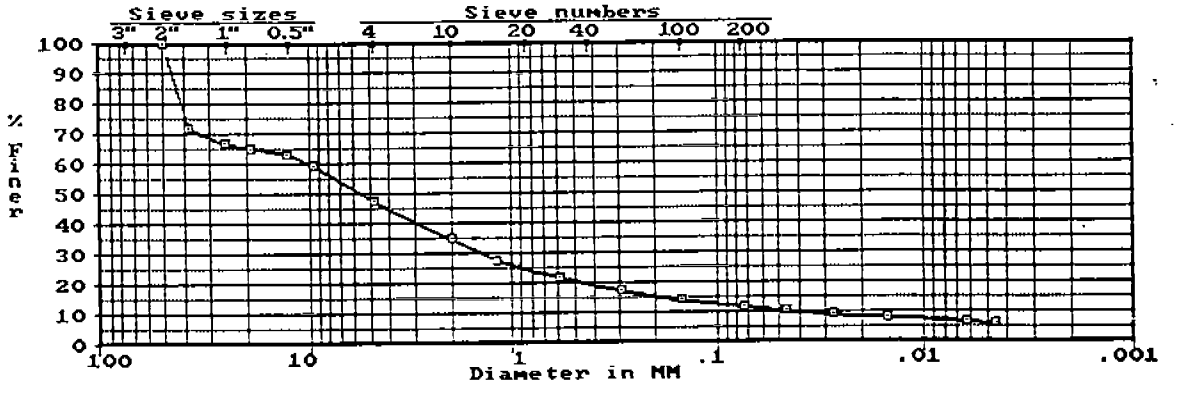
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 8.7 Frost Classification: **F1**

---------- Comments ----------

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.55



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: 95 RRFTA Sample: 2048 - SB Depth: Lab No.: 27203

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	0.00	100.0
3/4 In.	6.00	99.7
1/2 In.	98.00	95.0
3/8 In.	208.00	89.4
No. 4	450.00	77.1
No. 10	800.00	59.3
Pan	1967.00	0.0
No. 16	40.00	42.5
No. 30	73.90	28.3
No. 50	89.10	21.9
No. 100	96.10	18.9
No. 200	101.10	16.8
Pan	141.10	0.0

Hydrometer Analysis

Sample Weight: 141.1 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	[illegible]	0.0442	13.9
3	20.0	30.0	0.0261	12.7
10	20.0	27.0	0.0146	11.4
100	20.0	21.0	0.0062	8.9
200	20.0	19.0	0.0044	8.1

D85: 7.41 D60: 2.06 D50: 1.50 D30: 0.66 D15: .054 D10: .0090 mm

Cu: 100+ Cc: 23.4

Liquid Limit: 20.1 Plasticity Index: 5.6

Fines Type Used for Classification: CL-ML, Silty CLAY

Gravel: 22.9% Sand: 60.3% Fines: 16.8%

ASTM D 2487 Classification

SC-SM Silty, clayey SAND with gravel

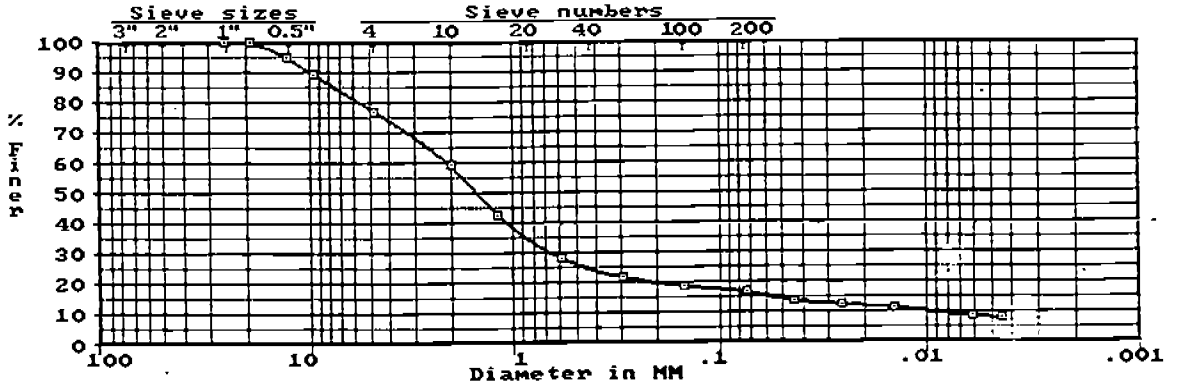
TM 5-818-2 Frost Classification

Percent finer than 0.02 mm: 12.1 Frost Classification: **F2**

Comments

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.59



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: **95 RRFTA** Sample: **2055 - SB** Depth: Lab No.: **27204**

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	0.00	100.0
3/4 In.	0.00	100.0
1/2 In.	24.00	97.9
3/8 In.	52.00	95.5
No. 4	110.00	90.4
No. 10	296.00	74.2
Pan	1146.00	0.0
No. 16	3.00	71.5
No. 30	6.80	68.1
No. 50	10.90	64.4
No. 100	15.80	60.0
No. 200	20.20	56.1
Pan	82.70	0.0

---------- Hydrometer Analysis ----------

Sample Weight:82.7 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	50.0	0.0382	44.8
3	20.0	45.0	0.0231	40.4
10	20.0	40.0	0.0132	36.0
100	20.0	30.0	0.0058	27.1
200	20.0	26.0	0.0042	23.5

D85: 3.60 D60: 0.15 D50: .052 D30: .0075 mm

Liquid Limit: 29.0 Plasticity Index: 7.7

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 9.6% Sand: 34.3% Fines: 56.1%

---------- ASTM D 2487 Classification ----------

CL Sandy Lean CLAY

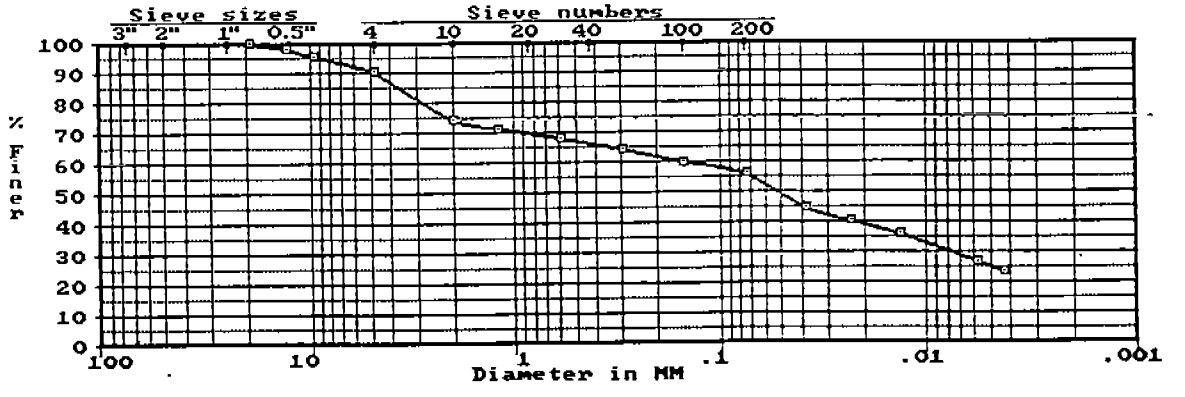
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 39.3 Frost Classification: **F4**

---------- Comments ----------

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.61



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: 95 RRFTA Sample: 2079 - SB Depth: Lab No.: 27205

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	376.00	80.5
1 In.	620.00	67.9
3/4 In.	748.00	61.2
1/2 In.	912.00	52.7
3/8 In.	990.00	48.7
No. 4	1182.00	38.8
No. 10	1360.00	29.5
Pan	1930.00	0.0
No. 16	30.40	24.3
No. 30	61.30	18.9
No. 50	83.50	15.1
No. 100	98.60	12.4
No. 200	108.80	10.7
Pan	170.40	0.0

---------- Hydrometer Analysis ----------

Sample Weight:170.4 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	48.0	0.0389	8.3
3	20.0	42.0	0.0237	7.3
10	20.0	37.0	0.0136	6.4
100	20.0	30.0	0.0058	5.2
200	20.0	27.0	0.0042	4.7

D85: 40.8 D60: 18.1 D50: 10.5 D30: 2.11 D15: 0.29 D10: .062 mm

Cu: 100+ Cc: 3.97

Liquid Limit: 21.4 Plasticity Index: 7.4

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 61.2% Sand: 28.1% Fines: 10.7%

---------- ASTM D 2487 Classification ----------

GP-GC Poorly graded GRAVEL with clay and sand

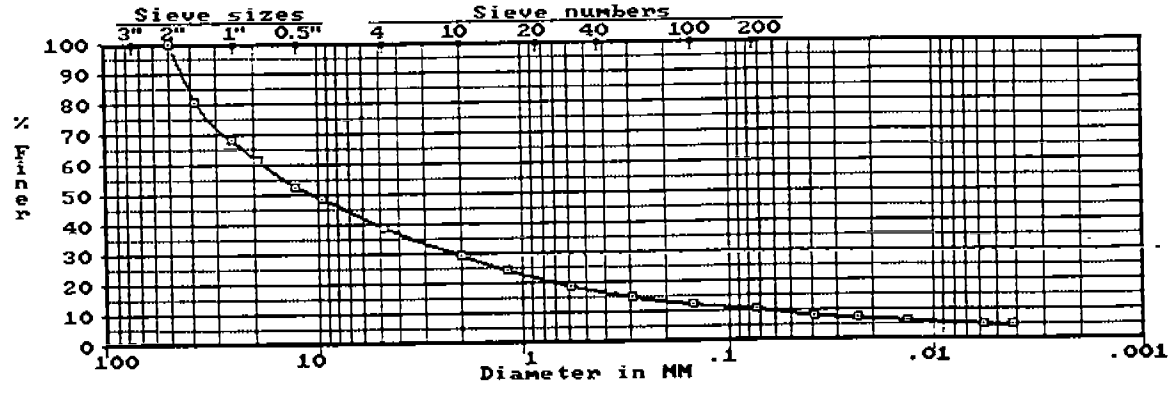
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 7.0 Frost Classification: F1

---------- Comments ----------

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.38



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: 95 RRFTA Sample: 2085 - SB Depth: Lab No.: 27206

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	410.00	76.0
1 In.	682.00	60.1
3/4 In.	788.00	53.9
1/2 In.	934.00	45.4
3/8 In.	986.00	42.3
No. 4	1118.00	34.6
No. 10	1274.00	25.5
Pan	1710.00	0.0
No. 16	18.80	21.3
No. 30	46.00	15.1
No. 50	64.50	10.9
No. 100	74.20	8.7
No. 200	79.50	7.5
Pan	112.90	0.0

---------- Hydrometer Analysis ----------

Sample Weight:112.9 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	26.0	0.0465	5.9
3	20.0	24.0	0.0272	5.5
10	20.0	22.0	0.0151	5.0
100	20.0	18.0	0.0063	4.1
200	20.0	16.0	0.0045	3.7

D85: 42.5 D60: 25.3 D50: 16.1 D30: 3.13 D15: 0.58 D10: 0.24 mm

Cu: 100+ Cc: 1.64

Liquid Limit: 22.0 Plasticity Index: 6.9

Fines Type Used for Classification: CL-ML, Silty CLAY

Gravel: 65.4% Sand: 27.1% Fines: 7.5%

---------- ASTM D 2487 Classification ----------

GW-GC Well-graded GRAVEL with silty clay and sand

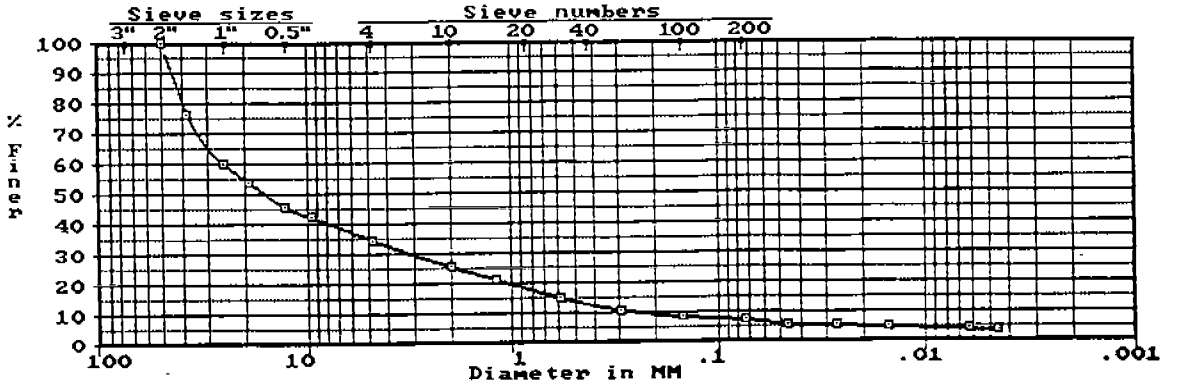
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 5.2 Frost Classification: Sl

---------- Comments ----------

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.77



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: 95 RRFTA Sample: 2104 - SB Depth: Lab No.: 27207

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	164.00	86.6
1 In.	164.00	86.6
3/4 In.	214.00	82.6
1/2 In.	296.00	75.9
3/8 In.	334.00	72.8
No. 4	472.00	61.6
No. 10	668.00	45.6
Pan	1228.00	0.0
No. 16	19.80	39.6
No. 30	46.30	31.5
No. 50	72.70	23.5
No. 100	88.40	18.7
No. 200	97.50	15.9
Pan	149.90	0.0

---------- Hydrometer Analysis ----------

Sample Weight:149.9 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	44.0	0.0404	13.4
3	20.0	38.0	0.0246	11.6
10	20.0	34.0	0.0139	10.4
100	20.0	28.0	0.0059	8.6
200	20.0	26.0	0.0042	7.9

D85: 22.3 D60: 4.39 D50: 2.58 D30: 0.52 D15: .060 D10: .012 mm

Cu: 100+ Cc: 5.40

Liquid Limit: 22.6 Plasticity Index: 9.4

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 38.4% Sand: 45.7% Fines: 15.9%

---------- ASTM D 2487 Classification ----------

SC Clayey SAND with gravel

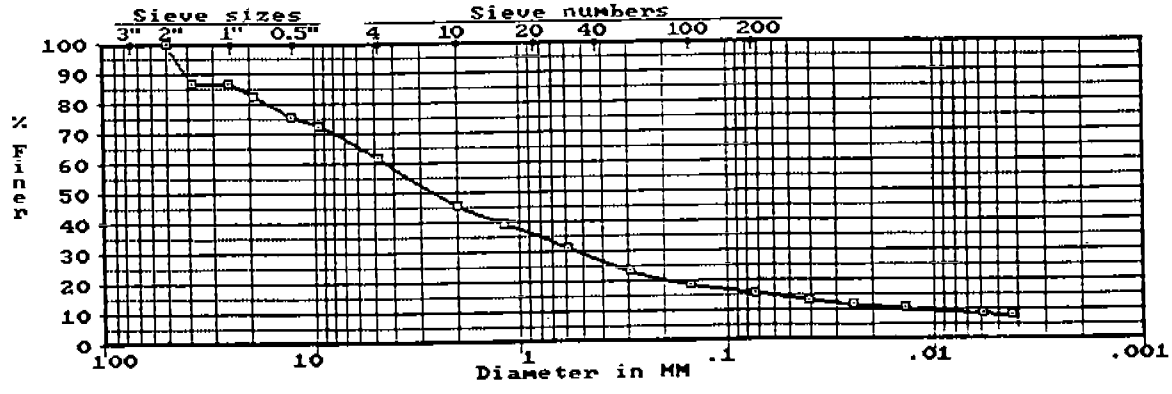
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 11.1 Frost Classification: **F2**

---------- Comments ----------

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.54



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: 95 **RRFTA** Sample: **2110 - SB** Depth: Lab No.: 27208

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	0.00	100.0
3/4 In.	86.00	94.8
1/2 In.	226.00	86.5
3/8 In.	338.00	79.7
No. 4	644.00	61.4
No. 10	1036.00	37.9
Pan	1668.00	0.0
No. 16	40.00	26.5
No. 30	75.80	16.3
No. 50	94.80	10.9
No. 100	102.60	8.7
No. 200	107.10	7.4
Pan	133.00	0.0

---------- Hydrometer Analysis ----------

Sample Weight:133.0 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	20.0	0.0484	5.8
3	20.0	19.0	0.0281	5.5
10	20.0	18.0	0.0155	5.2
100	20.0	15.0	0.0064	4.4
200	20.0	14.0	0.0046	4.1

D85: 11.9 D60: 4.53 D50: 3.16 D30: 1.41 D15: 0.52 D10: 0.24 mm

Cu: 18.9 Cc: 1.82

Liquid Limit: 20.7 Plasticity Index: 9.4

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 38.6% Sand: 54.0% Fines: 7.4%

---------- ASTM D 2487 Classification ----------

SW-SC Well-graded SAND with clay and gravel

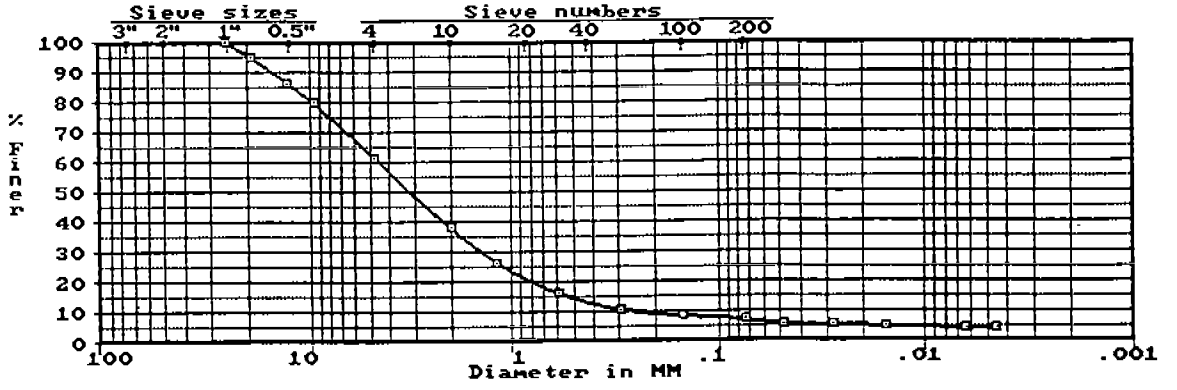
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 5.3 Frost Classification: S2

---------- Comments ----------

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.78



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: 95 RRFTA Sample: 2114 - SB Depth: Lab No.: 27209

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	164.00	91.3
3/4 In.	256.00	86.4
1/2 In.	312.00	83.5
3/8 In.	398.00	78.9
No. 4	662.00	64.9
No. 10	994.00	47.3
Pan	1886.00	0.0
No. 16	41.30	36.7
No. 30	92.40	23.5
No. 50	132.00	13.3
No. 100	144.00	10.2
No. 200	149.20	8.9
Pan	183.80	0.0

---------- Hydrometer Analysis ----------

Sample Weight:183.8 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	28.0	0.0459	7.1
3	20.0	26.0	0.0268	6.6
10	20.0	24.0	0.0149	6.2
100	20.0	20.0	0.0062	5.2
200	20.0	19.0	0.0044	5.0

D85: 15.8 D60: 3.74 D50: 2.29 D30: 0.84 D15: 0.34 D10: 0.14 mm

Cu: 27.7 Cc: 1.40

Liquid Limit: 20.8 Plasticity Index: 9.0

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 35.1% Sand: 56.0% Fines: 8.9%

---------- ASTM D 2487 Classification ----------

SW-SC Well-graded SAND with clay and gravel

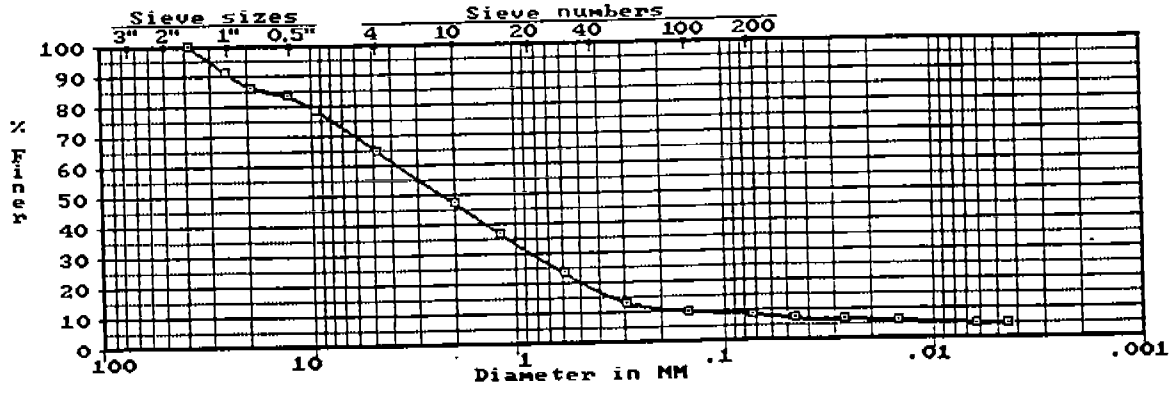
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 6.5 Frost Classification: F2

---------- Comments ----------

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.50



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FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: 95 RRFTA Sample: 2122 - SB Depth: Lab No.: 27210

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	0.00	100.0
3/4 In.	40.00	97.5
1/2 In.	130.00	91.8
3/8 In.	226.00	85.7
No. 4	488.00	69.2
No. 10	792.00	49.9
Pan	1582.00	0.0
No. 16	26.10	40.0
No. 30	55.30	28.9
No. 50	82.00	18.8
No. 100	93.20	14.5
No. 200	98.30	12.6
Pan	131.50	0.0

---------- Hydrometer Analysis ----------

Sample Weight:131.5 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	28.0	0.0459	10.7
3	20.0	26.0	0.0268	10.0
10	20.0	24.0	0.0149	9.2
100	20.0	20.0	0.0062	7.7
200	20.0	19.0	0.0044	7.3

D85: 9.22 D60: 3.20 D50: 2.01 D30: 0.63 D15: 0.17 D10: .027 mm

Cu: 100+ Cc: 4.70

Liquid Limit: 23.9 Plasticity Index: 11.0

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 30.8% Sand: 56.6% Fines: 12.6%

---------- ASTM D 2487 Classification ----------

SC Clayey SAND with gravel

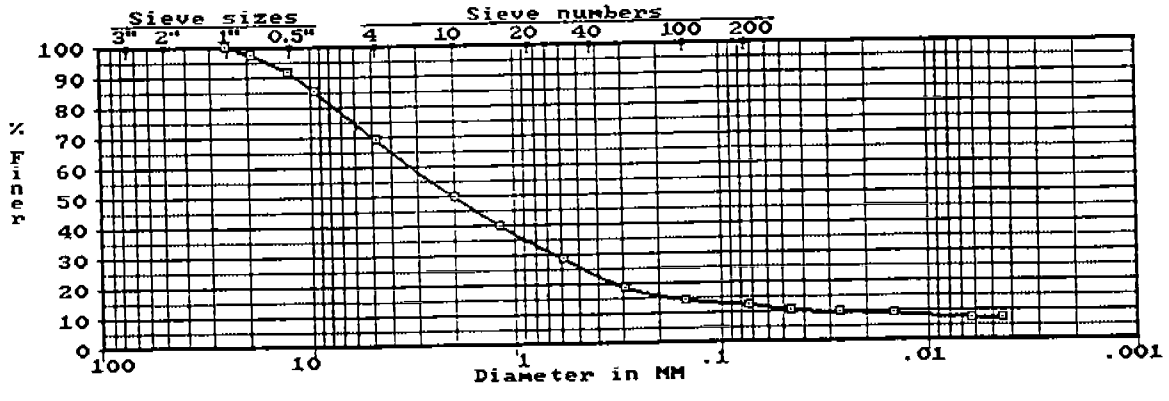
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 9.6 Frost Classification: F2

---------- Comments ----------

RUFF ROAD FIRE TRAINING AREA PROJECT

SPECIFIC GRAVITY: 2.57



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FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: **95-RRFTA** Sample: **2138-SB** Depth: -- Lab No.: 27211

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	324.00	82.0
3/4 In.	450.00	75.1
1/2 In.	610.00	66.2
3/8 In.	736.00	59.2
No. 4	980.00	45.7
No. 10	1222.00	32.3
Pan	1804.00	0.0
No. 16	33.90	23.2
No. 30	65.40	14.9
No. 50	82.60	10.3
No. 100	89.50	8.4
No. 200	93.30	7.4
Pan	121.20	0.0

---------- Hydrometer Analysis ----------

Sample Weight:121.2 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	25.0	0.0468	6.7
3	20.0	22.0	0.0276	5.9
10	20.0	19.0	0.0154	5.1
100	20.0	16.0	0.0064	4.3
200	20.0	14.0	0.0046	3.8

D85: 27.2 D60: 9.82 D50: 6.05 D30: 1.76 D15: 0.60 D10: 0.28 mm

Cu: 35.7 Cc: 1.14

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 54.3% Sand: 38.3% Fines: 7.4%

---------- ASTM D 2487 Classification ----------

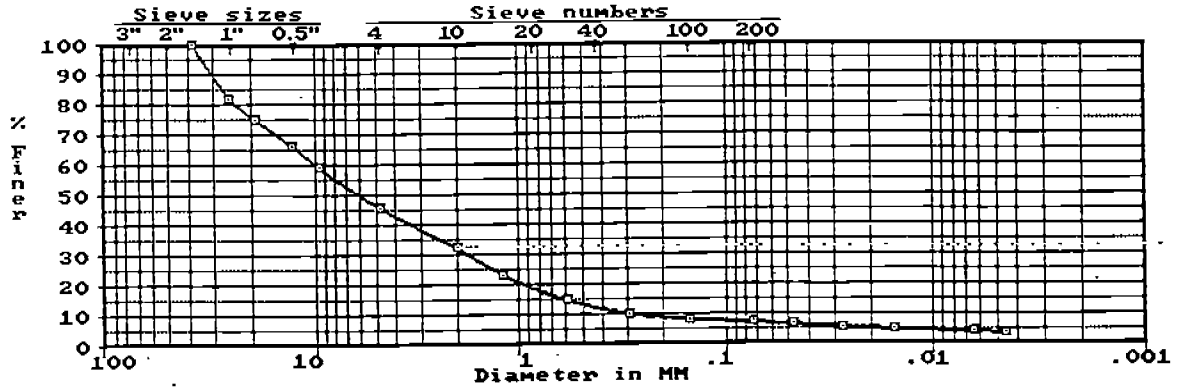
GW-GM Well-graded GRAVEL with silt and sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 5.4 Frost Classification: **S1**

---------- Comments ----------

- WATER CONTENT = 4.5%
- SPECIFIC GRAVITY = 2.71



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FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: **95-RRFTA** Sample: **2152-SB** Depth: -- Lab No.: 27212

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	78.00	93.8
1 In.	190.00	85.0
3/4 In.	314.00	75.2
1/2 In.	452.00	64.2
3/8 In.	540.00	57.3
No. 4	750.00	40.7
No. 10	934.00	26.1
Pan	1264.00	0.0
No. 16	25.40	19.9
No. 30	47.50	14.6
No. 50	62.60	10.9
No. 100	71.50	8.7
No. 200	75.90	7.6
Pan	107.30	0.0

---------- Hydrometer Analysis ----------

Sample Weight:107.3 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	27.0	0.0462	6.6
3	20.0	25.0	0.0270	6.1
10	20.0	23.0	0.0150	5.7
100	20.0	21.0	0.0062	5.2
200	20.0	19.0	0.0044	4.7

D85: 25.4 D60: 10.7 D50: 7.08 D30: 2.62 D15: 0.63 D10: 0.23 mm

Cu: 45.4 Cc: 2.75

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 59.3% Sand: 33.1% Fines: 7.6%

---------- ASTM D 2487 Classification ----------

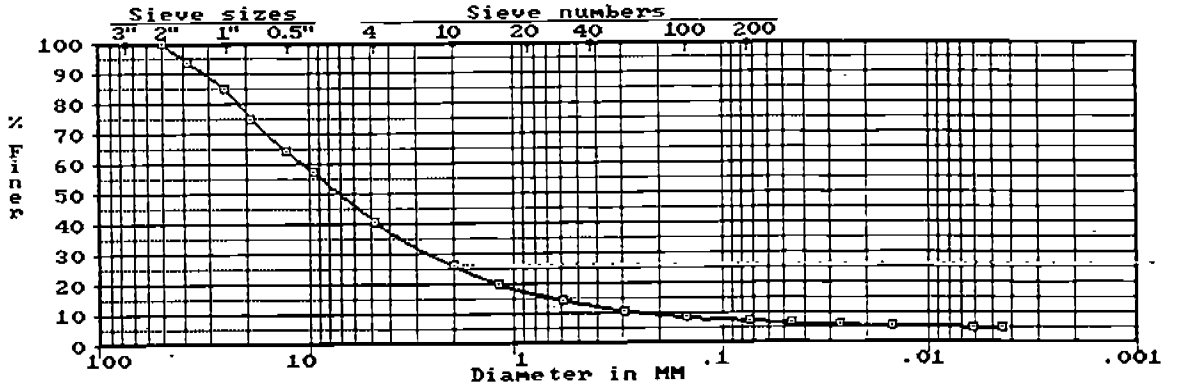
GW-GM Well-graded GRAVEL with silt and sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 5.9 Frost Classification: S1

---------- Comments ----------

- WATER CONTENT = 3.6%
- SPECIFIC GRAVITY = 2.64



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: **95-RRFTA** Sample: **2153-SB** Depth: -- Lab No.: 27213

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	0.00	100.0
3/4 In.	12.00	98.8
1/2 In.	58.00	94.0
3/8 In.	102.00	89.5
No. 4	180.00	81.4
No. 10	276.00	71.5
Pan	970.00	0.0
No. 16	3.50	67.4
No. 30	7.50	62.6
No. 50	11.10	58.3
No. 100	15.60	52.9
No. 200	20.55	47.0
Pan	60.00	0.0

---------- Hydrometer Analysis ----------

Sample Weight:60 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	33.0	0.0442	39.5
3	20.0	27.0	0.0267	32.5
10	20.0	21.0	0.0152	25.4
100	20.0	14.0	0.0065	17.1
200	20.0	11.0	0.0047	13.6

D85: 6.61 D60: 0.39 D50: 0.10 D30: .022 D15: .0053 mm

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 18.6% Sand: 34.4% Fines: 47.0%

---------- ASTM D 2487 Classification ----------

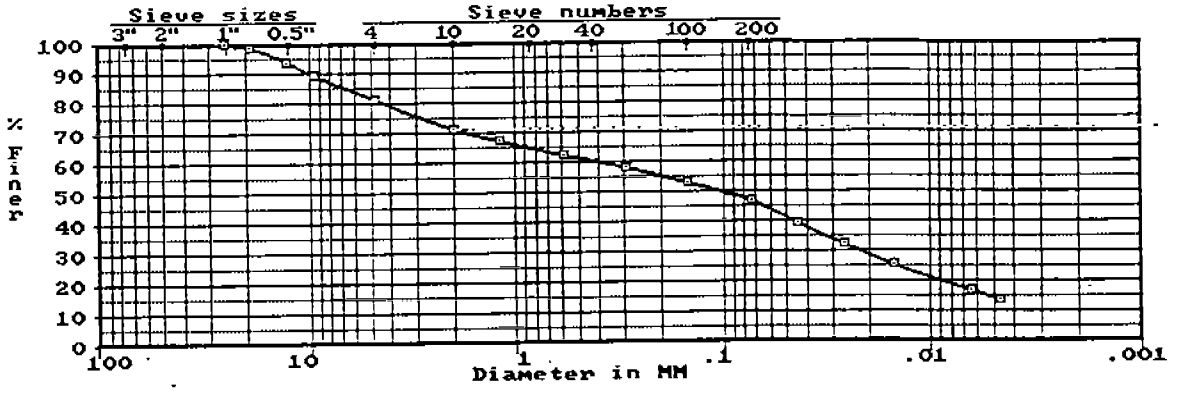
SM Silty SAND with gravel

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 28.7 Frost Classification: **F4**

---------- Comments ----------

- WATER CONTENT = 22.5%
- SPECIFIC GRAVITY = 2.74



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: **95-RRFTA** Sample: **2159-SB** Depth: -- Lab No.: 27214

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	166.00	87.8
3/4 In.	280.00	79.4
1/2 In.	372.00	72.6
3/8 In.	482.00	64.5
No. 4	710.00	47.7
No. 10	914.00	32.7
Pan	1358.00	0.0
No. 16	17.20	27.3
No. 30	41.20	19.7
No. 50	59.00	14.1
No. 100	67.90	11.3
No. 200	72.70	9.8
Pan	103.60	0.0

---------- Hydrometer Analysis ----------

Sample Weight:103.6 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	26.0	0.0465	8.3
3	20.0	24.0	0.0272	7.7
10	20.0	21.0	0.0152	6.7
100	20.0	18.0	0.0063	5.8
200	20.0	16.0	0.0045	5.2

D85: 23.2 D60: 8.01 D50: 5.29 D30: 1.56 D15: 0.34 D10: .082 mm

Cu: 98.0 Cc: 3.71

Liquid Limit: 24.5 Plasticity Index: 8.4

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 52.3% Sand: 37.9% Fines: 9.8%

---------- ASTM D 2487 Classification ----------

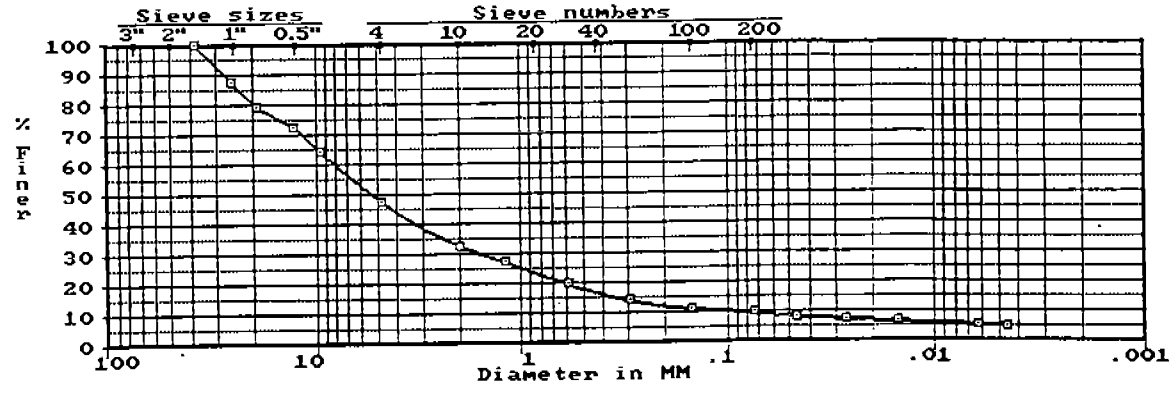
GP-GC Poorly graded GRAVEL with clay and sand

---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 7.2 Frost Classification: **F1**

---------- Comments ----------

- WATER CONTENT = 4.6%
- SPECIFIC GRAVITY = 2.72



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON/RUFF RD FIRE PROJECT 95-272

Boring: **95-RRFTA** Sample: **2166-SB** Depth: -- Lab No.: 27215

Sieve Analysis

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	216.00	83.3
1 In.	412.00	68.1
3/4 In.	546.00	57.7
1/2 In.	626.00	51.5
3/8 In.	774.00	40.1
No. 4	920.00	28.8
No. 10	994.00	23.1
Pan	1292.00	0.0
No. 16	26.30	17.2
No. 30	48.90	12.2
No. 50	67.80	8.0
No. 100	75.40	6.4
No. 200	78.90	5.6
Pan	104.10	0.0

Hydrometer Analysis

Sample Weight: 104.1 gr. Start Time: 0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	22.0	0.0477	4.9
3	20.0	21.0	0.0277	4.7
10	20.0	19.0	0.0154	4.3
100	20.0	16.0	0.0064	3.6
200	20.0	15.0	0.0046	3.4

D85: 39.2 D60: 20.5 D50: 12.2 D30: 5.50 D15: 0.90 D10: 0.43 mm

Cu: 48.1 Cc: 3.47

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 71.2% Sand: 23.2% Fines: 5.6%

ASTM D 2487 Classification

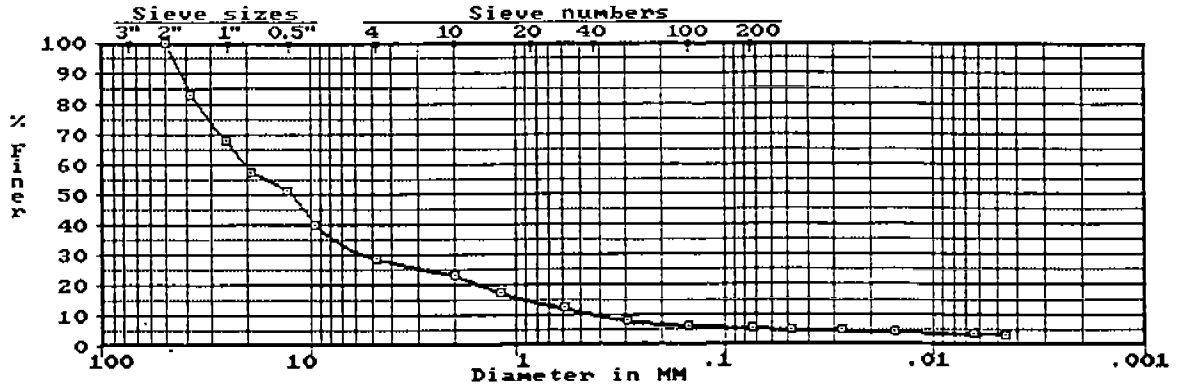
GP-GM Poorly graded GRAVEL with silt and sand

TM 5-818-2 Frost Classification

Percent finer than 0.02 mm: 4.5 Frost Classification: **S1**

Comments

- WATER CONTENT = 4.5%
- SPECIFIC GRAVITY = 2.69



OUA 0021127

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM ROAD
TROUTDALE, OREGON 97060-9508

REPLY TO
ATTENTION OF:

RECEIVED JUL 24 1995

July 20, 1995

Bill Richards
Ecology and Environment, Inc.
840 K Street, Suite 100
Anchorage, Alaska 99501

Mr. Richards:

1. Enclosed is report of mechanical analysis for 8 soil samples submitted from the Ft. Richardson OUA-POL Laboratory Dry Well project sampled by Ecology and Environment. Included are:

a) Enclosure 1, Summary of Water Content, Specific Gravity and Soil Classification.

b) Enclosures 2 through 9, Report of Particle Size Analysis and Classification Tests, one for each sample submitted.

2. Tests on all samples were performed by Advanced Soil Mechanics, Mt. Vernon, Washington.

3. This completes all physical analysis requested to date for this project.

Sincerely,

Mike L. Luttrell

Enclosures

FOR: JAMES K. HINDS, PE
Deputy Director
North Pacific Division Laboratory

CENPD-ET-P-L (95-273)

FT. RICHARDSON OUA - POL LABORATORY DRY WELL
Ft. Richardson, Alaska

Summary of Water Content, Specific Gravity and Soil Classification

Sample Id.		Water	Specific	Soil Classification	Frost Classification
Location	Number	Content, %	Gravity	ASTM D 2487	TM 5-818-2
95POLLDW	3001SB	13.3	2.57	GM	F1
	3015SB	7.3	2.76	GW-GC	F1
	3031SB	6.9	2.79	GW-GC	S1
	3037SB	6.6	2.74	GW-GC	F1
	3058SB	4.6	2.77	GW	PFS
	3068SB	5.9	2.80	GP-GC	S1
	3071SB	1.8	2.75	GW	PFS
	3081SB	1.2	2.77	GW	PFS

CENPD laboratory numbers 5257 and 5265, samples received 15 and 21 June, 1995.

* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUD POL LAB DRY WELL 95-273

Boring: 95 POLLOW Sample: 3001 SB Depth: ? Lab No.: 27306

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	160.00	92.4
3/4 In.	302.00	85.7
1/2 In.	554.00	73.8
3/8 In.	746.00	64.7
No. 4	1132.00	46.5
No. 10	1416.00	33.0
Pan	2114.00	0.0
No. 16	16.50	28.3
No. 30	33.00	23.6
No. 50	43.40	20.6
No. 100	51.00	18.4
No. 200	58.10	16.4
Pan	115.10	0.0

Sample Weight:115.1 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	41.0	0.0415	11.8
3	20.0	33.0	0.0255	9.5
10	20.0	26.0	0.0147	7.5
100	20.0	18.0	0.0063	5.3
200	20.0	14.0	0.0046	4.1

D85: 18.6 D60: 8.10 D50: 5.54 D30: 1.46 D15: .062 D10: .029 mm

Cu: 100+ Cc: 9.14

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 53.5% Sand: 30.1% Fines: 16.4%

ASTM D 2487 Classification

GM Silty GRAVEL with sand

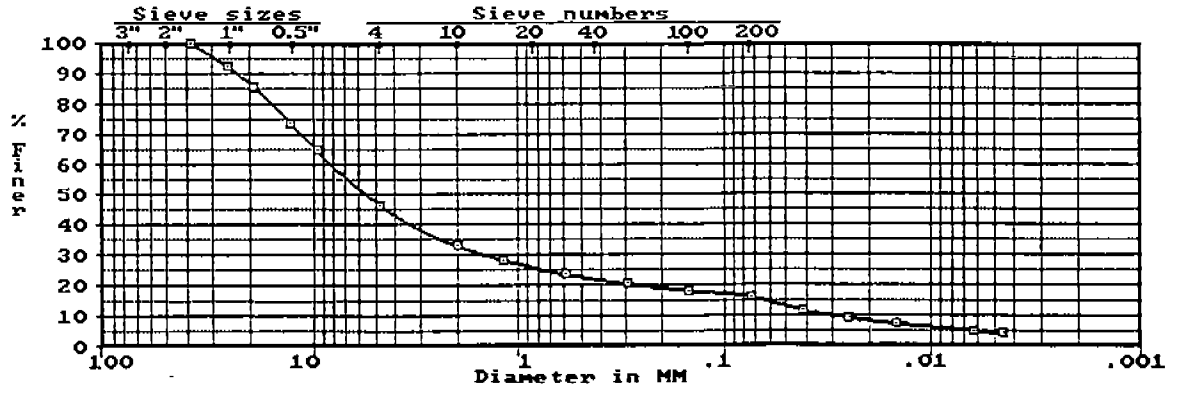
TM 5-818-2 Frost Classification

Percent finer than 0.02 mm: 8.5 Frost Classification: F1

Comments

WATER CONTENT: 13.3%

SPECIFIC GRAVITY: 2.57



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUD POL LAB DRY WELL 95-273

Boring: 95 POLLOW Sample: 3015 SB Depth: ? Lab No.: 27307

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	330.00	87.6
1 In.	442.00	83.4
3/4 In.	688.00	74.2
1/2 In.	986.00	63.0
3/8 In.	1132.00	57.5
No. 4	1468.00	44.9
No. 10	1784.00	33.0
Pan	2662.00	0.0
No. 16	24.50	28.2
No. 30	56.20	22.0
No. 50	89.00	15.6
No. 100	107.50	12.0
No. 200	118.40	9.9
Pan	169.00	0.0

---------- Hydrometer Analysis ----------

Sample Weight:169.0 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	36.0	0.0432	7.1
3	20.0	33.0	0.0255	6.5
10	20.0	30.0	0.0143	5.9
100	20.0	25.0	0.0060	4.9
200	20.0	23.0	0.0043	4.5

D85: 30.6 D60: 10.9 D50: 6.37 D30: 1.46 D15: 0.27 D10: .076 mm

Cu: 100+ Cc: 2.54

Liquid Limit: 22.8 Plasticity Index: 9.0

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 55.1% Sand: 35.0% Fines: 9.9%

---------- ASTM D 2487 Classification ----------

GW-GC Well-graded GRAVEL with clay and sand

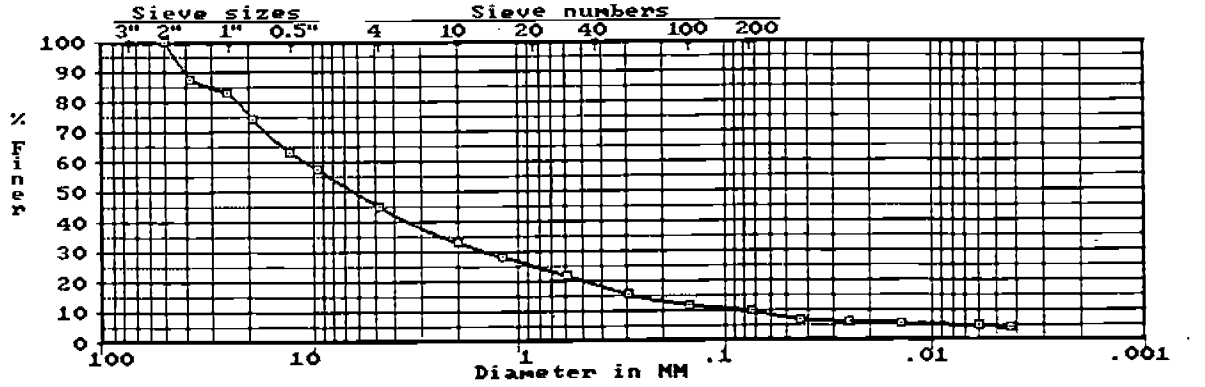
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 6.2 Frost Classification: F1

---------- Comments ----------

WATER CONTENT: 7.3%

SPECIFIC GRAVITY: 2.76



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUD POL LAB DRY WELL 95-273

Boring: 95 POLLOW Sample: 3031 SB Depth: ? Lab No.: 27308

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	210.00	91.9
1.5 In.	448.00	82.8
1 In.	676.00	74.1
3/4 In.	944.00	63.8
1/2 In.	1140.00	56.3
3/8 In.	1274.00	51.1
No. 4	1608.00	38.3
No. 10	1970.00	24.4
Pan	2606.00	0.0
No. 16	34.70	19.5
No. 30	65.90	15.1
No. 50	91.90	11.5
No. 100	112.60	8.6
No. 200	122.50	7.2
Pan	173.70	0.0

---------- Hydrometer Analysis ----------

Sample Weight:173.7 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	40.0	0.0418	5.6
3	20.0	36.0	0.0249	5.1
10	20.0	34.0	0.0139	4.8
100	20.0	30.0	0.0058	4.2
200	20.0	27.0	0.0042	3.8

D85: 40.8 D60: 16.0 D50: 8.96 D30: 2.94 D15: 0.58 D10: 0.21 mm

Cu: 74.4 Cc: 2.52

Liquid Limit: 24.3 Plasticity Index: 11.1

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 61.7% Sand: 31.1% Fines: 7.2%

---------- ASTM D 2487 Classification ----------

GW-GC Well-graded GRAVEL with clay and sand

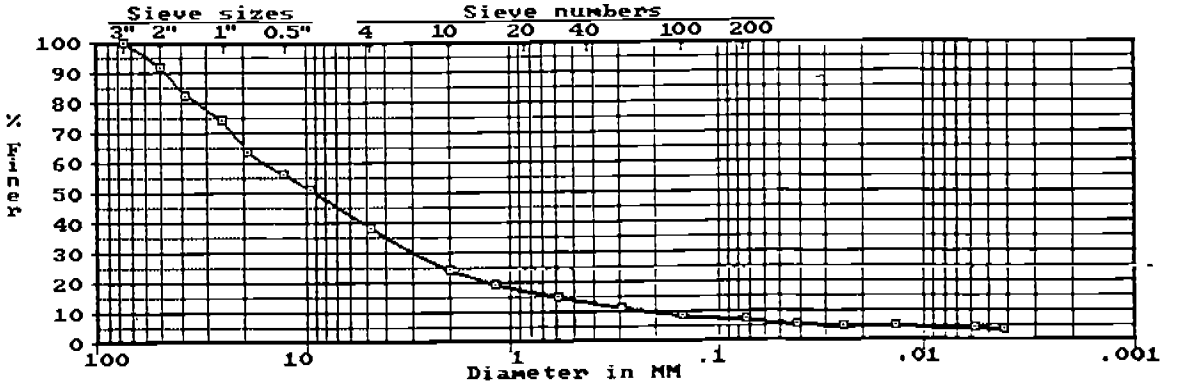
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 5.0 Frost Classification: **S1**

---------- Comments ----------

WATER CONTENT: 6.9%

SPECIFIC GRAVITY: 2.79



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUD POL LAB DRY WELL 95-273

Boring: 95 POLLOW Sample: 3037 SB Depth: ? Lab No.: 27309

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	0.00	100.0
1 In.	132.00	90.9
3/4 In.	268.00	81.5
1/2 In.	378.00	73.9
3/8 In.	486.00	66.4
No. 4	680.00	53.0
No. 10	892.00	38.3
Pan	1446.00	0.0
No. 16	22.80	33.1
No. 30	57.40	25.1
No. 50	91.40	17.2
No. 100	108.80	13.2
No. 200	118.20	11.1
Pan	166.20	0.0

---------- Hydrometer Analysis ----------

Sample Weight:166.2 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	38.0	0.0425	8.8
3	20.0	34.0	0.0253	7.9
10	20.0	32.0	0.0141	7.4
100	20.0	28.0	0.0059	6.5
200	20.0	25.0	0.0043	5.8

D85: 21.3 D60: 7.00 D50: 4.08 D30: 0.90 D15: 0.22 D10: .057 mm

Cu: 100+ Cc: 2.00

Liquid Limit: 23.8 Plasticity Index: 8.7

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 47.0% Sand: 41.9% Fines: 11.1%

---------- ASTM D 2487 Classification ----------

GW-GC Well-graded GRAVEL with clay and sand

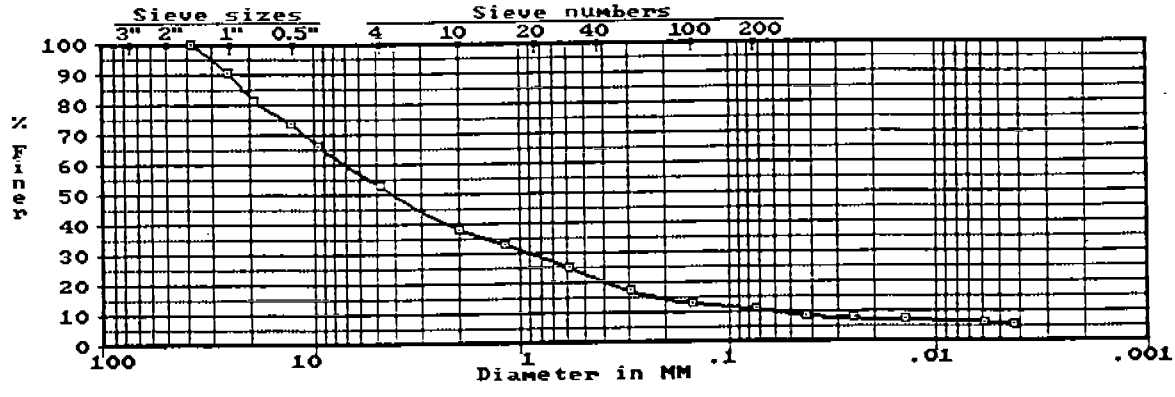
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 7.7 Frost Classification: F1

---------- Comments ----------

WATER CONTENT: 6.6%

SPECIFIC GRAVITY: 2.74



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUA POL LAB DRY WELL 95-273

Boring: 3058 SB Sample: BH-27 Depth: 40' Lab No.: 27301

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	450.00	76.1
1 In.	684.00	63.7
3/4 In.	926.00	50.8
1/2 In.	1096.00	41.8
3/8 In.	1188.00	36.9
No. 4	1362.00	27.7
No. 10	1550.00	17.7
Pan	1884.00	0.0
No. 16	25.40	13.7
No. 30	47.30	10.2
No. 50	64.40	7.5
No. 100	75.80	5.7
No. 200	81.60	4.8
Pan	111.60	0.0

---------- Hydrometer Analysis ----------

Sample Weight:111.6 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	23.0	0.0474	3.7
3	20.0	20.0	0.0279	3.2
10	20.0	17.0	0.0156	2.8
100	20.0	14.0	0.0065	2.3
200	20.0	13.0	0.0046	2.1

D85: 42.6 D60: 23.5 D50: 18.6 D30: 5.76 D15: 1.43 D10: 0.56 mm

Cu: 41.6 Cc: 2.50

Liquid Limit: 21.8 Plasticity Index: 5.7

Fines Type Used for Classification: CL-ML, Silty CLAY

Gravel: 72.3% Sand: 22.9% Fines: 4.8%

---------- ASTM D 2487 Classification ----------

GW Well-graded GRAVEL with sand

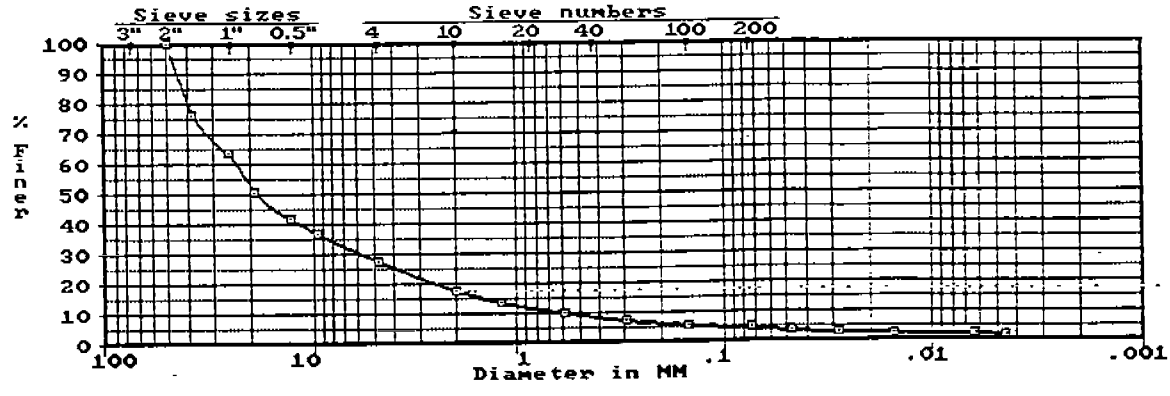
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 3.0 Frost Classification: **PFS**

---------- Comments ----------

WATER CONTENT: 4.6%

SPECIFIC GRAVITY: 2.77



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUA POL LAB DRY WELL 95-273

Boring: 3068 SB Sample: BH-28 Depth: 30' Lab No.: 27302

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	124.00	91.0
1 In.	270.00	80.4
3/4 In.	328.00	76.2
1/2 In.	424.00	69.3
3/8 In.	536.00	61.2
No. 4	702.00	49.1
No. 10	886.00	35.8
Pan	1380.00	0.0
No. 16	41.30	27.8
No. 30	92.60	17.8
No. 50	128.30	10.8
No. 100	142.80	8.0
No. 200	148.80	6.9
Pan	184.10	0.0

---------- Hydrometer Analysis ----------

Sample Weight:184.1 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	31.0	0.0449	6.1
3	20.0	28.0	0.0265	5.5
10	20.0	26.0	0.0147	5.1
100	20.0	22.0	0.0062	4.3
200	20.0	21.0	0.0044	4.1

D85: 30.9 D60: 8.98 D50: 5.08 D30: 1.37 D15: 0.47 D10: 0.26 mm

Cu: 34.7 Cc: 0.80

Liquid Limit: 23.3 Plasticity Index: 10.2

Fines Type Used for Classification: CL, Lean CLAY

Gravel: 50.9% Sand: 42.2% Fines: 6.9%

---------- ASTM D 2487 Classification ----------

GP-GC Poorly graded GRAVEL with clay and sand

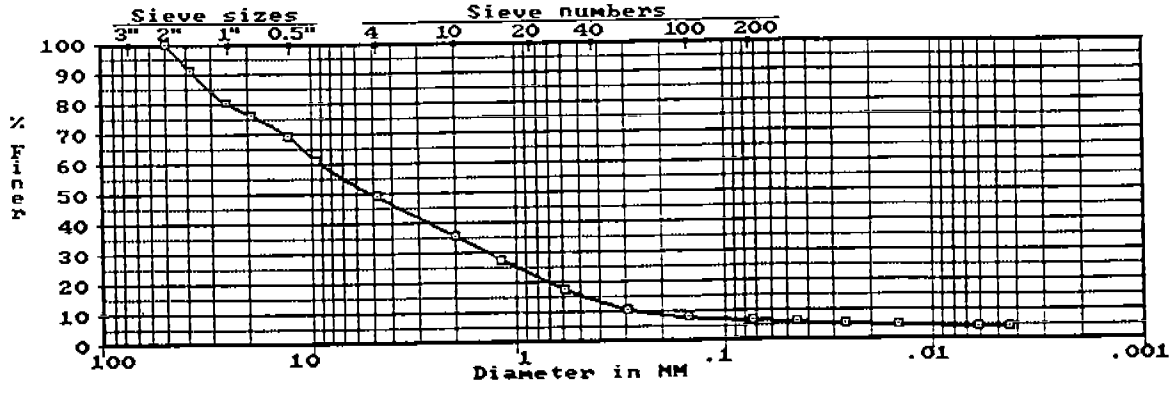
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 5.3 Frost Classification: S1

---------- Comments ----------

WATER CONTENT: 5.9%

SPECIFIC GRAVITY: 2.80



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUA POL LAB DRY WELL 95-273

Boring: 3071 SB Sample: BH-29 Depth: 5' Lab No.: 27303

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	320.00	86.6
1 In.	688.00	71.1
3/4 In.	872.00	63.4
1/2 In.	1116.00	53.1
3/8 In.	1242.00	47.8
No. 4	1576.00	33.8
No. 10	1884.00	20.8
Pan	2380.00	0.0
No. 16	29.10	15.6
No. 30	54.30	11.1
No. 50	72.30	7.9
No. 100	83.40	5.9
No. 200	89.70	4.7
Pan	116.00	0.0

---------- Hydrometer Analysis ----------

Sample Weight:116.0 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	20.0	0.0484	3.6
3	20.0	17.0	0.0284	3.1
10	20.0	14.0	0.0159	2.6
100	20.0	9.0	0.0067	1.7
200	20.0	7.0	0.0048	1.3

D85: 36.7 D60: 16.8 D50: 10.8 D30: 3.82 D15: 1.09 D10: 0.48 mm

Cu: 35.1 Cc: 1.81

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 66.2% Sand: 29.1% Fines: 4.7%

---------- ASTM D 2487 Classification ----------

GW Well-graded GRAVEL with sand

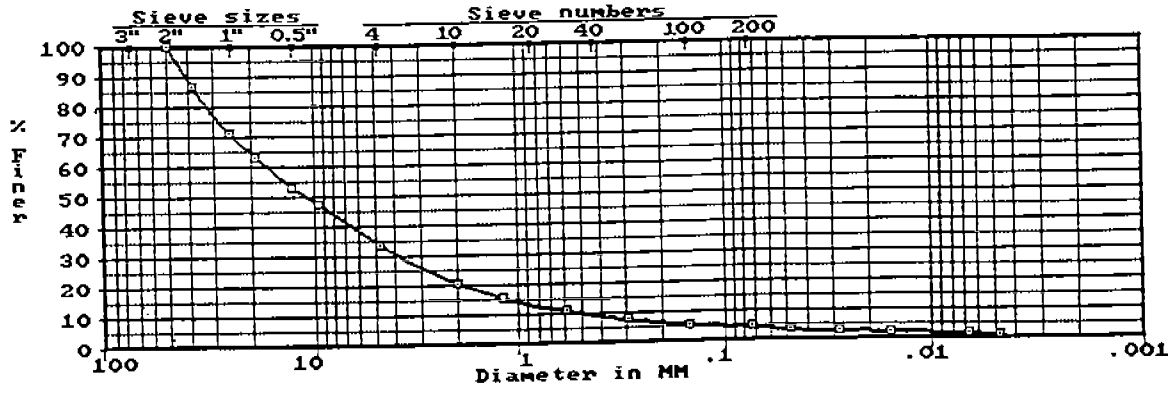
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 2.8 Frost Classification: **PFS**

---------- Comments ----------

WATER CONTENT: 1.8%

SPECIFIC GRAVITY: 2.75



* * * CORPS OF ENGINEERS - NORTH PACIFIC DIVISION LABORATORY * * *

FT. RICHARDSON OUA POL LAB DRY WELL 95-273

Boring: 3081 SB Sample: BH-30 Depth: 10' Lab No.: 27304

------ Sieve Analysis ------

Sieve	Cumulative Grams Retained	Percent Passing
3 In.	0.00	100.0
2 In.	0.00	100.0
1.5 In.	1080.00	67.9
1 In.	1538.00	54.3
3/4 In.	1716.00	49.0
1/2 In.	1988.00	41.0
3/8 In.	2152.00	36.1
No. 4	2512.00	25.4
No. 10	2778.00	17.5
Pan	3368.00	0.0
No. 16	43.60	13.1
No. 30	83.40	9.1
No. 50	111.90	6.3
No. 100	128.70	4.6
No. 200	138.10	3.6
Pan	174.20	0.0

---------- Hydrometer Analysis ----------

Sample Weight:174.2 gr. Start Time:0000

Time	Temp (C)	Hydrometer Reading	Diameter in mm	Percent Finer
1	20.0	26.0	0.0465	2.6
3	20.0	22.0	0.0276	2.2
10	20.0	19.0	0.0154	1.9
100	20.0	13.0	0.0065	1.3
200	20.0	11.0	0.0047	1.1

D85: 44.6 D60: 32.6 D50: 20.3 D30: 6.54 D15: 1.50 D10: 0.71 mm

Cu: 46.0 Cc: 1.86

Liquid Limit: NP Plasticity Index: NP

Fines Type Used for Classification: ML, SILT

Gravel: 74.6% Sand: 21.8% Fines: 3.6%

---------- ASTM D 2487 Classification ----------

GW Well-graded GRAVEL with sand

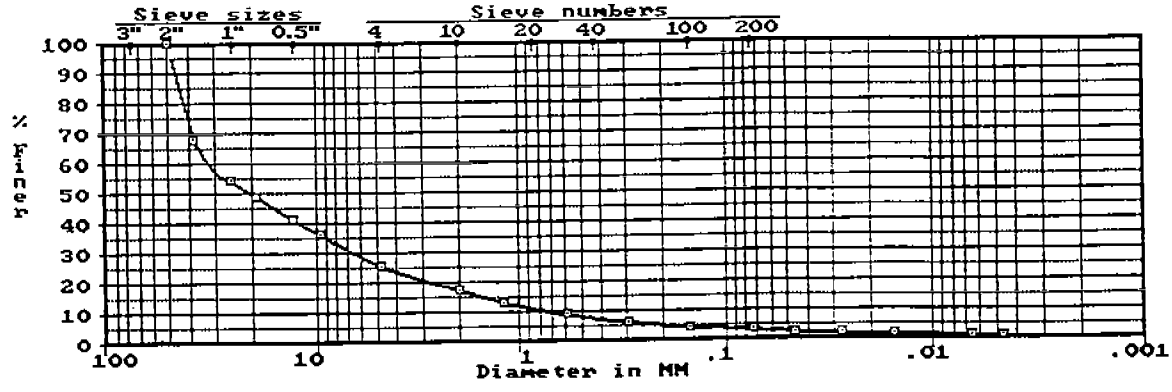
---------- TM 5-818-2 Frost Classification ----------

Percent finer than 0.02 mm: 2.0 Frost Classification: **PFS**

---------- Comments ----------

WATER CONTENT: 1.2%

SPECIFIC GRAVITY: 2.77



D Aquifer Test Results

OUA 0021138

D

D Aquifer Test Results

In October 1995, slug tests were conducted at a minimum of two monitoring wells at each of the three OU-A sites. All test data were analyzed according to the method provided by Bouwer and Rice (1976), and are summarized on Table D-1 and on the subsequent data charts. Groundwater elevations measured at OU-A during 1995 and 1996 are presented on Table D-2.

Slug tests are used to provide a semi-quantitative measure of the saturated hydraulic conductivity of an aquifer in the immediate vicinity of the test well. The test is performed by causing an instantaneous change in well head (water level), and measuring the subsequent rate at which the water level returns to its pre-stressed, or static, level. To change the head, a "slug" is added or withdrawn to displace the water level within the well. Following the instantaneous displacement of the water level, the respective fall or rise in the water level is measured using electronic pressure transducers and a data logger. After considering specific information about the aquifer, static water level, and well construction, the hydraulic conductivity is calculated as a function of the change in water level over time.

Slug tests are generally well suited to aquifers with moderate to lower permeability materials, where water levels require several minutes to an hour to return to static conditions. At most OU-A wells, however, field conditions suggested that aquifer permeabilities were relatively high because water levels generally returned to static conditions levels in a period of less than 30 seconds. (One exception was well AP-3658 at RRTSL.) As a result of the high permeabilities observed, all slug test results are presented as estimates. These results are consistent with values typically associated with sand and gravel aquifers, and with a published report of hydraulic conductivity for the regional aquifer (Patrick et al. 1989).

Table D-1

SLUG TEST DATA SUMMARY
OPERABLE UNIT A
FORT RICHARDSON, ALASKA
(OCTOBER 1995)

Site	Well	Test No.	K (ft./min)	Average K for Well (ft./min)
Roosevelt Road Transmitter Site Leachfield	AP-3658	1	0.002	
	AP-3659	1	0.02	
	Average K for Site			**0.01**
Ruff Road Fire Training Area	AP-3655	1	0.04	0.04
	AP-3656	1 2	0.03 0.03	0.03
	Average K for Site			**0.04**
Petroleum, Oil, and Lubricant Laboratory Dry Well	AP-3648	1	0.01	0.01
	AP-3649	1 2	0.02 0.02	0.02
	AP-3652	1 2	0.03 0.03	0.03
	Average K for Site			**0.02**

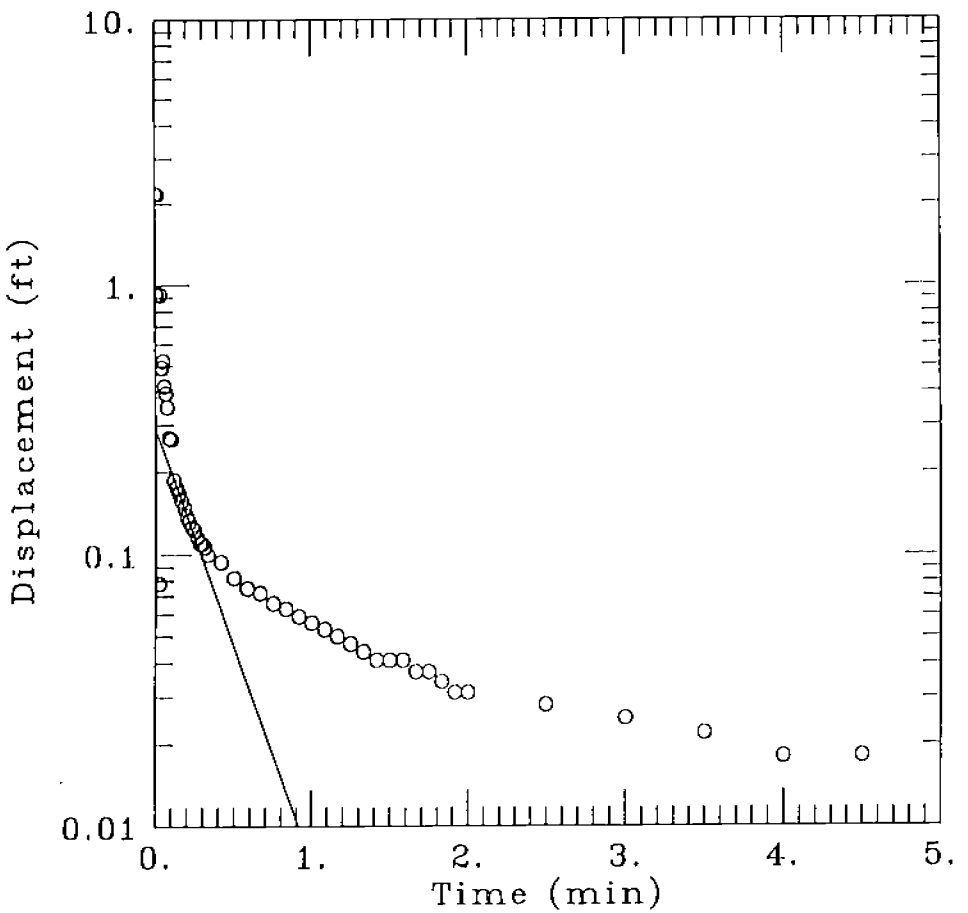
Note: Conductivity calculated according to Bouwer and Rice, 1976, "A Slug Test Method for Determining Hydraulic Conductivity of Unconfirmed Aquifers with Completely or Partially Penetrating Wells."

Key:

ft./min = foot per minute.
K = hydraulic conductivity.

Ecology & Environment, Inc.	Client: USACE
Project No.: JT-3000	Location: Fort Richardson, AK

Slug Test RRTSL: AP-3658



DATA SET:
ap-3658 aqt
03/08/96

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
18 Oct 1995

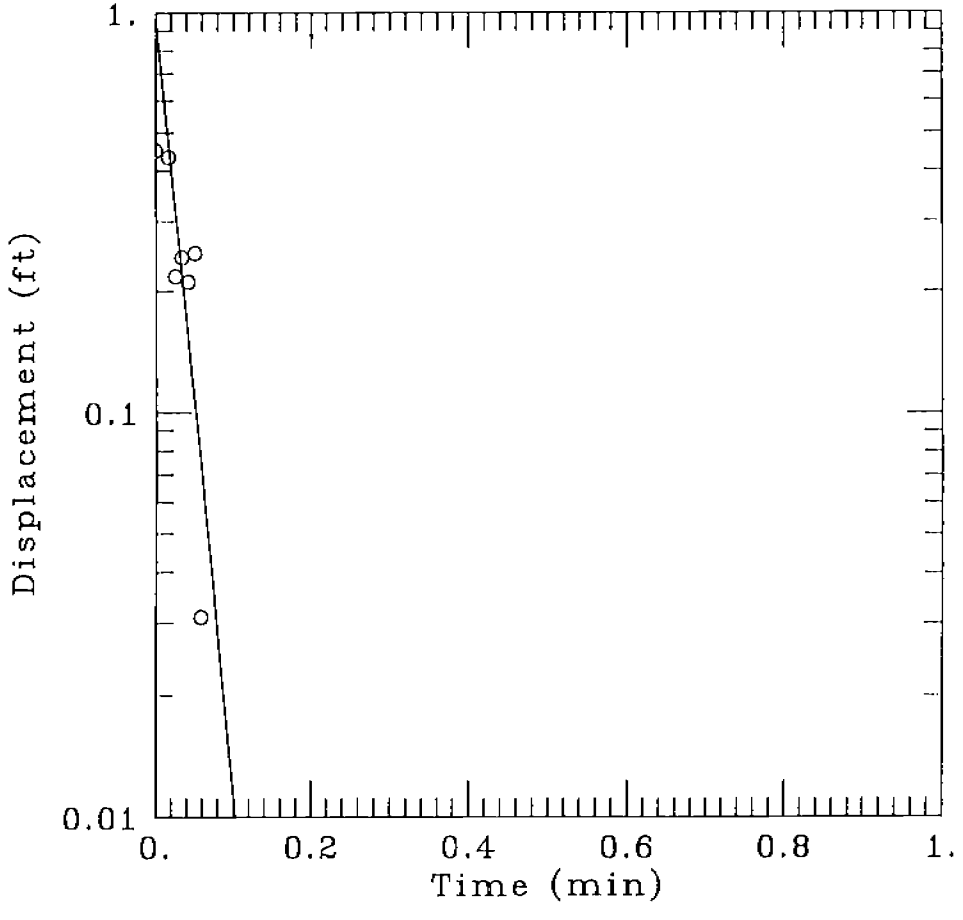
ESTIMATED PARAMETERS:
K = 0.001698 ft/min
y0 = 0.2873 ft

TEST DATA:
H0 = 2.2 ft
rc = 0.083 ft
rw = 0.25 ft
L = 20. ft
b = 25. ft
H = 11 ft

OUA 0021141

Ecology & Environment, Inc.	Client: USACE
Project No.: JT-3000	Location: Fort Richardson, AK

Slug Test RRTSL: AP-3659



DATA SET:
ap3659 aqt
03/06/96

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
18 Oct 1995

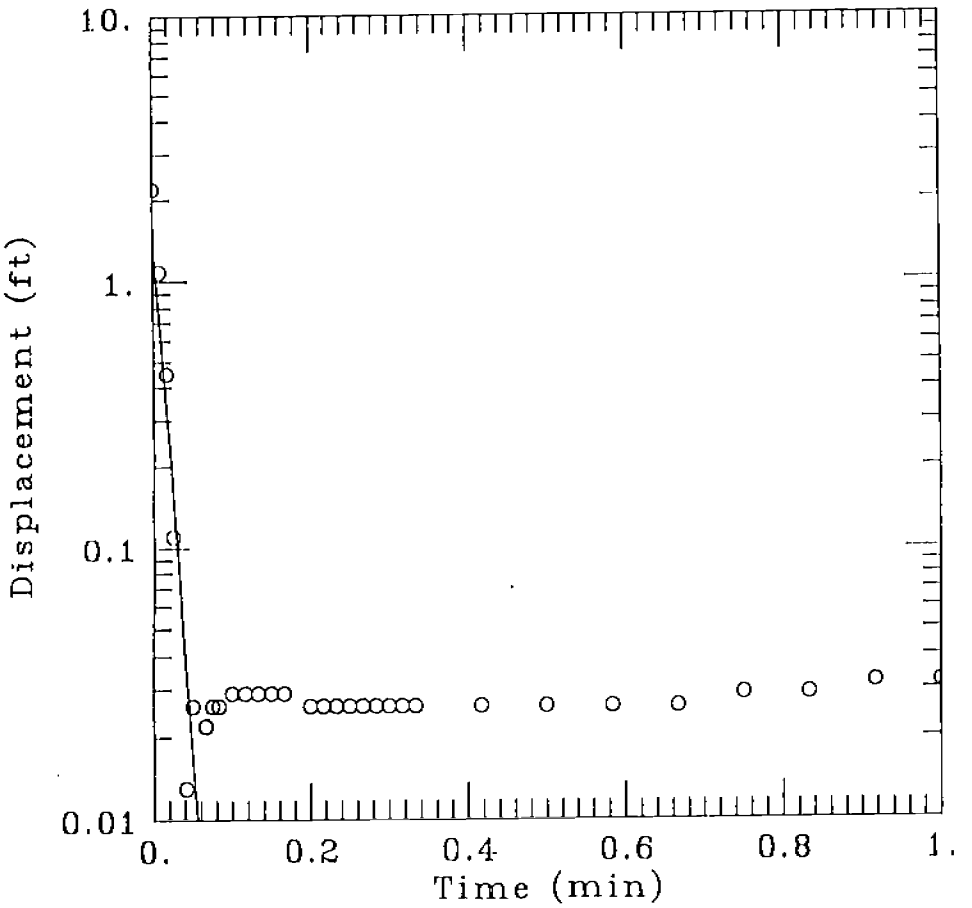
ESTIMATED PARAMETERS:
K = 0.02263 ft/min
y0 = 0.9611 ft

TEST DATA:
H0 = 0.45 ft
rc = 0.083 ft
rw = 0.25 ft
L = 20. ft
b = 25. ft
H = 17. ft

OUA 0021142

Ecology & Environment, Inc.	Client: USACE
Project No.: JT-3000	Location: Fort Richardson, AK

Slug Test RRFTA: AP-3655



DATA SET:
ap3655 aqt
03/05/96

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE.
18 Oct 1995

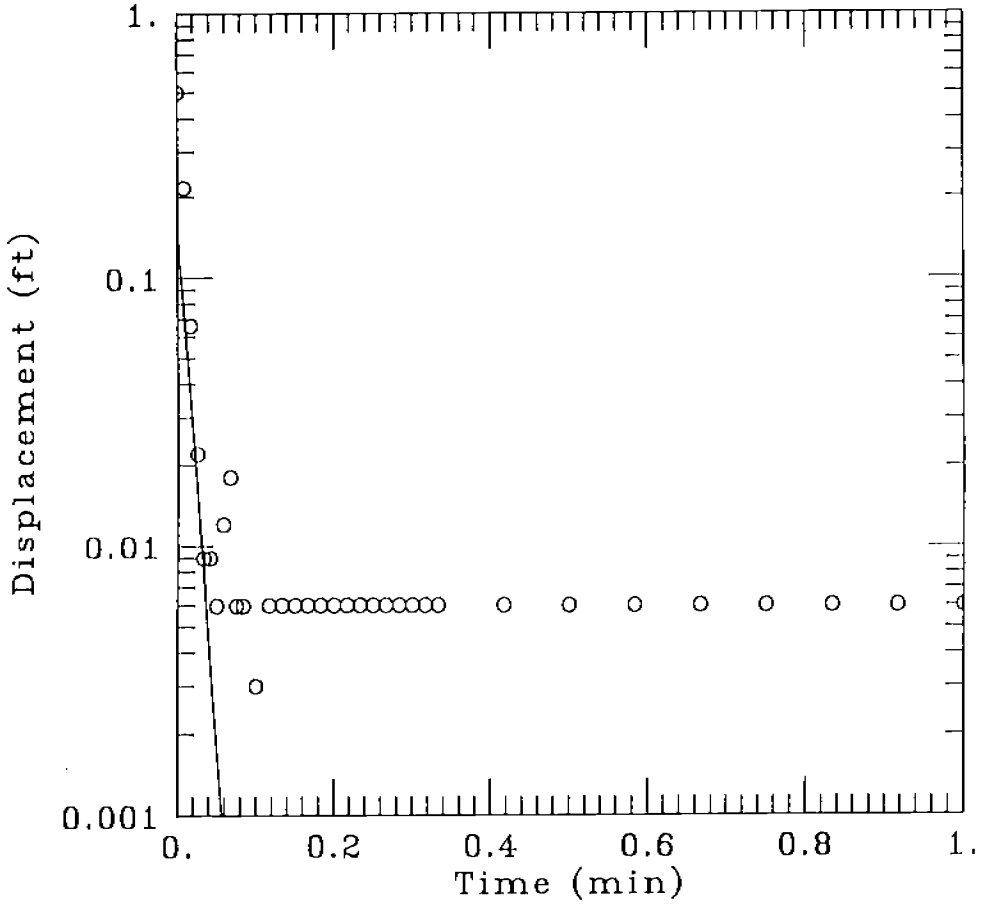
ESTIMATED PARAMETERS:
K = 0.04021 ft/min
y0 = 1.434 ft

TEST DATA:
H0 = 2.2 ft
rc = 0.083 ft
rw = 0 25 ft
L = 20. ft
b = 25. ft
H = 10. ft

OUA 0021143

Ecology & Environment, Inc.	Client: USACE
Project No.: JT-3000	Location: Fort Richardson, AK

Slug Test RRFTA: AP-3656 Test 1



DATA SET:
ap3656-1 aqt
03/06/96

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE
18 Oct 1995

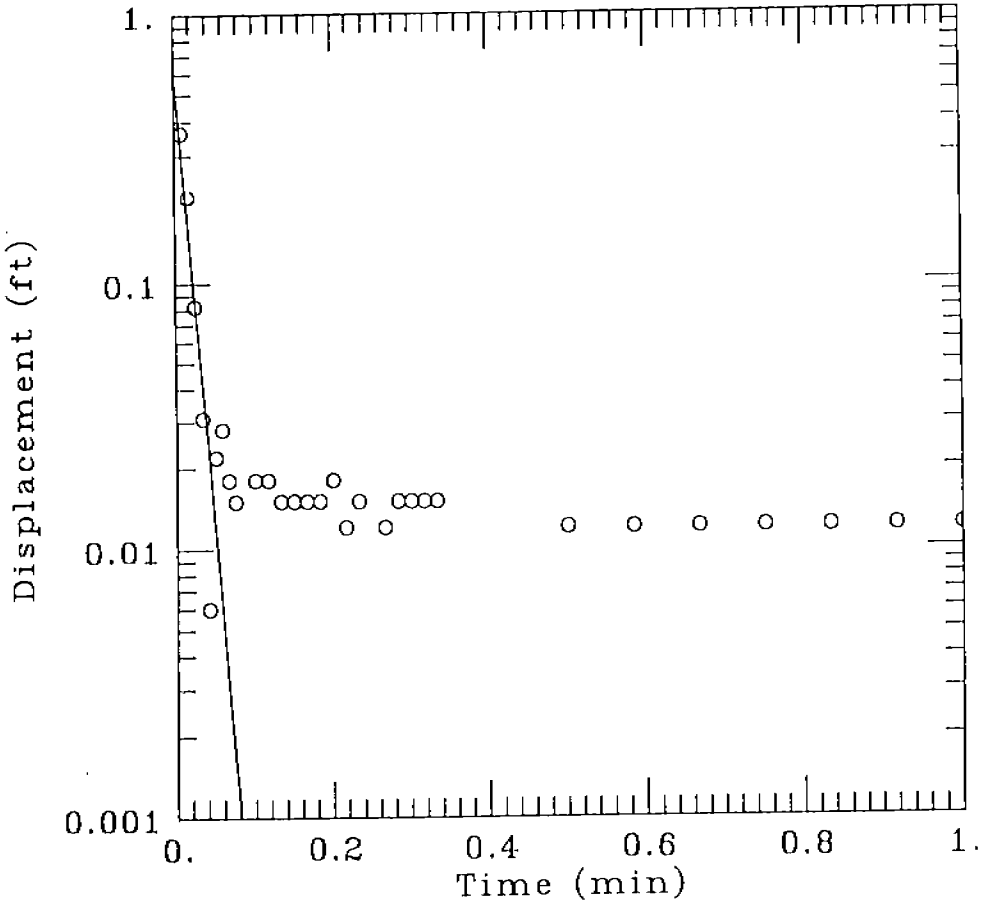
ESTIMATED PARAMETERS:
K = 0.03414 ft/min
y0 = 0.1522 ft

TEST DATA:
H0 = 0.5 ft
rc = 0.083 ft
rw = 0.25 ft
L = 20. ft
b = 25. ft
H = 5 ft

OUA 0021144

Ecology & Environment, Inc.	Client: USACE
Project No.: JT-3000	Location. Fort Richardson, AK

Slug Test RRFTA: AP-3656 Test 2



DATA SET.
ap3656-2 aqt
03/06/96

AQUIFER TYPE:
Unconfined
SOLUTION METHOD.
Bouwer Rice
TEST DATE.
18 Oct 1995

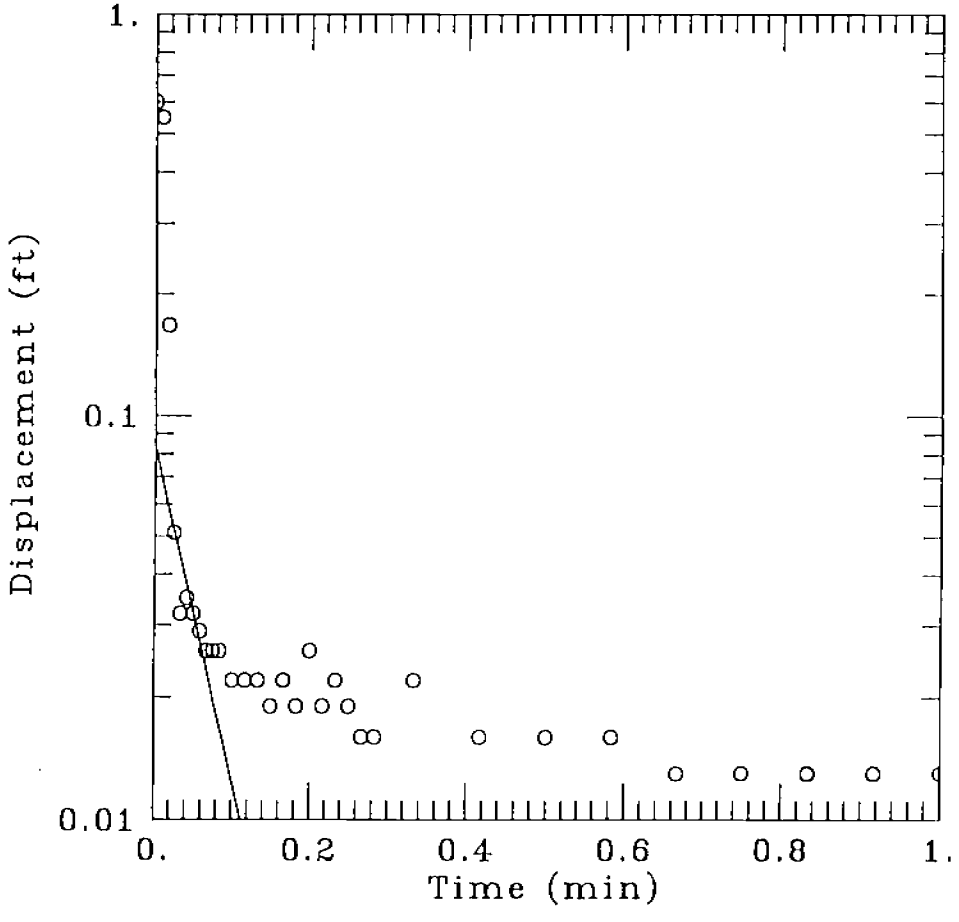
ESTIMATED PARAMETERS:
K = 0 03017 ft/min
y0 = 0.6025 ft

TEST DATA:
H0 = 1.4 ft
rc = 0 083 ft
rw = 0 25 ft
L = 20. ft
b = 25 ft
H = 5 ft

OUA 0021145

Ecology & Environment, Inc.	Client: USACE
Project No.: JT-3000	Location: Fort Richardson, AK

Slug Test POLLDW: AP-3648



DATA SET:
AP3648.AQT
03/05/96

AQUIFER TYPE:
Unconfined
SOLUTION METHOD.
Bouwer-Rice
TEST DATE.
18 Oct 1995

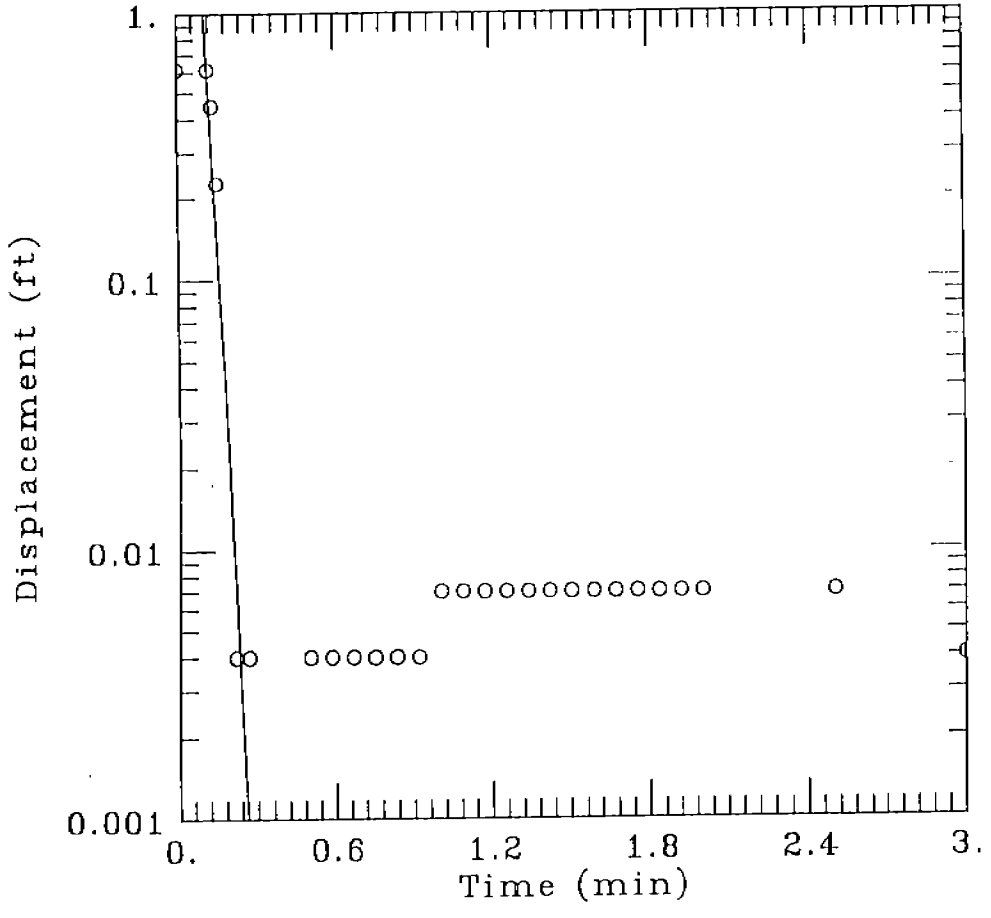
ESTIMATED PARAMETERS:
K = 0.01341 ft/min
y0 = 0.0827 ft

TEST DATA:
H0 = 0.6 ft
rc = 0.083 ft
rw = 0.25 ft
L = 10. ft
b = 25. ft
H = 5. ft

OUA 0021146

Ecology & Environment, Inc.	Client: USACE
Project No.: JT-3000	Location: Fort Richardson, AK

Slug Test POLLDW: AP-3649 Test 1



DATA SET:
ap3649-1.aqt
03/06/96

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
18 Oct 1995

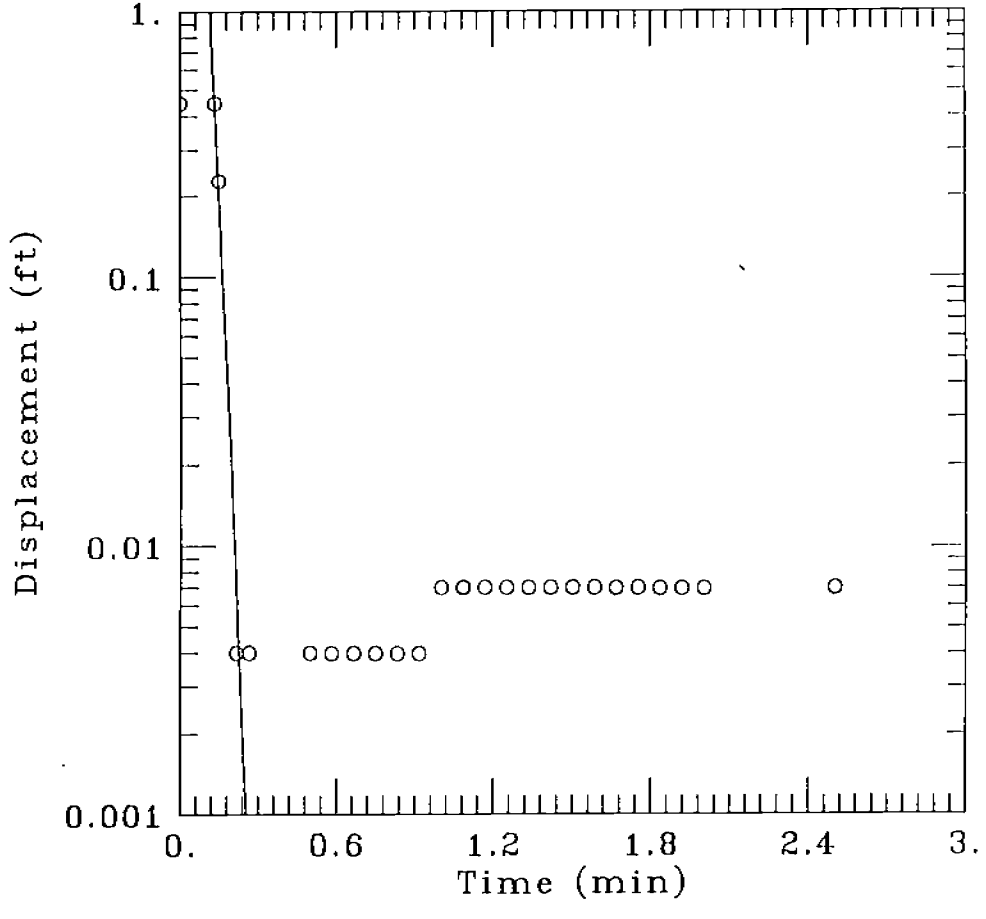
ESTIMATED PARAMETERS:
K = 0.02031 ft/min
y0 = 104.8 ft

TEST DATA:
H0 = 0.614 ft
rc = 0.083 ft
rw = 0.25 ft
L = 20 ft
b = 100. ft
H = 13. ft

OUA 0021147

Ecology & Environment, Inc.	Client. USACE
Project No.: JT-3000	Location. Fort Richardson, AK

Slug Test POLLDW: AP-3649 Test 2



DATA SET.
ap3649-2 aqt
03/06/96

AQUIFER TYPE
Unconfined
SOLUTION METHOD.
Bouwer-Rice
TEST DATE.
18 Oct 1995

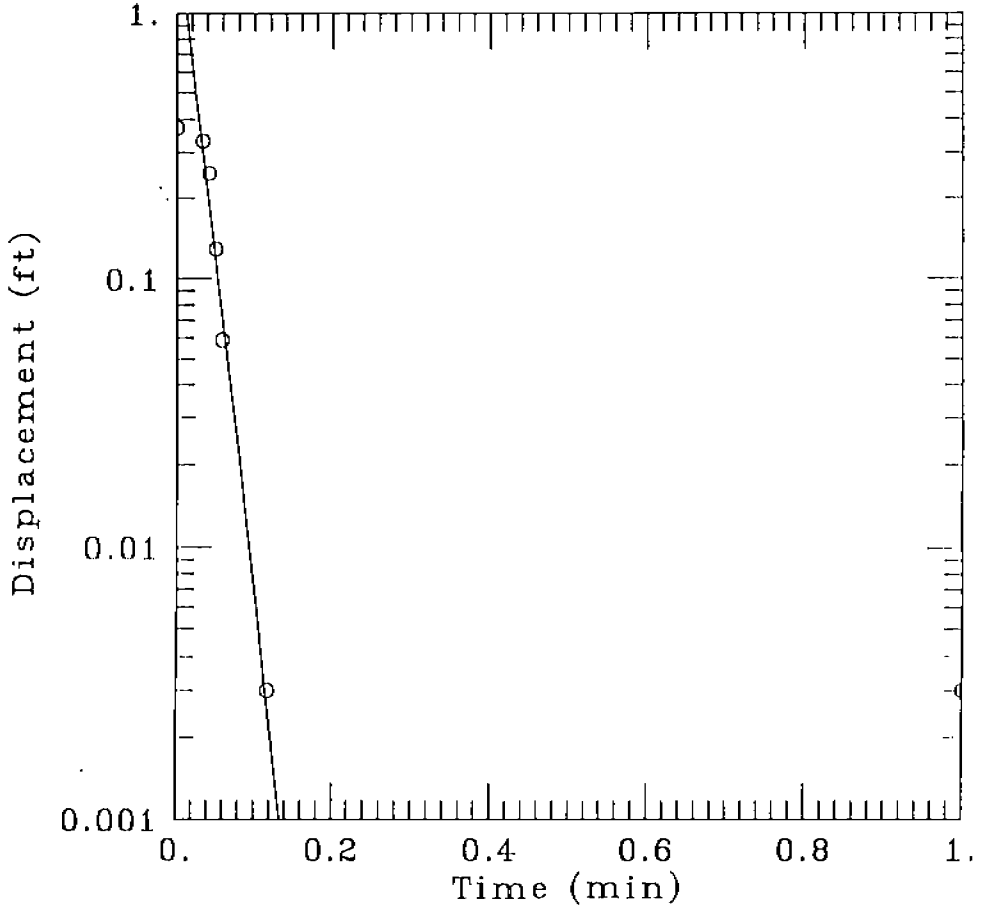
ESTIMATED PARAMETERS:
K = 0 02424 ft/min
y0 = 372.7 ft

TEST DATA:
H0 = 0 446 ft
rc = 0 083 ft
rw = 0 25 ft
L = 20. ft
b = 25. ft
H = 13 ft

OUA 0021148

Ecology & Environment, Inc.	Client: USACE
Project No.: JT-3000	Location: Fort Richardson, AK

Slug Test POLLDW: AP-3652 Test 1



DATA SET:
ap3652-1 aqt
03/06/96

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
18 Oct 1995

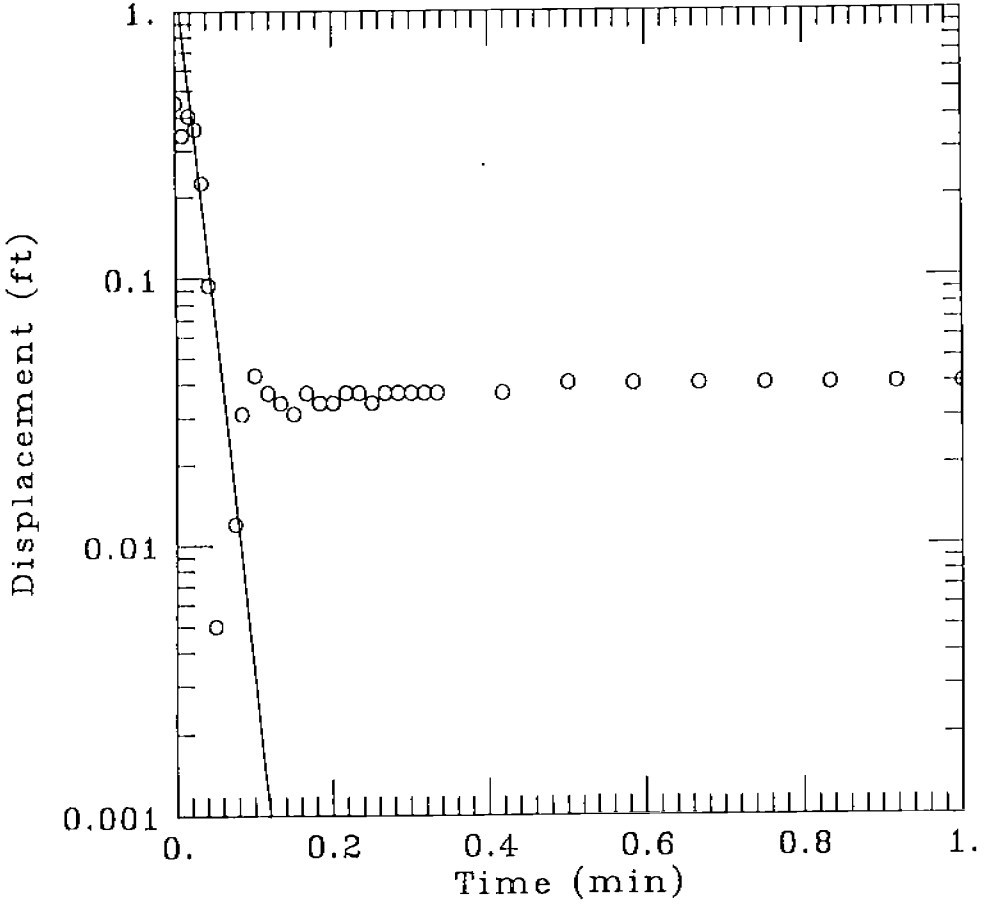
ESTIMATED PARAMETERS:
K = 0 02829 ft/min
y0 = 2 015 ft

TEST DATA:
H0 = 0.371 ft
rc = 0 083 ft
rw = 0.25 ft
L = 20 ft
b = 25. ft
H = 15 ft

OUA 0021149

Ecology & Environment, Inc.	Client. USACE
Project No.: JT-3000	Location. Fort Richardson, AK

Slug Test POLLDW: AP-3652 Test 2



DATA SET:
ap3652-2.aqt
03/06/96

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
18 Oct 1995

ESTIMATED PARAMETERS:
K = 0 02992 ft/min
y0 = 1 408 ft

TEST DATA:
H0 = 0.45 ft
rc = 0.083 ft
rw = 0.25 ft
L = 20 ft
b = 25 ft
H = 15. ft

OUA 0021150

Table D-2

GROUNDWATER ELEVATIONS
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Monitoring Well Number	Top of Inner Casing (feet AMSL)	Groundwater Elevations (feet AMSL)						
		10-18-95	10-24-95	11-2-95	11-10-95	12-15-95	1-19-96	2-15-96 or 2-16-96[a]
Roosevelt Road Transmitter Site Leachfield (RRTSL)								
AP-3658	262.22	177.68	177.78	177.59	NM	176.77	176.54	176.16*
AP-3659	258.83	178.02	178.03	177.96	177.95	177.37	177.14	177.27*
Well B	251.06	NM	152.67	152.71	152.84	152.73	152.56	152.25[a]
Ruff Road Fire Training Area (RRFTA)								
AP-3653	392.74	251.32	251.44	251.13	251.13	250.03	249.05	248.50
AP-3654	387.64	242.81	242.73	242.34	242.12	240.27	238.73	237.84
AP-3655	392.84	245.86	245.82	245.63	245.53	243.99	242.18	241.08
AP-3656	392.32	247.53	247.55	247.25	247.18	245.54	244.45	243.83
AP-3657	392.72	240.28	240.19	239.76	239.51	236.29	233.78	232.39
Petroleum Oil Lubricant Laboratory Dry Well (POLLDW)								
AP-3648	299.33	180.87	180.93	180.67	180.53	179.34	178.56	177.79*
AP-3649	296.19	NM	180.97	180.69	180.54	179.39	178.59	177.77*
AP-3650	293.56	180.88	180.90	180.64	180.46	179.32	178.61	177.77*
AP-3651	295.65	180.94	181.01	180.74	180.65	179.50	178.74	178.23*

Key at end of table.

OUA 0021151

Table D-2

GROUNDWATER ELEVATIONS
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Monitoring Well Number	Top of Inner Casing (feet AMSL)	Groundwater Elevations (feet AMSL)						
		10-18-95	10-24-95	11-2-95	11-10-95	12-15-95	1-19-96	2-15-96 or 2-16-96[a]
AP-3652	294.30	180.81	180.89	180.60	180.48	179.17	178.44	177.98*

Note:

[a] Elevation measured on 2-16-96.

Key:

AMSL = Above mean sea level.
NM = Elevation was not measured.

OUA 0021152

OUA 0021153

E

E Chemical Quality Assurance Reports and Data Validation Memorandum

MEMORANDUM

TO: Bill Richards, Project Manager, E & E, Anchorage

FROM: Paul Cooley, Chemist, E & E, Anchorage

DATE: February 15, 1996

SUBJECT: Analytical Program, Data Quality Assurance, and Data Usability for Operable Unit A (OU-A) at Fort Richardson.

This memorandum presents the OU-A Remedial Investigation (RI) analytical program, data quality assurance (QA) program, and data usability program. These programs provided the following: chemical-testing data required to support decision making regarding contamination at the OU-A source areas; data used to identify potential requirements for remedial action based on risk and Applicable, Relevant and Appropriate Requirements (ARARs); and information to assist in estimating and focusing remedial engineering options. The quality assurance (QA) review of analytical data provides decision makers with documentation and assurance that errors and uncertainty in data are within the acceptable limits used to establish adequate performance by laboratories conducting the required environmental analyses. The data usability review determined the adequacy of the data on a project-, site-, sample-, and analyte-specific basis as a function of the data quality objectives (DQOs) presented in the OU-A management plan. Actual site-specific results of quality assurance and data usability reviews are presented in the North Pacific Division Laboratory (NPDL) OU-A Chemical Quality Assurance Reports (CQARs) and the OU-A RI report.

ANALYTICAL PROGRAM

Three types of analytical laboratories provided data for this RI: a temporary field analytical laboratory established solely to support this project; fixed, off-site commercial project laboratories; and fixed, off-site commercial QA laboratories.

Objectives

Soil samples collected during field investigation activities at OU-A were analyzed by the on-site field laboratory for petroleum hydrocarbons (quantified as diesel oil). The main objectives of the field analyses were to provide analytical data in a timely manner to guide on-going work in the field (e.g., identification of the most appropriate sample locations to delineate extent of contamination) and to indicate the absence of contamination in areas where further study could be eliminated. Samples were screened for petroleum hydrocarbons because diesel was associated with other contaminants of concern in previous investigations of the site.

The primary objective of the project laboratory analysis was to provide definitive data sufficient for site characterization and regulatory decision making. The project laboratory also identified chemical constituents and types of petroleum products in samples to generate data for risk assessment, geotechnical purposes, and engineering evaluation purposes. These constituents included: volatile organic compounds (VOCs), base/neutral and acid-extractable

organic compounds (BNAs), polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dioxin, metals, total recoverable petroleum hydrocarbons (TRPH), diesel-range organics (DRO), gasoline-range organics (GRO), total organic carbon (TOC), and inorganics.

As part of the Corps' data validation program, a subset of project samples (splits and replicates) was submitted to the Corps-designated QA laboratory for the same analyses conducted by the project laboratory. A summary of methods and laboratories are provided in Table 1.

Program Structure

Brief summaries of each component of the analytical program, an overview of sampling procedures, and chain-of-custody procedures related to laboratory analyses are presented below.

Field Analytical Laboratory Program

Ninety-eight soil samples collected during the field investigation were submitted to the field analytical laboratory for petroleum hydrocarbon analysis. Soil samples intended for field screening analyses were collected and placed in 4-ounce glass jars with teflon-lined lids. Samples were assigned a seven-digit sample number after collection. The first two digits, *FL*, designated the field laboratory. The third and fourth digits identified the sample matrix (*SL* for soil and *SD* for sediment). The fifth through eighth digits identified the sample location area and consecutive sample numbers from that area. Examples of sample numbering schemes are presented in the quality assurance project plan (QAPP) submitted with the OU-A management plan (E & E 1995).

As the *FL* samples were collected, they were recorded on a chain-of-custody form. The form was relinquished to the project chemist when the samples were hand delivered to the field analytical laboratory. The project chemist recorded the sample numbers in a bound field logbook designated as the *Sample Log*, signed the chain-of-custody form, and stored the samples in a secured area at 4°C. The samples were stored at this temperature for a period of up to 14 days after collection in case re-analysis was necessary. After 14 days, samples were disposed of with other investigation-derived material (e.g., drill cuttings).

Approximately 15% of the field laboratory samples were submitted to the project laboratory for confirmatory analysis. Collocated samples were collected and submitted for analyses by the project and QA laboratories using similar sample numbering and chain-of-custody procedures. Collocated samples were selected for project laboratory analysis based on the criteria presented below. Ten percent of the project laboratory samples were duplicated (blind collocated duplicates), in accordance with the QAPP. In addition, approximately 10% of project laboratory samples were selected at random, duplicated, and submitted for QA laboratory analysis.

Quality Assurance/Quality Control

Quality control (QC) procedures included the analyses of reagent blanks, duplicates (to estimate precision), and blind duplicates at frequencies specified in the QAPP. Advisory control limits specified in the OU-A management plan (E & E 1995), test kit manufacturer's guidelines, previous experience, and intended data use were employed during QA reviews to eliminate data that did not achieve minimum QC standards.

Reporting

All raw data and calculations were recorded in the field logbook. The project chemist recorded results on a data reporting form and provided them to the project manager

as they were obtained (usually within 24 hours of sampling) in order to guide ongoing field activity.

Project and Quality Assurance Laboratory Program

NPDL contracted four off-site commercial laboratories to perform analyses for the RI. The RI was performed in two phases: Phase I involved sludge sampling and borehole drilling, surface soil sampling, and subsurface soil sampling. Phase II involved monitoring well installation, and groundwater sampling, soil sampling, and surface water and sediment sampling. Applied Research and Development Laboratory (ARDL) served as the QA laboratory for the Phase I Roosevelt Road Transmitter Site Leachfield (RRTSL) and the Petroleum, Oil, and Lubricant Laboratory Dry Well (POLLDW) area investigations, and it served as the project laboratory for all Phase II investigation activities. Columbia Analytical Services (CAS) served as the project laboratory for the Phase I RRTSL area investigation, the QA laboratory for the Phase I Ruff Road Fire Training Area (RRFTA) investigation, and Phase II investigation activities for surface water and sediment sample analysis. Sound Analytical Services (SAS) served as the project laboratory for both the Phase I POLLDW and the Phase I RRFTA investigations. NPDL and National Environmental Testing (NET) served as the QA laboratories for the Phase II area investigations. ALTA and Triangle Laboratories were subcontracted by the laboratories to perform dioxin analyses as either the project or QA laboratory. Northern Testing Laboratory (NTL) served as the project laboratory for specific short holding time analyses including Ph, alkalinity, total Kjeldahl nitrogen, total phosphorus, and heterotrophic bacteria. NPDL validated project laboratory data and compared the project laboratory performance with QA laboratory results. (A comparison of data from the project and QA laboratories is presented in the CQARs.)

All soil, sediment, and water samples submitted to off-site laboratories were handled according to Corps Regulation No. ER-1110-1-263, and sample containers complied with applicable guidelines outlined by the United States Environmental Protection Agency (EPA). Decontamination procedures outlined in the OU-A management plan were strictly adhered to.

All laboratory sample preparation and analyses were performed according to methods described in *Test Methods for Evaluating Solid Waste* (SW-846) (EPA 1990), *Test Methods for Evaluating Solid Wastes* and *Methods for Chemical Analysis of Water and Wastes* (MACAWW) (EPA 1983), or methods specified by the American Society for Testing and Materials (ASTM 1991; see Table 1). Control limits were defined by the particular analytical methods and by the QC acceptance criteria outlined in SW-846 and MACAWW. All data were validated by NPDL and reviewed by E & E chemists.

Field Quality Assurance/Quality Control

Triplicate samples, trip blanks, equipment rinsate samples, duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples were collected and submitted to the off-site laboratories to ensure that the quality of the analytical results met the RI DQOs specified in the management plan.

DATA QUALITY ASSURANCE

QA review (data validation) was performed on data from the project, QA, and field analytical laboratories. NPDL validated the project laboratory and QA laboratory data, compared laboratory data pairs, and produced a CQAR that documents the data validation results. The CQAR was used with field QC reports to document the data usability for various purposes associated with the RI. QA laboratory data were compared to project laboratory data to determine the reproducibility of the analytical results. QA laboratory results were not used to describe conditions at the site but were used to assess the quality of the project

laboratory data generated for the RI. In addition, QC samples, which included trip and rinsate blanks, were collected to evaluate potential contamination of samples resulting from sample handling or collection activities. The E & E chemists used the recommendations in the CQAR and EPA CLP guidelines to assign data qualifiers to the off-site laboratory analytical results (EPA 1994a; EPA 1994b). The field laboratory data were evaluated according to precision, accuracy, representativeness, completeness, and comparability (PARCC), the manufacturers guidelines, and the DQOs specified in the OU-A management plan.

On-Site Laboratory Data Validation

Results of the data validation are presented in the E & E Data Validation Memorandum dated November 2, 1995, and further summarized in the OU-A RI Report.

Off-Site Laboratory Data Validation

Results of the Project and QA laboratory data validation are presented in the NPDL CQARs, and further summarized in the OU-A RI Report.

Laboratory Quality Control Sample

Laboratory QC requirements are determined by the laboratory and applicable methodology. Laboratory QC samples include but are not limited to: method blanks, laboratory duplicates, surrogate spike, matrix spike/matrix spike duplicate, analytical spike. calibration verification, and laboratory control standards. Appendix B of the OU-A management plan (E & E 1995) describes these samples.

Field Quality Control Sample

Two types of field blanks were collected during the OU-A RI: trip blanks and equipment rinsate blanks (rinsates). Trip blanks, which apply only to VOCs, were collected to assess the potential for sample contamination resulting from ambient field and transport conditions. Rinsates were collected to determine whether reuse of sample collection equipment was causing cross-contamination of samples. The trip blanks and rinsates were prepared with commercially available deionized water, purified on site with a carbon filter. Trip blanks are described in Appendix B of the OU-A management plan (E & E, 1995).

Three rinsates were collected and submitted to the project laboratories during sampling. When the rinsates were collected, all of the samples associated with the rinsates required VOC, BNA, GRO, DRO, TRPH, and metals analysis; therefore, all rinsates were analyzed for these parameters. Additionally, some rinsates were analyzed for other parameters (i.e, PCBs and dioxins), depending on the required analyses of the associated site. A summary of analytes is presented in the OU-A CQARs.

DATA USABILITY

In addition to a review of laboratory performance, a data usability review was completed for all OU-A RI data. This review determined the adequacy of data on a project site-, sample-, and analyte-specific basis to:

- Describe or characterize sample or site conditions; and
- Describe, characterize, or interpret the results of conditions or activities impacting a sample or site.

Data usability is a function of the DQOs outlined as RI objectives, and the overall QA review of field and laboratory data. The qualification of analytical data does not necessarily preclude use of the data for decision making.

The primary goal of sample collection and analysis under the RI process was to determine the presence or absence of target analytes and, if present, to provide a reasonable estimate of analyte concentrations. Data that failed to meet minimum QC standards were rejected and annotated with an "R" qualifier. These data neither are reported nor utilized beyond that point. However, data flagged "J" (estimated concentration) were reviewed further to identify specific reasons for flagging; this information was incorporated into a determination of usability, based on the project data quality objectives. Results of the data usability review are presented in the OU-A RI report.

Table 1

LABORATORY ANALYTICAL METHODS
OPERABLE UNIT OU-A
FORT RICHARDSON, ALASKA

Parameters	Technical Method	Matrix	Brief Description of Method
Petroleum Hydrocarbons	SW-846 Method 4030	Soil	Enzyme-linked immunosorbent assay with a differential spectrophotometer
Volatile Organic Compounds (VOCs)	SW-846[a] Method 8260A	Soil/water	Gas chromatographic separation with mass spectrometric detection (GC/MS); capillary column
Base/Neutral and Acid-Extractable Organic Compounds (BNAs)	SW-846[a] Method 8270B	Soil/water	Gas chromatographic separation with mass spectrometric detection (GC/MS)
Polynuclear Aromatic Hydrocarbons (PAHs)	SW-846 Method 8310	Water	High-performance liquid chromatography with ultraviolet and fluorescence detectors.
Diesel-Range Organic (DRO) Compounds	SW-846 Modified[b] Method 8100	Soil/water	GC with flame ionization detection (FID) and an in-line photoionization detector (PID)
Gasoline-Range Organic (GRO) Compounds	SW-846 Modified Method 8015	Soil/water	GC separation with FID and an in-line PID
Fuel Identification (FIQ)	USACE Modified SW-846 Method 8015	Sludge	GC separation with FID
Total Recoverable Petroleum Hydrocarbons (TRPH)	EPA Method 418.1	Water	Nondispersive infrared spectrophotometer
Polychlorinated Biphenyls (PCBs)	SW-846 Method 8080A	Soil/water	GC separation with an electron-capture detector
Dioxin	SW-846 Method 8290	Soil/Water	High-resolution GC with high-resolution MS
Total Suspended Solids (TSS)	EPA Method 160.2	Water	Gravimetric
Surfactants	EPA Method 425.1	Water	Colorimetric
Hardness	EPA Method 130.1	Water	Colorimetric
Metals (total and dissolved; see Attachment 1 for parameters)	SW-846[a] Method 6010, 7000 series	Soil/Water	Atomic absorption, spectrometric detection (furnace); inductively coupled plasma

Key at end of table.

OUA 0021160

Table 1

LABORATORY ANALYTICAL METHODS
OPERABLE UNIT OU-A
FORT RICHARDSON, ALASKA

Parameters	Technical Method	Matrix	Brief Description of Method
Iron, manganese, aluminum, calcium, manganese, potassium, vanadium, and cobalt	SW-846[a], 6010 series	Soil	Inductively coupled plasma
Total Organic Carbon (TOC)	SW-846 Method 9060[a]	Soil	Combustion or oxidation
	EPA Method 415.1	Water	
Toxicity Characteristic Leaching Procedure (TCLP)—Inorganic, VOA, BNA	SW-846 Method 1311[a]	Soil	See individual analysis
Alkalinity	EPA Method 310.1	Soil/Water	Titrimetric
Total Dissolved Solids (TDS)	EPA Method 160.1	Water	Gravimetric, dried at 180°C
Biochemical Oxygen Demand (BOD)	EPA Method 405.1	Water	5 days, 20°C
Atterberg Limits	ASTM D4318[e]	Soil	Liquid and plastic limits using wet and dry preparation techniques
Total Kjeldahl Nitrogen	EPA Method 351.2	Soil	Colorimetric, semi-automated block digester
TRPH	EPA Method 9071A/418.1	Soil	Spectrophotometric, infrared
Moisture	ASTM D2216[e]	Soil	Oven dried at 110°C
Grain Size	ASTM D421, D422[e]	Soil	Mechanical grain size analysis using sieves and hydrometer
Specific Gravity of Soil Solids	ASTM D854[e]	Soil	Volumetric flask/pycnometer
Phosphorus	EPA Method 365.2[c]	Soil/Water	Colorimetric, Ascorbic acid, single reagent
Flashpoint	ASTM D0093[e]	Sludge	Penske-Martin closed cup
Major Cations (Dissolved)	I-1472-85[d]	Water	Atomic Absorption, spectrometric (ICP)
Major Anions (Dissolved)	I-2058-85[d]	Water	Ion exchange chromatographic separation, conductiometric detection (automated)

Key at end of table.

OUA 0021161

Table 1

LABORATORY ANALYTICAL METHODS
OPERABLE UNIT OU-A
FORT RICHARDSON, ALASKA

Parameters	Technical Method	Matrix	Brief Description of Method
Cyanide	SW-846 method 9010	Sludge	Titrimetric
Nitrate/Nitrite	EPA method 353.2[c]	Water	Colorimetric, automated, cadmium reduction
Heterotrophic Bacteria	SM-MPN	Soil/Water	Microbiological plate count
Sulfate	SW-846 Method 9036	Water	Colorimetric
Sulfide	SW-846 Method 9030	Water	Titrimetric
Chloride	SW-846 Method 9251	Water	Colorimetric

[a] Methods are contained in United States Environmental Protection Agency *Test Methods for Evaluating Solid Waste*, SW-846, Revision 3, January 1995.
[b] Modification to the method will be the Alaska State modification.
[c] Methods are contained in EPA *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, revised March 1983.
[d] Methods are contained in United States Geological Society *Methods for Determination of Inorganic Substances in Water and Fluvial Sediments*, 1989.
[e] Methods are contained in American Standards for Testing Materials.

Key:

ASTM = American Society for Testing Materials Standards.
BNA = Base neutral/acid extractable organic compound.
BOD = Biological oxygen demand.
EPA = United States Environmental Protection Agency.
SM-MPN = Standard methods for analysis of water and wastewater—most probable number.
USACE = United States Army Corps of Engineers.
VOA = Volatile organic analyses.

OUA 0021162

MEMORANDUM

TO: Bill Richards, Project Manager, E & E, Anchorage

FROM: Paul Cooley, Chemist, E & E, Anchorage

DATE: November 2, 1995

SUBJECT: Field Laboratory Screening Results
Operable Unit A
Ruff Road Fire Training Area
Fort Richardson, Alaska

Ecology and Environment, Inc., (E & E) performed field screening for 98 soil samples collected at the Fort Richardson Operable Unit A (OU-A) Ruff Road Fire Training Area (RRFTA). All samples were screened for petroleum hydrocarbons quantitated as diesel using enzyme-linked immunosorbent assay tests. The test does not differentiate between various petroleum fuels or components, and the test response is a composite of individual responses to petroleum fuel components in the sample. Field screening results provide tentative identification and estimated concentrations of petroleum contamination in order to guide field sampling activities. Approximately 15% of the samples were submitted to a project laboratory for confirmatory analyses by standard methods.

INSTRUMENT PARAMETERS

Millipore Envirogard Test Kit for Petroleum Fuels in Soil
Instrument: Differential Photometer 420 nm

Calibration

Calibration curves were prepared with known standard concentrations according to manufacturer's instructions for the test kits and were within the limits specified by the test kit manufacturer. The actual test kits are standardized to home heating oil. For the purposes of this project, the results were converted to the equivalents of diesel according to the manufacturer's specifications.

Duplicate Samples

Eight soil samples were analyzed as blind collocated duplicate samples and five samples were analyzed as laboratory replicates for an overall frequency of approximately 8% and 5%, respectively. The relative percent difference (RPD) was calculated between the sample results and the duplicate sample result. The sample identification, sample results, duplicate sample results, and RPD values are presented in Table 1. All RPD values were within laboratory QC limits specified in the OU-A management plan (E & E 1995).

Sample Results
For the field screening analyses, the sample was extracted with methanol and analyzed with the immunoassay following the manufacturer's procedures. Estimated concentrations for samples were calculated based on a three-point calibration.

Laboratory Comparability
Fifteen samples were sent off site for laboratory confirmation. All of the collocated samples analyzed by the off-site laboratory reported concentrations of total recoverable petroleum hydrocarbons (TRPH) using United States Environmental Protection Agency (EPA) Method 418.1, diesel-range organics (DRO) using Alaska-modified SW-846 Method 8100, and/or gasoline-range organics (GRO) using Alaska-modified SW-846 Method 8015. However, the laboratory (Sound Analytical Services) indicates that the reported low levels of GRO and DRO do not match the standard GRO and DRO chromatograms. The off-site laboratory results may be attributed to biogenic materials in the soil because the procedures used to assess petroleum hydrocarbons are not specific to petroleum hydrocarbons (E & E 1995). In the five field laboratory samples that indicated the presence of petroleum hydrocarbons, elevated levels of TRPH, DRO, and GRO were reported by the off-site laboratory. A comparison of the field laboratory results to the off-site laboratory are presented in Table 2. Tables 3 and 4 present regression analyses for field screening results compared with DRO and GRO off-site laboratory results, respectively.

Overall, the field laboratory met its objective of identifying areas of diesel fuel contamination in order to guide further sampling activities.

Table 1

FIELD LABORATORY DUPLICATE SAMPLE RESULTS
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Sample Identification	Sample Result (mg/kg)	Duplicate Result (mg/kg)	Relative Percent Difference
Laboratory Duplicates			
2017FL	ND	ND	NC
2048FL	29	27	6
3001FL	ND	ND	NC
2071FL	ND	ND	NC
2080FL	ND	ND	NC
Blind Duplicates			
2011FL/2012FL	17	14	19
2021FL/2023FL	ND	ND	NC
2033FL/2034FL	ND	ND	NC
2059FL/2060FL	ND	ND	NC
2065FL/2066FL	20	13	46
2067FL/2068FL	130	160	22
2072FL/2073FL	ND	ND	NC
2080FL/2081FL	ND	ND	NC

Key:

mg/kg = Milligrams per kilogram.
ND = Not detected.
NC = Not calculable, defined as zero relative percent difference.

Table 2

COMPARISON OF FIELD LABORATORY RESULTS WITH OFF-SITE LABORATORY RESULTS
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Field Laboratory Sample Number	PH-D (mg/kg)	Off-site Laboratory Sample Number	DRO (mg/kg)	TRPH (mg/kg)	GRO (mg/kg)
FLSS2001	ND(12)	95RRFTA2001SS	49[a]	126	ND(2.0)
FLSS2014	32	95RRFTA2004SS	1000	170	1.9
FLSS2027	ND(12)	95RRFTA2005SS	42[a]	36	0.47[a]
FLSS2032	ND(11)	95RRFTA2006SS	35[a]	54	ND(2.0)
FLSS2036	ND(11)	95RRFTA2007SS	10[a]	24	0.22[a]
FLSS2047	ND(15)	95RRFTA2008SS	16[a]	28	0.32[a]
FLSS2052	ND(15)	95RRFTA2016SS	37[a]	110	ND(2.0)
FLSS2054	680	95RRFTA2017SS	87[a]	5400	380
FLSS2057	ND(13)	95RRFTA2018SS	47[a]	71	2.1[a]
FLSS2072	ND(12)	95RRFTA2019SS	6.8[a]	31	ND(2.0)
FLSS2078	ND(12)	95RRFTA2020SS	10[a]	41	0.21[a]
FLSS2084	ND(12)	95RRFTA2023SS	13[a]	42	0.64[a]
FLSS2087	ND(12)	95RRFTA2024SS	370	680	2.4
FLSS2088	1300	95RRFTA2025SS	3400	5000	1300
FLSS2094	15	95RRFTA2026SS	5.7[a]	14	NA

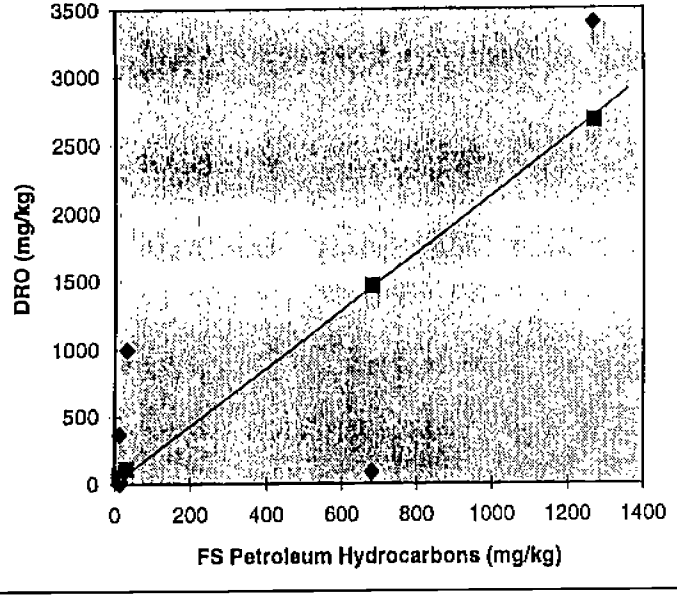
[a] The contaminant present does not appear to be typical diesel or gasoline product (Sound Analytical Services).

Key:

mg/kg = Milligrams per kilogram.
ND = Not detected.
NA = Not analyzed.
PH-D = Petroleum hydrocarbon quantitated as diesel.
TRPH = Total recoverable petroleum hydrocarbon.
DRO = Diesel-range organics.
GRO = Gasoline-range organics.

Table 3
Regression Statistics For
Field Screening Petroleum Hydrocarbons Data and Laboratory DRO Data

FS Petroleum Hydrocarbons (mg/kg)	DRO (mg/kg)	MATRIX
11.6	49	FILL SOIL
31.8	1000	FILL SOIL
11.5	42	FILL SOIL
10.9	35	FILL SOIL
10.9	10	FILL SOIL
14.5	16	FILL SOIL
14.5	37	FORMER SOIL SURFACE
681.7	87	FORMER SOIL SURFACE
13.1	47	FORMER SOIL SURFACE
11.7	6.8	FORMER SOIL SURFACE
11.7	10	FORMER SOIL SURFACE
12.2	13	FORMER SOIL SURFACE
12.2	370	FORMER SOIL SURFACE
1266.9	3400	FORMER SOIL SURFACE
14.8	5.7	FORMER SOIL SURFACE



Regression Statistics	
Multiple R	0.835038181
R Square	**0.697288764**
Adjusted R Square	0.674003285
Standard Error	505.1982879
Observations	15

	Coefficients
Intercept	46.84419593
FS Petroleum	2.077857775

Standard Error	t Stat
141.1462376	0.331884127
0.379710038	5.4722224

RESIDUAL OUTPUT

Observation	Predicted DRO (mg/kg)	Residuals
1	70.94734612	-21.9473
2	112.9200732	887.0799
3	70.73956034	-28.7396
4	69.49284568	-34.4928
5	69.49284568	-59.4928
6	76.97313367	-60.9731
7	76.97313367	-39.9731
8	1463.319841	-1376.32
9	74.06413278	-27.0641
10	71.1551319	-64.3551
11	71.1551319	-61.1551
12	72.19406079	-59.1941
13	72.19406079	297.8059
14	2679.282211	720.7178
15	77.596491	-71.8965

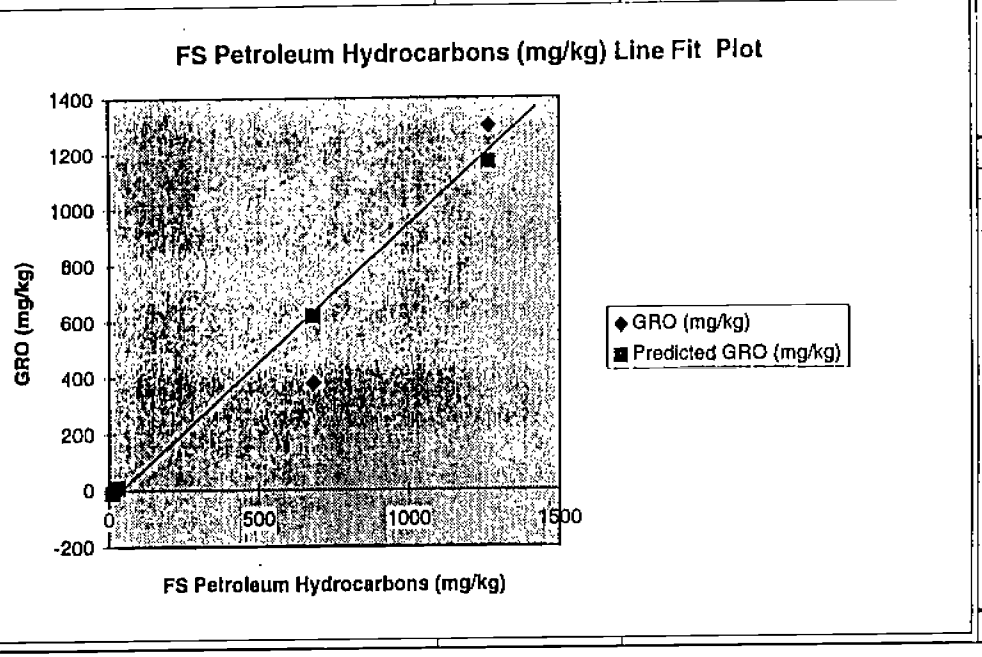
Key
DRO: Diesel range organics
R Square: Correlation coeffecient
t Stat: Students t statistic

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Ta ...

Regression Statistics For
Field Screening Petroleum Hydrocarbons Data and Laboratory GRO Data

FS Petroleum Hydrocarbons (mg/kg)	GRO (mg/kg)	MATRIX
11.6	2	FILL SOIL
31.8	1.9	FILL SOIL
11.5	0.47	FILL SOIL
10.9	2	FILL SOIL
10.9	0.22	FILL SOIL
14.5	0.32	FILL SOIL
14.5	2	FORMER SOIL SURFACE
681.7	380	FORMER SOIL SURFACE
13.1	2.1	FORMER SOIL SURFACE
11.7	2	FORMER SOIL SURFACE
11.7	0.21	FORMER SOIL SURFACE
12.2	0.64	FORMER SOIL SURFACE
12.2	2.4	FORMER SOIL SURFACE
1266.9	1300	FORMER SOIL SURFACE
14.8	Not Analyzed	FORMER SOIL SURFACE



Regression Statistics	
Multiple R	0.976462383
R Square	**0.953478786**
Adjusted R Square	0.949602018
Standard Error	79.46636536
Observations	14

	Coefficients
Intercept	-21.05658104
FS Petroleum	0.941306796

Standard Error	*t Stat*
23.09332472	-0.911803792
0.060022015	15.68269232

RESIDUAL OUTPUT

Observation	*Predicted GRO (mg/kg)*	*Residuals*
1	-10.13742221	12.13742
2	8.876975064	-6.97698
3	-10.23155289	10.70155
4	-10.79633697	12.79634
5	-10.79633697	11.01634
6	-7.407632505	7.727633
7	-7.407632505	9.407633
8	620.6322617	-240.632
9	-8.725462019	10.82546
10	-10.04329153	12.04329
11	-10.04329153	10.25329
12	-9.572638135	10.21264
13	-9.572638135	11.97264
14	1171.484999	128.515

KEY
GRO: Gasoline range organics
R Square: Correlation coefficient
t Stat: Students' t statistic

SUPPLEMENTAL QUALITY ASSURANCE REPORT:

DIOXIN AND FURAN ANALYSIS

Project: OU-A, Fort Richardson, AK
Laboratory: Triangle Laboratories, Inc.
Reviewer: M. Schwennesen
Date: March 18, 1996

ecology and environment, inc.
11 GOLDEN SHORE, LONG BEACH, CALIFORNIA 90802, TEL. (310) 435-6188
International Specialists in the Environment

recycled paper

Triangle Laboratories, Inc. (TLI) of Durham, North Carolina received six intact water samples from Applied Research and Development Laboratory Inc. (ARDL) on October 10, 1995 under proper chain of custody. The samples were collected by Ecology and Environment. Inc. on October 6, 1995 and received by ARDL on October 7, 1995. The samples were analyzed for polychlorinated dibenzo-*p*-dioxins and dibenzofurans (PCDDs and PCDFs) by high resolution chromatography/high resolution mass spectrometry by U.S. Environmental Protection Agency (EPA) Method 8290 (September 1994).

The sample identification numbers are:

Sample Number	Laboratory Tracking Number
95RRFTA-2001GW	9229-1
95RRFTA-2002GW	9229-2
95RRFTA-2004GW	9229-3
95RRFTA-2005GW	9229-4
95RRFTA-2006GW	9229-5
95RRFTA-2007GW	9229-6

Sample 95RRFTA-2007GW was incorrectly indicated as 95RRFTA-2009GW on the original sample chain of custody. The sample number was corrected on the original chain of custody on October 11, 1995 by ARDL personnel to reflect the sample number on the label, after the samples had already been forwarded to TLI.

The request for data review included all samples except 95RRFTA-2002GW; the raw data for this sample was therefore not reviewed.

The sample preparation and analysis for PCDDs/PCDFs were performed according to EPA Method 8290, using high resolution gas chromatography/high resolution mass spectrometry. The data were acquired by selected ion monitoring (SIM) of the groups of ion masses described in USEPA Method 8290.

All samples analyzed were found to contain low level (part per quadrillion) concentrations of some PCDDs/PCDFs. TLI submitted a case narrative for the analytical project, which suggested that all positive "hits" were a result of spike sample carry-over or could be discounted due to method blank contamination (for 2,3,4,6,7,8-HxCDF).

In the process of this data review, all analyte identification criteria specified in EPA 8290 Section 7.8.4 were reviewed for the subject samples. These identification criteria include: retention time or relative retention time check; ion abundance ratios; signal-to-noise ratios; polychlorinated diphenyl ether interferences; and peak integration accuracy. In addition to the above, the initial and continuing calibrations, detection limit calculations, and all sample tracking and extraction sheets were reviewed.

Results of the Review

In the process of the review, the reported analytical results for the five applicable samples were **verified both for identification and for quantification**, with the following qualifications:

- As per TLI's case narrative, concentrations detected in the samples could result from carry-over from previous spike analyses. It is not possible to confirm this presumption, although sample sequence and detected concentrations are indicative of such carry-over. TLI's decision not to confirm the sample concentrations or correct the carry-over problem indicates poor management of such a precise methodology. In the reviewer's opinion, any suspected carry-over problem should have been corrected prior to the analysis of further samples.

- All positive results are verified based on the initial calibration conducted on August 30, 1995 and the initial continuing calibration conducted on October 27, 1995. The post-analysis continuing calibration was requested from TLI on March 15, 1996, but was not received for review by the time of this report. Therefore, all confirmed "hits" are based on a successful closing continuing calibration which was not reviewed.

- The analyte 1,2,3,4,6,7,8-HpCDF in sample 9229-3 appears to have ether interference. The laboratory was contacted on March 15, 1996 regarding this potential misidentification, but no response has been received by the time of this report. Therefore, the concentration reported for this analyte should be considered a "maximum possible" concentration and should be listed as an EMPC.

Additional Observations:

Other than poor procedural techniques for dealing with possible analyte carry-over, the laboratory has correctly identified and quantified PCDDs/PCDFs in the samples. All analytes identified, however, were detected at concentrations well below the method detection limit, and, therefore, could be reported as <10 ppq (TCDD and TCDF); <50 ppq (OCDD and OCDF); or <25 ppq (all other analytes).

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM ROAD
TROUTDALE, OREGON 97060-9508

REPLY TO
ATTENTION OF:

February 16, 1996

Brad Ackman
Ecology and Environment, Inc.
840 K St., Suite 100
Anchorage, Alaska 99501

Dear Mr. Ackman:

Enclosed, completing all analyses requested to date, are reports of analytical data for the OUA (Phase II), Ft. Richardson project sampled by Ecology and Environment, Inc. from August 14 through October 1, 1995. Reference original report numbers 9159, 9172, 9173, 9178, 9189, 9193, 9208, 9209, 9211, 9214, 9215, 9216, 9218, 9221, 9226, and 9229 from Applied Research and Development (ARDL), Inc. Included are:

a. original Chemical Quality Assurance Report

b. original report numbers H-951589, H-951611, H-951637, H-951656, H-951739, H-951796, H-960007, H-960024, and H-960050 from U.S. Army Corps of Engineers North Pacific Division Laboratory (CENPD-ET-EN-L) with addenda

c. original report numbers 95.03378, 95.03415, 95.03482, 95.03555, 95.03675, 95.03720, 95.03813, 95.03832, 95.03862, 95.03895, and 95.03999 from National Environmental Testing (NET), Inc. with various addenda and amendments

d. original CENPD-ET-EN-L sample cooler receipt forms, cooler discrepancy notification forms and telephone records

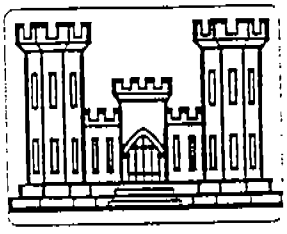
If you have any questions or comments concerning the Chemical Quality Assurance Report, please contact the author, Albert Hansen Jr., at (503)669-0246, or Pamela Hertzberg at (503)666-8143.

Sincerely,

Timothy J. Seeman

Timothy J. Seeman, Director
North Pacific Division Laboratory

Enclosures



U.S. Army Corps of Engineers
North Pacific Division Laboratory
Troutdale, Oregon

Chemical Quality Assurance Report

OUA (Phase II), Ft. Richardson

NPDL Work Order Number: 95-0501

Prepared for: **Alaska District**

For
Approved by: _____
PAMELA D. HERTZBERG, Chief
Project Management and Data Evaluation Branch

CENPD-ET-EN-L (95-0501) 16 Feb 96

CHEMICAL QUALITY ASSURANCE REPORT

OUA (PHASE II), FT. RICHARDSON

1. SUMMARY:

a. Delinquencies were noted on the sample cooler receipt forms. The nitrate and o-phosphate water samples were received at the laboratory after holding time expiration. The presence of 1,2-dichloropropane in the trip and rinsate blanks may indicate cross-contamination during sampling or sample shipment. The initial volatile organics data for sample 95RRSTL-1155SB are not valid as the sample was analyzed outside the 12 hour calibration window. The original semi-volatiles data for samples 95RRTSL-1154SB, -1155SB, and -1157SB is not valid due to a sample preparation error. The soil and/or water data of methylene chloride, acetone, and/or 2-butanone in most primary laboratory reports, di-n-butylphthalate and total recoverable petroleum hydrocarbons (TRPH) in two reports, and up to six selected dioxin/furan analytes in the Triangle Laboratory reports should be considered due to laboratory contamination. Insufficient volumes of water sample were submitted for matrix spike analysis in ARDL report 9226. Based on internal quality control (QC) failures, selected primary data should be considered as estimates. The field blind duplicate dioxin/furan data does not agree with each other for the majority of targeted analytes in Table IV-3. See section 6 of this report for details.

b. The primary and quality assurance (QA) data comparisons are presented in Tables III through XVII. All data agree with each other with the following exceptions. Their were two dioxin/furan, two diesel range organics (DRO), and two TRPH table discrepancies throughout the 15 sets of tables. In addition there were four total organic carbon (TOC) and four single analyte total metals discrepancies. See section 8 of this report and the specific table summaries for details.

2. **BACKGROUND:** The samples were collected on August 14 through October 1, 1995, and received by the analytical laboratories on August 23 through October 12, 1995.

3. OBJECTIVES:

a. Eighty-five soil, including 12 as blind duplicates, 16 water samples, including three as blind duplicates, six trip blank, and six rinsate blank samples were collected from various locations to determine the extent of the chemical contamination on the site.

b. Eleven QA soil, three water and three trip blank samples were submitted to evaluate the primary laboratories' data. It was noted that no rinsate blank samples were submitted for QA purposes.

4. PROJECT ORGANIZATION:

a. The samples were collected by Ecology and Environment (E&E), Inc., Anchorage, Alaska.

b. The primary samples were analyzed by Applied Research & Development Laboratory (ARDL), Inc., Mt. Vernon, Illinois. The analysis of dioxins and furans by EPA method 8290 was subcontracted to Triangle Laboratories, Inc. (TLI), Durham, North Carolina.

c. The QA samples were analyzed by U.S. Army Corps of Engineers (USACE) North Pacific Division Laboratory (CENPD-ET-EN-L), Troutdale, Oregon and National Environmental Testing (NET), Inc., Santa Rosa, California. The analysis of dioxins and furans by EPA method 8290 was subcontracted to Alta Analytical Laboratory (Alta), Inc., El Dorado Hills, California. The analysis of polynuclear aromatic hydrocarbons by EPA method 8310 was subcontracted to BC Laboratories, Inc., Bakersfield, California.

5. ANALYTICAL REFERENCES:

Number	Title	Date
SW-846, Third Edition	Test Methods for Evaluating Solid Waste - Final Update II	1/95
GRO & DRO	State of Alaska Interim TPH Methods	2/92
EPA 600/4-79-020	Methods for Chemical Analysis of Water and Wastes	3/83
SM 2340B	Standard Methods of the Examination of Water and Wastewater, 18th Edition - Total Hardness by Calculation	1992

6. EVALUATION OF THE PRIMARY LABORATORIES' DATA:

a. Chain of Custody Records and Sample Cooler Receipt Forms: All chain of custody (COC) records and sample shipping conditions, as documented on the sample cooler receipt (SCR) form, met EPA or U.S. Army Corps of Engineers (USACE) ER 1110-1-263 regulations with the following exceptions and/or notations.

- **ARDL report 9172:** Air bubbles (headspace) in 2 of 3 rinsate VOC containers for sample 95POLLDW-3003WA.

- **ARDL report 9173:** The condition of one of two sample shipments was noted as received "very wet". Any related problems due to the wetness of the containers was not indicated.

- **ARDL report 9189:** BNA soil sample had a cracked lid upon receipt. TLI report numbers 34007A and B were submitted under ARDL report 9189. TLI recorded a cooler temperature of 12.0 degrees Celsius (°C) which is outside the EPA requirements of 4 ± 2 °C. Rinsate sample 95RRFTA-2002GW and soil samples 95RRFTA-2173SB, -2174SB, and -2182SB were in the shipment.

- **ARDL report 9193:** TLI report number 34055 was submitted under ARDL report 9193.

- **ARDL report 9208:** TLI report number 34159 was submitted under ARDL report 9208.

- **ARDL report 9209:** ARDL did not complete the last nine items of the SCR form concerning sample condition. The four samples in this particular shipment are 95RRSTL-1148SB through -1151SB.

- **ARDL report 9211:** TOC container for sample 95RRTSL-1157SB did not have a label.

- **ARDL report 9216:** TLI report number 34264 was submitted under ARDL report 9216.

- **ARDL report 9218:** ARDL noted that the sulfide, cation. total and dissolved metals sample containers were not properly preserved. At the request of the North Pacific Division Laboratory (NPDL), ARDL adjusted the preservation of the water samples (see CENPD-ET-EN-L telephone records, dated 28 Sep 95 and 3 Oct 95). Headspace was noted in a few VOC/GRO sample containers.

- **ARDL report 9221:** ARDL adjusted the preservation of the sulfide water samples. Headspace was noted in a few VOC/GRO sample containers.

- **ARDL report 9226:** The contractor contacted NPDL on 3 Oct 95 to confirm the fact that all of the water dioxin samples (but not the rinsates) had been preserved with sodium hydroxide (NaOH) which was contrary to the method. The contractor stated that all

affected samples would be re-collected. Water samples 95RRFTA-2001GW and -2002GW of report 9221 and 95RRFTA-2004GW, -2005GW, -2006GW and -2007GW of report 9226 were affected by the sample preservation error. NPDL contacted ARDL and directed that all water samples submitted for dioxin analysis be discarded (see CENPD-ET-EN-L telephone record, dated 3 Oct 95). The nitrate+nitrite/phosphorus sample container for 95POLLDW-3007GW and the sulfide container for 95RRFTA-2005GW were found open and empty upon receipt with the contents lost. Selected sulfide water samples had pH values below the requirement of 9. It was not clear if ARDL adjusted the preservation of the samples. Headspace was noted in a few VOC/GRO sample containers.

- **ARDL report 9229:** The dioxin sample container labeled 95RRFTA-2007GW was identified on the COC record as -2009GW. Per NPDL, the sample was identified as 95RRFTA -2007GW. TLI report number 34493 was submitted under ARDL report 9229. TLI recorded on their SCR form a cooler temperature of 9.0 °C which is outside the EPA requirements of 4 ± 2 °C.

b. Trip Blank Results: The trip blank results are presented in Table I-a through I-d. Methylene chloride in three out of six primary trip blanks should be considered due to laboratory contamination. The presence of 2-butanone, below the reporting limit in Table I-b, is possibly due to contaminated deionized water and was not detected in any associated samples. The presence of toluene in three of six primary trip blanks is probably due to contaminated deionized water as it was detected at similar levels in the associated rinsates but not found in the associated samples. The presence of 1,2-dichloropropane in one of six trip blanks (Table I-c) may indicate cross-contamination during sampling or sample shipment as up to 16 ppb of 1,2-dichloropropane was detected throughout the ten associated groundwater samples. With the exception of methylene chloride and 1,2-dichloropropane, the VOC data quality was not adversely affected by this contamination.

c. Rinsate Blank Results: The rinsate blank results are presented in Table II-a and II-b.

1. Volatile Organic Compounds (VOC): The presence of methylene chloride is considered due to laboratory contamination. The presence of toluene is probably due to contaminated deionized water as it was detected at the similar levels in the associated trip blanks but not in the associated water samples. The presence of 1,2-dichloropropane in Table II-b may indicate incidental field cross-contamination during sampling as up to 16 ppb of 1,2-dichloropropane was detected throughout the ten groundwater samples. With the exception of

methylene chloride and 1,2-dichloropropane, the VOC data quality was not adversely affected by this contamination.

2. Total and Dissolved Metals: The presence of lead, zinc and cobalt near the reporting limit in selected rinsate blanks should not be considered attributable to incidental field cross-contamination. The absence of all other remaining metals indicate that incidental field cross-contamination did not occur during sampling.

3. Inorganics: The presence of total alkalinity, chloride, total phosphorus, and total dissolved solids in selected rinsate blanks near the reporting limit should not be considered attributable to incidental field cross-contamination but may be due to contaminated deionized water used to prepare the rinsate sample(s). The absence of all other remaining analytes indicate that incidental field cross-contamination did not occur during sampling.

d. Sample Holding Times, Reporting Limits, Laboratory Method Blanks, Accuracy, and Precision: Sample holding times and detection/reporting limits were evaluated per EPA or State of Alaska Department of Environmental Conservation (ADEC) method criteria. The laboratory method blanks were evaluated for the absence of targeted analytes. The extraction efficiency, accuracy and precision of the data, as represented by surrogate, matrix spike (MS), matrix spike duplicate (MSD), blank spike (BS) and laboratory control (LC) recoveries and relative percent difference (RPD) results, were compared to EPA, ADEC, or laboratory established (LE) quality control (QC) acceptance limits for out of control results. All of the above mentioned internal QC data met EPA, ADEC or LE method criteria and are acceptable with the following exceptions and/or notations.

1. VOC:

a. Soil Samples: VOC soil sample 95RRSTL-1155SB in ARDL report 9211 was analyzed outside the method specified 12 hour calibration window. Per method criteria, the original VOC results are not valid. The re-analysis of VOC soil sample 95RRSTL-1155SB was past the required holding time. The VOC data of this particular analysis should be considered as estimates. At the request of NPDL the laboratory submitted the re-analyzed VOC results for this sample on 9 Feb 96. The laboratory noted sample foaming during purging as a problem in the low level analysis of selected VOC soil samples. A majority of these samples were either analyzed by direct purge-n-trap at a 1:5 dilution (low level method) or they were extracted in methanol then analyzed (medium level method). The following samples were analyzed at a 1:5 dilution: 95POLLDW-3123SB, -3124SB, -3130SB, -3132SB, -3137SB (ARDL report 9178). These samples were analyzed by the medium level method: 95POLLDW-3096SB, -3098SB, -3100SB

(ARDL report 9159); -3108SB (ARDL report 9172); -3104SB, -3105SB, -3106SB, (ARDL report 9173); -3134SB and -3135SB (ARDL report 9178); 95RRTSL-1153SB (ARDL report 9211). Because the concentration of acetone exceeded the linear calibration range, samples 95RRFTA-2186SB and -2188SB were re-analyzed at a 5-fold dilution. These analyses were within holding time constraints and are acceptable. Methylene chloride, acetone, and/or 2-butanone were detected in many of the low level and medium level VOC method blanks throughout most ARDL reports. The VOC data of these analytes in the associated sample batches (where qualified by the laboratory with a "B" flag) should be considered due to laboratory contamination, as the associated sample results are less than ten times the level of method blank contamination when dilution factors are taken into account. Naphthalene and 2-hexanone were detected in a few soil VOC method blanks but were not detected in any associated soil samples so the VOC data quality was not adversely affected by this laboratory contamination. One out of five MS/MSD RPD results in ARDL report 9208 and one out of five referenced in ARDL report 9209 and 9211 was above the EPA QC limit. The precision of the associated soil VOC data are acceptable based on the remaining acceptable RPD results.

b. Water Samples: Sample holding times and reporting limits met method criteria. Up to 8 ppb of methylene chloride was detected in the water VOC method blanks of ARDL reports 9172, 9189, 9211, 9218, 9221, and 9226. The VOC data of methylene chloride in the associated sample batches (where qualified by the laboratory with a "B" flag) should be considered due to laboratory contamination, as the associated sample results are less than ten times the level of method blank contamination. Acetone, at 35 ppb, was detected the VOC method blank of ARDL report 9218 but was not detected in any associated water samples so the VOC data quality was not adversely affected by this laboratory contamination.

c. TCLP Samples: Sample holding times and reporting limits for the soil samples (ARDL reports 9214, 9215, and 9216) met method criteria. The associated internal QC results met acceptance limits and the data quality for these samples are acceptable.

2. Semi-volatile Organic Compounds (BNA):

a. Soil Samples: Sample holding times and reporting limits met method criteria. Because of a sample preparation error, surrogate compounds were not added to the soil samples of ARDL report 9211 and spike analytes were not added to the MS and MSD samples. The laboratory re-extracted all of the soil samples and associated QC samples five days past the maximum holding time. Based on holding time expiration, the BNA data for re-extracted samples 95RRTSL-1154SB, -1155SB, and -1157SB should be considered as estimates. The original BNA data for these samples is not valid due to the sample preparation error. Di-n-butylphthalate, at 200

ppb, was detected the BNA soil method blank referenced in ARDL reports 9208 and 9209. The BNA data of di-n-butylphthalate in the associated sample batches (where qualified by the laboratory with a "B" flag) should be considered due to laboratory contamination, as the associated sample results are less than ten times the level of method blank contamination.

b. Water Samples: Sample holding times and reporting limits met method criteria. The laboratory stated in the case narrative of ARDL reports 9172, 9189, and 9211 that an insufficient volume of water sample was submitted for matrix spike analysis. Since the water BNA samples of these reports only contained rinsate blank samples, the data quality was not adversely affected by the lack of matrix spike analyses. The laboratory stated in the case narrative of ARDL report 9226 that an insufficient volume of water sample was submitted for matrix spike analysis. The matrix effect on the accuracy of the associated BNA data could not be completely evaluated.

3. Polychlorinated Dioxins and Furans (Dioxin/Furan):

a. Soil Samples: Sample holding times and reporting limits for the soil samples (TLI report 34007B submitted under ARDL report 9189, TLI report 34055 in ARDL report 9193, and TLI report 34264 in ARDL report 9216) met method criteria. Four dioxin/furan analytes (OCDD, 2,3,4,6,7,8-HxCDF, total TCDD, and total HxCDF) at 0.22, 0.42, 0.14 and 0.42 ppt, respectively, were detected in the TLI method blank of ARDL report 9193. The dioxin/furan data of these analytes (with the exception of OCDD) in associated samples 95RRFTA-2187SB, -2192SB, -2193SB, -2196SB, -2201SB, and -2202SB should be considered due to laboratory contamination as the sample results are less than five times the level in the method blank. The OCDD data for samples -2192SB, -2193SB, -2196SB, -2201SB and -2202SB was greater than five times but less than 20 times the level in the method blank and per TLI laboratory's internal QC criteria, these data should be considered as estimates. The OCDD data for sample -2187SB was greater than 20 times the level in the method blank and are acceptable. OCDD, at 0.68 ppt, was detected in the TLI method blank of ARDL report 9208. The OCDD data for samples 95RRFTA-2208SB and -2209SB should be considered estimates as the results are greater than five times but less than 20 times the level in the method blank. Six dioxin/furan analytes (OCDD, 1,2,3,4,6,7,8-HpCDD, 2,3,4,6,7,8-HxCDF, total TCDD, total HpCDD, and total HxCDF) at 0.95, 0.13, 0.39, 0.13, 0.31, and 0.39 ppt, respectively, were detected in the TLI method blank of ARDL report 9216. The dioxin/furan data of these analytes in the associated sample (95RRFTA-004SP) should be considered due to laboratory contamination as the sample results are less than five times the level in the method blank. The laboratory qualified two PeCDF internal standards in sample 95RRFTA-2193SB as overestimates because of matrix interference. Consequently, the furan data of 1,2,3,7,8-PeCDF and 2,3,4,7,8-PeCDF for this sample should be considered underestimated with the likelihood of false negative results. The remaining associated internal QC results met acceptance

limits and the data quality for these samples are acceptable with the above mentioned qualifications.

b. Water Samples: Sample holding times and reporting limits for the water samples (TLI report 34007A submitted under ARDL report 9189 and TLI report 34493 in ARDL report 9229) met method criteria. 2,3,4,6,7,8-HxCDF at 2.9 ppq and total PeCDF at 2.9 ppq were detected in the TLI method blank of ARDL report 9229. The dioxin/furan data of these analytes in associated samples 95RRFTA-2001GW, -2002GW, -2004GW, -2005GW, -2006GW, and -2007GW should be considered due to laboratory contamination except for the total PeCDF datum of sample -2002GW which was greater than five times but less than 20 times the level in the method blank. Per the laboratory's internal QC criteria, this datum should be considered as an estimate. The associated internal QC results met acceptance limits and the data quality for these samples are acceptable with the above mentioned qualifications.

4. Polynuclear Aromatic Hydrocarbons (PAH): Sample holding times and reporting limits for the water samples met method criteria. The surrogate recovery for PAH sample 95POLLDW-3005GW (ARDL report 9226) was below the LE QC limit. Consequently, targeted PAH analytes may not have been detected, if present, at low concentrations in the sample. One out of 32 MS/MSD recoveries in ARDL report 9226 was above the EPA QC limit. The accuracy of the data are acceptable based on the remaining acceptable MS/MSD and LC recoveries. The RPD results for this particular batch ranged from 6 to 27 and are acceptable. The water PAH RPD results referenced in ARDL reports 9218 and 9221 ranged from 48 to 132. These apparently high RPD results indicate a poor precision between the MS and MSD recoveries. As targeted PAH analytes were not detected in any of the associated samples, the precision of the PAH data was not adversely affected by the RPD results and the accuracy of the data are acceptable based on acceptable sample specific surrogate recoveries, acceptable MS/MSD and LC recoveries.

5. Polychlorinated Biphenyls (PCB): Sample holding times and reporting limits for the soil and water samples (ARDL reports 9209, 9211, 9214, 9218, and 9221) met method criteria. The associated internal QC results met acceptance limits and the data quality for these samples are acceptable. The laboratory stated in the case narrative of ARDL report 9211 that an insufficient volume of water sample was submitted for matrix spike analysis. Since the water PCB sample of this report only contained a rinsate blank sample, the data quality was not adversely affected by the lack of matrix spike analyses.

6. Gasoline Range Organics (GRO): Sample holding times and reporting limits for the soil and water samples met method criteria. One out of two soil MS/MSD recoveries in ARDL report 9193 was slightly below the LE QC limits of 76 to 119%. The accuracy of the associated

GRO data are acceptable based on acceptable sample specific surrogate recoveries, remaining acceptable MS and acceptable LC/LCD recoveries.

7. Diesel Range Organics (DRO):

a. Soil Samples: Sample holding times and reporting limits met method criteria. One out of two soil MS/MSD recoveries in ARDL report 9173 was below the LE QC limits of 48 to 144% because of laboratory noted matrix interference. The associated RPD result was above LE QC limit due to the out of control spike recovery. The accuracy and precision of the associated data are acceptable based on acceptable sample specific surrogate recoveries, remaining acceptable MS and acceptable LC/LCD recoveries. One out of two soil RPD results referenced in ARDL reports 9211, 9214, 9215, and 9216 was slightly above the ADEC QC limit of 20. The precision of the associated data are acceptable based on the remaining acceptable RPD result.

b. Water Samples: Sample holding times and reporting limits met method criteria. The laboratory stated in the case narratives of ARDL reports 9172, 9189, and 9211 that an insufficient volume of water sample was submitted for matrix spike analysis. Since the water DRO samples of these reports only contained rinsate blank samples, the data quality was not adversely affected by the lack of matrix spike analyses. The laboratory stated in the case narrative of ARDL report 9226 that an insufficient volume of water sample was submitted for matrix spike analysis. The matrix effect on the accuracy of the associated DRO data could not be completely evaluated.

8. Total Recoverable Petroleum Hydrocarbons (TRPH):

a. Soil Samples: The extraction holding time for eight TRPH samples of ARDL report 9178 (95POLLDW-3121SB through -3128SB) was exceeded by one day. Based on holding time expiration, the TRPH data of these samples should be considered as estimates. TRPH at 18.7 ppm was detected in the method blank of ARDL report 9159. The TRPH results for associated samples 95POLLDW-3096SB, -3097SB, -3098SB, -3099SB, -3100SB, -3101SB, and -3102SB should be considered due to laboratory contamination as the results were within five times the level in the method blank. The TRPH datum for sample 95POLLDW-3096SB should be considered as an estimate as the result was greater than five but less than 20 times the level in the method blank. TRPH at 14.3 ppm was detected in the method blank of ARDL report 9173. The TRPH results for associated samples 95POLLDW-3106SB, -3107SB, and -3114SB should be considered due to laboratory contamination, the TRPH data for samples 95POLLDW-3104SB and -3105SB should be considered estimates (as defined above). Since TRPH was not detected in sample -3116SB the data quality was not adversely affected by the laboratory contamination. One out of two MS/MSD recoveries in ARDL report 9193 was marginally below the LE QC limits of 80 to 120%. The

accuracy of the associated data are acceptable based on the remaining acceptable MS and LC recoveries.

b. Water Samples: The maximum recommended holding time, in parentheses, for TRPH (28 days) was exceeded for the following samples:

ARDL report 9218: Three days for samples 95RRTSL-1001GW, -1002GW, and -1005WA; 2 days for 95RRFTA-2004WA.

ARDL report 9221: One day for samples 95RRFTA-2001GW, -2002GW, 95RRTSL-1004GW and -1005GW.

ARDL report 9226: Three days for samples 95POLLDW-3001GW, -3002GW, and -3005WA; 1 day for samples 95RRFTA-2004GW, -2005GW, -2006GW, -2007GW, 95POLLDW-3004GW, -3005GW, -3006GW, and -3007GW.

Based on holding time expiration, the TRPH data of these samples should be considered as estimates. The laboratory stated in the case narratives of ARDL reports 9172, 9189, and 9211 that an insufficient volume of water sample was submitted for matrix spike analysis. Since the water TRPH samples of these reports only contained rinsate blank samples, the data quality was not adversely affected by the lack of matrix spike analyses. One out of two MS/MSD recoveries in ARDL report 9218 was marginally above the LE QC limits of 80 to 120%. The accuracy of the associated data are acceptable based on the remaining acceptable MS and LC recoveries. The laboratory stated in the case narrative of ARDL report 9226 that an insufficient volume of water sample was submitted for matrix spike analysis. The matrix effect on the accuracy of the associated TRPH data could not be evaluated. The BS BSD and LCS recoveries in ARDL report 9226 were above the LE QC limits. These results indicate a high bias exists in the associated sample batch. Since TRPH was not detected in any of the eleven associated samples, the data quality was not adversely affected by the high spike recoveries.

9. Total Organic Carbon (TOC): Sample holding times and reporting limits met method criteria. TOC, at 11.1 ppm, was detected in the soil method blanks referenced in ARDL reports 9172, 9173 and 9178. TOC, at 10.6 ppm, was detected in the soil TOC method blanks referenced in ARDL reports 9193 and 9208. Since the associated TOC results of these reports were greater than 20 times the level in the method blank, the data quality was not adversely affected by the laboratory contamination.

10. Total Metals:

a. Soil Samples: Calcium, at 33.8 ppm, was detected in the soil method blank in ARDL report 9189. Iron, at 5.8 ppm, was detected in the soil method blank in ARDL report 9193. Since the associated calcium and iron results were greater than 20 times the level in the method blank, the data quality of the associated samples was not adversely affected by the laboratory contamination. The soil MS and MSD recoveries of aluminum, iron, and manganese in all of the ARDL reports were either not calculable or outside EPA QC limits but should not be considered significant for the purpose of data evaluation as the original sample results were greater than four times the spike amount. The accuracy and precision of the data are acceptable based on acceptable BS recoveries and laboratory duplicate RPD results. The MS and MSD recoveries for the following analytes were below EPA QC limits in their respective reports: antimony and silver in ARDL reports 9159 and 9172; antimony in reports 9173 and 9178; antimony and arsenic in report 9189; antimony in reports 9193, 9208, 9209, and 9211. Based on the low spike recoveries, the data of antimony, silver and/or arsenic should be considered low estimates when detected and low concentrations may not have been detected, if present, in the remaining samples. One out of two MS/MSD recoveries for the following analytes was outside EPA QC limits in the respective reports: arsenic and chromium in ARDL report 9172; arsenic and mercury in report 9173; arsenic in report 9178; arsenic, chromium, selenium and vanadium in report 9208; chromium in report 9209; arsenic and chromium in report 9211. The accuracy of the associated data are acceptable based on the remaining acceptable MS and LC recoveries. The laboratory duplicate results met EPA RPD acceptance limits of 35 except for the calcium and manganese data of report 9211. The calcium and manganese data of this report should be considered as estimates. The laboratory qualified a few RPD results as outside of QC limits in selected reports. As the sample results used to calculate the RPD result were within a factor of five to the analytes reporting limit, the RPD results should not be considered significant for the purpose of data evaluation.

b. Water Samples: One out of two total lead MS/MSD recoveries in ARDL report 9221 was slightly below the EPA QC limit. The accuracy of the associated data are acceptable based on the remaining acceptable MS and LC recoveries. The remaining associated internal QC results met acceptance limits and the data quality for the water samples are acceptable.

c. TCLP Samples: Zinc, at 0.0082 ppb, was detected in the TCLP method blank referenced in ARDL reports 9214, 9215, and 9216. Since the associated zinc results were greater than 20 times the level in the method blank, the data quality of the associated samples was not adversely affected by the laboratory contamination. The TCLP MS and MSD recoveries of manganese in ARDL reports 9214, 9215, and 9216 were outside EPA QC limits but should not be considered significant for the purpose of data evaluation as the original sample results were greater

than four times the spike amount. The accuracy and precision of the data are acceptable based on acceptable BS recoveries and laboratory duplicate RPD results.

11. Inorganic Parameters: The maximum recommended holding time, in parentheses, for nitrate (2 days), ortho-phosphate (2 days), total sulfide (7 days), total dissolved solids (TDS) (7 days), total suspended solids (TSS) (7days) was exceeded for the following samples. Based on holding time expiration, the associated data listed below should be considered as estimates.

- **ARDL report 9218:** Nitrate and ortho-phosphate (2 days), total sulfide (3 days), TDS and TSS (2 days) for samples 95RRTSL-1001GW, -1002GW, and -1005WA; nitrate and ortho-phosphate (1 day), total sulfide (2 days), TDS and TSS (1 day) for sample 95RRFTA-2004WA. It was noted that the nitrate and o-phosphate samples were received at the laboratory after holding time expiration.

- **ARDL report 9221:** Nitrate and ortho-phosphate (1 day), total sulfide (1 day), TSS (2 days) for samples 95RRFTA-2001GW, -2002GW, 95RRTSL-1004GW and -1005GW; TDS (2 days) for samples 95RRFTA-2001GW, 95RRTSL-1004GW and -1005GW; TDS 5 days for 95RRFTA-2002GW. It was noted that the nitrate and o-phosphate samples were received at the laboratory after holding time expiration.

- **ARDL report 9226:** Nitrate and ortho-phosphate (15 days) for samples 95POLLDW-3001GW, -3002GW; 18 days for -3005WA; 13 days for samples 95RRFTA-2004GW, -2005GW, -2006GW, -2007GW, 95POLLDW-3004GW, -3005GW, -3006GW, and -3007GW. TDS was 1 day past for sample 95POLLDW-3007GW. It was noted that the nitrate and o-phosphate samples were received at the laboratory after holding time expiration.

All of the associated internal QC results met acceptance limits and the respective data quality is acceptable with the following exceptions. The MS and MSD recoveries of total sulfide in ARDL reports 9218, 9221, and 9226 were above the EPA QC limits of 75 to 125%. The LC recovery was within QC limits, indicating possible matrix interference. Since total sulfide was not detected in any of the associated water samples, the data quality was not adversely affected by the high spike recoveries.

e. Field Blind Duplicate Results: The field blind duplicate results are presented in Tables III through XVII. All data agree with each other with the following exception.

- The field blind duplicate dioxin/furan data does not agree with each other for the majority of targeted analytes in Table IV-3. Since the laboratory had acceptable internal QC data, the discrepancies could not be analytically resolved. It was noted that the MS and MSD samples were analyzed immediately prior to primary sample 95RRFTA-2002GW and the positive results for this sample may indicate possible cross-contamination during analysis. The QA laboratory's sample results agree with primary sample -2001GW but not -2002GW. The primary results for sample 95RRFTA-2001GW are accepted based on QA data agreement.

f. Overall Evaluation of the Primary Laboratories' Data: Delinquencies (headspace in selected volatiles containers, a cracked lid, an incomplete SCR form, a missing sample label, improper sulfide and dioxin sample preservation, two sample containers received empty) were noted on the SCR forms. Two dioxin sample shipments had high cooler temperatures and the nitrate and o-phosphate water samples were received at the laboratory after holding time expiration. Methylene chloride in the trip and rinsate blank samples should be considered due to laboratory contamination. The presence of 2-butanone and toluene are possibly due to contaminated deionized water. The presence of 1,2-dichloropropane in the trip and rinsate blanks may indicate cross-contamination during sample shipment and/or sampling as up to 16 ppb of 1,2-dichloropropane was detected throughout the ten associated groundwater samples. The presence of lead, zinc, cobalt, total alkalinity, chloride, total phosphorus, and total dissolved solids near the reporting limit in selected rinsate blanks should not be considered attributable to incidental field cross-contamination. The field blind duplicate dioxin/furan data does not agree with each other for the majority of targeted analytes in Table IV-3.

1. VOC: The initial VOC results for soil sample 95RRSTL-1155SB are not valid as the sample was analyzed outside the 12 hour calibration window. The re-analysis of the soil sample was past the required holding time and the data are estimates. Because of sample foaming during purging 15 selected VOC soil samples were either analyzed by direct purge-n-trap at a 1:5 dilution or were methanol extracted prior to analysis. The soil and/or water volatiles data of methylene chloride, acetone, and/or 2-butanone throughout most ARDL reports, where qualified by the laboratory with a "B" flag, should be considered due to laboratory contamination.

2. BNA: Because of a sample preparation error, the laboratory re-extracted the BNA soil samples of ARDL report 9211 five days past holding time. The BNA data for re-extracted samples 95RRTSL-1154SB, -1155SB, and -1157SB should be considered as estimates. The original BNA data for these samples is not valid due to the sample preparation error. The data of di-n-butylphthalate in ARDL reports 9208 and 9209, where qualified by the laboratory with a "B" flag, should be considered due to laboratory contamination. The laboratory case narrative of ARDL

report 9226 that an insufficient volume of water sample was submitted for matrix spike analysis. The matrix effect on the accuracy of the associated water BNA data could not be completely evaluated.

3. Dioxin/Furan: The dioxin/furan data of four soil analytes in ARDL report 9193, one in report 9208, six in report 9216, and two water analytes in report 9226 should be considered due to laboratory contamination or as estimates due to their presence in the method blanks and at various concentrations in the associated samples. In spite of OCDD in the associated method blank, the OCDD data for sample 95RRFTA-2187SB are acceptable. The laboratory qualified two PeCDF internal standards in sample as overestimates because of matrix interference. The furan data of 1,2,3,7,8-PeCDF and 2,3,4,7,8-PeCDF for sample 95RRFTA-2193SB should be considered underestimated with the likelihood of false negative results.

4. PAH: Based on a low surrogate recovery, targeted PAH analytes may not have been detected, if present, at low concentrations in water sample 95POLLDW-3005GW.

5. PCB, GRO, DRO, and TOC: All internal QC data either met acceptance limits or upon evaluation it was determined that the data quality was not adversely affected by out of control QC results. The case narrative of ARDL report 9226 stated that an insufficient volume of water sample was submitted for matrix spike analysis. The matrix effect on the accuracy of the associated DRO data could not be completely evaluated.

6. TRPH: Because of holding time expiration, the soil TRPH data of ARDL report 9178 and the water data of reports 9218, 9221, and 9226 should be considered as estimates. Selected soil TRPH results of ARDL reports 9159 and 9173 should be considered either due to laboratory contamination or should be considered as estimates. The case narrative of ARDL report 9226 stated that an insufficient volume of water sample was submitted for matrix spike analysis. The matrix effect on the accuracy of the associated water TRPH data could not be evaluated.

7. Metals: Based on low matrix spike recoveries, the soil antimony, silver, and/or arsenic data in nine, two, and one reports, respectively, should be considered low estimates when detected and low concentrations may not have been detected, if present, in the remaining samples. Due to poor precision, the calcium and manganese data of ARDL report 9211 should be considered as estimates. All internal QC data for the water and TCLP samples either met acceptance limits or upon evaluation was determined to be acceptable and the associated data quality are acceptable.

8. Inorganic Parameters: Because of holding time expiration, the nitrate, ortho-phosphate, total sulfide, TDS, and TSS data of ARDL reports 9218 and 9221 and the nitrate and ortho-

phosphate data of report 9226 should be considered as estimates. All other internal QC data either met acceptance limits or upon evaluation it was determined that the data quality was not adversely affected by out of control QC results.

7. **EVALUATION OF THE QA LABORATORIES' DATA:** NET, Inc. performed the GRO, TRPH, TOC, total metals, dissolved metals and inorganic analyses. BC Laboratories performed the PAH analysis and Alta Analytical Laboratory the Dioxin/Furan analysis. CENPD-ET-EN-L performed the VOC, BNA, Pest/PCB and DRO analyses.

a. COC Records and SCR Forms: All COC records and sample shipping conditions, as documented on the SCR form, met EPA or USACE ER1110-1-263 requirements with the following exceptions and/or notations.

1. NPDL SCR Forms:

- **CENPD-ET-EN-L report H-951589:** A cooler temperature of 1.3 °C was recorded on the SCR form. It was noted that the samples arrived in good condition.

- **CENPD-ET-EN-L report H-951611:** A COC record (original or copy) was not submitted with samples 95POLLDW-3129SB and -3133SB. It was located with the QA samples sent by the contractor directly to NET laboratory (see NET report 95.03415).

- **CENPD-ET-EN-L report H-951656:** Sample containers not individually packaged. One 4 oz. sample container instead of the required 8oz. was submitted the dioxin/furan analysis of samples 95RRFTA-2194SB and -2203SB.

- **CENPD-ET-EN-L report H-960007:** NPDL noted that the sample collection date (9-22-95) recorded on the sample label of PAH sample 95RRTSL-1003GW did not match the COC record date of 9-25-95. The pH of sulfide sample 95RRSTL-1003GW was low and NPDL added NaOH to achieve proper preservation. One out of three GRO sample containers for -1003GW was received broken.

- **CENPD-ET-EN-L report H-960024:** NPDL noted that the sample collection date (9-26-95) recorded on the sample labels of most 95RRFTA-2003GW samples did not match the COC record date of 9-27-95. Headspace was noted in 1 out of 3 VOC sample containers

for 95RRFTA-2003GW. The pH of sulfide sample -2003GW was low. See NET report 95.03832 for details.

2. NET, Alta Analytical, and BC Laboratories SCR Forms:

- **NET report 95.03415:** The contractor apparently submitted QA samples 95POLLDW-3129SB and -3133SB of cooler #108 directly to NET laboratory. The original COC record for these samples was located in this report.

- **NET report 95.03482:** A cooler temperature of 0 °C was recorded on the SCR form. It was noted that the samples arrived in good condition.

- **NET report 95.03555:** A cooler temperature of 15 °C was recorded on the SCR form of Alta report 1695 submitted under this NET report. Dioxin/furan samples 95RRFTA-2194SB and -2203SB were in this Alta shipment.

- **NET report 95.03675:** A cooler temperature of 1 °C was recorded on the SCR form. It was noted that the samples arrived in good condition.

- **NET report 95.03813:** NET noted on the SCR form that nitrate sample 95RRTSL-1003GW was received past holding time; samples were analyzed per NPDL instruction. The BC Laboratories SCR form submitted under this NET report noted that 1 out of 3 PAH sample containers for sample 95RRTSL-1003GW was received broken.

- **NET report 95.03832:** The pH of sulfide sample 95RRFTA-2003GW was low and NET added NaOH to achieve proper preservation. NET noted on the SCR form that the nitrate sample -2003GW was received past holding time; samples were analyzed per NPDL instruction.

- **NET report 95.03862:** A cooler temperature of 1 °C was recorded on the SCR form. It was noted that the samples arrived in good condition. The dioxin/furan sample labels (95RRFTA-2003GW) indicated that NaOH was a preservative. A check of the samples pH by the laboratory indicated no preservative was used. A cooler temperature of 0 °C was recorded on the SCR form of Alta report 1781 submitted under this NET report. Dioxin/furan sample 95RRFTA-2003GW, collected 9-27-95, was in this Alta shipment.

- **NET report 95.03999:** A cooler temperature of 0 °C was recorded on the SCR form of Alta report 1812 submitted under this NET report. Dioxin/furan sample 95RRFTA-2003GW which was re-collected on 10-6-95 was in this Alta shipment.

b. Trip Blank Results: The trip blank results are presented in Tables I-a through I-c. The presence of toluene in three of six trip blanks and m,p-xylene in one trip blank (Table I-a) are probably due to contaminated deionized water and should not be considered due to cross-contamination as they were not detected in the associated water samples. The VOC data quality was not adversely affected by this contamination.

c. Sample Holding Times, Reporting Limits, Laboratory Method Blanks, Accuracy, and Precision: Sample holding times and detection/reporting limits were evaluated per EPA or ADEC method criteria. The laboratory method blanks were evaluated for the absence of targeted analytes. The extraction efficiency, accuracy and precision of the data, as represented by surrogate, MS, MSD, BS/BSD, LC and LCD recoveries, RPD results and continuing calibration verification (CCV) recoveries, were compared to EPA, ADEC, or LE QC acceptance limits for out of control results. All of the above mentioned internal QC data met EPA or ADEC method criteria and are acceptable with the following exceptions and/or notations.

1. VOC: Sample holding times and reporting limits met method criteria. One out of three soil MSD surrogate recoveries was above EPA QC limits in CENPD-ET-EN-L report H-951611. One out of three water MS surrogate recoveries was slightly below EPA QC limits in batch 386 referenced in reports H-960007 and H-960024. The associated VOC data should not be considered adversely affected by the out of control surrogate data since the recoveries are an indication of sample specific extraction efficiency and the surrogate recoveries of all associated samples were within acceptance criteria. Two of ten soil MS and MSD recoveries were below the EPA control limits in CENPD-ET-EN-L report H-951589. The accuracy of the associated VOC data are acceptable based on the eight remaining acceptable MS/MSD recoveries and acceptable LC recoveries.

2. BNA: Sample holding times and reporting limits met method criteria. One out of eleven soil MS and MSD recoveries and two of eleven LC and LCD recoveries of batch 402 in reports H-951637 and H-951656 exceeded EPA acceptance criteria. One of eleven soil MS, MSD, LC and LCD recoveries of batch 409 in reports H-951739 and H-951796 and batch 401 in reports H-951589 and H-951611 exceeded the EPA acceptance criteria. As all associated samples in these reports contained no detectable BNA contaminants, other than Bis (2-ethylhexyl)phthalate, the accuracy of the BNA data was not adversely affected by the out of control spike recoveries. One of

eleven water LC and LCD recoveries of batch 410 in reports H-960007 and H-960024 was below the EPA acceptance criteria. The accuracy of the associated data are acceptable based on the remaining ten acceptable LC and LCD recoveries and the acceptable MS/MSD recoveries.

3. Dioxin/Furan: Per conversation with the contractor, the dioxin/furan data of NET report 95.03862 was not used for QA purposes due to improper sample preservation (see NPDL telephone record, dated 8 Feb 96). The dioxin/furan samples were re-collected and reported in NET report 95.03999. Sample holding times and reporting limits met method criteria. The water matrix method blank associated with NET report 95.03999 contained 26.0 pq/L of OCDD. The OCDD data in sample (95RRFTA-2003GW) is attributable to laboratory contamination.

4. Pest/PCB: Sample holding times and reporting limits met method criteria. Both of the soil MS, MSD, LC and LCD recoveries (Aroclor 1016 and 1260) of batch 319 in reports H-951739 and H-951796 were above LE QC limits. Since targeted PCB aroclors were not detected in any associated samples, the data quality was not adversely affected by the high recoveries. The water matrix QC determinations, associated with batch 379 in report H-960007, were spiked with pesticide analytes rather than targeted PCB aroclors. The water MS, MSD, LC and LCD recoveries were all within LE QC limits and the data quality is acceptable (see CENPD-ET-EN-L e-mail, dated 6 Feb 96). One out of six (aldrin) LC/LCD RPD results exceeded LE QC limits in this same batch. The precision of the data are acceptable based on the remaining acceptable RPD results.

5. PAH: Sample holding times and reporting limits met method criteria. Eight out of 15 water MS recoveries were below, five out of 15 water MSD recoveries were above LE QC limits and eight of 15 MS/MSD RPD results exceeded LE QC limits in report 95.03813. Based on erratic MS/MSD recoveries, the PAH data of the associated sample (95RRTSL-1003GW) should be considered as estimates. Two out of 15 water MS recoveries exceeded LE QC limits and two and one of 15 water MS and MSD recoveries, respectively, were below the LE QC limits in report 95.03895. The accuracy of PAH data for the associated sample (95POLLDW-3003GW) are accepted based on sample specific surrogate and the remaining acceptable spike recoveries.

6. DRO: Sample reporting limits met method criteria. Sample 95RRFTA-2003GW was extracted 14 days beyond the recommended holding time. The contractor instructed that the analysis should be performed (see NPDL telephone record, dated 18 Oct 95). The DRO datum for this sample should be considered an estimate. The soil MS/MSD RPD of batch 300 in report H-951637 exceeded LE quality control criteria. The precision of the DRO data are acceptable based on the acceptable laboratory replicate and LC/LCD RPD results.

7. TRPH: Sample holding times and reporting limits met method criteria. The soil MS and MSD recoveries and RPD of batch WA6075S2 in report 95.03482 were above QC limits. The TRPH data are not considered adversely affected since the original sample concentration was greater than four times the spike amount. The accuracy and precision of the TRPH data are acceptable based on the acceptable LC recovery and laboratory replicate RPD results.

8. TOC: Sample holding times and reporting limits met method criteria. The associated internal QC results met acceptance limits and the data quality for the soil and water samples are acceptable.

9. Total Metals:

a. Soil Samples: The soil MS and MSD recoveries of aluminum, calcium, iron, and magnesium in all of the NET reports and potassium and manganese in a few reports were either not calculable or outside EPA QC limits but should not be considered significant for the purpose of data evaluation as the original sample results were greater than four times the spike amount. The associated RPD result may have also been out of control due to the MS/MSD recoveries. The accuracy of the data are acceptable based on acceptable BS recoveries. The precision is acceptable based on acceptable laboratory duplicate and/or MS/MSD RPD results. The QC data of total mercury is presented first. Out of control QC data for all other metals is organized by digestion/analytical batch number.

- Total Mercury: The total mercury laboratory replicate RPD exceeded the EPA QC limit in batch MK0054S1 of reports 95.03482 and 95.03415, and in batch MK0059S1 of report 95.03675. The mercury data are not considered adversely affected by the out of control results since the sample results of the RPD calculation were within a factor of five to the mercury reporting limit. The precision of the mercury data is acceptable based on the acceptable MS/MSD RPD results.

- NET report 95.03378/Batch 704: The MS, MSD and replicate determinations were performed on a sample that was not from this project. The MS and MSD recoveries and RPD results for arsenic, lead and selenium were outside of EPA QC limits. The laboratory replicate RPD of lead exceeded EPA QC limits. The accuracy of the associated sample data (95POLLDW-3111SB and 95POLLDW-3120SB) is accepted based on acceptable LC recoveries. The precision is acceptable based on acceptable laboratory duplicate and/or MS/MSD RPD results.

- NET report 95.03378/Batch 705: Iron was detected in the method blank at 10.4 ppm. Since the associated sample results are greater than five times the level in the blank, the data quality are acceptable. The MS and MSD analyses were performed on a sample that was not from this project. The MS and MSD recoveries of antimony were below EPA QC limits. The accuracy of the antimony data of the associated samples (95POLLDW-3111SB and 95POLLDW-3120SB) is accepted based on the acceptable LC recovery. The precision is acceptable based on acceptable laboratory duplicate and/or MS/MSD RPD results.

- NET report 95.03482/Batch 708: The MS, MSD and replicate determinations were performed on a sample that was not from this project. The MSD recovery of arsenic and the MS and MSD recoveries of selenium were below EPA QC limits. The selenium RPD exceeded EPA QC limits. The laboratory replicate RPD result of lead exceeded EPA QC limits. The accuracy of the arsenic and selenium data is accepted based on the acceptable LC recoveries. The precision is acceptable based on acceptable laboratory duplicate and/or MS/MSD RPD results.

- NET reports 95.03415 and 95.03482/Batch 709: The MS and MSD determinations were performed on a sample that was not from this project. The MS and MSD recoveries of sodium were above EPA QC limits. The MS and MSD recoveries and RPD result for antimony and selenium were outside EPA QC limits. The MS recovery of manganese was below, the MSD of magnesium above EPA QC limits. The MS and MSD recoveries of thallium were incorrectly reported "not applicable" (NA). The accuracy of the antimony, selenium, magnesium, manganese, sodium, and thallium data is accepted based on acceptable LC recoveries. The precision is acceptable based on acceptable laboratory duplicate and/or MS/MSD RPD results.

- NET report 95.03415/Batch 710: The MS and MSD recoveries of chromium, manganese, potassium, and sodium exceeded EPA QC limits. The MS and MSD recoveries of antimony were below EPA QC limits. The RPD results of antimony, iron and manganese exceeded EPA QC limits. The associated sample data are not considered adversely affected since the MS and MSD determinations were performed on a sample that was not from this project. The accuracy of the metals data is accepted based on the acceptable LC recoveries. The precision is acceptable based on acceptable laboratory duplicate and/or MS/MSD RPD results.

- NET report 95.03555/Batch 711: Sample 95RRFTA-2203SB was used for matrix spike analysis. The soil MS and MSD recoveries and RPD results of antimony and potassium were below EPA QC limits. The antimony and potassium data of the associated samples (95RRFTA-2194SB and 95RRFTA-2203SB) are considered low estimates based on the low

MS and MSD recoveries. The laboratory replicate RPD results for barium, copper and sodium exceeded EPA QC limits. The precision of the barium, copper and sodium data is accepted based on the acceptable MS/MSD RPD results.

- NET reports 95.03555 and 95.03675/Batch 712: Sample 95RRFTA-2203SB was used for matrix spike analysis. The MS and MSD recoveries of selenium were below EPA QC limits. The selenium data for the associated samples (95RRFTA-2194SB, -2203SB, -2210SB and 95RRTSL-1152SB) should be considered as low estimates where detected and low levels may not have been detected in the remaining samples. The laboratory replicate RPD for lead exceeded EPA QC limits. The precision of the lead data is accepted based on the acceptable MS/MSD RPD result.

- NET report 95.03675 Batch 713: The MS, MSD and replicate determinations were performed on a sample that was not from this project. The MS and MSD recoveries of antimony and potassium were below and the sodium MS and MSD recoveries above EPA QC limits. The potassium RPD exceeded EPA QC limits, one barium MS recovery was below, one chromium MS recovery above EPA QC limits. The accuracy of the total metals data is accepted based on the acceptable LC recoveries. The laboratory replicate RPD results for barium, vanadium and zinc exceeded LE QC limits. The precision of the data is accepted based on the remaining acceptable MS/MSD RPD results.

- NET report 95.03720/Batch 714: The MS/MSD determination was performed on a sample that was not from this project. The MS and MSD recoveries of arsenic were below and the RPD result exceeded EPA QC limits. The accuracy of the arsenic data of the associated samples is accepted based on the acceptable LC recovery. The precision is acceptable based on acceptable laboratory duplicate and/or MS/MSD RPD results.

- NET report 95.03720/Batch 715: The MS, MSD and replicate determinations were performed on a sample that was not from this project. The MS and MSD recoveries of antimony and potassium were below EPA QC limits. The aluminum, barium, calcium, cobalt, copper, iron, magnesium, manganese, sodium, vanadium and zinc laboratory replicate RPD results exceeded EPA QC limits. These out of control RPD results are probably attributable to a problem with the digestion of the replicate sample. The accuracy of the antimony and potassium data is accepted based on the acceptable LC recovery. The precision of the 11 metals listed above is accepted based on the remaining acceptable MS/MSD RPD results.

b. Water Samples: Sample holding times and reporting limits for the soil samples (ARDL reports 9214, 9215, and 9216) met method criteria. The associated internal QC results met acceptance limits and the data quality for these samples are acceptable.

10. Inorganics: Samples 95RRTSL-1003GW, 95RRFTA-2003GW, and 95POLLDW-3003GW were received past the recommended holding time for the analysis of nitrate and ortho-phosphate. The nitrate and ortho-phosphate data of samples -1003GW and -2003GW are considered as estimates due to holding time expiration. The laboratory did not report the nitrate or o-phosphate data for -3003GW. The analysis of sample -2003GW for total sulfide and TDS was performed after holding time expiration. These data should also considered as estimates due to holding time expiration.

d. Overall Evaluation of the QA Laboratories' Data: Delinquencies (a broken volatiles container, improper sulfide and dioxin sample preservation, sample labels did not match COC records, cooler temperatures outside of 4 ± 2 °C) were noted on the SCR forms. The dioxin/furan data of NET report 95.03862 was not used for QA purposes due to improper sample preservation. The OCDD in sample 95RRFTA-2003GW is due to laboratory contamination. Based on holding time expiration, the DRO, total sulfide and TDS data of -2003GW, and the nitrate and o-phosphate data for the two of three water samples should be considered as estimates. Based on erratic MS/MSD recoveries, the PAH data for sample 95RRTSL-1003GW should be considered as estimates. Based on low MS/MSD recoveries, the antimony and potassium data for samples 95RRFTA-2194SB and -2203SB and the selenium data for samples 95RRFTA-2194SB, -2203SB, -2210SB and 95RRTSL-1152SB should be considered as low estimates.

8. COMPARISON OF THE PRIMARY AND QA LABORATORIES' DATA: The primary and QA data comparisons are presented in Tables III through XVII. All data agree with each other and are comparable with the following exceptions.

a. Dioxin/Furan:

- The primary dioxin/furan data for 95RRFTA-2002GW does not agree with field blind duplicate or QA data for the majority of targeted analytes in Table IV-3. Since both laboratories had acceptable internal QC data, the discrepancies could not be analytically resolved. It was noted that the MS and MSD samples were analyzed immediately prior to primary sample -2002GW and the positive results for this sample may indicate possible

cross-contamination during analysis. The primary results for sample 95RRFTA-2001GW are accepted based on QA data agreement.

- The field blind duplicate data of total HpCDD in Table XV-3 does not agree. Since the laboratory had acceptable internal QC data, the discrepancy could not be analytically resolved. The laboratory reported an additional total HpCDD result of 3.1 ppt (EMPC) along with the 0.63 ppt data. The primary 95RRFTA-2208SB data of total HpCDD are acceptable.

b. Petroleum Hydrocarbons:

- The QA datum of DRO in Table VII-4 does not agree with the field blind duplicate data. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The QA laboratory's fuel chromatogram indicates diesel range and later eluting hydrocarbons while the primary laboratory's fuel chromatograms show only low level diesel range hydrocarbons. The primary and QA TRPH data in Table VII-5 substantiate the primary DRO data but not the QA results. Based on blind duplicate and TRPH data agreement, the primary DRO data are accepted.

- One of the primary and QA data comparisons of DRO in Table X-3 does not agree. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. Review of the primary and QA laboratories fuel chromatograms show a very similar fuel pattern for primary sample 95POLLDW-3131SB and the QA sample. The fuel pattern for primary sample -3132SB is not at all similar to the others. Based on fuel chromatogram review and QA data agreement, the primary DRO datum for 95POLLDW-3131SB is accepted.

- The primary (95POLLDW-3131SB) datum of TRPH in Table X-4 does not agree with the remaining field blind duplicate and QA data. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary fuel chromatogram of -3131SB indicates diesel range and late eluting hydrocarbons. The primary TRPH datum of sample -3131SB is not consistent with the associated DRO results (Table X-3) and is questionable. Based on chromatogram review and QA data agreement, the primary TRPH datum for 95POLLDW-3132SB is accepted.

- The primary (95RRFTA-2174SB) datum of TRPH in Table XI-6 does not agree with the remaining field blind duplicate and QA data. Since both laboratories had acceptable internal

QC data, the discrepancy could not be analytically resolved. The primary TRPH data for sample 95RRFTA-2173SB are accepted based on QA data agreement.

c. TOC, Metals and Inorganics:

- One out of two primary data of TOC does not agree with the QA data in Tables VII-6, and VIII-6, XI-7, and XV-7. Since both laboratories had acceptable internal QC data, the discrepancies could not be analytically resolved.

- The primary (95POLLDW-3131SB) and QA data comparison of sodium in Table X-5 does not agree. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved.

- The QA data of nickel in Table XI-8 does not agree with the field blind duplicate data. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary data of nickel are accepted based on blind duplicate agreement.

- The field blind duplicate data of total calcium and manganese in Table XVII-8 does not agree with the QA data. The primary data of calcium and manganese are estimates based on poor precision between the laboratory duplicate results (see ARDL report 9211).

9. PROBLEMS ENCOUNTERED\CORRECTIVE ACTIONS TAKEN:

a. Contractor (E&E) and Primary Laboratories (ARDL and TLI):

1. The contractor did not submit a complete QA/QC sample comparison key for this project (see attachment). Sample RRFTA-2182SB was designated a QA sample but was submitted to the primary laboratory and does not appear to be a split sample. The field blind duplicates (95RRFTA-2180SB and -2181SB appear to be collected from different locations but because they were designated on the QA/QC sample key as replicates, the sample results are compared to one another in Table XII. See ARDL report 9189 (cooler #113) for details. In addition, the project samples collected prior to and immediately after the rinsate blanks were not identified.

2. VOC soil sample 95RRSTL-1155SB in ARDL report 9211 was analyzed outside the method specified 12 hour calibration window. The laboratory's re-analysis of the sample (past

the required holding time) confirmed the original results. The original results are as follows; all targeted VOC analytes were not detected (ND) in the sample with the exception of methylene chloride which was due to laboratory contamination. The original results were submitted in the data deliverables received by CENPD-ET-EN-L.

3. The first QA shipment of this project (OUA, Ft. Richardson POLLDW Phase II) was inadvertently sent to ARDL (the primary laboratory) by NPDL staff. This happened because the contractor listed the project name as "OUA, Ft. Richardson POL Lab" and the QA laboratory for this project (NPDL W.O. 95-0273) was ARDL. The contractor was contacted and requested that testing on the sample (95POLLDW-3103SB) be omitted. See NPDL SCR form with attachments dated 18 Aug 95 and telephone record, dated 21 Aug 95.

4. TLI did not submit document control (sample receipt/preparation) information for reports 34007A, 34007B, 334055, 34159, and 34264. NPDL contacted ARDL and requested this information. ARDL submitted all requested information on 13 Feb 96 (see enclosure).

5. The contractor submitted primary samples to Northern Testing Laboratory for the following tests: BOD, heterotrophic bacteria, kjeldahl nitrogen, total phosphorus, alkalinity, pH on selected water and/or soil samples. These results were not submitted to CENPD-ET-EN-L and therefore are not a part of this report.

b. QA Laboratory (CENPD-ET-EN-L):

1. The PCB soil LC and LCD recoveries and the QC acceptance limits for Aroclor 1016 were not submitted for batch 319 referenced in CENPD-ET-EN-L reports H-951739 and H-951796. The case narrative of report H-951739 stated that the LC and LCD recoveries exceeded the upper QC limits. The laboratory was notified of the problem on 7 Feb 96, the corrected data was received on 14 Feb 96, incorporated into this report and included as an addendum.

2. Some CENPD-ET-EN-L reports included incorrect acetone reporting limits in selected samples. The amended pages were submitted 14 Feb 96 and are enclosed as an addendum.

3. It was noted during data review that several CENPD-ET-EN-L laboratory case narratives contained text errors regarding out of control internal QC data. The report data was properly evaluated by NPDL staff and the text errors did not adversely affect the project data quality.

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4. The CENPD-ET-EN-L BNA soil data (data above the detection limit) was initially reported with a factor of ten error (biased high) in the reports generated by EDF. The detection and reporting limits were not impacted by the error. The laboratory attributed the high results to a computer generated data reduction error. The amended results have been forwarded to Alaska District and were updated in reports H-951656, H-951739, and H-951796.

c. QA Laboratory (NET):

1. NET laboratory subcontracted the PAH analysis to BC Laboratories. The PAH data that was included in the NET EDF report did not accurately reflect the subcontractor data that was included as an addendum to the NET report. (Surrogate recoveries were not included and control limits were transcribed incorrectly.) NET laboratory was notified of these problems on 7 Feb 96 and corrections were requested at this time.

2. In NET report 95.03720, the GRO MS and MSD results and their recoveries were reported incorrectly. The laboratory was contacted on 7 Feb 96, the corrected data was received on 9 Feb 96, incorporated into this report and included as an addendum.

3. The GRO CCV recovery in NET report 95.03813 was reported incorrectly. The laboratory was notified of the problem on 7 Feb 96, the corrected data was received on 9 Feb 96, incorporated into this report and included as an addendum.

4. The soil TRPH results throughout the various NET reports had detection and reporting limits of 10 and 50 ppm, respectively, instead of the usual 2 and 10 ppm. The laboratory was contacted on 12 Jan 96 concerning the discrepancy. The error was due to a data entry test code problem. See NET facsimile, dated 15 Jan 96. The 10 ppm reporting limit was inserted in the TRPH table comparisons of this report and was utilized for data evaluation. Amendments to the various reports were not requested by this office.

5. The soil MS and MSD results of aluminum calcium, iron and magnesium reported for batch 710 of NET report 95.03415 had negative integers for the MS and MSD spike amounts. The laboratory was contacted on 9 Feb 96, the corrected data was received on 9 Feb 96, incorporated into this report and included as an addendum.

6. Because of discrepancy between the reporting limit and result of total nickel in NET report 95.03415 the laboratory was requested to review the data package. The laboratory revised the nickel, potassium and sodium RL's of 95POLLDW-3133SB to 5.3, 213 and 53 ppm, respectively. The potassium RL for sample 95POLLDW-3129SB was revised to 223 ppm. The

corrected data was received on 14 Feb 96, incorporated into this report and included as an addendum.

7. Dissolved metals data of manganese for batch MB3239W1 in NET reports 95.03832 and 95.03895 provided inconsistent MS and MSD results. The spike level was different between the two reports. The laboratory was contacted on 9 Feb 96, the corrected data was received on 15 Feb 96, incorporated into this report and included as an addendum.

8. Data of total aluminum, calcium, iron, magnesium, potassium, and sodium was omitted from NET reports 95.03378, 95.03482, and 95.03720. The data was submitted to NPDL as appendices, incorporated into this report and included as addenda.

9. Data of TSS and/or total hardness was omitted from NET reports 95.03813, 95.03832, and 95.03895. The data was submitted to NPDL as appendices, incorporated into this report and included as addenda.

10. Verification of the nitrate and nitrate+nitrite MS and MSD recoveries in NET report 95.03832 was requested as they were initially reported at approximately 1000%. The laboratory was contacted on 8 Feb 96, the corrected data was received on 14 Feb 96, incorporated into this report and included as an addendum.

11. The total phosphorus MS and MSD results of batch WA6276W1 in NET reports 95.03832, 95.03813 and 95.03895 were reported inconsistently. The sample and spike results were different in each of the reports but should have been the same since only one analytical batch was noted. The laboratory was contacted on 6 Feb 96, the corrected data was received on 14 Feb 96, incorporated into this report and included as an addendum.

12. The original COC records SCR forms for NET reports 95.03378, 95.03415, 95.03482, and 95.03832 were not submitted with the data deliverable. Copies of these documents were included in the report

CENPD-ET-EN-L (95-0501)

PRIMARY AND QA TRIP BLANK RESULTS

Table I-a

Project: OUA (Phase II), Ft. Richardson Matrix: Water Prefix: 95RRTSL-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/L (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Date: Analytes Detected	Primary Lab 09-25-95 1006WA	Reporting Limits	QA Lab 09-25-95 1007WA	Reporting Limits
m. p-Xylene	ND	5	0.43	0.39
Toluene	3 J	5	3.6	0.36

ND = Not detected
J = Estimated concentration

SUMMARY: The presence of toluene in the primary and QA trip blanks is probably due to contaminated deionized water as it was detected at the same level in the associated rinsate (-1005WA) but not in the associated water samples (-1001WA and -1002WA). The presence of m.p-xylene in the QA trip blank should also be considered due to contaminated deionized water as it was not detected in any associated water samples. The VOC data quality was not adversely affected by this contamination.

2. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: µg/L (ppb)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1006WA	Reporting Limits	QA Lab 1007WA	Reporting Limits
GRO	ND	100	ND	50

SUMMARY: The absence of fuel hydrocarbons in the primary and QA trip blanks indicate that no cross-contamination occurred during sample shipment, storage, or analysis.

CENPD-ET-EN-L (95-0501)

PRIMARY AND QA TRIP BLANK RESULTS

Table I-b

Project: OUA (Phase II), Ft. Richardson Matrix: Water

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/L (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Date:	Primary Lab 09-28-95		QA Lab 09-29-95	
Analytes Detected	RRTSL-1008WA	Reporting Limits	RRFTA-2005WA	Reporting Limits
2-Butanone	19 J	100	ND	1.4
Methylene Chloride	13 B	5	ND	3.1
Toluene	ND	5	0.68	0.36

ND = Not detected
J = Estimated concentration
B = Found in method blank

SUMMARY: The presence of methylene chloride is considered due to laboratory contamination. The presence of toluene in the QA trip blank is probably due to contaminated deionized water as it was not detected in any associated water samples. The presence of 2-butanone in the primary trip blank, below the reporting limit, is due contaminated deionized water and was not detected in any associated samples. With the exception of methylene chloride, the VOC data quality was not adversely affected by this contamination.

2. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: ug/L (ppb)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab RRTSL-1008WA	Reporting Limits	QA Lab RRFTA-2005WA	Reporting Limits
GRO	ND	100	ND	50

SUMMARY: The absence of fuel hydrocarbons in the primary and QA trip blanks indicate that no cross-contamination occurred during sample shipment, storage, or analysis.

CENPD-ET-EN-L (95-0501)

PRIMARY AND QA TRIP BLANK RESULTS

Table I-c

Project: OUA (Phase II), Ft. Richardson Matrix: Water Prefix: 95POLLDW-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/L (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Date: Analytes Detected	Primary Lab 09-29-95 3006WA	Reporting Limits	QA Lab 09-29-95 3007WA	Reporting Limits
Methylene Chloride	2 J,B	5	ND	3.1
Toluene	3 J	5	3.2	0.36
1.2-Dichloropropane	5	5	ND	0.66

ND = Not detected
J = Estimated concentration
B = Found in method blank

SUMMARY: The presence of methylene chloride is considered due to laboratory contamination. The presence of toluene in the primary and QA trip blanks is probably due to contaminated deionized water as it was detected at a similar level in the associated rinsate (-3005WA) but was not found in the associated water samples. The presence of 1.2-dichloropropane in the primary trip blank may indicate sample cross-contamination during sample shipment as up to 16 ppb of 1.2-dichloropropane was detected throughout the ten associated groundwater samples. With the exception of methylene chloride and 1,2-dichloropropane, the VOC data quality was not adversely affected by this contamination.

CENPD-ET-EN-L (95-0501)
Table I-c cont.

2. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: µg/L (ppb)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3006WA	Reporting Limits	QA Lab 3007WA	Reporting Limits
GRO	ND	100	ND	50

SUMMARY: The absence of fuel hydrocarbons in the primary and QA trip blanks indicate that no cross-contamination occurred during sample shipment, storage, or analysis.

CENPD-ET-EN-L (95-0501)

PRIMARY TRIP BLANK RESULTS

Table I-d

Project: OUA (Phase II), Ft. Richardson Matrix: Water

Primary Laboratory: ARDL, Inc.

1. Method: Volatile Organic Compounds (EPA 8260) Units: ug/L (ppb)

Date: Analytes Detected	08-22-95 95POLLDW-3004WA	08-29-95 95RRFTA-2003 WA	09-14-95 95RRTSL 1004WA	Reporting Limits
Methylene Chloride	ND	14 B	ND	5
Toluene	ND	ND	4 J	5

ND = Not detected
J = Estimated concentration
B = Found in method blank

SUMMARY: The presence of methylene chloride in one of the primary trip blanks is due to laboratory contamination. The presence of toluene is probably due to contaminated deionized water as mentioned previously in Tables I-a and I-c. It was noted that toluene was not detected in the four associated soil samples. With the exception of methylene chloride, the VOC data quality was not adversely affected by this contamination.

2. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: ug/L (ppb)

Analytes Detected	95POLLDW 3004WA	95RRFTA 2003 WA	95RRTSL 1004WA	Reporting Limits
GRO	ND	ND	ND	100

SUMMARY: The absence of fuel hydrocarbons in the primary trip blank indicate that no cross-contamination occurred during sample shipment, storage, or analysis.

PRIMARY RINSATE BLANK RESULTS

Table II-a

Project: OUA (Phase II), Ft. Richardson Matrix: Water

Primary Laboratory: ARDL, Inc.

1. Method: Volatile Organic Compounds (EPA 8260) Units: µg/L (ppb)

Date: Analytes Detected	8-22-95 95POLLDW 3003WA	8-29-95 95RRFTA 2002WA	9-14-95 95RRTSL 1003WA	Reporting Limits
Methylene Chloride	ND	18 B	ND	5
Toluene	ND	ND	4 J	5

ND = Not detected
B = Found in method blank
J = Estimated concentration

SUMMARY: The presence of methylene chloride in one of the primary rinsate blanks is due to laboratory contamination. The presence of toluene is probably due to contaminated deionized water as mentioned previously in the trip blank tables. It was noted that toluene was not detected in the four associated soil samples. With the exception of methylene chloride, the VOC data quality was not adversely affected by this contamination.

2. Method: Semi-volatile Organics (EPA 3510/8270) Units: µg/L (ppb)

Analytes Detected	95POLLDW 3003WA	95RRFTA 2002WA	95RRTSL 1003WA	Reporting Limits
	ND	ND	ND	10-50

SUMMARY: The absence of targeted analytes in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

CENPD-ET-EN-L (95-0501)
Table II-a cont.

3. Method: Polychlorinated Biphenyls (EPA 3510/8080) Units: µg/L (ppb)

Analytes Detected	95RRTSL 1003WA	Reporting Limits
	ND	1.0-2.0

SUMMARY: The absence of targeted aroclors in the primary rinsate blank indicate that no incidental field cross-contamination occurred during sampling.

4. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: pg/L (ppq)

Analytes Detected	95RRFTA 2002WA	Reporting Limits
	ND	11.7-38.3

SUMMARY: The absence of targeted analytes in the primary rinsate blank indicate that no incidental field cross-contamination occurred during sampling.

5. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: µg/L (ppb)

Analytes Detected	95POLLDW 3003WA	95RRFTA2 002WA	95RRTSL 1003WA	Reporting Limits
GRO	ND	ND	ND	100

SUMMARY: The absence of fuel hydrocarbons in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

6. Method: Diesel Range Organics (EPA 3510/ADEC 8100 Mod.) Units: ug/L (ppb)

Analytes Detected	95POLLDW 3003WA	95RRFTA2 002WA	95RRTSL 1003WA	Reporting Limits
DRO	ND	ND	ND	100

SUMMARY: The absence of fuel hydrocarbons in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

7. Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/L (ppm)

Analytes Detected	95POLLDW 3003WA	95RRFTA 2002WA	95RRTSL 1003WA	Reporting Limits
TRPH	ND	ND	ND	0.20

SUMMARY: The absence of petroleum hydrocarbons in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

8. Method: Total Organic Carbon (EPA 415.1) Units: mg/L (ppm)

Analytes Detected	95POLLDW3003WA	95RRFTA 2002WA	95RRTSL 1003WA	Reporting Limits
TOC	ND	ND	ND	1.0

SUMMARY: The absence of TOC in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

CENPD-ET-EN-L (95-0501)
Table II-a cont.

9. Method: Total Metals (EPA 3010, 3020/6010, 7000 Series) Units: µg/L (ppb)

Analytes Detected	95POLLDW3003WA	95RRFTA 2002WA	95RRTSL 1003WA	Reporting Limits
Aluminum	ND	ND	ND	50
Antimony	ND	ND	ND	20
Arsenic	ND	ND	ND	0.5
Barium	ND	ND	ND	10
Beryllium	ND	ND	ND	1.0
Cadmium	ND	ND	ND	5
Calcium	ND	ND	ND	100
Chromium	ND	ND	ND	5
Cobalt	ND	ND	ND	5
Copper	ND	ND	ND	5
Iron	ND	ND	ND	50
Lead	ND	1.3	ND	1.0
Magnesium	ND	ND	ND	100
Manganese	ND	ND	ND	5.0
Mercury	ND	ND	ND	0.2
Nickel	ND	ND	ND	20
Potassium	ND	ND	ND	1500
Selenium	ND	ND	ND	0.5
Silver	ND	ND	ND	50
Sodium	ND	ND	ND	400
Thallium	ND	ND	ND	1.0
Vanadium	ND	ND	ND	5.0
Zinc	ND	ND	ND	5.0

SUMMARY: The presence of lead in one of the rinsate blanks near the reporting limit should not be considered attributable to incidental field cross-contamination. The absence of all other remaining metals indicate that incidental field cross-contamination did not occur during sampling.

CENPD-ET-EN-L (95-0501)

PRIMARY RINSATE BLANK RESULTS

Table II-b

Project: OUA (Phase II), Ft. Richardson Matrix: Water

Primary Laboratory: ARDL, Inc.

1. Method: Volatile Organic Compounds (EPA 8260) Units: ug/L (ppb)

Date: Analytes Detected	9-25-95 95RRTSL1005WA	9-26-95 95RRFTA2004WA	9-29-95 95POLLDW3005WA	Reporting Limits
Methylene Chloride	6 B	7 B	3 J.B	5
Toluene	3 J	3 J	4 J	5
1,2-Dichloropropane	ND	ND	5 J	5

ND = Not detected
J = Estimated concentration
B = Found in method blank

SUMMARY: The presence of methylene chloride is considered due to laboratory contamination. The presence of toluene is probably due to contaminated deionized water as it was detected at the similar levels in the associated trip blanks but not in the associated water samples. The presence of 1,2-dichloropropane in the primary rinsate blank may indicate sample cross-contamination during sample shipment as up to 16 ppb of 1,2-dichloropropane was detected throughout the ten groundwater samples. With the exception of methylene chloride and 1,2-dichloropropane, the VOC data quality was not adversely affected by this contamination.

2. Method: Semi-volatile Organics (EPA 3510/8270) Units: ug/L (ppb)

Analytes Detected	95RRTSL1005WA	95RRFTA2004WA	95POLLDW3005WA	Reporting Limits
	ND	ND	ND	10-50

SUMMARY: The absence of targeted analytes in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

3. Method: Polynuclear Aromatic Hydrocarbons (EPA 3510/8310) Units: µg/L (ppb)

Analytes Detected	95RRTSL1005WA	95RRFTA2004WA	95POLLDW3005WA	Reporting Limits
	ND	ND	ND	0.13-18

SUMMARY: The absence of targeted analytes in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

4 Method: Polychlorinated Biphenyls (EPA 3510/8080) Units: µg/L (ppb)

Analytes Detected	95RRTSL 1005WA	Reporting Limits
	ND	1.0-2.0

SUMMARY: The absence of targeted PCB arochlors in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

5. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: µg/L (ppb)

Analytes Detected	95RRTSL1005WA	95RRFTA2004WA	95POLLDW3005WA	Reporting Limits
GRO	ND	ND	ND	100

SUMMARY: The absence of fuel hydrocarbons in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

CENPD-ET-EN-L (95-0501)
Table II-b cont.

6. Method: Diesel Range Organics (EPA 3510/ADEC 8100 Mod.) Units: µg/L (ppb)

Analytes Detected	95RRTSL1005WA	95RFTA2004WA	95POLLDW3005WA	Reporting Limits
DRO	ND	ND	ND	100

SUMMARY: The absence of fuel hydrocarbons in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

7. Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/L (ppm)

Analytes Detected	95RRTSL1005WA	95RFTA2004WA	95POLLDW3005WA	Reporting Limits
TRPH	ND	ND	ND	0.3-0.31

SUMMARY: The absence of TRPH in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

8. Method: Total Organic Carbon (EPA 9060) Units: mg/L (ppm)

Analytes Detected	95RRTSL1005WA	95RRFTA2004WA	95POLLDW3005WA	Reporting Limits
TOC	ND	ND	ND	1.0

SUMMARY: The absence of TOC in the primary rinsate blanks indicate that no incidental field cross-contamination occurred during sampling.

CENPD-ET-EN-L (95-0501)
Table II-b cont.

9. Method: Total Metals (EPA 3010, 3020/6010, 7000 Series) Units: µg L (ppb)

Analytes Detected	95RRTSL 1005WA	95RRFTA 2004WA	95POLLDW 3005WA	Reporting Limits
Aluminum	ND	ND	ND	50
Antimony	ND	ND	ND	20
Arsenic	ND	ND	ND	0.5
Barium	ND	ND	ND	10
Beryllium	ND	ND	ND	1.0
Cadmium	ND	ND	ND	5
Calcium	ND	ND	ND	100
Chromium	ND	ND	ND	5
Cobalt	ND	ND	ND	5
Copper	ND	ND	ND	5
Iron	ND	ND	ND	50
Lead	1.5	ND	1.2	1.0
Magnesium	ND	ND	ND	100
Manganese	ND	ND	ND	5.0
Mercury	ND	ND	ND	0.2
Nickel	ND	ND	ND	20
Potassium	ND	ND	ND	1500
Selenium	ND	ND	ND	0.5
Silver	ND	ND	ND	50
Sodium	ND	ND	ND	400
Thallium	ND	ND	ND	1.0
Vanadium	ND	ND	ND	5.0
Zinc	8.6	7.4	ND	5.0

SUMMARY: The presence of lead and zinc in two of the rinsate blanks near the reporting limit should not be considered attributable to incidental field cross-contamination. The absence of all other remaining metals indicate that incidental field cross-contamination did not occur during sampling.

CENPD-ET-EN-L (95-0501)
Table II-b cont.

10. Method: Dissolved Metals (EPA 3005/6010, 7000 Series) Units: µg/L (ppb)

Analytes Detected	95RRTSL 1005WA	95RRFTA 2004WA	95POLLDW 3005WA	Reporting Limits
Aluminum	ND	ND	ND	50
Antimony	ND	ND	ND	20
Arsenic	ND	ND	ND	0.5
Barium	ND	ND	ND	10
Beryllium	ND	ND	ND	1.0
Cadmium	ND	ND	ND	5
Calcium	ND	ND	ND	100
Chromium	ND	ND	ND	5
Cobalt	5.4	ND	ND	5
Copper	ND	ND	ND	5
Iron	ND	ND	ND	50
Lead	ND	ND	ND	1.0
Magnesium	ND	ND	ND	100
Manganese	ND	ND	ND	5.0
Mercury	ND	ND	ND	0.2
Nickel	ND	ND	ND	20
Potassium	ND	ND	ND	1500
Selenium	ND	ND	ND	0.5
Silver	ND	ND	ND	50
Sodium	ND	ND	ND	400
Thallium	ND	ND	ND	1.0
Vanadium	ND	ND	ND	5.0
Zinc	ND	ND	ND	5.0

SUMMARY: The presence of cobalt in one of the rinsate blanks near the reporting limit should not be considered attributable to incidental field cross-contamination. The absence of all other remaining metals indicate that incidental field cross-contamination did not occur during sampling.

11. Method: Inorganic Parameters (EPA 100-400 Series) Units: mg/L (ppm)

Analytes Detected	95RRTSL 1005WA	95RRFTA 2004WA	95POLLDW 3005WA	Reporting Limits
Total Alkalinity	ND	ND	5.8	5.0
Bromide	ND	ND	ND	0.40
Chloride	0.27	ND	ND	0.10
Fluoride	ND	ND	ND	0.10
Nitrate (as N)	ND	ND	ND	0.10
Nitrate+Nitrite (as N)	ND	ND	ND	0.020
Total Phosphorus (as P)	0.015	ND	0.011	0.010
Orthophosphate (as P)	ND	ND	ND	0.50
Sulfate	ND	ND	ND	0.50
Sulfide	ND	ND	ND	0.10
Silica	ND	ND	ND	0.10
Total Dissolved Solids	50.0	40.0	ND	40.0
Hardness (as $CaCO_3$)	ND	ND	ND	0.75
Total Suspended Solids	ND	ND	ND	2.0

SUMMARY: The presence of total alkalinity, chloride, total phosphorus, and total dissolved solids in selected rinsate blanks near the reporting limit should not be considered attributable to incidental field cross-contamination but may be due to contaminated deionized water used to prepare the rinsate sample(s). The absence of all other remaining analytes indicate that incidental field cross-contamination did not occur during sampling.

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table III

Project: OUA (Phase II), Ft. Richardson Matrix: Water Prefix: 95RRTSL-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/L (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1001GW	Primary Lab 1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
Methylene Chloride	7 B	7 B	5	ND	3.1

ND = Not detected
B = Found in method blank

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits for all targeted analytes and are comparable.

2. Primary Method: Semi-volatile Organics (EPA 3510/8270) Units: ug/L (ppb)
QA Method: Semi-volatile Organics (EPA 3520/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1001GW	Primary Lab 1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
	ND	ND	10-50	ND	3.7-29

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)
Table III cont.

3. Method: Polynuclear Aromatic Hydrocarbons (EPA 3510/8310) Units: µg/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: BC Laboratories, Inc.

Analytes Detected	Primary Lab 1001GW	Primary Lab 1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
	ND	ND	0.13-18	ND	0.08-8.0

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

4. Primary Method: Organochlorine Pesticides and PCBs (EPA 3510/8080) Units: µg/L (ppb)
QA Method: Polychlorinated Biphenyls (EPA 3510/8080)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1001GW	Primary Lab 1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
Pesticides	NR	NR		ND	0.96
Arochlor 1016	ND	ND	1.0	ND	0.96
Arochlor 1221	ND	ND	2.0	ND	1.6
Arochlor 1232	ND	ND	1.0	ND	0.65
Arochlor 1242	ND	ND	1.0	ND	0.61
Arochlor 1248	ND	ND	1.0	ND	0.26
Arochlor 1254	ND	ND	1.0	ND	0.69
Arochlor 1260	ND	ND	1.0	ND	0.24

NR = Not requested on chain of custody record

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted PCB arochlors and are comparable.

5. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: µg/L (ppb)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1001GW	Primary Lab 1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
GRO	ND	ND	100	ND	50

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

6. Primary Method: Diesel Range Organics (EPA 3510/ADEC 8100 Mod.) Units: µg/L (ppb)
QA Method: Diesel Range Organics (EPA 3520/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1001GW	Primary Lab 1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
DRO	ND	ND	100	ND	120

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table III cont.

7. Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/L (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1001GW	1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
TRPH	ND	ND	0.31	ND	1.0

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

8. Method: Total Organic Carbon (EPA 9060) Units: mg/L (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1001GW	1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
TOC	2.0	2.0	1.0	ND	1.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

9. Method: Total Metals (EPA 3010, 3020/6010, 7000 Series) Units: µg/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1001GW	Primary Lab 1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
Aluminum	ND	ND	50	ND	200
Antimony	ND	ND	20	ND	100
Arsenic	ND	0.53	0.5	ND	5
Barium	ND	12	10	ND	20
Beryllium	ND	ND	1.0	ND	20
Cadmium	ND	ND	5	ND	20
Calcium	48,500	48,000	100	42,000	500
Chromium	ND	ND	5	ND	20
Cobalt	ND	ND	5	ND	50
Copper	ND	ND	5	ND	20
Iron	ND	120	50	200	100
Lead	ND	ND	1.0	ND	2
Magnesium	14,800	14,600	100	15,000	500
Manganese	ND	ND	5.0	ND	20
Mercury	ND	ND	0.2	ND	0.2
Nickel	ND	ND	20	ND	50
Potassium	ND	ND	1500	ND	2000
Selenium	0.67	1.2	0.5	ND	0.5
Silver	ND	ND	50	ND	20
Sodium	3500	3400	400	4000	500
Thallium	ND	ND	1.0	ND	200
Vanadium	ND	ND	5.0	ND	50
Zinc	ND	ND	5.0	ND	50

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

10. Method: Dissolved Metals (EPA 3005/6010, 7000 Series) Units: ug/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1001GW	1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
Aluminum	ND	ND	50	ND	200
Antimony	ND	ND	20	ND	100
Arsenic	ND	ND	0.5	ND	5
Barium	13	13	10	ND	20
Beryllium	ND	ND	1.0	ND	20
Cadmium	ND	ND	5	ND	20
Calcium	49,300	49,300	100	44,000	500
Chromium	ND	ND	5	ND	20
Cobalt	ND	ND	5	ND	50
Copper	ND	ND	5	ND	20
Iron	58	66	50	ND	100
Lead	ND	ND	1.0	ND	2
Magnesium	15,500	15,500	100	15,000	500
Manganese	ND	ND	5.0	ND	20
Mercury	ND	ND	0.2	ND	0.2
Nickel	ND	ND	20	ND	50
Potassium	ND	ND	1500	ND	2000
Selenium	0.65	0.84	0.5	ND	5
Silver	ND	ND	50	ND	20
Sodium	3700	3600	400	3600	500
Thallium	ND	ND	1.0	ND	200
Vanadium	ND	ND	5.0	ND	50
Zinc	ND	ND	5.0	ND	50

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

11. Method: Inorganic Parameters (EPA 100-400 Series) Units: mg/L (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1001GW	Primary Lab 1002GW	Reporting Limits	QA Lab 1003GW	Reporting Limits
Total Alkalinity	174	168	5.0	160.0	10.0
Bromide	ND	ND	0.40	ND	1.0
Chloride	2.3	2.2	0.10	2.0	1.0
Fluoride	0.14	ND	0.10	0.1	0.1
Nitrate (as N)	0.54	0.54	0.10	0.49	0.03
Nitrate+Nitrite (as N)	0.48	0.47	0.020	0.49	0.03
Total Phosphorus (as P)	ND	0.019	0.010	0.032	0.02
Orthophosphate (as P)	ND	ND	0.50	ND	0.02
Sulfate	13.7	13.5	0.50	15.0	1.0
Sulfide	ND	ND	0.10	ND	1.0
Silica	10.8	11.6	0.10	10.6	0.1
Total Dissolved Solids	212	209	40.0	210.0	10.0
Hardness (as $CaCO_3$)	182	180	0.75	170.0	5.0
Total Suspended Solids	ND	ND	2.0/2.5	ND	4.0

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table IV

Project: OUA (Phase II). Ft. Richardson Matrix: Water Prefix: 95RRFTA-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/L (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2001GW	2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
Methylene Chloride	12 B	ND	5	ND	9.6

ND = Not detected
B = Found in method blank

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits for all targeted analytes and are comparable.

2. Primary Method: Semi-volatile Organics (EPA 3510/8270) Units: µg/L (ppb)
QA Method: Semi-volatile Organics (EPA 3520/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2001GW	2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
	ND	ND	10-50	ND	3.7-29

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)
Table IV cont.

3. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: pg/L (ppq)
Primary Laboratory: Triangle Laboratories, Inc. QA Laboratory: Alta, Inc.

Analytes Detected	Primary Lab 2001GW	Primary Lab 2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
2,3,7,8-TCDD	ND	ND	2.3/1.3	ND	2.9
1,2,3,7,8-PeCDD	ND	7.1	4.8/--	ND	4.4
1,2,3,4,7,8-HxCDD	ND	9.6	4.0/--	ND	4.3
1,2,3,6,7,8-HxCDD	ND	9.5	3.9/--	ND	4.2
1,2,3,7,8,9-HxCDD	ND	11.4	3.6/--	ND	3.9
1,2,3,4,6,7,8-HpCDD	ND	16.1	6.3/--	ND	3.3
OCDD	ND	42.2	14.8/--	25 B	7.6
2,3,7,8-TCDF	ND	ND	1.8/1.1	ND	1.2
1,2,3,7,8-PeCDF	ND	5.2	2.8/--	ND	2.6
2,3,4,7,8-PeCDF	ND	5.8	2.5/--	ND	2.4
1,2,3,4,7,8-HxCDF	ND	9.2	2.6/--	ND	1.6
1,2,3,6,7,8-HxCDF	ND	9.1	2.0/--	ND	1.6
2,3,4,6,7,8-HxCDF	2.9 B	13.6 B	--	ND	4.1
1,2,3,7,8,9-HxCDF	ND	10.9	2.5/--	ND	2.0
1,2,3,4,6,7,8-HpCDF	ND	12.9	2.7/--	ND	1.8
1,2,3,4,7,8,9-HpCDF	ND	13.0	3.7/--	ND	2.2
OCDF	ND	40.5	12.1/--	ND	3.8
Total TCDD	ND	ND	2.3/1.3	ND	2.9
Total PeCDD	ND	7.1	4.8/--	ND	13
Total HxCDD	ND	30.4	3.8/--	ND	4.3
Total HpCDD	ND	16.1	6.3/--	ND	3.3
Total TCDF	ND	ND	1.8/1.1	ND	1.2
Total PeCDF	ND	11.0	2.6/--	ND	2.6
Total HxCDF	2.9 B	42.8 B	--	ND	4.1
Total HpCDF	ND	26.0	3.1/--	ND	2.2

-- = Not reported

SUMMARY: The primary data for -2002GW does not agree with field blind duplicate or QA data for the majority of targeted analytes and is not comparable. Since both laboratories had acceptable internal QC data, the discrepancies could not be analytically resolved. It was noted that the MS and MSD samples were analyzed immediately prior to primary sample -2002GW and the positive results for this sample may indicate possible cross-contamination during analysis. The primary results for sample -2001GW are accepted based on QA data agreement.

4. Method: Polynuclear Aromatic Hydrocarbons (EPA 3510/8310) Units: µg/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: BC Laboratories, Inc.

Analytes Detected	Primary Lab 2001GW	Primary Lab 2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
	ND	ND	0.13-18	ND	0.08-8.0

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

5. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: µg/L (ppb)
QA Method: Gasoline Range Organics (EPA 5030 ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2001GW	Primary Lab 2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
GRO	ND	ND	100	ND	50

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

6. Primary Method: Diesel Range Organics (EPA 3510/ADEC 8100 Mod.) Units: µg/L (ppb)
QA Method: Diesel Range Organics (EPA 3520/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2001GW	Primary Lab 2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
DRO	ND	ND	100	ND	120

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table IV cont.

7. Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/L (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2001GW	Primary Lab 2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
TRPH	ND	ND	0.31/0.32	ND	1.0

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

8. Primary Method: Total Organic Carbon (EPA 9060) Units: mg/L (ppm)
QA Method: Total Organic Carbon (EPA 415.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2001GW	Primary Lab 2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
TOC	1.2	1.0	1.0	ND	1.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

9. Method: Total Metals (EPA 3010,3020/6010, 7000 Series) Units: ug/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2001GW	Primary Lab 2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
Aluminum	120	90	50	ND	200
Antimony	ND	ND	20	ND	100
Arsenic	0.96	0.74	0.5	ND	5
Barium	14	14	10	ND	20
Beryllium	ND	ND	1.0	ND	20
Cadmium	ND	ND	5	ND	20
Calcium	36,500	36,200	100	34,000	500
Chromium	ND	ND	5	ND	20
Cobalt	ND	ND	5	ND	50
Copper	ND	ND	5	ND	20
Iron	230	170	50	ND	100
Lead	2.2	1.7	1.0	ND	2
Magnesium	5400	5300	100	5700	500
Manganese	7.4	ND	5.0	ND	20
Mercury	ND	ND	0.2	ND	0.2
Nickel	ND	ND	20	ND	50
Potassium	ND	ND	1500	ND	2000
Selenium	ND	ND	0.5	ND	5
Silver	ND	ND	50	ND	20
Sodium	2700	2600	750	3700	500
Thallium	ND	ND	1.0	ND	200
Vanadium	ND	ND	5.0	ND	50
Zinc	ND	ND	5.0	ND	50

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0501)
Table IV cont.

10. Method: Dissolved Metals (EPA 3005 6010, 7000 Series) Units: µg/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2001GW	2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
Aluminum	ND	ND	50	ND	200
Antimony	ND	ND	20	ND	100
Arsenic	0.75	0.75	0.5	ND	5
Barium	13	13	10	ND	20
Beryllium	ND	ND	1.0	ND	20
Cadmium	ND	ND	5	ND	20
Calcium	39,500	39,100	100	34,000	500
Chromium	ND	ND	5	ND	20
Cobalt	ND	ND	5	ND	50
Copper	ND	ND	5	ND	20
Iron	79	ND	50	ND	100
Lead	ND	ND	1.0	ND	2
Magnesium	5900	2800	100	5600	500
Manganese	ND	ND	5.0	ND	20
Mercury	ND	ND	0.2	ND	0.2
Nickel	ND	ND	20	ND	50
Potassium	ND	ND	1500	ND	2000
Selenium	ND	0.64	0.5	ND	5
Silver	ND	ND	50	ND	20
Sodium	2800	2800	750	2700	500
Thallium	ND	ND	1.0	ND	200
Vanadium	ND	ND	5.0	ND	50
Zinc	ND	ND	5.0	ND	50

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

11. Method: Inorganic Parameters (EPA 100-400 Series) Units: mg/L (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2001GW	Primary Lab 2002GW	Reporting Limits	QA Lab 2003GW	Reporting Limits
Total Alkalinity	89.8	95.5	5.0	85.0	10.0
Bromide	ND	ND	0.40	ND	1.0
Chloride	7.4	7.9	0.10	8.0	1.0
Fluoride	ND	ND	0.10	ND	0.1
Nitrate (as N)	0.66	0.67	0.10	0.65	0.03
Nitrate+Nitrite (as N)	0.62	0.62	0.020	0.65	0.03
Total Phosphorus (as P)	0.020	0.024	0.010	0.029	0.02
Orthophosphate (as P)	ND	ND	0.50	ND	0.02
Sulfate	17.2	17.1	0.50	19	1.0
Sulfide	ND	ND	0.10	ND	1.0
Silica	9.4	9.5	0.10	DNS	0.1
Total Dissolved Solids	186	202	40.0	160.0	10.0
Hardness (as $CaCO_3$)	113	112	0.75	110.0	5.0
Total Suspended Solids	3.9	3.0	2.0/2.5	ND	4.0

DNS = Data not submitted, requested on chain of custody record

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table V

Project: OUA (Phase II), Ft. Richardson Matrix: Water Prefix: 95POLLDW-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/L (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3001GW	Primary Lab 3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
Methylene Chloride	3 J.B	3 J.B	5	ND	3.1
Carbon Disulfide	ND	ND	10	12.0	0.5
Chloroform	12	11	5	7.9	0.81
1.2-Dichloropropane	3 J	8	5	3.6	0.66
Carbon Tetrachloride	ND	ND	5	0.7	0.61

ND = Not detected
J = Estimated concentration
B = Found in method blank

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)
Table V cont.

2. Primary Method: Semi-volatile Organics (EPA 3510/8270) Units: µg/L (ppb)
QA Method: Semi-volatile Organics (EPA 3520/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3001GW	3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
	ND	ND	10-50	ND	3.7-29.0

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

3. Method: Polynuclear Aromatic Hydrocarbons (EPA 3510/8310) Units: µg/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: BC Laboratories, Inc.

Analytes Detected	Primary Lab 3001GW	3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
	ND	ND	0.13-18	ND	0.08-8.0

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

4. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: µg/L (ppb)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3001GW	3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
GRO	ND	ND	100	ND	50

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table V cont.

5. Primary Method: Diesel Range Organics (EPA 3510/ADEC 8100 Mod.) Units: ug/L (ppb)
QA Method: Diesel Range Organics (EPA 3520/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3001GW	Primary Lab 3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
DRO	ND	ND	100	ND	120

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

6. Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/L (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3001GW	Primary Lab 3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
TRPH	ND	ND	0.30/0.31	ND	1.0

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

7. Primary Method: Total Organic Carbon (EPA 9060) Units: mg/L (ppm)
QA Method: Total Organic Carbon (EPA 415.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3001GW	Primary Lab 3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
TOC	1.2	2.0	1.0	ND	1.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their detection limits and are comparable.

CENPD-ET-EN-L (95-0501)
Table V cont.

8. Method: Total Metals (EPA 3010,3020'6010, 7000 Series) Units: µg/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3001GW	3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
Aluminum	ND	ND	50	ND	200
Antimony	ND	ND	20	ND	100
Arsenic	1.2	0.56	0.5	ND	5
Barium	17	17	10	ND	20
Beryllium	ND	ND	1.0	ND	20
Cadmium	ND	ND	5	ND	20
Calcium	49,800	50,300	100	43,000	500
Chromium	ND	ND	5	ND	20
Cobalt	ND	ND	5	ND	50
Copper	ND	ND	5	ND	20
Iron	67	ND	50	ND	100
Lead	1.5	ND	1.0	ND	2
Magnesium	6300	6300	100	6300	500
Manganese	15	14	5.0	ND	20
Mercury	ND	ND	2.0	ND	0.2
Nickel	ND	ND	20	ND	50
Potassium	ND	ND	1500	ND	2000
Selenium	0.96	ND	0.5	ND	5
Silver	ND	ND	50	ND	20
Sodium	2500	2500	750	2700	500
Thallium	ND	ND	1.0	ND	200
Vanadium	ND	ND	5.0	ND	50
Zinc	ND	ND	5.0	ND	50

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

9. Method: Dissolved Metals (EPA 3005/6010, 7000 Series) Units: ug/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3001GW	3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
Aluminum	ND	ND	50	ND	200
Antimony	ND	ND	20	ND	100
Arsenic	0.5	ND	0.5	ND	5
Barium	17	16	10	ND	20
Beryllium	ND	ND	1.0	ND	20
Cadmium	ND	ND	5	ND	20
Calcium	52,200	52,000	100	46,000	500
Chromium	ND	ND	5	ND	20
Cobalt	ND	ND	5	ND	50
Copper	ND	ND	5	ND	20
Iron	ND	ND	50	ND	100
Lead	ND	ND	1.0	ND	2
Magnesium	6600	6600	100	6500	500
Manganese	13	13	5.0	ND	20
Mercury	ND	ND	2.0	ND	0.2
Nickel	ND	ND	20	ND	50
Potassium	ND	ND	1500	ND	2000
Selenium	ND	ND	0.5	ND	5
Silver	ND	ND	50	ND	20
Sodium	2600	2600	750	2600	500
Thallium	ND	ND	1.0	ND	200
Vanadium	ND	ND	5.0	ND	50
Zinc	ND	ND	5.0	ND	50

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0501)
Table V cont.

10. Method: Inorganic Parameters (EPA 100-400 Series) Units: mg/L (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3001GW	3002GW	Reporting Limits	QA Lab 3003GW	Reporting Limits
Total Alkalinity	122	128	5.0	120.0	10.0
Bromide	ND	ND	0.40	ND	1.0
Chloride	3.1	3.1	0.10	3.0	1.0
Fluoride	0.19	0.19	0.10	0.15	0.1
Nitrate (as N)	0.52	0.51	0.10	DNS	0.03
Nitrate+Nitrite (as N)	0.46	0.46	0.020	0.26	0.03
Total Phosphorus (as P)	0.020	0.024	0.010	0.027	0.02
Orthophosphate (as P)	ND	ND	0.50	DNS	0.02
Sulfate	26.9	27.2	0.50	30	1.0
Sulfide	ND	ND	0.10	ND	1.0
Silica	11.7	11.7	0.10	DNS	0.1
Total Dissolved Solids	199	220	40.0	200.0	10.0
Hardness (as $CaCO_3$)	150	152	0.75	130.0	50.0
Total Suspended Solids	ND	ND	2.0	ND	4.0

DNS = Data not submitted. requested on chain of custody record

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits for all targeted analytes and are comparable.

COMPARISON OF FIELD BLIND DUPLICATE RESULTS

Table VI

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95POLLDW-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/L (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3101SB	3102SB	Reporting Limits	QA Lab 3103SB	Reporting Limits
Methylene Chloride	25 B	18 B	6	SNS	

SNS = Sample not submitted for analysis
B = Found in method blank

SUMMARY: The field blind duplicate data agree within a factor of two with each other for all targeted volatiles. The QA analysis for sample -3103SB was canceled per contractor request. See CENPD-ET-EN-L sample cooler receipt form and HTRW discrepancy notification form, dated 18 Aug 95.

2. Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3101SB	3102SB	Reporting Limits	QA Lab 3103SB	Reporting Limits
	ND	ND	390/2000	SNS	

ND = Not detected

SUMMARY: The field blind duplicate data agree with each other for all targeted analytes. The QA analysis for sample -3103SB was canceled per contractor request. See CENPD-ET-EN-L sample cooler receipt form and HTRW discrepancy notification form, dated 18 Aug 95.

CENPD-ET-EN-L (95-0501)
Table VI cont.

3. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3101SB	3102SB	Reporting Limits	QA Lab 3103SB	Reporting Limits
GRO	ND	ND	5.0	SNS	

SUMMARY: The field blind duplicate data agree with each other. The QA analysis for sample -3103SB was canceled per contractor request.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3101SB	3102SB	Reporting Limits	QA Lab 3103SB	Reporting Limits
DRO	93	26	9.8/4.8	SNS	

SUMMARY: The field blind duplicate data agree within a factor of four with each other. The QA analysis for sample -3103SB was canceled per contractor request.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3101SB	3102SB	Reporting Limits	QA Lab 3103SB	Reporting Limits
TRPH	28.8	27.9	12.3/11.9	SNS	

SUMMARY: The field blind duplicate data agree within a factor of two with each other. The QA analysis for sample -3103SB was canceled per contractor request.

6. Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/Kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3101SB	3102SB	Reporting Limits	QA Lab 3103SB	Reporting Limits
Aluminum	16,300	12,300	6.1/5.9	SNS	
Antimony	4.9	ND	2.5/2.4		
Arsenic	5.7	7.9	0.61/0.59		
Barium	38.1	22.9	1.2		
Beryllium	0.33	0.18	0.12		
Cadmium	ND	ND	0.37/0.36		
Calcium	9690	5370	12.3/11.9		
Chromium	43.9	29.8	0.61/0.59		
Cobalt	15.4	11.1	0.61/0.59		
Copper	44.4	29.5	0.61/0.59		
Iron	31,000	25,400	6.1/5.9		
Lead	7.6	6.5	3.7/3.6		
Magnesium	15,000	10,200	12.3/11.9		
Manganese	576	491	0.61/0.59		
Mercury	ND	ND	0.096/0.094		
Nickel	70.0	41.5	2.5/2.4		
Potassium	735	408	123/119		
Selenium	ND	ND	0.061/0.059		
Silver	ND	ND	0.61/0.59		
Sodium	122	103	49.0/47.6		
Thallium	ND	ND	0.12		
Vanadium	72.5	51.3	0.61/0.59		
Zinc	59.4	54.2	0.61/0.59		

SUMMARY: The field blind duplicate data agree within a factor of three with each other or their reporting limits. The QA analysis for sample -3103SB was canceled per contractor request.

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table VII

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95POLLDW-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3109SB	Primary Lab 3110SB	Reporting Limits	QA Lab 3111SB	Reporting Limits
Methylene Chloride	7 B	ND	5	ND	10
Acetone	33 J	ND	110	ND	10

ND = Not detected
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of four with each other or their reporting limits.

2. Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 3540/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3109SB	Primary Lab 3110SB	Reporting Limits	QA Lab 3111SB	Reporting Limits
	ND	ND	350-1800	ND	130-2800

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

3. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3109SB	Primary Lab 3110SB	Reporting Limits	QA Lab 3111SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.1

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3109SB	Primary Lab 3110SB	Reporting Limits	QA Lab 3111SB	Reporting Limits
DRO	7.6	6.1	4.3	85	13

SUMMARY: The field blind duplicate data agree within a factor of two with each other but does not agree within a factor of five with the QA datum. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The QA fuel chromatogram indicates diesel range and later eluting hydrocarbons while the primary fuel chromatograms show only low level diesel range hydrocarbons. The primary and QA TRPH data in Table VII-5 substantiate the primary but not the QA results. Based on blind duplicate and TRPH data agreement, the primary DRO data are accepted.

CENPD-ET-EN-L (95-0501)
Table VII cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3109SB	Primary Lab 3110SB	Reporting Limits	QA Lab 3111SB	Reporting Limits
TRPH	ND	16.4	11.0/10.8	ND	11.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

6. Primary Method: Total Organic Carbon (EPA 9060 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 415.1 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3109SB	Primary Lab 3110SB	Reporting Limits	QA Lab 3111SB	Reporting Limits
TOC	4370	2020	4.4/4.3	480	25

SUMMARY: The field blind duplicate and QA agree within a factor of five with each other and are comparable except for the primary (-3109SB) and QA data comparison. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved.

CENPD-ET-EN-L (95-0501)
Table VII cont.

7. Method: Total Metals (EPA 3050/6010,7000 Series) Units: mg/Kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3109SB	Primary Lab 3110SB	Reporting Limits	QA Lab 3111SB	Reporting Limits
Aluminum	12,200	11,900	5.5/5.4	17,200	23
Antimony	ND	ND	2.2/2.2	ND	11.0
Arsenic	3.3	3.2	0.55/0.54	4.9	0.6
Barium	32.2	28.5	1.1/1.1	42.0	2.3
Beryllium	0.21	0.22	0.11/0.11	ND	2.3
Cadmium	ND	ND	0.33/0.32	ND	2.3
Calcium	6830	13,000	11/10.8	10,400	57
Chromium	27.0	23.9	0.55/0.54	34.0	2.3
Cobalt	11.2	9.7	0.55/0.54	9.3	5.7
Copper	24.8	19.2	0.55/0.54	24.0	2.3
Iron	25,200	23,400	0.55/0.54	28,700 B	11
Lead	5.8	6.6	3.3/3.2	4.6	0.2
Magnesium	10,400	8490	11.0/10.8	12,600	57
Manganese	464	455	0.55/0.54	529	2.3
Mercury	ND	ND	0.086/0.085	0.04	0.02
Nickel	38.5	25.1	2.2/2.2	40.0	5.7
Potassium	511	395	110/108	667	230
Selenium	0.061	0.054	0.055/0.054	ND	0.6
Silver	ND	ND	0.55/0.54	ND	0.1
Sodium	83.6	85.2	43.8/43.1	241	57
Thallium	ND	ND	0.11/0.11	ND	0.6
Vanadium	56.2	51.9	0.55/0.54	55.0	5.7
Zinc	52.0	46.1	0.55/0.54	56.0	5.7

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table VIII

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95POLLDW-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3118SB	Primary Lab 3119SB	Reporting Limits	QA Lab 3120SB	Reporting Limits
	ND	ND	6-110	ND	0.3-3.3

ND = Not detected

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted volatiles.

2. Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: ug/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 3540/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3118SB	Primary Lab 3119SB	Reporting Limits	QA Lab 3120SB	Reporting Limits
	ND	ND	380-1800	ND	130-2600

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

3. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3118SB	3119SB	Reporting Limits	QA Lab 3120SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.1

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3118SB	3119SB	Reporting Limits	QA Lab 3120SB	Reporting Limits
DRO	ND	3.9 J	4.4/4.0	ND	12

J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3118SB	3119SB	Reporting Limits	QA Lab 3120SB	Reporting Limits
TRPH	18.3	11.8	11.3/11.0	ND	11.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

6. Primary Method: Total Organic Carbon (EPA 9060 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 415.1 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3118SB	3119SB	Reporting Limits	QA Lab 3120SB	Reporting Limits
TOC	1840	1140	4.5/4.4	253.0	28.0

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other except for the primary -3118SB and QA data comparison. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved.

CENPD-ET-EN-L (95-0501)
Table VIII cont.

7. Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/Kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3118SB	Primary Lab 3119SB	Reporting Limits	QA Lab 3120SB	Reporting Limits
Aluminum	12,000	12,400	5.7/5.5	14,300	22
Antimony	ND	ND	2.3/2.2	ND	11.0
Arsenic	4.0	3.7	0.57/0.55	3.7	0.6
Barium	27.5	26.2	1.1/1.1	42.0	2.2
Beryllium	0.22	0.21	0.11/0.11	ND	2.2
Cadmium	ND	ND	0.57/0.55	ND	2.2
Calcium	6390	6250	11.3/11.0	6600	55
Chromium	30.2	29.8	0.57/0.55	31.0	2.2
Cobalt	12.6	12.0	0.57/0.55	9.8	5.5
Copper	24.3	24.5	0.57/0.55	23.0	2.2
Iron	26,000	25,500	5.7/5.5	28,600 B	11
Lead	5.9	7.1	2.8/2.8	4.0	0.2
Magnesium	11,900	11,600	11.3/11.0	11,000	55
Manganese	489	473	0.57/0.55	484.0	2.2
Mercury	ND	ND	0.09/0.087	0.07	0.02
Nickel	46.4	49.0	2.3/2.2	35.0	5.5
Potassium	503	551	170/166	671	220
Selenium	0.19	0.064	0.057/0.055	ND	0.6
Silver	ND	ND	0.57/0.55	ND	0.1
Sodium	77.4	90.8	45.4/44.2	110	55
Thallium	0.16	ND	0.11/0.11	ND	0.6
Vanadium	55.0	53.5	0.57/0.55	54.0	5.5
Zinc	57.0	49.6	0.57/0.55	50.0	5.5

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table IX

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95POLLDW-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3127SB	3128SB	Reporting Limits	QA Lab 3129SB	Reporting Limits
	ND	ND	5-120	ND	1.3-12.0

ND = Not detected

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted volatiles.

2. Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 3540/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3127SB	3128SB	Reporting Limits	QA Lab 3129SB	Reporting Limits
	ND	ND	350-2000	ND	120-2500

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)
Table IX cont.

3. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3127SB	3128SB	Reporting Limits	QA Lab 3129SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.1

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3127SB	3128SB	Reporting Limits	QA Lab 3129SB	Reporting Limits
DRO	12	9.6	4.2/4.9	ND	12

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3127SB	3128SB	Reporting Limits	QA Lab 3129SB	Reporting Limits
TRPH	17.5	20.2	10.5/12.1	18.0	10.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table IX cont.

6. Primary Method: Total Organic Carbon (EPA 9060 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 415.1 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3127SB	3128SB	Reporting Limits	QA Lab 3129SB	Reporting Limits
TOC	658	1070	4.2/4.8	391.0	28.0

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0501)
Table IX cont.

7. Primary Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/Kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3127SB	Primary Lab 3128SB	Reporting Limits	QA Lab 3129SB	Reporting Limits
Aluminum	10,600	7240	5.2/6.1	9820	22.0
Antimony	ND	ND	2.1/2.4	ND	11.0
Arsenic	3.2	3.5	0.52/0.61	4.1	0.6
Barium	21.7	19.1	1.0/1.2	26.0	2.2
Beryllium	0.19	0.13	0.10/0.12	ND	2.2
Cadmium	ND	ND	0.52/0.61	ND	2.2
Calcium	4130	3700	10.5/12.1	5690	56.0
Chromium	26.9	16.7	0.52/0.61	23.0	2.2
Cobalt	9.9	7.1	0.52/0.61	7.7	5.6
Copper	24.1	18.1	0.52/0.61	21.0	2.2
Iron	22,700	16,900	5.2/6.1	19,600	11.0
Lead	5.8	5.1	2.6/3.0	5.8	0.2
Magnesium	8910	5210	10.5/12.1	7590	56.0
Manganese	418	362	0.52/0.61	379	2.2
Mercury	ND	ND	0.083/0.097	0.04	0.02
Nickel	34.3	23.8	2.1/2.4	26.0	5.6
Potassium	428	217	157/182	491	223
Selenium	0.055	ND	0.052/0.061	ND	0.6
Silver	ND	ND	0.52/0.61	ND	0.1
Sodium	78.7	ND	41.9/48.5	97.0	56.0
Thallium	ND	ND	0.10/0.12	ND	0.6
Vanadium	45.3	30.6	0.52/0.61	40.0	5.6
Zinc	44.5	36.7	0.52/0.61	39.0	5.6

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table X

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95POLLDW-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3131SB	3132SB	Reporting Limits	QA Lab 3133SB	Reporting Limits
	ND	ND	5-100	ND	0.98-9.2

ND = Not detected

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted volatiles.

2. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3131SB	3132SB	Reporting Limits	QA Lab 3133SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.0

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

3. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540 ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 3131SB	Primary Lab 3132SB	Reporting Limits	QA Lab 3133SB	Reporting Limits
DRO	39	19	4.1	120	12

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other except for the primary (-3132SB) and QA data comparison. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. Review of the primary and QA fuel chromatograms show very similar fuel patterns for primary sample -3131SB and the QA sample. The fuel pattern for primary sample -3132SB is not at all similar to the others. Based on chromatogram review and QA data agreement, the primary DRO datum for 95POLLDW-3131SB is accepted.

4. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3131SB	Primary Lab 3132SB	Reporting Limits	QA Lab 3133SB	Reporting Limits
TRPH	42.1	352	10.3	1300	10.0

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other except for the primary (-3131SB) datum. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary fuel chromatogram of -3131SB indicates diesel range and late eluting hydrocarbons. The primary TRPH datum of sample -3131SB is not consistent with the associated DRO results and is questionable. Based on chromatogram review and QA data agreement, the primary TRPH datum for 95POLLDW-3132SB is accepted.

CENPD-ET-EN-L (95-0501)
Table X cont.

5. Primary Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/Kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 3131SB	Primary Lab 3132SB	Reporting Limits	QA Lab 3133SB	Reporting Limits
Aluminum	10,000	9950	5.1	12,300	21.0
Antimony	ND	ND	2.1	ND	11.0
Arsenic	3.3	2.2	0.51	3.9	0.5
Barium	27.4	27.7	1.0	33.0	2.1
Beryllium	0.15	0.13	0.10	ND	2.1
Cadmium	ND	ND	0.51	ND	2.1
Calcium	6840	6680	10.3	9280	53.0
Chromium	21.6	27.1	0.51	30.0	2.1
Cobalt	9.6	9.8	0.51	9.3	5.3
Copper	23.1	23.6	0.51	23.0	2.1
Iron	21,500	20,800	5.1	24,300	11.0
Lead	5.1	6.5	2.6	4.9	0.2
Magnesium	7910	8380	10.3	9060	53.0
Manganese	428	409	0.51	480	2.1
Mercury	ND	ND	0.081	0.05	0.02
Nickel	28.2	30.1	2.1	32.0	5.3
Potassium	309	355	154	490	213
Selenium	ND	0.057	0.051	ND	0.5
Silver	ND	ND	0.51	ND	0.1
Sodium	92.3	366	41.0	501	53
Thallium	ND	ND	0.10	ND	0.5
Vanadium	44.2	44.1	0.51	47.0	5.3
Zinc	44.8	47.8	0.51	49.0	5.3

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable except for the primary (-3131SB) and QA data comparison of sodium. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XI

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95RRFTA-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2173SB	Primary Lab 2174SB	Reporting Limits	QA Lab 2175SB	Reporting Limits
Methylene Chloride	17 B	19 B	5	DNS	

ND = Not detected
B = Found in method blank
DNS = Data not submitted due to laboratory error

SUMMARY: The field blind duplicate data agree within a factor of two with each other for all targeted volatiles and are comparable.

2 Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 3540/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2173SB	Primary Lab 2174SB	Reporting Limits	QA Lab 2175SB	Reporting Limits
	ND	ND	350-1700	ND	130-2500

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)
Table XI cont.

3. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: pg/g (ppt)
Primary Laboratory: Triangle Laboratories, Inc. QA Laboratory: Alta, Inc.

Analytes Detected	Primary Lab 2173SB	Primary Lab 2174SB	Reporting Limits	QA Lab 2175SB	Reporting Limits
OCDD	1.1	2.0 EM	--	ND	9.9
Total HpCDD	0.25	ND	--/0.2	ND	3.1
1,2,3,4,6,7-HxCDF	0.45	0.40	--	ND	1.2
Total HxCDF	0.45	0.40	--	ND	2.2
OCDF	ND	0.33 EM	0.4/--	ND	6.0

EM = Estimated maximum possible concentration
-- = Not reported

SUMMARY: The field blind duplicate data agree within a factor of two with each other, agree with the QA data, and are comparable.

4. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2173SB	Primary Lab 2174SB	Reporting Limits	QA Lab 2175SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.1

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table XI cont.

5. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2173SB	2174SB	Reporting Limits	QA Lab 2175SB	Reporting Limits
DRO	11	11	4.2/4.3	17	12

SUMMARY: The field blind duplicate and QA data agree within a factor of two and are comparable.

6. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2173SB	2174SB	Reporting Limits	QA Lab 2175SB	Reporting Limits
TRPH	53.8	ND	10.5/10.7	79.0	10.0

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits except for the primary data of sample -2174SB. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary TRPH data for sample -2173SB are accepted based on QA data agreement.

CENPD-ET-EN-L (95-0501)
Table XI cont.

7. Primary Method: Total Organic Carbon (EPA 9060 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 415.1 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2173SB	Primary Lab 2174SB	Reporting Limits	QA Lab 2175SB	Reporting Limits
TOC	3540	1150	4.2/4.3	490.0	27.0

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other except for the primary (-2173SB) and QA data comparison. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved.

CENPD-ET-EN-L (95-0501)
Table XI cont.

8. Primary Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/Kg/(ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2173SB	2174SB	Reporting Limits	QA Lab 2175SB	Reporting Limits
Aluminum	11,800	12,600	5.3	16,800	20
Antimony	ND	ND	2.1	ND	11.0
Arsenic	5.3	5.7	0.53	4.3	0.5
Barium	35.5	38.3	1.1	52.0	2.1
Beryllium	0.27	0.27	0.11	ND	2.1
Cadmium	ND	ND	0.32	ND	2.1
Calcium	8200	9340	10.5	14,000	50
Chromium	30.4	25.9	0.53	30.0	2.1
Cobalt	12.2	11.9	0.53	10.0	5.3
Copper	25.4	26.0	0.53	26.0	2.1
Iron	24,000	25,800	5.3	32,700	10
Lead	7.2	7.1	3.2	5.5	0.2
Magnesium	9610	9590	10.5	11,200	50
Manganese	463	470	0.53	618.0	2.1
Mercury	ND	ND	0.84	0.06	0.02
Nickel	42.2	39.4	2.1	ND	5.3
Potassium	662	647	105	842	200
Selenium	0.081	0.21	0.053	ND	0.5
Silver	ND	ND	0.53	ND	0.1
Sodium	113	131	42.1	170	50
Thallium	0.12	0.14	0.11	ND	0.5
Vanadium	41.6	41.5	0.53	70.0	5.3
Zinc	52.3	54.6	0.53	65.0	5.3

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable except for the primary (-2175SB) and QA data comparison of nickel. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary nickel data are accepted based on blind duplicate agreement.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE RESULTS

Table XII

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95RRFTA-

1. Method: Volatile Organic Compounds (EPA 8260) Units: µg/Kg (ppb)
Primary Laboratory: ARDL, Inc.

Analytes Detected	Primary Lab 2180SB	Primary Lab 2181SB	Reporting Limits
Methylene Chloride	16 B	18 B	5

B = Found in method blank

SUMMARY: The field blind duplicate data agree within a factor of two with each other for all targeted volatiles.

2. Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)

Analytes Detected	Primary Lab 2180SB	Primary Lab 2181SB	Reporting Limits
	ND	ND	350-1700

ND = Not detected

SUMMARY: The field blind duplicate data agree with each other for all targeted analytes.

3. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2180SB	2181SB	Reporting Limits
GRO	ND	ND	5.0

SUMMARY: The field blind duplicate data agree with each other.

4. Method: Diesel Range Organics (EPA 3550 ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2180SB	2181SB	Reporting Limits
DRO	36	11	4.3

SUMMARY: The field blind duplicate data agree within a factor of four with each other.

5. Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2180SB	2181SB	Reporting Limits
TRPH	48.1	53.5	10.4/10.6

SUMMARY: The field blind duplicate data agree within a factor of two with each other.

6. Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2180SB	Primary Lab 2181SB	Reporting Limits
Aluminum	14,200	14,800	5.3
Antimony	ND	2.1	2.1
Arsenic	5.3	6.3	0.53
Barium	28.5	42.2	1.1
Beryllium	0.36	0.38	0.11
Cadmium	ND	ND	0.32
Calcium	9490	8870	10.6
Chromium	27.4	27.5	0.53
Cobalt	12.0	12.6	0.53
Copper	24.4	27.4	0.53
Iron	29,000	29,700	5.3
Lead	7.8	9.4	3.2
Magnesium	10,100	9590	10.6
Manganese	534	515	0.53
Mercury	ND	ND	0.084
Nickel	36.5	31.2	2.1
Potassium	585	820	106
Selenium	0.086	0.072	0.053
Silver	ND	ND	0.53
Sodium	86.5	109	42.6
Thallium	0.13	0.15	0.11
Vanadium	50.6	57.9	0.53
Zinc	59.8	63.8	0.53

SUMMARY: The field blind duplicate data agree within a factor of two with each other.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XIII

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95RRFTA-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2192SB	2193SB	Reporting Limits	QA Lab 2194SB	Reporting Limits
Methylene Chloride	7 B	7 B	5	DNS	

DNS = Data not submitted due to laboratory error
B = Found in method blank

SUMMARY: The field blind duplicate data agree within a factor of two with each other for all targeted volatiles.

2. Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 3540/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2192SB	2193SB	Reporting Limits	QA Lab 2194SB	Reporting Limits
Bis(2-Ethylhexyl)phthalate	430	180 J	340	520	200
Di-n-Butylphthalate	190 J	ND	340	ND	290

ND = Not detected
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other and are comparable.

3. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: [illegible] (ppt)
Primary Laboratory: Triangle Laboratories, Inc. QA Laboratory: Alta,

Analytes Detected	Primary Lab 2192SB	Primary Lab 2193SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
OCDD	3.0 B	2.7 B	--	3.3 J	9.9
1,2,3,4,6,7,8-HpCDD	0.39	0.38 EM	--	ND	2.4
2,3,4,6,7,8-HxCDF	0.36 B	0.39 B	--	ND	1.2
Total TCDD	0.09 B,EM	ND	--/0.1	ND	0.33
Total HpCDD	1.2	0.92	--	ND	2.4
Total HxCDF	0.36 B	0.39 B	--	ND	2.2

EM = Estimated maximum possible concentration
-- = Not reported

SUMMARY: The field blind duplicate data agree within a factor of two with each other or their reporting limits, agree with the QA data, and are comparable.

4. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2192SB	Primary Lab 2193SB	Reporting Limits	QA Lab 2194SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.0

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table XIII cont.

5. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2192SB	Primary Lab 2193SB	Reporting Limits	QA Lab 2194SB	Reporting Limits
DRO	16	17	4.2	14	11

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other and are comparable.

6. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2192SB	Primary Lab 2193SB	Reporting Limits	QA Lab 2194SB	Reporting Limits
TRPH	25.3	19.9	15.7	30.0	10.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table XIII cont.

7. Primary Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/Kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2192SB	Primary Lab 2193SB	Reporting Limits	QA Lab 2194SB	Reporting Limits
Aluminum	14,500	13,900	5.2	13,400	21.0
Antimony	2.6	2.7	2.1	ND	10.0
Arsenic	5.5	4.8	0.52	4.8	0.5
Barium	36.6	35.3	1.0	35.0	2.1
Beryllium	0.35	0.32	0.1	ND	2.1
Cadmium	ND	ND	0.52	ND	2.1
Calcium	10,200	8070	10.4	10,900	52.0
Chromium	24.1	25.7	0.52	30.0	2.1
Cobalt	12.4	12.9	0.52	14.0	5.2
Copper	28.8	25.9	0.52	24.0	2.1
Iron	29,900	28,700	5.2	27,700	10.0
Lead	7.0	7.7	2.6	5.4	0.2
Magnesium	11,100	11,600	10.4	17,400	52.0
Manganese	569	529	0.52	591.0	2.1
Mercury	ND	ND	0.083	0.07	0.02
Nickel	41.6	46.4	2.1	77.0	5.2
Potassium	609	529	157	684.0	207.0
Selenium	ND	ND	0.052	ND	0.5
Silver	0.97	1.1	0.52	ND	2.1
Sodium	104	101	41.8	114.0	52.0
Thallium	ND	ND	0.10	ND	21.0
Vanadium	42.5	42.3	0.52	48.0	5.2
Zinc	74.7	65.3	0.52	60.0	5.2

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XIV

Project: OUA (Phase II). Ft. Richardson Matrix: Soil Prefix: 95RRFTA-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2201SB	2202SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
Methylene Chloride	6 J.B	ND	6	DNS	

DNS = Data not submitted due to laboratory error
B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The field blind duplicate data agree within a factor of two with each other or their reporting limits for all targeted volatiles.

2. Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 3540/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2201SB	2202SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
Bis(2-Ethylhexyl)phthalate	140 J	150 J	380/390	ND	210
Di-n-Butylphthalate	1500	380 J	380/390	830	310

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits for all targeted analytes and are comparable.

3. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: pg/g (ppt)
Primary Laboratory: Triangle Laboratory, Inc. QA Laboratory: Alta, Inc.

Analytes Detected	Primary Lab 2201SB	Primary Lab 2202SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
OCDD	ND	1.2 B	0.8/--	ND	9.9
2,3,4,6,7,8-HxCDF	ND	0.36 B,EM	0.3/--	ND	1.2
Total HxCDF	ND	0.36 B,EM	0.3/--	ND	2.2

EM = Estimated maximum possible concentration
-- = Not reported

SUMMARY: The field blind duplicate data agree within a factor of two with each other, agree with the QA data, and are comparable.

4. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2201SB	Primary Lab 2202SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.2

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

5. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2201SB	Primary Lab 2202SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
DRO	3.5	2.9	4.7/4.8	ND	12

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limit and are comparable.

6. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2201SB	Primary Lab 2202SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
TRPH	18.1	18.6	17.4/17.9	15.0	10.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other and are comparable.

7. Primary Method: Total Organic Carbon (EPA 9060 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 415.1 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2201SB	Primary Lab 2202SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
TOC	2420	1690	4.7/4.8	519.0	28.0

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table XIV cont.

8. Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/Kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2201SB	Primary Lab 2202SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
Aluminum	16,200	12,500	5.8/6.0	14,200	22.0
Antimony	2.8	2.8	2.3/2.4	ND	11.0
Arsenic	5.3	5.4	0.58/0.60	4.8	0.6
Barium	37.4	32.2	1.2/1.2	36.0	2.2
Beryllium	0.37	0.25	0.12/0.12	ND	2.2
Cadmium	ND	ND	0.5/0.60	ND	55.0
Calcium	9760	7,770	11.6/11.9	9270	55.0
Chromium	34.0	35.4	0.58/0.60	31.0	5.5
Cobalt	13.8	11.9	0.58/0.60	11.0	2.2
Copper	26.5	25.3	0.58/0.60	23.0	11.0
Iron	32,200	37,600	5.8/6.0	28,500	55.0
Lead	7.2	6.3	29./3.0	4.8	0.2
Magnesium	12,600	10,900	11.6/11.9	11,900	5.5
Manganese	578	512	0.58/0.60	519.0	221.0
Mercury	ND	ND	0.093/0.094	0.08	0.02
Nickel	47.3	44.2	2.3/2.4	46.0	2.2
Potassium	750	684	174/179	773.0	55.0
Selenium	ND	ND	0.058/0.060	ND	0.6
Silver	1.2	1.3	0.58/0.60	ND	22.0
Sodium	147	110	46.5/47.8	154.0	5.5
Thallium	ND	ND	0.12/0.12	ND	5.5
Vanadium	60.8	60.9	0.58/0.60	52.0	5.0
Zinc	63.3	55.4	0.58/0.60	53.0	5.0

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XV

Project: QUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95RRFTA-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2208SB	Primary Lab 2209SB	Reporting Limits	QA Lab 2210SB	Reporting Limits
Methylene Chloride	17 B	6 B	5	ND	9.9

ND = Not detected
B = Found in method blank

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits for all targeted volatiles and are comparable.

2. Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 3540/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2208SB	Primary Lab 2209SB	Reporting Limits	QA Lab 2210SB	Reporting Limits
Bis(2-Ethylhexyl)phthalate	ND	ND	350/360	1600	210
Di-n-Butylphthalate	ND	130 J,B	350/360	ND	300

J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits for all targeted analytes and are comparable.

3. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: pg/g (ppt)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2208SB	Primary Lab 2209SB	Reporting Limits	QA Lab 2210SB	Reporting Limits
1,2,3,4,6,7,8-HpCDD	0.63	0.83 EM	0.4	ND	2.4
OCDD	6.5 B	8.4 B	0.68	1.7 J	9.9
2,3,4,6,7,8-HxCDF	0.34 EM	0.25 EM	--	ND	1.2
Total HpCDD	0.63	3.8 EM	--	ND	2.4
Total HxCDF	0.34 EM	0.25 EM	--	ND	2.2

EM = Estimated maximum possible concentration
-- = Not reported

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable except for the field blind duplicate data of total HpCDD. Since the laboratory had acceptable internal QC data, the discrepancy could not be analytically resolved. The laboratory reported an additional total HpCDD result of 3.1 ppt (EMPC) along with the 0.63 ppt data. The primary -2208SB data of total HpCDD are acceptable.

4. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2208SB	Primary Lab 2209SB	Reporting Limits	QA Lab 2210SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.1

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table XV cont.

5. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2208SB	Primary Lab 2209SB	Reporting Limits	QA Lab 2210SB	Reporting Limits
DRO	6.9	13	4.3	ND	12

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

6. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2208SB	Primary Lab 2209SB	Reporting Limits	QA Lab 2210SB	Reporting Limits
TRPH	21.8	28.0	16.0/16.2	110.0	10.0

SUMMARY: The field blind duplicate data agree within a factor of two with each other, agree with the QA data by a factor of five, and are comparable.

7. Primary Method: Total Organic Carbon (EPA 9060 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 415.1 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2208SB	Primary Lab 2209SB	Reporting Limits	QA Lab 2210SB	Reporting Limits
TOC	1350	3980	4.3	650.0	27.0

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other except for the primary (-2209SB) and QA data comparison. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved.

CENPD-ET-EN-L (95-0501)
Table XV cont.

8. Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 2208SB	2209SB	Reporting Limits	QA Lab 2210SB	Reporting Limits
Aluminum	14,300	12,300	5.3/5.4	14,400	21.0
Antimony	2.2	ND	2.1/2.2	ND	11.0
Arsenic	4.1	4.8	0.53/0.54	3.5	0.5
Barium	38.5	38.5	1.1/1.1	39.0	2.1
Beryllium	0.37	0.31	0.11/0.11	ND	2.1
Cadmium	ND	ND	0.53/0.54	ND	2.1
Calcium	11,100	11,000	10.7/10.8	11,300	53.0
Chromium	29.1	25.4	0.53/0.54	34.0	2.1
Cobalt	12.5	10.6	0.53/0.54	9.6	5.3
Copper	26.4	23.3	0.53/0.54	22.0	2.1
Iron	27,900	25,700	5.3/5.4	25,400	11.0
Lead	8.9	6.3	2.7/2.7	4.2	0.2
Magnesium	10,700	8600	10.7/10.8	10,700	53.0
Manganese	566	546	0.53/0.54	490.0	2.1
Mercury	ND	ND	0.085/0.086	0.06	0.02
Nickel	38.5	28.1	2.1/2.2	36.0	5.3
Potassium	732	592	160/162	810.0	213.0
Selenium	ND	ND	0.053/0.054	ND	0.5
Silver	0.95	0.97	0.53/0.54	ND	2.1
Sodium	156	91.1	42.7/43.3	117.0	53.0
Thallium	ND	ND	0.11/0.11	ND	21.0
Vanadium	55.6	46.0	0.53/0.54	62.0	5.3
Zinc	79.3	56.6	0.53/0.54	47.0	5.3

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XVI

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95RRTSL-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1150SB	Primary Lab 1151SB	Reporting Limits	QA Lab 1152SB	Reporting Limits
Methylene Chloride	6 B	12 B	5	ND	9.9

B = Found in method blank
ND = Not detected

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits for all targeted volatiles and are comparable.

2. Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 3540/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1150SB	Primary Lab 1151SB	Reporting Limits	QA Lab 1152SB	Reporting Limits
Bis(2-Ethylhexyl)phthalate	2200	2400	350	2000	210

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)
Table XVI cont.

3. Primary Method: Polychlorinated Biphenyls (EPA 3550/8080) Units: mg Kg (ppm)
QA Method: Polychlorinated Biphenyls (EPA 3540/8080)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1150SB	Primary Lab 1151SB	Reporting Limits	QA Lab 1152SB	Reporting Limits
Arochlor 1016	ND	ND	0.085	ND	0.095
Arochlor 1221	ND	ND	0.085	ND	0.34
Arochlor 1232	ND	ND	0.085	ND	0.084
Arochlor 1242	ND	ND	0.085	ND	0.12
Arochlor 1248	ND	ND	0.085	ND	0.086
Arochlor 1254	ND	ND	0.170	ND	0.018
Arochlor 1260	ND	ND	0.170	ND	0.076

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted PCB arochlors and are comparable.

4. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1150SB	Primary Lab 1151SB	Reporting Limits	QA Lab 1152SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.1

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table XVI cont.

5. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 2201SB	2202SB	Reporting Limits	QA Lab 2203SB	Reporting Limits
DRO	4.7	8.2	4.3	ND	12

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

6. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1150SB	1151SB	Reporting Limits	QA Lab 1152SB	Reporting Limits
TRPH	23.9	18.5	10.6/10.7	19.0	10.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other and are comparable.

7. Primary Method: Total Organic Carbon (EPA 9060 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 415.1 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1150SB	1151SB	Reporting Limits	QA Lab 1152SB	Reporting Limits
TOC	1320	2200	4.3	845.0	28.0

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other and are comparable.

8. Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/Kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1150SB	Primary Lab 1151SB	Reporting Limits	QA Lab 1152SB	Reporting Limits
Aluminum	13,300	10,100	5.3/5.4	14,000	22.0
Antimony	ND	ND	2.1/2.1	ND	11.0
Arsenic	3.9	3.0	0.53/0.54	4.0	0.6
Barium	36.5	24.4	1.1/1.1	51.0	2.2
Beryllium	0.33	0.21	0.11/0.11	ND	2.2
Cadmium	ND	ND	0.53/0.54	ND	2.2
Calcium	10,600	6470	10.6/10.7	10,200	56.0
Chromium	25.5	17.5	0.53/0.54	26.0	2.2
Cobalt	10.9	8.6	0.53/0.54	9.4	5.6
Copper	19.5	15.5	0.53/0.54	20.0	2.2
Iron	24,700	21,200	5.3/5.4	25,500	11.0
Lead	8.0	6.87	2.7/2.7	5.4	0.2
Magnesium	8450	6770	10.6/10.7	9450	56.0
Manganese	447	368	0.53/0.54	478.0	2.2
Mercury	ND	ND	0.084/0.085	0.06	0.02
Nickel	27.4	19.6	2.1/2.1	32.0	5.6
Potassium	717	509	159/161	823.0	222.0
Selenium	ND	ND	0.053/0.054	ND	0.6
Silver	1.1	0.93	0.53/0.54	ND	2.2
Sodium	128	116	42.5/42.9	167.0	56.0
Thallium	0.11	ND	0.11/0.11	ND	22.0
Vanadium	54.7	42.5	0.53/0.54	57.0	5.6
Zinc	48.3	41.5	0.53/0.54	47.0	5.6

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0501)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XVII

Project: OUA (Phase II), Ft. Richardson Matrix: Soil Prefix: 95RRTSL-

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: µg/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 5030/8260)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1154SB	Primary Lab 1155SB	Reporting Limits	QA Lab 1156SB	Reporting Limits
Methylene Chloride	14 B	11 B	5	ND	9.6

B = Found in method blank
ND = Not detected

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits for all targeted volatiles and are comparable.

2. Primary Method: Semi-volatile Organics (EPA 3550/8270) Units: µg/Kg (ppb)
QA Method: Semi-volatile Organics (EPA 3540/8270)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1154SB	Primary Lab 1155SB	Reporting Limits	QA Lab 1156SB	Reporting Limits
Bis(2-Ethylhexyl)phthalate	1200	1800	350	3200	200

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0501)
Table XVII cont.

3. Primary Method: Polychlorinated Biphenyls (EPA 3550/8080) Units: mg/Kg (ppm)
QA Method: Polychlorinated Biphenyls (EPA 3540/8080)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1154SB	Primary Lab 1155SB	Reporting Limits	QA Lab 1156SB	Reporting Limits
Arochlor 1016	ND	ND	0.084	ND	0.092
Arochlor 1221	ND	ND	0.084	ND	0.33
Arochlor 1232	ND	ND	0.084	ND	0.081
Arochlor 1242	ND	ND	0.084	ND	0.11
Arochlor 1248	ND	ND	0.084	ND	0.084
Arochlor 1254	ND	ND	0.170	ND	0.018
Arochlor 1260	ND	ND	0.170	ND	0.074

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted PCB arochlors and are comparable.

4. Primary Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1154SB	Primary Lab 1155SB	Reporting Limits	QA Lab 1156SB	Reporting Limits
GRO	ND	ND	5.0	ND	1.0

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table XVII cont.

5. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CENPD-ET-EN-L

Analytes Detected	Primary Lab 1154SB	Primary Lab 1155SB	Reporting Limits	QA Lab 1156SB	Reporting Limits
DRO	25	31	4.2	23	11

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other and are comparable.

6. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 3540/418.1)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1154SB	Primary Lab 1155SB	Reporting Limits	QA Lab 1156SB	Reporting Limits
TRPH	31.0	31.0	15.8	34.0	10.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other and are comparable.

7. Primary Method: Total Organic Carbon (EPA 9060 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 415.1 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1154SB	Primary Lab 1155SB	Reporting Limits	QA Lab 1156SB	Reporting Limits
TOC	1510	3310	4.2	1050	26.0

SUMMARY: The field blind duplicate and QA data agree within a factor of four with each other and are comparable.

CENPD-ET-EN-L (95-0501)
Table XVII cont.

8. Method: Total Metals (EPA 3050/6010, 7000 Series) Units: mg/kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: NET, Inc.

Analytes Detected	Primary Lab 1154SB	Primary Lab 1155SB	Reporting Limits	QA Lab 1156SB	Reporting Limits
Aluminum	10,700	10,100	5.3	14,300	21
Antimony	ND	ND	2.1	ND	10.0
Arsenic	3.5	4.2	0.53	2.5	0.5
Barium	32.0	28.5	1.1	115.0	2.1
Beryllium	0.23	0.25	0.11	ND	2.1
Cadmium	ND	ND	0.53	ND	2.1
Calcium	7330	7090	10.5	56,800	52
Chromium	20.7	24.8	0.53	19.0	2.1
Cobalt	10.4	9.6	0.53	9.5	5.2
Copper	21.6	21.9	0.53	19.0	2.1
Iron	21,400	20,200	5.3	23,100	10
Lead	6.7	6.5	2.6	4.8	0.2
Magnesium	7360	7620	10.5	7760	52
Manganese	404	390	0.53	2520	2.1
Mercury	ND	ND	0.084	0.05	0.02
Nickel	28.3	31.1	2.1	26.0	5.2
Potassium	523	533	158	756	210
Selenium	ND	ND	0.053	ND	0.5
Silver	0.72	0.90	0.53	ND	2.1
Sodium	153	137	42.0	304	52
Thallium	ND	ND	0.11	ND	21.0
Vanadium	37.7	34.0	0.53	37.0	5.2
Zinc	43.8	41.3	0.53	47.0	5.2

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable except for the QA data of calcium and manganese. The primary data of calcium and manganese are estimates based on poor precision between the laboratory duplicate results (ARDL report 9211).

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM ROAD
TROUTDALE, OREGON 97060-9508

OUA 0021283

REPLY TO ATTENTION OF

February 8, 1996

RECEIVED FEB 0 9 1996

Bill Richards
Ecology and Environment, Inc.
840 K St., Suite 100
Anchorage, Alaska 99501

Dear Mr. Richards:

Enclosed, completing all analyses requested to date, are reports of analytical data for the Ft. Richardson OUA, Phase II (Additional Sampling) project sampled by Ecology and Environment, Inc. on November 3, 1995. Reference original report number 9243 from ARDL, Inc. with Triangle Laboratories, Inc. report numbers 34885 A, B, and C. Included are:

a. original Chemical Quality Assurance Report

b. original report number K9507016 from Columbia Analytical Services, Inc. with Alta Analytical Laboratory, Inc. report number 1896

c. addendum from ARDL to Triangle Laboratories reports 34885 A and B, dated 6 Feb 96

d. CENPD-ET-EN-L sample cooler receipt form and telephone record

If you have any questions or comments concerning the Chemical Quality Assurance Report, please contact the author, Ruth Abney, at (503) 669-0246, or Pamela Hertzberg at (503) 666-8143.

Sincerely,

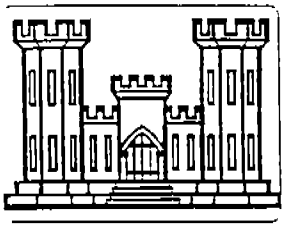
Timothy J. Seeman

Timothy J. Seeman, Director
North Pacific Division Laboratory

Enclosures

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ecology and environment



U.S. Army Corps of Engineers
North Pacific Division Laboratory
Troutdale, Oregon

Chemical Quality Assurance Report

OUA (Phase II) (Add'l)
Ft. Richardson

NPDL Work Order Number: 96-0055

Prepared for: **Alaska District**

Approved by: Pamela D. Hertzberg

PAMELA D. HERTZBERG, Chief
Project Management and Data Evaluation Branch

CENPD-ET-EN-L (96-0055) 8 Feb 96

CHEMICAL QUALITY ASSURANCE REPORT

OUA (PHASE II), (ADD'L), FT. RICHARDSON

1. **SUMMARY:**

a. Selected dioxin analytes are attributed to laboratory contamination. The arsenic data of samples 95RRFTA2001SD, -2002SD and -2003SD are considered estimates. Low levels of antimony may not have been detected if present in samples -2001SD, -2002SD and -2003SD.

b. The primary and QA data are presented in Tables I and II. All data agree with each other except for the field blind duplicate and QA dioxin data of selected analytes in Tables I-2 and II-2 do not agree. Based on acceptable internal QC provided by both laboratories, the data discrepancies could not be analytically resolved. The field blind duplicate and QA data of zinc in Table I-4 do not agree. Based on acceptable internal QC and blind duplicate agreement, the primary zinc data are accepted.

2. **BACKGROUND:** The samples were collected on November 3, 1995, and received by the analytical laboratories on November 7, 8, and 10, 1995.

3. **OBJECTIVES:**

a. Three sediment samples, including one blind duplicate, and three water samples, including one blind duplicate, were collected from various locations to determine the extent of the chemical contamination on the site.

b. One QA sediment sample, and one QA water sample were submitted to evaluate the primary laboratories' data.

4. **PROJECT ORGANIZATION:**

a. The samples were collected by Ecology and Environment, Inc., Anchorage, Alaska.

b. The primary samples were analyzed by Applied Research & Development Laboratory (ARDL), Inc., Mt. Vernon, Illinois. The Polychlorinated Dioxins and Furans analyses were subcontracted to Triangle Laboratories (TLI), Inc., Durham, North Carolina.

c. The QA samples were analyzed by Columbia Analytical Services (CAS), Inc., Kelso, Washington. The Polychlorinated Dioxin and Furan analyses were subcontracted to Alta Analytical Laboratory (ALTA), Inc., El Dorado Hills, California.

5. ANALYTICAL REFERENCES:

Number	Title	Date
SW-846. Third Edition	Test Methods for Evaluating Solid Waste - Final Update II	1/95
GRO & DRO	State of Alaska Interim TPH Methods	2/92
ASTM D4129-82 Mod.	Total Organic Carbon in Water - Oxidation by Coulometric Detection	1989

6. EVALUATION OF THE PRIMARY LABORATORIES' DATA:

a. Chain of Custody Records and Sample Cooler Receipt Forms: All chain of custody (COC) records and sample shipping conditions, as documented on the sample cooler receipt (SCR) form, met EPA or U.S. Army Corps of Engineers (USACE) ER 1110-1-263 regulations with the following exception. The laboratory personnel noted that the sample containers were wet and muddy upon receipt.

b. Sample Holding Times, Reporting Limits, Laboratory Method Blanks, Accuracy and Precision: Sample holding times and reporting limits were evaluated per EPA and State of Alaska Department of Environmental Conservation (ADEC) method criteria. The laboratory method blanks were evaluated for the absence of targeted analytes. The extraction efficiency, accuracy and precision of the data, as represented by the surrogate, matrix spike (MS), matrix spike duplicate (MSD), blank spike (BS) and blank spike duplicate (BD) recoveries and relative percent difference (RPD) results were compared to EPA, ADEC or laboratory established (LE) quality control (QC) acceptance limits. All of the above mentioned internal QC data met EPA, ADEC or LE method criteria and are acceptable with the following exceptions.

1. Dioxins: The water matrix method blank (associated with samples 95RRFTA2001SW and -2002SW) contained up to 13.1 ppq of OCDD, 2,3,4,6,7,8-HxCDF and Total HxCDF. The water matrix method blank (associated with sample -2003SW) contained up to 52.7 ppq of OCDD,

2,3,4,6,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, OCDF, Total HxCDF and Total HpCDF. The sediment matrix method blank (associated with samples 95RRFTA2001SD, -2002SD, and -2003SD) contained up to 1.8 ppt of OCDD, 2,3,4,6,7,8-HxCDF and Total HxCDF. These analytes, where detected in the associated samples, are attributed to laboratory contamination since the sample concentration was less than five times the amount detected in the blank. All internal standard and surrogate recoveries were within acceptance criteria.

2. Diesel Range Organics (DRO): The sediment MS/MSD RPD was marginally above the LE QC limits of 20. The DRO data are accepted based on the remaining acceptable BS/BD RPD result.

3. Total Metals:

a. Water Samples: The iron MS and MSD recoveries were below the 75-125% acceptance criteria and the iron RPD exceeded the acceptance criteria. The out of control QC results are not considered significant since the original sample concentration was greater than four times the spike amount. The accuracy of the iron data are accepted based on the acceptable BS determination.

b. Sediment Samples: The arsenic MS/MSD RPD exceeded the EPA and LE limit of 20. Samples -2001SD, -2002SD and -2003SD contained from 3.8 to 9.1 ppm of arsenic. The arsenic data of these samples are considered estimates because of the precision failure. The aluminum MS recovery was below the 75-125% acceptance range and the MSD recovery was above. The aluminum MS/MSD RPD exceeded control limits. The failed QC data are not considered significant since the original sample concentration was greater than four times the spike amount. The accuracy of the aluminum data are accepted based on the acceptable BS recovery. The MS and MSD recoveries for antimony were below the QC limits. The BS sample exhibited an acceptable recovery indicating possible negative matrix interference. Consequently, low levels of antimony may not have been detected if present in samples -2001SD, -2002SD and -2003SD. The iron MS and MSD recoveries and the associated RPD exceeded QC criteria. The out of control QC data are not considered significant since the original sample concentration was greater than four times the spike amount. The accuracy of the iron data are accepted based on the acceptable BS recovery. One of two manganese matrix spikes was below the EPA QC limits. The manganese MS/MSD RPD exceeded QC criteria. The out of control QC data are not considered significant since the original sample concentration was greater than four times the spike amount. The accuracy of the manganese data are accepted based on the acceptable BS recovery.

4. Total Organic Carbon (TOC): The TOC method blank contained 7.6 ppm. The TOC data of the samples is not attributed to laboratory contamination since the sample concentrations were greater than twenty times the amount detected in the method blank.

c. Field Blind Duplicate Results: The field blind duplicate results are presented in Tables I and II. All data agree with each other.

d. Overall Evaluation of the Primary Laboratories' Data: Selected dioxin analytes are due to laboratory contamination. The arsenic data of samples -2001SD, -2002SD and -2003SD are considered estimates. Low levels of antimony may not have been detected if present in the sediment samples based on the associated MS and MSD failure.

7. EVALUATION OF THE QA LABORATORIES' DATA:

a. Chain of Custody Records and Sample Cooler Receipt Forms: All COC records and sample shipping conditions, as documented on the SCR form, met EPA or USACE ER 1110-1-263 regulations with the following exception. The lids for sample -2004SD were not completely tightened for the containers designated for BNA, DRO, Metals, TOC and Dioxin analyses.

b. Sample Holding Times, Reporting Limits, Laboratory Method Blanks, Accuracy and Precision: Sample holding times and reporting limits were evaluated per EPA and ADEC method criteria. The laboratory method blanks were evaluated for the absence of targeted analytes. The extraction efficiency, accuracy and precision of the data, as represented by surrogate, MS, MSD, BS, and BD recoveries and RPD results were compared to EPA, ADEC or LE QC acceptance limits. All of the above mentioned internal QC data met EPA, ADEC or LE method criteria and are acceptable with the following exceptions.

1. Semi-volatile Organics (BNA): Two of eleven water BS/BD RPDs exceeded EPA QC limits. The precision of the BNA data are accepted based on the remaining nine acceptable RPD results. The initial preparation and analysis of sample -2004SD, which was performed within the required holding time, yielded four of six surrogate recoveries that were below EPA criteria. Low levels of BNA target analytes may not have been detected as indicated by the low surrogate recoveries. The sample was re-extracted past the recommended holding time with acceptable surrogate results. The data are considered estimates due to the holding time expiration.

2. Dioxins: The water matrix method blank contained 7.1 pg/L OCDD. This analyte in sample -2004SW is attributed to laboratory contamination since the result was less than five times the level in the method blank.

3. Total Metals: The sediment MS recoveries for aluminum, iron and manganese exceeded QC limits, which is not considered significant since the original sample concentration was greater than four times the spike amount. The accuracy of the aluminum, iron and manganese data are accepted based on the acceptable BS recoveries. The sediment MS recoveries of antimony, selenium and silver were below QC limits, with an acceptable BS determination, indicating possible negative matrix interference. Consequently, low levels of these analytes may not have been detected if present in sample -2004SD. The sediment replicate RPD of calcium exceeded QC limits. The sediment calcium data are considered estimates due to the poor precision performance. The arsenic, cobalt and lead replicate RPD data exceeded QC limits but this is not considered significant since the original sample concentration was less than five times the reporting limit.

8. **COMPARISON OF THE PRIMARY AND QA LABORATORIES' DATA:** The primary and QA data comparisons are presented in Tables I and II. All data agree with the following exceptions:

- The dioxin field blind duplicate and QA data in Table I-2 do not agree within a factor of three with each other or their reporting limits for Total HpCDD. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved.

- The total metals field blind duplicate and QA data in Table I-4 agree within a factor of three with each other or their reporting limits for all targeted analytes with the exception of zinc. Since both laboratories had acceptable internal QC, the zinc data discrepancy could not be resolved analytically. The primary zinc data are accepted based on blind duplicate agreement.

- The dioxin field blind duplicate and QA data in Table II-2 do not agree within a factor of five with each other or their reporting limits for 1,2,3,4,6,7,8-HpCDD, Total HpCDD, OCDD, 1,2,3,4,6,7,8-HpCDF and Total HpCDF. Since both laboratories had acceptable internal QC data, the discrepancies could not

CENPD-ET-EN-L (96-0055)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table I

Project: OUA (Phase II) (Add'l) Ft. Richardson Matrix: Water Prefix: 95RRFTA-
Primary Laboratory: ARDL, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Semi-Volatile Organics (EPA 3510/8270) Units: µg/L (ppb)
QA Method: Semi-Volatile Organics (EPA 3520A/8270A)

Analytes Detected	Primary Lab 2002SW	Primary Lab 2003SW	Reporting Limits	QA Lab 2004SW	Reporting Limits
Phenol	ND	ND	10	0.7 J	10

ND = Not detected
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits. Estimated analyte concentrations are not considered significant for the purpose of data comparison.

CENPD-ET-EN-L (96-0055)
Table I cont.

2. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: pg/L (ppq)
Primary Laboratory: TLI QA Laboratory: ALTA, Inc.

Analytes Detected	Primary Lab 2002SW	Primary Lab 2003SW	Reporting Limits	QA Lab 2004SW	eporting Limits
Total TCDDs	2.3 #	ND	--/2.7	ND	1.2
2,3,7,8-TCDD	ND	ND	4.0/2.7	ND	1.2
Total PeCDDs	ND	ND	7.2/2.8	ND	1.6
1,2,3,7,8-PeCDD	ND	ND	7.2/2.8	ND	1.6
Total HxCDDs	ND	ND	7.8/1.1	ND	1.3
1,2,3,4,7,8-HxCDD	ND	ND	8.5/1.2	ND	1.2
1,2,3,6,7,8-HxCDD	ND	ND	7.3/1.1	ND	1.3
1,2,3,7,8,9-HxCDD	ND	ND	7.6/1.0	ND	1.2
Total HpCDD	ND	4.5	8.8/--	ND	1.2
1,2,3,4,6,7,8-HpCDD	ND	2.8	8.8/--	ND	1.2
OCDD	27.1 B	107 B	--	6.8 B	--
Total TCDFs	ND	ND	3.9/2.0	ND	1.1
2,3,7,8-TCDF	ND	ND	3.9/2.0	ND	1.1
Total PeCDF	ND	ND	5.2/2.0	ND	1.2
1,2,3,7,8-PeCDF	ND	ND	5.5/2.1	ND	1.2
2,3,4,7,8-PeCDF	ND	ND	5.0/1.9	ND	1.0
Total HxCDFs	8.0 B	3.7 B	10.6/--	ND	2.8
1,2,3,4,7,8-HxCDF	ND	ND	6.7/1.3	ND	1.6
1,2,3,6,7,8-HxCDF	2.7 #	ND	--/1.0	ND	1.5
2,3,4,6,7,8-HxCDF	8.0 B	3.7 B	--	ND	2.8
1,2,3,7,8,9-HxCDF	ND	ND	7.1/1.2	ND	2.0
Total HpCDFs	ND	1.2 B	6.9/--	ND	1.3
1,2,3,4,6,7,8-HpCDF	ND	1.2 B	5.7/--	ND	1.0
1,2,3,4,7,8,9-HpCDF	ND	ND	8.7/1.2	ND	1.3
OCDF	ND	6.8 B,#	10.1/--	ND	1.3

# = Estimated maximum possible concentration
B = Found in method blank

SUMMARY: The presence of OCDD, 2,3,4,6,7,8-HxCDF, Total HxCDF, 1,2,3,4,6,7,8-HpCDF, Total HpCDF and OCDF are attributed to laboratory contamination. The field blind duplicate and QA data do not agree within a factor of three with each other or their reporting limits for Total HpCDD. Based on acceptable internal QC data, the data discrepancy could not be analytically resolved.

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CENPD-ET-EN-L (96-0055)
Table I cont.

3. Primary Method: Diesel Range Organics (EPA 3510/ ADEC 8100 Mod.) Units: µg/L (ppb)
QA Method: Diesel Range Organics (EPA 3510A/ADEC 8100 Mod.)
Primary Laboratory: ARDL, Inc. QA Laboratory: CAS, Inc.

Analytes Detected	Primary Lab 2002SW	2003SW	Reporting Limits	QA Lab 2004SW	Reporting Limits
DRO	ND	ND	100	91	50

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other or their reporting limits.

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CENPD-ET-EN-L (96-0055)
Table I cont.

4. Primary Method: Total Metals (EPA 3010, 3020/6010,7000 Series)
QA Method: Total Metals (EPA 3010A, 3020A/6010, 7000 Series) Units: ug/L (ppb)
Primary Laboratory: ARDL, Inc. QA Laboratory: CAS, Inc.

Analytes Detected	Primary Lab 2002SW	Primary Lab 2003SW	Reporting Limits	QA Lab 2004SW	Reporting Limits
Aluminum	3300	2800	50	2170	50
Antimony	ND	ND	20	ND	50
Arsenic	3.0	2.2	0.5	2 J	5
Barium	54	48	10	40	5
Beryllium	ND	D	1.0	ND	5
Cadmium	ND	ND	5.0	ND	3
Calcium	39,700	39,000	100	38,000	50
Chromium	ND	ND	5.0	ND	5
Cobalt	ND	ND	5.0	7 J	10
Copper	6.9	5.0	5.0	6 J	10
Iron	5500	5100	50	3860	20
Lead	2.8	2.8	1.0	2	2
Magnesium	8900	8600	100	8320	10
Manganese	1000	980	5.0	981	5
Mercury	ND	ND	0.2	ND	0.5
Nickel	ND	ND	20	ND	20
Potassium	2100	1700	1500	1000	2000
Selenium	ND	ND	0.5	ND	5
Silver	ND	ND	5.0	ND	10
Sodium	3800	3700	400	3810	100
Thallium	ND	ND	1.0	ND	5
Vanadium	9.3	7.9	5.0	7 J	10
Zinc	20	19	5.0	225	10

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other or their reporting limits for all targeted analytes with the exception of zinc. Since both laboratories had acceptable internal QC data, the zinc data discrepancy could not be resolved analytically. The primary zinc data are accepted based on blind duplicate agreement.

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CENPD-ET-EN-L (96-0055)
Table I cont.

5. Primary Method: Hardness (SM 2340 B) Units: mg/L (ppm)
QA Method: Hardness (EPA 3010A/6010A)
Primary Laboratory: ARDL, Inc. QA Laboratory: CAS, Inc.

Analytes Detected	Primary Lab 2002SW	Primary Lab 2003SW	Reporting Limits	QA Lab 2004SW	Reporting Limits
Hardness	136	133	0.75	129	0.2

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other.

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CENPD-ET-EN-L (96-0055)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table II

Project: OUA (Phase II) (Add'l) Ft. Richardson Matrix: Sediment Prefix: 95RRFTA-
Primary Laboratory: ARDL, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Semi-Volatile Organics (EPA 3550/8270) Units: mg/Kg (ppm)
QA Method: Semi-Volatile Organics (EPA 3550A/8270A)

Analytes Detected	Primary Lab 2002SD	Primary Lab 2003SD	Reporting Limits	QA Lab 2004SD	Reporting Limits
Phenol	ND	ND	0.410/0.420	0.07 J,RE	10
3 & 4-Methylphenol	--	--		0.3 RE	0.3
4-Methylphenol	ND	ND	0.410/0.420	--	
Benzoic Acid	ND	ND	2.000	0.2 J,RE	2

ND = Not detected
J = Estimated concentration
RE = Sample reanalysis
-- = Not reported

SUMMARY: The QA data are considered estimates since the initial sample analysis failed QC criteria and the re-extraction of the sample occurred after the expiration of the recommended holding time. The primary data are acceptable based on acceptable internal quality control results.

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CENPD-ET-EN-L (96-0055)
Table II cont.

2. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/l (ppt)
Primary Laboratory: TLI QA Laboratory: ALTA, Inc.

Analytes Detected	Primary Lab 2002SD	Primary Lab 2003SD	Reporting Limits	QA Lab 2004SD	Reporting Limits
Total TCDDs	ND	ND	0.4	ND	0.12
2,3,7,8-TCDD	ND	ND	0.4	ND	0.12
Total PeCDDs	ND	ND	0.4/0.5	ND	0.11
1,2,3,7,8-PeCDD	ND	ND	0.4/0.5	ND	0.11
Total HxCDDs	ND	ND	0.3/0.4	ND	0.32
1,2,3,4,7,8-HxCDD	ND	ND	0.3/0.4	ND	0.28
1,2,3,6,7.8-HxCDD	ND	ND	0.3/0.4	ND	0.32
1,2,3,7,8,9-HxCDD	ND	ND	0.3/0.4	ND	0.29
Total HpCDD	0.65	0.37 #	--	3.0	--
1,2,3,4,6,7,8-HpCDD	0.65	0.19 #	--	1.7	--
OCDD	4.3 B	1.8 B	--	10	--
Total TCDFs	ND	ND	0.4	0.45	--
2,3,7,8-TCDF	ND	ND	0.4	ND	0.11
Total PeCDF	ND	ND	0.4/0.5	ND	0.10
1,2,3,7,8-PeCDF	ND	ND	0.4/0.5	ND	0.10
2,3,4,7,8-PeCDF	ND	ND	0.5/0.5	ND	0.085
Total HxCDFs	0.49 B	0.35 #, B	--	ND	0.38
1,2,3,4,7,8-HxCDF	ND	ND	0.3/0.5	ND	0.15
1,2,3,6,7,8-HxCDF	ND	ND	0.2/0.3	ND	0.14
2,3,4,6,7,8-HxCDF	0.49 B	0.35 #, B	--	ND	0.38
1,2,3,7,8,9-HxCDF	ND	ND	0.3/0.4	ND	0.18
Total HpCDFs	0.34 #	0.11 #	--	1.1	--
1,2,3,4,6.7.8-HpCDF	0.34 #	0.11 #	--	0.61	--
1,2,3,4,7,8,9-HpCDF	ND	ND	0.3/0.4	ND	0.11
OCDF	ND	0.25 #	0.4/--	0.73	--

# = Estimated maximum possible concentration
B = Found in method blank

SUMMARY: The presence of OCDD and 2,3,4,6,7,8-HxCDF in the primary samples is due to laboratory contamination. The field blind duplicate and QA data do not agree within a factor of five with each other or their reporting limits for 1,2,3,4,6,7.8-HpCDD. Total HpCDD, OCDD, 1,2,3,4,6,7,8-HpCDF and Total HpCDF. Based on the acceptable internal QC provided by both laboratories, the data discrepancies could not be resolved analytically.

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3. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod. Units: mg/Kg (ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: CAS, Inc.

Analytes Detected	Primary Lab 2002SD	2003SD	Reporting Limits	QA Lab 2004SD	Reporting Limits
DRO	14	7.8	5/5.1	32	10

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other.

4. Primary Method: Total Organic Carbon (EPA 9060 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (ASTM D4129-82M)
Primary Laboratory: ARDL, Inc. QA Laboratory: CAS, Inc.

Analytes Detected	Primary Lab 2002SD	2003SD	Reporting Limits	QA Lab 2004SD	Reporting Limits
TOC	19,700	15,500	5.0/5.1	14,300	50.0

SUMMARY: The field blind duplicate and QA data agree within a factor of two with each other.

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CENPD-ET-EN-L (96-0055)
Table II cont.

5. Primary Method: Total Metals (EPA 3050/6010,7000 Series)
QA Method: Total Metals (EPA 3050A/6010, 7000 Series) Units: mg/K ppm)
Primary Laboratory: ARDL, Inc. QA Laboratory: CAS, Inc

Analytes Detected	Primary Lab 2002SD	Primary Lab 2003SD	Reporting Limits	QA Lab 2004SD	Reporting Limits
Aluminum	14,500	12,700	6.3/6.4	19,900	10
Antimony	ND	ND	2.5	ND	10
Arsenic	8.5	9.1	0.63/0.64	7	1
Barium	80.8	63.0	1.3	90	1
Beryllium	0.39	0.36	0.13	0.5 J	1
Cadmium	ND	ND	0.63/0.64	ND	1
Calcium	3540	3500	12.6/12.7	4730	10
Chromium	27.8	21.0	0.63/0.64	35	2
Cobalt	12.1	10.6	0.63/0.64	12	2
Copper	21.5	20.4	0.63/0.64	26	2
Iron	25,200	20,000	6.3/6.4	30,600	4
Lead	9.8	10.5	3.1/3.2	9	5
Magnesium	6160	4670	12.6/12.7	7580	2
Manganese	504	642	0.63/0.64	579	1
Mercury	ND	ND	0.10	0.1 J	0.2
Nickel	27.6	21.8	2.5	33	10
Potassium	343	455	189/191	570	400
Selenium	0.26	0.17	0.063/0.064	ND	1
Silver	1.7	1.5	0.63/0.64	0.5 J	2
Sodium	101	123	50.3/50.9	141	20
Thallium	ND	ND	0.13	ND	2
Vanadium	47.3	37.1	0.63/0.64	64	2
Zinc	56.8	54.4	0.63/0.64	61	2

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or theirreporting limits for all targeted analytes.

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DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-9503

OUA 0021299

August 31, 1995

Paul Cooley
Ecology and Environmental
840 K Street
Anchorage, Alaska 99501

Dear Mr. Cooley

Enclosed, completing all analyses requested to date, are reports of analytical data for the Ft. Richardson, OUA- Roosevelt Road, sampled by E&E, on May 22 through Jun. 7, 1995. Reference original reports, K9503251, K9503309, K9503402, K9503433, K9503523, K9503564 and K9504127 form CAS, Inc.

a. Enclosure 1, Original Chemical Quality Assurance Report.

b. Enclosure 2, Original reports numbers 9005, 9007, 9009 and 9011 from ARDL, Inc.

c. Enclosure 3, Original CENPD-ET-EN-L sample cooler receipt forms

Please contact Dr. Ajmal Ilias at (503) 669-0246 if you have any questions.

Sincerely,

for TIMOTHY J. SEEMAN, Director
North Pacific Division Laboratory

Enclosure

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CENPD-ET-EN-L (95-0271) 08 Aug 95

CHEMICAL QUALITY ASSURANCE REPORT

FORT RICHARDSON OUA - ROOSEVELT ROAD

1. **SUMMARY:**

a. Overall, the following deficiencies were noted in the primary laboratory's data. The MS recovery of reactive sulfide, indicates that the none detected data could be a false negative. Data of total selenium, antimony, and thallium associated with the low MS recoveries should be considered low estimates if detected. Calcium's relative percent difference (RPD) in report K9503309 was above EPA QC limits, data should be considered estimates. The samples associated with contaminated method blanks with concentration less than ten times the blank concentration should be considered due to laboratory contamination. Some coolers were received outside of the USACE required $4 \pm 2°C$.

b. The primary and quality assurance (QA) data are presented in Tables III through XVI. All data agree with each other with the following exceptions. The QA TCLP mercury data presented in Table (III-5) and the QA data of selenium and thallium presented in most of the total metals tables confirm the primary laboratory results at higher detection limits. The QA and primary blind duplicate gasoline range organics (GRO) data presented in Table (VIII-3) do not agree due to QA laboratory's quantitation of non-fuel related unknown compounds.

2. **BACKGROUND:** The samples were collected on 22 May through 6 June 1995 and received by the analytical laboratories on 26 May and 1 through 10, Jun. 1995.

3. **OBJECTIVES:**

a. One hundred and twenty eight soil, three sludge samples including thirteen soil blind duplicates, one rinsate blank, and one trip blank were collected from various locations to determine the extent of the chemical contamination on the site.

b. Fourteen QA soil sludge samples were submitted to evaluate the primary laboratory's data.

4. **PROJECT ORGANIZATION:**

a. The samples were collected by Ecology and Environment (E&E), Anchorage, Alaska.

b. The primary samples were analyzed by Columbia Analytical Services (CAS), Inc., Kelso, Washington, and Northern Testing Laboratories Inc., Fairbanks, Alaska.

c. The QA samples were analyzed by Applied Research and Development Laboratory (ARDL), Inc., Mt. Vernon, Illinois.

5. **ANALYTICAL REFERENCES:**

Number	Title	Date
SW-846, Third Edition	Test Methods for Evaluating Solid Waste - Final Update II 1/95	
EPA-600/4-79-20	Method for Chemical Analysis of Water and Waste	3/83
GRO & DRO	State of Alaska Interim TPH Methods	2/92
FIQ (COE 8015)	Proposed U.S.Army Corps of Engineers Fuel Identification/Quantitation EPA 8015 Modified	1989
ASTM D4129-82 Mod.	Total and Organic Carbon in Water - Oxidation by Coulometric Detection	1989

6. **EVALUATION OF THE PRIMARY LABORATORY'S DATA:**

a. Surrogate Recoveries: All surrogate recoveries were within EPA, State of Alaska Department of Environmental Conservation (ADEC), or laboratory established (LE) quality control (QC) limits and are acceptable with the following exceptions and/or notations. One of three volatile organic carbons (VOC) surrogates bromoflourobenzene (BFB) was below EPA QC limits in soil sample -1099SB of CAS report K9503433. The sample was reanalyzed with similar results. Target analytes detected in the samples should be regarded as low estimates, and low levels of targeted analytes may have not been detected if present.

b. Matrix Spike (MS), Matrix Spike Duplicate (MSD) Laboratory Control (LC) Recoveries and Laboratory Duplicate Results: All MS, MSD, and LC recoveries and relative percent difference (RPD) results were within EPA, ADEC or LE QC limits with the following exceptions and/or notations.

I. (VOC): One of seven MS/MSD RPD results were outside of EPA QC limits in CAS reports K9503402, K9503251, K9503523, and K9503564. The precision of the associated data are accepted based on the remaining six acceptable RPD's.

II. BNA: Semi-volatile organic compounds (BNA). One of eleven TCLP/BNA MS recoveries (pyridine) in report K9503251 was not calculable due to matrix interference. The data of the associated samples are accepted based on the remaining acceptable recoveries. Two of twenty-two LC/LCD recoveries (1,2,4-trichlorobenzene) in report K9503523 and the batched QC

in report K9503564 were slightly below EPA QC limits. The data of the associated samples are acceptable based on the majority of in-control LC/LCD recoveries.

III. GRO and FIQ: The GRO LCD recovery in report K9503433 was above LE QC limits due to an "auto-sampler" problem. The high LCD recovery (in contrast with the in-control LC recovery) affected the RPD result. The GRO LCD recovery in report K9503309 was below LE QC limits. The low LCD recovery affected the RPD result. The GRO accuracy and precision of the associated data in both reports are accepted based on the remaining acceptable MS and LC recoveries and duplicate RPD results. The fuel identification quantitation (FIQ) duplicate RPD results were above FIQ limits due to a non-homogenious sample.

IV. DRO: Diesel range organics(DRO). The LCD recovery in report K9504127 was above LE QC limits due to possible spiking error which in turn affected the RPD results. The data's accuracy of the associated sample was not adversely affected since no DRO were detected in the sample. The DRO MS batched in QC of report K9503251 was not calculable based on a sample concentration that was four times greater than the spike concentration. The duplicate RPD results were above ADEC QC limits due to non-homogeneous sample. The accuracy and precision of the associated data are accepted based on the remaining acceptable LC/ LCD recoveries and RPD results.

V. TPH: Total petroleum hydrocarbons (TPH). The LCD recovery in report K9503309 was below LE QC limits. The data of the associated samples are accepted based on the remaining acceptable MS and LC recoveries. The batched QC in report K9504127 was not calculable due to the proximity of the results to the detection limits. The duplicate RPD results in reports K9503251, K9503523, K9503309, and K9503564 were above LE QC limits due to the proximity of the results to the detection limits. The precision of the associated data are accepted based on acceptable LC/LCD RPD results.

VI. Total Metals: The Ms recoveries of aluminum, iron and manganese in reports K9503402, K9503433, K9503523, and K9503309, aluminum and iron in report K9503251, and aluminum in report K9503564 were not calculable based on the samples concentrations, four times greater than the spike concentration. The MS recoveries of antimony in all the reports, the MS recoveries of selenium in reports K9503309, K9503402, and K9503523 and the MS recovery of thallium in report K9503433 were below EPA QC limits. The data of antimony, selenium, and thallium in the aforementioned reports should be considered low estimates when detected and low levels may have not been detected if present. The duplicate RPD results of arsenic, and cadmium in report K9504127, antimony in reports K9503433 and K9503564, mercury in report K9503523, and antimony and cadmium in report K9503251 were above EPA ICP QC limits of 35 due to the proximity of the results to the detection

limits. The precision of arsenic, antimony, cadmium, and mercury of the associated data are accepted. The duplicate RPD result of calcium in report K9503309 was above EPA QC limits. The calcium data in the associated samples should be considered estimates.

VII. Inorganic: the MS recovery of reactive sulfide in report K9503251 was 7 percent. It is below the LE QC limits of 50 to 150. The low levels may not have been detected if present.

c. Primary Blind Duplicate Results: The primary blind duplicate results are presented in Tables III through XIV. All data agree. Estimated analytes detected between the method detection limit and laboratory reporting limit are not considered significant for the purpose of data evaluation.

d Laboratory Method, Trip and Rinsate Blank Results: The trip and rinsate blanks are shown in Tables I and II, respectively. The rinsate and trip blank data were free of targeted analytes except for some VOC analytes. However according to the chain of custody records, the trip and rinsate blanks are not associated with any soil sample collected from the site. All laboratory's method blanks were free of targeted analytes with the following exceptions:

I. VOC: Two to forty-two of sixty-three target analytes were detected in all VOC soil and water method blanks at low estimated concentration. The majority of the samples exhibited the same target analytes with similar results at concentrations less than ten times the method blank contamination. The data of the associated samples should be considered due to laboratory contamination.

II. BNA: 13ppb of bis (2-ethylexyl) phthalate were detected in the water method blank in report K9504127. The associated sample was not affected by the blank contamination.

III. TPH: 4.5 and 7.2 ppm were detected in the method blanks in report number K9503402. Data of the associated samples when less than ten times the blanks concentrations respectively should be considered due to laboratory contamination. 15 ppm were detected in report K9503433. The associated samples were not affected by the blank contamination.

IV. Total Metals: 0.06 ppm of mercury was detected in the soil method blank of report K9503433. Data of the associated samples -1110SB, -1113SB, -1114SB, -1115SB, and -1116SB at concentrations less than ten times the blank contamination should be considered due to laboratory contamination. 0.4ppm of copper and 0.4ppm of zinc were detected in the soil method blank of report K9503523, and 0.6 ppm of magnesium were detected in the two soil method blanks of report K9503251. Data of the associated samples in both reports were not affected by the blank contamination as the samples results were ten times greater than the method blank concentrations

respectively. 490 ppb of potassium and 3ppb of zinc were detected in the water method blank of report K9504127. Data of the associated sample -1001WA at levels less than ten times the blank concentration should be considered due to laboratory contamination.

e. Holding Times and Detection Limits: All holding times and detection limits met method requirements with the following exceptions and/or notations. The dilution reanalysis of soil VOC sample -1099SB was performed one day after the recommended holding times. Three TCLP BNA analysis (K9503751) were performed six days beyond the recommended holding time due to a laboratory's error. The detection limits for GRO, DRO, and TPH of sample -1094SB in report K9503433 were elevated based on low percent solids. The detection limits for FIQ and PCB in report K9503251 were elevated for some samples based on required dilution, or matrix interference.

f. Chain of Custody (COC) Records and Sample Cooler Receipt (SCR) Forms: All COC records and SCR forms met U.S. Army Corps of Engineers (USACE) ER1110-1-263 protocols with the following exceptions. Five out of six COC in report K9503309 and one out of six in report K9503433 were not signed and dated by the laboratory upon receipt. Sample transfer chain is incomplete. Thirteen coolers out of twenty seven coolers were received below and above 4 ± 2 °C. The laboratory did not indicate which samples were in the affected coolers.

g. Overall Evaluation of the Primary Laboratory's Data: Overall, the following deficiencies were noted in the primary laboratory's data.. The MS recovery of reactive sulfide in report K9503251 was 7 percent. It is below the LE QC limits of 50- 150. Data of selenium, antimony, and thallium associated with the low MS recoveries should be considered low estimates. Calcium's data in report K9503309, should be considered estimates based on high RPD. The samples, trip blank, and rinsate blank associated with contaminated method blanks with concentration less than ten times the blank concentration should be considered due to blank contamination. Some coolers were received with internal temperatures above or below 4 ± 2°C.

7. EVALUATION OF QA LABORATORY'S DATA:

a. Surrogate, MS, MSD, RPD and LC, LCD Recoveries: All surrogate, MS/MSD, and LC/LCD recoveries and duplicate RPD results were within EPA, ADEC, or LE QC limits with the following exceptions. FIQ surrogate recovery of sample -1003SL, and the MS/MSD recoveries in report 9009 were diluted out. The extraction efficiency, and the data accuracy and precision of the single sample can not be determined. One out of ten VOC MS/MSD recoveries in report 9009 was marginally below EPA QC limit. The accuracy of the associated data are accepted based on the remaining acceptable recoveries. One out of five VOC RPD MS/MSD results in report 9011 was above EPA QC limits. The precision of the associated data are accepted based on the remaining acceptable results.

One out of twelve TCLP BNA MS/MSD recoveries in report 9009 was below LE QC limits which affected the RPD results. The accuracy and precision of the associated data are accepted based on the remaining acceptable recoveries. Five out of eleven BNA MS/MSD RPD results in report 9011 were above LE QC limits. The precision of the data are not adversely affected since no targeted analytes were detected in the associated samples. The GRO MS/MSD recoveries in report 9005 were above ADEC QC limits. The data of the associated sample should be considered high estimates. The MS/MSD of aluminum, iron, manganese, and magnesium in report 9005 and the batched QC in report 9007, 9009, and 9011 were not calculable due to the sample concentration which was four times greater than the spike concentration. Data of the associated samples are accepted based on acceptable LC recoveries.

b. Laboratory Method Blanks, Holding Times, Detection Limits: All laboratory method blanks, were free of targeted analytes with the following exceptions and/or notations. 9 ppb and 8 ppb of methylene chloride were detected in the VOC method blanks of reports 9009, and 9011 respectively. The data of methylene chloride in the associated samples -1010SB, -1023SB, -1096SB, -1109SB, -1109SB and -1130SB at levels less than ten times the blank concentration should be considered due to laboratory contamination. All holding times and detection limits were within EPA, ADEC, or LE QC limits with the following notations. The polychlorinated biphenyls (PCB) and FIQ detection limits in report 9009 were elevated due to the required dilution.

c. Chain of Custody Records and Sample Cooler Receipt Forms: The COC record and SCR forms met EPA and/or USACE ER1110-1-263 requirements with the following exceptions. One cooler was received at temperature of 1.5 degrees Celsius, which is below the recommended temperature of 4 $\pm$ 2°C. Samples present in this cooler were -1010SB, -1023SB, -1028SB, and -1003SL. Samples in the coolers associated with reports 9005 and 9009 were either sampled in inappropriate jars, or more than one jar were sealed in the same bag. This does not meet the packing and shipping requirements per ER 1110-1-263.

d. Overall Evaluation of the QA Laboratory's Data: Overall, the following deficiencies were noted in the QA laboratory's data. The extraction efficiency, the accuracy and precision of the FIQ data of sample -1003SL can not be determined based on diluted out surrogate and MS/MSD recoveries in report 9009. The GRO in report 9005 should be considered high estimate based on high MS/MSD recoveries. The data of methylene chloride in samples -1010SB, -1023SB,-1096SB, -1109SB, -1109SB and -1130SB at levels less than ten times the blank concentration should be considered due to laboratory contamination as it was detected in the associated method blank.

8. **COMPARISON OF THE PRIMARY AND QA LABORATORIES' DATA:** The primary and QA laboratories data are presented in Tables III through XVI. All data agree with each other

and are comparable with the following exceptions and or notations. The QA TCLP mercury data presented in Table (III-5) and the QA data of selenium and thallium presented in most of the total metals tables confirm the primary laboratory results at higher detection limits. The QA and primary blind duplicate GRO data presented in Table (VIII-3) do not agree due to QA laboratory's quantitation of non targeted hydrocarbons. The QA laboratory internal QC indicates high MS recovery. The QA data should be considered high estimates. The primary GRO data are accepted based on acceptable internal QC.

9. **PROBLEMS ENCOUNTERED/CORRECTIVE ACTIONS TAKEN:**

a. The primary laboratory did not analyze the TCLP VOC test due to a laboratory error. The comparison of the QA data was not possible.

b. The VOC blank contamination was overwhelming, beyond the range of tabulation. Most of the reported VOC in the primary report is due to laboratory contamination.

c. The rinsate and trip blank were collected at a date that does not correspond with any soil samples collected from the site.

CENPD-ET-EN-L (95-0271)

PROJECT TRIP BLANK RESULTS

Table I

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Water Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc.

1. Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/L (ppb)

Analytes Detected	Primary Lab 1002WA	Detection Limits
Acetone	54	20
Bromodichloromethane	0.18 J	0.5
2-Butanone	3.02 J	20
Chloroform	3.9	0.5
Chloromethane	2.6	0.5
1,2-Dichloropropane	0.20 J	0.5
Toluene	0.36 J	0.5
Total Xylenes	0.42 J	0.5

J = Estimated concentration

SUMMARY: Eight analytes were detected in the trip blank, however, the trip and rinsate blanks do not correspond with any soil sample collected from the site.

2. Method: Gasoline Range Organics (EPA 5030/8015) Units: ug/L (ppb)

Analytes Detected	Primary Lab 1002WA	Detection Limits
GRO	ND	50

SUMMARY: The trip blank is free of targeted analytes, however, it does not correspond with any soil sample collected from the site.

CENPD-ET-EN-L (95-0271)

PROJECT RINSATE BLANK RESULTS

Table II

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Water Prefix: 95RRTSL-
Primary Laboratory: CAS. Inc.

1. Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/L (ppb)

Analytes Detected	Primary Lab 1001WA	Detection Limits
Acetone	30	20
Bromodichloromethane	0.18 J	0.5
2-Butanone	2.35 J	20
Chloroform	3.9	0.5
Chloromethane	0.6	0.5
Toluene	0.17 J	0.5

J = Estimated concentration

SUMMARY: Six analytes were detected in the rinsate blank, however, the rinsate blank does not correspond with any soil sample collected from the site.

2. Method: Semi-Volatile Organics (EPA 3520A/8270) Units: ug/L (ppb)

Analytes Detected	Primary Lab 1001WA	Detection Limits
	ND	10-25

SUMMARY: The rinsate blank is free of targeted analytes, however, it does not correspond with any soil sample collected from the site.

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3. Method: Polychlorinated Biphenyls/PCBs (EPA 3510/8080) Units: ug/L (ppb)

Analytes Detected	Primary Lab 1001WA	Detection Limits
Aroclor 1016	ND	0.2
Aroclor 1221	ND	0.2
Aroclor 1232	ND	0.2
Aroclor 1242	ND	0.2
Aroclor 1248	ND	0.2
Aroclor 1254	ND	0.2
Aroclor 1260	ND	0.2

SUMMARY: The rinsate blank is free of targeted analytes. however, it does not correspond with any soil sample collected from the site.

4. Method: Gasoline Range Organics (EPA 5030/8015) Units: ug/L (ppb)

Analytes Detected	Primary Lab 1001WA	Detection Limits
GRO	ND	50

SUMMARY: The rinsate blank is free of targeted analytes. however, it does not correspond with any soil sample collected from the site.

5. Method: Diesel Range Organics (EPA 3510A/8100) Units: ug/L (ppb)

Analytes Detected	Primary Lab 1001WA	Detection Limits
DRO	ND	50

SUMMARY: The rinsate blank is free of targeted analytes. however, it does not correspond with any soil sample collected from the site.

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CENPD-ET-EN-L (95-0271)
Table II cont.

6. Method: Total Petroleum Hydrocarbons (EPA 418.1) Units: mg/L (ppm)

Analytes Detected	Primary Lab 1001WA	Detection Limits
TPH	ND	0.2

SUMMARY: The rinsate blank is free of targeted analytes, however, it does not correspond with any soil sample collected from the site.

7. Method: Total Organic Carbon (EPA 415.1) Units: mg/L (ppm)

Analytes Detected	Primary Lab 1001WA	Detection Limits
TOC	ND	0.5

SUMMARY: The rinsate blank is free of targeted analytes, however, it does not correspond with any soil sample collected from the site.

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CENPD-ET-EN-L (95-0271)
Table II cont.

8. Method: Total Metals (EPA CLAA, CLFAA 6010, 7000 Series) Units: ug/L (ppb)

Analytes Detected	Primary Lab 1001WA	Detection Limits
Aluminum	42 J	50
Antimony	ND	50
Arsenic	1 J	5
Barium	11	5
Beryllium	ND	5
Cadmium	3	3
Calcium	20,100	50
Chromium	ND	5
Cobalt	ND	10
Copper	6 J	10
Iron	ND	20
Lead	ND	2
Magnesium	3110	10
Manganese	1 J	1
Mercury	ND	0.5
Nickel	ND	20
Potassium	460 J	2000
Selenium	ND	5
Silver	ND	10
Sodium	6510	100
Thallium	ND	5
Vanadium	4 J	10
Zinc	4 J	10

SUMMARY: The metals detected in the rinsate blank indicate some sort of cross-contamination did occur, however, this rinsate does not correspond with any soil sample collected from the site.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table III

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Sludge Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: TCLP Volatile Organic Compounds (EPA 1311/5030/8260)` Units: ug/L (ppb)

Analytes Detected	Primary Lab 1001SL	1002SL	Detection Limits	QA Lab 1003SL	Detection Limits
	DNS	DNS		ND	5-100

-- = Not reported
DNS = Data not submitted

SUMMARY: The primary laboratory did not perform TCLP VOC due to an inadvertent laboratory error.

2. Method: TCLP Semi-Volatile Organic Compounds (EPA 1311/3510/8270) Units: ug/L (ppb)

Analytes Detected	Primary Lab 1001SL	1002SL	Detection Limits	QA Lab 1003SL	Detection Limits
	ND	ND	100-250	ND	10-50

SUMMARY: The project blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

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CENPD-ET-EN-L (95-0271)
Table III cont.

3. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: mg/Kg (ppm)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1001SL	1002SL	Detection Limits	QA Lab 1003SL	Detection Limits*
Aroclor 1016	ND	ND	0.1	ND	1.3
Aroclor 1221	ND	ND	0.1	ND	1.3
Aroclor 1232	ND	ND	0.1	ND	1.3
Aroclor 1242	ND	ND	0.1	ND	1.3
Aroclor 1248	ND	ND	0.1	ND	1.3
Aroclor 1254	ND	ND	1 DF	2.2 J	2.6
Aroclor 1260	1.8	1.5	0.1	1.3 J	2.6
Percent Solids	65.8	69.3		62	

* = Reporting limit elevated due to sample dilution
J = Estimated concentration
DF = Reporting limit elevated due to matrix interference

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other or their detection limits.

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CENPD-ET-EN-L (95-0271)
Table III cont.

4. Project Method: Fuel Identification/ Quantitation (COE 3540A/8015 Mod.) Units: mg/Kg (ppm)
QA Method: Fuel Identification/Quantitation (COE 3550/8015 Mod.)

Analytes Detected	Primary Lab 1001SL	1002SL	Detection Limits*	QA Lab 1003SL	Detection Limits*
Gasoline	ND	ND	1500/1000	ND	270
Mineral Spirits	ND	ND	1500/1000	--	
Kerosene	ND	ND	1500/1000	ND	270
Jet Fuel	ND	ND	1500/1000	ND	270
Diesel Fuel #2	ND	ND	1500/1000	ND	270
Bunker C (D#6)	--	--		5700	1000
Other	12,000	9600	3000/2000	--	

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other. For the purpose of data evaluation bunker C and other are considered comparable.

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5. Method: TCLP Metals (EPA 3010,7470/6010,7470) Units: mg/L (ppm)

Analytes Detected	Primary Lab 1001SL	1002SL	Detection Limits	QA Lab 1003SL	Detection Limits
Arsenic	ND	ND	0.1	ND	0.03
Barium	0.7	0.8	0.5	1.1	0.01
Cadmium	0.06	0.06	0.01	0.064	0.003
Chromium	ND	ND	0.01	0.0052	0.005
Lead	0.24	0.38	0.05	0.22	0.03
Mercury	0.001 J	ND	0.001	0.00029	0.0002
Selenium	ND	ND	0.1	ND	0.04
Silver	ND	ND	0.1	ND	0.005

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other or their detection limits for all targeted analytes except for the data of mercury. The mercury analysis by the QA laboratory confirms the primary laboratory analysis near the method detection limit. Data comparisons at or below the detection limits are not considerd significant.

6. Project Method: Cyanide (EPA 335.2) Units: HCN/Kg (ppm)
QA Method: Cyanide (EPA 9012) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1001SL	1002SL	Detection Limits	QA Lab 1003SL	Detection Limits
Total Cyanide	1.2	1.3	0.2	2.7	0.74
Cyanide reactive	--	--		ND	0.41

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other.

CENPD-ET-EN-L (95-0271)
Table III cont.

7. Method: Flashpoint (EPA 1010) Units: degrees F

Analytes Detected	Primary Lab 1001SL	Primary Lab 1002SL	Detection Limits	QA Lab 1003SL	Detection Limits
	>200	>200		>200	

SUMMARY: The project blind duplicate and QA data agree with each other.

8. Method: pH (EPA 9045) Units: pH units

Analytes Detected	Primary Lab 1001SL	Primary Lab 1002SL	Detection Limits	QA Lab 1003SL	Detection Limits
pH	7.00	7.03	--	6.3	

SUMMARY: The project blind duplicate and QA data agree with each other.

9. Method: Sulfide (EPA 9030) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1001SL	Primary Lab 1002SL	Detection Limits	QA Lab 1003SL	Detection Limits
	ND	ND	25	45.8	40.5

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other or their detection limits.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table IV

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1008SB	Primary Lab 1009SB	Detection Limits	QA Lab 1010SB	Detection Limits
Acetone	11.3 JB	ND	50	ND	100
Methylene Chloride	7.37 J	6.03 J	10	7 B	5
Toluene	0.21 JB	ND	5	ND	5
1,2,4-Trichlorobenzene	0.38 JB	0.31 JB	20	ND	5
1,2,3-Trichlorobenzene	0.66 JB	0.37 JB	20	ND	5
Percent Solids	91.6	92.1		96	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree with each other for all targeted analytes except for the estimated project data of acetone. toluene, 1,2,4- and 1,2,3-trichlorobenzene. Estimated concentrations are not considered significant for the purpose of data comparison. Most of the estimated analyte concentrations are due to laboratory contamination based on the associated method blank results.

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2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1008SB	1009SB	Detection Limits	QA Lab 1010SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	83
Aroclor 1221	ND	ND	100	ND	83
Aroclor 1232	ND	ND	100	ND	83
Aroclor 1242	ND	ND	100	ND	83
Aroclor 1248	ND	ND	100	ND	83
Aroclor 1254	ND	ND	100	ND	170
Aroclor 1260	ND	ND	100	ND	170
Percent Solids	93.4	93.8		96	

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1008SB	1009SB	Detection Limits	QA Lab 1010SB	Detection Limits
GRO	ND	ND	5.0	ND	5.0

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

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ecology and environment

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1008SB	Primary Lab 1009SB	Detection Limits	QA Lab 1010SB	Detection Limits
DRO	14	12	10	6.5	4.2

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other and are comparable.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1008SB	Primary Lab 1009SB	Detection Limits	QA Lab 1010SB	Detection Limits
TPH	12	16	10	13.4	10.4

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other and are comparable.

CENPD-ET-EN-L (95-0271)
Table IV cont.

6. Method: Total Metals (EPA 3050/6010,7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1008SB	Primary Lab 1009SB	Detection Limits	QA Lab 1010SB	Detection Limits
Aluminum	16,000	16,000	10	17,900	5.2
Antimony	ND	ND	10	2.3	2.1
Arsenic	7	8	1	4.9	0.26
Barium	68	57	1	49.4	1.0
Beryllium	0.4 J	0.4 J	1	0.39	0.10
Cadmium	ND	ND	1	ND	0.31
Calcium	5620	5480	10	8000	10.4
Chromium	31	30	2	35.9	0.52
Cobalt	13	13	2	15.7	0.52
Copper	33	28	2	30.0	0.52
Iron	29,200	30,300	4	31,700	5.2
Lead	8	6	1	10.6	3.1
Magnesium	9290	8800	2	10,900	10.4
Manganese	704	703	1	723	0.52
Mercury	0.1 J	0.1 J	0.2	ND	0.081
Nickel	39	36	10	47.0	2.1
Potassium	660	610	400	812	104
Selenium	ND	ND	1	0.093	0.052
Silver	ND	ND	2	ND	0.52
Sodium	116	97	20	167	41.7
Thallium	0.2 J	ND	1	0.19	0.10
Vanadium	56	57	2	76.2	0.52
Zinc	82	57	2	63.6	0.52

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits.

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COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table V

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS. Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1021SB	Primary Lab 1022SB	Detection Limits	QA Lab 1023SB	Detection Limits
Acetone	14.8 J	8.56 J	50	ND	110
Methylene Chloride	12 B	2.36 JB	10	6 B	5
Toluene	0.52 J	ND	5	ND	5
1,4-Dichlorobenzene	0.32 JB	ND	5	ND	5
1,2-Dichlorobenzene	0.22 JB	ND	5	ND	5
1,2,4-Trichlorobenzene	0.34 JB	0.37 JB	20	ND	5
1,2,3-Trichlorobenzene	0.58 JB	0.64 JB	20	ND	5
Naphthalene	0.75 JB	0.67 JB	20	ND	5
Percent Solids	94.6	95.3		94.0	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree with each other for all targeted analytes. The project estimated concentrations of acetone and toluene are not considered significant for the purpose of data evaluation. 1,4- and 1,2-dichlorobenzene, 1,2,4- 1,2,3-trichlorobenzene and naphthalene are due to primary laboratory method blank contamination.

CENPD-ET-EN-L (95-0271)
Table V cont.

2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1021SB	Primary Lab 1022SB	Detection Limits	QA Lab 1023SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	85
Aroclor 1221	ND	ND	100	ND	85
Aroclor 1232	ND	ND	100	ND	85
Aroclor 1242	ND	ND	100	ND	85
Aroclor 1248	ND	ND	100	ND	85
Aroclor 1254	ND	ND	100	ND	170
Aroclor 1260	ND	ND	100	ND	170
Percent Solids	96.2	95.3		94.0	

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1021SB	Primary Lab 1022SB	Detection Limits	QA Lab 1023SB	Detection Limits
GRO	ND	ND	5.0	ND	5.0

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table V cont.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1021SB	1022SB	Detection Limits	QA Lab 1023SB	Detection Limits
DRO	11	26	10	5.3	4.3

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1021SB	1022SB	Detection Limits	QA Lab 1023SB	Detection Limits
TPH	15	18	10	10.8	10.6

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table V cont.

6. Method: Total Metals (EPA 3050/6010,7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1021SB	Primary Lab 1022SB	Detection Limits	QA Lab 1023SB	Detection Limits
Aluminum	14,700	14,300	10	17,100	5.3
Antimony	ND	ND	10	ND	2.1
Arsenic	6	5	1	4.2	0.26
Barium	54	54	1	60.3	1.1
Beryllium	0.2 J	0.4 J	1	0.35	0.11
Cadmium	ND	ND	1	ND	0.32
Calcium	5720	5410	10	6850	10.6
Chromium	33	29	2	32.9	0.53
Cobalt	12	11	2	14.9	0.53
Copper	28	28	2	27.6	0.53
Iron	28,300	27,200	4	31,300	5.3
Lead	5	5	1	8.7	3.2
Magnesium	9030	9070	2	10,200	10.6
Manganese	625	611	1	661	0.53
Mercury	0.1 J	ND	0.2	ND	0.084
Nickel	42	37	10	35.6	2.1
Potassium	650	680	400	772	106
Selenium	ND	ND	1	ND	0.053
Silver	ND	ND	2	ND	0.53
Sodium	123	117	20	148	42.3
Thallium	ND	ND	1	0.16	0.11
Vanadium	51	50	2	74.2	0.53
Zinc	54	55	2	61.4	0.53

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other or their detection limits except for the QA laboratory thallium data. The QA analysis of thallium confirmed the primary laboratory results of none detected at the higher detection limit.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table VI

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Sludge Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

Project Method: Total Organic Carbon (ASTM D4129-82 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 9060 Mod.)

Analytes Detected	Primary Lab 1026SB	1027SB	Detection Limits	QA Lab 1028SB	Detection Limits
TOC	1400	3800	500	6500	4.3

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table VII

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS. Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1036SB	Primary Lab 1037SB	Detection Limits	QA Lab 1038SB	Detection Limits
Acetone	66 B	20.4 JB	50	ND	100
Methylene Chloride	ND	2.53 J	10	9	5
Toluene	1.84 JB	1.52 JB	5	ND	5
Ethylbenzene	1.41 J	0.83 J	5	ND	5
1,3,5-Trimethylbenzene	0.25 J	0.27 J	20	ND	5
1,3-Dichlorobenzene	0.49 JB	0.29 JB	5	ND	5
1,4-Dichlorobenzene	0.45 JB	0.42 JB	5	ND	5
n-Butylbenzene	0.37 JB	0.31 JB	20	ND	5
1,2-Dichlorobenzene	0.36 JB	0.43 JB	5	ND	5
1,2,4-Trichlorobenzene	1.00 JB	0.93 JB	20	ND	5
1,2,3-Trichlorobenzene	1.15 JB	1.07 JB	20	ND	5
Trichloroethene	ND	0.61 J	5	ND	5
Total Xylenes	10	5	5	ND	5
Styrene	ND	0.41 J	5	ND	5
1,2,4-Trimethylbenzene	ND	0.62 J	20	ND	5
Naphthalene	ND	1.15 JB	20	ND	5
Hexachlorobutadiene	ND	1.04 JB	20	ND	5
Percent Solids	95.5	94.5		97.0	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree with each other for all targeted analytes. Estimated analyte concentrations are not considered significant for the purpose of data evaluation. Most of the analytes reported by the project laboratory are due either to laboratory cross-contamination or artifacts.

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CENPD-ET-EN-L (95-0271)
Table VII cont.

2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1036SB	Primary Lab 1037SB	Detection Limits	QA Lab 1038SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	82
Aroclor 1221	ND	ND	100	ND	82
Aroclor 1232	ND	ND	100	ND	82
Aroclor 1242	ND	ND	100	ND	82
Aroclor 1248	ND	ND	100	ND	82
Aroclor 1254	ND	ND	100	ND	160
Aroclor 1260	ND	ND	100	ND	160
Percent Solids	89.7	94.9		96.9	

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1036SB	Primary Lab 1037SB	Detection Limits	QA Lab 1038SB	Detection Limits
GRO	ND	ND	5.0	15	5.0

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other or their detection limits and are comparable.

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CENPD-ET-EN-L (95-0271)
Table VII cont.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1036SB	Primary Lab 1037SB	Detection Limits	QA Lab 1038SB	Detection Limits
DRO	27	32	10	11	4.1

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other and are comparable.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1036SB	Primary Lab 1037SB	Detection Limits	QA Lab 1038SB	Detection Limits
TPH	44	44	10	62.1	10.3

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table VII cont.

6. Method: Total Metals (EPA 3050/6010.7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1036SB	Primary Lab 1037SB	Detection Limits	QA Lab 1038SB	Detection Limits
Aluminum	12,900	14,900	10	12,500	5.2
Antimony	ND	ND	10	ND	2.1
Arsenic	6	6	1	7.0	0.52
Barium	50	54	1	37.2	1.0
Beryllium	0.3 J	0.4 J	1	0.28	0.10
Cadmium	ND	ND	1	ND	0.31
Calcium	5050	6720	10	5220	10.3
Chromium	30	31	2	24.6	0.52
Cobalt	12	12	2	11.9	0.52
Copper	30	32	2	26.8	0.52
Iron	30,000	28,900	4	25,500	5.2
Lead	8	7	1	9.6	3.1
Magnesium	9080	10,100	2	8470	10.3
Manganese	697	651	1	546	0.52
Mercury	ND	ND	0.2	ND	0.082
Nickel	44	42	10	35.0	2.1
Potassium	740	840	400	536	103
Selenium	ND	ND	1	ND	0.052
Silver	ND	ND	2	ND	0.52
Sodium	96	136	20	95.0	41.3
Thallium	ND	ND	1	0.15	0.10
Vanadium	48	56	2	56.1	0.52
Zinc	57	60	2	51.4	0.52

SUMMARY: The project.blind duplicate and QA data agree within a factor of two with each other or their detection limits and are comparable except for the QA data of thallium. The QA analysis of thallium confirms the primary laboratory results of none detected at the higher detection limit..

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table VIII

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1045SB	Primary Lab 1046SB	Detection Limits	QA Lab 1047SB	Detection Limits
Acetone	29.4 J	29.4 JB	50	ND	110
Methylene Chloride	2.70 J	2.98 J	10	14	5
Trichloroethene	0.78 J	1.11 J	5	ND	5
Toluene	6	4.50 J	5	ND	5
Ethylbenzene	1.96 J	2.14 J	5	ND	5
Total Xylenes	12	13	5	ND	5
n-Butylbenzene	0.19 JB	ND	20	ND	5
1,2,4-Trichlorobenzene	0.56 JB	0.48 JB	20	ND	5
1,2,3-Trichlorobenzene	0.76 JB	0.70 JB	20	ND	5
Naphthalene	0.84 JB	0.83 JB	20	ND	5
Percent Solids	95.0	94.6		95.0	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits for all targeted analytes except. Estimated analyte concentrations are not considered significant for the purpose of data evaluation. Roughly half of the estimated analytes are considered due to laboratory contamination based on the associated method blank results.

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CENPD-ET-EN-L (95-0271)
Table VIII cont.

2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1045SB	Primary Lab 1046SB	Detection Limits	QA Lab 1047SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	82
Aroclor 1221	ND	ND	100	ND	82
Aroclor 1232	ND	ND	100	ND	82
Aroclor 1242	ND	ND	100	ND	82
Aroclor 1248	ND	ND	100	ND	82
Aroclor 1254	ND	ND	100	ND	160
Aroclor 1260	ND	ND	100	ND	160
Percent Solids	93.9	94.8		97.0	

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1045SB	Primary Lab 1046SB	Detection Limits	QA Lab 1047SB	Detection Limits
GRO	ND	ND	5.0	44	5.0

SUMMARY: The project blind duplicate data agree with each other but do not agree within a factor of five with the QA data. The internal QC of both laboratories are acceptable except for the matrix spike data of the QA laboratory; GRO data should be considered high estimates. A review of the QA data indicate that two single peaks eluting in the GRO range accounted for the 44 ppm result. The peaks in the QA chromatogram did not exhibit a gasoline pattern and these same peaks were not present in the project GRO chromatograms. Overall the project GRO data are acceptable. Overall, the primary GRO data are acceptable.

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CENPD-ET-EN-L (95-0271)
Table VIII cont.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1045SB	Primary Lab 1046SB	Detection Limits	QA Lab 1047SB	Detection Limits
DRO	14	16	10	8	4.2

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other and are comparable.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1045SB	Primary Lab 1046SB	Detection Limits	QA Lab 1047SB	Detection Limits
TPH	21	20	10	46.9	10.5

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table VIII cont.

6. Method: Total Metals (EPA 3050/6010,7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1045SB	Primary Lab 1046SB	Detection Limits	QA Lab 1047SB	Detection Limits
Aluminum	20,300	18,200	10	16,000	5.3
Antimony	ND	ND	10	2.4	2.1
Arsenic	8	5	1	8.1	0.53
Barium	77	60	1	52.8	1.1
Beryllium	0.6 J	0.6 J	1	0.40	0.11
Cadmium	ND	ND	1	ND	0.32
Calcium	9250	7740	10	6590	10.5
Chromium	41	49	2	33.5	0.53
Cobalt	15	14	2	15.6	0.53
Copper	37	31	2	34.1	0.53
Iron	34,200	31,600	4	35,200	5.3
Lead	9	7	1	7.6	3.2
Magnesium	12,200	11,800	2	9570	10.5
Manganese	802	707	1	877	0.53
Mercury	ND	ND	0.2	ND	0.084
Nickel	48	41	10	36.7	2.1
Potassium	900	820	400	617	105
Selenium	ND	ND	1	0.091	0.053
Silver	ND	ND	2	ND	0.53
Sodium	177	148	20	134	42.1
Thallium	ND	ND	1	0.13	0.11
Vanadium	78	71	2	82.5	0.53
Zinc	69	61	2	61.8	0.53

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other except for the QA laboratory data of thallium. The QA analysis of thallium confirms the primary laboratory results of none detected at the higher detection limit.

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CENPD-ET-EN-L (95-0271)
Table VIII cont.

7. Project Method: Total Organic Carbon (ASTM D4129-82 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 9060 Mod.)

Analytes Detected	Primary Lab 1045SB	Primary Lab 1046SB	Detection Limits	QA Lab 1047SB	Detection Limits
TOC	3900	4000	500	9620	4.2

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table IX

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1061SB	1062SB	Detection Limits	QA Lab 1063SB	Detection Limits
Acetone	32.0 JB	16.2 JB	50	ND	110
Methylene Chloride	ND	ND	10	14	5
Toluene	1.55 JB	3.67 J	5	5	5
Ethylbenzene	0.34 J	1.21 J	5	ND	5
Total Xylenes	2.60 J	8	5	ND	5
Percent Solids	95.3	95.8		95	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits for all targeted analytes. Estimated concentrations of targeted analytes are not considered significant for the purpose of data evaluation. Since acetone results are considered laboratory contamination based on the associated method blank contamination.

recycled paper ecology and environment

CENPD-ET-EN-L (95-0271)
Table IX cont.

2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1061SB	Primary Lab 1062SB	Detection Limits	QA Lab 1063SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	84
Aroclor 1221	ND	ND	100	ND	84
Aroclor 1232	ND	ND	100	ND	84
Aroclor 1242	ND	ND	100	ND	84
Aroclor 1248	ND	ND	100	ND	84
Aroclor 1254	ND	ND	100	ND	170
Aroclor 1260	ND	ND	100	ND	170
Percent Solids	94.8	95.2		95.3	

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1061SB	Primary Lab 1062SB	Detection Limits	QA Lab 1063SB	Detection Limits
GRO	ND	ND	5.0	ND	5.0

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table IX cont.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1061SB	Primary Lab 1062SB	Detection Limits	QA Lab 1063SB	Detection Limits
DRO	5 J	5 J	10	ND	4.2

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other or their detection limits.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1061SB	Primary Lab 1062SB	Detection Limits	QA Lab 1063SB	Detection Limits
TPH	8.5 J	6.1 J	10	21.5	10.5

SUMMARY: The project blind duplicate and QA data agree within a factor of four with each other.

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CENPD-ET-EN-L (95-0271)
Table IX cont.

6. Method: Total Metals (EPA 3050/6010,7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1061SB	Primary Lab 1062SB	Detection Limits	QA Lab 1063SB	Detection Limits
Aluminum	13,400	15,000	10	13,200	5.2
Antimony	ND	5	10	ND	2.1
Arsenic	5	6 J	1	7.1	0.26
Barium	51	52	1	42.4	1.0
Beryllium	0.2 J	0.3 J	1	0.31	0.10
Cadmium	ND	ND	1	ND	0.31
Calcium	7590	8660	10	6250	10.5
Chromium	34	29	2	31.7	0.52
Cobalt	11	11	2	13.5	0.52
Copper	28	27	2	27.9	0.52
Iron	26,700	29,200	4	27,200	5.2
Lead	7	8	1	7.0	3.1
Magnesium	10,000	9840	2	9460	10.5
Manganese	597	617	1	590	0.52
Mercury	0.09	0.1	0.2	ND	0.084
Nickel	38 J	40 J	10	40.4	2.1
Potassium	710	830	400	593	105
Selenium	ND	ND	1	0.076	0.052
Silver	ND	ND	2	ND	0.52
Sodium	100	105	20	89.7	42.0
Thallium	ND	ND	1	0.15	0.10
Vanadium	50	57	2	59.3	0.52
Zinc	51	54	2	53.5	0.52

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other except for the QA laboratory data of selenium and thallium. The QA analysis of selenium and thallium confirms the primary laboratory results of none detected at the higher detection limit.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table X

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1074SB	Primary Lab 1075SB	Detection Limits	QA Lab 1076SB	Detection Limits
Acetone	52 B	16.9 JB	50	ND	110
Methylene Chloride	ND	ND	10	8	6
Toluene	1.73 JB	1.66 JB	5	ND	6
Ethylbenzene	1.04 J	0.82 J	5	ND	6
Total Xylenes	7	6	5	ND	6
1,3-Dichlorobenzene	0.39 JB	0.30 JB	5	ND	6
1,4-Dichlorobenzene	0.45 JB	0.49 JB	5	ND	6
n-Butylbenzene	0.30 JB	0.33 JB	20	ND	6
1,2-Dichlorobenzene	0.49 JB	0.46 JB	5	ND	6
1,2,4-Trichlorobenzene	1.23 JB	1.07 JB	20	ND	6
1,2,3-Trichlorobenzene	1.48 JB	1.46 JB	20	ND	6
Naphthalene	1.64 JB	1.63 JB	20	ND	6
Hexachlorobutadiene	1.16 JB	1.01 JB	20	ND	6
Percent Solids	90.4	90.4		90.0	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits for all targeted analytes except for low estimated values. Estimated concentrations of targeted analytes are not considered significant for the purpose of data evaluation. Most of the detected analytes are due to laboratory contamination since they were detected in the associated method blank.

recycled paper ecology and environment

CENPD-ET-EN-L (95-0271)
Table X cont.

2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1074SB	Primary Lab 1075SB	Detection Limits	QA Lab 1076SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	89
Aroclor 1221	ND	ND	100	ND	89
Aroclor 1232	ND	ND	100	ND	89
Aroclor 1242	ND	ND	100	ND	89
Aroclor 1248	ND	ND	100	ND	89
Aroclor 1254	ND	ND	100	ND	180
Aroclor 1260	ND	ND	100	ND	180
Percent Solids	90.4	90.4		90.0	

SUMMARY: The project blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1074SB	Primary Lab 1075SB	Detection Limits	QA Lab 1076SB	Detection Limits
GRO	ND	ND	5.0	ND	5.0

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table X cont.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1074SB	Primary Lab 1075SB	Detection Limits	QA Lab 1076SB	Detection Limits
DRO	8 J	22 AJ	10	8.3	4.4

AJ = Heavier hydrocarbon than diesel

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1074SB	Primary Lab 1075SB	Detection Limits	QA Lab 1076SB	Detection Limits
TPH	17	29	10	37.3	11.2

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other.

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CENPD-ET-EN-L (95-0271)
Table X cont.

6. Method: Total Metals (EPA 3050/6010,7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1074SB	Primary Lab 1075SB	Detection Limits	QA Lab 1076SB	Detection Limits
Aluminum	20,000	21,900	10	17,000	5.6
Antimony	ND	4 J	10	ND	2.2
Arsenic	6	8	1	8.3	0.28
Barium	68	75	1	55.6	1.1
Beryllium	0.4 J	0.5 J	1	0.37	0.11
Cadmium	ND	ND	1	ND	0.33
Calcium	5870	5190	10	3210	11.2
Chromium	33	36	2	31.5	0.56
Cobalt	12	15	2	15.5	0.56
Copper	30	56	2	29.6	0.56
Iron	30,800	35,600	4	29,300	5.6
Lead	8	8	1	11.3	3.3
Magnesium	8530	9550	2	7940	11.2
Manganese	573	631	1	540	0.56
Mercury	ND	0.1 J	0.2	ND	0.089
Nickel	35	44	10	37.7	2.2
Potassium	660	640	400	472	112
Selenium	ND	ND	1	0.20	0.056
Silver	ND	ND	2	ND	0.56
Sodium	123	131	20	91.6	44.6
Thallium	ND	ND	1	0.15	0.11
Vanadium	65	69	2	64.6	0.56
Zinc	56	58	2	49.1	0.56

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits except for the QA laboratory data of thallium. The QA analysis of thallium confirms the primary laboratory results of none detected at the higher detection limit.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table XI

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Sludge Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: Semi-Volatile Organic Compounds (EPA 3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 1082SB	Primary Lab 1083SB	Detection Limits	QA Lab 1084SB	Detection Limits
	ND	ND	300-2000	ND	350-1700
Percent Solids	94.2	95.2		95.0	

ND = Not detected

SUMMARY: The project blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

2. Project Method: Total Organic Carbon (ASTM D4129-82 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 9060 Mod.)

Analytes Detected	Primary Lab 1082SB	Primary Lab 1083SB	Detection Limits	QA Lab 1084SB	Detection Limits
TOC	1200	1100	500	5560	4.2

SUMMARY: The project blind duplicate and QA data almost agree within a factor of five with each other.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table XII

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS. Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1085SB	Primary Lab 1086SB	Detection Limits	QA Lab 1087SB	Detection Limits
Acetone	31.8 JB	11.2 JB	50	ND	110
Methylene Chloride	1.82 J	ND	10	12	5
Toluene	1.48 JB	0.40 JB	5	ND	5
Ethylbenzene	0.60 J	0.58 J	5	ND	5
Total Xylenes	3.51 J	3.19 J	5	ND	5
1,3,5-Trimethylbenzene	0.26 JB	ND	20	ND	5
1,3-Dichlorobenzene	0.27 JB	0.31 JB	5	ND	5
1,4-Dichlorobenzene	0.37 JB	0.36 JB	5	ND	5
n-Butylbenzene	0.42 JB	0.29 JB	20	ND	5
1,2-Dichlorobenzene	0.43 JB	0.35 JB	5	ND	5
1,2-Dichloro-3-chloropropome	0.60 JB	ND	20	ND	11
1,2,4-Trichlorobenzene	0.89 JB	0.74 JB	20	ND	5
1,2,3-Trichlorobenzene	1.28 JB	1.14 JB	20	ND	5
Naphthalene	1.93 JB	1.55 JB	20	ND	5
Hexachlorobutadiene	0.73 JB	0.80 JB	20	ND	5
Percent Solids	95.6	94.0		93.0	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits for all targeted analytes. Estimated concentrations of targeted analytes are considered insignificant for the purpose of data evaluation. Most of the detected analytes are due to laboratory contamination since they were detected in the associated method blank.

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CENPD-ET-EN-L (95-0271)
Table XII cont.

2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1085SB	1086SB	Detection Limits	QA Lab 1087SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	86
Aroclor 1221	ND	ND	100	ND	86
Aroclor 1232	ND	ND	100	ND	86
Aroclor 1242	ND	ND	100	ND	86
Aroclor 1248	ND	ND	100	ND	86
Aroclor 1254	ND	ND	100	ND	170
Aroclor 1260	ND	ND	100	ND	170
Percent Solids	94.6	94.0		93.4	

SUMMARY: The project blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1085SB	1086SB	Detection Limits	QA Lab 1087SB	Detection Limits
GRO	ND	ND	5.0	ND	5.0

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XII cont.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1085SB	Primary Lab 1086SB	Detection Limits	QA Lab 1087SB	Detection Limits
DRO	5 J	4 J	10	8.2	4.3

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other and are comparable.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1085SB	Primary Lab 1086SB	Detection Limits	QA Lab 1087SB	Detection Limits
TPH	11	9.6 J	11	18.1	10.7

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XII cont.

6. Method: Total Metals (EPA 3050/6010.7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1085SB	Primary Lab 1086SB	Detection Limits	QA Lab 1087SB	Detection Limits
Aluminum	16,600	14,400	10	13,200	5.4
Antimony	ND	5 J	10	ND	2.1
Arsenic	5	5	1	6.9	0.27
Barium	81	60	1	50.0	1.1
Beryllium	0.4 J	0.3 J	1	0.35	0.11
Cadmium	ND	ND	1	0.44	0.32
Calcium	8830	7700	10	6820	10.7
Chromium	37	34	2	28.6	0.54
Cobalt	14	22	2	13.3	0.54
Copper	34	29	2	27.6	0.54
Iron	31,800	32,900	4	28,000	5.4
Lead	7	6	1	8.1	3.2
Magnesium	10,300	26,100	2	8780	10.7
Manganese	748	728	1	600	0.54
Mercury	0.1 J	0.1 J	0.2	ND	0.084
Nickel	47	167	10	36.9	2.1
Potassium	930	810	400	641	107
Selenium	ND	ND	1	0.11	0.054
Silver	ND	ND	2	ND	0.54
Sodium	171	129	20	119	42.8
Thallium	ND	ND	1	0.13	0.11
Vanadium	61	54	2	60.5	0.54
Zinc	66	59	2	64.8	0.54

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits except for the QA laboratory data of selenium and thallium. The QA analysis of selenium and thallium confirms the primary laboratory results of none detected at the higher detection limit.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table XIII

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1094SB	Primary Lab 1095SB	Detection Limits	QA Lab 1096SB	Detection Limits
Acetone	4.87 JB	5.65 JB	50	ND	110
Chloroform	1.26 JB	1.77 JB	5	ND	5
Toluene	0.21 J	0.41 J	5	ND	5
Total Xylenes	1.02 J	2.89 J	5	ND	5
Ethylbenzene	ND	0.23 J	5	ND	5
Methylene Chloride	ND	ND	10	4 JB	5
Percent Solids	94.0	94.3		94.0	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other for all targeted analytes. Estimated analyte concentrations are considered insignificant for the purpose of data evaluation. The data of acetone and chloroform in the project data and QA methylene chloride in the QA data are due to laboratory contamination since these analytes were detected in the associated method blanks.

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CENPD-ET-EN-L (95-0271)
Table XIII cont.

2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1094SB	Primary Lab 1095SB	Detection Limits	QA Lab 1096SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	85
Aroclor 1221	ND	ND	100	ND	85
Aroclor 1232	ND	ND	100	ND	85
Aroclor 1242	ND	ND	100	ND	85
Aroclor 1248	ND	ND	100	ND	85
Aroclor 1254	ND	ND	100	ND	170
Aroclor 1260	40 J	40 J	100	ND	170
Percent Solids	68.6	94.1		94.1	

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1094SB	Primary Lab 1095SB	Detection Limits	QA Lab 1096SB	Detection Limits
GRO	ND *	ND	10/5.0	ND	5.0

* = Detection limit elevated due to low percent solid

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XIII cont.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1094SB	1095SB	Detection Limits	QA Lab 1096SB	Detection Limits
DRO	11 * J	15	20/10	13	4.3

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other and are comparable.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1094SB	1095SB	Detection Limits	QA Lab 1096SB	Detection Limits
TPH	ND *	14	20/10	36.9	10.6

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other or their detection limits and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XIII cont.

6. Method: Total Metals (EPA 3050/6010.7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1094SB	Primary Lab 1095SB	Detection Limits	QA Lab 1096SB	Detection Limits
Aluminum	22,800	15,400	10	16,700	5.3
Antimony	6 J	4 J	10	2.3	2.1
Arsenic	9	6	1	3.3	0.27
Barium	83	52	1	48.7	1.1
Beryllium	0.5 J	0.4 J	1	0.34	0.11
Cadmium	ND	ND	1	ND	0.32
Calcium	10,400	6760	10	7890	10.6
Chromium	53	36	2	34.3	0.53
Cobalt	19	13	2	15.9	0.53
Copper	47	32	2	34.2	0.53
Iron	44,600	30,100	4	32,100	5.3
Lead	28	14	1	19.5	3.2
Magnesium	15,200	10,100	2	11,000	10.6
Manganese	1070	674	1	696	0.53
Mercury	ND	ND	0.2	ND	0.085
Nickel	65	47	10	45.0	2.1
Potassium	950	690	400	733	106
Selenium	ND	ND	1	ND	0.053
Silver	ND	ND	2	ND	0.53
Sodium	157	101	20	131	42.5
Thallium	ND	ND	1	0.16	0.11
Vanadium	86	57	2	74.0	0.53
Zinc	89	61	2	67.9	0.53

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other or their detection limits for all targeted metals except for the QA laboratory data of thallium. The QA analysis of thallium confirms the primary laboratory results of none detected at the higher detection limit.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table XIV

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1100SB	Primary Lab 1101SB	Detection Limits	QA Lab 1102SB	Detection Limits
Acetone	21.5 J	20.5 JB	50	ND	110
Chloroform	0.31 JB	2.49 JB	5	ND	5
Toluene	0.17 J	0.60 J	5	ND	5
Total Xylenes	2.05 J	4.58 J	5	ND	5
1,3,5-Trimethylbenzene	2.12 J	ND	20	ND	5
Ethylbenzene	ND	0.53 J	5	ND	5
4-Isopropyltoluene	ND	0.65 J	20	ND	5
Percent Solids	93.4	94.0		94.0	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits for all targeted analytes. Estimated concentrations of targeted analytes are considered insignificant for the purpose of data evaluation. The primary laboratory data of acetone and chloroform are due to laboratory contamination as they were detected in the associated method blank.

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CENPD-ET-EN-L (95-0271)
Table XIV cont.

2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1100SB	Primary Lab 1101SB	Detection Limits	QA Lab 1102SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	85
Aroclor 1221	ND	ND	100	ND	85
Aroclor 1232	ND	ND	100	ND	85
Aroclor 1242	ND	ND	100	ND	85
Aroclor 1248	ND	ND	100	ND	85
Aroclor 1254	ND	ND	100	ND	170
Aroclor 1260	ND	ND	100	ND	170
Percent Solids	94.7	94.0		94.0	

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1100SB	Primary Lab 1101SB	Detection Limits	QA Lab 1102SB	Detection Limits
GRO	ND	ND	5.0	ND	5.0

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XIV cont.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1100SB	1101SB	Detection Limits	QA Lab 1102SB	Detection Limits
DRO	9 J	19	10	7.5	4.3

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other and are comparable.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1100SB	1101SB	Detection Limits	QA Lab 1102SB	Detection Limits
TPH	ND	5 J	10	20.6	10.7

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits.

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CENPD-ET-EN-L (95-0271)
Table XIV cont.

6. Method: Total Metals (EPA 3050/6010.7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1100SB	Primary Lab 1101SB	Detection Limits	QA Lab 1102SB	Detection Limits
Aluminum	15,500	16,600	10	15,300	5.3
Antimony	ND	ND	10	2.6	2.1
Arsenic	6	5	1	3.2	0.27
Barium	71	80	1	51.0	1.1
Beryllium	0.5 J	0.5 J	1	0.31	0.11
Cadmium	ND	ND	1	0.43	0.32
Calcium	7880	8590	10	7730	10.6
Chromium	35	35	2	35.0	0.53
Cobalt	14	15	2	16.0	0.53
Copper	30	28	2	34.1	0.53
Iron	41,000	51,100	4	35,000	5.3
Lead	7	8	1	10.0	3.2
Magnesium	10,100	10,300	2	10,500	10.6
Manganese	840	972	1	660	0.53
Mercury	ND	ND	0.2	0.10	0.085
Nickel	42	38	10	45.7	2.1
Potassium	880	990	400	655	106
Selenium	ND	ND	1	ND	0.053
Silver	ND	ND	2	ND	0.53
Sodium	182	221	20	258	42.5
Thallium	ND	ND	1	0.20	0.11
Vanadium	61	67	2	69.6	0.53
Zinc	59	61	2	60.4	0.53

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits and are comparable.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table XV

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS. Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1107SB	Primary Lab 1108SB	Detection Limits	QA Lab 1109SB	Detection Limits
Methylene Chloride	1.67 J	5.70 J	10	6 B	5
Chloroform	0.94 JB	1.66 JB	5	ND	5
Toluene	0.82 JB	0.99 JB	5	ND	5
Total Xylenes	1.16 J	3.49 J	5	ND	5
Ethylbenzene	ND	0.40 JB	5	ND	5
Percent Solids	93.5	94.1		95	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits for all targeted analytes. Estimated concentrations of targeted analytes are not considered significant for the purpose of data evaluation. The project data of chloroform, toluene and ethylbenzene are due to laboratory contamination as they were detected in the associated method blank.

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CENPD-ET-EN-L (95-0271)
Table XV cont.

2. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1107SB	Primary Lab 1108SB	Detection Limits	QA Lab 1109SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	84
Aroclor 1221	ND	ND	100	ND	84
Aroclor 1232	ND	ND	100	ND	84
Aroclor 1242	ND	ND	100	ND	84
Aroclor 1248	ND	ND	100	ND	84
Aroclor 1254	ND	ND	100	ND	170
Aroclor 1260	ND	ND	100	ND	170
Percent Solids	95.1	93.7		94.7	

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

Gasoline
3. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1107SB	Primary Lab 1108SB	Detection Limits	QA Lab 1109SB	Detection Limits
GRO	ND	ND	5	ND	5

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XV cont.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1107SB	1108SB	Detection Limits	QA Lab 1109SB	Detection Limits
DRO	7 J	16	10	8.5	4.2

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other.

5. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1107SB	1108SB	Detection Limits	QA Lab 1109SB	Detection Limits
TPH	9.6 J	10	10	27.1	10.6

SUMMARY: The project blind duplicate and QA data agree within a factor of three with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XV cont.

6. Method: Total Metals (EPA 3050/6010,7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1107SB	Primary Lab 1108SB	Detection Limits	QA Lab 1109SB	Detection Limits
Aluminum	19,200	19,000	10	17,900	5.3
Antimony	ND	5 J	10	2.8	2.1
Arsenic	7	8	1	3.5	0.26
Barium	71	73	1	52.0	1.1
Beryllium	0.5 J	0.5 J	1	0.33	0.11
Cadmium	ND	ND	1	ND	0.32
Calcium	6760	7110	10	6080	10.6
Chromium	39	38	2	34.3	0.53
Cobalt	14	12	2	15.5	0.53
Copper	28	29	2	27.7	0.53
Iron	31,000	30,700	4	30,800	5.3
Lead	10	12	1	12.4	3.2
Magnesium	10,300	10,200	2	10,900	10.6
Manganese	677	676	1	633	0.53
Mercury	ND	ND	0.2	ND	0.084
Nickel	46	41	10	43.7	2.1
Potassium	820	930	400	648	106
Selenium	ND	ND	1	ND	0.053
Silver	ND	ND	2	ND	0.53
Sodium	177	208	20	137	42.2
Thallium	ND	ND	1	0.20	0.11
Vanadium	66	67	2	73.8	0.53
Zinc	64	65	2	65.2	0.53

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits and are comparable.

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CENPD-ET-EN-L (95-0271)

COMPARISON OF PROJECT BLIND DUPLICATE AND QA RESULTS

Table XVI

Project: Ft. Richardson OUA - Roosevelt Road Matrix: Soil Prefix: 95RRTSL-
Primary Laboratory: CAS, Inc. QA Laboratory: ARDL, Inc.

1. Project Method: Volatile Organic Compounds (EPA 5030A/8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 1128SB	Primary Lab 1129SB	Detection Limits	QA Lab 1130SB	Detection Limits
Acetone	26.0 JB	ND	50	ND	100
Methylene Chloride	6.96 J	6.30 J	10	59 B	5
Chloroform	0.54 J	0.54 J	5	ND	5
Toluene	2.44 J	2.10 J	5	ND	5
Ethylbenzene	1.07 J	0.49 J	5	ND	5
Total Xylenes	8	3.19 J	5	ND	5
1,2,4-Trichlorobenzene	0.50 JB	0.51 JB	20	ND	5
1,2,3-Trichlorobenzene	0.62 JB	0.76 JB	20	ND	5
Naphthalene	0.83 JB	0.83 JB	20	ND	5
Percent Solids	96.6	96.2		97.0	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits for all targeted analytes except methylene chloride. The QA data of methylene chloride, acetone, 1,2,4- and 1,2,3-trichlorobenzene and naphthalene in the project data are due to laboratory contamination as these analytes were detected in the associated method blank, respectively. Estimated concentrations of targeted analytes are considered insignificant for the purpose of data evaluation.

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CENPD-ET-EN-L (95-0271)
Table XVI cont.

2. Method: Semi-Volatile Organic Compounds (EPA 3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 1028SB	1029SB	Detection Limits	QA Lab 1030SB	Detection Limits
	ND	ND	300-2000	ND	340-1600
Percent Solids	96.6	96.9		97.0	

SUMMARY: The project blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

3. Project Method: Polychlorinated Biphenyls/PCBs (EPA 3540A/8080) Units: ug/Kg (ppb)
QA Method: Polychlorinated Biphenyls/PCBS (EPA 3550/8080)

Analytes Detected	Primary Lab 1128SB	1129SB	Detection Limits	QA Lab 1130SB	Detection Limits
Aroclor 1016	ND	ND	100	ND	82
Aroclor 1221	ND	ND	100	ND	82
Aroclor 1232	ND	ND	100	ND	82
Aroclor 1242	ND	ND	100	ND	82
Aroclor 1248	ND	ND	100	ND	82
Aroclor 1254	ND	ND	100	ND	160
Aroclor 1260	ND	ND	100	ND	160

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XVI cont.

Gasoline

4. Project Method: Range Organics (EPA 5030A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
QA Method: Gasoline Range Organics (ADEC 8015 Mod.)

Analytes Detected	Primary Lab 1128SB	1129SB	Detection Limits	QA Lab 1130SB	Detection Limits
GRO	ND	ND	5	ND	5.0

SUMMARY: The project blind duplicate and QA data agree with each other and are comparable.

5. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1128SB	1129SB	Detection Limits	QA Lab 1130SB	Detection Limits
DRO	6 J	6 J	10	6.6	4.1

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other and are comparable.

6. Method: Total Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1128SB	1129SB	Detection Limits	QA Lab 1130SB	Detection Limits
TPH	9 J	7 J	10	ND	10.3

SUMMARY: The project blind duplicate and QA data agree within a factor of two with each other or their detection limits and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XVI cont.

7. Project Method: Total Organic Carbon (ASTM D4129-82 Mod.) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (EPA 9060 Mod.)

Analytes Detected	Primary Lab 1128SB	Primary Lab 1029SB	Detection Limits	QA Lab 1030SB	Detection Limits
TOC	1800	2100	500	5770	4.1

SUMMARY: The project blind duplicate and QA data agree within a factor of four with each other and are comparable.

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CENPD-ET-EN-L (95-0271)
Table XVI cont.

8. Method: Total Metals (EPA 3050/6010.7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 1128SB	Primary Lab 1129SB	Detection Limits	QA Lab 1130SB	Detection Limits
Aluminum	14,000	15,200	10	15,900	5.2
Antimony	5 J	6 J	10	2.9	2.1
Arsenic	7	7	1	8.1	0.52
Barium	53	53	1	47.5	1.0
Beryllium	0.4 J	0.4 J	1	0.37	0.10
Cadmium	ND	ND	1	ND	0.31
Calcium	6690	6810	10	7860	10.3
Chromium	48	52	2	35.3	0.52
Cobalt	11	13	2	12.7	0.52
Copper	30	35	2	32.4	0.52
Iron	27,800	29,600	4	32,100	5.2
Lead	10	7	1	10.1	3.1
Magnesium	10,400	11,800	2	12,700	10.3
Manganese	583	611	1	687	0.52
Mercury	0.07 J	0.07 J	0.2	0.11	0.083
Nickel	43	48	10	28.4	2.1
Potassium	770	930	400	816	103
Selenium	ND	ND	1	ND	0.052
Silver	ND	ND	2	ND	0.52
Sodium	118	116	20	139	41.4
Thallium	ND	ND	1	ND	0.10
Vanadium	54	53	2	65.7	0.52
Zinc	55	59	2	65.3	0.52

SUMMARY: The project blind duplicate and QA data agree within a factor of five with each other or their detection limits and are comparable, with the exception of thallium. The QA analysis of thallium confirms the primary laboratory results of none detected at the higher detection limit.

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OUA 0021365

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM ROAD
TROUTDALE, OREGON 97060-9508

REPLY TO
ATTENTION OF:

October 5, 1995

Bill Richards
Ecology & Environment, Inc.
840 K Street, Suite 100
Anchorage, Alaska 99501

Dear Mr. Richards:

Enclosed, completing all analyses requested to date, are reports of analytical data for the Ft. Richardson, OUA Ruff Road Fire Training Area project sampled by Ecology & Environment, Inc. between June 19 and July 12, 1995. Included are:

a. Chemical Quality Assurance Report

b. original reports K9503867, K9503958, K9503978, K9504072, K9504202, K9504237, K9504305 and K9504393 from Columbia Analytical Services, Inc.

c. original CENPD-ET-EN-L sample cooler receipt forms

d. CENPD-ET-EN-L HTRW discrepancy form

Please reference original reports 49847, 49935, 49959, 49607, 49677, 49708, 49814, 49992, 50025 and 50104 from Sound Analytical Services, Inc. directly submitted to your office by the laboratory.

Please contact Dr. Ajmal Ilias at (503) 669-0246 if you have any questions.

Sincerely,

Enclosures

for Timothy J. Seeman, Director
North Pacific Division Laboratory

CENPD-ET-EN-L (95-0272) 5 Oct 95

CHEMICAL QUALITY ASSURANCE REPORT

FT. RICHARDSON OUA. RUFF ROAD FIRE TRAINING AREA

1. **SUMMARY:**

a. The following deficiencies and/or delinquencies are noted in the primary laboratories' data. The detection of gasoline range organics (GRO), nine targeted metals and total organic carbon (TOC) in the rinsate sample (Table I) indicates cross-contamination may have occurred during sampling. Most GRO and all di-*n*-butylphthalate data from four reports should be considered due to laboratory contamination. Extensive dioxin/furan method blank contamination was observed in all reports. All dioxin/furan data in all reports flagged with "B" should be considered due to laboratory contamination except for the samples listed in section 6-d. Over one-third of the volatile organic compounds (VOC) data should be considered estimates due to surrogate recovery failure or holding time expiration. GRO data for samples -2166SB, -2017SS, -2134SB, and diesel range organic (DRO) data for samples -2017SS and -2025SS should be considered estimates due to surrogate recovery failure. GRO data from report 49847, DRO data from reports 49677, 49814, 49607, and total recoverable petroleum hydrocarbon (TRPH) data from reports 49677 and 49959 should be considered estimates based on matrix spike (MS), matrix spike duplicate (MSD) recoveries and or relative percent differences (RPD's) failure. . The dioxin/furan data of samples -2061SB, -2147SB, -2152SB, -2086SB and -2084SB and all dioxin/furan data from report 49935 should be considered estimates. The OCDF, 1,2,3,7,8,9-HxCDF and 2,3,4,6,7,8-HxCDF data from report 50104 and the OCDF and 1,2,3,4,6,7,8-HpCDF data from report 49992 should be considered estimates based on questionable internal QC and laboratory cross-contamination.. Antimony data from reports 49708, 49992. 49607, 49677, and 50025 should be considered as low estimates. The following data should be considered estimates based on MS and RPD failure: Arsenic (report 49992); calcium, potassium and sodium (report 50025), aluminum, chromium, copper and zinc (report 49677), aluminum, calcium, potassium and vanadium (report 49959), and chromium (report 49814). The field blind duplicate data for 4-methyl-2-pentanone (Table XX-1), acetone (Table XXII-1), TRPH (Table XX-5) and dioxin/furans (Tables II-5, X-7, XVII-7, XIX-8 and XXII-7) do not agree due inpart to data variability and the quantitation approach used. The custody of the dioxin/furan samples reports 49607, 49677, and 49708 may have been compromised. Samples associated with reports 49847, 49959, 49607, 49677, 49708, 49814 and the dioxin/furan samples associated with report 50104 were received outside of the USACE required 4°+/-2 range.

b. The primary and QA data comparisons are presented in Tables II through XIII and XV through XXIII. All data agree with each other with the following exceptions. There were many VOC, dioxin/furan and a few other analytes detected due to laboratory contamination. All analytes flagged with "B" should be considered due to laboratory contamination unless

noted in the respective table summary. Analytes detected at or below the reporting limit (flagged with "J") or detected due to laboratory contamination should be considered insignificant for data comparison purposes.

I. VOC and BNA: The VOC data discrepancies for acetone, 2- butanone and 4-isopropyltoluene in Table XI-1. One of two primary data of trichloroethene and tetrachloroethene in Table XIX-1 and 4-isopropyltoluene data in Table XXIII-1 did not agree. Data disagreements in Table XI-1 and XXIII are due to non-compatible samples (see percent solid in respective tables). Data disagreement in Table XIX-1 is due to QA laboratory's questionable data. Primary data of this table are acceptable based on blind duplicate data agreement. BNA(phthalate) data in Table XV (di-*n*-butylphthalate), Table XIX-2 (bis(2-ethylhexyl)phthalate and di-*n*-butylphthalate) and Table XX-2 (di-*n*-butylphthalate) did not agree and data discrepancy could not be resolved analytically. Since phthalate is a common laboratory contaminate, the above disagreements could be due to unknown source of laboratory contamination.

II. GRO, DRO, TRPH, dioxins/furans and Metals: One of the two or both primary GRO data in Tables VII-2, X-3, XII-3, XV-3, XVII-3, XX-3 and XXIII-3 did not agree mainly due to primary laboratory's data reporting at or below the reporting limits. Since similar levels of GRO also reported in many primary laboratory's laboratory blanks. The reported GRO data in most blind duplicate are due either to laboratory cross-contamination or artifacts. DRO data in Tables XI-4 and XXI-4 did not agree. Primary data are questionable based on blind duplicate (XI-4) disagreements and reporting as estimates value close to the reporting limits. One of the two primary TRPH data in Table XX-5 did not agree with the QA data, discrepancy could not be resolved analytically. Primary DRO and TRPH pattern indicates possibility of non-identical samples. The dioxin/furan data in Tables II-5, III-7, VII-7, X-7, XI-7, XII-7, XIII-7, XV-7, XVI-7, XVIII-8, XIX-8, XX-8, and XXII-7 do not agree with each other due to various reasons. The dioxin/furan data for samples -002SP (Table III-7) and -2046SB(Table X-7), -2054SB (Table XI-7), -2155SB (Table XXII-7) should be considered suspect due to high levels of many targeted analytes detected that were not detected in either of the other two samples from the triplicate split.

The remaining dioxin/furan data discrepancies are inpart due to laboratory cross-contamination and different assumptions used by the laboratories in calculating total dioxin/furan.. The antimony and/or cadmium primary data in all twenty tables do not agree with the QA data. These data disagreements are due inpart to non-identical methods, reporting limits and methods used.

2. **BACKGROUND:** The samples were collected between June 19 and July 12, 1995 and were received by the analytical laboratories between June 21 and July 17, 1995.

3. **OBJECTIVES:**

   a. Approximately 170 soil samples, including 22 blind duplicate samples, and one water rinsate blank, were collected from various locations to determine the extent of the chemical contamination on the site.

   b. Twenty-one QA soil samples were submitted to evaluate the primary laboratories' data quality.

4. **PRIMARY ORGANIZATION:**

   a. The samples were collected by Ecology and Environment, Inc., Anchorage, Alaska.

   b. The primary samples were analyzed by Sound Analytical Services (SAS), Inc., Tacoma, Washington, Southwest Laboratory of Oklahoma (SLO), Inc., Broken Arrow, Oklahoma and Northern Testing Laboratories (NTL), Anchorage, Alaska.

   c. The QA samples were analyzed by Columbia Analytical Services (CAS), Kelso, Washington, and Alta Laboratory, Inc. El Dorado Hill, California.

5. ANALYTICAL REFERENCES:

Number	Title	Date
SW-846, Third Edition	Test Methods for Evaluating Solid Waste - Final Update II	1/95
GRO and DRO	State of Alaska Interim TPH Methods	2/92
SM179215D	Standard Methods for the Examination of Water and Wastewater, 18th Edition-Heterotrophic Plate Count	1993
EPA 600/4-79-020	Methods for Chemical Analysis of Water and Wastes	3/83

6. EVALUATION OF THE PRIMARY LABORATORIES' (SAS and SLO) DATA:

a. Surrogate Recoveries: All surrogate recoveries are within EPA, State of Alaska Department of Conservation (ADEC), or laboratory established (LE) quality control (QC) limits and were acceptable with the following exceptions.

I. VOC: One or two of three VOC surrogate recoveries were above EPA QC limits in the following samples: 95RRFTA2133SB, -2135SB, (report 49992), -2124SB (report 49959), -2098SB, -2099SB, -21035SB, -2108SB (report 49935), -2089SB, -2091SB through -2095SB (report 49847), -2045SB, -2046SB, -20488SB, -2050SB, -2058SB, -2059SB (report 49708), -2067SB, -2072SB, -2086SB, -2068SB, -2076SB (report 49814), -2017SS, -2025SS (report 49677), -2146SB, -2146SB-re, -2151SB, -2151SB-re, -2152SB, -2152SB-re. -2153SB, -2155SB, -2156SB, -2156SB-re, -2170SB (report 50025). The VOC analyte data of the samples reported as detects should be considered high estimates and all not-detected data should be considered unaffected by the high surrogate recoveries. One or two of three VOC surrogate recoveries were below EPA QC limits in following samples: -2022SS, -2023SS, -2024SS (report 49677), -2051SB (report 49708), -2122SB (report 49959), -2134SB (report 49992), -2060SB, -203SB, -2064SB, -2075SB, -2077SB, -2083SB, 2081SB (report 49814). The VOC analyte data of the samples reported as detects should be considered low estimates and it should be noted for no-detected analytes that low levels may not have been detected based on low surrogate recovery. The following samples had erratic VOC surrogate recoveries and the data should be considered estimates: -2014SS (report 49959), -2104SB, -2106SB (report 49935), -2137SB (report 49992), -2085SB (report 49814), -2147SB, -2147SB-re, -

2148SB, -2148SB-re (report 50025). Sample -2149SB (report 50025) had one of three VOC surrogate recoveries above QC limits. Upon re-extraction one surrogate recovery was below and one surrogate recovery was above QC limits. The data from the original sample should be used as high estimates for detected analytes and non-detected analytes should be considered unaffected by the high surrogate recovery. Samples -2153SB, -2158SB, and -2170SB (report 50025) had VOC surrogate recoveries above QC limits in the initial analysis but upon reanalysis the surrogate recoveries were within QC limits. However, these samples were reanalyzed after the holding time had expired. The data of the reanalyzed samples with detected analytes should be considered estimates and non detected data should be considered with the caveat that low levels may have not been detected. Samples -2136SB and -2138SB had VOC surrogate recoveries out of control in the initial analysis but upon reanalysis the surrogate recoveries were within QC limits. The VOC reanalysis data for these two samples are acceptable.

II. BNA, GRO and DRO: One of six BNA surrogates was above EPA QC limits in samples -2080SB and -2081SB from report 49814 and the matrix spike (MS) sample from report 49677. The associated data are acceptable based on the remaining five surrogate recoveries within QC limits. The GRO surrogate recovery for sample -2166SB, report 50104, was below ADEC QC limits. Low levels of GRO may not have been detected if present. The GRO surrogate was diluted out in samples -2017SS, report 49677, and -2134SB, report 49992; data should be considered estimates. The DRO surrogate was diluted out in samples -2017SS and -2025SS, report 49677; data should be considered estimates.

III. Dioxins/furans: Up to four ^{13}C-dioxins and up to two ^{13}C-furans were below EPA QC limits in report 49814. Low levels of 2,3,7,8-TCDD and 2,3,7,8-TCDF analytes in samples -2086SB and -2084SB may not have been detected, if present. In sample -2061SB the OCDF datum should be considered a low estimate and low levels of the remaining analytes may not have been detected, if present. The data for the first analysis of sample -2064SB should be considered unacceptable due to low ^{13}C-dioxin and ^{13}C-furan recoveries failure and laboratory contamination. The re-extracted and reanalyzed data for sample -2064SB are acceptable. Low levels of 2,3,7,8-TCDF and 1,2,3,7,8-PeCDF may not have been detected, if present, in samples -2147SB and -2152SB (report 50025), respectively, as evidenced by low ^{13}C dioxin and ^{13}C-furan recoveries.

b. MS, Matrix Spike Duplicate (MSD), Laboratory Control (LC) Recoveries and Relative Percent Difference (RPD) Results: All MS, MSD, and LC recoveries and RPD results were within EPA, ADEC, or LE QC limits and were acceptable with the following exception.

I. VOC and BNA: Two of five VOC MS/MSD RPD results from report 49708, performed on July 7 and July 8, 1995, were above EPA QC limits. The precision of the data is acceptable based on the remaining three RPD results from each batch. Four of 22 and two of 22 MS/MSD recoveries were above EPA QC limits in reports 49814 and 49677, respectively. The accuracy of the data is acceptable based on the remaining MS/MSD recoveries within QC limits.

II. GRO: Two of two GRO MS/MSD recoveries from report 49847 were below LE the QC limit. The associated data with detects should be considered low estimates and not-detected data should be viewed with the caveat that low levels of GRO may not have been detected. The GRO sample duplicate RPD results from reports 49814, 49959, and 49992 were not calculable due to the sample concentration being near the reporting limit. The precision of the associated data is acceptable based on MS/MSD or LC/LCD RPD results within QC limits.

III. DRO: The DRO MS/MSD recoveries in report 49959 were not calculable due to a sample concentration greater than 10 times the spike amount. The matrix effect on accuracy for the associated samples could not be determined. The DRO MS/MSD recoveries in report 49677 were above LE QC limits; associated data with detects should be considered high estimates and not-detected data are unaffected. One of two DRO MS/MSD recoveries in reports 49607 was below the LE QC limit resulting in a RPD result above the ADEC QC limit. The associated data with detects should be considered low estimates and not-detected data should be viewed with the caveat that low levels of DRO may not have been detected. The DRO MS/MSD RPD result from report 49814 was above ADEC QC limits; associated data should be considered estimates due to lack of precision. The DRO sample duplicate RPD results from reports 50025 and 49992 were above EPA QC limits. The DRO sample duplicate RPD results from reports 49677, 49935, and 49708 were not calculable due to the sample concentration being near the reporting limit. The precision of the associated data is acceptable based on the MS/MSD RPD results within QC limits.

IV. TRPH: Two of two TRPH MS/MSD recoveries in reports 49677 and 49959 were above EPA QC limits; associated data with detects should be considered as high estimates and not-detected data are unaffected. The TRPH sample duplicate RPD result in report 49814 was above the EPA QC limit. The precision of the associate data is acceptable based on a MS/MSD RPD result within QC limits.

V. Dioxin/furans: Neither the dioxin/furan MS/MSD nor LC/LCD recoveries were not reported in report 49935; associated data could not be completely evaluated. One of two OCDF MS/MSD recoveries from report 50104 was below LE QC limits, resulting in an elevated RPD result. The detected OCDF data of associated samples should be considered low estimates. The 1,2,3,7,8,9-HxCDF and 2,3,4,6,7,8-HxCDF MS/MSD RPD results from report 50104 were above LE QC limits; the 1,2,3,7,8,9-HxCDF and 2,3,4,6,7,8-HxCDF data of associated samples should be considered estimates due to possible erratic results. The OCDF and 1,2,3,4,6,7,8-HpCDF MSD recoveries and MS/MSD RPD results from report 49992 were above LE QC limits. The data of associated samples with detects of these analytes should be considered high estimates and samples with not-detected data for these analytes should be considered unaffected.

VI. Metals: The MS/MSD recoveries for the aluminum, iron, and manganese were not calculable in all reports due to a sample concentration greater than four times the spike amount. The MS recovery for antimony in reports 49708, 49992, 49607, 49677, and 50025 was below EPA QC limits. Antimony data from these reports with detects should be considered as low estimates. The sample duplicate RPD results for the following were above EPA QC limits and the associated data should be considered estimates: arsenic from report 49992; calcium, potassium and sodium from report 50025, aluminum, chromium, copper and zinc from report 49677, aluminum, calcium, potassium and vanadium from report 49959, and chromium from report 49814. Beryllium (report 49935), thallium (reports 49847, 49814), lead (report 49847), antimony (reports 49959 and 49814), and potassium (report 49847, water sample) sample duplicate RPD results were not calculable due to detection near the reporting limit. These non-calculable RPD results do not adversely affect the precision of the associated data.

c. Field Blind Duplicate Results: The field blind duplicate results are presented Tables II and XXIII. All data agree with each other with the following exceptions or notations. Data reported at or below the reporting limit (flagged "J") or detected due to laboratory contamination (flagged "B") are considered insignificant for data comparison purposes. The field blind duplicate data for one targeted VOC analyte in Tables XX-1 and XXII-1 do not agree with each other. The acetone datum for sample -2156SB in Table XXII-1 should be considered a high estimate due to surrogate recovery failure. The 4-methyl-2-pentanone datum discrepancy in Table XX-1 could not be analytically resolved. The TRPH field blind duplicate data in Table XX-5 do not agree with each other and this discrepancy could not be analytically resolved, DRO pattern supports non-identical samples (XX-4). The dioxin/furan field blind duplicate data in Tables II-5, X-7, XVII-7, XX-8, XXI-8 and XXII-7 do not agree with each other. The data of samples -002SP (Table II-5), -2046SB (Table X-7) and -2155SB (Table

XXII-7) should be considered suspect due to the detection of high levels of 13, 11, and 10 targeted analytes, respectively, that were not detected at high levels in either of the other two samples of the triplicate splits. The Total HpCDDs data do not agree in Table XVII-7. The HpCDD isomers do not agree with each other or the reporting limit within a factor of four. The Total HpCDDs datum for sample -2119SB is greater than the sum of the data for the HpCDD isomers. This data discrepancy should be considered due to the reporting of non-targeted analytes as Total HpCDDs in sample -2119SB. The OCDF field blind duplicate data do not agree in Table XIX-8. The OCDF datum of sample -2129SB should be considered due to laboratory contamination. The OCDF datum for sample -2128SB should not be considered due to laboratory contamination as the analyte concentration was greater than five times the method blank concentration. The OCDF datum for sample -2128SB is higher by a factor of 100 than the reporting limit of its blind duplicate, -2129SB. The OCDF datum of sample -2128SB should be considered a high estimate due to MS/MSD recovery and RPD failure.

d. Laboratory Method and Rinsate Blank Results: All laboratory method and the primary rinsate blank (Table I) were free of targeted analytes with the following exceptions. The detection of GRO, nine targeted metals and TOC in the rinsate sample -2001WA indicates cross-contamination may have occurred during sampling due to incomplete decontamination of sampling equipment. GRO, at an estimated concentration of 0.92, 0.82, 0.36, and 0.46 ppm, was detected in the method blank from reports 49814, 50025, 49677 and 49607, respectively. The GRO data for associated samples should be considered due to laboratory contamination except for the data for samples -2018SS, -2024SS and -2025SS (report 49677). Di-*n*-butylphthalate, at a concentration of 1200, 470, 760, 18 ppb, was detected the BNA method blanks from reports 49708, 49607, 50025, and 49847, respectively. The di-*n*-butylphthalate data for the associated samples should be considered due to laboratory contamination. The OCDF and 1,2,3,4,6,7,8-HpCDF data for sample -2103SB (report 49935) were not flagged with "B" but should be considered due to laboratory contamination as these analytes were detected in the associated method blank. The dioxin/furan data flagged with "B" in all reports should be considered due to laboratory contamination with the following exceptions: OCDD data for samples -2004SS through -2014SS (report 49607) -2119SB (report 49959), -2016SS, through -2018SS, -2020SS through -2025SS (report 49677), -2144SB, -2145SB, -2153SB, -2155SB (report 50025), -2085SB (report 49814), -2096SB, -2098SB, -2104SB, -2106SB, -2114SB, -2115SB, -2116SB, -2117SB (report 49935), -002SP (report 50104), -2136SB (report 49992), OCDF data for samples -2004SS, -2005SS (report 49607), -2096SB, -2107SB, -2108SB (report 49935), -2145SB, -2147SB, -2151SB, -2153SB, -2155SB, -2170SB (report 50025), -2138SB, -2140SB, -2141SB, -2128SB, -2137SB, -2136SB (report 49992), -002SP, -2167SB, -2168SB (report 50104), -2017SS, -2025SS (report 49677), 1,2,3,4,6,7,8-HpCDF data for samples -2004SS (report 49607), -002SP, -2167SB, -2168SB

(report50104), -2017SS, -2024SS, -2025SS (report 49677), -2145SB, -2155SB (report50025), -2137SB, -2138SB, -2141SB (report 49992), -2096SB, -2098SB, -2106SB, -2108SB (report 49935), 1,2,3,4,6,7,8-HpCDD data for samples -2115SB and -2116SB (report 49935). The above listed data were greater than five times the associated method blank data and should not be considered due to laboratory contamination.

e. Sample Holding Times and Reporting Limits: All sample holding times met EPA and ADEC method criteria and are acceptable with the following exception. Samples -2057SB (report 49708), -2024SS, -2017SS, -2025SS (report 49677), -2068SB, -2067SB (report 49814) were analyzed for VOC two, 10, eight, eight, one and two days past the recommended holding time, respectively. The data should be considered estimates as the samples may have been compromised prior to analysis due to the extended holding time.

f. Chain of Custody (COC) Records and Sample Cooler Receipt (SCR) Forms: All COC records and SCR forms met EPA and/or U. S. Army Corps of Engineers (USACE) ER1110-1-263 regulations with the following exceptions. Either there was not a COC record or it was not signed by the receiving laboratory for dioxin/furan samples sent to SLO associated with SAS reports 49607, 49677, and 49708. The custody and security of the associated samples may have been compromised. The SCR forms associated with SAS reports 49847, 49959, 49607, 49677, 49708, 49814 and the dioxin/furan SCR form associated with report 50104 indicates the cooler temperatures were out of the required $4 \pm 2\ ^{\circ}C$.

g. Overall Evaluation of the Primary Laboratories' Data: The following deficiencies and/or delinquencies were noted in the primary laboratories' data. The detection of GRO, nine targeted metals and TOC in the rinsate sample indicates cross-contamination may have occurred during sampling. All GRO data from reports 49814, 50025, 49677 and 49607 except for the data for samples -2018SS, -2024SS and -2025SS (report 49677). and Di-*n*-butylphthalate data from reports 49708, 49607, 50025, and 49847 should be considered due to laboratory contamination. All dioxin/furan data in all reports flagged with "B" should be considered due to laboratory contamination except for the samples listed in section 6-d. Over one-third of the VOC data should be considered estimates due to surrogate recovery failure or holding time expiration. GRO data for samples -2166SB, report 50104, -2017SS, report 49677, -2134SB, report 49992 and DRO data for samples -2017SS and -2025SS, report 49677 should be considered estimates due to surrogate recovery failure. GRO data from report 49847 and DRO data from reports 49677 and 49607 should be considered, low, high and low estimates, respectively, due to MS/MSD or RPD failure. The DRO data from report 49814 should be considered estimates due to lack of precision.. TRPH data in reports 49677 and 49959 should be considered as high estimates. Due to internal standard recovery failure,

the dioxin/furan data of sample -2061SB should be considered low estimates. Low levels of 2,3,7,8-TCDF and 1,2,3,7,8-PeCDF in samples -2147SB and -2152SB (report 50025), respectively, and low levels of 2,3,7,8-TCDD and 2,3,7,8-TCDF analytes in samples -2086SB and -2084SB may not have been detected, if present, due to low internal standard recovery. The dioxin/furan data from report 49935 should be considered estimates due to lack of supporting internal QC. The OCDF, 1,2,3,7,8,9-HxCDF and 2,3,4,6,7,8-HxCDF data from report 50104 should be considered estimates due to MS/MSD recovery and/or RPD failure. The OCDF and 1,2,3,4,6,7,8-HpCDF data from report 49992 should be considered high estimates due to MSD recovery and RPD failure. The matrix effect on the accuracy for the aluminum, iron, and manganese data in all reports could not be determined. Antimony data from reports 49708, 49992, 49607, 49677, and 50025 should be considered as low estimates. The following data should be considered estimates: arsenic (report 49992); calcium, potassium and sodium (report 50025), aluminum, chromium, copper and zinc (report 49677), aluminum, calcium potassium and vanadium (report 49959), and chromium (report 49814). The field blind duplicate data for 4-methyl-2-pentanone (Table XX-1), acetone (Table XXII-1), TRPH (Table XX-5) and dioxin/furans (Tables II-5, X-7, XVII-7, XIX-8 and XXII-7) do not agree with each other due inpart to data variability. The custody of the dioxin/furan samples sent to SLO, associated with SAS reports 49607, 49677, and 49708, may have been compromised. Samples associated with SAS reports 49847, 49959, 49607, 49677, 49708, 49814 and the dioxin/furan samples associated with report 50104 were received outside of the USACE required 4°+/-2.

7. EVALUATION OF THE QA LABORATORIES' (CAS and ALTA) DATA:

a. Method Blanks, Sample Holding Times and Reporting Limits: All laboratory method were free of targeted analytes with the following exceptions. From four to 19 analytes were detected at estimated concentrations, in the VOC and TCLP VOC method blanks from all eight CAS reports. Detects for these analytes in the corresponding samples should be considered due to laboratory contamination. Total HxCDD, at a concentration of 1.4 ppt, was detected in the dioxin/furan method blank from CAS reports K9503867 and K9503958. The detection of Total HxCDD in samples -2003SS and -2015SS should be considered due to laboratory contamination. The detection of Total HxCDD in sample -20218S was not due to laboratory contamination as the analyte concentration was greater than five times the method blank concentration. Zinc, at an estimated concentration of 0.4, 1.4, 1.5, 0.5, 0.7 ppm, was detected in the method blanks from CAS reports K9504202, -4305, -4393, -3867, and -3958, respectively. Magnesium, at a concentration of 0.9 and 3 ppm, was detected in the method blanks from CAS reports K9504305 and -4393, respectively. Aluminum and calcium, at estimated concentrations of 3 and 95 ppm, respectively, were detected in the method blank

from CAS report K9504393. The detection of zinc, magnesium, aluminum and calcium in the associated samples was not due to laboratory contamination as the concentration of these analytes was greater than 10 times the blank contamination in all cases. All holding times and reporting limits met method requirements.

b. Surrogate Recoveries: All surrogate recoveries were within EPA, ADEC, or LE QC limits and are acceptable with the following exception. The GRO surrogate recovery for the MS sample from CAS report K9504072 was below ADEC QC limits. The MS sample datum should be considered a low estimate.

c. MS, MSD and LC Recoveries and RPD Results: All MS, MSD and LC recoveries and RPD results were within EPA or LE QC limits with the following exceptions. One of two GRO LC recoveries from CAS report K9504237 was above ADEC QC limits; data are acceptable based on the remaining LC/LCD and MS recoveries within QC limits. The GRO MS recovery from CAS report K9504072 was below LE QC limits. GRO at or near the reporting limit may not have been detected in either of the associated samples due to matrix interference. The antimony MS recovery from CAS reports K9503978, -4202, -4305, -4393, -4237, -3867, -3958, and -4072 was below EPA QC limits. The antimony data for the following samples should be considered as low estimates: -2120SB, -2125SB (report K9504237), -2130SB, -2142SB, -2150SB (report K9504305) and -2019SB (report K9503958). Low levels of antimony may not have been detected in the associated samples with antimony reported as not-detected. One of seven VOC MS/MSD RPD results from CAS reports K9504393, -3958, -3867 and -3978 was above QC limits; data are acceptable based on the remaining six RPD results within QC limits. The precision of the TCLP VOC data from CAS report K9504393 could not be evaluated as RPD results were not submitted. One of two DRO RPD results from CAS reports K9503958, -3978, -4072 and one of one DRO RPD result from CAS report K9504202 was above QC limits. The associated DRO data should be considered estimates due to possible variability within the data.

d. COC Records and SCR Forms: All COC records and SCR forms met EPA and/or USACE ER1110-1-263 requirements with the following exceptions. The samples associated with report K9504393 were sent to the laboratory from CENPD-ET-EN-L without a COC record. The COC record was subsequently forwarded to CAS. The security and custody of these samples may have been compromised. The COC record associated with report K9504305 was not signed at CAS incurring a break in custody. The SCR forms indicate that coolers associated with reports K9503958, K9503978, K9504072, K9504202, and K9504393 arrived at either CENPD-ET-EN-L or CAS (or both) with temperatures outside the required 4 ± 2 °C. The dioxin/furan samples associated with report K9503978

and K9504305 arrived at Alta Laboratories, Inc. with a cooler temperature of 21 and 22 °C, respectively.

e. Overall Evaluation of the QA laboratories' Data:. Up to 19 analytes were detected in VOC method blanks from all eight CAS reports. Data reported as detects for these analytes in the corresponding samples should be considered due to laboratory contamination.. The detection of Total HxCDD in samples -2003SS and -2015SS (CAS report K9503867 and K9503958) should be considered due to laboratory contamination. Low levels of GRO in samples from report K9504072 may not have been detected due to matrix interference. Due to MS recovery failure, antimony data for the following samples should be considered as low estimates: -2120SB, -2125SB (report K9504237), -2130SB, 2142SB, 2150SB (report K9504305) and -2019SB (report K9503958). Low levels of antimony may not have been detected in samples from these reports where antimony was reported as no-detected. The DRO data from reports K9503958, -3978, -4072, and -4202 should be considered estimates due to RPD failure. The security of the samples associated with reports K9504393 and K9504305 may have been compromised due to breaks in custody. Samples associated with reports K9503958, K9503978, K9504072, K9504202, and K9504393 and the dioxin/furan samples associated with reports K9503978 and K9504305 were received outside of the 4°+/-2 required by the USACE.

8. **COMPARISON OF THE PRIMARY AND QA LABORATORIES' DATA:** The primary and QA data comparisons are presented in Tables II through XIII, XV and XXIII. All data agree with each other with the following exceptions. There were many VOC, dioxin/furan and a few other analytes detected due to laboratory contamination. All analytes flagged with "B" should be considered due to laboratory contamination unless noted in the respective table summary. Analytes detected at or below the reporting limit (flagged with "J") or detected due to laboratory contamination should be considered insignificant for data comparison purposes.

a. VOC and BNA: The VOC data discrepancies for acetone, 2- butanone and 4-isopropyltoluene in Table XI-1. One of two primary data of trichloroethene and tetrachloroethene in Table XIX-1 and 4-isopropyltoluene data in Table XXIII-1 did not agree. Data disagreements in Table XI-1 and XXIII are due to non-compatible samples (see percent solid in respective tables). Data disagreement in Table XIX-1 is due to QA laboratory's questionable data. Primary data of this table are acceptable based on blind duplicate data agreement. BNA(phthalate) data in Table XV (di-*n*-butylphthalate), Table XIX-2 (bis(2-ethylhexyl)phthalate and di-*n*-butylphthalate) and Table XX-2 (di-*n*-butylphthalate) did not agree and data discrepancy could not be resolved analytically. Since phthalate is a common

laboratory contaminate, the above disagreements could be due to unknown source of laboratory contamination.

b. GRO, DRO, TRPH, dioxin/furans and Metals: One of the two or both primary GRO data in Tables VII-2, X-3, XII-3, XV-3, XVII-3, XX-3 and XXIII-3 did not agree mainly due to primary laboratory's data reporting at or below the reporting limits. Since similar levels of GRO also reported in many primary laboratory's laboratory blanks. The reported GRO data in most blind duplicate are due either to laboratory cross-contamination or artifacts. DRO data in Tables XI-4 and XXI-4 did not agree. Primary data are questionable based on blind duplicate (XI-4) disagreements and reporting as estimates value close to the reporting limits. One of the two primary TRPH data in Table XX-5 did not agree with the QA data, discrepancy could not be resolved analytically. Primary DRO and TRPH pattern indicates possibility of non-identical samples. The dioxin/furan data in Tables II-5, III-7, VII-7, X-7, XI-7, XII-7, XIII-7, XV-7, XVI-7, XVIII-8, XIX-8, XX-8, and XXII-7 do not agree with each other due to various reasons. The dioxin/furan data for samples -002SP (Table III-7) and -2046SB(Table X-7), -2054SB (Table XI-7), -2155SB (Table XXII-7) should be considered suspect due to high levels of many targeted analytes detected that were not detected in either of the other two samples from the triplicate split. The remaining dioxin/furan data discrepancies are inpart due to laboratory cross-contamination and different assumptions used by the laboratories in calculating total dioxin/furan.. The antimony and/or cadmium primary data in all twenty tables do not agree with the QA data. These data disagreements are due inpart to non-identical methods reporting limits and methods used.

9 PROBLEMS ENCOUNTERED/CORRECTIVE ACTIONS TAKEN:

a. The data from NTL was never received at CENPD-ET-EN-L and therefore evaluation of these data was not included in this report. The contractor and the district have been notified.

b. The QA sample 95RRFTA2090SB was not submitted from the field. The contractor was notified by CENPD-ET-EN-L coordination branch staff.

CENPD-ET-EN-L (95-0272)

PROJECT RINSATE RESULTS

Table I

Project: Ft. Richardson OUA - Ruff Road Matrix: Water Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc.

1. Method: Volatile Organic Compounds (EPA 8260) Units: ug/L (ppb)

Analytes Detected	Primary Lab 2001WA	Reporting Limits*
Acetone	24	16

* = Method reporting limit

SUMMARY: The detection of acetone in the project rinsate sample may indicate incomplete decontamination procedures during sampling or could have detected from unknown source of laboratory cross-contamination. As acetone is a common laboratory contaminant. The absence of all other targeted analytes indicates the decontamination procedure is adequate to eliminate cross-contamination during sampling.

2. Method: Semi-Volatile Organic Compounds (EPA 3510/8270) Units: ug/L (ppb)

Analytes Detected	Primary Lab 2001WA	Reporting Limits*
Di-n-butylphthalate	21 B	2.6
Butylbenzylphthalate	1.1 J	0.92

B = Found in method blank
J = Estimated concentration

SUMMARY: The detection of di-n-butylphthalate in rinsate blank should be considered due to laboratory contamination. The detection of butylbenzlphthalate, the common laboratory contaminant, below the practical quantitation limit should not be taken as an indication of incomplete decontamination of sampling equipment for BNA analytes. The absence of all other targeted indicates that the decontamination procedure is adequate to eliminate cross-contamination of BNA analytes during sampling.

CENPD-ET-EN-L (95-0272)
Table I cont.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/L (ppm)

Analytes Detected	Primary Lab 2001WA	Reporting Limits*
GRO	0.01	0.0043

SUMMARY: The detection of GRO in the rinsate sample indicates incomplete decontamination of sampling equipment for GRO. Quantification of GRO at this level is questionable and could be reported due to laboratory artifacts.

4. Method: Diesel Range Organics (EPA 3510/ADEC 8100 Mod.) Units: mg/L (ppm)

Analytes Detected	Primary Lab 2001WA	Reporting Limits*
DRO	ND	0.053

ND = Not detected

SUMMARY: The absence of DRO in the rinsate sample indicates complete decontamination of the sampling equipment for DRO.

5. Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/L (ppm)

Analytes Detected	Primary Lab 2001WA	Reporting Limits*
TRPH	ND	0.38

SUMMARY: The absence of TRPH in the rinsate sample indicates complete decontamination of the sampling equipment for TRPH.

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6. Method: Total Metals (EPA 3005/200.8, 6010, 7471) Units: mg/L (ppm)

Analytes Detected	Primary Lab 2001WA	Reporting Limits*
Aluminum	ND	150
Antimony	ND	0.45
Arsenic	2.5	0.089
Barium	ND	4.1
Beryllium	ND	3.2
Cadmium	0.12	0.024
Calcium	1000	340
Chromium	ND	7.7
Cobalt	ND	46
Copper	12	8.2
Iron	ND	95
Lead	6.3	0.045
Magnesium	240	82
Manganese	ND	8.9
Mercury	ND	0.17
Nickel	ND	36
Potassium	500	440
Selenium	ND	0.16
Silver	ND	8.4
Sodium	ND	490
Thallium	0.52	0.24
Vanadium	ND	49
Zinc	19	14

SUMMARY: The detection of nine targeted metals in the rinsate sample indicates incomplete decontamination of sampling equipment for metals.

CENPD-ET-EN-L (95-0272)
Table I cont.

7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: pg/L (ppq)
Primary Laboratory: Southwest Laboratory of Oklahoma

Analytes Detected	Primary Lab 2001WA	Reporting Limits
OCDD	9.987 B	2.173

SUMMARY: The detection of OCDD in the rinsate blank should be considered due to laboratory contamination as indicated by the detection of the analyte in the method blank. The absence of all other targeted analytes indicates that cross-contamination of dioxins and furans did not occur during sampling.

8. Method: Total Organic Carbon (EPA 9060) Units: mg/L (ppm)

Analytes Detected	Primary Lab 2001WA	Reporting Limits*
TOC	1.1	1

SUMMARY: The detection of TOC in the rinsate blank indicates incomplete decontamination of sampling equipment for TOC.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table II

Project: Ft. Richardson OUA - Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: TCLP Volatile Organic Compounds (EPA 1311/8260) Units: mg/L (ppm)
QA Method: TCLP Volatile Organic Compounds (EPA 1311/5030/8260)

Analytes Detected	Primary Lab 001SP	002SP	Reporting Limits*	QA Lab 003SP	Reporting Limits
2-Butanone	0.088 J	ND	0.038	ND	1
Benzene	0.11	ND	0.044	ND	0.02
Chloroform	ND	ND	0.053	0.01 J, B	0.02
Acetone	--	--		0.07 J, B	1
Methylene Chloride	--	--		0.3 B	0.05
Total Xylenes	--	--		0.02 J	0.02
1,2-Trimethylbenzene	--	--		0.01 J	0.1
Percent Solids	--	--		93.4	

* = Method reporting limit
B = Found in method blank
J = Estimated concentration
-- = Not reported
ND = Not detected

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of five for all targeted analytes. The detection of analytes below the reporting limit should be considered insignificant for data comparisons. The primary laboratory only reported TCLP VOC data for analytes listed in the federal registry. The QA laboratory reported data for the entire 8260 analyte list.

CENPD-ET-EN-L (95-0272)
Table II cont.

2. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 001SP	002SP	Reporting Limits*	QA Lab 003SP	Reporting Limits
GRO	19	28	0.49/0.47	11	5
Percent Solids	90.79	92.04		82.8	

SUMMARY: The field blind duplicate and QA data agree within a factor of three with each other and are comparable.

3. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 001SP	002SP	Reporting Limits*	QA Lab 003SP	Reporting Limits
DRO	47	56	0.84/0.82	163	10

SUMMARY: The field blind duplicate and QA data agree within a factor of four with each other and are comparable.

CENPD-ET-EN-L (95-0272)
Table II cont.

4. Primary Method: TCLP Metals (EPA 1311/3005/6010. 7470) Units: mg/L (ppm)
QA Method: TCLP Metals (EPA 1311/3010/6010.7000 Series)

Analytes Detected	Primary Lab 001SP	002SP	Reporting Limits*	QA Lab 003SP	Reporting Limits
Arsenic	ND	ND	0.15	ND	0.1
Barium	0.47	0.45	0.0041	ND	0.5
Cadmium	ND	ND	0.01	ND	0.01
Chromium	0.021	0.029	0.0077	0.02	0.01
Lead	ND	ND	0.046	ND	0.05
Mercury	ND	ND	0.0017	ND	0.001
Selenium	ND	ND	0.1	ND	0.1
Silver	ND	ND	0.0084	ND	0.01

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five and are comparable.

CENPD-ET-EN-L (95-0272)
Table II cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta, Inc.
5. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 001SP	002SP	Reporting Limits	QA Lab 003SP	Reporting Limits
Total HxCDDs	ND	7.623	0.232/0.135	ND	1.1
1,2,3,6,7,8-HxCDD	ND	2.396	0.215/0.126	ND	1.0
1,2,3,7,8,9-HxCDD	ND	0.963 E	0.220/0.129	ND	0.98
Total HpCDDs	0.966	17.848	0.338/0.217	ND	1.8
1,2,3,4,6,7,8-HpCDD	0.829 E	9.633	0.338/0.217	ND	1.8
OCDD	6.091 B	29.967 B	0.228/0.079	13 J	--
Total HxCDFs	ND	6.479	0.314/0.236	ND	0.34
1,2,3,4,7,8-HxCDF	ND	1.787	0.376/0.244	ND	0.32
1,2,3,6,7,8-HxCDF	ND	2.554	0.314/0.204	ND	0.32
1,2,3,7,8,9-HxCDF	ND	0.564 E	0.393/0.246	ND	0.32
Total HpCDFs	ND	34.543 B	0.250/7.993	ND	0.35
1,2,3,4,6,7,8-HpCDF	1.143 E, B	30.570 B	0.232/7.418	ND	0.33
OCDF	3.177 B	77.474 B	0.434/0.161	ND	2.0
Percent Solids	92.69	93.95		90	

E = Estimated maximum possible concentration

SUMMARY: The primary sample -001SP and QA data agree with each other or their reporting limits within a factor of five and are comparable. The detection of 13 targeted analytes in primary sample -002SP is mostly likely due to contamination of the sample during collection and processing or due to some type of random laboratory contamination other than that indicated by method blank contamination. The data of primary sample -001SP should be considered estimates due to RPD failure. The QA sample -003SP data are acceptable based on acceptable internal QC.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table III

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS. Inc. QA Laboratory: CAS. Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2001SS	Primary Lab 2002SS	Reporting Limits*	QA Lab 2003SS	Reporting Limits
Acetone	45	17	16/17	61 B	50
Methylene Chloride	6.7	ND	3.9/4	26	10
Toluene	8.7	ND	2.1	10	5
Benzene	ND	ND	2.3	0.43 J	5
2-Hexanone	ND	ND	17	0.89 J,B	20
Tetrachloroethene	ND	ND	1.8	0.74 J	5
Ethylbenzene	ND	ND	1.6/1.7	2.37 J	5
1,3,5-Trimethylbenzene	ND	ND	2	0.45 J	20
1,2,4-Trimethylbenzene	ND	ND	2.1/2.2	0.90 J	20
1,3-Dichlorobenzene	ND	ND	2.2/2.3	0.37 J,B	5
4-Isopropyltoluene	ND	ND	2.2/2.3	0.54 J	20
1,4-Dichlorobenzene	ND	ND	3.9/4	0.54 J,B	5
n-Butylbenzene	ND	ND	2/2.1	0.28 J,B	20
1,2-Dichlorobenzene	ND	ND	2.8/2.9	0.33 J	5
1,2,4-Trichlorobenzene	ND	ND	5.7/5.8	1.05 J,B	20
1,2,3-Trichlorobenzene	ND	ND	3.8/3.9	1.23 J,B	20
Naphthalene	ND	ND	3.4/3.5	1.19 J,B	20
Hexachlorobutadiene	ND	ND	12	0.47 J,B	20
Total Xylenes	ND	ND	2.1/2.2	16	5
Percent Solids	97.19	95.69		89.0	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other or there reporting limits within a factor of five for all but eight targeted analytes. Data comparisons at or below the reporting limit should be considered insignificant. The detection of analytes flagged with "B" should be considered due to laboratory contamination.

CENPD-ET-EN-L (95-0272)
Table III cont.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2001SS	2002SS	Reporting Limits*	QA Lab 2003SS	Reporting Limits
Bis(2-ethylhexyl)phthalate	ND	ND	170	50 J	300
Percent Solids	97.19	95.69		96.0	

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits for all targeted analytes within a factor of four. The data comparisons at or below the reporting limit are not considered significant.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2001SS	2002SS	Reporting Limits*	QA Lab 2003SS	Reporting Limits
GRO	ND	1.7 B	0.19	ND	5

SUMMARY: The field blind duplicate and QA data agree with each other. The detection of GRO in sample -2002SS should be considered due to laboratory contamination.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2001SS	2002SS	Reporting Limits*	QA Lab 2003SS	Reporting Limits
DRO	49	30	3.1/3.2	33	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table III cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1)

Analytes Detected	Primary Lab 2001SS	2002SS	Reporting Limits*	QA Lab 2003SS	Reporting Limits
TRPH	120	43	7.6.7	66 B	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of three and are comparable. The detection of TRPH in sample -2303SS should not be considered due to laboratory contamination since the analyte concentration is greater than five times the analyte concentration in the method blank.

CENPD-ET-EN-L (95-0272)
Table III cont.

6. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2001SS	2002SS	Reporting Limits*	QA Lab 2003SS	Reporting Limits
Aluminum	17,000	19,000	14/16	21,100	10
Antimony	0.58	ND	0.4/0.46	ND	10
Arsenic	4.3	4.6	0.079/0.091	11	1
Barium	110	120	0.37/0.42	127	1
Beryllium	0.4	0.4	0.29/0.33	0.6 J	1
Cadmium	0.12	0.34	0.021/0.025	ND	1
Calcium	3200	3400	31/35	5180	10
Chromium	34	35	0.69/0.79	39	2
Cobalt	14	14	4.1/4.7	13	2
Copper	25	26	0.73/8.4	28	2
Iron	30,000	30,000	8.5/9.8	31,600	4
Lead	7.8	7.6	0.04/0.046	10	1
Magnesium	6300	6700	7.3/8.4	7690	2
Manganese	760	700	0.79/0.91	729	1
Mercury	0.097	0.18	0.067/0.073	0.07 J	0.2
Nickel	35	38	3.2/3.7	39	10
Potassium	390	400	39/45	840	400
Selenium	ND	ND	0.14/0.16	ND	2.5
Silver	ND	ND	0.75/0.86	ND	2
Sodium	450	460	44/50	203	20
Thallium	ND	ND	0.21/0.24	ND	1
Vanadium	53	57	4.3/5	70	2
Zinc	60	61	1.3/1.5	62 B	2

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five with the exception of antimony and cadmium. The reporting of antimony and cadmium by the primary laboratory but not by the QA laboratory is due to the higher reporting limits used by the QA laboratory and different analytical procedures used by the laboratories.

CENPD-ET-EN-L (95-0272)
Table III cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc.
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2001SS	Primary Lab 2002SS	Reporting Limits	QA Lab 2003SS	Reporting Limits
Total TCDDs	ND	ND	0.212/0.273	0.36 J	--
Total HxCDDs	ND	ND	0.292/0.168	1.5 J,B	--
Total HpCDDs	ND	0.651	0.233/0.232	4.1	--
1,2,3,4,6,7,8 - HpCDD	0.725 E	0.651	0.233/0.232	2.3 J	--
OCDD	3.275 B	3.455 B	0.182/0.154	9.7	--
1,2,3,4,6,7,8 - HpCDF	0.389 EB	0.847 EB	0.255/0.205	ND	0.86
OCDF	0.281 EB	2.319 B	0.267/0.253	ND	0.60
Total TCDFs	ND	ND	0.377/0.329	1.6	--
Percent Solids	94.46	95.35		96	

-- = Not reported
B = Found in method blank
E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five with the exception of Total HpCDDs. The data discrepancy for total HpCDDs can not be resolved analytically. All analytes detected at or below the reporting limits (flagged "J") or detected due to laboratory contamination (flagged "B"). The data comparisons at or below reporting limits are not considered significant.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table IV

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS. Inc. QA Laboratory: CAS. Inc.

1. Primary Method: Diesel Range Organics (EPA 3550 ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2005SB	Primary Lab 2006SB	Reporting Limits*	QA Lab 2007SB	Reporting Limits
DRO	ND	ND	3.2	ND	10
Percent Solids	96.55	92.54		93.8	

* = Method reporting limit
ND = Not detected

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

2. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2005SB	Primary Lab 2006SB	Reporting Limits*	QA Lab 2007SB	Reporting Limits
TRPH	ND	ND	7.5/6.8	8 J,B	10

J = Estimated concentration
B = Found in method blank

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of two. The detection of TRPH in QA sample -2007SB should be considered due to laboratory contamination as evidenced by detection of TRPH in the method blank.

CENPD-ET-EN-L (95-0272)
Table IV cont.

3. Primary Method: Total Metals (EPA 3051/ 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2005SB	Primary Lab 2006SB	Reporting Limits*	QA Lab 2007SB	Reporting Limits
Aluminum	11,000	12,000	14/15	16,300	10
Antimony	ND	ND	0.42/0.45	ND	10
Arsenic	2.8	2.6	0.083/0.087	7	1
Barium	76	46	0.39/0.41	59	1
Beryllium	ND	ND	0.3/0.32	0.6 J	1
Cadmium	0.31	0.098	0.023/0.024	ND	1
Calcium	4700	4500	32/34	8310	10
Chromium	24	24	0.73/0.76	34	2
Cobalt	11	11	4.3/4.6	12	2
Copper	23	24	0.77/0.81	32	2
Iron	22,000	24,000	9/9.4	31,000	4
Lead	5.9	5.4	0.042/0.044	8	1
Magnesium	7200	8200	7.8/8.1	10,300	2
Manganese	500	470	0.84/0.88	638	1
Mercury	ND	ND	0.076/0.081	0.07 J	0.2
Nickel	27	29	3.4/3.6	34	10
Potassium	600	610	42/44	1200	400
Selenium	ND	ND	0.15	ND	2.5
Silver	ND	ND	0.79/0.83	ND	2
Sodium	390	350	46/48	170	20
Thallium	ND	ND	0.22/0.23	ND	1
Vanadium	37	39	4.6/4.8	62	2
Zinc	56	58	1.3/1.4	65	2

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limit within a factor of five and are comparable with the exception of cadmium. The data discrepancy for cadmium is mostly due to the higher but acceptable reporting limits used by the QA laboratory.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table V

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2013SS	Primary Lab 2014SS	Reporting Limits*	QA Lab 2015SS	Reporting Limits
DRO	10	9.7	3.1	16	10
Percent Solids	97.61	96.72		96.6	

* = Method reporting limit

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

2. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2013SS	Primary Lab 2014SS	Reporting Limits*	QA Lab 2015SS	Reporting Limits
TRPH	18	13	6.4/7	27 B	10

B = Found in method blank

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of three. The detection of TRPH in QA sample -2015SS should be considered due to laboratory contamination as evidenced by the detection of TRPH in the method blank.

CENPD-ET-EN-L (95-0272)
Table V cont.

3. Primary Method: Total Metals (EPA 3051/ 200.8, 6010, 7471) Units: mg/K (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2013SS	Primary Lab 2014SS	Reporting Limits*	QA Lab 2015SS	Reporting Limits
Aluminum	15,000	18,000	14	21,300	10
Antimony	ND	ND	0.4/0.41	ND	10
Arsenic	3.8	4	0.078/0.08	9	1
Barium	84	97	0.36/0.37	105	1
Beryllium	0.29	0.33	0.28/0.29	0.6 J	1
Cadmium	0.11	0.14	0.02/0.22	ND	1
Calcium	3100	3400	30/31	6340	10
Chromium	27	30	0.68/0.69	34	2
Cobalt	12	14	4.1	13	2
Copper	21	25	0.73/0.74	28	2
Iron	24,000	28,000	8.5/8.6	30,900	4
Lead	7.5	7.6	0.04	10	1
Magnesium	6000	6800	7.3/7.4	8430	2
Manganese	540	640	0.79/0.8	677	1
Mercury	0.089	ND	0.071/0.077	0.07 J	0.2
Nickel	28	32	3.2/3.3	32	10
Potassium	350	420	39/40	1050	400
Selenium	ND	ND	0.14	ND	2.5
Silver	ND	ND	0.74/0.76	ND	2
Sodium	340	350	43/44	221	20
Thallium	ND	ND	0.21	ND	1
Vanadium	44	52	4.3/4.4	71	2
Zinc	52	61	1.3	63	2

ND = Not detected

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five with the exception of cadmium. The detection of cadmium by the primary laboratory but not by the QA laboratory is due to the higher but acceptable reporting limits used by the QA laboratory.

CENPD-ET-EN-L (95-0272)
Table V cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
4. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2013SS	Primary Lab 2014SS	Reporting Limits	QA Lab 2015SS	Reporting Limits
Total HxCDDs	ND	ND	0.152/0.728	1.9 J,B	--
Total HpCDDs	1.434	ND	0.149/0.682	3.1	--
1,2,3,4,6,7,8 - HpCDD	0.870	ND	0.149/0.682	1.8 J	--
OCDD	5.982 B	4.864 B	0.113/0.360	7.6	--
Total HxCDFs	0.418	ND	0.215/0.794	ND	0.21
1,2,3,7,8,9 - HxCDF	0.418	ND	0.234/0.861	ND	0.13
Total HpCDFs	0.499 B	ND	0.147/0.380	ND	0.57
1,2,3,4,6,7,8 - HpCDF	0.499 B	ND	0.136/0.353	ND	0.57
OCDF	0.747 B	0.584 B	0.183/0.302	ND	0.64
Percent Solids	98.45	97.54		95	

-- = Not reported

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five. The detection of OCDD by the primary laboratory in sample -2013SS and -2014SS should not be considered due to laboratory contamination since the concentration of the analytes in these samples is greater than five times the analyte concentration in the method blank. All other analyte data flagged with "B" should be considered due to laboratory contamination.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table VI

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.) Units: mg/Kg (ppm)
Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2017SB	Primary Lab 2018SB	Reporting Limits*	QA Lab 2019SB	Reporting Limits
DRO	3.1 J	4	0.77	6 J	10
Percent Solids	92.67	92.87		97.8	

* = Method reporting limit
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two.

2. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/ 418.1)

Analytes Detected	Primary Lab 2017SB	Primary Lab 2018SB	Reporting Limits*	QA Lab 2019SS	Reporting Limits
TRPH	13	13	7.2	15	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table VI cont.

3. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2017SB	Primary Lab 2018SB	Reporting Limits*	QA Lab 2019SB	Reporting Limits
Aluminum	13,000	7900	13/15	20,800	10
Antimony	ND	ND	0.39/0.45	4 J	10
Arsenic	2.4	2.4	0.077/0.087	9	1
Barium	40	28	0.36/0.41	83	1
Beryllium	ND	ND	0.28/0.32	0.6 J	1
Cadmium	0.052	0.034	0.021/0.024	ND	1
Calcium	3800	2000	30/34	8190	10
Chromium	28	19	0.67/0.76	42	2
Cobalt	12	8.2	4/4.5	14	2
Copper	20	16	0.71/0.81	33	2
Iron	24,000	16,000	8.3/9.4	34,300	4
Lead	4.5	3.2	0.039/0.044	7	1
Magnesium	7800	4900	7.1/8.1	11,200	2
Manganese	510	370	0.77/0.88	738	1
Mercury	0.3	0.12	0.07/0.076	0.09 J	0.2
Nickel	35	25	3.1/3.6	44	10
Potassium	440	260	38/44	1300	400
Selenium	ND	ND	0.13/0.15	ND	1
Silver	ND	ND	0.73/0.83	ND	2
Sodium	110	83	42/48	228	20
Thallium	ND	ND	0.21/0.23	ND	1
Vanadium	41	21	4.2/4.8	74	2
Zinc	51	35	1.2/1.4	68	2

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five with the exception of antimony and cadmium. The discrepancy between the primary and QA cadmium data are due to the higher but acceptable reporting limits used by the QA laboratory. Data comparisons at or below the reporting limit, such as the antimony datum for sample -2019SB, are not considered significant.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table VII

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Method: Volatile Organic Compounds (EPA 5030/8260) Units: ug/L (ppb)

Analytes Detected	Project Lab 2020SS	Project Lab 2022SS	Detection Limits	QA Lab 2021SS	Detection Limits
					20
n-Butylbenzene	ND	ND	2.0	0.8 J	20
tert-Butylbenzene	ND	ND	2.9	0.27 J,B	20
Toluene	ND	ND	2.1	1.47 J,B	20
2-Chlorotoluene	ND	ND	2.1	0.46 J,B	20
4-Chlorotoluene	ND	ND	2.2	0.58 J,B	20
CYMP	ND	ND	2.3	0.65 J,B	20
1,2-Dibromo-3-dichloropropane	ND	ND	3.3	1.03 J,B	20
1,2-Dichlorobenzene	ND	ND	2.8	0.96 J,B	5
1,3-Dichlorobenzene	ND	ND	2.2	0.81 J,B	5
1,4-Dichlorobenzene	ND	ND	3.9	0.99 J,B	5
Hexachlorobutadiene	ND	ND	12.0	2.46 J,B	20
4-Methyl-2-pentanone	12.0	5.5	2.4	ND	20
Methylene Chloride	6.1	ND	3.9	ND	10
Naphthalene	ND	ND	3.4	3.21 J	20
n-Propylbenzene	ND	ND	1.9	0.42 J	20
1,2,3-Trichlorobenzene	ND	ND	3.9	3.02 J	20
1,2,4-Tirchlorobenzene	ND	ND	5.8	2.04 J	20
Trichloroethene	ND	ND	2.6	1.12 J	5
1,3,5-Trimethylbenzene	ND	ND	2.0	0.4 J	20

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits for all targeted analytes except for tert-butylbenzene. All QA analytes flagged with "B" should be considered due to laboratory contamination.

CENPD-ET-EN-L (95-0272)
Table VII cont.

2. Method: Semi-Volatile Organic Compounds (EPA 3550 8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2020SS	Primary Lab 2022SS	Reporting Limits	QA Lab 2021SS	Reporting Limits
Di-n-butylphthalate	390	ND	230	ND	300
Bis(2-ethylhexyl)phthalate	ND	ND	170/180	100 J	300

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five for all targeted analytes.

3. QA Method: Gasoline Range Organics (EPA 3540A/ADEC 8015 Mod.) Units: mg/Kg (ppm)
Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2020SS	Primary Lab 2022SS	Reporting Limits	QA Lab 2021SS	Reporting Limits
GRO	0.21	1.6	0.18	ND	5

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of five. These discrepancies are most likely due to the higher. but acceptable, reporting limits used by the QA laboratory and data variability of the primary laboratory at close to the reporting limits.

4. QA Method: Diesel Range Organics (EPA 3540/ADEC S100 Mod.) Units: mg/Kg (ppm)
Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2020SS	Primary Lab 2022SS	Reporting Limits*	QA Lab 2021SS	Reporting Limits
DRO	10	11	0.81/0.88	11	10
Percent Solids	97.43	96.51		93.9	

* = Method reporting limit

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table VII cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/ 418.1)

Analytes Detected	Primary Lab 2020SS	2022SS	Reporting Limits*	QA Lab 2021SS	Reporting Limits
TRPH	41	45	7.5/6.6	36	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table VII cont.

6. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2020SS	Primary Lab 2022SS	Reporting Limits*	QA Lab 2021SS	Reporting Limits
Aluminum	14,000	16,000	15	23,800	10
Antimony	0.48	ND	0.44/0.43	ND	10
Arsenic	3.1	3.1	0.086/0.085	9	1
Barium	52	53	0.4/0.39	103	1
Beryllium	ND	0.32	0.31	0.8 J	1
Cadmium	0.21	0.23	0.023	ND	1
Calcium	3000	3400	34/33	8640	10
Chromium	31	30	0.75/0.74	41	2
Cobalt	11	14	4.5/4.4	14	2
Copper	35	39	0.8/0.79	44	2
Iron	25,000	29,000	9.3/9.1	34,400	4
Lead	8.5	8.7	0.044/0.043	9	1
Magnesium	7300	8600	7.9	10,100	2
Manganese	540	640	0.87/0.85	756	1
Mercury	0.1	0.089	0.067/0.068	0.08 J	0.2
Nickel	30	35	3.5	35	10
Potassium	450	450	43/42	1600	400
Selenium	ND	ND	0.15	ND	1
Silver	ND	ND	0.82/0.81	ND	2
Sodium	91	86	48/47	249	20
Thallium	ND	ND	0.23	ND	1
Vanadium	41	47	4.7	79	2
Zinc	63	71	1.4	75	2

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five with the exception of antimony. The detection of antimony by the primary laboratory but not by the QA laboratory are due to the higher reporting limits used by the QA laboratory for antimony.

CENPD-ET-EN-L (95-0272)
Table VII cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2020SS	Primary Lab 2022SS	Reporting Limits	QA Lab 2021SS	Reporting Limits
Total HxCDDs	1.231	0.877	0.165/0.177	10 B	--
1,2,3,6,7,8 - HxCDD	ND	ND	0.153/0.164	1.8 J	--
1,2,3,7,8,9 - HxCDD	ND	ND	0.156/0.168	1.2 J	--
Total HpCDDs	29.828	25.837	0.209/0.151	41	--
1,2,3,4,6,7,8 - HpCDD	14.867	12.640	0.209/0.151	21	--
OCDD	114.150	89.3958	0.192/0.137	150	--
Total HxCDFs	0.448	ND	0.242/0.223	2.6	--
2,3,4,6,7,8 - HxCDF	ND	ND	0.210/0.223	0.77 J	--
1,2,3,7,8,9 - HxCDF	0.486 E	ND	0.263/0.279	ND	0.24
Total HpCDF	0.964 B	0.794 B	0.242/0.228	4.6	--
1,2,3,4,6,7,8 - HpCDF	0.964 B	0.794 B	0.225/0.186	2.9	--
OCDF	1.111 B	0.567 EB	0.190/0.186	2.5 J	--
Percent Solids	95.25	96.52		93	

-- = Not reported
B = Found in method blank
E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five for all but five targeted analytes. Total HxCDDs, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD should be considered insignificant for data comparisons due to laboratory contamination and detection below the reporting limit by the QA laboratory. The data disagreements of total HxCDFs and total HpCDF are in part due to the primary laboratory's data variability and laboratory cross-contamination.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table VIII

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2030SB	Primary Lab 2031SB	Reporting Limits*	QA Lab 2032SB	Reporting Limits
DRO	ND	ND	0.82/0.8	ND	10
Percent Solids	94.22	93.23		95.8	

ND = Not detected
* = Method reporting limit

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

2. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/ 418.1)

Analytes Detected	Primary Lab 2030SB	Primary Lab 2031SB	Reporting Limits*	QA Lab 2032SB	Reporting Limits
TRPH	13	17	7.3/7.5	10	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table IX

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2035SB	2036SB	Reporting Limits*	QA Lab 2037SB	Reporting Limits
DRO	3.7 J	13	0.84/0.83	19	10
Percent Solids	90.75	91.39		91.8	

* = Method reporting limit
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of five and are comparable.

2. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/ 418.1)

Analytes Detected	Primary Lab 2035SB	2036SB	Reporting Limits*	QA Lab 2037SB	Reporting Limits
TRPH	32	34	6.8/7.3	46 B	10

B = Found in method blank

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable. The detection of TRPH in the QA sample should not be considered only due to blank contamination.

3. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2030SB	Primary Lab 2031SB	Reporting Limits*	QA Lab 2032SB	Reporting Limits
Aluminum	14,000	15,000	16/14	16,900	10
Antimony	ND	ND	0.47/0.41	ND	10
Arsenic	2.4	2.5	0.092/0.08	6	1
Barium	35	37	0.43/0.37	67	1
Beryllium	ND	ND	0.33/0.29	0.5 J	1
Cadmium	0.064	0.075	0.025/0.022	ND	1
Calcium	4500	4700	36/31	6650	10
Chromium	24	29	0.8/0.7	32	2
Cobalt	11	11	4.8/4.2	10	2
Copper	25	23	0.85/0.75	34	2
Iron	28,000	29,000	9.9/8.7	29,000	4
Lead	5.7	6.3	0.046/0.041	6	1
Magnesium	9000	9800	8.5/7.5	9160	2
Manganese	520	530	0.92/0.81	531	1
Mercury	0.098	0.13	0.075/0.066	0.08 J	0.2
Nickel	27	28	3.8/3.3	28	10
Potassium	630	540	46/40	1500	400
Selenium	ND	ND	0.16/0.14	ND	1
Silver	ND	ND	0.87/0.76	ND	2
Sodium	100	100	51/44	254	20
Thallium	ND	ND	0.24/0.21	ND	1
Vanadium	45	47	5/4.4	60	2
Zinc	58	62	1.5/1.3	60	2

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five for all targeted metals except cadmium. The detection of low levels of cadmium in the primary samples but not in the QA sample is due to the higher, but acceptable, reporting limit used by the QA laboratory.

CENPD-ET-EN-L (95-0272)
Table IX cont.

3. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2035SB	Primary Lab 2036SB	Reporting Limits*	QA Lab 2037SB	Reporting Limits
Aluminum	17,000	16,000	17/15	20,500	10
Antimony	0.58	0.47	0.49/0.44	ND	10
Arsenic	4.2	4.5	0.097/0.086	9	1
Barium	79	79	0.45/0.4	97	1
Beryllium	ND	ND	0.35/0.31	0.5 J	1
Cadmium	0.099	0.1	0.026/0.023	ND	1
Calcium	4500	4200	38/33	6450	10
Chromium	28	28	0.84/0.75	38	2
Cobalt	13	14	5/4.5	13	2
Copper	21	23	0.9/0.8	30	2
Iron	27,000	26,000	10/9.3	32,200	4
Lead	7.4	7.1	0.049/0.043	7	1
Magnesium	7800	7900	9/8	9570	2
Manganese	590	590	0.98/0.87	692	1
Mercury	0.08	0.086	0.075/0.081	0.05 J	0.2
Nickel	32	33	4/3.5	35	10
Potassium	790	700	49/43	1100	400
Selenium	ND	ND	0.17/0.15	ND	1
Silver	ND	ND	0.92/0.82	ND	2
Sodium	190	190	53/48	211	20
Thallium	ND	ND	0.26/0.23	ND	1
Vanadium	53	52	5.3/4.7	70	2
Zinc	57	58	1.6/1.4	66	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory and not by the QA laboratory are due to the higher reporting limits used by the QA laboratory. The reporting limits used for Cadmium by the QA laboratory is elevated but acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table IX cont.

4. Primary Method: Total Organic Carbon (EPA 9060) Units: mg/K g (ppm)
QA Method: Total Organic Carbon (ASTM D4129-82 Mod.)

Analytes Detected	Primary Lab 2035SB	2036SB	Reporting Limits*	QA Lab 2037SB #	Reporting Limits
TOC	9500	9700	100	8100	500

= Converted from percent to ppm

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table X

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. QA Method: Volatile Organic Compounds (EPA5030/8260) Units: ug/Kg (ppb)
Primary Method: Volatile Organic Compounds (EPA 8260)

Analytes Detected	Primary Lab 2045SB	Primary Lab 2046SB	Reporting Limits*	QA Lab 2047SB	Reporting Limits
Acetone	ND	ND	16	17.29 J,B	50
Methylene Chloride	ND	ND	3.8/3.9	2.68 J	10
Toluene	ND	ND	2.1	1.00 J	5
Total Xylenes	ND	ND	2.1	0.93 J	5
Percent Solids	96.89	97.62		86.7	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits and are comparable.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2045SB	Primary Lab 2046SB	Reporting Limits*	QA Lab 2047SB	Reporting Limits
Di-n-butylphthalate	3400 B	3800 B	230/220	ND	300
Bis(2-ethylhexyl)phthalate	ND	ND	170	100 J	300
Percent Solids	96.89	97.62		97.4	

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of two for all targeted analytes with the exception of di-*n*-butylphthalate. The detection of di-*n*-butylphthalate in the primary data should be considered due to laboratory contamination.

CENPD-ET-EN-L (95-0272)
Table X cont.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2045SB	Primary Lab 2046SB	Reporting Limits*	QA Lab 2047SB	Reporting Limits
GRO	0.28 J	0.37 J	0.19/0.18	ND	5

SUMMARY: The field blind duplicate data agree with each other within a factor of two but do not agree with the QA datum. The discrepancy is most likely due to the higher reporting limit used by the QA laboratory.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540 / ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2045SB	Primary Lab 2046SB	Reporting Limits*	QA Lab 2047SB	Reporting Limits
DRO	11	7.1	0.78	8 J	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

5. Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/ 418.1)

Analytes Detected	Primary Lab 2045SB	Primary Lab 2046SB	Reporting Limits*	QA Lab 2047SB	Reporting Limits
TRPH	35	23	6.5/6.8	32 B	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable. The detection of TRPH in the QA sample should not be considered only due to laboratory contamination.

CENPD-ET-EN-L (95-0272)
Table X cont.

6. Primary Method: Total Metals (EPA 3051 / 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050 / 6010, 7000 Series)

Analytes Detected	Primary Lab 2045SB	Primary Lab 2046SB	Reporting Limits*	QA Lab 2047SB	Reporting Limits
Aluminum	17,000	15,000	15/14	17,600	10
Antimony	0.57	0.48	0.44/0.41	ND	10
Arsenic	2.8	2.6	0.087/0.08	7	1
Barium	53	45	0.4/0.37	62	1
Beryllium	ND	ND	0.31/0.29	0.4 J	1
Cadmium	0.18	0.15	0.024/0.022	ND	1
Calcium	5100	4700	34/31	7380	10
Chromium	33	28	0.76/0.7	28	2
Cobalt	14	13	4.5/4.2	11	2
Copper	37	33	0.81/0.75	29	2
Iron	31,000	28,000	9.4/8.7	29,400	4
Lead	8.6	8.3	0.044/0.041	12	1
Magnesium	11,000	9200	8.1/7.5	9620	2
Manganese	660	620	0.87/0.81	619	1
Mercury	0.085	0.095	0.063/0.08	0.06 J	0.2
Nickel	37	31	3.6/3.3	25	10
Potassium	910	740	43/40	1300	400
Selenium	ND	ND	0.15/0.14	ND	1
Silver	ND	ND	0.82/0.77	ND	2
Sodium	170	130	48/44	206	20
Thallium	0.39	ND	0.23/0.21	ND	1
Vanadium	59	51	4.8/4.4	67	2
Zinc	74	64	1.4/1.3	59	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. These data disagreements are due to non-identical methods and reporting limits used.

CENPD-ET-EN-L (95-0272)
Table X cont.

7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/kg (ppt)
Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc.

Analytes Detected	Primary Lab 2045SB	Primary Lab 2046SB	Reporting Limits	QA Lab 2047S	Reporting Limits
Total HxCDDs	ND	37.654	0.850/0.619	ND	0.25
1,2,3,6,7,8-HxCDD	ND	15.266	0.855/0.623	ND	0.24
1,2,3,7,8,9-HxCDD	ND	7.270	0.778/0.567	ND	0.22
Total HpCDDs	3.376	793.294	0.764/0.549	6.4	--
1,2,3,6,7,8-HpCDD	3.376	543.996	0.764/0.549	3.3	--
OCDD	27.318 E,B	4190.476 B	1.039/0.844	32	--
Total HxCDFs	ND	28.391	0.850/0.814	ND	0.24
Total HpCDFs	ND	272.828	0.740/0.810	0.98 J	--
1,2,3,4,6,7,8-HpCDF	2.532 E	64.183	0.712/0.780	0.46 J	--
1,2,3,4,7,8,9-HpCDF	ND	8.018	0.769/0.842	ND	0.17
OCDF	5.358	506.963	1.224/1.382	0.72 J	--
Percent Solids	97.43	96.77		97	

-- = Not reported
E = Estimated maximum possible concentration

SUMMARY: The primary sample -2045SB and QA data agree with each other or their reporting limits within a factor of five for all targeted analytes with the exception of 1,2,3,6,7,8-HpCDF and OCDF. The data comparisons at or below the reporting limits is not considered significant. The data for primary sample -2046SB is suspect due to the detection of very high levels of 11 targeted analytes. The data of sample -2046SB indicates non-identical samples.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XI

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2053SB	Primary Lab 2054SB	Reporting Limits*	QA Lab 2055SB	Reporting Limits
Acetone	33	ND	19/20	420	50
Carbon Disulfide	ND	ND	7/7.3	0.96 J	5
2-Butanone	ND	ND	2.3/2.4	62	20
2-Hexanone	ND	ND	19/20	11.06 J,B	20
Toluene	ND	ND	2.4/2.5	1.49 J	5
Total Xylenes	ND	ND	2.5	0.61 J	5
4-Isopropyltoluene	120	74	2.6/2.7	660	20
Percent Solids	81.08	77.95		71.3	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other or their reporting limits for all but three targeted analytes. The data discrepancies for acetone, 2- butanone and 4-isopropyltoluene could not be resolved analytically. Data comparisons at or below reporting limits are not considered significant.

CENPD-ET-EN-L (95-0272)
Table XI cont.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2053SB	Primary Lab 2054SB	Reporting Limits*	QA Lab 2055SB	Reporting Limits
Bis(2-ethylhexyl)phthalate	ND	ND	210	200 J	300
Di-n-butylphthalate	330 J,B	670 J,B	270/280	ND	300
Percent Solids	81.08	77.95		80.2	

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of three for all targeted analytes and are comparable.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2053SB	Primary Lab 2054SB	Reporting Limits*	QA Lab 2055SB	Reporting Limits
GRO	0.37 J	ND	0.22/0.24	ND	5

SUMMARY: The field blind duplicate and QA data agree with each other. The data comparison at or below the reporting limits are not considered significant.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2053SB	Primary Lab 2054SB	Reporting Limits*	QA Lab 2055SB	Reporting Limits
DRO	5.3	3.9 J	0.94/0.98	24	10

SUMMARY: The field blind duplicate agree with each other within a factor of two but primary sample -2054SB datum does not agree with the QA datum within a factor of five. The data discrepancy could not be analytically resolved.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1)

Analytes Detected	Primary Lab 2053SB	Primary Lab 2054SB	Reporting Limits*	QA Lab 2055SB	Reporting Limits
TRPH	20	21	8.7/9.3	28 B	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable. The QA sample datum should not be considered only due to laboratory contamination.

CENPD-ET-EN-L (95-0272)
Table XI cont.

6. Primary Method: Total Metals (EPA 3051 / 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/ 6010, 7000 Series)

Analytes Detected	Primary Lab 2053SB	Primary Lab 2054SB	Reporting Limits	QA Lab 2055SB	Reporting Limits
Aluminum	19,000	25,000	16/17	23,300	10
Antimony	ND	0.52	0.47/0.51	ND	10
Arsenic	4.3	4.5	0.093/0.1	12	1
Barium	120	150	0.43/0.46	170	1
Beryllium	0.45	0.54	0.34/0.36	0.5 J	1
Cadmium	0.11	0.13	0.025/0.27	ND	1
Calcium	4000	5200	36/39	5250	10
Chromium	36	44	0.81/0.87	43	2
Cobalt	17	21	4.8/5.2	19	2
Copper	45	32	0.86/0.93	35	2
Iron	32,000	39,000	10/11	38,300	4
Lead	8.8	9.8	0.047/0.051	8	1
Magnesium	7600	8400	8.6/9.3	7810	2
Manganese	960	1100	0.93/1	1150	1
Mercury	0.094	0.12	0.081/0.083	0.07 J	0.2
Nickel	40	41	3.8/4.1	36	10
Potassium	500	600	46/50	960	400
Selenium	ND	ND	0.16/0.18	ND	1
Silver	ND	ND	0.88/0.95	ND	2
Sodium	160	210	51/55	199	20
Thallium	ND	ND	0.25/0.27	ND	1
Vanadium	59	88	5.1/5.5	76	2
Zinc	80	87	1.5/1.6	82	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory but not by the QA laboratory is due to the higher reporting limits used by the QA laboratory. The reporting limit used for cadmium by the QA laboratory is elevated, but is acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table XI cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2053SB	Primary Lab 2054SB	Reporting Limits	QA Lab 2055SB	Reporting Limits
Total TCDDs	ND	ND	1.498/1.764	1.1	--
Total HxCDDs	ND	2.719	1.064/1.156	ND	0.22
1,2,3,6,7,8-HxCDD	ND	2.719	0.987/1.073	ND	0.22
Total HpCDDs	ND	5.504	0.587/0.744	0.72 J	--
1,2,3,4,6,7,8-HpCDD	ND	5.504	0.587/0.744	0.72 J	--
OCDD	1.817 E,B	26.897 B	0.340/0.193	5.6	--
Total TCDFs	ND	ND	2.107/2.093	1.0	--
Total HxCDFs	ND	3.734	1.165/1.093	ND	0.44
1,2,3,6,7,8-HxCDF	ND	3.734	1.008/0.946	ND	0.44
Total HpCDFs	ND	6.558	0.619/0.948	0.87 J	--
1,2,3,4,6,7,8-HpCDF	ND	6.558	0.514/0.880	0.87 J	--
OCDF	ND	13.601 B	0.397/0.409	0.74 J	--
Percent Solids	80.69	79.57		80	

-- = Not reported
E = Estimated maximum possible concentration

SUMMARY: The primary sample -2053SB and QA data agree with each other or their reporting limits within a factor of five for all targeted analytes. The primary sample -2053SB does not agree with the field blind duplicate or QA data for most of the targeted analytes. These data discrepancies could not be analytically resolved but the data for sample -2054SB is suspect to be a non-identical sample due to the detection of six analytes at high levels without blind duplicate or QA agreement.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XII

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2064SB	Primary Lab 2065SB	Reporting Limits*	QA Lab 2066SB	Reporting Limits
Acetone	ND	ND	17	17.4 J,B	50
Carbon Disulfide	ND	ND	6.2	0.36 J	5
Methylene Chloride	ND	ND	3.9	4.46 J	10
Benzene	ND	ND	2.3	0.66 J	5
Toluene	ND	6	2.1	9	5
Ethylbenzene	ND	ND	1.7	1.12 J	5
Total Xylenes	ND	ND	2.2	7	5
1,2,4-Trimethylbenzene	ND	ND	2.2	0.94 J	20
Percent Solids	96.2	96.33		85.8	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five and are comparable with the exception of carbon disulfide. The detection of carbon disulfide by the QA laboratory below the reporting limit should be considered insignificant for data comparison purposes.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2064SB	Primary Lab 2065SB	Reporting Limits*	QA Lab 2066SB	Reporting Limits
	ND	ND	17-450	ND	300-2000
Percent Solids	96.2	96.33		97.0	

SUMMARY: The field blind duplicate and QA data agree for all targeted analytes with each other and are comparable.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2064SB	Primary Lab 2065SB	Reporting Limits*	QA Lab 2066SB	Reporting Limits
GRO	0.67	1.6	0.18/0.19	ND	5

SUMMARY: The field blind duplicate agree with each other within a factor of five and the datum for sample -2065SS agrees with the QA reporting limit. Primary sample -2064SB datum does not agree within a factor of five with the QA method reporting limit. This discrepancy is most likely due to the higher but acceptable reporting limits used by the QA laboratory.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2064SB	Primary Lab 2065SB	Reporting Limits*	QA Lab 2066SB	Reporting Limits
DRO	ND	ND	3.2	ND	10

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

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5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9[illegible]418.1)

Analytes Detected	Primary Lab 2064SB	2065SB	Reporting Limits*	QA Lab 2066SB	Reporting Limits
TRPH	14	13	7.6 - 9	11 B	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table XII cont.

6. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2064SB	Primary Lab 2065SB	Reporting Limits *	QA Lab 2066SB	Reporting Limits
Aluminum	16,000	17,000	14/15	17,700	10
Antimony	0.45	ND	0.43	ND	10
Arsenic	2.8	2.5	0.084/0.085	9	1
Barium	47	47	0.39/0.4	59	1
Beryllium	ND	ND	0.3/0.31	0.6 J	1
Cadmium	0.11	0.11	0.023	ND	1
Calcium	5800	6200	32/33	7760	10
Chromium	33	32	0.73/0.74	38	2
Cobalt	14	14	4.4	12	2
Copper	32	29	0.78/0.79	36	2
Iron	29,000	30,000	9/9.2	32,700	4
Lead	6.4	6.4	0.042/0.043	8	1
Magnesium	10,000	11,000	7.8/7.9	10,800	2
Manganese	590	620	0.84/0.86	666	1
Mercury	0.085	0.076	0.069/0.063	ND	0.2
Nickel	36	33	3.4/3.5	33	10
Potassium	710	760	42/43	1100	400
Selenium	ND	ND	0.15	ND	1
Silver	ND	ND	0.79/0.81	0.7 J	2
Sodium	170	160	46/47	199	20
Thallium	ND	ND	0.22/0.23	ND	1
Vanadium	53	57	4.6/4.7	70	2
Zinc	66	64	1.4	66	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory but not by the QA laboratory is due to the higher reporting limits used by the QA laboratory. The reporting limit used for cadmium by the QA laboratory is elevated, but acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table XII cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2064SB	Primary Lab 2065SB	Reporting Limits	QA Lab 2066SB	Reporting Limits
Total HxCDDs	ND	ND	0.849/0.336	4.3	--
Total HpCDDs	ND	ND	1.497/0.430	3.6	--
1,2,3,4,6,7,8-HpCDD	ND	ND	1.497/0.430	1.8 J	--
OCDD	ND	ND	1.782/0.405	2.9 J	--
Total HpCDFs	ND	0.689 B	1.897/0.451	1.3 J	--
1,2,3,4,6,7,8-HpCDF	ND	0.664 B	1.827/0.434	1.3 J	--
OCDF	ND	1.563 B	2.794/0.495	ND	0.94
Percent Solids	97.32	94.24		96	

-- = Not reported

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five and are comparable with the following exceptions. The total HxCDDs, total HpCDDs and OCDD QA data does not agree within a factor of five with reporting limits for primary sample -2065SB. These data discrepancies could not be analytically resolved.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XIII

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2071SB	2072SB	Reporting Limits*	QA Lab 2073SB	Reporting Limits
Acetone	ND	ND	17	6.78 J.B	50
Toluene	ND	ND	2.1/2.2	0.63 J	5
Total Xylenes	ND	ND	2.2	0.53 J	5
4-Isopropyltoluene	ND	ND	2.3	0.67 J	20
1,2,4-Trichlorobenzene	ND	ND	5.8/5.9	0.37 J.B	20
1,2,3-Trichlorobenzene	ND	ND	3.9/4	0.37 J.B	20
Naphthalene	ND	ND	3.5	0.84 J.B	20
Percent Solids	92.66	92.63		93.3	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits for all but three targeted analytes, most of the detected analytes by the QA laboratory are due either to laboratory cross-contamination or artifacts.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2071SB	Primary Lab 2072SB	Reporting Limits*	QA Lab 2073SB	Reporting Limits
Bis(2-ethylhexyl)phthalate	ND	ND	180	100 J	300
Di-n-butylphthalate	360 J	360 J	230/240	ND	300
Percent Solids	92.66	92.63		92.6	

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of two for all targeted analytes and are comparable.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2071SB	Primary Lab 2072SB	Reporting Limits*	QA Lab 2073SB	Reporting Limits
GRO	ND	ND	0.2/0.19	ND	5

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2071SB	Primary Lab 2072SB	Reporting Limits*	QA Lab 2073SB	Reporting Limits
DRO	11	13	3.2/3.3	7 J	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table XIII cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2071SB	2072SB	Reporting Limits*	QA Lab 2073SB	Reporting Limits
TRPH	32	29	6.8/7.2	35 B	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

6. Primary Method: Total Metals (EPA 3051/ 200.8, 6010, 7471) Units: mg/K (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2071SB	Primary Lab 2072SB	Reporting Limits	QA Lab 2073SB	Reporting Limits
Aluminum	19,000	19,000	15	20,300	10
Antimony	0.58	0.61	0.45/0.46	ND	10
Arsenic	3.6	3.7	0.087/0.09	10	1
Barium	73	78	0.41/0.42	92	1
Beryllium	ND	ND	0.32	0.6 J	1
Cadmium	0.11	0.12	0.024	ND	1
Calcium	5000	5400	34/35	7140	10
Chromium	69	35	0.76/0.78	38	2
Cobalt	15	15	4.6/4.7	13	2
Copper	24	24	0.81/0.83	29	2
Iron	30,000	31,000	9.4/9.7	32,800	4
Lead	7.1	7.1	0.044/0.045	9	1
Magnesium	9800	9200	8.1/8.3	9770	2
Manganese	660	670	0.88/0.9	743	1
Mercury	ND	ND	0.076/0.073	ND	0.2
Nickel	40	37	3.6/3.7	35	10
Potassium	740	770	44/45	1100	400
Selenium	ND	ND	0.15/0.16	ND	1
Silver	ND	ND	0.83/0.85	0.5 J	2
Sodium	160	160	48/50	215	20
Thallium	ND	ND	0.23/0.24	ND	1
Vanadium	58	61	4.8/4.9	74	2
Zinc	63	64	1.4/1.5	64	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory but not the QA laboratory is due to the higher reporting limits used by the QA laboratory. The reporting limit used for cadmium by the QA laboratory is elevated, but acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table XIII cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2071SB	Primary Lab 2072SB	Reporting Limits*	QA Lab 2073SB	Reporting Limits
Total HxCDDs	ND	ND	1.095/0.575	4.1	--
Total HpCDDs	ND	ND	0.931/0.592	4.1	--
1,2,3,4,6,7,8-HpCDD	ND	ND	0.931/0.592	2.2	--
OCDD	1.543 B	3.854 B	0.406/0.257	4.7	--
Total HpCDFs	ND	1.033	0.380/0.605	1.9	--
1,2,3,4,6,7,8-HpCDF	ND	1.033	0.352/0.562	1.1	--
OCDF	ND	0.838 E	0.890/0.496	ND	0.19
Percent Solids	95.34	94.65		93	

-- = Not reported
B = Found in method blank
E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five for all but two targeted analytes. Sample -2072SB Total HxCDDs and Total HpCDDs reporting limits do not agree with the QA data within a factor of five. These data discrepancies could not be analytically resolved.

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XIV

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2088SB	Primary Lab 2089SB	Reporting Limits*	QA Lab 2090SB	Reporting Limits
	ND	ND	1.8-17	SNS	
Percent Solids	96.13	95.75			

SNS = Sample not submitted from the field
ND = Not detected
* = Method reporting limit

SUMMARY: The field blind duplicate data agree with each other for all targeted analytes.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2088SB	Primary Lab 2089SB	Reporting Limits*	QA Lab 2090SB	Reporting Limits
	ND	ND	17-450	SNS	
Percent Solids	96.13	95.75		SNS	

SUMMARY: The field blind duplicate data agree with each other for all targeted analytes.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2088SB	2089SB	Reporting Limits*	QA Lab 2090SB	Reporting Limits
GRO	ND	ND	0.45/0.46	SNS	

SUMMARY: The field blind duplicate data agree with each other.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2088SB	2089SB	Reporting Limits*	QA Lab 2090SB	Reporting Limits
DRO	24	19	0.79/0.81	SNS	

SUMMARY: The field blind duplicate data agree with each other.

5. Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2088SB	2089SB	Reporting Limits*	QA Lab 2090SB	Reporting Limits
TRPH	55	50	7.2/7.3	SNS	

SUMMARY: The field blind duplicate data agree with each other.

CENPD-ET-EN-L (95-0272)
Table XIV cont.

5. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2088SB	Primary Lab 2089SB	Reporting Limits	QA Lab 2090SB	Reporting Limits
Aluminum	12,000	11,000	14	SNS	
Antimony	0.47	ND	0.41/0.4	SNS	
Arsenic	2.9	2.6	0.08/0.079	SNS	
Barium	40	36	0.37	SNS	
Beryllium	ND	ND	0.29	SNS	
Cadmium	0.14	0.1	0.022/0.021	SNS	
Calcium	3600	4000	31	SNS	
Chromium	28	21	0.69	SNS	
Cobalt	10	9.5	4.1	SNS	
Copper	28	25	0.73	SNS	
Iron	24,000	21,000	8.5	SNS	
Lead	8.2	6.7	0.04	SNS	
Magnesium	7700	7000	7.3	SNS	
Manganese	550	490	0.8/0.79	SNS	
Mercury	0.082	0.08	0.073/0.074	SNS	
Nickel	29	23	3.2	SNS	
Potassium	490	490	40	SNS	
Selenium	ND	ND	0.14	SNS	
Silver	ND	ND	0.75	SNS	
Sodium	120	110	44	SNS	
Thallium	ND	ND	0.21	SNS	
Vanadium	39	34	4.3	SNS	
Zinc	57	51	1.3	SNS	

SUMMARY: The field blind duplicate data agree with each other within a factor of two.

CENPD-ET-EN-L (95-0272)
Table XIV cont.

Primary Laboratory: Southwest Laboratory of Oklahoma
6. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2088SB	Primary Lab 2089SB	Reporting Limits	QA Lab 2090SB	Reporting Limits
Total HpCDDs	2.380	4.342	0.586/0.782	SNS	
1,2,3,4,6,7,8-HpCDD	2.294 E	2.306	0.586/0.782		
OCDD	29.968 B	17.645 B	0.332/0.465		
OCDF	0.800	ND	0.794/1.106		
Percent Solids	96.05	96.69			

B = Found in method blank
E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate data agree with each other within a factor of two.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XV

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2099SB	Primary Lab 2100SB	Reporting Limits*	QA Lab 2101SB	Reporting Limits
Acetone	27	ND	17	60 B	50
Trichloroethene	ND	ND	2.6	1.17 J	5
Toluene	ND	ND	2.2	6	5
Ethylbenzene	ND	ND	1.7	0.46 J	5
Total Xylenes	ND	ND	2.2	2.52 J	5
Styrene	ND	ND	3	0.23 J	5
2-Chlorotoluene	ND	ND	2.1	0.65 J	20
4-Chlorotoluene	ND	ND	2.2	0.82 J	20
1,3,5-Trimethylbenzene	ND	ND	2.1	0.64 J	20
tert-Butylbenzene	ND	ND	3	0.46 J	20
1,2,4-Trimethylbenzene	ND	ND	2.2	0.80 J	20
sec-Butylbenzene	ND	ND	2.4	0.59 J	20
1,3-Dichlorobenzene	ND	ND	2.3	0.76 J	5
4-Isopropyltoluene	ND	ND	2.3	0.89 J	20
1,4-Dichlorobenzene	ND	ND	4	0.80 J	5
n-Butylbenzene	ND	ND	2.1	1.03 J,B	20
1,2-Dichlorobenzene	ND	ND	2.9	0.96 J,B	5
1,2-Dibromo-3-chloropropane	ND	ND	3.4	2.68 J	20
1,2,4-Trichlorobenzene	ND	ND	5.9	2.13 J,B	20
1,2,3-Trichlorobenzene	ND	ND	4	3.42 J,B	20
Naphthalene	ND	ND	3.5	4.66 J,B	20
Hexachlorobutadiene	ND	ND	12	2.49 J,B	20
Percent Solids	94.42	94.12		86.4	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five for all targeted analytes except for the data of styrene and tert-butylbenzene. The data comparison at or below reporting limits are not considered significant.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2099SB	Primary Lab 2100SB	Reporting Limits*	QA Lab 2101SB	Reporting Limits
Di-n-butylphthalate	1700	610	110	ND	300
Butylbenzylphthalate	79 J	ND	75	ND	300
Bis(2-ethylhexyl)phthalate	ND	ND	87	100	300
Percent Solids	94.42	94.12		94.3	

SUMMARY: The field blind duplicate and QA data agree within a factor of four with each other or their reporting limits with the exception of the di-*n*-butylphthalate. This data discrepancy could not be resolved analytically. This could be due either to primary laboratory data variability or contributed to unknown source of laboratory cross-contamination.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2099SB	Primary Lab 2100SB	Reporting Limits*	QA Lab 2101SB	Reporting Limits
GRO	ND	0.86	0.47/0.48	ND	5

SUMMARY: The field blind duplicate data agree with each other but the datum of sample - 2100SB does not agree within a factor of five with the reporting limit of QA sample -2101SB. This data discrepancy could not be resolved analytically.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2099SB	Primary Lab 2100SB	Reporting Limits*	QA Lab 2101SB	Reporting Limits
DRO	ND	ND	3.2	ND	10

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0272)
Table XV cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2090SB	Primary Lab 2100SB	Reporting Limits*	QA Lab 2101SB	Reporting Limits
TRPH	ND	ND	7/7.6	6 J,B	10

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of two and are comparable.

6. Primary Method: Total Metals (EPA 3051/ 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2099SB	Primary Lab 2100SB	Reporting Limits	QA Lab 2101SB	Reporting Limits
Aluminum	13,000	14,000	14/15	13,700	10
Antimony	ND	0.48	0.42/0.45	ND	10
Arsenic	2.7	3.2	0.082/0.088	6	1
Barium	36	39	0.38/0.41	41	1
Beryllium	ND	ND	0.3/0.32	0.3 J	1
Cadmium	0.092	0.12	0.022/0.024	ND	1
Calcium	4500	4800	32/34	5960	10
Chromium	24	25	0.72/0.77	29	2
Cobalt	12	11	4.3/4.6	11	2
Copper	24	25	0.76/0.82	33	2
Iron	25,000	28,000	8.9/9.5	28,600	4
Lead	5.4	5.4	0.042/0.045	8	1
Magnesium	8500	8700	7.7/8.2	9410	2
Manganese	430	450	0.83/0.89	491	1
Mercury	ND	ND	0.075/0.066	ND	0.2
Nickel	29	31	3.4/3.6	31	10
Potassium	500	540	41/44	590	400
Selenium	ND	ND	0.14/0.16	ND	1
Silver	ND	ND	0.78/0.84	ND	2
Sodium	97	93	45/49	80	20
Thallium	ND	ND	0.22/0.24	ND	1
Vanadium	42	43	4.5/4.9	48	2
Zinc	56	63	1.3/1.4	66	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory but not the QA laboratory is due to the higher reporting limits used by the QA laboratory. The reporting limit used for cadmium by the QA laboratory is elevated, but acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table XV cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2099SB	Primary Lab 2100SB	Reporting Limits	QA Lab 2101SB	Reporting Limits
Total PeCDDs	ND	ND	0.695/0.464	2.4 J	--
Total HxCDDs	ND	ND	0.207/0.227	19	--
1,2,3,6,7,8-HxCDD	ND	ND	0.208/0.249	3.5	--
1,2,3,7,8,9-HxCDD	ND	ND	0.190/0.227	1.5 J	--
Total HpCDDs	ND	ND	0.284/0.157	10	--
1,2,3,4,6,7,8-HpCDD	ND	ND	0.284/0.157	5.2	--
OCDD	2.361 E,B	4.092 E,B	0.417/0.356	6.5	--
HxCDFs	ND	ND	0.158/0.178	1.5 J	--
1,2,3,6,7,8-HxCDF	ND	ND	0.158/0.188	0.35 J	--
1,2,3,7,8,9-HxCDF	ND	0.473 E	0.179/0.185	ND	0.048
Total HpCDFs	1.226 B	ND	0.182/0.292	3.7	--
1,2,3,4,6,7,8-HpCDF	1.226 B	1.419 E,B	0.175/0.281	2.4 J	--
OCDF	3.760 E,B	5.306 B	0.436/0.357	0.82 J	--
Percent Solids	98.06	97.63		97	

-- = Not reported
B = Found in method blank
E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of five except for the QA data of total HxCDDs, total-HpCDF and OCDF. The data comparison at or below reporting limits are not considered significant. The differences in total HxCDDs and HpCDDs are due to total dioxin/furan quantitation approach by the laboratories. OCDD data disagreements are due to primary laboratory's laboratory cross-contamination.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XVI

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2111SB	Primary Lab 2112SB	Reporting Limits*	QA Lab 2113SB	Reporting Limits
Acetone	33	56	16/15	120 B	50
Benzene	ND	ND	2.2/2.1	0.29 J	5
Toluene	ND	ND	2	2.68 J	5
Ethylbenzene	ND	ND	1.6/1.5	0.68 J	5
Total Xylenes	ND	ND	2	4.04 J	5
1,3,5-Methylbenzene	ND	ND	1.9	0.42 J	20
1,2-Dichlorobenzene	ND	ND	2.7/2.6	0.20 J,B	5
1,2,4-Trichlorobenzene	ND	ND	5.5/5.4	0.43 J,B	20
1,2,3-Trichlorobenzene	ND	ND	3.7/3.6	0.61 J,B	20
Naphthalene	ND	ND	3.3/3.2	0.92 J,B	20
Percent Solids	93.13	92.58		86.1	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of five for all targeted analytes except for the data of benzene, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene and 1,2,3-trichlorobenzene. The data comparison at or below the reporting limit are not considered significant. All of the analytes reported by the QA laboratory are due to either to laboratory artifacts or cross-contamination except for acetone. Higher levels of acetone reported by the QA laboratory is due to laboratory cross-contamination.

CEHNC-ED-ET-EN-L (95-0272)
Table XVI cont.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2111SB	2112SB	Reporting Limits*	QA Lab 2113SB	Reporting Limits
Bis (2-ethylhexyl)phthalate	ND	ND	89/90	200	300
Di-n-butylphthalate	1200	1500	120	ND	300
Percent Solids	93.13	92.58		89.7	

SUMMARY: The field blind duplicate and QA data agree with each other on their reporting limits within a factor of five for all targeted analytes and are comparable.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2111SB	2112SB	Reporting Limits*	QA Lab 2113SB	Reporting Limits
GRO	ND	ND	0.48/0.5	ND	5

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

4. Primary Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)
QA Method: Diesel Range Organics (EPA 3540/ADEC 8100 Mod.)

Analytes Detected	Primary Lab 2111SB	2112SB	Reporting Limits*	QA Lab 2113SB	Reporting Limits
DRO	ND	ND	3.2/3.3	ND	10

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0272)
Table XVI cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2111SB	2112SB	Reporting Limits*	QA Lab 2113SB	Reporting Limits
TRPH	ND	ND	7.9/7.3	10 B	10

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table XVI cont.

6. Primary Method: Total Metals EPA 3051/ 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3150/6010, 7000 Series)

Analytes Detected	Primary Lab 2111SB	2112SB	Reporting Limits	QA Lab 2113SB	Reporting Limits
Aluminum	12,000	10,000	14	10,100	10
Antimony	ND	ND	0.43/0.41	ND	10
Arsenic	3	2.2	0.084/0.08	6	1
Barium	35	29	0.39/0.37	36	1
Beryllium	ND	ND	0.3/0.29	0.2 J	1
Cadmium	0.099	0.076	0.023/0.022	ND	1
Calcium	6200	4300	33/31	8240	10
Chromium	24	17	0.73/0.7	22	2
Cobalt	10	8.9	4.4/4.2	8	2
Copper	26	18	0.78/0.75	24	2
Iron	23,000	21,000	9/8.7	21,100	4
Lead	4.7	5	0.042/0.041	5	1
Magnesium	7400	6400	7.8/7.5	6730	2
Manganese	420	360	0.84/0.81	413	1
Mercury	ND	0.085	0.078/0.074	0.06 J	0.2
Nickel	27	21	3.4/3.3	22	10
Potassium	500	440	42/40	460	400
Selenium	ND	ND	0.15/0.14	ND	1
Silver	ND	ND	0.8/0.76	0.4 J	2
Sodium	110	81	46/44	79	20
Thallium	ND	ND	0.22/0.21	ND	1
Vanadium	31	34	4.6/4.4	35	2
Zinc	55	47	1.4/1.3	50	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory but not the QA laboratory is due to the higher reporting limits used by the QA laboratory. The reporting limit used for cadmium by the QA laboratory is elevated, but acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table XVI cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2111SB	Primary Lab 2112SB	Reporting Limits	QA Lab 2113SB	Reporting Limits
Total PeCDDs	ND	ND	0.470/0.324	3.0 J	--
Total HxCDDs	ND	0.06	0.210/0.118	16	--
1,2,3,6,7,8-HxCDD	ND	ND	0.195/0.110	3.0	--
1,2,3,7,8,9-HxCDD	ND	ND	0.199/0.112	1.3 J	--
Total HpCDDs	ND	ND	0.272/0.162	9.1	--
1,2,3,4,6,7,8-HpCDD	ND	ND	0.272/0.162	4.5	--
OCDD	2.126 B	1.122 E,B	0.149/0.089	6.1	--
Total HxCDFs	ND	ND	0.123/0.139	1.5 J	--
2,3,4,6,7,8-HxCDF	ND	ND	0.107/0.139	0.38 J	--
1,2,3,7,8,9-HxCDF	0.424 E	0.440 E	0.134/0.174	ND	0.021
Total HpCDFs	ND	ND	0.497/0.217	3.4	--
1,2,3,4,6,7,8-HpCDF	1.191 E,B	1.421 E,B	0.461/0.201	2.1 J	--
OCDF	3.978 B	3.544 B	0.288/0.256	0.74 J	--
Percent Solids	91.5	95.94		95	

-- = Not reported
E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate agree with each other or their reporting limits for all targeted analytes but do not agree with the QA data for nine targeted analytes. The primary data flagged with "B" should be considered due to laboratory contamination. The QA data reported as estimated concentrations should be considered insignificant for data comparison purposes. The remaining data discrepancies could not be resolved analytically.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XVII

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS. Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2118SB	Primary Lab 2119SB	Reporting Limits*	QA Lab 2120SB	Reporting Limits
Acetone	73	90	17	280	50
2-Butanone	ND	ND	2	140 J	20
cis-1,2-Dichloroethene	6	ND	3	2.31 J	5
1,2-Dichloroethane	ND	ND	3.2	1.45 J	5
Benzene	ND	ND	2.3	0.38 J	5
Trichloroethene	18	15	2.6	10	5
Toluene	10	7.4	2.1	2.91 J	5
4-Methyl-2-pentanone	ND	10	2.4	0.70 J	20
Ethylbenzene	ND	ND	1.7	1.64 J	5
Total Xylenes	13	10	2.2	11	5
n-Propylbenzene	ND	ND	1.9	0.36 J	20
1,3,5-Trimethylbenzene	ND	ND	2	1.14 J	20
1,2,4-Trimethylbenzene	ND	ND	2.2	3.23 J	20
n-Butylbenzene	ND	ND	2.1/2	0.31 J,B	20
1,2,4-Trichlorobenzene	7	ND	5.9/5.8	0.35 J,B	20
1,2,3-Trichlorobenzene	ND	ND	3.9	0.46 J,B	20
Naphthalene	ND	ND	3.5/3.4	0.96 J,B	20
Percent Solids	94.35	95.67		86.1	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five. The data discrepancies for 2-butanone, benzene, 4-methyl-2-pentanone, n-propylbenzene, n-butylbenzene, 1,2,4-trichlorobenzene, 1,2,3-trichlorobenzene should be considered due to the QA analytes detected below the reporting limits or due to laboratory contamination.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2118SB	2119SB	Reporting Limits*	QA Lab 2120SB	Reporting Limits
Di-n-butylphthalate	670	550	110	ND	300
Percent Solids	94.35	95.67		94.3	

SUMMARY: The field blind duplicate and QA data agree within each other or their reporting limits for all targeted analytes within a factor of three and are comparable.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2118SB	2119SB	Reporting Limits*	QA Lab 2120SB	Reporting Limits
GRO	1.1	0.53	0.46/0.47	ND	5

SUMMARY: The field blind duplicate data agree with each other and the datum of sample - 2118SB agrees with the QA reporting limit within a factor of five. The primary datum for sample -2119SB does not agree with QA reporting limit within a factor of five. This discrepancy is most likely due to the higher, but acceptable, reporting limit used by the QA laboratory.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2118SB	2119SB	Reporting Limits*	QA Lab 2120SB	Reporting Limits
DRO	4.2 J	3.7 J	0.82/0.8	ND	10

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of three and are comparable.

CENPD-ET-EN-L (95-0272)
Table XVII cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2118SB	Primary Lab 2119SB	Reporting Limits*	QA Lab 2120SB	Reporting Limits
TRPH	ND	ND	7.7/7.1	4 J	10

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table XVII cont.

6. Primary Method: Total Metals (EPA 3051 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals 3050 / 6010, 7000 Series)

Analytes Detected	Primary Lab 2118SB	Primary Lab 2119SB	Reporting Limits	QA Lab 2120SB	Reporting Limits
Aluminum	14,000	12,000	16/15	18,400	10
Antimony	0.52	ND	0.47/0.45	6 J	10
Arsenic	2.4	2.5	0.091/0.088	8	2
Barium	47	47	0.42/0.41	67	1
Beryllium	ND	ND	0.33/0.32	ND	1
Cadmium	0.11	0.11	0.025/0.024	0.5 J	1
Calcium	5800	4700	36/34	6790	10
Chromium	24	24	0.8/0.76	44	2
Cobalt	12	10	4.8/4.6	15	2
Copper	25	24	0.85/0.81	53	2
Iron	24,000	23,000	9.9/9.4	37,800	4
Lead	5.3	5.2	0.046/0.044	9	1
Magnesium	8300	7900	8.5/8.1	13,200	2
Manganese	450	420	0.92/0.88	655	1
Mercury	ND	0.11	0.072/0.069	0.09 J	0.2
Nickel	30	28	3.7/3.6	39	10
Potassium	760	530	46/44	1700	400
Selenium	ND	ND	0.16/0.15	ND	1
Silver	ND	ND	0.87/0.83	ND	2
Sodium	210	220	50/48	157	20
Thallium	ND	ND	0.24/0.23	ND	1
Vanadium	48	39	5/4.8	71	2
Zinc	57	54	1.5/1.4	79	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory but not the QA laboratory is due to the higher reporting limits used by the QA laboratory. The reporting limit used for cadmium by the QA laboratory is elevated, but acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table XVII cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2118SB	Primary Lab 2119SB	Reporting Limits*	QA Lab 2120SB	Reporting Limits
Total HxCDDs	ND	ND	0.207/0.104	1.7 J	--
Total HpCDDs	0.399 B	1.715	0.244/0.324	1.9 J	--
1,2,3,4.6,7.8-HpCDD	0.399 B	0.774	0.244/0.324	1.0 J	--
OCDD	1.919 B	9.324 B	0.223/0.240	2.8 J	--
1,2,3,4.6.7.8-HpCDF	3.898 E,B	1.649 E,B	0.152/0.246	ND	0.065
OCDF	16.311 B	3.647 B	0.424/0.262	ND	0.19
Percent Solids	94.35	95.67		96	

-- = Not reported
E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes with the exception of the six analytes listed in the table. All analytes flagged with "B" in the table should be considered due to laboratory contamination. In addition, analytes detected below the reporting limit by the QA laboratory should be considered insignificant for data comparison purposes.

Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.
8. Primary Method: Total Organic Carbon (EPA 9060) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (ASTM D4129-82 Mod.)

Analytes Detected	Primary Lab 2118SB	Primary Lab 2119SB	Reporting Limits*	QA Lab 2120SB #	Reporting Limits
TOC	930	810	100	800	500

= Units converted from percent to ppm

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XVIII

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2123SB	Primary Lab 2124SB	Reporting Limits*	QA Lab 2125SB	Reporting Limits
Acetone	21	20	17	100 B	50
1,2-Dichloroethane	ND	ND	3.2	1.67 J	5
Benzene	ND	ND	2.3	1.35 J	5
Trichloroethene	ND	ND	2.6	3.36 J	5
Toluene	ND	ND	2.1	1.02 J	5
Ethylbenzene	ND	ND	1.7	1.04 J	5
Total Xylenes	ND	ND	2.2/2.1	3.13 J	5
Isopropylbenzene	ND	ND	2.1	0.39 J	20
1,3,5-Trimethylbenzene	ND	ND	2	0.38 J	20
1,2,4-Trimethylbenzene	ND	ND	2.2	0.82 J	20
1,2,4-Trichlorobenzene	ND	ND	5.8	0.38 J,B	20
1,2,3-Trichlorobenzene	ND	ND	3.9	0.61 J,B	20
Naphthalene	ND	ND	3.5/3.4	0.76 J,B	20
Percent Solids	93.33	95.69		86.0	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of five for all targeted analytes except for the data of isopropylbenzene, 1,3,5-trimethylbenzene, 1,2,4-trichlorobenzene and 1,2,3-trichlorobenzene. The detection of analytes at or below the reporting limit or detection due to laboratory contamination is insignificant for data comparison purposes.

CENPD-ET-EN-L (95-0272)
Table XVIII cont.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2123SB	Primary Lab 2124SB	Reporting Limits*	QA Lab 2125SB	Reporting Limits
Di-n-butylphthalate	470	200 J	120/110	ND	300
Percent Solids	93.33	95.69		93.5	

SUMMARY: The field blind duplicate and QA data agree within each other or their reporting limits for all targeted analytes within a factor of three and are comparable.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2123SB	Primary Lab 2124SB	Reporting Limits*	QA Lab 2125SB	Reporting Limits
GRO	ND	ND	0.48/0.45	ND	5

SUMMARY: The field blind duplicate and QA data agree and are comparable.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2123SB	Primary Lab 2124SB	Reporting Limits*	QA Lab 2125SB	Reporting Limits
DRO	2.6 J	2.6 J	0.8	ND	10

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of four and are comparable.

CENPD-ET-EN-L (95-0272)
Table XVIII cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2123SB	2124SB	Reporting Limits*	QA Lab 2125SB	Reporting Limits
TRPH	ND	ND	7.5/7	ND	10

SUMMARY: The field blind duplicate and QA data agree and are comparable.

CENPD-ET-EN-L (95-0272)
Table XVIII cont.

6. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2123SB	Primary Lab 2124SB	Reporting Limits	QA Lab 2125SB	Reporting Limits
Aluminum	12,000	12,000	16/15	19,200	10
Antimony	ND	ND	0.46/0.43	6	10
Arsenic	2.6	2.6	0.09/0.085	7	1
Barium	37	32	0.42/0.4	62	1
Beryllium	ND	ND	0.33/0.31	0.3 J	1
Cadmium	0.099	0.093	0.025/0.023	ND	1
Calcium	6500	6100	35/33	11,800	10
Chromium	23	21	0.79/0.74	43	2
Cobalt	11	10	4.7/4.4	16	2
Copper	24	23	0.84/0.79	41	2
Iron	23,000	23,000	9.7/9.2	39,100	4
Lead	5.2	5	0.046/0.043	8	1
Magnesium	9800	8100	8.4/7.9	16,600	2
Manganese	430	420	0.91/0.86	774	1
Mercury	ND	ND	0.066/0.065	ND	0.2
Nickel	36	28	3.7/3.5	60	10
Potassium	550	520	45/43	1500	400
Selenium	ND	ND	0.16/0.15	ND	1
Silver	ND	ND	0.86/0.81	ND	2
Sodium	92	94	50/47	171	20
Thallium	ND	0.29	0.24/0.23	ND	1
Vanadium	41	41	5/4.7	68	2
Zinc	54	52	1.5/1.4	83	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory but not the QA laboratory is due to the higher reporting limits used by the QA laboratory. The reporting limit used for cadmium by the QA laboratory is elevated, but acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table XVIII cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
8. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2123SB	Primary Lab 2124SB	Reporting Limits	QA Lab 2125SB	Reporting Limits
OCDD	2.381 E,B	3.807	0.496/1.274	ND	1.2
1,2,3,4,6,7,8-HpCDF	1.398 E,B	ND	0.408/1.134	ND	0.28
OCDF	4.222 B	2.674	0.627/1.221	ND	0.27
Percent Solids	95.41	96.39		94	

-- = Not reported
E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of five except for the OCDF data. The OCDF datum of primary sample -2123SB should be considered due to laboratory contamination. The discrepancy between the OCDF datum of primary sample -2124SB and the QA reporting limit could not be analytically resolved.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XIX

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2128SB	Primary Lab 2129SB	Reporting Limits*	QA Lab 2130SB	Reporting Limits
Acetone	ND	ND	17/16	10 J,B	50
Methylene Chloride	7.4	6.9	4/3.8	3 J	50
Benzene	ND	ND	2.3/2.2	0.5 J	10
Trichloroethene	20	5.1	2.6/2.5	36	5
Toluene	ND	ND	2.2/2.1	3 J	5
Tetrachloroethene	6.5	ND	1.8/1.7	14	5
Total Xylenes	ND	ND	2.2/2.1	0.9 J	5
Bromobenzene	ND	ND	1.9/1.8	0.4 J,B	5
2-Chlorotoluene	ND	ND	2.1/2	0.4 J,B	20
4-Chlorotoluene	ND	ND	2.2/2.1	0.5 J,B	20
1,3,5-Trimethylbenzene	ND	ND	2.1/2	0.4 J,B	20
tert-Butylbenzene	ND	ND	3/2.8	0.3 J,B	20
sec-Butylbenzene	ND	ND	2.4/2.3	0.4 J,B	20
1,3-Dichlorobenzene	ND	ND	2.3/2.2	0.8 J,B	5
4-Isopropyltoluene	ND	ND	2.3/2.2	0.6 J,B	20
1,4-Dichlorobenzene	ND	ND	4/3.8	1 J,B	5
n-Butylbenzene	ND	ND	2.1/2	0.7 J,B	20
1,2-Dichlorobenzene	ND	ND	2.9/2.7	0.9 J,B	5
1,2,4-Trichlorobenzene	ND	ND	5.9/5.6	2 J,B	20
1,2,3-Trichlorobenzene	ND	ND	4/3.8	3 J,B	20
Naphthalene	ND	ND	3.5/3.3	3 J,B	20
Hexachlorobutadiene	ND	ND	12	2 J,B	20
Percent Solids	93.16	96.47		95.4	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of five except for trichloro ethene, tetrachloroethene, 2-chlorotoluene, 1,3,5-trimethylbenzene, tert-butylbenzene, sec-butylbenzene and hexachlorobutadiene. Analytes detected at or below the reporting limit or detected due to laboratory contamination should be considered insignificant for data comparison purposes.

CENPD-ET-EN-L (95-0272)
Table XIX cont.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2128SB	Primary Lab 2129SB	Reporting Limits*	QA Lab 2130SB	Reporting Limits
Bis(2-ethylhexyl)phthalate	ND	ND	89/87	500	300
Di-n-butylphthalate	2100	480	120/110	ND	300
Percent Solids	93.16	96.47		92.9	

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five for all targeted analytes with the following exceptions. The primary reporting limit for bis(2-ethylhexyl)phthalate does not agree with the QA datum within a factor of five. The primary di-*n*-butylphthalate datum for sample -2128SB does not agree with the QA reporting limit within a factor of five. These data discrepancies could not be analytically resolved.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2128SB	Primary Lab 2129SB	Reporting Limits*	QA Lab 2130SB	Reporting Limits
GRO	ND	ND	0.47/0.46	ND	5

SUMMARY: The field blind duplicate and QA data agree and are comparable.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2128SB	Primary Lab 2129SB	Reporting Limits*	QA Lab 2130SB	Reporting Limits
DRO	ND	ND	2.1	ND	10

SUMMARY: The field blind duplicate and QA data agree and are comparable.

CENPD-ET-EN-L (95-0272)
Table XIX cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2128SB	Primary Lab 2129SB	Reporting Limits*	QA Lab 2130SB	Reporting Limits
TRPH	ND	ND	7.8/7.6	6 J	10

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table XIX cont.

7. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2128SB	Primary Lab 2129SB	Reporting Limits	QA Lab 2130SB	Reporting Limits
Aluminum	16,000	12,000	14/15	17,300	10
Antimony	0.63	0.58	0.4/0.45	5 J	10
Arsenic	3.2	3.5	0.079/0.088	8	1
Barium	47	35	0.37/0.41	61	1
Beryllium	ND	ND	0.29/0.32	0.3 J	1
Cadmium	0.12	0.11	0.022/0.024	ND	1
Calcium	6800	4300	31/34	7200	10
Chromium	24	21	0.69/0.77	31	2
Cobalt	12	9.9	4.1/4.6	12	2
Copper	27	26	0.74/0.82	33	2
Iron	26,000	22,000	8.6/9.5	31,700	4
Lead	6.1	6.3	0.04/0.044	7	1
Magnesium	8700	7300	7.4/8.2	10,100	2
Manganese	560	470	0.8/0.89	746	1
Mercury	0.1	0.11	0.08/0.076	ND	0.2
Nickel	28	27	3.3/3.6	35	10
Potassium	830	530	40/44	1400	400
Selenium	ND	ND	0.14/0.15	ND	1
Silver	ND	ND	0.76/0.84	ND	2
Sodium	120	80	44/49	152	20
Thallium	ND	ND	0.21/0.24	ND	1
Vanadium	50	37	4.4/4.8	60	2
Zinc	61	58	1.3/1.4	70	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of cadmium at low levels by the primary laboratory but not the QA laboratory is due to the higher but acceptable reporting limits used by the QA laboratory. The detection of analytes at or near the reporting limits, such as the QA datum of antimony, should not be considered significant for data comparison purposes.

CENPD-ET-EN-L (95-0272)
Table XIX cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
8. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2128SB	Primary Lab 2129SB	Reporting Limits	QA Lab 2130SB	Reporting Limits
Total HpCDDs	ND	0.395	0.126/0.105	ND	0.92
1,2,3,4,6,7,8-HpCDD	ND	0.395 B	0.126/0.105	ND	0.84
OCDD	1.068 B	1.989 B	0.091/0.074	2.6	--
Total HxCDFs	1.519	0.781	0.132/0.103	ND	0.32
1,2,3,4,7,8-HxCDF	0.860	0.847 E	0.137/0.106	ND	0.27
1,2,3,6,7,8-HxCDF	0.600 E	0.444 E	0.114/0.089	ND	0.27
1,2,3,7,8,9-HxCDF	0.531 E,B	0.562 E,B	0.143/0.111	ND	0.32
Total HpCDFs	12.412	ND	0.092/1.030	ND	0.39
1,2,3,4,6,7,8-HpCDF	10.543 B	9.761 E,B	0.085/0.956	ND	0.39
1,2,3,4,7,8,9-HpCDF	0.739	ND	0.099/1.116	ND	0.30
OCDF	151.690 B	33.42B	0.117/0.145	ND	0.70
Percent Solids	93.16	96.41		96	

-- = Not reported
E = Estimated maximum possible concentration
B = Found in method blank

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five with the exception of Total HpCDFs, 1,2,3,4,6,7,8-HpCDF, and OCDF. All analytes flagged with "B" in the primary laboratory's data should be considered due to laboratory contamination with the exception of the OCDF datum for sample -2128SB. The OCDF and 1,2,3,4,6,7,8-HpCDF data for sample -2128SB should be considered high estimates due to MS/MSD recovery and RPD failures.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XX

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS. Inc. QA Laboratory: CAS, Inc

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2140SB	Primary Lab 2141SB	Reporting Limits*	QA Lab 2142SB	Reporting Limits
Acetone	19	18	17	40 J,B	50
Methylene Chloride	ND	ND	3.9/4	3 J	10
1,1-Dichloroethane	ND	ND	3.2	0.4 J	5
Chloroform	ND	ND	2.8	0.3 J	5
1,2-Dichloroethene	ND	ND	3.2	2 J	5
Benzene	ND	ND	2.3	2 J	5
Trichloroethene	ND	ND	2.6	7	5
Toluene	ND	ND	2.1	2 J	5
Tetrachloroethene	ND	ND	1.8	0.4 J	5
Total Xylenes	6.5	ND	2.2	ND	5
4-Methyl-2-pentanone	ND	38	2.4	ND	20
Isopropylbenzene	ND	ND	2.1	3 J	20
n-Propylbenzene	ND	ND	1.9	6 J,B	20
1,3,5-Trimethylbenzene	ND	ND	2	2 J,B	20
1,2,4-Trimethylbenzene	ND	ND	2.2	5 J	20
sec-Butylbenzene	ND	ND	2.3	2 J	20
1,3-Dichlorobenzene	ND	ND	2.2/2.3	0.7 J,B	20
4-Isopropyltoluene	ND	ND	2.3	2 J,B	20
1,4-Dichlorobenzene	ND	ND	4	0.8 J,B	5
n-Butylbenzene	ND	ND	2/2.1	2 J,B	20
1,2-Dichlorobenzene	ND	ND	2.8	0.8 J,B	5
1,2-Dibromo-3-chloropropane	ND	ND	3.3	0.6 J,B	20
1,2,4-Trichlorobenzene	ND	ND	5.8	2 J,B	20
1,2,3-Trichlorobenzene	ND	ND	3.9	3 J,B	20
Naphthalene	ND	ND	3.4/3.5	8 J,B	20
Hexachlorobutadiene	ND	ND	12	2 J,B	20
Percent Solids	94.87	94.26		94.7	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The primary blind duplicate data do not agree for 4-methyl-2-pentanone but field blind duplicate and QA data agree for all except five targeted analytes. The data comparisons at or below reporting limits are not considered significant. The discrepancy between the primary 4-methyl-2-pentanone data could not be analytically resolved.

CENPD-ET-EN-L (95-0272)
Table XX cont.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2140SB	Primary Lab 2141SB	Reporting Limits*	QA Lab 2142SB	Reporting Limits
Di-n-butylphthalate	1600	2000	110/120	ND	300
Butylbenzylphthalate	170 J	120 J	76/77	ND	300
Percent Solids	94.87	94.26		92.8	

SUMMARY: The field blind duplicate and QA data agree within a factor of three for all targeted analytes except for the data of di-n-butylphthalate. These data discrepancies could not be resolved analytically.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2140SB	Primary Lab 2141SB	Reporting Limits*	QA Lab 2142SB	Reporting Limits
GRO	0.8 J	0.64 J	0.44/0.47	ND	5

SUMMARY: The field blind duplicate agree with each other within a factor of two but do not agree with the QA datum most likely because of the higher reporting limit used by the QA laboratory. The data comparison below the reporting limits are not considered significant.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2140SB	Primary Lab 2141SB	Reporting Limits*	QA Lab 2142SB	Reporting Limits
DRO	10	ND	2.1	ND	10

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of five and are comparable.

CENPD-ET-EN-L (95-0272)
Table XX cont.

5. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2140SB	2141SB	Reporting Limits*	QA Lab 2142SB	Reporting Limits
TRPH	50	ND	6.6/6.9	18	10

SUMMARY: The field blind duplicate data do not agree with each other or their reporting limits within a factor of five but each agrees with the QA datum. DRO and TRPH results of sample 2141SB indicates that this sample is not true replicate of its blind duplicate 2140SB or corresponding QA sample. Data disagreements are probably due to non-identical samples.

CENPD-ET-EN-L (95-0272)
Table XX cont.

6. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2140SB	Primary Lab 2141SB	Reporting Limits	QA Lab 2142SB	Reporting Limits
Aluminum	10,000	11,000	14	15,800	10
Antimony	ND	ND	0.41/0.42	5 J	10
Arsenic	2.5	3	0.081/0.082	6	1
Barium	31	33	0.38	55	1
Beryllium	ND	ND	0.29/0.3	ND	1
Cadmium	0.083	0.1	0.022	ND	1
Calcium	5000	7500	31/32	17,400	10
Chromium	19	19	0.71/0.72	32	2
Cobalt	9.1	9.5	4.2/4.3	10	2
Copper	19	23	0.75/0.76	27	2
Iron	19,000	21,000	8.7/8.9	28,400	4
Lead	4.4	7.8	0.041/0.042	5	1
Magnesium	6700	7200	7.5/7.7	10,100	2
Manganese	360	460	0.82/0.83	591	1
Mercury	0.1	0.11	0.072/0.074	ND	0.2
Nickel	23	25	3.3/3.4	30	10
Potassium	430	460	41	1300	400
Selenium	ND	ND	0.14	ND	1
Silver	ND	ND	0.77/0.78	ND	2
Sodium	85	70	45	227	20
Thallium	ND	ND	0.22	ND	1
Vanadium	33	35	4.4/4.5	57	2
Zinc	49	52	1.3	59	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory but not the QA laboratory is due to the higher reporting limits used by the QA laboratory. The reporting limit used for cadmium by the QA laboratory is elevated, but acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table XX cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
8. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2140SB	Primary Lab 2141SB	Reporting Limits	QA Lab 2142SB	Reporting Limits
Total HxCDDs	ND	ND	0.128/0.101	4.9	--
Total HpCDDs	ND	0.517	0.161/0.092	4.4	--
1,2.3,4,6,7,8-HpCDD	0.255 E,B	0.333 E,B	0.161/0.092	2.3 J	--
OCDD	0.939 B	2.529 B	0.079/0.082	3.3 J	--
Total HxCDFs	3.037	7.658	0.203/0.300	ND	0.41
1,2.3,4,7,8-HxCDF	1.662	3.656	0.243/0.311	ND	0.37
1,2.3,6,7,8-HxCDF	0.679 E	1.450	0.203/0.260	ND	0.37
Total HpCDFs	22.367	41.156	0.148/0.061	ND	1.1
1,2,3,4,6,7,8-HpCDF	19.795 B	38.260 B	0.137/0.056	ND	1.1
1,2,3,4,7,8,9-HpCDF	0.733	0.894 E	0.160/0.066	ND	0.79
OCDF	64.077 B	77.728 B	0.118/0.113	ND	0.69
Percent Solids	94.81	94.26		95	

-- = Not reported
E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate data agree with each other or their reporting limits but not with the QA data or their reporting limits within a factor of five for all targeted analytes. These data discrepancies could not be analytically resolved. All data flagged with "B" should be considered due to laboratory contamination with the exception of the OCDF data and the 1,2,4,6,7,8-HpCDF datum of sample -2141SB. Data comparisons at or below reporting limits are not considered significant.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XXI

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2148SB	Primary Lab 2149SB	Reporting Limits*	QA Lab 2150SB	Reporting Limits
Acetone	65	45	16/17	130 B	50
Methylene Chloride	ND	ND	3.8/3.9	7 J	10
Chloroform	ND	ND	2.7/2.8	0.6 J	5
Toluene	ND	ND	2/2.1	5 J	5
4-Methyl-2-pentanone	ND	ND	2.3/2.4	3 J	20
Ethylbenzene	ND	ND	1.6/1.7	0.6 J	5
Total Xylenes	ND	ND	2.1	4 J	5
Isopropylbenzene	ND	ND	2/2.1	0.3 J	20
n-Propylbenzene	ND	ND	1.9	0.4 J,B	20
2-Chlorotoluene	ND	ND	2/2.1	0.4 J,B	20
4-Chlorotoluene	ND	ND	2.1/2.2	0.3 J,B	20
1,3,5-Trimethylbenzene	ND	ND	2	0.4 J,B	20
1,2,4-Trimethylbenzene	ND	ND	2.1/2.2	0.7 J	20
sec-Butylbenzene	ND	ND	2.3	0.4 J,B	20
1,3-Dichlorobenzene	ND	ND	2.2	0.6 J,B	5
4-Isopropyltoluene	ND	ND	2.2/2.3	0.5 J,B	20
1,4-Dichlorobenzene	ND	ND	3.8/3.9	0.7 J,B	5
n-Butylbenzene	ND	ND	2	0.6 J,B	20
1,2-Dichlorobenzene	ND	ND	2.7/2.8	0.7 J,B	5
1,2,4-Trichlorobenzene	ND	ND	5.6/5.8	2 J,B	20
1,2,3-Trichlorobenzene	ND	ND	3.8/3.9	2 J,B	20
Naphthalene	ND	ND	3.3/3.4	4 J,B	20
Hexachlorobutadiene	ND	ND	12	2 J,B	20
Percent Solids	93.82	94.07		94.1	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of five for all targeted analytes except for isopropylbenzene, 2-chlorotoluene, 4-chlorotoluene, sec-butylbenzene, 1,4-dichlorobenzene and hexachlorobutadiene. Data comparisons at or below reporting limits are not considered significant.

CENPD-ET-EN-L (95-0272)
Table XXI cont.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2148SB	Primary Lab 2149SB	Reporting Limits*	QA Lab 2150SB	Reporting Limits
	ND	ND	17-460	ND	300-2000
Percent Solids	93.82	94.07		94.0	

SUMMARY: The field blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2148SB	Primary Lab 2149SB	Reporting Limits*	QA Lab 2150SB	Reporting Limits
GRO	0.58 J,B	3.5 B	0.46/0.47	ND	5

SUMMARY: The field blind duplicate and QA data agree with each other. The detection of GRO in the primary samples should be considered due to laboratory contamination.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2148SB	Primary Lab 2149SB	Reporting Limits*	QA Lab 2150SB	Reporting Limits
DRO	1.1 J	0.89 J	0.81/0.82	ND	10

SUMMARY: The field blind duplicate data agree with each other but not the QA datum most likely because of the higher, but acceptable, reporting limit used by the QA laboratory. Data comparisons at or close to reporting limits are not considered significant.

CENPD-ET-EN-L (95-0272)
Table XXI cont.

6. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2148SB	Primary Lab 2149SB	Reporting Limits*	QA Lab 2150SB	Reporting Limits
TRPH	ND	ND	6.9/6.7	5 J	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table XXI cont.

7. Primary Method: Total Metals (EPA 3051/200.8. 6010. 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010. 7000 Series)

Analytes Detected	Primary Lab 2148SB	Primary Lab 2149SB	Reporting Limits	QA Lab 2150SB	Reporting Limits
Aluminum	14,000	13,000	14/15	17.200	10
Antimony	ND	ND	0.4/0.43	4 J	10
Arsenic	2.6	4	0.079/0.085	7	1
Barium	39	38	0.36/0.39	58	1
Beryllium	ND	ND	0.28/0.31	0.2 J	1
Cadmium	0.12	0.12	0.021/0.023	ND	1
Calcium	6900	7200	31/33	9950	10
Chromium	27	25	0.68/0.74	33	2
Cobalt	10	11	4.1/4.4	11	2
Copper	22	24	0.73/0.79	30	2
Iron	25,000	26,000	8.5/9.2	31,700	4
Lead	5.9	7.6	0.04/0.043	6	1
Magnesium	8700	9600	7.3/7.9	10.600	2
Manganese	480	500	0.79/0.85	593	1
Mercury	0.092	0.07	0.069/0.07	ND	0.2
Nickel	29	36	3.2/3.5	32	10
Potassium	700	610	39/42	1500	400
Selenium	ND	ND	0.14/0.15	ND	1
Silver	ND	ND	0.75/0.81	ND	2
Sodium	120	85	43/47	196	20
Thallium	ND	ND	0.21/0.23	ND	1
Vanadium	42	40	4.3/4.7	64	2
Zinc	57	58	1.3/1.4	66	2

SUMMARY: The field blind duplicate and QA data agree with each of their reporting limits within a factor of five with the exception of antimony and cadmium. The detection of antimony and cadmium at low levels by the primary laboratory but not the QA laboratory is due to the higher reporting limits used by the QA laboratory. The reporting limit used for cadmium by the QA laboratory is elevated, but acceptable. The data disagreement between the two laboratories are due to non-identical methods used.

CENPD-ET-EN-L (95-0272)
Table XXI cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
8. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2148SB	Primary Lab 2149SB	Reporting Limits	QA Lab 2150SB	Reporting Limits
Total HpCDDs	0.295	ND	0.045/0.055	ND	0.93
1,2,3,4,6,7,8-HpCDD	0.295 B	0.234 E,B	0.045/0.055	ND	0.86
OCDD	0.779 B	0.664 B	0.026/0.031	ND	1.5
Total HxCDFs	0.145	0.309	0.048/0.067	ND	0.35
1,2,3,4,7,8-HxCDF	0.223 E	0.189	0.056/0.077	ND	0.31
1,2,3,6,7,8-HxCDF	0.063 E	ND	0.034/0.047	ND	0.31
Total HpCDFs	2.155 B	2.158 B	0.414/0.187	ND	0.37
1,2,3,4,6,7,8-HpCDF	2.155 B	2.158 B	0.354/0.160	ND	0.33
OCDF	6.372 B	6.743 B	0.050/0.041	ND	0.56
Percent Solids	94.18	92.21		91	

E = Estimated maximum possible concentration

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of five for all targeted analytes except for the data for total HpCDFs, 1,2,3,4,6,7,8-HpCDF and OCDF, due to primary laboratory's laboratory cross-contamination. The detection of these three analytes by the primary laboratory, in addition to 1,2,3,4,6,7,8-HpCDD and OCDD, should be considered due to laboratory contamination.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XXII

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2155SB	Primary Lab 2156SB	Reporting Limits*	QA Lab 2157SB	Reporting Limits
Acetone	ND	91	16/17	7.0 J,B	50
Methylene Chloride	ND	5.8	3.9/4	6 J	10
1,1-Dichloroethane	5.9	ND	3.2	ND	5
Chloroform	ND	ND	2.7/2.8	0.8 J	5
Toluene	ND	ND	2.1	3 J	5
Ethylbenzene	ND	ND	1.7	0.3 J	5
Total Xylenes	ND	ND	2.1/2.2	2 J	5
1,3-Dichlorobenzene	ND	ND	2.2/2.3	0.6 J,B	5
4-Isopropyltoluene	ND	ND	2.2/2.3	0.7 J,B	20
1,4-Dichlorobenzene	ND	ND	3.9/4	0.6 J,B	5
n-Butylbenzene	ND	ND	2/2.1	0.6 J,B	20
1,2-Dichlorobenzene	ND	ND	2.8/2.9	0.6 J,B	5
1,2,4-Trichlorobenzene	ND	ND	5.7/5.8	2 J,B	20
1,2,3-Trichlorobenzene	ND	ND	3.8/3.9	2 J,B	20
Naphthalene	ND	ND	3.4/3.5	3 J,B	20
Hexachlorobutadiene	ND	ND	12	2 J,B	20
1,2-Dibromo-3-chloropropane	6.2	ND	3.3	ND	20
Percent Solids	94.85	94.24		91.8	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree within a factor of five except for the data of acetone, ethylbenzene, 1,4-dichlorobenzene, hexachlorobutadiene and 1,2-dibromo-3-chloropropane. Data comparisons at or below reporting limits are not considered significant. The acetone datum of sample -2156SB should be considered a high estimate due to surrogate recovery failure.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2155SB	Primary Lab 2156SB	Reporting Limits*	QA Lab 2157SB	Reporting Limits
Di-n-butylphthalate	500 J,B	ND	230	ND	300
Percent Solids	94.85	94.24		93.4	

SUMMARY: The field blind duplicate and QA data agree within each other or their reporting limits within a factor of three for all targeted analytes and are comparable.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2155SB	Primary Lab 2156SB	Reporting Limits*	QA Lab 2157SB	Reporting Limits
GRO	0.69 J,B	0.83 J,B	0.47/0.48	ND	5

SUMMARY: The detection of GRO in the primary samples should be considered due to laboratory contamination. With that notation, the field blind duplicate and QA data agree with each other.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2155SB	Primary Lab 2156SB	Reporting Limits*	QA Lab 2157SB	Reporting Limits
DRO	5	4.4	0.8/0.82	ND	10

SUMMARY: The field blind duplicate and QA data agree within each other or their reporting limits within a factor of three and are comparable.

6. Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2155SB	2156SB	Reporting Limits*	QA Lab 2157SB	Reporting Limits
TRPH	ND	ND	7.3/7.4	4 J	10

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table XXII cont.

6. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2155SB	Primary Lab 2156SB	Reporting Limits	QA Lab 2157SB	Reporting Limits
Aluminum	15,000	17,000	14/15	17,600	10
Antimony	ND	ND	0.42/0.44	ND	10
Arsenic	2.4	3.1	0.083/0.087	7	1
Barium	32	44	0.38/0.4	55	1
Beryllium	ND	ND	0.3/0.32	0.2 J	1
Cadmium	0.11	0.12	0.022/0.024	ND	1
Calcium	4700	6100	32/34	7510	10
Chromium	30	32	0.72/0.76	38	2
Cobalt	11	13	4.3/4.5	11	2
Copper	27	26	0.77/0.81	32	2
Iron	26,000	29,000	8.9/9.4	30,500	4
Lead	4.8	5.6	0.042/0.044	8	1
Magnesium	9000	10,000	7.7/8.1	10,400	2
Manganese	500	580	0.83/0.88	590	1
Mercury	0.084	0.085	0.078/0.072	ND	0.2
Nickel	31	30	3.4/3.6	32	10
Potassium	500	720	41/44	1300	400
Selenium	ND	ND	0.15	ND	1
Silver	ND	ND	0.79/0.83	ND	2
Sodium	120	200	46/48	237	20
Thallium	ND	ND	0.22/0.23	ND	1
Vanadium	49	55	4.5/4.8	66	2
Zinc	61	64	1.3/1.4	65	2

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limit within a factor of five and are comparable with the exception of cadmium. The data discrepancy for cadmium is due to the higher but acceptable reporting limits used by the QA laboratory.

CENPD-ET-EN-L (95-0272)
Table XXII cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: mg/Kg (ppb)

Analytes Detected	Primary Lab 2155SB	Primary Lab 2156SB	Reporting Limits	QA Lab 2157SB	Reporting Limits
Total HpCDDs	22.567	0.866	0.645/0.500	ND	0.74
1,2,3,4,6,7,8-HpCDD	12.696	0.866 B	0.645/0.500	ND	0.74
OCDD	103.926 B	9.699 B	0.158/0.283	ND	1.3
Total HxCDFs	29.136	ND	0.281/0.448	ND	0.19
1,2,3,4,7,8-HxCDF	13.873	ND	1.176/0.537	ND	0.18
1,2,3,6,7,8-HxCDF	4.943	ND	0.721/0.448	ND	0.18
2,3,4,6,7,8-HxCDF	1.170 E	ND	1.138/0.542	ND	0.19
Total HpCDFs	196.726	ND	0.329/0.305	ND	0.22
1,2,3,4,6,7,8-HpCDF	167.541 B	1.250 E,B	0.281/0.283	ND	0.18
1,2,3,4,7,8,9-HpCDF	5.264	ND	0.397/0.331	ND	0.22
OCDF	807.137 B	2.873 B	0.441/0.434	ND	0.52
Percent Solids	96.82	96.37		96	

E = Estimated maximum possible concentration

SUMMARY: The primary sample -2156SB and QA data agree within a factor of five with each other or their reporting limits except for the data of OCDD, 1,2,3,4,6,7,8-HpCDF and OCDF. The analytes flagged with "B" in the data for sample -2156SB should be considered due to laboratory contamination. The data for sample -2155SB do not agree with the blind duplicate or QA data. The detection of high levels of 11 targeted analytes in sample -2155SB indicates non-identical samples were analyzed.

Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.
8. Primary Method: Total Organic Carbon (EPA 9060) Units: mg/Kg (ppm)
QA Method: Total Organic Carbon (ASTM-D4129-82 Mod.)

Analytes Detected	Primary Lab 2155SB	Primary Lab 2156SB	Reporting Limits*	QA Lab 2157SB P	Reporting Limits
TOC	1000	1000	100	1000	500

P = Units converted from percent to ppm

SUMMARY: The field blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0272)

COMPARISON OF FIELD BLIND DUPLICATE AND QA RESULTS

Table XXIII

Project: Ft. Richardson OUA-Ruff Road Matrix: Soil Prefix: 95RRFTA-
Primary Laboratory: SAS, Inc. QA Laboratory: CAS, Inc.

1. Primary Method: Volatile Organic Compounds (EPA 8260) Units: ug/Kg (ppb)
QA Method: Volatile Organic Compounds (EPA5030/8260)

Analytes Detected	Primary Lab 2163SB	Primary Lab 2164SB	Reporting Limits*	QA Lab 2165SB	Reporting Limits
Acetone	ND	19	17/19	15 J,B	50
Methylene Chloride	ND	ND	3.9/4.5	3 J	10
Toluene	ND	ND	2.1/2.4	2 J,B	5
Total Xylenes	ND	ND	2.1/2.4	1 J	5
n-Propylbenzene	ND	ND	1.9/2.2	0.6 J	20
4-Isopropyltoluene	ND	8.5	2.3/2.6	140	20
n-Butylbenzene	ND	ND	2/2.3	0.3 J	20
1,2-Dichlorobenzene	ND	ND	2.8/3.2	0.3 J,B	5
1,2,4-Trichlorobenzene	ND	ND	5.8/6.6	0.6 J,B	20
1,2,3-Trichlorobenzene	ND	ND	3.9/4.4	0.9 J,B	20
Naphthalene	ND	ND	3.4/3.9	2 J,B	20
Percent Solids	94.11	83.53		89.6	

ND = Not detected
* = Method reporting limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of five for all targeted analytes, except for the data of 4-isopropyltoluene, n-butylbenzene, 1,2-dichlorobenzene and 1,2,4-trichlorobenzene. Analytes detected at or below the reporting limit should be considered insignificant for data comparison purposes. The data discrepancy for 4-isopropyltoluene could not be analytically resolved.

CENPD-ET-EN-L (95-0272)
Table XXIII cont.

2. Method: Semi-Volatile Organic Compounds (EPA3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 2163SB	Primary Lab 2164SB	Reporting Limits*	QA Lab 2165SB	Reporting Limits
Di-n-butylphthalate	590 J	1500	230/260	ND	300
Percent Solids	94.11	83.53		82.0	

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limits for all targeted analytes within a factor of five and are comparable.

3. Method: Gasoline Range Organics (EPA 5030/ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2136SB	Primary Lab 2164SB	Reporting Limits*	QA Lab 2165SB	Reporting Limits
GRO	ND	0.99 J	0.48/0.51	4 J	5

SUMMARY: The field blind duplicate and QA data agree within a factor of five with each other except for the comparison between the of primary datum of -2136SB and QA datum. Analytes detected at or near the reporting limit should be considered insignificant for data comparison purposes.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 2163SB	Primary Lab 2164SB	Reporting Limits*	QA Lab 2165SB	Reporting Limits
DRO	8	6.5	0.81/0.9	18	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of three and are comparable.

CENPD-ET-EN-L (95-0272)
Table XXIII cont.

5 Primary Method: Total Recoverable Petroleum Hydrocarbons (EPA 418.1) Units: mg/Kg (ppm)
QA Method: Total Recoverable Petroleum Hydrocarbon (EPA 9071/418.1)

Analytes Detected	Primary Lab 2163SB	2164SB	Reporting Limits*	QA Lab 2165SB	Reporting Limits
TRPH	10	10	7.7/7.5	11	10

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of two and are comparable.

CENPD-ET-EN-L (95-0272)
Table XXIII cont.

6. Primary Method: Total Metals (EPA 3051/200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 2163SB	Primary Lab 2164SB	Reporting Limits	QA Lab 2165SB	Reporting Limits
Aluminum	13,000	14,000	14/17	19,600	10
Antimony	ND	ND	0.4/0.51	ND	10
Arsenic	3.1	3.8	0.79/0.1	10	1
Barium	44	54	0.37/0.47	97	1
Beryllium	ND	ND	0.29/0.37	0.6 J	1
Cadmium	0.089	0.093	0.021/0.27	ND	1
Calcium	3300	3300	31/39	3880	10
Chromium	24	24	0.69/0.88	34	2
Cobalt	10	12	4.1/5.3	14	2
Copper	21	24	0.73/0.94	32	2
Iron	23,000	25,000	8.5/11	33,700	4
Lead	5.8	7.7	0.04/0.051	9	1
Magnesium	6800	6900	7.4/9.4	8650	2
Manganese	510	620	0.8/1	765	1
Mercury	0.12	0.1	0.071/0.083	0.06 J	0.2
Nickel	26	29	3.2/4.1	34	10
Potassium	430	410	40/51	730	400
Selenium	ND	ND	0.14/0.18	ND	1
Silver	ND	ND	0.75/0.96	ND	2
Sodium	110	87	44/56	112	20
Thallium	ND	ND	0.21/0.27	ND	1
Vanadium	39	40	4.3/5.5	66	2
Zinc	52	59	1.3/1.6	74	2

SUMMARY: The field blind duplicate and QA data agree with each other or their reporting limit within a factor of five and are comparable with the exception of cadmium. The data discrepancy for cadmium is due to the higher but acceptable reporting limits used by the QA laboratory.

CENPD-ET-EN-L (95-0272)
Table XXIII cont.

Primary Laboratory: Southwest Laboratory of Oklahoma QA Laboratory: Alta Laboratory, Inc
7. Method: Polychlorinated Dioxins and Furans (EPA 8290) Units: ng/Kg (ppt)

Analytes Detected	Primary Lab 2163SB	Primary Lab 2169SB	Reporting Limits*	QA Lab 2165SB	Reporting Limits
Total HpCDDs	0.652	ND	0.241/0.421	ND	0.42
1,2,3,4,6,7,8-HpCDD	0.652	ND	0.241/0.421	ND	0.42
OCDD	1.770 B	1.393 B	0.173/0.226	ND	2.6
Total HpCDFs	1.560	ND	0.349/0.451	ND	0.40
1,2,3,4,6,7,8-HpCDF	1.560 B	1.073 E,B	0.324/0.418	ND	0.28
OCDF	3.788 B	4.646 B	0.345/0.333	ND	1.6
Percent Solids	94.49	93.87		93	

SUMMARY: The field blind duplicate and QA data agree with each other within a factor of five for all targeted analytes. All analytes flagged with "B" should be considered due to laboratory contamination.

DEPARTMENT OF THE ARMY
NORTH PACIFIC DIVISION LABORATORY
CORPS OF ENGINEERS
1491 N.W. GRAHAM AVENUE
TROUTDALE, OREGON 97060-9503

October 3, 1995

Bill Richards
Ecology and Environment, Inc.
840 K Street, Suite 100
Anchorage, Alaska 99501

Dear Mr. Richards:

Enclosed, completing all analyses requested to date, are reports of analytical data for the Ft. Richardson OU-A POL Laboratory Dry Well project sampled by Ecology and Environment, Inc. from June 8 through 30, 1995. Included are:

a. Enclosure 1, Original Chemical Quality Assurance Report

b. Enclosure 2, Original report numbers 9014, 9019, 9022, 9024, and 9029 from ARDL, Inc. with facsimile addendum dated 05 Sep 95

c. Enclosure 3, Original CENPD-ET-EN-L sample cooler receipt forms and telephone records

Reference original report numbers 49334, 49403, 49481, 49512, 49606, 49848, and 50103 from Sound Analytical Services, Inc. previously submitted to your office by the laboratory.

Please contact Dr. Ajmal M. Ilias at (503) 669-0246 if you have any questions.

Sincerely,

Enclosures

For Ajmal M. Ilias
Timothy J. Seeman, Director
North Pacific Division Laboratory

CENPD-ET-EN-L (95-0273) 03 Oct 95

CHEMICAL QUALITY ASSURANCE REPORT

FT. RICHARDSON OU-A, POL LABORATORY DRY WELL

1. SUMMARY:

a. The following deficiencies and/or delinquencies were noted in the primary laboratory's data. Di-n-butylphthalate and gasoline range organics (GRO) was detected in selected soil laboratory method blanks in various Sound Analytical Services (SAS) reports. Where applicable, the associated data of these analytes should be considered due to laboratory contamination. Sample cooler temperatures ranging from 0 to 2 °C were recorded throughout five out of seven SAS reports, which is outside of the USACE required 4°+/-2.

I. Volatiles (VOC): Based on holding time expiration, the VOC data for seventeen selected soil samples and two sludge samples should be considered estimates. Surrogate recoveries for 43 VOC soil samples were outside of EPA quality control (QC) limits. Based on the out of control surrogate recoveries, the VOC data for these samples should be considered estimates. Due to out of control internal standard results during the initial analysis of VOC soil samples 95POLLDW-3017SB and -3028SB (SAS report 49403), the data should be considered unusable as the outlier internal standards directly affect the quantitation of selected VOC targeted analytes.

II. Polychlorinated Biphenyls (PCB) and Inorganics: Based on low surrogate and/or matrix spike recoveries, low levels of targeted PCB analytes, reactive cyanide and reactive sulfide would not have been detected if present in sludge samples 95POLLDW-3001SG and -3002SG of SAS report 49334.

III. GRO, DRO, and TRPH: Based on holding time expiration, the GRO data for three reanalyzed samples should be considered estimates. The surrogate recovery for two GRO samples and three DRO samples were diluted out due to the high concentration of fuel in the samples; data should be considered estimates. Based on low surrogate recoveries, low levels of GRO may not have been detected if present in three soil samples. Based on out of control QC data, low levels of GRO may not have been detected the soil samples of SAS report 49848, the soil DRO data of SAS report 49848 should be considered estimates and the soil TRPH data of SAS report 49848 should be considered high estimates.

IV. TCLP and Total Metals: Based on out of control QC data, the TCLP-mercury data of sludge samples -3001SG and -3002SG and the total chromium data of SAS report 49334 should be considered high estimates. low levels of total antimony may not have been detected in the associated soil samples of SAS reports 49334, 49403, 49521, 49606, and 49848 and low levels of total mercury may not have been detected in the soil samples of SAS report 49334. Based on out of control RPD results, the following soil data should be considered estimates: total calcium in

SAS reports 49403, 49481, and 49848; total magnesium and vanadium in SAS report 49848; and total potassium in SAS report49521.

b. The primary blind duplicate and QA data comparisons are presented in Tables I through IX. All data agree with each other and are comparable with the following exceptions: The primary blind duplicate data of GRO in Table III-2, total nickel and silver in Table IV-5, bis(2-ethylhexyl)phthalate in Table V-2, total mercury in Table V-6, and total thallium in Table VII-5. In these instances, the primary laboratory had acceptable internal QC data and the discrepancies could not be analytically resolved. One out of two primary data did not agree with the QA data for bis(2-ethylhexyl)phthalate in Table V-2, total nickel and silver in Table IV-5, total mercury in Table V-6, total thallium in Table VII-5 and DRO in Tables IV-3 and VII-3. The QA data of bunker C in Table I-4, TRPH in Table II-5, TCLP-chromium, mercury, and silver in Table I-5, total antimony in Tables VI-5, VII-5, and VIII-6, and reactive sulfide in Table I-6 did not agree with the primary blind duplicate results. In the majority of cases, both laboratories had acceptable internal QC data and the primary data was accepted based on blind duplicate or QA data agreements. See section 8 of this report and their respective comparison tables for details of the data discrepancies.

2. **BACKGROUND:** The samples were collected on June 8, 9, 12, 13, 15, 16, 19, and 30, 1995 and received by the analytical laboratories on June 10, 13 through 17, 20 through 22, and July 1, 3, 14, 1995.

3. **OBJECTIVES:**

a. Eighty soil, one sludge, two water, and nine blind duplicate samples were collected from various location to determine the extent of the chemical contamination on the site.

b. Seven QA soil and one sludge samples were submitted to evaluate the primary laboratory's data quality.

4. **PROJECT ORGANIZATION:**

a. The samples were collected by Ecology and Environment, Inc., Anchorage, Alaska.

b. The primary samples were analyzed by Sound Analytical Services (SAS), Inc., Tacoma, Washington.

c. The QA samples were analyzed by Applied Research & Development Laboratory (ARDL), Inc., Mt. Vernon, Illinois.

5. ANALYTICAL REFERENCES:

Number	Title	Date
SW-846, Third Edition	Test Methods for Evaluating Solid Waste - Final Update II	1/95
GRO and DRO	State of Alaska Interim TPH Methods	2/92

6. EVALUATION OF THE PRIMARY LABORATORY'S DATA:

a. Surrogate Recoveries: Three, six, two and two surrogates, similar to the analytes of interest, were used in the following analyses: volatile organic compounds (VOC) by EPA method 8260, semi-volatile organics (BNA) by EPA method 8270, polychlorinated biphenyls (PCB) by EPA method 8080, and U.S. Army Corps of Engineers Fuel Identification\Quantitation (COE/FIQ), respectively. One surrogate was used in the following analyses: gasoline range organics (GRO) by State of Alaska fuel hydrocarbon method 8015 modified, and diesel range organics (DRO) by State of Alaska fuel hydrocarbon method 8100 modified. All surrogate recoveries were within EPA, Alaska Department of Environmental Conservation (ADEC) or laboratory established (LE) quality control (QC) limits and are acceptable with the following exceptions and/or notations.

I. VOC: One out of three surrogate recoveries for VOC soil samples 95POLLDW-3001SB, -3008SB, -3017SB(RE), -3021SB, -3026SB, -3029SB, -3030SB, -3032SB, -3033SB, -3036SB, -3037SB, -3069SB, -3072SB, -3074SB, -3076SB, -3077SB, and -3092SB was above the EPA QC limit. Based on a high surrogate recovery, the VOC data for these samples should be considered high estimates. One out of three surrogate recoveries for VOC soil samples -3004SB, -3009SB, -3010SB, -3014SB, -3015SB, -3018SB, -3019SB, -3023SB, -3057SB, -3059SB, -3075SB(RE), -3093SB, -3094SB, and -3095SB was below the EPA QC limit. Two out of three surrogate recoveries for VOC soil sample -3022SB were below EPA QC limits. Based on the low surrogate recovery results, the VOC data for these samples should be considered low estimates and low levels of targeted volatiles may not have been detected if present. Two out of three surrogate recoveries for VOC soil samples -3011SB, -3013SB, -3016SB, -3025SB, -3028SB, -3028SB(RE), -3034SB, -3062SB, -3070SB, and -3075SB were outside EPA QC limits. Based on the out of control surrogate recoveries, the VOC data for these samples should be considered estimates. Three out of three surrogate recoveries for VOC soil sample -3012SB were outside EPA QC limits due to severe fuel hydrocarbon matrix interference.

Based on the out of control surrogate recoveries, the VOC data should be considered estimates. The laboratory indicated in the report case narratives that most of the VOC samples which exhibited out of control surrogate recoveries were reanalyzed usually past holding time requirements.

II. PCB: The surrogate recoveries for PCB sludge samples -3001SG and -3002SG were below LE QC limits due to severe matrix interference encountered during analysis. Based on the low surrogate recoveries, low levels of targeted PCB's would not have been detected if present in these samples.

III. GRO and DRO: The surrogate recovery for GRO samples -3012SB and -3021SB were diluted out due to the high concentration of GRO in the samples. As the extraction efficiency of these samples could not be determined, the GRO data for these samples should be considered estimates. The surrogate recovery for GRO samples -3092SB, -3093SB, and -3094SB was below the ADEC QC limit. Based on the low surrogate recoveries, low levels of GRO may not have been detected if present. The laboratory performed a reanalysis of these samples past holding time and achieved acceptable surrogate recoveries; these data should be considered estimates due to holding time expiration. The surrogate recovery for DRO samples -3012SB, -3013SB, and -3021SB were diluted out due to the high concentration of DRO in the samples. As the extraction efficiency of these samples could not be determined, the DRO data for these samples should be considered estimates.

b. Matrix Spike (MS), Matrix Spike Duplicate (MSD), Laboratory Control (LC) Recoveries and Relative Percent Difference (RPD) Results: All MS/MSD and LC recoveries and RPD results were within EPA, ADEC or LE QC limits and are acceptable with the following exceptions and/or notations.

I. VOC: Three out of 20 TCLP-VOC MS/MSD recoveries in SAS report 49334 were above EPA QC limits. Since VOC targeted analytes were not detected in the associated TCLP samples, the VOC data quality was not adversely affected by the high recoveries. Three out of five soil VOC RPD results in batch A407 in SAS report 49334 were marginally above EPA QC limits due to the matrix of the original sample (-3001SB). Two out of five medium level protocol soil VOC RPD results in batch A741 referenced in SAS reports 49334 and 49403 were above EPA QC limits. One out of five soil VOC RPD results in batches A928 and A959 referenced in SAS reports 49512 and 49848 were above EPA QC limits. The precision of the above mentioned associated data are accepted based on the remaining acceptable RPD results.

II. BNA: Three out of 22 BNA soil MS/MSD recoveries in SAS report 49481 were above EPA QC limits. Four out of 22 BNA water MS/MSD recoveries in SAS report 49848 were above EPA QC limits. The accuracy of the associated BNA data of these reports are accepted based on the remaining acceptable matrix spike recoveries.

III. PCB and COE/FIQ: The sludge PCB MS and MSD recoveries in SAS report 49334 were below the LE QC limit due to severe matrix interference encountered during analysis. Based on the low spike recoveries, low levels of targeted PCB analytes would not have been detected if present in samples -3001SG and -3002SG. The COE/FIQ MS and MSD recoveries of kerosene and the RPD result were outside of LE QC limits in SAS report 49334 due to the high level of fuel hydrocarbons in the original sample (-3002SG). For the purpose of data evaluation, the out of control results should not be considered significant as the original sample concentration was greater than four times the spike amount. The COE/FIQ blank spike (BS) sample was inadvertently spiked below the detection limit by the laboratory during extraction and therefore was not useful in evaluating the accuracy of the COE/FIQ data. The accuracy of the COE/FIQ data of this report (samples -3001SG and -3002SG) are acceptable based on the acceptable sample surrogate recoveries.

IV. GRO, DRO and TRPH: The soil GRO laboratory duplicate RPD result in SAS report 49334 was above the LE QC limit. The out of control RPD result should be considered significant as the data of the comparison are attributable to laboratory contamination. The soil GRO MS and MSD recoveries in SAS report 49848 were below the LE QC limit due to laboratory noted laboratory noted matrix interference. Based on the low spike recoveries, low levels of GRO may not have been detected if present in associated samples of this report (-3087SB through -3095SB). One out of two soil GRO MS/MSD recoveries in SAS report 50103 was below the LE QC limit. The accuracy of the GRO data are acceptable based on the remaining acceptable matrix spike and LC recoveries. The soil DRO laboratory duplicate RPD result in SAS report 49512 was not reported but was calculated as above the LE QC limit at 74. For the purpose of data evaluation, the out of control RPD result should not be considered significant as the data of the comparison was within a factor of five to the DRO detection limit. The soil DRO MS and MSD recoveries in SAS report 49848 were above the LE QC limit due to laboratory noted sample non-homogeneity. Review of the related internal QC data, substantiates this assumption. The accuracy of the DRO data in this report are accepted based on acceptable sample surrogate and acceptable LC sample recoveries. The soil DRO laboratory duplicate RPD result in SAS report 49848 was above the LE QC limit due to sample non-homogeneity as noted above. The DRO data of this report (samples -3087SB through -3095SB) should be considered estimates. The soil TRPH MS and MSD recoveries in SAS report 49848 were above the LE QC limit. Based on the high spike recoveries, the TRPH data of this report (samples -3087SB through -3095SB) should be considered high

estimates. It is possible that sample non-homogeneity may have attributed to the out of control results.

V. TCLP and Total Metals: The MS recovery of TCLP-mercury in SAS report 49334 was above the EPA QC limit. Based on the high spike recovery, the TCLP-mercury data of the associated samples (-3001SG and -3002SG) should be considered high estimates. Due to the high concentration of targeted metals in the original samples, the MS recoveries of aluminum, iron, and manganese in selected SAS reports were not calculable. The accuracy of the data are acceptable based on acceptable LC standard recoveries. The soil MS recovery of total chromium in SAS report 49334 was above the EPA QC limit. The total chromium data associated with this report (samples -3001SB through -3016SB) should be considered high estimates. The soil MS recovery of total antimony in SAS reports 49334, 49403, 49521, 49606, and 49848 was below the EPA QC limit. Based on the low spike recoveries, low levels of total antimony may not have been detected if present in the associated samples of these respective reports (-3001SB through -3016SB, -3017SB through -3037SB, -3058SB through -3077SB, -3078SB through -3086SB, and -3087SB through -3095SB). The soil MS recovery of total mercury in SAS report 49334 was below the EPA QC limit. Based on the low spike recovery, low levels of total mercury may not have been detected if present in the associated samples of this report (-3001SB through -3016SB). The soil MS recovery of total manganese in SAS report 49606 was above the EPA QC limit due to the presence of manganese in the original sample; data are accepted. The laboratory duplicate RPD of total calcium in SAS reports 49403, 49481, and 49848 was above the LE QC limit of 35. The soil calcium data of these respective reports (samples -3017SB through -3037SB, -3038SB through -3057SB, and -3087SB through -3095SB) should be considered estimates. The laboratory duplicate RPD of total magnesium and vanadium in SAS report 49848 was above the LE QC limit. The soil magnesium and vanadium data of this report (samples -3087SB through -3095SB) should be considered estimates. The laboratory duplicate RPD of total potassium in SAS report 49521 was above the LE QC limit. The soil potassium data of this report (samples -3058SB through -3077SB) should be considered estimates. The laboratory duplicate RPD of total cadmium in SAS report 49403 and total mercury in SAS report 49481 was above the LE QC limit. For the purpose of data evaluation, the out of control RPD results should not be considered significant as the data of the comparison was within a factor of five to the analytes detection limit.

VI. Inorganics: The MS recovery of reactive cyanide and reactive sulfide in SAS report 49334 were below the LE QC limit. Based on the low spike recoveries, low levels of reactive cyanide and reactive sulfide may not have been detected if present in samples -3001SG and -3002SG.

c. Field Blind Duplicate Results: The primary field blind duplicate results are presented in Tables I through IX. All data agree with each other with the following exceptions. The primary blind duplicate data of GRO in Table III-2, total nickel and silver in Table IV-5, bis(2-ethylhexyl)phthalate in Table V-2, total mercury in Table V-6. and total thallium in Table VII-5. As the primary laboratory had acceptable internal QC data. the discrepancies could not be analytically resolved.

d. Laboratory Method Blanks: All laboratory method blanks were free of targeted analytes with the following exceptions. Di-n-butylphthalate, at 2.4 ppm, was detected in the soil BNA method blank of SAS report 49403. The di-n-butylphthalate data for samples -3021SB and -3034SB should be considered due to laboratory contamination. Di-n-butylphthalate, at 0.47 ppm, was detected in the soil BNA method blank referenced in SAS reports 49512 and 49848. Since di-n-butylphthalate was not detected in any associated BNA samples, the BNA data quality was not adversely affected by the laboratory contamination. Di-n-butylphthalate, at 18 ppb, was detected in the water BNA method blank of SAS report 49848. The di-n-butylphthalate data for sample -3001WA should be considered due to laboratory contamination. GRO, at 1.1 ppm, was detected in the soil GRO method blank of SAS report 49334. The GRO data of the associated samples (-3001SB through -3016SB) should be considered due to laboratory contamination except for the data of sample -3012SB which had a GRO result greater than ten times the level of method blank contamination. GRO. at 0.83 ppm, was detected in the soil GRO method blank of SAS report 49512. The GRO data of the associated samples (-3058SB through -3077SB) should be considered due to laboratory contamination. where applicable. GRO, at 0.46 ppm, was detected in the soil GRO method blank of SAS report 49606. The GRO data of the associated samples (-3078SB through -3086SB) should be considered due to laboratory contamination, where applicable. GRO, at 0.72 ppm, was detected in the soil GRO method blank of SAS report 50103. The GRO data for sample 95POLLDW-001SP are acceptable as the GRO result (8.8 ppm) was greater than ten times the level of method blank contamination.

e. Sample Holding Times and Detection Limits: All sample holding times and detection/reporting limits met EPA and ADEC method criteria and are acceptable with the following exceptions.

I. VOC: Due to out of control continuing calibration recoveries, sludge samples -3001SG and -3002SG in SAS report 49334 were reanalyzed for TCLP-VOC's 13 days past the maximum holding time. The TCLP-VOC data for these samples should be considered estimates. VOC samples -3001SB, -3011SB, -3011SB(RE), -3012SB, -3017SB(RE), -3028SB(RE), -3059SB(RE), -3062SB(RE), -3069SB(RE), -3070SB(RE), -3075SB(RE), -3092SB(RE), -3093SB(RE), -3094SB(RE) and -3094SB(RE)-dilution were either initially analyzed past holding time or were

reanalyzed past holding time due to initial out of control internal QC data.. Based on holding time expiration, the VOC data for the affected samples should be considered estimates. VOC samples -3012SB and -3021SB were reanalyzed past holding time by the medium level protocol (methanolic extraction) due to the high concentration of 4-methyl-2-pentanone (MIBK) in the samples. Based on holding time expiration. the VOC data of these analyses should be considered estimates.

II. GRO and COE/FIQ: The reanalysis of GRO samples -3092SB, -3093SB and -3094SB was performed 8 days past holding time. Based on holding time expiration, the GRO data of these analyses should be considered estimates. The original analysis of soil sample -3092SB was reported as being performed on 22 Jul 95. This was a laboratory typographical error and the initial analysis (14 Jul 95) was not past holding time. The laboratory did not exceed the 28 day extraction/analysis holding time for COE/FIQ samples -3001SG and -3002SG. The SAS report 49334 case narrative stated that the samples were extracted 17 days after collection and were three days past holding time. The COE/FIQ samples were actually eleven days within holding time.

f. Internal Standard and Calibration Verification Results: Due to initial out of control TCLP-VOC continuing calibration percent difference (%D) results, sludge samples -3001SG and -3002SG in SAS report 49334 were reanalyzed past holding time. It was noted that the laboratory submitted the reanalyzed TCLP-VOC results for these samples. Due to out of control internal standard results during the initial analysis of VOC soil samples -3017SB and -3028SB in SAS report 49403 were reanalyzed past holding time. It was noted that the laboratory submitted the both the initial and reanalyzed VOC results for these samples. The initial VOC data should be considered unusable as the outlier internal standards directly affect the quantitation of selected VOC targeted analytes.

g. Chain of Custody (COC) Records and Sample Cooler Receipt (SCR) Forms: All COC records and SCR forms met U.S. Army Corps of Engineers (USACE) ER1110-1-263 regulations with the following exceptions and/or notations. Sample cooler temperatures ranging from 0 to 2 degrees Celsius ($^{\circ}$C) were recorded throughout five out of seven SAS reports (49334, 49403, 49481, 49512 and 49606), which is below the USACE requirement of 4 ± 2 $^{\circ}$C.

h. Overall Evaluation of the Primary Laboratory's Data: The following deficiencies and/or delinquencies were noted in the primary laboratory's data. Di-n-butylphthalate and GRO were detected in selected soil laboratory method blanks in various SAS reports. Where applicable, the associated data of these analytes should be considered due to laboratory contamination. Sample cooler temperatures ranging from 0 to 2 $^{\circ}$C were recorded throughout five out of seven SAS reports.

I. VOC: Based on holding time expiration, the VOC data for seventeen selected soil samples and two sludge samples should be considered estimates. Surrogate recoveries for 43 VOC soil samples were outside of EPA QC limits. Based on the out of control surrogate recoveries, the VOC data for these samples should be considered estimates. The laboratory indicated in the report case narratives that most of the VOC samples which exhibited out of control surrogate recoveries were reanalyzed, usually past holding time requirements. Due to out of control internal standard results during the initial analysis of VOC soil samples -3017SB and -3028SB (SAS report 49403), the data should be considered unusable as the outlier internal standards directly affect the quantitation of selected VOC targeted analytes.

II. PCB and Inorganics: Based on low surrogate and matrix spike recoveries, low levels of targeted PCB analytes would not have been detected if present in sludge samples -3001SG and -3002SG of SAS report 49334. Based on low matrix spike recoveries, low levels of reactive cyanide and reactive sulfide may not have been detected if present in sludge samples -3001SG and -3002SG.

III. GRO, DRO, and TRPH: Based on holding time expiration, the GRO data for reanalyzed samples -3092SB, -3093SB and -3094SB should be considered estimates. The surrogate recovery for GRO samples -3012SB and -3021SB and DRO samples -3012SB, -3013SB, and -3021SB were diluted out due to the high concentration of fuel in the samples. As the extraction efficiency of these samples could not be determined, the GRO and/or DRO data for these samples should be considered estimates. Based on low surrogate recoveries, low levels of GRO may not have been detected if present in samples -3092SB, -3093SB, and -3094SB. Based on low matrix spike recoveries, low levels of GRO may not have been detected the soil samples of SAS report 49848. Based on out of control RPD results, the soil DRO data of SAS report 49848 should be considered estimates. Based on high matrix spike recoveries, the soil TRPH data of SAS report 49848 should be considered high estimates.

IV. TCLP and Total Metals: Based on high matrix spike recoveries, the TCLP-mercury data of sludge samples -3001SG and -3002SG and the total chromium data of SAS report 49334 should be considered high estimates. Based on low matrix spike recoveries, low levels of total antimony may not have been detected in the associated soil samples of SAS reports 49334, 49403, 49521, 49606, and 49848 and low levels of total mercury may not have been detected in the soil samples of SAS report 49334. Based on out of control RPD results, the following soil data should be considered estimates: total calcium in SAS reports 49403, 49481, and 49848; total magnesium and vanadium in SAS report 49848; and total potassium in SAS report49521.

7. EVALUATION OF THE QA LABORATORY'S DATA:

a. Laboratory Method Blanks: All laboratory method blanks were free of targeted analytes with the following exceptions. Up to 5 ppb of methylene chloride was detected in the soil VOC method blanks referenced in ARDL reports 9022, 9024, and 9029. The associated VOC data of methylene chloride in samples 95POLLDW-3041SB, -3047SB, -3061SB, and -3080SB should be considered due to laboratory contamination. Chloroform and 5 ppb and 1,4-dichlorobenzene at 11 ppb were detected in the TCLP-VOC and TCLP-BNA method blanks of ARDL report 9014. The VOC data of chloroform in sample -3003SG should be considered due to laboratory contamination. Since 1,4-dichlorobenzene was not detected in any associated sample, the TCLP-BNA data quality was not adversely affected by the laboratory contamination. TOC, at 5.1 ppm, was detected in the soil method blank referenced in ARDL reports 9014, 9022, and, 9029. Since the associated TOC results for samples -3003SB, -3041SB, and -3080SB are greater than ten times the level of method blank contamination, the TOC data are acceptable and should not be considered due to laboratory contamination.

b. Sample Holding Times, Reporting Limits and Calibration Verifications: All sample holding times, reporting limits and calibration verifications (CCVs) met EPA and ADEC method criteria and are acceptable with the following exceptions. The PCB reporting limit for sludge sample -3003SG was elevated ten-fold due to the matrix of the sample. The laboratory noted in the case narrative of ARDL report 9014 that the sample extract could only be concentrated to 10 milliliters (ml) instead of the required 1 ml. The resulting PCB reporting limits ranged from 2.6 to 5.8 ppm. The FIQ reporting limit for sludge sample -3003SG was elevated one thousand-fold due to the matrix of the sample and the high concentration of fuel (kerosene) in the sample. The resulting fuel reporting limits ranged from 2100 to 11,000 ppm.

c. Surrogate Recoveries: All surrogate recoveries were within EPA, ADEC or LE QC limits with the following exceptions and/or notations. One out of three surrogate recoveries in the VOC MS sample of ARDL report 9014 was above the EPA QC limit. The accuracy of the associated VOC data are acceptable based on acceptable sample surrogate recoveries and acceptable MS and MSD analyte recoveries. One out of two surrogate recoveries in PCB sample -3003SG and in the PCB MS sample was above the LE QC limit. Per method, the PCB data are acceptable. The FIQ surrogate recovery for sludge sample -3003SG, and in the MS and MSD samples was diluted out due to the high concentration of fuels in the sample. As the extraction efficiency of the sample could not be determined, the kerosene and bunker C data for this sample should be considered estimates.

d. MS, MSD, and LC Recoveries and RPD Results: All MS, MSD, and LC recoveries and RPD results were within EPA, ADEC, or LE QC limits with the following exceptions and/or

notations. The PCB MS and MSD recoveries in ARDL report 9014 were above the LE QC limit. The LC recovery was within QC limits indicating matrix interference was encountered during the analysis. As PCB targeted analytes were not detected in the associated sample (-3003SG), the PCB data quality was not adversely affected by the high spike recoveries. The FIQ MS and MSD recoveries for sample -3003SG were diluted out due to the high concentration of fuels in the sample. The soil MS and MSD recoveries of aluminum, iron, and manganese in each ARDL report and the matrix spike recoveries of mercury as referenced in ARDL reports 9014 and 9019 of were outside of EPA QC limits. For the purpose of data evaluation, the spike recovery data should not be considered significant as the original sample results were greater than four times the spike amounts. One out of two soil MS/MSD recoveries of arsenic, chromium, and magnesium referenced in ARDL reports 9014 and 9019 and of selenium and zinc in ARDL report 9029 of were outside of EPA QC limits. The accuracy of the associated data are acceptable based on the remaining acceptable matrix spike and LC recoveries. The soil MS and MSD recoveries of calcium referenced in ARDL reports 9014 and 9019 were below the EPA QC limit. The calcium data for soil samples -3003SB, -3020SB, and -3027SB should be considered low estimates. he RPD of calcium in ARDL reports 9022 and 9024 was above the EPA QC limit. The calcium data for soil samples -3041SB, -3047SB, and -3061SB should be considered estimates. The MS and MSD recoveries of antimony in ARDL reports 9022, 9024, and 9029 were below the EPA QC limit. The LC recoveries were within QC limits indicating matrix interference was encountered during the analysis. Based on the low matrix spike recoveries, low levels of antimony may not have been detected if present in all of the QA soil samples. The RPD of sodium in ARDL report 9024 was above the EPA QC limit but should not be considered significant for the purpose of data evaluation, as the data of the comparison was within five times the reporting limit of sodium (45.2 ppm). The laboratory did not report MS and MSD recoveries for calcium, magnesium, potassium, and sodium in ARDL reports 9022, 9024, and 9029. The accuracy of the associated data are acceptable based on acceptable LC recoveries. The total cyanide MS and MSD recoveries in ARDL report 9014 were above the EPA QC limit of 125 percent. The LC recovery was within QC limits indicating matrix interference was encountered during the analysis. The total cyanide data for sludge sample -30o3SG should be considered a high estimate. The reactive sulfide RPD result in ARDL report 9014 was above the LE QC limit but should not be considered significant for the purpose of data evaluation, as the data of the comparison was less than five times the reporting limit of reactive sulfide (81.4 ppm).

e. COC Records and SCR Forms: All met EPA and/or USACE ER1110-1-263 requirements with the following exceptions and/or notations. The North Pacific Division Laboratory (NPDL) SCR form in ARDL report 9019 noted the following delinquencies. The sample containers for soil sample 95POLLDW-3047SB were not individually packaged (see SCR of ARDL report 9022). One out of two VOC sample containers for soil sample -3061SB had headspace (see SCR of ARDL

report 9024). VOC and GRO samples listed on NPDL SCR as containing headspace were not of this project. The NPDL SCR recorded a sample cooler temperature of 1.0 and 1.3 °C for the samples of ARDL report 9019 and 9024, respectively. This cooler temperature is below the USACE requirement of 4 ± 2 °C. .

f. Overall Evaluation of the QA Laboratory's Data: The data of analytes detected in the laboratory method blanks should be considered due to laboratory contamination in the associated samples with the exception of the soil TOC data. The PCB and FIQ reporting limits for sludge sample -3003SG were elevated due to the matrix of the sample and/or the high concentration of fuel (kerosene) in the sample. Based on a diluted out surrogate recovery, the extraction efficiency of the FIQ sludge sample -3003SG could not be determined. The kerosene and bunker C data for this sample should be considered estimates. The soil MS and MSD recoveries of calcium referenced in ARDL reports 9014 and 9019 were below the EPA QC limit. Based on out of control MS/MSD recoveries or RPD results, the calcium data for soil samples -3003SB, -3020SB, and -3027SB should be considered low estimates and the calcium data for soil samples -3041SB, -3047SB, and -3061SB should be considered estimates. Based on out of control matrix spike recoveries, low levels of antimony may not have been detected if present in all of the QA soil samples. Based on out of control matrix spike recoveries, the total cyanide data for sludge sample -3003SG should be considered a high estimate. Because of out of control cooler temperatures, QA samples 95POLLDW-3020SB, -3027SB, and -3061SB may have been compromised prior to analysis.

8. **COMPARISON OF THE PRIMARY AND QA LABORATORIES' DATA:** The primary and QA data comparisons are presented in Tables I through VIII. All data agree with each other and are comparable with the following exceptions.

I. BNA and COE/FIQ: The primary (-3039SB) data of bis(2-ethylhexyl)phthalate do not agree with either the blind duplicate or QA data in Table V-2. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary (-3040SB) data of bis(2-ethylhexyl)phthalate are accepted based on QA data agreement. The QA data of bunker C does not agree with the primary blind duplicate data in Table I-4 A review of the QA laboratory's fuel chromatogram (ARDL report 9014) indicates that bunker C was erroneously quantified in the QA sample. The laboratory incorrectly integrated a portion of the kerosene fuel pattern during quantitation of bunker C. The primary data are acceptable based on blind duplicate agreement and consistent pattern recognition/integration procedures.

II. DRO and TRPH: The primary (-3026SB) and QA data comparison of DRO does not agree with each other in Table IV-3. Since both laboratories had acceptable internal QC data, the

discrepancy could not be analytically resolved. Review of the primary and QA fuel chromatograms indicate the presence of a fuel hydrocarbon pattern in the samples. The primary DRO data of sample -3025SB are accepted based on QA data agreement. The primary (-3059SB) and QA data comparison of DRO does not agree with each other in Table VII-3. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. A review of the primary and QA fuel chromatograms indicate the presence of diesel range fuel hydrocarbons in all samples. The level of fuel hydrocarbons detected in primary sample -3059SB was below the detection limit. The primary (-3060SB) DRO data are accepted based on QA agreement. The QA data of TRPH does not agree with the primary blind duplicate data in Table II-5. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary and QA fuel chromatograms indicate diesel range and late eluting fuel hydrocarbons which probably should have been detectable as TRPH in the primary samples.

III. TCLP Metals, Total Metals and Inorganics: The QA data comparisons of TCLP-chromium, mercury, and silver do not agree with the primary blind duplicate data in Table I-5. Since both laboratories had acceptable internal QC data for TCLP-chromium and silver, the data discrepancies could not be analytically resolved. The primary data of TCLP-chromium, mercury, and silver are accepted based on blind duplicate agreement. The primary data of TCLP-mercury should be considered high estimates based on a high laboratory matrix spike recovery (see SAS report 49334). The primary (-3025SB) data of total nickel and silver do not agree with either the blind duplicate or QA data in Table IV-5. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary (-3026SB) data of nickel and silver are accepted based on QA data agreement. The primary (-3039SB) data of total mercury do not agree with either the blind duplicate or QA data in Table V-6. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary (-3040SB) data of mercury are accepted based on QA data agreement. The primary (-3060SB) data of total thallium does not agree with either the blind duplicate or QA data in Table VII-5. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary (-3059SB) data of thallium are accepted based on QA agreement. The QA data of antimony does not agree with the primary blind duplicate data in Table VI-5. The primary laboratory had acceptable internal QC data while the QA data of antimony should be considered low estimates based on low matrix spike recoveries. The primary data of antimony are accepted based on acceptable internal QC and blind duplicate agreement. The QA data of antimony do not agree with the blind duplicate data in Tables VII-5 and VIII-6. The primary and QA data of antimony should be considered low estimates based on low matrix spike recoveries. The primary data of antimony are accepted based on blind duplicate agreement. The primary and QA data comparison of reactive sulfide

does not agree in Table I-6. Based on a low matrix spike recovery, low levels of reactive sulfide may not have been detected in the primary samples (see SAS report 49334). The QA data are acceptable based on acceptable internal QC data.

CENPD-ET-EN-L (95-0273)

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table I

Project: Ft. Richardson OU-A POL Lab Dry Well Matrix: Sludge Prefix: 95POLLDW-
Primary Laboratory: SAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: TCLP Volatile Organics Compounds (EPA 1311/5030, 8260) Units: ug/L (ppb)

Analytes Detected	Primary Lab 3001SG	Primary Lab 3002SG	Reporting Limits	QA Lab 3003SG	Reporting Limits
Vinyl Chloride	ND	ND	60	ND	10
1,1-Dichloroethene	ND	ND	52	ND	5
2-Butanone	ND	ND	38	ND	100
Chloroform	ND	ND	53	7 B	5
Carbon Tetrachloride	ND	ND	73	ND	5
1,2-Dichloroethane	ND	ND	60	ND	5
Benzene	ND	ND	44	ND	5
Trichloroethene	ND	ND	49	ND	5
Tetrachloroethene	ND	ND	34	ND	5
Chlorobenzene	ND	ND	64	ND	5

B = Found in method blank
ND = Not detected

SUMMARY: The primary blind duplicate and QA data agree with each other for all targeted volatiles and are comparable.

CENPD-ET-EN-L (95-0273)
Table I cont.

2. Method: TCLP Semi-Volatile Organics Compounds (EPA 1311/3510,8270) Units: ug/L (ppb)

Analytes Detected	Primary Lab 3001SG	Primary Lab 3002SG	Reporting Limits	QA Lab 3003SG	Reporting Limits
1,4-Dichlorobenzene	ND	ND	100	ND	10
2-Methylphenol	ND	ND	100	ND	10
4-Methylphenol	ND	ND	280	11	10
Hexachloroethane	ND	ND	200	ND	10
Nitrobenzene	ND	ND	300	ND	10
Hexachlorobutadiene	ND	ND	79	ND	10
2,4,6-Trichlorophenol	ND	ND	81	ND	10
2,4,5-Trichlorophenol	ND	ND	87	ND	50
2,4-Dinitrotoluene	ND	ND	130	ND	10
Hexachlorobenzene	ND	ND	74	ND	10
Pentachlorophenol	ND	ND	100	ND	50
Pyridine	ND	ND	500	ND	10

SUMMARY: The primary blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0273)
Table I cont.

3. Method: Polychlorinated Biphenyls (EPA 3550/8080) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3001SG	Primary Lab 3002SG	Reporting Limits	QA Lab 3003SG	Reporting Limits
Aroclor 1016	ND	ND	180/210	ND	2600
Aroclor 1221	ND	ND	220/260	ND	2600
Aroclor 1232	ND	ND	110/130	ND	2600
Aroclor 1242	ND	ND	130/150	ND	2600
Aroclor 1248	ND	ND	290/340	ND	2600
Aroclor 1254	ND	ND	110/130	ND	2600
Aroclor 1260	ND	ND	220/260	ND	2600
Percent Solids	17.2	14.4		30.7	

SUMMARY: The primary blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

4. Method: Fuel Identification/Quantitation (EPA 3550/COE 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3001SG	Primary Lab 3002SG	Reporting Limits	QA Lab 3003SG	Reporting Limits
Gasoline	ND	ND	1400/1600	ND	11,000
Kerosene	67,000	66,000	1400/1600	70,000	11,000
Jet Fuel	ND	ND	1400/1600	ND	11,000
Diesel Fuel #2	ND	ND	1100/1300	ND	11,000
Bunker C (D#6)	ND	ND	5600/6500	70,000	2100

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits except for the QA data of bunker C. A review of the QA laboratory's fuel chromatogram (ARDL report 9014) indicates that bunker C was erroneously quantified in the QA sample. The laboratory incorrectly integrated a portion of the kerosene fuel pattern during quantitation of bunker C. The primary data are acceptable based on blind duplicate agreement and consistent pattern recognition/integration procedures.

CENPD-ET-EN-L (95-0273)
Table I cont.

5. Primary Method: TCLP Metals (EPA 1311/EPA 3005, 6010, 7470) Units: mg/L (ppm)
QA Method: TCLP Metals (EPA 1311/EPA 3010, 6010, 7470)

Analytes Detected	Primary Lab 3001SG	3002SG	Reporting Limits	QA Lab 3003SG	Reporting Limits
Arsenic	ND	ND	0.15	0.035	0.030
Barium	4.5	5	0.0041	3.5	0.010
Cadmium	ND	0.015	0.01	ND	0.0030
Chromium	0.24	0.41	0.0077	0.020	0.0050
Lead	4.6	5.4	0.046	2.7	0.030
Mercury	0.087	0.033	0.017	0.0019	0.00020
Selenium	ND	ND	0.1	ND	0.040
Silver	0.24	0.43	0.0084	ND	0.0050

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable except for the data comparisons of chromium, mercury, and silver. Since both laboratories had acceptable internal QC data for chromium and silver, the data discrepancies could not be analytically resolved. The primary data of chromium, mercury, and silver are accepted based on blind duplicate agreement. The primary data of mercury should be considered high estimates based on a high laboratory matrix spike recovery (see SAS report 49334).

CENPD-ET-EN-L (95-0273)
Table I cont.

6. Method: Inorganic Parameters (EPA SW-846 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3001SG	Primary Lab 3002SG	Reporting Limits	QA Lab 3003SG	Reporting Limits
Total Cyanide	6.8	11	0.5	22.7	1.6
Reactive Cyanide	ND	ND	20	ND	0.81
Reactive Sulfide	ND	ND	20	451	81.4
Flashpoint (°F)	>212	>212	20	>200	81.4
pH (SU)	6.22	6.13	NA	5.8	
Corrosivity(mm per year)	0.0007	0.0009	0.0002	NR	

NR = Not requested on chain of custody record
NA = Not applicable

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other except for the data comparison of reactive sulfide. Based on a low matrix spike recovery, low levels of reactive sulfide may not have been detected in the primary samples (see SAS report 49334). The QA data are acceptable based on acceptable internal QC data.

CENPD-ET-EN-L (95-0273)

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table II

Project: Ft. Richardson OU-A POL Lab Dry Well Matrix: Soil Prefix: 95POLLDW-
Primary Laboratory: SAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: Volatile Organics Compounds (EPA 5030/8260) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3001SB	3002SB	Reporting Limits	QA Lab 3003SB	Reporting Limits
Methylene Chloride	6	ND	4.1/4.4	9	6
Percent Solids	90.8	85.0		87.8	

ND = Not detected

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other or their reporting limits for all targeted volatiles and are comparable.

2. Method: Semi-Volatile Organics Compounds (EPA 3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3001SB	3002SB	Reporting Limits	QA Lab 3003SB	Reporting Limits
	ND	ND	18-500	ND	380-1800

SUMMARY: The primary blind duplicate and QA data agree with each other for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0273)
Table II cont.

3. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm

Analytes Detected	Primary Lab 3001SB	Primary Lab 3002SB	Reporting Limits*	QA Lab 3003SB	Reporting Limits
GRO	1.6 B	0.46 JB	0.2/0.22	ND	5.0

* = Method detection limit
B = Found in method blank
J = Estimated concentration

SUMMARY: The primary blind duplicate data agree within a factor of four with each other, agree with the QA data and are comparable.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3001SB	Primary Lab 3002SB	Reporting Limits*	QA Lab 3003SB	Reporting Limits
DRO	29	24	3.3/3.6	17.0	4.5

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other and are comparable.

5. Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3001SB	Primary Lab 3002SB	Reporting Limits	QA Lab 3003SB	Reporting Limits
TRPH	ND	ND	7.4/8.4	96.0	11.4

SUMMARY: The primary blind duplicate data agree each other but do not agree within a factor of five with the QA data. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary and QA fuel chromatograms indicate diesel range and late eluting fuel hydrocarbons which probably should have been detectable as TRPH in the primary samples.

CENPD-ET-EN-L (95-0273)
Table II cont.

6. Primary Method: Total Metals (EPA 3051/EPA 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 3001SB	Primary Lab 3002SB	Reporting Limits	QA Lab 3003SB	Reporting Limits
Aluminum	17,000	15,000	15/18	18,500	5.7
Antimony	0.92	1.4	0.45/0.52	ND	2.3
Arsenic	3.8	4.9	0.088/0.1	8	0.57
Barium	79	78	0.41/0.47	85.1	1.1
Beryllium	ND	ND	0.32/0.37	0.41	0.11
Cadmium	0.15	0.096	0.024/0.028	ND	0.34
Calcium	3400	2800	34/40	8610	11.4
Chromium	24	23	0.77/0.89	39.4	0.57
Cobalt	12	11	4.6/5.3	14.2	0.57
Copper	25	20	0.82/0.95	22.1	0.57
Iron	25,000	23,000	9.5/11	28,900	5.7
Lead	20	23	0.045/0.052	26.4	3.4
Magnesium	6900	5500	8.2/9.5	7720	11.4
Manganese	500	470	0.89/1	606	0.57
Mercury	2.2	2.1	0.83/0.78	1.8	0.090
Nickel	34	28	3.6/4.2	32.1	2.3
Potassium	330	290	44/51	526	114
Selenium	ND	ND	0.15/0.18	0.23	0.057
Silver	ND	ND	0.84/0.97	ND	0.57
Sodium	110	90	49/56	125	45.6
Thallium	ND	ND	0.24/0.27	0.22	0.11
Vanadium	46	45	4.8/5.6	72.4	0.5
Zinc	53	50	1.4/1.7	58.8	0.5

SUMMARY: The primary blind duplicate and QA data agree within a factor of four with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0273)
Table II cont.

7. Method: Total Organic Carbon (EPA 9060) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3001SB	Primary Lab 3002SB	Reporting Limits	QA Lab 3003SB	Reporting Limits
TOC	13,000	16,000	100	37,800	4.6

SUMMARY: The primary blind duplicate and QA data agree within a factor of three with each other and are comparable.

CENPD-ET-EN-L (95-0273)

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table III

Project: Ft. Richardson OU-A POL Lab Dry Well Matrix: Soil Prefix: 95POLLDW-
Primary Laboratory: SAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: Volatile Organics Compounds (EPA 5030/8260) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3018SB	Primary Lab 3019SB	Reporting Limits	QA Lab 3020SB	Reporting Limits
Methylene Chloride	ND	ND	3.9/3.8	13	5
Percent Solids	96.1	95.6		96.7	

ND = Not detected

SUMMARY: The primary blind duplicate and QA data agree within a factor of four with each other or their reporting limits for all targeted volatiles and are comparable.

2. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3018SB	Primary Lab 3019SB	Reporting Limits*	QA Lab 3020SB	Reporting Limits
GRO	ND	1.1	0.19	ND	5.0

* = Method detection limit

SUMMARY: The primary blind duplicate data do not agree within a factor of five with each other or their detection limit. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. Due to the higher, but acceptable reporting limit used, the QA data was not useful in resolving the primary data discrepancy.

CENPD-ET-EN-L (95-0273)
Table III cont.

3. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3018SB	Primary Lab 3019SB	Reporting Limits*	QA Lab 3020SB	Reporting Limits
DRO	6	7.4	0.79/0.8	6.3	4.1

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other and are comparable.

4. Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3018SB	Primary Lab 3019SB	Reporting Limits	QA Lab 3020SB	Reporting Limits
TRPH	ND	13	7.4/6.9	26.6	10.3

SUMMARY: The primary blind duplicate and QA data agree within a factor of four with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0273)
Table III cont.

5. Primary Method: Total Metals (EPA 3051/EPA 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 3018SB	Primary Lab 3019SB	Reporting Limits	QA Lab 3020SB	Reporting Limits
Aluminum	14,000	15,000	14/15	17,500	5.2
Antimony	0.57	0.57	0.4/0.46	ND	2.1
Arsenic	2.4	2.9	0.079/0.089	7.8	0.26
Barium	48	50	0.37/0.41	63.8	1.0
Beryllium	ND	ND	0.29/0.32	0.40	0.10
Cadmium	0.097	0.088	0.021/0.024	ND	0.31
Calcium	3800	4000	31/35	6410	10.3
Chromium	28	29	0.69/0.78	35.0	0.52
Cobalt	11	11	4.1/4.7	15.8	0.52
Copper	23	24	0.73/0.83	32.0	0.52
Iron	26,000	24,000	8.5/9.6	31,400	5.2
Lead	6.3	6.9	0.04/0.045	9.9	3.1
Magnesium	8200	8000	7.4/8.3	10,500	10.3
Manganese	570	510	0.8/0.9	670	0.52
Mercury	0.14	0.2	0.07/0.071	0.10	0.082
Nickel	33	31	3.2/3.7	37.5	2.1
Potassium	470	560	4.0/4.5	801	103
Selenium	ND	ND	0.14/0.16	0.082	0.052
Silver	ND	ND	0.75/0.85	ND	0.52
Sodium	110	160	44/49	180	41.4
Thallium	ND	ND	0.14/0.16	ND	0.41
Vanadium	41	42	4.3/4.9	74.3	0.52
Zinc	54	48	1.3/1.4	60.5	0.52

SUMMARY: The primary blind duplicate and QA data agree within a factor of four with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0273)

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table IV

Project: Ft. Richardson OU-A POL Lab Dry Well Matrix: Soil Prefix: 95POLLDW-
Primary Laboratory: SAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: Volatile Organics Compounds (EPA 5030/8260) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3025SB	Primary Lab 3026SB	Reporting Limits	QA Lab 3027SB	Reporting Limits
Methylene Chloride	ND	ND	3.9/3.8	6	5
1,2-Dichloroethane	7	ND	3.1	ND	5
Percent Solids	95.7	96.2		95.3	

ND = Not detected

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

2. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3025SB	Primary Lab 3026SB	Reporting Limits*	QA Lab 3027SB	Reporting Limits
GRO	ND	ND	0.19	ND	5

* = Method detection limit

SUMMARY: The primary blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0273)
Table IV cont.

3. Method: Diesel Range Organics (ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3025SB	Primary Lab 3026SB	Reporting Limits*	QA Lab 3027SB	Reporting Limits
DRO	2.8 J	ND	0.81/0.79	6.1	4.2

J = Estimated concentration

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits except for the primary (-3026SB) and QA data comparison. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. Review of the primary and QA fuel chromatograms indicate the presence of a fuel hydrocarbon pattern in the samples. The primary data of sample -3025SB are accepted based on QA data agreement.

4. Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3025SB	Primary Lab 3026SB	Reporting Limits	QA Lab 3027SB	Reporting Limits
TRPH	ND	ND	7.2/6.9	11.9	10.5

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0273)
Table IV cont.

5. Primary Method: Total Metals (EPA 3051/EPA 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 3025SB	Primary Lab 3026SB	Reporting Limits	QA Lab 3027SB	Reporting Limits
Aluminum	5700	11,000	14/15	13,600	5.2
Antimony	ND	ND	0.42/0.43	ND	2.1
Arsenic	1.4	2.9	0.083/0.084	3.8	0.26
Barium	21	29	0.30	51	1.0
Beryllium	ND	ND	0.3/0.31	0.33	0.10
Cadmium	0.066	0.07	0.023	ND	0.31
Calcium	2500	5400	32/33	6730	10.5
Chromium	28	26	0.73	27.1	0.52
Cobalt	36	13	4.3/4.4	12.7	0.52
Copper	25	19	0.77/0.78	26.9	0.52
Iron	30,000	26,000	9/9.1	27,800	5.2
Lead	2.7	4.4	0.42/0.43	9.5	3.1
Magnesium	55,000	12,000	7.8	9020	10.5
Manganese	600	480	0.84/0.85	988	0.52
Mercury	0.17	0.14	0.069/0.076	ND	0.084
Nickel	280	55	3.4/3.5	34.2	2.1
Potassium	290	370	42	571	105
Selenium	ND	ND	0.15	ND	0.052
Silver	12	ND	0.79/0.8	ND	0.52
Sodium	52	ND	46	122	42.0
Thallium	ND	68	0.22	ND	0.42
Vanadium	25	42	4.6	62.2	0.52
Zinc	38	51	1.4	52.3	0.52

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits for all metals except for the primary (-3025SB) data of nickel and silver. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary (-3026SB) data of nickel and silver are accepted based on QA data agreement.

CENPD-ET-EN-L (95-0273)

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table V

Project: Ft. Richardson OU-A POL Lab Dry Well Matrix: Soil Prefix: 95POLLDW-
Primary Laboratory: SAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: Volatile Organics Compounds (EPA 5030/8260) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3039SB	Primary Lab 3040SB	Reporting Limits	QA Lab 3041SB	Reporting Limits
Methylene Chloride	ND	ND	3.9/4	8 B	5
Toluene	ND	ND	2.1/2.2	2 J	5
Percent Solids	92.9	93.1		93.6	

J = Estimated concentration
B = Found in method blank
ND = Not detected

SUMMARY: The primary blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

2. Method: Semi-Volatile Organics Compounds (EPA 3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3039SB	Primary Lab 3040SB	Reporting Limits	QA Lab 3041SB	Reporting Limits
Bis(2-ethylhexyl)phthalate	1100	ND	180	ND	350

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits for all targeted analytes except for the primary (-3039SB) data of bis(2-ethylhexyl)phthalate. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary (-3040SB) data of bis(2-ethylhexyl)phthalate are accepted based on QA data agreement.

CENPD-ET-EN-L (95-0273)
Table V cont.

3. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3039SB	Primary Lab 3040SB	Reporting Limits*	QA Lab 3041SB	Reporting Limits
GRO	ND	ND	0.19/0.2	ND	5.0

* = Method detection limit

SUMMARY: The primary blind duplicate and QA data agree with each other and are comparable.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3039SB	Primary Lab 3040SB	Reporting Limits*	QA Lab 3041SB	Reporting Limits
DRO	ND	ND	2.2/2.1	4.3	4.3

SUMMARY: The primary blind duplicate and QA data agree within a factor of three with each other and are comparable.

5. Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3039SB	Primary Lab 3040SB	Reporting Limits	QA Lab 3041SB	Reporting Limits
TRPH	ND	ND	6.8/7.8	ND	10.7

SUMMARY: The primary blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0273)
Table V cont.

6. Primary Method: Total Metals (EPA 3051/EPA 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 3039SB	Primary Lab 3040SB	Reporting Limits	QA Lab 3041SB	Reporting Limits
Aluminum	7500	11,000	14/15	13,100	5.3
Antimony	ND	ND	0.42/0.44	ND	2.1
Arsenic	1.8	1.8	0.083/0.086	4.2	0.27
Barium	44	45	0.3/0.4	54.0	1.1
Beryllium	ND	ND	0.3/0.31	0.30	0.11
Cadmium	0.076	0.075	0.022/0.023	ND	0.32
Calcium	3300	6100	32/34	7110	10.7
Chromium	23	22	0.72/0.75	31.2	0.53
Cobalt	8.1	10	4.3/4.5	11.8	0.53
Copper	20	22	0.77/0.8	24.9	0.53
Iron	17,000	22,000	8.9/9.3	25,100	5.3
Lead	3.6	4.7	0.042/0.044	6.5	3.2
Magnesium	6100	7200	7.7/8	8960	10.7
Manganese	480	390	0.83/0.87	473	0.53
Mercury	0.61	0.1	0.076/0.065	ND	0.085
Nickel	31	31	3.4/3.5	32.0	2.1
Potassium	320	510	4.1/4.3	577	107
Selenium	ND	ND	0.15	0.058	0.053
Silver	ND	ND	0.79/0.82	ND	0.53
Sodium	87	130	46/48	107	42.7
Thallium	ND	ND	0.22/0.23	ND	0.11
Vanadium	23	35	4.5/4.7	56.2	0.53
Zinc	36	45	1.3/1.4	49.3	0.53

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable except for the primary (-3039SB) data of mercury. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. The primary (-3040SB) data of mercury are accepted based on QA data agreement.

7. Method: Total Organic Carbon (EPA 9060) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3039SB	Primary Lab 3040SB	Reporting Limits	QA Lab 3041SB	Reporting Limits
TOC	2600	3000	100	1120	4.3

SUMMARY: The primary blind duplicate and QA data agree within a factor of three with each other and are comparable.

CENPD-ET-EN-L (95-0273)

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table VI

Project: Ft. Richardson OU-A POL Lab Dry Well Matrix: Soil Prefix: 95POLLDW-
Project Laboratory: SAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: Volatile Organic Compounds (EPA 5030/8260) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3045SB	Primary Lab 3046SB	Reporting Limits	QA Lab 3047SB	Reporting Limits
Methylene Chloride	ND	ND	3.9/3.7	9 B	5
Toluene	ND	ND	2.1/2	5	5
Percent Solids	96.8	97.6		97.1	

B = Found in method blank
ND = Not detected

SUMMARY: The primary blind duplicate and QA data agree within a factor of three with each other or their reporting limits for all targeted volatiles and are comparable.

2. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3045SB	Primary Lab 3046SB	Reporting Limits*	QA Lab 3047SB	Reporting Limits
GRO	ND	ND	0.18/0.19	ND	5.0

* = Method detection limit

SUMMARY: The primary blind duplicate and QA data agree with each other and are comparable.

CENPD-ET-EN-L (95-0273)
Table VI cont.

3. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3045SB	3046SB	Reporting Limits*	QA Lab 3047SB	Reporting Limits
DRO	2.2 J	2.3 J	2.1/2.2	4.8	4.1

J = Estimated concentration

SUMMARY: The primary blind duplicate and QA data agree within a factor of three with each other and are comparable.

4. Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3045SB	3046SB	Reporting Limits	QA Lab 3047SB	Reporting Limits
TRPH	ND	ND	6.8/6.4	14.1	10.3

SUMMARY: The primary blind duplicate and QA data agree within a factor of three with each other and are comparable.

CENPD-ET-EN-L (95-0273)
Table VI cont.

5. Primary Method: Total Metals (EPA 3051/EPA 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 3045SB	Primary Lab 3046SB	Reporting Limits	QA Lab 3047SB	Reporting Limits
Aluminum	13,000	12,000	14	16,900	5.1
Antimony	ND	ND	0.4/0.43	2.3	2.1
Arsenic	2.6	3.5	0.078/0.084	5.6	0.26
Barium	48	48	0.36/0.39	56.7	1.0
Beryllium	ND	ND	0.28/0.3	0.38	0.10
Cadmium	0.1	0.096	0.021/0.023	ND	0.31
Calcium	3400	3100	30/33	6180	10.3
Chromium	27	40	0.68/0.73	34.7	0.51
Cobalt	12	11	4.1/4.4	15.2	0.51
Copper	23	26	0.73/0.78	31.1	0.51
Iron	26,000	24,000	8.4/9	30,200	5.1
Lead	6	6.3	0.04/0.062	8.2	3.1
Magnesium	9400	8500	7.3/7.8	12,500	10.3
Manganese	600	540	0.79/0.84	650	0.51
Mercury	0.087	0.072	0.075/0.072	ND	0.082
Nickel	38	42	3.2/3.4	54.1	2.1
Potassium	430	400	39/42	666	103
Selenium	ND	ND	0.14/0.15	0.075	0.051
Silver	ND	ND	0.74/0.8	ND	0.51
Sodium	110	100	43/46	147	41.2
Thallium	ND	ND	0.21/0.22	ND	0.10
Vanadium	40	37	4.3/4.6	69.3	0.51
Zinc	53	54	1.3/1.4	61.3	0.51

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable except for the QA data of antimony. The primary laboratory had acceptable internal QC data. The QA data of antimony should be considered low estimates based on low matrix spike recoveries. The primary data of antimony are accepted based on acceptable internal QC and blind duplicate agreement.

CENPD-ET-EN-L (95-0273)

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table VII

Project: Ft. Richardson OU-A POL Lab Dry Well Matrix: Soil Prefix: 95POLLDW-
Primary Laboratory: SAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: Volatile Organic Compounds (EPA 5030/8260) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3059SB	Primary Lab 3060SB	Reporting Limits	QA Lab 3061SB	Reporting Limits
Methylene Chloride	11	8.6	3.7/3.8	9 B	6
Percent Solids	93.3	91.6		88.4	

B = Found in method blank
ND = Not detected

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other for all targeted volatiles and are comparable.

2. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3059SB	Primary Lab 3060SB	Reporting Limits*	QA Lab 3061SB	Reporting Limits
GRO	1 JB	0.75 JB	0.15	ND	5.0

J = Estimated concentration
* = Method detection limit

SUMMARY: The primary blind duplicate agree within a factor of two with each other, agree with the QA data and are comparable.

CENPD-ET-EN-L (95-0273)
Table VII cont.

3. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3059SB	Primary Lab 3060SB	Reporting Limits*	QA Lab 3061SB	Reporting Limits
DRO	ND	14	3.2/3.3	19	4.5

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their detection limit except for the primary (-3059SB) and QA data comparison. Since both laboratories had acceptable internal QC data, the discrepancy could not be analytically resolved. A review of the primary and QA fuel chromatograms indicate the presence of diesel range fuel hydrocarbons in all samples. The level of fuel hydrocarbons detected in primary sample -3059SB was below the detection limit. The primary (-3060SB) DRO data are accepted based on QA agreement.

4. Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3059SB	Primary Lab 3060SB	Reporting Limits	QA Lab 3061SB	Reporting Limits
TRPH	ND	ND	6.6/6.7	31.8	11.3

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0273)
Table VII cont.

5. Primary Method: Total Metals (EPA 3051/EPA 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 3059SB	Primary Lab 3060SB	Reporting Limits	QA Lab 3061SB	Reporting Limits
Aluminum	8300	10,000	15/16	13,200	5.7
Antimony	ND	ND	0.45/0.47	2.5	2.3
Arsenic	1.9	1.5	0.088/0.093	5.4	0.28
Barium	32	42	0.41/0.43	41.9	1.1
Beryllium	ND	ND	0.32/0.34	0.29	0.11
Cadmium	0.047	0.045	0.024/0.025	ND	0.34
Calcium	3100	4900	34/36	10,600	11.3
Chromium	16	17	0.76/0.81	29.2	0.57
Cobalt	7.2	9.4	4.6/4.8	11.9	0.57
Copper	16	17	0.81/0.86	22.3	0.57
Iron	17,000	20,000	9.5/10	25,400	5.7
Lead	3.1	4.1	0.044/0.047	6.1	3.4
Magnesium	5500	6700	8.2/8.6	8470	11.3
Manganese	350	390	0.88/0.94	515	0.57
Mercury	0.2	0.081	0.07/0.077	ND	0.090
Nickel	25	28	3.6/3.8	31.5	2.3
Potassium	360	360	44/47	482	113
Selenium	ND	ND	0.15/0.16	ND	0.057
Silver	ND	ND	0.83/0.88	ND	0.57
Sodium	98	89	48/51	98.0	45.2
Thallium	ND	2.3	0.23/0.25	0.13	0.11
Vanadium	26	31	4.8/5.1	61.8	0.57
Zinc	36	42	1.4/1.5	50.6	0.57

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable except for the QA data of antimony and the primary (-3060SB) data of thallium. The primary and QA data of antimony should be considered low estimates based on low matrix spike recoveries. The primary data of antimony are accepted based on blind duplicate agreement. The primary and QA laboratories had acceptable internal QC data for thallium and the discrepancy could not be analytically resolved. The primary (-3059SB) data of thallium are accepted based on QA agreement.

CENPD-ET-EN-L (95-0273)

COMPARISON OF PRIMARY BLIND DUPLICATE AND QA RESULTS

Table VIII

Project: Ft. Richardson OU-A POL Lab Dry Well Matrix: Soil Prefix: 95POLLDW-
Primary Laboratory: SAS, Inc. QA Laboratory: ARDL, Inc.

1. Method: Volatile Organics Compounds (EPA 5030/8260) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3078SB	3079SB	Reporting Limits	QA Lab 3080SB	Reporting Limits
Methylene Chloride	ND	ND	3.7/3.8	6 B	5
Toluene	ND	ND	2	5 J	5
Percent Solids	97.6	97.6		97.9	

B = Found in method blank
J = Estimated concentration
ND = Not detected

SUMMARY: The primary blind duplicate and QA data agree within a factor of three with each other or their reporting limits for all targeted volatiles and are comparable.

2. Method: Semi-Volatile Organics Compounds (EPA 3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3078SB	3079SB	Reporting Limits	QA Lab 3080SB	Reporting Limits
Bis(2-ethylhexyl)phthalate	210 J	ND	170	ND	340

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other or their reporting limits for all targeted analytes and are comparable.

CENPD-ET-EN-L (95-0273)
Table VIII cont.

3. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3078SB	Primary Lab 3079SB	Reporting Limits*	QA Lab 3080SB	Reporting Limits
GRO	0.23 JB	1.1 B	0.18/0.19	ND	5.0

* = Method detection limit

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other, agree with the QA data and are comparable.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3078SB	Primary Lab 3079SB	Reporting Limits*	QA Lab 3080SB	Reporting Limits
DRO	3.8 J	3.5 J	3.1	4.3	4.1

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other and are comparable.

5. Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3078SB	Primary Lab 3079SB	Reporting Limits	QA Lab 3080SB	Reporting Limits
TRPH	9.5	ND	7/6.8	17.6	10.2

SUMMARY: The primary blind duplicate and QA data agree within a factor of three with each other or their reporting limits and are comparable.

CENPD-ET-EN-L (95-0273)
Table VIII cont.

6. Primary Method: Total Metals (EPA 3051/EPA 200.8, 6010, 7471) Units: mg/Kg (ppm)
QA Method: Total Metals (EPA 3050/6010, 7000 Series)

Analytes Detected	Primary Lab 3078SB	Primary Lab 3079SB	Reporting Limits	QA Lab 3080SB	Reporting Limits
Aluminum	16,000	12,000	14	21,100	5.1
Antimony	0.5	ND	0.41/0.42	3.5	2.0
Arsenic	3.5	3.5	0.08/0.082	7.0	0.26
Barium	45	38	0.37/0.38	53.7	1.0
Beryllium	ND	ND	0.29/0.3	0.50	0.10
Cadmium	0.2	0.45	0.022	0.33	0.31
Calcium	3500	2500	31/32	7790	10.2
Chromium	26	21	0.7/0.72	37.4	0.51
Cobalt	12	10	4.2/4.3	16.3	0.51
Copper	29	21	0.74/0.76	30.0	0.51
Iron	25,000	20,000	8.6/8.9	35,100	5.1
Lead	13	8.2	0.04/0.064	15.4	3.1
Magnesium	8700	6900	7.4/7.6	12,800	10.2
Manganese	610	410	0.8/0.83	731	0.51
Mercury	0.087	0.091	0.064/0.061	ND	0.081
Nickel	38	33	3.3/3.4	51.9	2.0
Potassium	390	340	41/41	713	102
Selenium	ND	ND	0.14	0.081	0.051
Silver	ND	ND	0.76/0.75	ND	0.51
Sodium	290	270	44/45	174	40.9
Thallium	ND	ND	0.21/0.22	ND	0.10
Vanadium	45	35	4.4/4.5	83.3	0.51
Zinc	69	83	1.3	83.0	0.51

SUMMARY: The primary blind duplicate and QA data agree within a factor of five with each other or their reporting limits and are comparable except for the QA data of antimony. The primary and QA data of antimony should be considered low estimates based on low matrix spike recoveries. The primary data of antimony are accepted based on blind duplicate agreement.

CENPD-ET-EN-L (95-0273)
Table VIII cont.

7. Method: Total Organic Carbon (EPA 9060) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3078SB	Primary Lab 3079SB	Reporting Limits	QA Lab 3080SB	Reporting Limits
TOC	3000	3100	100	4330	4.1

SUMMARY: The primary blind duplicate and QA data agree within a factor of two with each other and are comparable.

CENPD-ET-EN-L (95-0273)

COMPARISON OF PRIMARY BLIND DUPLICATE RESULTS

Table IX

Project: Ft. Richardson OU-A POL Lab Dry Well Matrix: Soil Prefix: 95POLLDW-
Primary Laboratory: SAS, Inc.

1. Method: Volatile Organics Compounds (EPA 5030/8260) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3088SB	Primary Lab 3089SB	Reporting Limits
Methylene Chloride	ND	ND	1.8-1.7
Percent Solids	96.1	95.5	

ND = Not detected

SUMMARY: The primary blind duplicate data agree with each other for all targeted volatiles.

2. Method: Semi-Volatile Organics Compounds (EPA 3550/8270) Units: ug/Kg (ppb)

Analytes Detected	Primary Lab 3088SB	Primary Lab 3089SB	Reporting Limits
	ND	ND	16-440

SUMMARY: The primary blind duplicate data agree with each other for all targeted analytes.

3. Method: Gasoline Range Organics (ADEC 8015 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3088SB	Primary Lab 3089SB	Reporting Limits*
GRO	ND	ND	0.46/0.45

* = Method detection limit

SUMMARY: The primary blind duplicate data agree with each other.

4. Method: Diesel Range Organics (EPA 3550/ADEC 8100 Mod.) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3088SB	Primary Lab 3089SB	Reporting Limits*
DRO	32	59	0.8

SUMMARY: The primary blind duplicate data agree within a factor of two with each other.

5. Method: Total Recoverable Petroleum Hydrocarbons (EPA 9071/418.1) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3088SB	Primary Lab 3089SB	Reporting Limits
TRPH	140	95	7.2/7.6

SUMMARY: The primary blind duplicate data agree within a factor of two with each other.

CENPD-ET-EN-L (95-0273)
Table IX cont.

6. Method: Total Metals (EPA 3050/6010,7000 Series) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3088SB	Primary Lab 3089SB	Reporting Limits
Aluminum	12,000	13,000	15/14
Antimony	0.51	0.62	0.45/0.42
Arsenic	2.6	2.6	0.089/0.082
Barium	42	45	0.41/0.38
Beryllium	ND	ND	0.32/0.3
Cadmium	0.11	0.14	0.024/0.022
Calcium	3700	4300	35/32
Chromium	29	28	0.78/0.72
Cobalt	11	12	4.6/4.3
Copper	27	28	0.83/0.76
Iron	22,000	25,000	9.6/8.9
Lead	14	28	0.045/0.042
Magnesium	8300	9800	8.3/7.7
Manganese	600	600	0.9/0.83
Mercury	0.085	0.08	0.064/0.061
Nickel	40	41	3.7/3.4
Potassium	450	490	45/41
Selenium	ND	ND	0.16/0.14
Silver	ND	ND	0.85/0.78
Sodium	100	110	49/45
Thallium	ND	2	0.24/0.22
Vanadium	35	40	4.9/4.5
Zinc	54	55	1.4/1.3

SUMMARY: The primary blind duplicate data agree within a factor of two with each other or their reporting limits for all metals.

CENPD-ET-EN-L (95-0273)
Table IX cont.

7. Method: Total Organic Carbon (EPA 9060) Units: mg/Kg (ppm)

Analytes Detected	Primary Lab 3088SB	Primary Lab 3089SB	Reporting Limits
TOC	1900	2400	100

SUMMARY: The primary blind duplicate data agree within a factor of two with each other.

ecology and environment, inc.
International Specialists in the Environment

840 K Street
Anchorage, Alaska 99501
Tel: (907) 257-5000, Fax: (907) 257-5037

October 25, 1996

Mr. Ted Bales
Project Manager
United States Army Engineer District,
Alaska
P.O. Box 898
Anchorage, Alaska 99506-0898

Re: Contract No. DACA85-93-D-0009, Delivery Order No. 0026; Resampling Groundwater Monitoring Wells for Dioxin/Furans at Ruff Road Fire Training Area (RRFTA); Operable Unit A (OU-A); Fort Richardson, Alaska

Dear Mr. Bales:

Ecology and Environment, Inc., (E & E) is submitting two copies of a data review summary and analytical results for the OU-A remedial investigation under United States Army Engineer District, Alaska, (Alaska District) Contract No. DACA85-93-D-0009 and Delivery Order No. 0026. The review summary addresses the data validation and usability of the polychlorinated dibenzo-p-dioxins/polychlorinated dibenzo-p-furans (dioxins/furans) data generated from the resampling of five monitoring wells at RRFTA on August 14 and 15, 1996.

E & E wrote the data review summary report to supplement the Alaska District's North Pacific Division Laboratory chemical quality assurance report (CQAR). However, the CQAR is not yet completed and therefore is unavailable. E & E will assess the usability of the laboratory data based on the data quality objectives specified in the OU-A management plan, the data review summary report, and the CQAR once the CQAR is completed.

If you have any questions or comments on this report, please contact Mr. William Richards or me at 257-5000.

Sincerely,

Paul Cooley
Project Chemist

PC/rph

Enclosures

QA/QC DATA REVIEW SUMMARY

I. Introduction:

Quanterra Environmental Services of West Sacramento, California, received seven groundwater samples intact from Ecology and Environment, Inc., (E & E) on August 20, 1996. The samples were collected by E & E using ultra-clean sampling protocol on August 14 and 15, 1996. Samples were analyzed for polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) by high-resolution gas chromatography/high-resolution mass spectrometry SW-846 Method 8290. The sample identification numbers are:

96RRFTA001GW, 96RRFTA002GW, 96RRFTA004GW, 96RRFTA005GW, 96RRFTA006WA, 96RRFTA007GW, 96RRFTA008GW

For each sample, the laboratory submitted a data summary form containing PCDD/PCDF analysis results along with the percent recovery results for the internal standards. The reported analytical results were verified for identification and quantification by a review of the raw analytical data. Sample results were verified, and this review summary was prepared based on the quality assurance/quality control (QA/QC) protocols in SW-846 Method 8290 and *Quality Assurance/Quality Control Guidance for Removal Activities—Sampling QA/QC Plan and Data Validation Procedures* (United States Environmental Protection Agency 540-G-90-004).

II. Data Validation Comments:

The laboratory successfully analyzed the samples without any major problems. The raw data and supporting documents regarding QC parameters such as initial and daily calibrations, sample preparation, recoveries of internal and surrogate standards, PCDD/PCDF isomer peaks resolution, retention time and mass ion ratios for PCDD/PCDF identification, and method blank analyses were reviewed and found acceptable with the following exception. Surrogate recoveries of 13C-2,3,7,8-TCDF and 13C-2,3,7,8-TCDD in samples 96RRFTA-004GW, 96RRFTA005GW, and surrogate 13C-2,3,7,8-TCDF in sample 96RRFTA008GW were below the method recovery goal of 40%. Results associated with these surrogates are qualified *UJ* as nondetected estimated detection limit and are considered usable. The remainder of the data are considered valid with no qualification necessary.

Quanterra
Environmental Services

POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS
Method 8290

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA001GW
Lab ID: 089126-0001-SA
Matrix: AQUEOUS
Authorized: 20 AUG 96

Sampled: 14 AUG 96
Prepared: 23 AUG 96

Received: 20 AUG 96
Analyzed: 27 AUG 96

Sample Amount 1.04 L
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Furans				
TCDFs (total)	ND	pg/L	1.8	
2,3,7,8-TCDF	ND	pg/L	1.8	
PeCDFs (total)	ND	pg/L	1.7	
1,2,3,7,8-PeCDF	ND	pg/L	1.7	
2,3,4,7,8-PeCDF	ND	pg/L	1.4	
HxCDFs (total)	ND	pg/L	2.8	
1,2,3,4,7,8-HxCDF	ND	pg/L	0.90	
1,2,3,6,7,8-HxCDF	ND	pg/L	0.71	
2,3,4,6,7,8-HxCDF	ND	pg/L	2.8	
1,2,3,7,8,9-HxCDF	ND	pg/L	1.1	
HpCDFs (total)	ND	pg/L	2.1	
1,2,3,4,6,7,8-HpCDF	ND	pg/L	1.3	
1,2,3,4,7,8,9-HpCDF	ND	pg/L	2.1	
OCDF	ND	pg/L	15	
Dioxins				
TCDDs (total)	ND	pg/L	2.1	
2,3,7,8-TCDD	ND	pg/L	2.1	
PeCDDs (total)	ND	pg/L	1.8	
1,2,3,7,8-PeCDD	ND	pg/L	1.8	
HxCDDs (total)	ND	pg/L	3.0	
1,2,3,4,7,8-HxCDD	ND	pg/L	2.7	
1,2,3,6,7,8-HxCDD	ND	pg/L	2.7	
1,2,3,7,8,9-HxCDD	ND	pg/L	3.0	
HpCDDs (total)	ND	pg/L	2.5	
1,2,3,4,6,7,8-HpCDD	ND	pg/L	2.5	
OCDD	ND	pg/L	6.5	

(continued on following page)

ND = Not detected
NA = Not applicable

Reported By: Clark Pickell

Approved By: Saleh Arghestani

The cover letter is an integral part of this report.
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Quanterra
Environmental Services

POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS (CONT.)
Method 8290

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA001GW
Lab ID: 089126-0001-SA
Matrix: AQUEOUS
Authorized: 20 AUG 96

Sampled: 14 AUG 96
Prepared: 23 AUG 96

Received: 20 AUG 96
Analyzed: 27 AUG 96

Sample Amount 1.04 L
Column Type DB-5

	% Recovery
13C-2,3,7,8-TCDF	66
13C-2,3,7,8-TCDD	71
13C-1,2,3,7,8-PeCDF	71
13C-1,2,3,7,8-PeCDD	80
13C-1,2,3,4,7,8-HxCDF	74
13C-1,2,3,6,7,8-HxCDD	79
13C-1,2,3,4,6,7,8-HpCDF	82
13C-1,2,3,4,6,7,8-HpCDD	95
13C-OCDD	102

ND = Not detected
NA = Not applicable

Reported By: Clark Pickell

Approved By: Saleh Arghestani

The cover letter is an integral part of this report.
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Quanterra
Environmental Services

POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS
Method 8290

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA002GW
Lab ID: 089126-0002-SA
Matrix: AQUEOUS Sampled: 14 AUG 96 Received: 20 AUG 96
Authorized: 20 AUG 96 Prepared: 23 AUG 96 Analyzed: 27 AUG 96

Sample Amount 1.02 L
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Furans				
TCDFs (total)	ND	pg/L	0.97	
2,3,7,8-TCDF	ND	pg/L	0.97	
PeCDFs (total)	ND	pg/L	1.1	
1,2,3,7,8-PeCDF	ND	pg/L	1.1	
2,3,4,7,8-PeCDF	ND	pg/L	0.92	
HxCDFs (total)	ND	pg/L	2.8	
1,2,3,4,7,8-HxCDF	ND	pg/L	0.80	
1,2,3,6,7,8-HxCDF	ND	pg/L	0.63	
2,3,4,6,7,8-HxCDF	ND	pg/L	2.8	
1,2,3,7,8,9-HxCDF	ND	pg/L	0.99	
HpCDFs (total)	ND	pg/L	1.1	
1,2,3,4,6,7,8-HpCDF	ND	pg/L	0.67	
1,2,3,4,7,8,9-HpCDF	ND	pg/L	1.1	
OCDF	ND	pg/L	8.8	
Dioxins				
TCDDs (total)	ND	pg/L	1.1	
2,3,7,8-TCDD	ND	pg/L	1.1	
PeCDDs (total)	ND	pg/L	1.0	
1,2,3,7,8-PeCDD	ND	pg/L	1.0	
HxCDDs (total)	ND	pg/L	1.5	
1,2,3,4,7,8-HxCDD	ND	pg/L	1.4	
1,2,3,6,7,8-HxCDD	ND	pg/L	1.4	
1,2,3,7,8,9-HxCDD	ND	pg/L	1.5	
HpCDDs (total)	ND	pg/L	1.3	
1,2,3,4,6,7,8-HpCDD	ND	pg/L	1.3	
OCDD	ND	pg/L	4.7	

(continued on following page)

ND = Not detected
NA = Not applicable

Reported By: Clark Pickell Approved By: Saleh Arghestani

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Environmental Services

POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS (CONT.)
Method 8290

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA002GW
Lab ID: 089126-0002-SA
Matrix: AQUEOUS Sampled: 14 AUG 96 Received: 20 AUG 96
Authorized: 20 AUG 96 Prepared: 23 AUG 96 Analyzed: 27 AUG 96

Sample Amount 1.02 L
Column Type DB-5

	% Recovery
13C-2,3,7,8-TCDF	73
13C-2,3,7,8-TCDD	75
13C-1,2,3,7,8-PeCDF	78
13C-1,2,3,7,8-PeCDD	91
13C-1,2,3,4,7,8-HxCDF	78
13C-1,2,3,6,7,8-HxCDD	95
13C-1,2,3,4,6,7,8-HpCDF	83
13C-1,2,3,4,6,7,8-HpCDD	99
13C-OCDD	98

ND = Not detected
NA = Not applicable

Reported By: Clark Pickell Approved By: Saleh Arghestani

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Quanterra Environmental Services

POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS
Method 8290

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA004GW
Lab ID: 089126-0003-SA
Matrix: AQUEOUS Sampled: 15 AUG 96 Received: 20 AUG 96
Authorized: 20 AUG 96 Prepared: 23 AUG 96 Analyzed: 27 AUG 96

Sample Amount 1.02 L
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Furans				
TCDFs (total)	ND	pg/L	2.3	
2,3,7,8-TCDF	ND	pg/L	2.3	
PeCDFs (total)	ND	pg/L	1.6	
1,2,3,7,8-PeCDF	ND	pg/L	1.6	
2,3,4,7,8-PeCDF	ND	pg/L	1.3	
HxCDFs (total)	ND	pg/L	2.9	
1,2,3,4,7,8-HxCDF	ND	pg/L	0.58	
1,2,3,6,7,8-HxCDF	ND	pg/L	0.46	
2,3,4,6,7,8-HxCDF	ND	pg/L	2.9	
1,2,3,7,8,9-HxCDF	ND	pg/L	0.72	
HpCDFs (total)	ND	pg/L	1.2	
1,2,3,4,6,7,8-HpCDF	ND	pg/L	0.70	
1,2,3,4,7,8,9-HpCDF	ND	pg/L	1.2	
OCDF	ND	pg/L	7.8	
Dioxins				
TCDDs (total)	ND	pg/L	2.0	
2,3,7,8-TCDD	ND	pg/L	2.0	
PeCDDs (total)	ND	pg/L	1.5	
1,2,3,7,8-PeCDD	ND	pg/L	1.5	
HxCDDs (total)	ND	pg/L	1.6	
1,2,3,4,7,8-HxCDD	ND	pg/L	1.5	
1,2,3,6,7,8-HxCDD	ND	pg/L	1.5	
1,2,3,7,8,9-HxCDD	ND	pg/L	1.6	
HpCDDs (total)	ND	pg/L	1.4	
1,2,3,4,6,7,8-HpCDD	ND	pg/L	1.4	
OCDD	ND	pg/L	4.3	

(continued on following page)

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NA = Not applicable

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POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS (CONT.)
Method 8290

OUA 0021534

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA004GW
Lab ID: 089126-0003-SA
Matrix: AQUEOUS Sampled: 15 AUG 96 Received: 20 AUG 96
Authorized: 20 AUG 96 Prepared: 23 AUG 96 Analyzed: 27 AUG 96

Sample Amount 1.02 L
Column Type DB-5

	% Recovery	
13C-2,3,7,8-TCDF	32	m
13C-2,3,7,8-TCDD	34	m
13C-1,2,3,7,8-PeCDF	52	
13C-1,2,3,7,8-PeCDD	69	
13C-1,2,3,4,7,8-HxCDF	66	
13C-1,2,3,6,7,8-HxCDD	85	
13C-1,2,3,4,6,7,8-HpCDF	81	
13C-1,2,3,4,6,7,8-HpCDD	97	
13C-OCDD	97	

Note m : Internal standard recovery is outside method recovery goal.

ND = Not detected
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POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS
Method 8290

OUA 0021535

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA005GW
Lab ID: 089126-0004-SA
Matrix: AQUEOUS
Authorized: 20 AUG 96

Sampled: 15 AUG 96
Prepared: 23 AUG 96

Received: 20 AUG 96
Analyzed: 27 AUG 96

Sample Amount 1.04 L
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Furans				
TCDFs (total)	ND	pg/L	3.0	U
2,3,7,8-TCDF	ND	pg/L	3.0	U
PeCDFs (total)	ND	pg/L	2.0	
1,2,3,7,8-PeCDF	ND	pg/L	2.0	
2,3,4,7,8-PeCDF	ND	pg/L	1.7	
HxCDFs (total)	ND	pg/L	2.3	
1,2,3,4,7,8-HxCDF	ND	pg/L	0.51	
1,2,3,6,7,8-HxCDF	ND	pg/L	0.40	
2,3,4,6,7,8-HxCDF	ND	pg/L	2.3	
1,2,3,7,8,9-HxCDF	ND	pg/L	0.63	
HpCDFs (total)	ND	pg/L	1.3	
1,2,3,4,6,7,8-HpCDF	ND	pg/L	0.79	
1,2,3,4,7,8,9-HpCDF	ND	pg/L	1.3	
OCDF	ND	pg/L	7.1	
Dioxins				
TCDDs (total)	ND	pg/L	3.2	U
2,3,7,8-TCDD	ND	pg/L	3.2	U
PeCDDs (total)	ND	pg/L	1.3	
1,2,3,7,8-PeCDD	ND	pg/L	1.3	
HxCDDs (total)	ND	pg/L	1.7	
1,2,3,4,7,8-HxCDD	ND	pg/L	1.5	
1,2,3,6,7,8-HxCDD	ND	pg/L	1.5	
1,2,3,7,8,9-HxCDD	ND	pg/L	1.7	
HpCDDs (total)	ND	pg/L	1.2	
1,2,3,4,6,7,8-HpCDD	ND	pg/L	1.2	
OCDD	ND	pg/L	5.8	

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POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS (CONT.)
Method 8290

OUA 0021536

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA005GW
Lab ID: 089126-0004-SA
Matrix: AQUEOUS
Authorized: 20 AUG 96

Sampled: 15 AUG 96
Prepared: 23 AUG 96

Received: 20 AUG 96
Analyzed: 27 AUG 96

Sample Amount 1.04 L
Column Type DB-5

	% Recovery	
13C-2,3,7,8-TCDF	29	m
13C-2,3,7,8-TCDD	35	m
13C-1,2,3,7,8-PeCDF	48	
13C-1,2,3,7,8-PeCDD	64	
13C-1,2,3,4,7,8-HxCDF	62	
13C-1,2,3,6,7,8-HxCDD	80	
13C-1,2,3,4,6,7,8-HpCDF	77	
13C-1,2,3,4,6,7,8-HpCDD	95	
13C-OCDD	92	

Note m : Internal standard recovery is outside method recovery goal.

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NA = Not applicable

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POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS
Method 8290

OUA 0021537

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA006GW
Lab ID: 089126-0005-SA
Matrix: AQUEOUS
Authorized: 20 AUG 96

Sampled: 15 AUG 96
Prepared: 23 AUG 96

Received: 20 AUG 96
Analyzed: 27 AUG 96

Sample Amount 1.02 L
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Furans				
TCDFs (total)	ND	pg/L	1.6	
2,3,7,8-TCDF	ND	pg/L	1.6	
PeCDFs (total)	ND	pg/L	0.46	
1,2,3,7,8-PeCDF	ND	pg/L	0.46	
2,3,4,7,8-PeCDF	ND	pg/L	0.40	
HxCDFs (total)	ND	pg/L	3.0	
1,2,3,4,7,8-HxCDF	ND	pg/L	0.68	
1,2,3,6,7,8-HxCDF	ND	pg/L	0.54	
2,3,4,6,7,8-HxCDF	ND	pg/L	3.0	
1,2,3,7,8,9-HxCDF	ND	pg/L	0.84	
HpCDFs (total)	ND	pg/L	0.97	
1,2,3,4,6,7,8-HpCDF	ND	pg/L	0.59	
1,2,3,4,7,8,9-HpCDF	ND	pg/L	0.97	
OCDF	ND	pg/L	5.8	
Dioxins				
TCDDs (total)	ND	pg/L	2.6	
2,3,7,8-TCDD	ND	pg/L	2.6	
PeCDDs (total)	ND	pg/L	1.5	
1,2,3,7,8-PeCDD	ND	pg/L	1.5	
HxCDDs (total)	ND	pg/L	1.4	
1,2,3,4,7,8-HxCDD	ND	pg/L	1.3	
1,2,3,6,7,8-HxCDD	ND	pg/L	1.3	
1,2,3,7,8,9-HxCDD	ND	pg/L	1.4	
HpCDDs (total)	ND	pg/L	1.2	
1,2,3,4,6,7,8-HpCDD	ND	pg/L	1.2	
OCDD	ND	pg/L	4.3	

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POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS (CONT.)
Method 8290

OUA 0021538

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA006GW
Lab ID: 089126-0005-SA
Matrix: AQUEOUS Sampled: 15 AUG 96 Received: 20 AUG 96
Authorized: 20 AUG 96 Prepared: 23 AUG 96 Analyzed: 27 AUG 96

Sample Amount 1.02 L
Column Type DB-5

	% Recovery
13C-2,3,7,8-TCDF	40
13C-2,3,7,8-TCDD	44
13C-1,2,3,7,8-PeCDF	56
13C-1,2,3,7,8-PeCDD	72
13C-1,2,3,4,7,8-HxCDF	65
13C-1,2,3,6,7,8-HxCDD	79
13C-1,2,3,4,6,7,8-HpCDF	78
13C-1,2,3,4,6,7,8-HpCDD	94
13C-OCDD	91

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NA = Not applicable

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POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS
Method 8290

OUA 0021539

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA008GW
Lab ID: 089126-0006-SA
Matrix: AQUEOUS Sampled: 15 AUG 96 Received: 20 AUG 96
Authorized: 20 AUG 96 Prepared: 23 AUG 96 Analyzed: 27 AUG 96

Sample Amount 1.04 L
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Furans				
TCDFs (total)	ND	pg/L	2.1	
2,3,7,8-TCDF	ND	pg/L	2.1	
PeCDFs (total)	ND	pg/L	0.46	
1,2,3,7,8-PeCDF	ND	pg/L	0.46	
2,3,4,7,8-PeCDF	ND	pg/L	0.40	
HxCDFs (total)	ND	pg/L	2.6	
1,2,3,4,7,8-HxCDF	ND	pg/L	0.60	
1,2,3,6,7,8-HxCDF	ND	pg/L	0.47	
2,3,4,6,7,8-HxCDF	ND	pg/L	2.6	
1,2,3,7,8,9-HxCDF	ND	pg/L	0.74	
HpCDFs (total)	ND	pg/L	1.1	
1,2,3,4,6,7,8-HpCDF	ND	pg/L	0.68	
1,2,3,4,7,8,9-HpCDF	ND	pg/L	1.1	
OCDF	ND	pg/L	5.5	
Dioxins				
TCDDs (total)	ND	pg/L	1.6	
2,3,7,8-TCDD	ND	pg/L	1.6	
PeCDDs (total)	ND	pg/L	1.6	
1,2,3,7,8-PeCDD	ND	pg/L	1.6	
HxCDDs (total)	ND	pg/L	1.2	
1,2,3,4,7,8-HxCDD	ND	pg/L	1.1	
1,2,3,6,7,8-HxCDD	ND	pg/L	1.1	
1,2,3,7,8,9-HxCDD	ND	pg/L	1.2	
HpCDDs (total)	ND	pg/L	1.0	
1,2,3,4,6,7,8-HpCDD	ND	pg/L	1.0	
OCDD	ND	pg/L	3.8	

(continued on following page)

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ISOMER SPECIFIC ANALYSIS (CONT.)
Method 8290

OUA 0021540

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA008GW
Lab ID: 089126-0006-SA
Matrix: AQUEOUS Sampled: 15 AUG 96 Received: 20 AUG 96
Authorized: 20 AUG 96 Prepared: 23 AUG 96 Analyzed: 27 AUG 96

Sample Amount 1.04 L
Column Type DB-5

	% Recovery	
13C-2,3,7,8-TCDF	34	m
13C-2,3,7,8-TCDD	43	
13C-1,2,3,7,8-PeCDF	57	
13C-1,2,3,7,8-PeCDD	75	
13C-1,2,3,4,7,8-HxCDF	72	
13C-1,2,3,6,7,8-HxCDD	88	
13C-1,2,3,4,6,7,8-HpCDF	82	
13C-1,2,3,4,6,7,8-HpCDD	101	
13C-OCDD	92	

Note m : Internal standard recovery is outside method recovery goal.

ND = Not detected
NA = Not applicable

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POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS
Method 8290

OUA 0021541

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA007GW
Lab ID: 089126-0007-SA
Matrix: AQUEOUS Sampled: 15 AUG 96 Received: 20 AUG 96
Authorized: 20 AUG 96 Prepared: 23 AUG 96 Analyzed: 27 AUG 96

Sample Amount 1.02 L
Column Type DB-5

Parameter	Result	Units	Detection Limit	Data Qualifiers
Furans				
TCDFs (total)	ND	pg/L	2.1	
2,3,7,8-TCDF	ND	pg/L	2.1	
PeCDFs (total)	ND	pg/L	0.70	
1,2,3,7,8-PeCDF	ND	pg/L	0.70	
2,3,4,7,8-PeCDF	ND	pg/L	0.60	
HxCDFs (total)	ND	pg/L	2.8	
1,2,3,4,7,8-HxCDF	ND	pg/L	0.90	
1,2,3,6,7,8-HxCDF	ND	pg/L	0.71	
2,3,4,6,7,8-HxCDF	ND	pg/L	2.8	
1,2,3,7,8,9-HxCDF	ND	pg/L	1.1	
HpCDFs (total)	ND	pg/L	1.7	
1,2,3,4,6,7,8-HpCDF	ND	pg/L	1.0	
1,2,3,4,7,8,9-HpCDF	ND	pg/L	1.7	
OCDF	ND	pg/L	7.6	
Dioxins				
TCDDs (total)	ND	pg/L	2.1	
2,3,7,8-TCDD	ND	pg/L	2.1	
PeCDDs (total)	ND	pg/L	1.6	
1,2,3,7,8-PeCDD	ND	pg/L	1.6	
HxCDDs (total)	ND	pg/L	2.3	
1,2,3,4,7,8-HxCDD	ND	pg/L	2.1	
1,2,3,6,7,8-HxCDD	ND	pg/L	2.1	
1,2,3,7,8,9-HxCDD	ND	pg/L	2.3	
HpCDDs (total)	ND	pg/L	2.3	
1,2,3,4,6,7,8-HpCDD	ND	pg/L	2.3	
OCDD	ND	pg/L	10	

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POLYCHLORINATED DIOXINS/FURANS
ISOMER SPECIFIC ANALYSIS (CONT.)
Method 8290

OUA 0021542

Client Name: Ecology & Environment, Inc.
Client ID: 96RRFTA007GW
Lab ID: 089126-0007-SA
Matrix: AQUEOUS
Authorized: 20 AUG 96

Sampled: 15 AUG 96
Prepared: 23 AUG 96

Received: 20 AUG 96
Analyzed: 27 AUG 96

Sample Amount 1.02 L
Column Type DB-5

	% Recovery
13C-2,3,7,8-TCDF	48
13C-2,3,7,8-TCDD	53
13C-1,2,3,7,8-PeCDF	63
13C-1,2,3,7,8-PeCDD	78
13C-1,2,3,4,7,8-HxCDF	76
13C-1,2,3,6,7,8-HxCDD	89
13C-1,2,3,4,6,7,8-HpCDF	86
13C-1,2,3,4,6,7,8-HpCDD	101
13C-OCDD	94

ND = Not detected
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OUA 0021543

F

OUA 0021544

F Contaminant Characteristics

F Contaminant Characteristics

Appendix F presents chemical contaminants present at Operable Unit A (OU-A) that can be attributed to the site based on background information and available literature regarding the constituents of petroleum products. In addition, the physical-chemical characteristics affecting the environmental fate and transport of the identified contaminants are presented. Table F-1 summarizes the chemical contaminants of potential concern identified at OU-A.

Petroleum Hydrocarbons

Petroleum fuels are associated with each contaminant source identified at OU-A. Petroleum products are complex mixtures of more than 1,200 different hydrocarbons ranging from short-chain aliphatics to complex long-chain compounds. The physical properties of petroleum fuels vary according to refining processes, the origin of the crude oil, and the constituents and their percentages. Based on their molecular structure and solubility in water, most constituents of petroleum can be divided into one of the following groups:

- Those that preferentially adsorb to soil particles;
- Those that volatilize rapidly;
- Those that tend to migrate through soil to groundwater as a solute; and
- Those for which multiple pathways exist.

The major constituents and additives to regular unleaded gasoline, leaded gasoline, aviation fuel (jet A), and diesel fuel No. 2 are presented in Table F-2. Table F-3 presents the hazardous constituents of regular unleaded gasoline, leaded gasoline, JP-4, and DFA according to Material Safety Data Sheets (MSDSs) provided by MAPCO Alaska Petroleum, Inc. Table F-4 presents the estimated relative environmental partitioning of selected common petroleum constituents.

The transport of a petroleum product in the environment is largely determined by the physical and chemical properties of the individual constituents of the product. In general, soils with high organic content tend to adsorb petroleum hydrocarbons. Low-molecular weight constituents are not bound as strongly and will volatilize or leach out before the higher molecular weight constituents.

The aromatic constituents of petroleum products have densities of less than one. Consequently, a fresh petroleum spill that infiltrates soil to groundwater will accumulate at the water table. In this case, the most frequent migration mechanisms would be groundwater flow in the water table aquifer and vapor transport to vadose zone soils. As the petroleum mixes with groundwater, the aromatic petroleum constituents can become dissolved in the groundwater and natural degradation will begin to occur. At this point, vertical and horizontal groundwater gradients will influence the migration of the dissolved petroleum constituents. Long-chain hydrocarbons, such as bunker C-range organic compounds, will be the most prevalent form of the petroleum mixture as the residence time of the original product in the subsurface increases. These degraded petroleum fractions can be detected at locations far removed from the original spill location (Nyer 1992; Kostecki and Calabrese 1989).

Polynuclear Aromatic Hydrocarbons (PAHs)

Four PAHs were detected during the RI: benzo(a)anthracene, benzo(a)pyrene, benzo (b)fluoranthene, and indeno(1,2,3-c,d) pyrene. The chemical characteristics and behavior of these high molecular weight PAHs are expected to be similar in the environment. Table F-5 presents the physical and chemical properties of the organic channel of potential concern. They will volatilize from soil and water to a limited extent (Lyman et al. 1982) and have a strong tendency to adsorb to soil particles in soils with high organic content. These PAHs have low solubilities in water and are primarily found sorbed to suspended particles or settled in the bottom of the water column. PAHs will undergo biodegradation in soil and aquatic systems.

Dioxins/Furans (PCDDs/PCDFs)

PCDDs and PCDFs were detected during the OU-A RI investigation and are associated with the combustion of diesel, waste oils, and solvents. They are primarily associated with organic matter because of their high lipophilicity and low water solubility. PCDDs/PCDFs show little vertical migration in soil due to low water solubility and vapor pressure (Palarusky et al. 1986). Solvents such as waste oil or diesel fuel, and surfactants enhance their mobility in soils (Puri et al. 1989). PCDDs/PCDFs are extremely stable

compounds under most environmental conditions and have exhibited strong resistance to microbial degradation in soils (Freeman and Schory 1984). Several studies have reported that photolysis is a primary mechanism of degradation.

Inorganic Elements

Many inorganic elements were detected in various media at OU-A. Based on site-specific knowledge, however, chromium, mercury, and silver are the only elements suspected of being released to the environment from previous operations at OU-A. The mobility of inorganics is greatly affected by the oxidation-reduction potential, pH, particle-size distribution, and the concentration of other inorganics and organics in the surrounding environment.

Chromium

Chromium (Cr) occurs in two oxidation states in aqueous systems: Cr^{+3} and Cr^{+6}. Cr^{+6} is more toxic than Cr^{+3}. Trivalent chromium (Cr^{+3}) reacts with hydroxide ions in water to form insoluble chromium hydroxide, $Cr(OH)_3$, which is rapidly removed from water by precipitation and sorption to soils or sediments (EPA 1984). Hexavalent chromium (Cr^{+6}) forms soluble chromate and dichromate anions, which are not strongly sorbed to soils or sediments, and are mobile in the environment (EPA 1984). Cr^{+6} and Cr^{+3} can be converted in soils or surface water under conditions that change the redox potential of the system to solubilize or precipitate chromium (EPA 1979).

Chromium does not appear to undergo biological transformation reactions such as methylation, but Cr^{+6} can be chemically reduced to Cr^{+3} upon contact with plant or animal tissue (E & E 1994).

Mercury

Mercury (Hg) can be found in three oxidation states: Hg^0, Hg^{+1}, and Hg^{+2}. Hg^0 is a liquid at room temperature and forms amalgams with many metals. These amalgams are liquid when the concentration of the other metal is small, but they solidify as the other metal concentration increases. Mercury forms approximately 68 known inorganic compounds and 42 organic derivatives (CRC 1983). Organic mercury compounds tend to be more soluble and mobile than inorganic mercury compounds (Manahan 1994). Inorganic mercury can be converted in the environment to methylmercury by bacteria (Manahan 1994). Mercury may volatilize, however, the vapor pressure is somewhat irregular (Clayton et al. 1981).

Silver

Silver is a white, lustrous metal, which is very ductile and malleable, and it is the best conductor of heat and electricity. Silver can be found in three oxidation states: Ag^0, Ag^{+1}, and Ag^{+2}. The majority of silver is found as Ag^{+1}. Silver is insoluble in water and soluble in nitric acid. Silver tends to be immobilized in the presence of iron and manganese complexes, and organic matter (Boyle 1968). Silver may form complex ions with chlorides, and sulfates; forms soluble organic compounds; and adsorb onto humic complexes and suspended particles (Boyle 1968). Biotransformation is not a significant process because silver inhibits bacterial biodegrative enzymes (Domsch 1984).

Table F-1 CHEMICAL CONTAMINANTS[a] OPERABLE UNIT A FORT RICHARDSON, ALASKA
Fuel
Gasoline
Diesel
Base, Neutral, Acid Extractable Compounds (BNAs)
benzo (A) Anthracene
benzo (A) Pyrene
benzo (b) fluoranthene
indeno (1,2,3-cd) Pyrene
Inorganic Elements
Chromium
Mercury
Silver
Dioxins/Furans

[a] The list of contaminants presented in this table is referenced in the contaminants list provided in the Approach Document for the Baseline Human Health Risk Assessment (E & E 1995). The Approach Document list has been condensed on the basis of attributability to OU-A contaminant sources.

OUA 0021550

Table F-2

COMPOSITION OF FUELS
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Regular Unleaded Gasoline	Volume %
Normal/Iso Hydrocarbons (58%)	
Isopentane	9-11
n-Butane	4-5
n-Pentane	2.6-2.7
Isobutane	0.7-1
Propane	0.07-0.08
2-Methylpentane	—
Hexane	—
Methylhexanes	—
Heptane	—
Methylheptanes	—
Methyloctanes	—
Decane	—
Undecane	—
Aromatic Hydrocarbons (32%)	
Xylenes	6-7
Toluene	6-7
Ethylbenzene	5
Benzene	2-5
1,3,5-Trimethylbenzene	1.3
1,2,3-Trimethylbenzene	0.73
n-Propylbenzene	0.6
Naphthalene	0.2-0.5
n-Butylbenzene	0.08
Methylnaphthalenes	—
Benzo(b)fluoranthene	3.9 (mg/L)
Fluoranthene	1.84 (mg/L)
Anthracene	1.84 (mg/L)
Anthracene	1.55 (mg/L)
Benzo(e)pyrene	0.3 (mg)
Olefins (5%)	
3-Methyl 1-butene	0.06-0.08
2-Butene	0.16-0.17
Cyclic Hydrocarbons (5%)	
Cyclopentane	—
Cydohexane	—

Leaded Gasoline	Volume %
Normal/Iso Hydrocarbons (59%)	
Isopentane	9-11
n-Butane	4-5
n-Pentane	2.6-2.7
Isobutane	0.1
Propane	0.07-0.08
2-Methylpentane	—
Hexane	—
Methylhexanes	—
Heptane	—
Methylheptanes	—
Decane	—
Undecane	—
Aromatic Hydrocarbons (26%)	
Xylenes	6-7
Toluene	6-7
Ethylbenzene	5
Benzene	2-5
1,3,5-Trimethylbenzene	1.3
1,2,3-Trimethylbenzene	0.73
Naphthalene	0.08
n-Butylbenzene	0.2-0.5
Methylnaphthalenes	—
Benzo(b)fluoranthene	3.9 (mg/L)
Fluoranthene	1.84 (mg/L)
Anthracene	1.55 (mg/L)
Benzo(e)pyrene	0.3 (mg/L)
Olefins (5%)	
2-Butene	0.06-0.17
3-Methyl 1-butene	0.06-0.08
Cyclic Hydrocarbons (5%)	
Cyclopentane	—
Cydohexane	—
Methylcyclopentane	—
Methylcyclohexane	—
Additives	

Key at end of table.

OUA 0021551

Table F-2

COMPOSITION OF FUELS
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Regular Unleaded Gasoline	Volume %	Leaded Gasoline	Volume %
Methylcyclopentane	—	Tetraethyl lead	600 (mg/L)
Methylcyclohexane	—	Tetramethyl lead	5 (mg/L)
Additives		Dichloroethane	210 (mg/L)
Ethyl Alcohol (octane booster)	Up to 5	Dibromoethane (EDB)	190 (mg/L)
Methyl t-butyl ether (octane booster)	Up to 12	2,6-di-t-butyl-4-methylphenol (anti-oxidant)	—
Methyl alcohol (fuel line anti-icer)	0.2		
Tricresyl phosphate (combustion chamber deposit modifier)	Up to 0.2 (mg/L)		
2,6 Di-t-butyl-4-methylphenol (anti-oxidant)	—		

Key at end of table.

OUA 0021552

Table F-2

COMPOSITION OF FUELS
OPERABLE UNIT A
FORT WAINWRIGHT, ALASKA

Aviation Fuel (Jet A)	Volume %	Diesel Fuel No. 2	Volume %
Normal/Iso Hydrocarbons (59%)		**Cyclic Hydrocarbons (0.93%)**	
Undecane	36	Cyclopentane	0.59
Decane	16.5	Tetramethylcyclopentane	0.01
3-Methyloctane	2.5	Propylcyclohexane	0.07
Dodecane	0.7	Ethylcyclohexane	0.04
Tridecane	0.5	1,1,3-Trimethylcyclohexane	0.03
2,6,10-Trimethyldodecane	0.45	**Additives**	
2-Methylbutane	0.2	Dibromoethane (EDB)	0.05
2-Methylnonane	0.2	**Normal/Iso Hydrocarbons (75%)**	
2-Methylbutane	0.26	Predominantly C_{10} to C_{16}	
3-Methyldecane	0.14	**Aromatic Hydrocarbons (15%)**	
4-Methylnonane	0.22	Phenanthrene	0.26-0.3
Aromatic Hydrocarbons (35%)		Naphthalene	0.14-0.11
1,2,4,5-Tetramethylbenzene	9	Fluorene	0.07-0.1
1,2,3-Trimethylbenzene	6.6	Anthracene	0.013-0.02
1,2-Dimethyl-3-propylbenzene	5.4	1,2,3,4-Tetrahydroquinoline	—
Propylbenzene	3-5	2,6-Dimethylquinoline	—
1-Methyl-4-propylbenzene	3.3	1-Methylnaphthalene	—
Buytlbenzene	2	2,3,6-Trimethylnaphthalene	—
2-Methylnaphthalene	—	2,3,5-Trimethylnaphthalene	—
Methylindane	0.3	1,3,5-Trimethylbenzene	—
Naphthalene	0.14	n-Propylbenzene	Trace
2-Methylnaphthalene	0.34	Ethylbenzene	Trace
1,2-Diethylbenzene	0.24	Xylenes	Trace
1,4-Dimethyl-2-ethylbenzene	0.2	Toluene	Trace
1,3-Dimethylnaphthalene	0.15	Benzene	Trace
Xylenes	.07	**Additives**	
Ethylbenzene	0.02	N,N-Disalicylidene diamine (metal deactivator)	—
Benzene	0.02	Alkyl Nitrate (cetane improver)	0.2
Toluene	Trace	2,6-Di-t-butyl-4-methylphenol (anti-oxidant)	—
Olefins (0%)		Tetroethyl lead	600 (mg/L)
Aviation Fuel (JP-4)			
n-Butane	0.12	2,5-Dimethylheptane	0.52
Isobutane	0.66	Unidentified	0.98

Key at end of table.

OUA 0021553

Table F-2

COMPOSITION OF FUELS
OPERABLE UNIT A
FORT WAINWRIGHT, ALASKA

Aviation Fuel (Jet A)	Volume %	Diesel Fuel No. 2	Volume %
n-Pentane	1.06	Ethylbenzene	0.37
2,2-Dimethylbutane	0.10	m-Xylene	0.96
2-Methylpentane	1.28	p-Xylene	0.35
3-Methylpentane	0.89	3,4-Dimethylheptane	0.43
n-Hexane	2.21	4-Ethylheptane	0.18
Methylcyclopentane	1.16	4-Methyloctane	0.86
2,2-Dimethylpentane	0.25	2-Methyloctane	0.88
Benzene	0.50	3-Methyloctane	0.79
Cyclohexane	1.24	o-Xylene	1.01
2-Methylhexane	2.35	1-Methyl-4-ethylcyclohexane	0.48
3-Methylhexane	1.97	n-Nonane	2.25
trans-1,3-Dimethylcyclopentane	0.36	Isopropylbenzene	0.30
cis-1,3-Dimethylcyclopentane	0.34	n-Propylbenzene	0.71
cis-1,2-bimethylcyclopentane	0.54	1-Methyl-3-ethylbenzene	0.49
n-Heptane	3.67	1-Methyl-4-ethylbenzene	0.43
Methylcyclohexane	2.27	1,3,5-Trimethylbenzene	0.42
2,2,3,3-Tetramethylbutane	0.24	1-Methyl-2-ethylbenzene	0.23
Ethylcyclopentane	0.26	1,2,4-Trimethylbenzene	1.01
2,5-Dimethylhexane	0.37	n-Decane	2.16
2,4-Dimethylhexane	0.58	n-Butylcyclohexane	0.70
1,2,4-Trimethylcyclopentane	0.25	1,3-Diethylbenzene	0.46
3,3-Dimethylhexane	0.26	1-Methyl-4-propylbenzene	0.40
1,2,3-Trimethylcyclopentane	0.25	1,3-Dimethyl-5-ethylbenzene	0.61
Toluene	1.33	1-Methyl-2-i-propylbenzene	0.29
2,2-Dimethylhexane	0.71	1,4-Dimethyl-2-ethylbenzene	0.70
2-Methylheptane	2.70	1,2-Dimethyl-4-ethylbenzene	0.77
4-Methylheptane	0.92	n-Undecane	2.32
cis-1,3-Dimethylcyclohexane	0.42	1,2,3,4-Tetramethylbenzene	0.75
3-Methylheptane	3.04	Naphthalene	0.50
1-Methyl-3-ethylcyclohexane	0.17	2-Methylundecane	0.64
1-Methyl-2-ethylcyclohexane	0.39	n-Dodecane	2.00
Dimethylcyclohexane	0.43	2,6-Dimethylundecane	0.71
n-Octane	3.80	Unidentified	0.68
1,3,5-Trimethylcyclohexane	0.99	2-Methylnaphthalene	0.56

Key at end of table.

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Table F-2

COMPOSITION OF FUELS
OPERABLE UNIT A
FORT WAINWRIGHT, ALASKA

Aviation Fuel (Jet A)	Volume %	Diesel Fuel No. 2	Volume %
1,1,3-Trimethylcyclohexane	0.48	1-Methylnaphthalene	0.78
		n-Tridecane	1.52
		2,6-Dimethylnaphthalene	0.25
		n-Tetradecane	

Key:

— = Hydrocarbon is not present.

Source: Watts 1989.

Table F-3

HAZARDOUS CONSTITUENTS OF MAPCO REFINERY FUEL BY AVERAGE WEIGHT (%) OPERABLE UNIT A FORT RICHARDSON, ALASKA

Constituent	Unleaded Gasoline (MUR)	Leaded Gasoline (MOGAS)	Jet Fuel (JP-4)	Arctic Grade Fuel Oil (DFA)
Benzene	3.63	3.63	0.78	0.24
Cumene (isopropylbenzene)	0.62	0.70	—	0.04
Cyclohexane	2.07	2.07	<4.0	—
Ethylbenzene	1.70	1.80	0.85	0.09
1,2,4-Trimethylbenzene	3.58	4.20	0.81	0.27
Toluene	6.95	6.95	3.33	0.50
Mixed xylenes	9.04	9.85	2.60	0.53
Tetra ethyl lead	—	0.007	—	—
Diethylene glycol monomethyl ether	—	—	0.17	—
Naphthalene	—	—	—	0.34

Source: Mapco 1993a.

Table F-4

ESTIMATED RELATIVE ENVIRONMENTAL PARTITIONING OF SELECTED PETROLEUM CONSTITUENTS OPERABLE UNIT A FORT RICHARDSON, ALASKA

Petroleum Constituents	Percent Adsorbed to Soil Particles	Percent Volatilized	Percent Solubilized in Groundwater and Soil Moisture
Alkanes			
(n)Heptane	0.1	99.8	0.1
(n)Hexane	0.1	99.8	0.1
(n)Pentane	0.1	99.8	0.1
Aromatics			
Benzene	3	62	35
Ethylbenzene	21	59	20
Naphthalene	61	8	31
Toluene	3	77	20
O-Xylene	15	54	31

Source: Adapted from Kostecki and Calabrese 1989.

Table F-5

PHYSICAL AND CHEMICAL PROPERTIES OF PRIMARY ORGANIC CHEMICALS OF POTENTIAL CONCERN OPERABLE UNIT A FORT RICHARDSON, ALASKA

Chemical Name	CAS Number	Mole Weight (g/mole)	Physical State at 20°C	Water Solubility (mg/L)	Source	Liquid Density (g/mL)	Source	Vapor Pressure (mm Hg)	Source	Henry's Law Constant (atm-m^3/mol)	Source	K_{oc} (mL/g)	Source	Log K_{oc}	Source	BCF	Source
Dioxins/Furans																	
2,3,7,8-TCDD	1746-02-6	322.0	Solid	2.00 E-04	A	1.83	B	1.70 E-06	A	3.60 E-03	A	B3.30 E+06	A	6.20	B	5.00 E+03	A
Polynuclear Aromatic Hydrocarbons																	
Benzo(a)anthracene	56-55-3	228.30	Solid	1.20 E-02	B	1.27	B	2.20 E-08	B	2.30 E-06	B	1.38 E+06	B	5.90	B	1.17 E+04	A
Benzo(a)pyrene	50-32-8	252.32	Solid	390 E-03	B	1.35	B	5.60 E-09	B	2.40 E-06	B	1.00 E-06	B	6.00	B	5.00 E+03	C
Benzo(b)fluoranthene	205-99-2	252.32	Solid	1.40 E-02	B	–	–	5.00 E-07	B	2.20 E-05	B	5.49 E+05	B	6.57	B	–	–
Indeno (1,2,3-cd)Pyrene	193-39-5	276.3	Solid	–	B	–	–	10^{-10}	B	6.95×10^{-8}	B	1.6× E-0^6	B	6.20	B	–	–

A Miscellaneous Physical Contract Handbook.
B Knox, R.C., 1993, *Subsurface Fate and Transport Processes*, Lewis Publishers, Inc., Ann Arbor, Michigan.
C Kitano, M., 1978, *Biodegradation and Bioaccumulation Tests on Chemical Substances*, OECD Tokyo Meeting, TSU-No. 3.

Key:

-	=	No available data.
atm -m^3/mol	=	Atmospheres in cubic meters per inch.
BCF	=	Bioconcentration Factor.
g/mL	=	Grams per liter.
K_{oc}	=	Organic carbon coefficient.
mg/L	=	Milligrams per liter.
mL/g	=	Milliliters per gram.
mmHg	=	Millimeters of mercury.
VOCs	=	Volatile organic compounds.

Key at end of table.

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G

G Contaminant Transport Modeling

G Contaminant Transport Modeling

Objectives

The SESOIL contaminant transport model was used to calculate preliminary, conservative, order-of-magnitude estimates of the leachability of petroleum constituents in subsurface soil at each OU-A site. Each SESOIL model is based on a simplified conceptual system of the unsaturated soil horizon and uses the best available site information, appropriate published data, and professional estimates where necessary.

The effects of biodegradation, chemical transformation, and dispersion are not accounted for in the models for OU-A. Therefore, the chemical concentrations and estimates of the maximum depth of contaminant migration provided by the models are probably much greater than if degradation processes were included in the models. Contaminated media volumes assumed for each site were also estimated conservatively.

SESOIL Computer Model

SESOIL is a seasonal soil compartment model that estimates the rate of vertical chemical transport and transformation in the soil column in terms of mass and concentration distributions among the soil, water, and air phases in the unsaturated soil zone (Bonazountas and Wagner 1984). The model uses regional and site-specific input data for climate, soil characteristics, chemical parameters, contaminant application rates, and contaminant degradation rates to simulate chemical mobility and fate within a discrete soil column.

The soil column is defined in the model as a compartment that extends from the soil surface through the unsaturated zone to the groundwater table. The soil compartment can be divided into a maximum of four layers of varying thickness and specific soil properties, and contaminant data can be defined for each layer. Layers may then be further divided into a maximum of 10 sublayers. Sublayers share the same input properties as defined for the layer and are used for contaminant tracking and data reporting.

The SESOIL model output includes chemical concentrations, mass quantities, and partitioning (e.g., quantities adsorbed, volatilized, and dissolved in soil moisture) for each layer and sublayer of the model. Output from the models is produced monthly to create simulations up to a total simulation time of 99 years. A summary of the results generated by each model for the three OU-A sites is presented in Table G-1. Tables G-2 through G-4 present the results generated by each site-specific model for OU-A.

Model Input Data

Site-specific data used for the model design and input are provided in this appendix following Tables G-2 through G-4, and the sources of the data are included. In general, climatological and chemical property data were not specific to individual sites, but were available through published resources and applied uniformly to all three sites. (Climate data were available from Merrill Air Field station.) Soil characterization information was developed on a site-specific basis and was derived from either site sample data or published values for generalized soil types. Soil horizons and contaminant zone designs were derived from the soil borings and sample analytical data generated during the RI.

Analytical data for diesel-range organics (DRO) were the most consistently available data for subsurface soils at each OU-A site. However, only one chemical's properties (e.g., molecular weight, Henry's Law constant) can be input into the SESOIL model. Thus, DRO, a mixture of chemicals, cannot be used as a contaminant in SESOIL. Because the SESOIL model requires compound-specific information, naphthalene was chosen as a representative and persistent component of the arctic-grade diesel that is believed to be a likely source of the DRO contamination at OU-A. The concentrations of naphthalene used for the model were derived as a fraction of the average DRO concentration detected at each site. The fraction of naphthalene in DRO was determined from the average percent constituents of diesel fuels reported by Mapco Alaska (Mapco 1993b). The area, thickness, and average concentration of contamination were conservatively determined for each site based on the depths and locations of soil boring samples containing DRO at concentrations greater than 100 mg/kg.

Model Calibration

Calibration of the SESOIL model involves adjusting various input parameters (soil disconnectedness, intrinsic permeability, and porosity) so that output parameters, such as soil moisture and recharge, reflect actual (measured) or reasonable site-specific conditions. Each model was calibrated to a soil moisture reading from 5% to 7.5% according to the results of laboratory soil analyses. In addition, the total recharge estimates formulated by the models

averaged approximately 7.8 inches per year, or 57% of the total annual precipitation. These estimates are reasonable for this location based on the data presented in a 1989 groundwater model for the Anchorage area prepared by the United States Geological Survey (Patrick et al. 1989).

SESOIL Model Results

All SESOIL models were run for a total simulation time of 90 years. Model output data are summarized in Table G-1 for each site for years 1, 10, and 90 of the simulation. The model data presented in this table include: maximum depths of contaminant movement, concentrations of adsorbed naphthalene, and concentrations of naphthalene in soil moisture. Based on observed depth of groundwater at each site, the depth to groundwater from the contaminant front was determined based on the model results. Abbreviated model output reports for each site are also provided in this appendix.

As indicated in Table G-1, contaminant migration in the unsaturated soil column does not reach groundwater levels at any of the three OU-A sites during the 90-year model simulations. At the RRTSL site, contaminants originating at an observed maximum depth of 20-feet BGS migrate approximately 0.5 feet, 4.5 feet, and 37 feet over the 1-, 10-, and 90-year modeling periods, respectively. Without considering the effects of natural attenuation processes, such as biodegradation, the contaminant front would migrate to within 30 feet of groundwater levels. As a result of such degradation processes, it is unlikely that groundwater contamination would pose concern at the RRTSL site.

At the RRFTA and POLLDW sites, maximum estimated contaminant migration distances of 9.5 feet and 11 feet, respectively, were predicted for the 90-year simulation period. With observed maximum contaminants depths of 20 feet at the RRFTA site and 64 feet at the POLLDW site, the contaminant front in each case migrates to within 121 feet and 40 feet of groundwater, respectively. Based on the likelihood that biodegradation and other natural attenuation processes would reduce contaminant concentrations and migration distances, it is extremely unlikely that groundwater contamination would pose concern at either site.

Table G-1

SESOIL MODEL SUMMARY
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Site	Modeling Time	Modeled Maximum Contaminant Depth (ft. BGS)[a]	Vertical Contaminant Migration Distance from Time 0 (ft.)	Estimated Distance to Groundwater from Contaminants (ft.)	Model Estimated Naphthalene Concentrations	
					Soil (mg/kg)	Soil Moisture (mg/L)
Roosevelt Road Transmitter Site Leachfield	1 year	20	0.5	66	12	9.1
	10 year	24	4.5	62	0.11	0.08
	90 year	56	37	30	0.61	0.47
Ruff Road Fire Training Area	1 year	20	0.5	130	17	3.3
	10 year	21	1.5	129	1.1	0.21
	90 year	29	9.5	121	0.82	0.15
Petroleum, Oil, and Lubricant Laboratory Dry Well	1 year	65	0	51	120	30
	10 year	66	2	49	21	5.2
	90 year	75	11	40	0.7	0.17

[a] The maximum contaminant depths were originally calculated in metric units (see attached data).

Key:

BGS = below ground surface.
ft. = feet.
m = meters.
mg/kg = milligrams per kilogram.
mg/L = milligrams per liter.

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Table G-2

SESOIL MODEL INPUT SUMMARY
ROOSEVELT ROAD TRANSMITTER SITE LEACHFIELD
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Parameter	Baseline Input Data	Source
Soil Data:		
Intrinsic Permeability (cm^2)	5.00E-09	Site Data, Literature
Effective Porosity	0.29	Literature
Soil Disconnectedness	4	Documentation
Total Organic Carbon (%)	0.1	Site Data
Soil pH	7	Documentation
Dry Bulk Density (g/cm^3)	1.7	Site Data / Documentation
CEC (meq/100g)	0	Documentation
Freudlich Exponent	1	Documentation
Chemical Data:		
Adsorption Coefficient, K_{oc} (µg/g)/(µg/mL)	1300	Literature
Biodegradation Rate, water (1/day)	0	--
Biodegradation Rate, soil (1/day)	0	--
Solubility (ug/mL @ 25°C)	31.7	Literature
Diffusion Coefficient in Air (cm^2/s)	0.001	Literature
Henry's Law Constant @ 25°C	0.00115	Literature
Soil Partition Coefficient, K_d (µg/g)/(µg/mL)	calculated	--
Molecular Weight (g/mol)	128	Literature
Neutral Hydrolysis (L/mol-day)	0	--
Base Hydrolysis (L/mol-day)	0	--
Acid Hydrolysis (L/mol-day)	0	--
Ligand Stability Constant	0	--
Ligand Ratio	0	--
Ligand Molecular Weight (g/mol)	0	--
Application and Climate Data:		
Site Latitude	61	Site Data
Surface Area (cm^2)	1.20E+07	Site Data
Spill Index (1-spill, 2-constant)	1	--
Residual Concentration (mg/kg of naphthalene)	0.83	Site Data
No. of Layers / Compartments	4	Documentation
Layer 1 thickness (cm)	580	Site Data
Layer 2 thickness (cm)	30	Site Data
Layer 3 thickness (cm)	1000	Site Data
Layer 4 thickness (cm)	1000	Site Data
All Interlayer Ratios	1	Documentation
Climate	Merrill Field	Literature

Notes: Documentation = refers to model recommended settings.
Literature = refers to available information of published data.
Site Data = refers to site specific data collected during the RI.

Key at end of table.

Key:

-- = not applicable or not required.
cm = centimeters.
cm^2 = square centimeters.
cm^2/s = square centimeters per second.
g/cm^3 = grams per cubic centimeter.
g/mol = grams per mole.
L/mol-day = liters per mole per day.
meq/100g = milliequivalents per 100 grams of dry soil.
µg/g = micrograms per gram.
mg/kg = milligrams per kilogram.
µg/mL = micrograms per milliliter.

RRTSL025_WPD

OUA 0021566

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**********************************************************************************************************
*****                                                                                                    *****
***** SESOIL-84 :  SEASONAL CYCLES OF WATER, SEDIMENT, AND POLLUTANTS IN SOIL ENVIRONMENTS               *****
*****                                                                                                    *****
***** DEVELOPERS:  M. BONAZOUNTAS,ARTHUR D. LITTLE INC.  ,(617)864-5770,X5871                           *****
*****              J. WAGNER     ,DIS/ADLPIPE, INC.      ,(617)492-1991,X5820                          *****
*****                                                                                                    *****
***** MODIFIED EXTENSIVELY BY:                                                                          *****
***** D.M. HETRICK                                                                                      *****
***** OAK RIDGE NATIONAL LABORATORY                                                                     *****
***** (615) 576-7556                                                                                    *****
***** VERSION    :  SEPTEMBER 1986                                                                      *****
*****                                                                                                    *****
**********************************************************************************************************
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****** MONTHLY SESOIL MODEL OPERATION ******
MONTHLY SITE SPECIFIC SIMULATION

REGION : Ft. Richardson: OU-A RRTSL
SOIL TYPE : Sand
COMPOUND : Naphthalene
WASHLOAD DATA :
APPLICATION AREA: AP3598, AP3603, AP3602; 5 to 20ft

GENERAL INPUT PARAMETERS

-- SOIL INPUT PARAMETERS --

SOIL DENSITY (G/CM**3):	1.70
INTRINSIC PERMEABILITY (CM**2):	.500E-08
DISCONNECTEDNESS INDEX (-):	4.00
POROSITY (-):	.290
ORGANIC CARBON CONTENT (%):	.100
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL):	.000
FREUNDLICH EXPONENT (-):	1.00

1

-- CHEMICAL INPUT PARAMETERS --

SOLUBILITY (UG/ML):	31.7
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC):	.100E-02
HENRYS LAW CONSTANT (M**3-ATM/MOLE):	.115E-02
ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC):	.130E+04
ADSORPTION COEFFICIENT ON SOIL (K):	.000
MOLECULAR WEIGHT (G/MOL):	128.
VALENCE (-):	.000
NEUTRAL HYDROLYSIS CONSTANT (/DAY):	.000
BASE HYDROLYSIS CONSTANT (L/MOL-DAY):	.000
ACID HYDROLYSIS CONSTANT (L/MOL-DAY):	.000
DEGRADATION RATE IN MOISTURE (/DAY):	.000
DEGRADATION RATE ON SOIL (/DAY):	.000
LIGAND-POLLUTANT STABILITY CONSTANT (-):	.000
NO. MOLES LIGAND/MOLE POLLUTANT (-):	.000
LIGAND MOLECULAR WEIGHT (G/MOL):	.000

-- APPLICATION INPUT PARAMETERS --

NUMBER OF SOIL LAYERS:	4			
YEARS TO BE SIMULATED:	90			
AREA (CM**2):	0.120E+08			
APPLICATION AREA LATITUDE (DEG.):	61.1			
SPILL (1) OR STEADY APPLICATION (0):	1			
DEPTHS (CM):	0.58E+03	30.	0.10E+04	0.10E+04
NUMBER OF SUBLAYERS/LAYER	1	1	10	10
PH (CM):	7.0	7.0	7.0	7.0
INTRINSIC PERMEABILITIES (CM**2):	0.00	0.00	0.00	0.00
KDEL RATIOS (-):	1.0	1.0	1.0	
KDES RATIOS (-):	1.0	1.0	1.0	
OC RATIOS (-):	1.0	1.0	1.0	
CEC RATIOS (-):	1.0	1.0	1.0	
FRN RATIOS(-):	1.0	1.0	1.0	
ADS RATIOS(-):	1.0	1.0	1.0	

YEAR - 1 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TEMP. (DEG C)	1.390	-5.000	-11.200	-14.900	-9.500	-6.050	2.170	7.390	12.390	14.720	13.560	8.780
CLOUD CVR (FRAC.)	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
REL. HUM.(FRAC.)	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
ALBEDO (-)	0.180	0.320	0.480	0.510	0.480	0.420	0.210	0.150	0.150	0.150	0.150	0.150
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PRECIP. (CM)	3.690	1.350	3.150	2.030	1.170	0.990	0.660	0.790	3.450	4.060	7.210	6.530
M.TIME RAIN(DAYS)	0.430	0.500	0.430	0.480	0.370	0.310	0.310	0.320	0.380	0.470	0.590	0.420
M. STORM NO. (-)	2.170	2.170	1.520	1.410	1.040	0.910	1.180	1.520	3.320	4.240	4.180	2.000
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

-- POLLUTANT INPUT PARAMETERS --

POL. INP-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
SURFACE RUNOFF MULT.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. IN RAIN (FRAC-SL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

POL. INP-2 (UG/CM**2)	6.45E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-2	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

POL. INP-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

POL. INP-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-L	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

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YEAR - 2 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS ARE SAME AS LAST YEAR

-- POLLUTANT INPUT PARAMETERS --

POL. INP-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
SURFACE RUNOFF MULT.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. IN RAIN (FRAC-SL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

POL. INP-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-2	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

POL. INP-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

POL. INP-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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 TRNSFORMD-L (UG/CM**2) 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
 SINKS-L (UG/CM**2)     0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
 LIG.INPUT-L (UG/CM**2) 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00 0.00E+00
 VOLATILIZATION MULT.-L 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
1
      YEAR - 3    MONTHLY INPUT PARAMETERS
      ========    ========================

      -- CLIMATIC INPUT PARAMETERS ARE SAME AS LAST YEAR

      -- POLLUTANT INPUT PARAMETERS ARE SAME AS LAST YEAR
1
.
.       (etc.......)
.
1
      YEAR -90    MONTHLY INPUT PARAMETERS
      ========    ========================

      -- CLIMATIC INPUT PARAMETERS ARE SAME AS LAST YEAR

      -- POLLUTANT INPUT PARAMETERS ARE SAME AS LAST YEAR
1



      YEAR - 1    MONTHLY RESULTS (OUTPUT)
      ========    ========================


      -- HYDROLOGIC CYCLE COMPONENTS --

                          OCT       NOV       DEC       JAN       FEB       MAR       APR       MAY       JUN       JUL       AUG       SEP

 MOIS. IN L1 (%)        6.424     6.395     6.946     6.975     6.714     6.279     5.525     4.945     5.061     5.177     5.989     6.627
 MOIS. BELOW L1 (%)     6.424     6.395     6.946     6.975     6.714     6.279     5.525     4.945     5.061     5.177     5.989     6.627
 PRECIPATION (CM)       3.712     1.401     3.158     2.012     1.170     1.038     0.692     0.822     3.426     4.079     7.188     6.511
 NET INFILT. (CM)       3.708     1.401     3.123     2.009     1.169     1.037     0.692     0.822     3.426     4.079     7.188     6.438
 EVAPOTRANS. (CM)       0.510     0.304     0.304     0.304     0.304     0.731     1.326     1.323     2.203     2.694     3.451     2.464
 MOIS. RETEN (CM)       1.394    -0.063     1.204     0.063    -0.570    -0.950    -1.647    -1.267     0.253     0.254     1.774     1.394
 SUR. RUNOFF (CM)       0.000     0.000     0.035     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.073
 GRW. RUNOFF (CM)       1.805     1.160     1.615     1.642     1.435     1.257     1.013     0.767     0.970     1.132     1.963     2.580
 YIELD (CM)             1.808     1.160     1.650     1.644     1.436     1.257     1.013     0.767     0.970     1.132     1.963     2.652

 PAU/MPA (GZU)          1.006     1.038     1.003     0.991     1.000     1.049     1.048     1.041     0.993     1.005     0.997     0.997
 PA/MPA (GZ)            1.006     1.038     1.003     0.991     1.000     1.049     1.048     1.041     0.993     1.005     0.997     0.997

1                                        -- POLLUTANT MASS INPUT TO COLUMN (UG) --
                                         ----------------------------------------

                OCT       NOV       DEC       JAN       FEB       MAR       APR       MAY       JUN       JUL       AUG       SEP

 PRECIP.      0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 LOAD UPPER   0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 LOAD ZONE 2  7.740E+09 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 LOAD ZONE 3  0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
 LOAD LOWER   0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00

 TOTAL INPUT  7.740E+09 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0          -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED
           ------------------------------------------------------------------------------------------------------------


      UPPER SOIL ZONE:

           SUBLAYER  1

 VOLATILIZED  9.795E+01 6.123E+02 1.140E+03 1.653E+03 2.244E+03 2.977E+03 3.978E+03 5.052E+03 5.663E+03 6.197E+03 6.105E+03 6.099E+03
 IN SOIL MOI  5.594E+05 1.736E+06 3.077E+06 4.264E+06 5.264E+06 6.071E+06 6.457E+06 6.837E+06 8.010E+06 9.181E+06 1.157E+07 1.376E+07
 ADS ON SOIL  1.925E+07 6.001E+07 9.790E+07 1.351E+08 1.733E+08 2.137E+08 2.583E+08 3.056E+08 3.498E+08 3.919E+08 4.270E+08 4.589E+08
 IN SOIL AIR  9.994E+04 3.196E+05 5.210E+05 7.104E+05 9.098E+05 1.134E+06 1.392E+06 1.654E+06 1.850E+06 2.028E+06 2.141E+06 2.269E+06

      SOIL ZONE 2:

           SUBLAYER  1

 DIFFUSED UP  2.130E+07 4.224E+07 3.952E+07 3.872E+07 3.958E+07 4.170E+07 4.554E+07 4.824E+07 4.627E+07 4.446E+07 3.937E+07 3.608E+07
 IN SOIL MOI  2.169E+08 2.148E+08 2.315E+08 2.313E+08 2.217E+08 2.066E+08 1.813E+08 1.616E+08 1.643E+08 1.670E+08 1.916E+08 2.104E+08
 ADS ON SOIL  7.463E+09 7.422E+09 7.366E+09 7.328E+09 7.299E+09 7.272E+09 7.251E+09 7.223E+09 7.175E+09 7.130E+09 7.070E+09 7.017E+09
 IN SOIL AIR  3.875E+07 3.953E+07 3.920E+07 3.854E+07 3.832E+07 3.860E+07 3.907E+07 3.910E+07 3.795E+07 3.689E+07 3.545E+07 3.470E+07
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SOIL ZONE 3:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

-- POLLUTANT CONCENTRATIONS (UG/ML) OR (UG/G) -- NOTE: IF CONCENTRATIONS ARE ZERO FOR EACH MONTH, THEY ARE NOT PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

MOISTURE	1.251E-03	3.901E-03	6.365E-03	8.783E-03	1.127E-02	1.389E-02	1.679E-02	1.987E-02	2.274E-02	2.548E-02	2.776E-02	2.984E-02
%SOLUBILITY	3.947E-03	1.231E-02	2.008E-02	2.771E-02	3.554E-02	4.382E-02	5.297E-02	6.267E-02	7.174E-02	8.038E-02	8.757E-02	9.412E-02
ADSORBED	1.627E-03	5.072E-03	8.274E-03	1.142E-02	1.465E-02	1.806E-02	2.183E-02	2.583E-02	2.956E-02	3.312E-02	3.609E-02	3.879E-02
SOIL AIR	6.361E-05	2.031E-04	3.394E-04	4.634E-04	5.866E-04	7.173E-04	8.517E-04	9.881E-04	1.110E-03	1.223E-03	1.337E-03	1.457E-03

SOIL ZONE 2:

SUBLAYER 1

MOISTURE	9.380E+00	9.329E+00	9.259E+00	9.211E+00	9.174E+00	9.140E+00	9.114E+00	9.078E+00	9.019E+00	8.962E+00	8.886E+00	8.82[illegible]+00

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 SOLUBILITY 2.959E+01 2.943E+01 2.921E+01 2.906E+01 2.894E+01 2.883E+01 2.875E+01 2.864E+01 2.845E+01 2.827E+01 2.803E+01 2.782E+01
ADSORBED    1.219E+01 1.213E+01 1.204E+01 1.197E+01 1.193E+01 1.188E+01 1.185E+01 1.180E+01 1.172E+01 1.165E+01 1.155E+01 1.147E+01
SOIL AIR    4.768E-01 4.857E-01 4.937E-01 4.860E-01 4.777E-01 4.719E-01 4.623E-01 4.515E-01 4.403E-01 4.302E-01 4.280E-01 4.308E-01

     SOIL ZONE 3:

     LOWER SOIL ZONE:


POL DEP CM  5.964E+02 5.970E+02 5.982E+02 5.991E+02 5.996E+02 6.001E+02 6.004E+02 6.008E+02 6.020E+02 6.035E+02 6.062E+02 6.086E+02

1                          YEAR -   1 ANNUAL SUMMARY REPORT
                           ==========================

       -- TOTAL INPUTS (UG) --
UPPER SOIL ZONE              0.000E+00
SOIL ZONE 2                  7.740E+09
SOIL ZONE 3                  0.000E+00
LOWER SOIL ZONE              0.000E+00

          -- HYDROLOGIC CYCLE COMPONENTS --
AVERAGE SOIL MOISTURE ZONE 1 (%)                 6.088
AVERAGE SOIL MOISTURE BELOW ZONE 1 (%)           6.088
TOTAL PRECIPITATION (CM)                        35.209
TOTAL INFILTRATION (CM)                         35.094
TOTAL EVAPOTRANSPIRATION (CM)                   15.917
TOTAL SURFACE RUNOFF (CM)                        0.108
TOTAL GRW RUNOFF (CM)                           17.338
TOTAL MOISTURE RETENTION (CM)                    1.838
TOTAL YIELD (CM)                                17.454
0          -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED
           ------------------------------------------------------------------------------------------------------------
FOR FINAL MASS IN SOIL MOI., ADS. ON SOIL, SOIL AIR, IMMOBIL CEC, COMPLEXED, AND PURE PHASE FOR EACH SUBLAYER, SEE ABOVE (MONTH SEP)
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     UPPER SOIL ZONE:

          SUBLAYER  1

               TOTAL VOLATILIZED                  4.182E+04

     SOIL ZONE 2:

          SUBLAYER  1

               TOTAL DIFFUSED (UP)                4.830E+08

     SOIL ZONE 3:

          SUBLAYER  1

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9

          SUBLAYER 10

     LOWER SOIL ZONE:

          SUBLAYER  1

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6
```

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

1 -- AVERAGE POLLUTANT CONCENTRATIONS -- NOTE: ONLY NON-ZERO VALUES ARE PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	1.566E-02
ADSORBED SOIL (UG/G)	2.036E-02
SOIL AIR (UG/ML)	7.784E-04

SOIL ZONE 2:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	9.114E+00
ADSORBED SOIL (UG/G)	1.185E+01
SOIL AIR (UG/ML)	4.612E-01

SOIL ZONE 3:

LOWER SOIL ZONE:

MAX. POLL. DEPTH (M) 6.086E+00

1

1

YEAR -10 MONTHLY RESULTS (OUTPUT)

-- HYDROLOGIC CYCLE COMPONENTS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MOIS. IN L1 (%)	6.946	6.772	7.207	7.178	6.859	6.366	5.583	4.974	5.090	5.206	6.018	6.656
MOIS. BELOW L1 (%)	6.946	6.772	7.207	7.178	6.859	6.366	5.583	4.974	5.090	5.206	6.018	6.656
PRECIPATION (CM)	3.677	1.383	3.162	2.085	1.171	0.987	0.701	0.794	3.476	4.137	7.259	6.575
NET INFILT. (CM)	3.674	1.383	3.126	2.082	1.170	0.986	0.701	0.794	3.476	4.137	7.259	6.501
EVAPOTRANS. (CM)	0.510	0.304	0.304	0.304	0.304	0.735	1.355	1.339	2.230	2.725	3.483	2.482
MOIS. RETEN (CM)	0.697	-0.380	0.950	-0.063	-0.697	-1.077	-1.711	-1.331	0.253	0.254	1.774	1.394
SUR. RUNOFF (CM)	0.000	0.000	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.074
GRW. RUNOFF (CM)	2.467	1.459	1.871	1.841	1.563	1.328	1.056	0.785	0.992	1.158	2.001	2.625
YIELD (CM)	2.470	1.459	1.907	1.844	1.564	1.329	1.056	0.785	0.992	1.158	2.001	2.699
PAU/MPA (GZU)	0.996	1.024	1.004	1.027	1.001	0.997	1.061	1.005	1.007	1.019	1.007	1.007
PA/MPA (GZ)	0.996	1.024	1.004	1.027	1.001	0.997	1.061	1.005	1.007	1.019	1.007	1.007

1 -- POLLUTANT MASS INPUT TO COLUMN (UG) --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PRECIP.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD UPPER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD LOWER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTAL INPUT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

UPPER SOIL ZONE:

SUBLAYER 1

VOLATILIZED	1.613E+04	1.695E+04	1.621E+04	1.609E+04	1.668E+04	1.783E+04	1.968E+04	2.108E+04	2.034E+04	1.963E+04	1.743E+04	1.5[illegible]4
IN SOIL MOI	3.709E+07	3.616E+07	3.835E+07	3.817E+07	3.651E+07	3.395E+07	2.987E+07	2.669E+07	2.726E+07	2.781E+07	3.191E+07	3.5[illegible]7
ADS ON SOIL	1.180E+09	1.180E+09	1.176E+09	1.175E+09	1.176E+09	1.179E+09	1.183E+09	1.186E+09	1.184E+09	1.181E+09	1.172E+09	1.1[illegible]9

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 N SOIL AIR 5.986E+06 6.181E+06 6.184E+06 6.123E+06 6.136E+06 6.232E+06 6.356E+06 6.412E+06 6.252E+06 6.102E+06 5.870E+06 5.751E+06

     SOIL ZONE 2:

          SUBLAYER  1

DIFFUSED UP 7.630E+05 7.846E+05 7.367E+05 7.156E+05 7.336E+05 7.811E+05 8.623E+05 9.262E+05 8.833E+05 8.280E+05 6.988E+05 6.007E+05
IN SOIL MOI 6.531E+06 6.331E+06 6.586E+06 6.480E+06 6.173E+06 5.730E+06 5.051E+06 4.522E+06 4.538E+06 4.528E+06 4.962E+06 5.234E+06
ADS ON SOIL 2.078E+08 2.066E+08 2.020E+08 1.995E+08 1.989E+08 1.989E+08 2.000E+08 2.009E+08 1.971E+08 1.922E+08 1.822E+08 1.738E+08
IN SOIL AIR 1.054E+06 1.082E+06 1.062E+06 1.039E+06 1.038E+06 1.052E+06 1.075E+06 1.086E+06 1.041E+06 9.933E+05 9.126E+05 8.583E+05

     SOIL ZONE 3:

          SUBLAYER  1

DIFFUSED UP 2.416E+06 2.550E+06 2.437E+06 2.402E+06 2.475E+06 2.633E+06 2.894E+06 3.085E+06 2.957E+06 2.827E+06 2.479E+06 2.239E+06
IN SOIL MOI 1.896E+08 1.850E+08 1.950E+08 1.926E+08 1.833E+08 1.697E+08 1.488E+08 1.324E+08 1.339E+08 1.351E+08 1.521E+08 1.642E+08
ADS ON SOIL 6.032E+09 6.037E+09 5.978E+09 5.931E+09 5.907E+09 5.892E+09 5.890E+09 5.884E+09 5.815E+09 5.736E+09 5.586E+09 5.452E+09
IN SOIL AIR 3.060E+07 3.162E+07 3.144E+07 3.090E+07 3.081E+07 3.116E+07 3.166E+07 3.181E+07 3.072E+07 2.964E+07 2.798E+07 2.693E+07

          SUBLAYER  2

IN SOIL MOI 0.000E+00 0.000E+00 1.733E+06 3.417E+06 4.288E+06 4.786E+06 4.730E+06 4.684E+06 6.442E+06 8.565E+06 1.378E+07 1.912E+07
ADS ON SOIL 0.000E+00 0.000E+00 5.314E+07 1.052E+08 1.382E+08 1.661E+08 1.872E+08 2.081E+08 2.797E+08 3.636E+08 5.059E+08 6.350E+08
IN SOIL AIR 0.000E+00 0.000E+00 2.794E+05 5.481E+05 7.207E+05 8.786E+05 1.006E+06 1.125E+06 1.478E+06 1.879E+06 2.534E+06 3.136E+06

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9

          SUBLAYER 10

     LOWER SOIL ZONE:

          SUBLAYER  1

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9

          SUBLAYER 10


     -- POLLUTANT CONCENTRATIONS (UG/ML) OR (UG/G) -- NOTE: IF CONCENTRATIONS ARE ZERO FOR EACH MONTH, THEY ARE NOT PRINTED --
     ---------------------------------------------------------------------------------------------------------------------------

     UPPER SOIL ZONE:

          SUBLAYER  1

MOISTURE    7.672E-02 7.673E-02 7.646E-02 7.640E-02 7.648E-02 7.662E-02 7.688E-02 7.710E-02 7.695E-02 7.677E-02 7.620E-02 7.570E-02
%SOLUBILITY 2.420E-01 2.420E-01 2.412E-01 2.410E-01 2.413E-01 2.417E-01 2.425E-01 2.432E-01 2.427E-01 2.422E-01 2.404E-01 2.388E-01
ADSORBED    9.973E-02 9.975E-02 9.940E-02 9.932E-02 9.942E-02 9.961E-02 9.995E-02 1.002E-01 1.000E-01 9.980E-02 9.905E-02 9.841E-02
SOIL AIR    3.900E-03 3.995E-03 4.077E-03 4.031E-03 3.982E-03 3.956E-03 3.900E-03 3.834E-03 3.757E-03 3.685E-03 3.670E-03 3.698E-03

     SOIL ZONE 2:

          SUBLAYER  1

MOISTURE    2.612E-01 2.597E-01 2.539E-01 2.508E-01 2.500E-01 2.500E-01 2.513E-01 2.526E-01 2.477E-01 2.416E-01 2.290E-01 2.184E-01
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 SOLUBILITY 8.239E-01 8.193E-01 8.008E-01 7.910E-01 7.886E-01 7.888E-01 7.928E-01 7.968E-01 7.813E-01 7.621E-01 7.225E-01 6.890E-01
ADSORBED    3.395E-01 3.376E-01 3.300E-01 3.260E-01 3.250E-01 3.251E-01 3.267E-01 3.283E-01 3.220E-01 3.141E-01 2.978E-01 2.84
SOIL AIR    1.328E-02 1.352E-02 1.354E-02 1.323E-02 1.302E-02 1.291E-02 1.275E-02 1.256E-02 1.209E-02 1.160E-02 1.103E-02 1.0

     SOIL ZONE 3:

          SUBLAYER  1

MOISTURE    2.261E+00 2.263E+00 2.241E+00 2.223E+00 2.214E+00 2.208E+00 2.208E+00 2.205E+00 2.180E+00 2.150E+00 2.094E+00 2.044E+00
%SOLUBILITY 7.133E+00 7.139E+00 7.069E+00 7.012E+00 6.984E+00 6.967E+00 6.964E+00 6.957E+00 6.876E+00 6.782E+00 6.605E+00 6.447E+00
ADSORBED    2.939E+00 2.942E+00 2.913E+00 2.890E+00 2.878E+00 2.871E+00 2.870E+00 2.867E+00 2.834E+00 2.795E+00 2.722E+00 2.657E+00
SOIL AIR    1.149E-01 1.178E-01 1.195E-01 1.173E-01 1.153E-01 1.140E-01 1.120E-01 1.097E-01 1.064E-01 1.032E-01 1.008E-01 9.983E-02

          SUBLAYER  2

MOISTURE    0.000E+00 0.000E+00 1.992E-02 3.943E-02 5.179E-02 6.228E-02 7.018E-02 7.801E-02 1.048E-01 1.363E-01 1.896E-01 2.380E-01
%SOLUBILITY 0.000E+00 0.000E+00 6.283E-02 1.244E-01 1.634E-01 1.965E-01 2.214E-01 2.461E-01 3.307E-01 4.299E-01 5.982E-01 7.508E-01
ADSORBED    0.000E+00 0.000E+00 2.589E-02 5.126E-02 6.732E-02 8.096E-02 9.123E-02 1.014E-01 1.363E-01 1.772E-01 2.465E-01 3.094E-01
SOIL AIR    0.000E+00 0.000E+00 1.062E-03 2.080E-03 2.696E-03 3.216E-03 3.559E-03 3.880E-03 5.119E-03 6.541E-03 9.133E-03 1.163E-02

     LOWER SOIL ZONE:


POL DEP CM  7.097E+02 7.103E+02 7.114E+02 7.123E+02 7.129E+02 7.134E+02 7.137E+02 7.141E+02 7.151E+02 7.164E+02 7.186E+02 7.207E+02


1                          YEAR -  10 ANNUAL SUMMARY REPORT
                           ********************************

       -- TOTAL INPUTS (UG) --
UPPER SOIL ZONE              0.000E+00
SOIL ZONE 2                  0.000E+00
SOIL ZONE 3                  0.000E+00
LOWER SOIL ZONE              0.000E+00

          -- HYDROLOGIC CYCLE COMPONENTS --
AVERAGE SOIL MOISTURE ZONE 1 (%)              6.238
AVERAGE SOIL MOISTURE BELOW ZONE 1 (%)        6.238
TOTAL PRECIPITATION (CM)                     35.405
TOTAL INFILTRATION (CM)                      35.287
TOTAL EVAPOTRANSPIRATION (CM)                16.076
TOTAL SURFACE RUNOFF (CM)                     0.109
TOTAL GRW RUNOFF (CM)                        19.148
TOTAL MOISTURE RETENTION (CM)                 0.064
TOTAL YIELD (CM)                             19.265
0         -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED
          ------------------------------------------------------------------------------------------------------
FOR FINAL MASS IN SOIL MOI., ADS. ON SOIL, SOIL AIR, IMMOBIL CEC, COMPLEXED, AND PURE PHASE FOR EACH SUBLAYER, SEE ABOVE (MONTH SEP)
-------------------------------------------------------------------------------------------------------------------------------


     UPPER SOIL ZONE:

          SUBLAYER  1

               TOTAL VOLATILIZED              2.140E+05

     SOIL ZONE 2:

          SUBLAYER  1

               TOTAL DIFFUSED (UP)            9.314E+06

     SOIL ZONE 3:

          SUBLAYER  1

               TOTAL DIFFUSED (UP)            3.139E+07

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9
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SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

1 -- AVERAGE POLLUTANT CONCENTRATIONS -- NOTE: ONLY NON-ZERO VALUES ARE PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	7.658E-02
ADSORBED SOIL (UG/G)	9.956E-02
SOIL AIR (UG/ML)	3.874E-03

SOIL ZONE 2:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	2.472E-01
ADSORBED SOIL (UG/G)	3.213E-01
SOIL AIR (UG/ML)	1.252E-02

SOIL ZONE 3:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	2.191E+00
ADSORBED SOIL (UG/G)	2.848E+00
SOIL AIR (UG/ML)	1.109E-01

SUBLAYER 2

SOIL MOISTURE (UG/ML)	8.253E-02
ADSORBED SOIL (UG/G)	1.073E-01
SOIL AIR (UG/ML)	4.076E-03

LOWER SOIL ZONE:

MAX. POLL. DEPTH (M)	7.207E+00

1

YEAR -90 MONTHLY RESULTS (OUTPUT)

-- HYDROLOGIC CYCLE COMPONENTS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MOIS. IN L1 (%)	6.946	6.772	7.207	7.178	6.859	6.366	5.583	4.974	5.090	5.206	6.018	6.656
MOIS. BELOW L1 (%)	6.946	6.772	7.207	7.178	6.859	6.366	5.583	4.974	5.090	5.206	6.018	6.656
PRECIPATION (CM)	3.677	1.383	3.162	2.085	1.171	0.987	0.701	0.794	3.476	4.137	7.259	6.575
NET INFILT. (CM)	3.674	1.383	3.126	2.082	1.170	0.986	0.701	0.794	3.476	4.137	7.259	6.501
EVAPOTRANS. (CM)	0.510	0.304	0.304	0.304	0.304	0.735	1.355	1.339	2.230	2.725	3.483	2.482
MOIS. RETEN (CM)	0.697	-0.380	0.950	-0.063	-0.697	-1.077	-1.711	-1.331	0.253	0.254	1.774	1.394
SUR. RUNOFF (CM)	0.000	0.000	0.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.074
GRW. RUNOFF (CM)	2.467	1.459	1.871	1.841	1.563	1.328	1.056	0.785	0.992	1.158	2.001	2.625
YIELD (CM)	2.470	1.459	1.907	1.844	1.564	1.329	1.056	0.785	0.992	1.158	2.001	2.699

PAU/MPA (GZU)	0.996	1.024	1.004	1.027	1.001	0.997	1.061	1.005	1.007	1.019	1.007	1.007
PA/MPA (GZ)	0.996	1.024	1.004	1.027	1.001	0.997	1.061	1.005	1.007	1.019	1.007	1.007

1 -- POLLUTANT MASS INPUT TO COLUMN (UG) --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PRECIP.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD UPPER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD LOWER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTAL INPUT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

UPPER SOIL ZONE:

SUBLAYER 1

VOLATILIZED	2.374E+03	2.493E+03	2.382E+03	2.363E+03	2.448E+03	2.615E+03	2.885E+03	3.087E+03	2.976E+03	2.870E+03	2.547E+03	2.334E+03
IN SOIL MOI	5.456E+06	5.317E+06	5.634E+06	5.604E+06	5.356E+06	4.978E+06	4.377E+06	3.906E+06	3.986E+06	4.065E+06	4.660E+06	5.118E+06
ADS ON SOIL	1.736E+08	1.735E+08	1.728E+08	1.725E+08	1.726E+08	1.728E+08	1.733E+08	1.736E+08	1.731E+08	1.726E+08	1.711E+08	1.699E+08
IN SOIL AIR	8.806E+05	9.087E+05	9.086E+05	8.989E+05	9.003E+05	9.138E+05	9.311E+05	9.385E+05	9.143E+05	8.917E+05	8.571E+05	8.393E+05

SOIL ZONE 2:

SUBLAYER 1

DIFFUSED UP	2.978E+03	3.121E+03	2.979E+03	2.952E+03	3.049E+03	3.248E+03	3.579E+03	3.833E+03	3.701E+03	3.579E+03	3.187E+03	2.929E+03
IN SOIL MOI	3.005E+05	2.928E+05	3.103E+05	3.086E+05	2.949E+05	2.740E+05	2.409E+05	2.150E+05	2.195E+05	2.238E+05	2.567E+05	2.819E+05
ADS ON SOIL	9.561E+06	9.555E+06	9.515E+06	9.500E+06	9.502E+06	9.512E+06	9.537E+06	9.555E+06	9.530E+06	9.502E+06	9.427E+06	9.360E+06
IN SOIL AIR	4.850E+04	5.004E+04	5.003E+04	4.950E+04	4.956E+04	5.030E+04	5.125E+04	5.166E+04	5.034E+04	4.910E+04	4.721E+04	4.623E+04

SOIL ZONE 3:

SUBLAYER 1

DIFFUSED UP	3.872E+03	4.062E+03	3.878E+03	3.846E+03	3.983E+03	4.256E+03	4.694E+03	5.022E+03	4.842E+03	4.668E+03	4.140E+03	3.7
IN SOIL MOI	1.275E+06	1.242E+06	1.316E+06	1.309E+06	1.251E+06	1.162E+06	1.022E+06	9.123E+05	9.311E+05	9.493E+05	1.089E+06	1.1
ADS ON SOIL	4.058E+07	4.054E+07	4.037E+07	4.030E+07	4.031E+07	4.036E+07	4.046E+07	4.053E+07	4.043E+07	4.030E+07	3.998E+07	3.970E+07
IN SOIL AIR	2.058E+05	2.123E+05	2.123E+05	2.100E+05	2.103E+05	2.134E+05	2.175E+05	2.192E+05	2.136E+05	2.083E+05	2.002E+05	1.960E+05

SUBLAYER 2

DIFFUSED UP	6.217E+03	6.520E+03	6.221E+03	6.163E+03	6.375E+03	6.804E+03	7.500E+03	8.025E+03	7.731E+03	7.445E+03	6.591E+03	6.022E+03
IN SOIL MOI	1.705E+06	1.661E+06	1.759E+06	1.748E+06	1.671E+06	1.552E+06	1.364E+06	1.218E+06	1.242E+06	1.266E+06	1.451E+06	1.592E+06
ADS ON SOIL	5.424E+07	5.419E+07	5.394E+07	5.383E+07	5.383E+07	5.388E+07	5.401E+07	5.411E+07	5.395E+07	5.376E+07	5.329E+07	5.286E+07
IN SOIL AIR	2.751E+05	2.838E+05	2.836E+05	2.805E+05	2.808E+05	2.849E+05	2.903E+05	2.926E+05	2.850E+05	2.778E+05	2.669E+05	2.611E+05

SUBLAYER 3

DIFFUSED UP	1.226E+04	1.284E+04	1.224E+04	1.211E+04	1.252E+04	1.336E+04	1.472E+04	1.574E+04	1.515E+04	1.457E+04	1.287E+04	1.174E+04
IN SOIL MOI	2.550E+06	2.483E+06	2.628E+06	2.611E+06	2.494E+06	2.316E+06	2.036E+06	1.817E+06	1.852E+06	1.886E+06	2.158E+06	2.364E+06
ADS ON SOIL	8.115E+07	8.105E+07	8.060E+07	8.040E+07	8.037E+07	8.042E+07	8.060E+07	8.073E+07	8.043E+07	8.008E+07	7.925E+07	7.850E+07
IN SOIL AIR	4.116E+05	4.244E+05	4.238E+05	4.189E+05	4.192E+05	4.253E+05	4.332E+05	4.365E+05	4.248E+05	4.138E+05	3.969E+05	3.877E+05

SUBLAYER 4

DIFFUSED UP	2.612E+04	2.734E+04	2.605E+04	2.576E+04	2.662E+04	2.840E+04	3.129E+04	3.345E+04	3.219E+04	3.095E+04	2.733E+04	2.490E+04
IN SOIL MOI	4.352E+06	4.236E+06	4.479E+06	4.447E+06	4.246E+06	3.941E+06	3.463E+06	3.090E+06	3.148E+06	3.203E+06	3.658E+06	4.001E+06
ADS ON SOIL	1.385E+08	1.382E+08	1.374E+08	1.369E+08	1.368E+08	1.368E+08	1.371E+08	1.373E+08	1.367E+08	1.360E+08	1.343E+08	1.328E+08
IN SOIL AIR	7.025E+05	7.239E+05	7.223E+05	7.133E+05	7.136E+05	7.236E+05	7.369E+05	7.423E+05	7.220E+05	7.026E+05	6.728E+05	6.561E+05

SUBLAYER 5

DIFFUSED UP	5.182E+04	5.426E+04	5.171E+04	5.117E+04	5.289E+04	5.641E+04	6.215E+04	6.645E+04	6.396E+04	6.152E+04	5.437E+04	4.958E+04
IN SOIL MOI	7.928E+06	7.714E+06	8.154E+06	8.093E+06	7.725E+06	7.169E+06	6.299E+06	5.619E+06	5.723E+06	5.820E+06	6.644E+06	7.263E+06
ADS ON SOIL	2.523E+08	2.518E+08	2.501E+08	2.492E+08	2.489E+08	2.489E+08	2.493E+08	2.497E+08	2.485E+08	2.471E+08	2.440E+08	2.412E+08
IN SOIL AIR	1.280E+06	1.318E+06	1.315E+06	1.298E+06	1.298E+06	1.316E+06	1.340E+06	1.350E+06	1.313E+06	1.277E+06	1.222E+06	1.191E+06

SUBLAYER 6

DIFFUSED UP	9.154E+04	9.591E+04	9.144E+04	9.051E+04	9.357E+04	9.981E+04	1.100E+05	1.176E+05	1.132E+05	1.090E+05	9.641E+04	8.805E+04
IN SOIL MOI	1.425E+07	1.386E+07	1.465E+07	1.454E+07	1.388E+07	1.288E+07	1.132E+07	1.009E+07	1.028E+07	1.046E+07	1.194E+07	1.306E+07
ADS ON SOIL	4.534E+08	4.524E+08	4.494E+08	4.478E+08	4.472E+08	4.472E+08	4.480E+08	4.485E+08	4.464E+08	4.440E+08	4.386E+08	4.336E+08
IN SOIL AIR	2.300E+06	2.369E+06	2.363E+06	2.333E+06	2.333E+06	2.365E+06	2.408E+06	2.425E+06	2.358E+06	2.294E+06	2.197E+06	2.141E+06

SUBLAYER 7

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 FFUSED UP 1.338E+05 1.403E+05 1.339E+05 1.327E+05 1.373E+05 1.466E+05 1.615E+05 1.727E+05 1.665E+05 1.605E+05 1.424E+05 1.304E+05
 N SOIL MOI 2.349E+07 2.286E+07 2.418E+07 2.401E+07 2.292E+07 2.127E+07 1.869E+07 1.667E+07 1.699E+07 1.730E+07 1.978E+07 2.165E+07
ADS ON SOIL 7.474E+08 7.460E+08 7.415E+08 7.391E+08 7.384E+08 7.384E+08 7.397E+08 7.407E+08 7.377E+08 7.343E+08 7.263E+08 7.190E+08
IN SOIL AIR 3.791E+06 3.907E+06 3.899E+06 3.851E+06 3.852E+06 3.905E+06 3.976E+06 4.005E+06 3.897E+06 3.795E+06 3.638E+06 3.551E+06

          SUBLAYER  8

DIFFUSED UP 1.552E+05 1.630E+05 1.559E+05 1.547E+05 1.603E+05 1.712E+05 1.889E+05 2.021E+05 1.950E+05 1.884E+05 1.676E+05 1.541E+05
IN SOIL MOI 3.422E+07 3.332E+07 3.528E+07 3.505E+07 3.347E+07 3.107E+07 2.731E+07 2.436E+07 2.485E+07 2.533E+07 2.902E+07 3.182E+07
ADS ON SOIL 1.089E+09 1.087E+09 1.082E+09 1.079E+09 1.078E+09 1.079E+09 1.081E+09 1.083E+09 1.079E+09 1.075E+09 1.066E+09 1.057E+09
IN SOIL AIR 5.524E+06 5.695E+06 5.688E+06 5.622E+06 5.626E+06 5.705E+06 5.810E+06 5.853E+06 5.701E+06 5.557E+06 5.337E+06 5.219E+06

          SUBLAYER  9

DIFFUSED UP 1.307E+05 1.378E+05 1.321E+05 1.315E+05 1.366E+05 1.461E+05 1.614E+05 1.729E+05 1.672E+05 1.621E+05 1.449E+05 1.340E+05
IN SOIL MOI 4.329E+07 4.217E+07 4.470E+07 4.444E+07 4.247E+07 3.945E+07 3.468E+07 3.095E+07 3.161E+07 3.225E+07 3.703E+07 4.070E+07
ADS ON SOIL 1.377E+09 1.376E+09 1.371E+09 1.368E+09 1.368E+09 1.370E+09 1.373E+09 1.375E+09 1.372E+09 1.369E+09 1.360E+09 1.351E+09
IN SOIL AIR 6.987E+06 7.207E+06 7.207E+06 7.129E+06 7.138E+06 7.242E+06 7.378E+06 7.436E+06 7.249E+06 7.075E+06 6.811E+06 6.674E+06

          SUBLAYER 10

DIFFUSED UP 4.884E+04 5.222E+04 5.068E+04 5.115E+04 5.366E+04 5.787E+04 6.433E+04 6.929E+04 6.761E+04 6.643E+04 6.057E+04 5.736E+04
IN SOIL MOI 4.670E+07 4.554E+07 4.834E+07 4.812E+07 4.602E+07 4.278E+07 3.762E+07 3.360E+07 3.436E+07 3.511E+07 4.042E+07 4.454E+07
ADS ON SOIL 1.486E+09 1.486E+09 1.482E+09 1.482E+09 1.483E+09 1.485E+09 1.489E+09 1.493E+09 1.492E+09 1.491E+09 1.484E+09 1.479E+09
IN SOIL AIR 7.538E+06 7.783E+06 7.794E+06 7.719E+06 7.735E+06 7.853E+06 8.005E+06 8.072E+06 7.880E+06 7.702E+06 7.434E+06 7.304E+06

     LOWER SOIL ZONE:

          SUBLAYER  1

IN SOIL MOI 3.721E+07 3.658E+07 3.935E+07 3.960E+07 3.817E+07 3.572E+07 3.158E+07 2.833E+07 2.927E+07 3.028E+07 3.559E+07 4.005E+07
ADS ON SOIL 1.184E+09 1.194E+09 1.207E+09 1.219E+09 1.230E+09 1.240E+09 1.250E+09 1.259E+09 1.271E+09 1.285E+09 1.307E+09 1.330E+09
IN SOIL AIR 6.006E+06 6.252E+06 6.345E+06 6.352E+06 6.416E+06 6.559E+06 6.720E+06 6.806E+06 6.713E+06 6.642E+06 6.546E+06 6.568E+06

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9

          SUBLAYER 10

     -- POLLUTANT CONCENTRATIONS (UG/ML) OR (UG/G) -- NOTE: IF CONCENTRATIONS ARE ZERO FOR EACH MONTH, THEY ARE NOT PRINTED --
     ---------------------------------------------------------------------------------------------------------------------------

     UPPER SOIL ZONE:

          SUBLAYER  1

MOISTURE    1.129E-02 1.128E-02 1.123E-02 1.122E-02 1.122E-02 1.123E-02 1.126E-02 1.128E-02 1.125E-02 1.122E-02 1.113E-02 1.105E-02
%SOLUBILITY 3.560E-02 3.559E-02 3.544E-02 3.539E-02 3.540E-02 3.544E-02 3.553E-02 3.560E-02 3.550E-02 3.539E-02 3.510E-02 3.485E-02
ADSORBED    1.467E-02 1.466E-02 1.460E-02 1.458E-02 1.459E-02 1.461E-02 1.464E-02 1.467E-02 1.463E-02 1.458E-02 1.446E-02 1.436E-02
SOIL AIR    5.737E-04 5.873E-04 5.990E-04 5.918E-04 5.842E-04 5.801E-04 5.713E-04 5.612E-04 5.494E-04 5.385E-04 5.359E-04 5.397E-04

     SOIL ZONE 2:

          SUBLAYER  1

MOISTURE    1.202E-02 1.201E-02 1.196E-02 1.194E-02 1.194E-02 1.196E-02 1.199E-02 1.201E-02 1.198E-02 1.194E-02 1.185E-02 1.176E-02
%SOLUBILITY 3.791E-02 3.789E-02 3.773E-02 3.767E-02 3.767E-02 3.771E-02 3.781E-02 3.788E-02 3.778E-02 3.768E-02 3.738E-02 3.711E-02
ADSORBED    1.562E-02 1.561E-02 1.555E-02 1.552E-02 1.553E-02 1.554E-02 1.558E-02 1.561E-02 1.557E-02 1.553E-02 1.540E-02 1.529E-02
SOIL AIR    6.109E-04 6.253E-04 6.377E-04 6.300E-04 6.218E-04 6.173E-04 6.080E-04 5.973E-04 5.848E-04 5.732E-04 5.706E-04 5.747E-04

     SOIL ZONE 3:

          SUBLAYER  1

MOISTURE    1.521E-02 1.520E-02 1.513E-02 1.511E-02 1.511E-02 1.513E-02 1.517E-02 1.519E-02 1.515E-02 1.511E-02 1.499E-02 1.488E-02
%SOLUBILITY 4.798E-02 4.794E-02 4.773E-02 4.766E-02 4.767E-02 4.772E-02 4.784E-02 4.793E-02 4.781E-02 4.765E-02 4.727E-02 4.694E-02
ADSORBED    1.977E-02 1.976E-02 1.967E-02 1.964E-02 1.964E-02 1.966E-02 1.971E-02 1.975E-02 1.970E-02 1.964E-02 1.948E-02 1.934E-02
SOIL AIR    7.731E-04 7.912E-04 8.069E-04 7.971E-04 7.868E-04 7.810E-04 7.692E-04 7.556E-04 7.399E-04 7.251E-04 7.217E-04 7.268E-04

          SUBLAYER  2
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MOISTURE	2.033E-02	2.031E-02	2.022E-02	2.018E-02	2.018E-02	2.019E-02	2.024E-02	2.028E-02	2.022E-02	2.015E-02	1.997E-02	1.981E-02
%SOLUBILITY	6.413E-02	6.408E-02	6.377E-02	6.365E-02	6.365E-02	6.370E-02	6.386E-02	6.398E-02	6.379E-02	6.356E-02	6.301E-02	6.2[illegible]
ADSORBED	2.643E-02	2.641E-02	2.628E-02	2.623E-02	2.623E-02	2.625E-02	2.632E-02	2.637E-02	2.629E-02	2.620E-02	2.597E-02	2.5[illegible]
SOIL AIR	1.033E-03	1.058E-03	1.078E-03	1.065E-03	1.051E-03	1.043E-03	1.027E-03	1.009E-03	9.872E-04	9.671E-04	9.619E-04	9.679E-04

SUBLAYER 3

MOISTURE	3.042E-02	3.038E-02	3.021E-02	3.014E-02	3.012E-02	3.014E-02	3.021E-02	3.026E-02	3.015E-02	3.002E-02	2.970E-02	2.942E-02
%SOLUBILITY	9.595E-02	9.583E-02	9.531E-02	9.507E-02	9.503E-02	9.508E-02	9.530E-02	9.546E-02	9.510E-02	9.469E-02	9.370E-02	9.281E-02
ADSORBED	3.954E-02	3.949E-02	3.928E-02	3.918E-02	3.916E-02	3.918E-02	3.927E-02	3.934E-02	3.919E-02	3.902E-02	3.861E-02	3.825E-02
SOIL AIR	1.546E-03	1.582E-03	1.611E-03	1.590E-03	1.568E-03	1.556E-03	1.532E-03	1.505E-03	1.472E-03	1.441E-03	1.431E-03	1.437E-03

SUBLAYER 4

MOISTURE	5.191E-02	5.182E-02	5.149E-02	5.132E-02	5.128E-02	5.129E-02	5.139E-02	5.146E-02	5.123E-02	5.096E-02	5.035E-02	4.980E-02
%SOLUBILITY	1.637E-01	1.635E-01	1.624E-01	1.619E-01	1.618E-01	1.618E-01	1.621E-01	1.623E-01	1.616E-01	1.608E-01	1.588E-01	1.571E-01
ADSORBED	6.748E-02	6.736E-02	6.693E-02	6.672E-02	6.666E-02	6.667E-02	6.681E-02	6.690E-02	6.660E-02	6.625E-02	6.546E-02	6.473E-02
SOIL AIR	2.639E-03	2.698E-03	2.745E-03	2.708E-03	2.670E-03	2.648E-03	2.607E-03	2.559E-03	2.501E-03	2.446E-03	2.425E-03	2.432E-03

SUBLAYER 5

MOISTURE	9.455E-02	9.436E-02	9.373E-02	9.340E-02	9.329E-02	9.329E-02	9.346E-02	9.358E-02	9.314E-02	9.262E-02	9.146E-02	9.039E-02
%SOLUBILITY	2.983E-01	2.977E-01	2.957E-01	2.946E-01	2.943E-01	2.943E-01	2.948E-01	2.952E-01	2.938E-01	2.922E-01	2.885E-01	2.851E-01
ADSORBED	1.229E-01	1.227E-01	1.218E-01	1.214E-01	1.213E-01	1.213E-01	1.215E-01	1.217E-01	1.211E-01	1.204E-01	1.189E-01	1.175E-01
SOIL AIR	4.806E-03	4.913E-03	4.998E-03	4.928E-03	4.858E-03	4.817E-03	4.741E-03	4.654E-03	4.547E-03	4.445E-03	4.405E-03	4.415E-03

SUBLAYER 6

MOISTURE	1.699E-01	1.696E-01	1.684E-01	1.678E-01	1.676E-01	1.676E-01	1.679E-01	1.681E-01	1.673E-01	1.664E-01	1.644E-01	1.625E-01
%SOLUBILITY	5.361E-01	5.350E-01	5.314E-01	5.295E-01	5.288E-01	5.288E-01	5.297E-01	5.303E-01	5.278E-01	5.250E-01	5.186E-01	5.127E-01
ADSORBED	2.209E-01	2.205E-01	2.190E-01	2.182E-01	2.179E-01	2.179E-01	2.183E-01	2.185E-01	2.175E-01	2.163E-01	2.137E-01	2.113E-01
SOIL AIR	8.638E-03	8.829E-03	8.982E-03	8.856E-03	8.728E-03	8.655E-03	8.517E-03	8.361E-03	8.169E-03	7.988E-03	7.917E-03	7.939E-03

SUBLAYER 7

MOISTURE	2.802E-01	2.796E-01	2.779E-01	2.770E-01	2.768E-01	2.768E-01	2.773E-01	2.776E-01	2.765E-01	2.752E-01	2.723E-01	2.695E-01
%SOLUBILITY	8.838E-01	8.821E-01	8.767E-01	8.740E-01	8.731E-01	8.731E-01	8.747E-01	8.758E-01	8.723E-01	8.682E-01	8.588E-01	8.501E-01
ADSORBED	3.642E-01	3.635E-01	3.613E-01	3.602E-01	3.598E-01	3.598E-01	3.605E-01	3.609E-01	3.595E-01	3.578E-01	3.539E-01	3.503E-01
SOIL AIR	1.424E-02	1.456E-02	1.482E-02	1.462E-02	1.441E-02	1.429E-02	1.406E-02	1.381E-02	1.350E-02	1.321E-02	1.311E-02	1.316E-02

SUBLAYER 8

MOISTURE	4.082E-01	4.076E-01	4.055E-01	4.045E-01	4.042E-01	4.044E-01	4.052E-01	4.058E-01	4.045E-01	4.031E-01	3.994E-01	3.9[illegible]1
%SOLUBILITY	1.288E+00	1.286E+00	1.279E+00	1.276E+00	1.275E+00	1.276E+00	1.278E+00	1.280E+00	1.276E+00	1.271E+00	1.260E+00	1.249E+00
ADSORBED	5.306E-01	5.299E-01	5.271E-01	5.258E-01	5.255E-01	5.257E-01	5.267E-01	5.275E-01	5.259E-01	5.240E-01	5.193E-01	5.149E-01
SOIL AIR	2.075E-02	2.122E-02	2.162E-02	2.134E-02	2.105E-02	2.088E-02	2.055E-02	2.018E-02	1.975E-02	1.935E-02	1.924E-02	1.935E-02

SUBLAYER 9

MOISTURE	5.162E-01	5.158E-01	5.138E-01	5.129E-01	5.129E-01	5.133E-01	5.146E-01	5.155E-01	5.144E-01	5.132E-01	5.097E-01	5.065E-01
%SOLUBILITY	1.629E+00	1.627E+00	1.621E+00	1.618E+00	1.618E+00	1.619E+00	1.623E+00	1.626E+00	1.623E+00	1.619E+00	1.608E+00	1.598E+00
ADSORBED	6.711E-01	6.706E-01	6.679E-01	6.668E-01	6.668E-01	6.673E-01	6.689E-01	6.701E-01	6.688E-01	6.672E-01	6.627E-01	6.585E-01
SOIL AIR	2.624E-02	2.686E-02	2.740E-02	2.706E-02	2.671E-02	2.651E-02	2.610E-02	2.564E-02	2.512E-02	2.463E-02	2.455E-02	2.474E-02

SUBLAYER 10

MOISTURE	5.570E-01	5.570E-01	5.556E-01	5.553E-01	5.558E-01	5.566E-01	5.583E-01	5.596E-01	5.591E-01	5.587E-01	5.564E-01	5.543E-01
%SOLUBILITY	1.757E+00	1.757E+00	1.753E+00	1.752E+00	1.753E+00	1.756E+00	1.761E+00	1.765E+00	1.764E+00	1.762E+00	1.755E+00	1.749E+00
ADSORBED	7.241E-01	7.241E-01	7.223E-01	7.219E-01	7.225E-01	7.236E-01	7.258E-01	7.274E-01	7.269E-01	7.263E-01	7.233E-01	7.206E-01
SOIL AIR	2.831E-02	2.900E-02	2.963E-02	2.930E-02	2.894E-02	2.874E-02	2.832E-02	2.783E-02	2.730E-02	2.682E-02	2.680E-02	2.708E-02

LOWER SOIL ZONE:

SUBLAYER 1

MOISTURE	4.438E-01	4.475E-01	4.523E-01	4.570E-01	4.610E-01	4.649E-01	4.687E-01	4.718E-01	4.764E-01	4.818E-01	4.899E-01	4.984E-01
%SOLUBILITY	1.400E+00	1.412E+00	1.427E+00	1.442E+00	1.454E+00	1.466E+00	1.478E+00	1.488E+00	1.503E+00	1.520E+00	1.545E+00	1.572E+00
ADSORBED	5.769E-01	5.817E-01	5.880E-01	5.941E-01	5.993E-01	6.043E-01	6.093E-01	6.134E-01	6.193E-01	6.263E-01	6.368E-01	6.480E-01
SOIL AIR	2.256E-02	2.330E-02	2.412E-02	2.411E-02	2.400E-02	2.400E-02	2.377E-02	2.347E-02	2.326E-02	2.312E-02	2.359E-02	2.435E-02

POL DEP CM	1.686E+03	1.687E+03	1.688E+03	1.688E+03	1.689E+03	1.690E+03	1.690E+03	1.690E+03	1.691E+03	1.692E+03	1.693E+03	1.695E+03

1 YEAR - 90 ANNUAL SUMMARY REPORT

-- TOTAL INPUTS (UG) --

UPPER SOIL ZONE	0.000E+00
SOIL ZONE 2	0.000E+00
SOIL ZONE 3	0.000E+00
LOWER SOIL ZONE	0.000E+00

-- HYDROLOGIC CYCLE COMPONENTS --

AVERAGE SOIL MOISTURE ZONE 1 (%)	6.238
AVERAGE SOIL MOISTURE BELOW ZONE 1 (%)	6.238
TOTAL PRECIPITATION (CM)	35.405
TOTAL INFILTRATION (CM)	35.287
TOTAL EVAPOTRANSPIRATION (CM)	16.076
TOTAL SURFACE RUNOFF (CM)	0.109
TOTAL GRW RUNOFF (CM)	19.148
TOTAL MOISTURE RETENTION (CM)	0.064
TOTAL YIELD (CM)	19.265

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

FOR FINAL MASS IN SOIL MOI., ADS. ON SOIL, SOIL AIR, IMMOBIL CEC, COMPLEXED, AND PURE PHASE FOR EACH SUBLAYER, SEE ABOVE (MONTH SEP)

UPPER SOIL ZONE:

SUBLAYER 1

TOTAL VOLATILIZED 3.137E+04

SOIL ZONE 2:

SUBLAYER 1

TOTAL DIFFUSED (UP) 3.913E+04

SOIL ZONE 3:

SUBLAYER 1

TOTAL DIFFUSED (UP) 5.106E+04

SUBLAYER 2

TOTAL DIFFUSED (UP) 8.161E+04

SUBLAYER 3

TOTAL DIFFUSED (UP) 1.601E+05

SUBLAYER 4

TOTAL DIFFUSED (UP) 3.404E+05

SUBLAYER 5

TOTAL DIFFUSED (UP) 6.763E+05

SUBLAYER 6

TOTAL DIFFUSED (UP) 1.197E+06

SUBLAYER 7

TOTAL DIFFUSED (UP) 1.759E+06

SUBLAYER 8

TOTAL DIFFUSED (UP) 2.056E+06

SUBLAYER 9

TOTAL DIFFUSED (UP) 1.757E+06

SUBLAYER 10

TOTAL DIFFUSED (UP) 7.000E+05

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

1 -- AVERAGE POLLUTANT CONCENTRATIONS -- NOTE: ONLY NON-ZERO VALUES ARE PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	1.122E-02
ADSORBED SOIL (UG/G)	1.459E-02
SOIL AIR (UG/ML)	5.677E-04

SOIL ZONE 2:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	1.195E-02
ADSORBED SOIL (UG/G)	1.553E-02
SOIL AIR (UG/ML)	6.043E-04

SOIL ZONE 3:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	1.511E-02
ADSORBED SOIL (UG/G)	1.965E-02
SOIL AIR (UG/ML)	7.645E-04

SUBLAYER 2

SOIL MOISTURE (UG/ML)	2.017E-02
ADSORBED SOIL (UG/G)	2.623E-02
SOIL AIR (UG/ML)	1.021E-03

SUBLAYER 3

SOIL MOISTURE (UG/ML)	3.010E-02
ADSORBED SOIL (UG/G)	3.913E-02
SOIL AIR (UG/ML)	1.523E-03

SUBLAYER 4

SOIL MOISTURE (UG/ML)	5.119E-02
ADSORBED SOIL (UG/G)	6.655E-02
SOIL AIR (UG/ML)	2.590E-03

SUBLAYER 5

SOIL MOISTURE (UG/ML)	9.311E-02
ADSORBED SOIL (UG/G)	1.210E-01
SOIL AIR (UG/ML)	4.711E-03

SUBLAYER 6

SOIL MOISTURE (UG/ML)	1.673E-01
ADSORBED SOIL (UG/G)	2.175E-01
SOIL AIR (UG/ML)	8.465E-03

SUBLAYER 7

SOIL MOISTURE (UG/ML)	2.764E-01
ADSORBED SOIL (UG/G)	3.593E-01
SOIL AIR (UG/ML)	1.398E-02

SUBLAYER 8

SOIL MOISTURE (UG/ML)	4.040E-01
ADSORBED SOIL (UG/G)	5.252E-01
SOIL AIR (UG/ML)	2.044E-02

SUBLAYER 9

SOIL MOISTURE (UG/ML)	5.132E-01
ADSORBED SOIL (UG/G)	6.672E-01
SOIL AIR (UG/ML)	2.596E-02

SUBLAYER 10

SOIL MOISTURE (UG/ML)	5.570E-01
ADSORBED SOIL (UG/G)	7.241E-01
SOIL AIR (UG/ML)	2.817E-02

LOWER SOIL ZONE:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	4.678E-01
ADSORBED SOIL (UG/G)	6.081E-01
SOIL AIR (UG/ML)	2.364E-02

MAX. POLL. DEPTH (M)	1.695E+01

**********EXECUTION COMPLETED**********

Table G-3

SESOIL MODEL INPUT SUMMARY
RUFF ROAD FIRE TRAINING AREA
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Parameter	Baseline Input Data	Source
Soil Data:		
Intrinsic Permeability (cm^2)	2.0E - 08	Site Data, Literature
Effective Porosity	0.29	Literature
Soil Disconnectedness	4.3	Documentation
Total Organic Carbon (%)	0.41	Site Data
Soil pH	7	Documentation
Dry Bulk Density (g/cm^3)	1.7	Site Data / Documentation
CEC (meq/100g)	0	Documentation
Freudlich Exponent	1	Documentation
Chemical Data:		
Adsorption Coefficient, K_{oc} (µg/g)/(µg/mL)	1300	Literature
Biodegradation Rate, water (1/day)	0	--
Biodegradation Rate, soil (1/day)	0	--
Solubility (ug/mL @ 25°C)	31.7	Literature
Diffusion Coefficient in Air (cm^2/s)	0.001	Literature
Henry's Law Constant @ 25°C	0.00115	Literature
Soil Partition Coefficient, K_d (µg/g)/(µg/mL)	calculated	--
Molecular Weight (g/mol)	128	Literature
Neutral Hydrolysis (L/mol-day)	0	--
Base Hydrolysis (L/mol-day)	0	--
Acid Hydrolysis (L/mol-day)	0	--
Ligand Stability Constant	0	--
Ligand Ratio	0	--
Ligand Molecular Weight (g/mol)	0	--
Application and Climate Data:		
Site Latitude	61	Site Data
Surface Area (cm^2)	5.60E+07	Site Data
Spill Index (1-spill, 2-constant)	1	--
Residual Concentration (mg/kg of naphthalene)	1	Site Data
No. of Layers / Compartments	4	Documentation
Layer 1 thickness (cm)	580	Site Data
Layer 2 thickness (cm)	30	Site Data
Layer 3 thickness (cm)	2000	Site Data
Layer 4 thickness (cm)	2000	Site Data
All Interlayer Ratios	1	Documentation
Climate	Merrill Field	Literature

Notes: Documentation = refers to model recommended settings.
Literature = refers to available information of published data.
Site Data = refers to site specific data collected during the RI.

Key at end of table.

Key:

-- = not applicable or not required.
cm = centimeters.
cm^2 = square centimeters.
cm^2/s = square centimeters per second.
g/cm^3 = grams per cubic centimeter.
g/mol = grams per mole.
L/mol-day = liters per mole per day.
meq/100g = milliequivalents per 100 grams of dry soil.
µg/g = micrograms per gram.
mg/kg = milligrams per kilogram.
µg/mL = micrograms per milliliter.

RRFTA024.WPD

OUA 0021583

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**********************************************************************************************************
*****                                                                                                 *****
***** SESOIL-84 :  SEASONAL CYCLES OF WATER, SEDIMENT, AND POLLUTANTS IN SOIL ENVIRONMENTS            *****
*****                                                                                                 *****
***** DEVELOPERS:  M. BONAZOUNTAS,ARTHUR D. LITTLE INC.  ,(617)864-5770,X5871                        *****
*****             J. WAGNER      ,DIS/ADLPIPE, INC.      ,(617)492-1991,X5820                       *****
*****                                                                                                 *****
***** MODIFIED EXTENSIVELY BY:                                                                       *****
***** D.M. HETRICK                                                                                   *****
***** OAK RIDGE NATIONAL LABORATORY                                                                  *****
***** (615) 576-7556                                                                                 *****
***** VERSION    :  SEPTEMBER 1986                                                                   *****
*****                                                                                                 *****
**********************************************************************************************************

                    ****** MONTHLY SESOIL MODEL OPERATION ******
                           MONTHLY SITE SPECIFIC SIMULATION

REGION           :      Ft. Richardson: OU-A   RRFTA
SOIL TYPE        :      Sand
COMPOUND         :      Naphthalene
WASHLOAD DATA    :
APPLICATION AREA:       AP3635, AP3641, AP3642; 2.5to 20 ft


     GENERAL INPUT PARAMETERS
     ========================


     -- SOIL INPUT PARAMETERS --

SOIL DENSITY (G/CM**3):                                    1.70
INTRINSIC PERMEABILITY (CM**2):                            .200E-07
DISCONNECTEDNESS INDEX (-):                                4.30
POROSITY (-):                                              .290
ORGANIC CARBON CONTENT (%):                                .410
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL):        .000
FREUNDLICH EXPONENT (-):                                   1.00
1

     -- CHEMICAL INPUT PARAMETERS --

SOLUBILITY (UG/ML):                                        31.7
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC):                  .100E-02
HENRYS LAW CONSTANT (M**3-ATM/MOLE):                       .115E-02
ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC):             .130E+04
ADSORPTION COEFFICIENT ON SOIL (K):                        .000
MOLECULAR  WEIGHT (G/MOL):                                 128.
VALENCE (-):                                               .000
NEUTRAL HYDROLYSIS CONSTANT (/DAY):                        .000
BASE HYDROLYSIS CONSTANT (L/MOL-DAY):                      .000
ACID HYDROLYSIS CONSTANT (L/MOL-DAY):                      .000
DEGRADATION RATE IN MOISTURE (/DAY):                       .000
DEGRADATION RATE ON SOIL (/DAY):                           .000
LIGAND-POLLUTANT STABILITY CONSTANT (-):                   .000
NO. MOLES LIGAND/MOLE POLLUTANT (-):                       .000
LIGAND MOLECULAR WEIGHT (G/MOL):                           .000

     -- APPLICATION INPUT PARAMETERS --

NUMBER OF SOIL LAYERS:                                      4
YEARS TO BE SIMULATED:                                      90
AREA (CM**2):                                              0.560E+08
APPLICATION AREA LATITUDE (DEG.):                           61.1
SPILL (1) OR STEADY APPLICATION (0):                        1
DEPTHS (CM):                                               0.58E+03  30.     0.20E+04 0.20E+04
NUMBER OF SUBLAYERS/LAYER                                         1         1        10       10
PH (CM):                                                    7.0       7.0      7.0      7.0
INTRINSIC PERMEABILITIES (CM**2):                          0.00      0.00     0.00     0.00
KDEL RATIOS (-):                                            1.0       1.0      1.0
KDES RATIOS (-):                                            1.0       1.0      1.0
OC RATIOS (-):                                              1.0       1.0      1.0
CEC RATIOS (-):                                             1.0       1.0      1.0
FRN RATIOS(-):                                              1.0       1.0      1.0
ADS RATIOS(-):                                              1.0       1.0      1.0
1
     YEAR - 1    MONTHLY INPUT PARAMETERS
     ========    ========================
```

-- CLIMATIC INPUT PARAMETERS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TEMP. (DEG C)	1.390	-5.000	-11.200	-14.900	-9.500	-6.050	2.170	7.390	12.390	14.720	13.560	8.780
CLOUD CVR (FRAC.)	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
REL. HUM.(FRAC.)	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
ALBEDO (-)	0.180	0.320	0.480	0.510	0.480	0.420	0.210	0.150	0.150	0.150	0.150	0.150
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PRECIP. (CM)	3.690	1.350	3.150	2.030	1.170	0.990	0.660	0.790	3.450	4.060	7.210	6.530
M.TIME RAIN(DAYS)	0.430	0.500	0.430	0.480	0.370	0.310	0.310	0.320	0.380	0.470	0.590	0.420
M. STORM NO. (-)	2.170	2.170	1.520	1.410	1.040	0.910	1.180	1.520	3.320	4.240	4.180	2.000
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

-- POLLUTANT INPUT PARAMETERS --

POL. INP-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
SURFACE RUNOFF MULT.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. IN RAIN (FRAC-SL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. INP-2 (UG/CM**2)	9.06E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-2	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
POL. INP-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
POL. INP-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0
TRNSFORMD-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-L	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

1

YEAR - 2 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS ARE SAME AS LAST YEAR

-- POLLUTANT INPUT PARAMETERS --

POL. INP-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
SURFACE RUNOFF MULT.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. IN RAIN (FRAC-SL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. INP-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-2	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
POL. INP-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
POL. INP-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

OLATILIZATION MULT.-L 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00

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YEAR - 3 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS ARE SAME AS LAST YEAR

-- POLLUTANT INPUT PARAMETERS ARE SAME AS LAST YEAR

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YEAR -90 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS ARE SAME AS LAST YEAR

-- POLLUTANT INPUT PARAMETERS ARE SAME AS LAST YEAR

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YEAR - 1 MONTHLY RESULTS (OUTPUT)

-- HYDROLOGIC CYCLE COMPONENTS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MOIS. IN L1 (%)	5.217	5.188	5.536	5.565	5.420	5.159	4.724	4.347	4.405	4.463	4.985	5.420
MOIS. BELOW L1 (%)	5.217	5.188	5.536	5.565	5.420	5.159	4.724	4.347	4.405	4.463	4.985	5.420
PRECIPATION (CM)	3.713	1.393	3.216	2.037	1.226	1.066	0.799	0.858	3.540	4.114	7.201	6.570
NET INFILT. (CM)	3.713	1.393	3.216	2.037	1.226	1.066	0.799	0.858	3.540	4.114	7.201	6.570
EVAPOTRANS. (CM)	0.510	0.304	0.304	0.304	0.304	0.695	1.200	1.257	2.053	2.466	2.989	2.121
MOIS. RETEN (CM)	1.326	-0.110	1.326	0.110	-0.552	-0.994	-1.657	-1.436	0.221	0.221	1.989	1.657
SUR. RUNOFF (CM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRW. RUNOFF (CM)	1.878	1.200	1.586	1.622	1.475	1.365	1.257	1.037	1.265	1.427	2.223	2.792
YIELD (CM)	1.878	1.200	1.586	1.622	1.475	1.365	1.257	1.037	1.265	1.427	2.223	2.792
PAU/MPA (GZU)	1.006	1.032	1.021	1.003	1.048	1.077	1.211	1.086	1.026	1.013	0.999	1.006
PA/MPA (GZ)	1.006	1.032	1.021	1.003	1.048	1.077	1.211	1.086	1.026	1.013	0.999	1.006

1 -- POLLUTANT MASS INPUT TO COLUMN (UG) --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PRECIP.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD UPPER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 2	5.074E+10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD LOWER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTAL INPUT	5.074E+10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

UPPER SOIL ZONE:

SUBLAYER 1

VOLATILIZED	5.709E+01	3.573E+02	6.965E+02	1.022E+03	1.365E+03	1.756E+03	2.213E+03	2.691E+03	3.016E+03	3.316E+03	3.427E+03	3.566E+03
IN SOIL MOI	2.227E+05	6.917E+05	1.226E+06	1.716E+06	2.144E+06	2.503E+06	2.734E+06	2.935E+06	3.385E+06	3.835E+06	4.700E+06	5.541E+06
ADS ON SOIL	3.868E+07	1.208E+08	2.007E+08	2.793E+08	3.584E+08	4.396E+08	5.244E+08	6.118E+08	6.963E+08	7.785E+08	8.543E+08	9.263E+08
IN SOIL AIR	5.161E+04	1.653E+05	2.772E+05	3.812E+05	4.856E+05	5.972E+05	7.126E+05	8.278E+05	9.228E+05	1.012E+06	1.090E+06	1.177E+06

SOIL ZONE 2:

SUBLAYER 1

DIFFUSED UP	4.165E+07	8.281E+07	8.058E+07	7.926E+07	7.972E+07	8.189E+07	8.533E+07	8.795E+07	8.550E+07	8.324E+07	7.757E+07	7.387E+07
IN SOIL MOI	2.898E+08	2.877E+08	3.064E+08	3.075E+08	2.990E+08	2.843E+08	2.600E+08	2.389E+08	2.416E+08	2.444E+08	2.724E+08	2.956E+08

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\DS ON SOIL 5.034E+10 5.025E+10 5.015E+10 5.007E+10 4.999E+10 4.992E+10 4.986E+10 4.979E+10 4.970E+10 4.962E+10 4.951E+10 4.941E+10
IN SOIL AIR 6.716E+07 6.876E+07 6.925E+07 6.832E+07 6.774E+07 6.783E+07 6.776E+07 6.737E+07 6.587E+07 6.449E+07 6.320E+07 6.28[illegible]7

     SOIL ZONE 3:

          SUBLAYER  1

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9

          SUBLAYER 10

     LOWER SOIL ZONE:

          SUBLAYER  1

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9

          SUBLAYER 10


     -- POLLUTANT CONCENTRATIONS (UG/ML) OR (UG/G) -- NOTE: IF CONCENTRATIONS ARE ZERO FOR EACH MONTH, THEY ARE NOT PRINTED --
     ---------------------------------------------------------------------------------------------------------------------

     UPPER SOIL ZONE:

          SUBLAYER  1

MOISTURE    1.314E-04 4.105E-04 6.820E-04 9.491E-04 1.218E-03 1.494E-03 1.782E-03 2.079E-03 2.366E-03 2.645E-03 2.903E-03 3.147E-03
%SOLUBILITY 4.146E-04 1.295E-03 2.151E-03 2.994E-03 3.841E-03 4.712E-03 5.620E-03 6.557E-03 7.464E-03 8.345E-03 9.157E-03 9.929E-03
ADSORBED    7.005E-04 2.188E-03 3.635E-03 5.059E-03 6.491E-03 7.961E-03 9.496E-03 1.108E-02 1.261E-02 1.410E-02 1.547E-02 1.678E-02
SOIL AIR    6.681E-06 2.137E-05 3.637E-05 5.008E-05 6.341E-05 7.713E-05 9.037E-05 1.034E-04 1.155E-04 1.270E-04 1.398E-04 1.537E-04

     SOIL ZONE 2:
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SUBLAYER 1

MOISTURE	3.307E+00	3.301E+00	3.294E+00	3.289E+00	3.284E+00	3.280E+00	3.276E+00	3.271E+00	3.265E+00	3.259E+00	3.252E+00	3.246E+00
%SOLUBILITY	1.043E+01	1.041E+01	1.039E+01	1.038E+01	1.036E+01	1.035E+01	1.033E+01	1.032E+01	1.030E+01	1.028E+01	1.026E+01	1.024E+01
ADSORBED	1.762E+01	1.759E+01	1.756E+01	1.753E+01	1.750E+01	1.748E+01	1.746E+01	1.743E+01	1.740E+01	1.737E+01	1.734E+01	1.730E+01
SOIL AIR	1.681E-01	1.719E-01	1.757E-01	1.735E-01	1.710E-01	1.693E-01	1.661E-01	1.627E-01	1.594E-01	1.564E-01	1.566E-01	1.586E-01

SOIL ZONE 3:

LOWER SOIL ZONE:

POL DEP CM	5.954E+02	5.955E+02	5.959E+02	5.961E+02	5.962E+02	5.963E+02	5.964E+02	5.965E+02	5.969E+02	5.973E+02	5.980E+02	5.987E+02

1 YEAR - 1 ANNUAL SUMMARY REPORT

-- TOTAL INPUTS (UG) --

UPPER SOIL ZONE	0.000E+00
SOIL ZONE 2	5.074E+10
SOIL ZONE 3	0.000E+00
LOWER SOIL ZONE	0.000E+00

-- HYDROLOGIC CYCLE COMPONENTS --

AVERAGE SOIL MOISTURE ZONE 1 (%)	5.036
AVERAGE SOIL MOISTURE BELOW ZONE 1 (%)	5.036
TOTAL PRECIPITATION (CM)	35.734
TOTAL INFILTRATION (CM)	35.733
TOTAL EVAPOTRANSPIRATION (CM)	14.507
TOTAL SURFACE RUNOFF (CM)	0.000
TOTAL GRW RUNOFF (CM)	19.127
TOTAL MOISTURE RETENTION (CM)	2.100
TOTAL YIELD (CM)	19.127

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

FOR FINAL MASS IN SOIL MOI., ADS. ON SOIL, SOIL AIR, IMMOBIL CEC, COMPLEXED, AND PURE PHASE FOR EACH SUBLAYER, SEE ABOVE (MONTH SEP)

UPPER SOIL ZONE:

SUBLAYER 1

TOTAL VOLATILIZED 2.348E+04

SOIL ZONE 2:

SUBLAYER 1

TOTAL DIFFUSED (UP) 9.394E+08

SOIL ZONE 3:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

1 -- AVERAGE POLLUTANT CONCENTRATIONS -- NOTE: ONLY NON-ZERO VALUES ARE PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	1.651E-03
ADSORBED SOIL (UG/G)	8.797E-03
SOIL AIR (UG/ML)	8.207E-05

SOIL ZONE 2:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	3.277E+00
ADSORBED SOIL (UG/G)	1.747E+01
SOIL AIR (UG/ML)	1.658E-01

SOIL ZONE 3:

LOWER SOIL ZONE:

MAX. POLL. DEPTH (M)	5.987E+00

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YEAR -10 MONTHLY RESULTS (OUTPUT)

-- HYDROLOGIC CYCLE COMPONENTS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MOIS. IN L1 (%)	5.594	5.478	5.739	5.739	5.565	5.275	4.782	4.376	4.405	4.463	4.985	5.4
MOIS. BELOW L1 (%)	5.594	5.478	5.739	5.739	5.565	5.275	4.782	4.376	4.405	4.463	4.985	5.42

PRECIPATION (CM)	3.707	1.378	3.150	2.156	1.293	1.104	0.678	0.797	3.429	4.114	7.201	6.570
NET INFILT. (CM)	3.707	1.378	3.150	2.156	1.293	1.104	0.678	0.797	3.429	4.114	7.201	6.570
EVAPOTRANS. (CM)	0.510	0.304	0.304	0.304	0.304	0.706	1.232	1.276	2.053	2.466	2.989	2.121
MOIS. RETEN (CM)	0.663	-0.442	0.994	0.000	-0.663	-1.105	-1.878	-1.547	0.111	0.221	1.989	1.657
SUR. RUNOFF (CM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRW. RUNOFF (CM)	2.535	1.516	1.852	1.852	1.652	1.502	1.324	1.067	1.265	1.427	2.223	2.792
YIELD (CM)	2.535	1.516	1.852	1.852	1.652	1.502	1.324	1.067	1.265	1.427	2.223	2.792
PAU/MPA (GZU)	1.005	1.021	1.000	1.062	1.105	1.115	1.027	1.008	0.994	1.013	0.999	1.006
PA/MPA (GZ)	1.005	1.021	1.000	1.062	1.105	1.115	1.027	1.008	0.994	1.013	0.999	1.006

1 -- POLLUTANT MASS INPUT TO COLUMN (UG) --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PRECIP.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+
LOAD UPPER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E
LOAD ZONE 2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+
LOAD ZONE 3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD LOWER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTAL INPUT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

UPPER SOIL ZONE:

SUBLAYER 1

VOLATILIZED	2.713E+04	2.839E+04	2.813E+04	2.796E+04	2.842E+04	2.951E+04	3.122E+04	3.254E+04	3.197E+04	3.132E+04	2.935E+04	2.808E+04
IN SOIL MOI	4.133E+07	4.067E+07	4.279E+07	4.298E+07	4.188E+07	3.990E+07	3.637E+07	3.348E+07	3.385E+07	3.444E+07	3.857E+07	4.205E+07
ADS ON SOIL	6.694E+09	6.727E+09	6.755E+09	6.786E+09	6.819E+09	6.854E+09	6.892E+09	6.931E+09	6.963E+09	6.992E+09	7.011E+09	7.029E+09
IN SOIL AIR	8.790E+06	9.093E+06	9.247E+06	9.191E+06	9.183E+06	9.266E+06	9.343E+06	9.368E+06	9.228E+06	9.088E+06	8.949E+06	8.935E+06

SOIL ZONE 2:

SUBLAYER 1

DIFFUSED UP	3.436E+07	3.540E+07	3.458E+07	3.385E+07	3.398E+07	3.489E+07	3.653E+07	3.770E+07	3.652E+07	3.510E+07	3.210E+07	2.987E+07
IN SOIL MOI	1.409E+08	1.371E+08	1.418E+08	1.405E+08	1.354E+08	1.276E+08	1.152E+08	1.050E+08	1.043E+08	1.041E+08	1.133E+08	1.203E+08
ADS ON SOIL	2.282E+10	2.267E+10	2.238E+10	2.218E+10	2.204E+10	2.192E+10	2.183E+10	2.174E+10	2.145E+10	2.113E+10	2.059E+10	2.011E+10
IN SOIL AIR	2.996E+07	3.064E+07	3.064E+07	3.004E+07	2.968E+07	2.964E+07	2.960E+07	2.938E+07	2.843E+07	2.746E+07	2.629E+07	2.556E+07

SOIL ZONE 3:

SUBLAYER 1

IN SOIL MOI	1.266E+08	1.247E+08	1.321E+08	1.332E+08	1.298E+08	1.236E+08	1.124E+08	1.033E+08	1.051E+08	1.079E+08	1.232E+08	1.366E+08
ADS ON SOIL	2.050E+10	2.062E+10	2.086E+10	2.103E+10	2.114E+10	2.123E+10	2.131E+10	2.138E+10	2.163E+10	2.192E+10	2.240E+10	2.284E+10
IN SOIL AIR	2.692E+07	2.787E+07	2.855E+07	2.848E+07	2.846E+07	2.871E+07	2.888E+07	2.889E+07	2.866E+07	2.848E+07	2.859E+07	2.903E+07

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

-- POLLUTANT CONCENTRATIONS (UG/ML) OR (UG/G) -- NOTE: IF CONCENTRATIONS ARE ZERO FOR EACH MONTH, THEY ARE NOT PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

MOISTURE	2.275E-02	2.286E-02	2.295E-02	2.306E-02	2.317E-02	2.329E-02	2.342E-02	2.355E-02	2.366E-02	2.376E-02	2.382E-02	2.388E-02
%SOLUBILITY	7.175E-02	7.211E-02	7.241E-02	7.274E-02	7.309E-02	7.346E-02	7.387E-02	7.430E-02	7.464E-02	7.495E-02	7.515E-02	7.534E-02
ADSORBED	1.212E-01	1.218E-01	1.223E-01	1.229E-01	1.235E-01	1.241E-01	1.248E-01	1.255E-01	1.261E-01	1.266E-01	1.270E-01	1.273E-01
SOIL AIR	1.156E-03	1.190E-03	1.224E-03	1.217E-03	1.206E-03	1.202E-03	1.188E-03	1.171E-03	1.155E-03	1.140E-03	1.147E-03	1.[illegible]3

SOIL ZONE 2:

SUBLAYER 1

MOISTURE	1.499E+00	1.489E+00	1.470E+00	1.457E+00	1.448E+00	1.440E+00	1.434E+00	1.428E+00	1.409E+00	1.388E+00	1.353E+00	1.321E+00
%SOLUBILITY	4.729E+00	4.698E+00	4.639E+00	4.596E+00	4.568E+00	4.543E+00	4.524E+00	4.505E+00	4.446E+00	4.379E+00	4.268E+00	4.167E+00
ADSORBED	7.990E+00	7.937E+00	7.838E+00	7.766E+00	7.718E+00	7.675E+00	7.644E+00	7.611E+00	7.512E+00	7.398E+00	7.211E+00	7.041E+00
SOIL AIR	7.620E-02	7.754E-02	7.841E-02	7.688E-02	7.539E-02	7.436E-02	7.275E-02	7.102E-02	6.881E-02	6.662E-02	6.516E-02	6.453E-02

SOIL ZONE 3:

SUBLAYER 1

MOISTURE	2.040E-01	2.051E-01	2.075E-01	2.092E-01	2.103E-01	2.112E-01	2.120E-01	2.127E-01	2.151E-01	2.180E-01	2.228E-01	2.272E-01
%SOLUBILITY	6.434E-01	6.471E-01	6.545E-01	6.599E-01	6.633E-01	6.664E-01	6.686E-01	6.709E-01	6.787E-01	6.878E-01	7.030E-01	7.167E-01
ADSORBED	1.087E+00	1.093E+00	1.106E+00	1.115E+00	1.121E+00	1.126E+00	1.130E+00	1.134E+00	1.147E+00	1.162E+00	1.188E+00	1.211E+00
SOIL AIR	1.037E-02	1.068E-02	1.106E-02	1.104E-02	1.095E-02	1.091E-02	1.075E-02	1.058E-02	1.050E-02	1.046E-02	1.073E-02	1.110E-02

LOWER SOIL ZONE:

POL DEP CM	6.268E+02	6.270E+02	6.273E+02	6.275E+02	6.277E+02	6.278E+02	6.279E+02	6.280E+02	6.283E+02	6.286E+02	6.292E+02	6.298E+02

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-- TOTAL INPUTS (UG) --

UPPER SOIL ZONE	0.000E+00
SOIL ZONE 2	0.000E+00
SOIL ZONE 3	0.000E+00
LOWER SOIL ZONE	0.000E+00

-- HYDROLOGIC CYCLE COMPONENTS --

AVERAGE SOIL MOISTURE ZONE 1 (%)	5.152
AVERAGE SOIL MOISTURE BELOW ZONE 1 (%)	5.152

```
TOTAL PRECIPITATION (CM)                    35.577
TOTAL INFILTRATION (CM)                     35.577
TOTAL EVAPOTRANSPIRATION (CM)               14.569
TOTAL SURFACE RUNOFF (CM)                    0.000
TOTAL GRW RUNOFF (CM)                       21.008
TOTAL MOISTURE RETENTION (CM)                0.000
TOTAL YIELD (CM)                            21.008
0          -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED
           ------------------------------------------------------------------------------------------------------
FOR FINAL MASS IN SOIL MOI., ADS. ON SOIL, SOIL AIR, IMMOBIL CEC, COMPLEXED, AND PURE PHASE FOR EACH SUBLAYER, SEE ABOVE (MONTH SEP)
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     UPPER SOIL ZONE:

          SUBLAYER  1

               TOTAL VOLATILIZED              3.540E+05

     SOIL ZONE 2:

          SUBLAYER  1

               TOTAL DIFFUSED (UP)            4.149E+08

     SOIL ZONE 3:

          SUBLAYER  1

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9

          SUBLAYER 10

     LOWER SOIL ZONE:

          SUBLAYER  1

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9
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SUBLAYER 10

1 -- AVERAGE POLLUTANT CONCENTRATIONS -- NOTE: ONLY NON-ZERO VALUES ARE PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	2.335E-02
ADSORBED SOIL (UG/G)	1.244E-01
SOIL AIR (UG/ML)	1.180E-03

SOIL ZONE 2:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	1.428E+00
ADSORBED SOIL (UG/G)	7.612E+00
SOIL AIR (UG/ML)	7.230E-02

SOIL ZONE 3:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	2.129E-01
ADSORBED SOIL (UG/G)	1.135E+00
SOIL AIR (UG/ML)	1.076E-02

LOWER SOIL ZONE:

MAX. POLL. DEPTH (M)	6.298E+00

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YEAR -90 MONTHLY RESULTS (OUTPUT)

-- HYDROLOGIC CYCLE COMPONENTS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MOIS. IN L1 (%)	5.594	5.478	5.739	5.739	5.565	5.275	4.782	4.376	4.405	4.463	4.985	5.420
MOIS. BELOW L1 (%)	5.594	5.478	5.739	5.739	5.565	5.275	4.782	4.376	4.405	4.463	4.985	5.420
PRECIPATION (CM)	3.707	1.378	3.150	2.156	1.293	1.104	0.678	0.797	3.429	4.114	7.201	6.570
NET INFILT. (CM)	3.707	1.378	3.150	2.156	1.293	1.104	0.678	0.797	3.429	4.114	7.201	6.570
EVAPOTRANS. (CM)	0.510	0.304	0.304	0.304	0.304	0.706	1.232	1.276	2.053	2.466	2.989	2.121
MOIS. RETEN (CM)	0.663	-0.442	0.994	0.000	-0.663	-1.105	-1.878	-1.547	0.111	0.221	1.989	1.657
SUR. RUNOFF (CM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRW. RUNOFF (CM)	2.535	1.516	1.852	1.852	1.652	1.502	1.324	1.067	1.265	1.427	2.223	2.792
YIELD (CM)	2.535	1.516	1.852	1.852	1.652	1.502	1.324	1.067	1.265	1.427	2.223	2.792
PAU/MPA (GZU)	1.005	1.021	1.000	1.062	1.105	1.115	1.027	1.008	0.994	1.013	0.999	1.006
PA/MPA (GZ)	1.005	1.021	1.000	1.062	1.105	1.115	1.027	1.008	0.994	1.013	0.999	1.006

1 -- POLLUTANT MASS INPUT TO COLUMN (UG) --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PRECIP.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD UPPER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD LOWER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTAL INPUT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

UPPER SOIL ZONE:

SUBLAYER 1

VOLATILIZED	2.331E+04	2.426E+04	2.392E+04	2.366E+04	2.393E+04	2.472E+04	2.602E+04	2.697E+04	2.636E+04	2.570E+04	2.396E+04	2.283E+04
IN SOIL MOI	3.542E+07	3.468E+07	3.630E+07	3.628E+07	3.518E+07	3.334E+07	3.024E+07	2.768E+07	2.785E+07	2.819E+07	3.143E+07	3.411E+07
ADS ON SOIL	5.737E+09	5.736E+09	5.730E+09	5.728E+09	5.727E+09	5.727E+09	5.729E+09	5.731E+09	5.728E+09	5.723E+09	5.713E+09	5.703E+09
IN SOIL AIR	7.533E+06	7.752E+06	7.844E+06	7.758E+06	7.713E+06	7.743E+06	7.767E+06	7.746E+06	7.590E+06	7.438E+06	7.292E+06	7.250E+06

SOIL ZONE 2:

SUBLAYER 1

DIFFUSED UP	1.469E+05	1.529E+05	1.509E+05	1.492E+05	1.512E+05	1.568E+05	1.658E+05	1.728E+05	1.692E+05	1.646E+05	1.523E+05	1.435E+05
IN SOIL MOI	2.428E+06	2.379E+06	2.489E+06	2.489E+06	2.415E+06	2.291E+06	2.081E+06	1.907E+06	1.918E+06	1.940E+06	2.157E+06	2.336E+06
ADS ON SOIL	3.933E+08	3.935E+08	3.930E+08	3.929E+08	3.932E+08	3.936E+08	3.943E+08	3.949E+08	3.945E+08	3.939E+08	3.921E+08	3.904E+08
IN SOIL AIR	5.164E+05	5.319E+05	5.380E+05	5.322E+05	5.295E+05	5.321E+05	5.345E+05	5.337E+05	5.228E+05	5.120E+05	5.005E+05	4.963E+05

SOIL ZONE 3:

SUBLAYER 1

DIFFUSED UP	8.260E+05	8.591E+05	8.463E+05	8.363E+05	8.453E+05	8.728E+05	9.180E+05	9.512E+05	9.290E+05	9.045E+05	8.422E+05	8.009E+05
IN SOIL MOI	1.624E+08	1.589E+08	1.662E+08	1.660E+08	1.609E+08	1.524E+08	1.382E+08	1.264E+08	1.271E+08	1.285E+08	1.430E+08	1.549E+08
ADS ON SOIL	2.630E+10	2.628E+10	2.624E+10	2.621E+10	2.619E+10	2.618E+10	2.618E+10	2.618E+10	2.614E+10	2.609E+10	2.599E+10	2.590E+10
IN SOIL AIR	3.454E+07	3.552E+07	3.591E+07	3.549E+07	3.527E+07	3.539E+07	3.549E+07	3.538E+07	3.464E+07	3.391E+07	3.317E+07	3.292E+07

SUBLAYER 2

IN SOIL MOI	9.505E+07	9.320E+07	9.788E+07	9.807E+07	9.522E+07	9.038E+07	8.202E+07	7.515E+07	7.585E+07	7.710E+07	8.657E+07	9.459E+07
ADS ON SOIL	1.540E+10	1.542E+10	1.545E+10	1.548E+10	1.550E+10	1.552E+10	1.554E+10	1.556E+10	1.560E+10	1.565E+10	1.574E+10	1.581E+10
IN SOIL AIR	2.022E+07	2.084E+07	2.115E+07	2.097E+07	2.088E+07	2.099E+07	2.107E+07	2.103E+07	2.068E+07	2.035E+07	2.008E+07	2.010E+07

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

-- POLLUTANT CONCENTRATIONS (UG/ML) OR (UG/G) -- NOTE: IF CONCENTRATIONS ARE ZERO FOR EACH MONTH, THEY ARE NOT PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

MOISTURE	1.949E-02	1.949E-02	1.947E-02	1.946E-02	1.946E-02	1.946E-02	1.947E-02	1.947E-02	1.946E-02	1.945E-02	1.941E-02	1.938E-02
%SOLUBILITY	6.149E-02	6.148E-02	6.142E-02	6.140E-02	6.139E-02	6.139E-02	6.141E-02	6.143E-02	6.139E-02	6.134E-02	6.123E-02	6.113E-02
ADSORBED	1.039E-01	1.039E-01	1.038E-01	1.037E-01	1.037E-01	1.037E-01	1.038E-01	1.038E-01	1.037E-01	1.036E-01	1.035E-01	1.033E-01
SOIL AIR	9.909E-04	1.015E-03	1.038E-03	1.027E-03	1.013E-03	1.005E-03	9.875E-04	9.685E-04	9.502E-04	9.333E-04	9.349E-04	9.466E-04

SOIL ZONE 2:

SUBLAYER 1

MOISTURE	2.584E-02	2.585E-02	2.582E-02	2.581E-02	2.583E-02	2.586E-02	2.590E-02	2.594E-02	2.592E-02	2.588E-02	2.576E-02	2.565E-02
%SOLUBILITY	8.150E-02	8.155E-02	8.145E-02	8.143E-02	8.148E-02	8.157E-02	8.170E-02	8.184E-02	8.176E-02	8.163E-02	8.125E-02	8.091E-02
ADSORBED	1.377E-01	1.378E-01	1.376E-01	1.376E-01	1.377E-01	1.378E-01	1.380E-01	1.383E-01	1.381E-01	1.379E-01	1.373E-01	1.367E-01
SOIL AIR	1.313E-03	1.346E-03	1.377E-03	1.362E-03	1.345E-03	1.335E-03	1.314E-03	1.290E-03	1.265E-03	1.242E-03	1.240E-03	1.253E-03

SOIL ZONE 3:

SUBLAYER 1

MOISTURE	2.617E-01	2.615E-01	2.610E-01	2.607E-01	2.605E-01	2.604E-01	2.605E-01	2.605E-01	2.600E-01	2.595E-01	2.586E-01	2.577E-01
%SOLUBILITY	8.254E-01	8.248E-01	8.233E-01	8.224E-01	8.219E-01	8.216E-01	8.217E-01	8.216E-01	8.203E-01	8.187E-01	8.156E-01	8.128E-01
ADSORBED	1.395E+00	1.394E+00	1.391E+00	1.390E+00	1.389E+00	1.388E+00	1.388E+00	1.388E+00	1.386E+00	1.383E+00	1.378E+00	1.373E+00
SOIL AIR	1.330E-02	1.361E-02	1.392E-02	1.376E-02	1.357E-02	1.345E-02	1.321E-02	1.295E-02	1.270E-02	1.246E-02	1.245E-02	1.259E-02

SUBLAYER 2

MOISTURE	1.532E-01	1.534E-01	1.537E-01	1.540E-01	1.542E-01	1.544E-01	1.546E-01	1.548E-01	1.552E-01	1.557E-01	1.565E-01	1.573E-01
%SOLUBILITY	4.832E-01	4.838E-01	4.849E-01	4.859E-01	4.866E-01	4.872E-01	4.877E-01	4.883E-01	4.897E-01	4.912E-01	4.938E-01	4.962E-01
ADSORBED	8.163E-01	8.174E-01	8.194E-01	8.210E-01	8.221E-01	8.232E-01	8.241E-01	8.251E-01	8.273E-01	8.300E-01	8.343E-01	8.38
SOIL AIR	7.786E-03	7.985E-03	8.197E-03	8.127E-03	8.031E-03	7.974E-03	7.842E-03	7.699E-03	7.578E-03	7.474E-03	7.539E-03	7.6

LOWER SOIL ZONE:

POL DEP CM	8.939E+02	8.940E+02	8.943E+02	8.945E+02	8.947E+02	8.948E+02	8.949E+02	8.950E+02	8.953E+02	8.957E+02	8.963E+02	8.968E+02

1 YEAR - 90 ANNUAL SUMMARY REPORT

-- TOTAL INPUTS (UG) --

UPPER SOIL ZONE	0.000E+00
SOIL ZONE 2	0.000E+00
SOIL ZONE 3	0.000E+00
LOWER SOIL ZONE	0.000E+00

-- HYDROLOGIC CYCLE COMPONENTS --

AVERAGE SOIL MOISTURE ZONE 1 (%)	5.152
AVERAGE SOIL MOISTURE BELOW ZONE 1 (%)	5.152
TOTAL PRECIPITATION (CM)	35.577
TOTAL INFILTRATION (CM)	35.577
TOTAL EVAPOTRANSPIRATION (CM)	14.569
TOTAL SURFACE RUNOFF (CM)	0.000
TOTAL GRW RUNOFF (CM)	21.008
TOTAL MOISTURE RETENTION (CM)	0.000
TOTAL YIELD (CM)	21.008

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

FOR FINAL MASS IN SOIL MOI., ADS. ON SOIL, SOIL AIR, IMMOBIL CEC, COMPLEXED, AND PURE PHASE FOR EACH SUBLAYER, SEE ABOVE (MONTH SEP)

UPPER SOIL ZONE:

SUBLAYER 1

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          TOTAL VOLATILIZED                2.956E+05
SOIL ZONE 2:
     SUBLAYER  1
          TOTAL DIFFUSED (UP)              1.876E+06
SOIL ZONE 3:
     SUBLAYER  1
          TOTAL DIFFUSED (UP)              1.043E+07
     SUBLAYER  2
     SUBLAYER  3
     SUBLAYER  4
     SUBLAYER  5
     SUBLAYER  6
     SUBLAYER  7
     SUBLAYER  8
     SUBLAYER  9
     SUBLAYER 10
LOWER SOIL ZONE:
     SUBLAYER  1
     SUBLAYER  2
     SUBLAYER  3
     SUBLAYER  4
     SUBLAYER  5
     SUBLAYER  6
     SUBLAYER  7
     SUBLAYER  8
     SUBLAYER  9
     SUBLAYER 10
1                    -- AVERAGE POLLUTANT CONCENTRATIONS --  NOTE: ONLY NON-ZERO VALUES ARE PRINTED --
                     ------------------------------------------------------------------------------

UPPER SOIL ZONE:
     SUBLAYER  1
                              SOIL MOISTURE (UG/ML)  1.946E-02
                              ADSORBED SOIL (UG/G)   1.037E-01
                              SOIL AIR (UG/ML)       9.841E-04
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SOIL ZONE 2:

     SUBLAYER  1

                              SOIL MOISTURE (UG/ML)  2.584E-02
                              ADSORBED SOIL (UG/G)   1.377E-01
                              SOIL AIR (UG/ML)       1.307E-03

SOIL ZONE 3:

     SUBLAYER  1

                              SOIL MOISTURE (UG/ML)  2.602E-01
                              ADSORBED SOIL (UG/G)   1.387E+00
                              SOIL AIR (UG/ML)       1.316E-02

     SUBLAYER  2

                              SOIL MOISTURE (UG/ML)  1.548E-01
                              ADSORBED SOIL (UG/G)   8.249E-01
                              SOIL AIR (UG/ML)       7.826E-03

LOWER SOIL ZONE:

                              MAX. POLL. DEPTH (M)   8.968E+00


*****************************************EXECUTION COMPLETED*****************************************
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Table G-4

SESOIL MODEL INPUT SUMMARY
PETROLEUM, OIL, AND LUBRICANT LABORATORY DRY WELL
OPERABLE UNIT A
FORT RICHARDSON, ALASKA

Parameter	Baseline Input Data	Source
Soil Data:		
Intrinsic Permeability (cm^2)	1.0E - 08	Site Data, Literature
Effective Porosity	0.29	Literature
Soil Disconnectedness	4.2	Documentation
Total Organic Carbon (%)	0.31	Site Data
Soil pH	7	Documentation
Dry Bulk Density (g/cm^3)	1.7	Site Data / Documentation
CEC (meq/100g)	0	Documentation
Freudlich Exponent	1	Documentation
Chemical Data:		
Adsorption Coefficient, K_{oc} (µg/g)/(µg/mL)	1300	Literature
Biodegradation Rate, water (1/day)	0	- -
Biodegradation Rate, soil (1/day)	0	- -
Solubility (ug/mL @ 25°C)	31.7	Literature
Diffusion Coefficient in Air (cm^2/s)	0.001	Literature
Henry's Law Constant @ 25°C	0.00115	Literature
Soil Partition Coefficient, K_d (µg/g)/(µg/mL)	calculated	- -
Molecular Weight (g/mol)	128	Literature
Neutral Hydrolysis (L/mol-day)	0	- -
Base Hydrolysis (L/mol-day)	0	- -
Acid Hydrolysis (L/mol-day)	0	- -
Ligand Stability Constant	0	- -
Ligand Ratio	0	- -
Ligand Molecular Weight (g/mol)	0	- -
Application and Climate Data:		
Site Latitude	61	Site Data
Surface Area (cm^2)	4.2E + 06	Site Data
Spill Index (1-spill, 2-constant)	1	- -
Residual Concentration (mg/kg of naphthalene)	2.41	Site Data
No. of Layers / Compartments	4	Documentation
Layer 1 thickness (cm)	2000	Site Data
Layer 2 thickness (cm)	30	Site Data
Layer 3 thickness (cm)	760	Site Data
Layer 4 thickness (cm)	760	Site Data
All Interlayer Ratios	1	Documentation
Climate	Merrill Field	Literature

Notes: Documentation = refers to model recommended settings.
Literature = refers to available information of published data.
Site Data = refers to site specific data collected during the RI.

Key at end of table.

Key:

-- = not applicable or not required.
cm = centimeters.
cm^2 = square centimeters.
cm^2/s = square centimeters per second.
g/cm^3 = grams per cubic centimeter.
g/mol = grams per mole.
L/mol-day = liters per mole per day.
meq/100g = milliequivalents per 100 grams of dry soil.
µg/g = micrograms per gram.
mg/kg = milligrams per kilogram.
µg/mL = micrograms per milliliter.

POLLDW23.wpd

OUA 0021599

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**********************************************************************************************
*****                                                                                    *****
***** SESOIL-84 :  SEASONAL CYCLES OF WATER, SEDIMENT, AND POLLUTANTS IN SOIL ENVIRONMENTS *****
*****                                                                                    *****
***** DEVELOPERS:  M. BONAZOUNTAS,ARTHUR D. LITTLE INC.  ,(617)864-5770,X5871           *****
*****              J. WAGNER     ,DIS/ADLPIPE, INC.      ,(617)492-1991,X5820           *****
*****                                                                                    *****
***** MODIFIED EXTENSIVELY BY:                                                          *****
***** D.M. HETRICK                                                                      *****
***** OAK RIDGE NATIONAL LABORATORY                                                     *****
***** (615) 576-7556                                                                    *****
***** VERSION   :  SEPTEMBER 1986                                                       *****
*****                                                                                    *****
**********************************************************************************************

                    ****** MONTHLY SESOIL MODEL OPERATION ******
                           MONTHLY SITE SPECIFIC SIMULATION

REGION          :      Ft. Richardson: OU-A      POLLDW
SOIL TYPE       :      Sand and Gravel
COMPOUND        :      Naphthalene
WASHLOAD DATA   :
APPLICATION AREA:      AP3619, AP3620, AP3648; 15 to 65 ft


     GENERAL INPUT PARAMETERS
     ========================


     -- SOIL INPUT PARAMETERS --

SOIL DENSITY (G/CM**3):                                    1.70
INTRINSIC PERMEABILITY (CM**2):                            .100E-07
DISCONNECTEDNESS INDEX (-):                                4.20
POROSITY (-):                                              .290
ORGANIC CARBON CONTENT (%):                                .310
CATION EXCHANGE CAPACITY (MILLI EQ./100G DRY SOIL):        .000
FREUNDLICH EXPONENT (-):                                   1.00
1

     -- CHEMICAL INPUT PARAMETERS --

SOLUBILITY (UG/ML):                                        31.7
DIFFUSION COEFFICIENT IN AIR (CM**2/SEC):                  .100E-02
HENRYS LAW CONSTANT (M**3-ATM/MOLE):                       .115E-02
ADSORPTION COEFFICIENT ON ORGANIC CARBON(KOC):             .130E+04
ADSORPTION COEFFICIENT ON SOIL (K):                        .000
MOLECULAR  WEIGHT (G/MOL):                                 128.
VALENCE (-):                                               .000
NEUTRAL HYDROLYSIS CONSTANT (/DAY):                        .000
BASE HYDROLYSIS CONSTANT (L/MOL-DAY):                      .000
ACID HYDROLYSIS CONSTANT (L/MOL-DAY):                      .000
DEGRADATION RATE IN MOISTURE (/DAY):                       .000
DEGRADATION RATE ON SOIL (/DAY):                           .000
LIGAND-POLLUTANT STABILITY CONSTANT (-):                   .000
NO. MOLES LIGAND/MOLE POLLUTANT (-):                       .000
LIGAND MOLECULAR WEIGHT (G/MOL):                           .000


     -- APPLICATION INPUT PARAMETERS --

NUMBER OF SOIL LAYERS:                                      4
YEARS TO BE SIMULATED:                                      90
AREA (CM**2):                                              0.420E+07
APPLICATION AREA LATITUDE (DEG.):                          61.1
SPILL (1) OR STEADY APPLICATION (0):                        1
DEPTHS (CM):                                               0.20E+04  30.     0.76E+03 0.76E+03
NUMBER OF SUBLAYERS/LAYER                                        1          1        10       10
PH (CM):                                                    7.0       7.0      7.0      7.0
INTRINSIC PERMEABILITIES (CM**2):                          0.00      0.00     0.00     0.00
KDEL RATIOS (-):                                            1.0       1.0      1.0
KDES RATIOS (-):                                            1.0       1.0      1.0
OC RATIOS (-):                                              1.0       1.0      1.0
CEC RATIOS (-):                                             1.0       1.0      1.0
FRN RATIOS(-):                                              1.0       1.0      1.0
ADS RATIOS(-):                                              1.0       1.0      1.0
1

      YEAR - 1    MONTHLY INPUT PARAMETERS
      ========    ========================
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-- CLIMATIC INPUT PARAMETERS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
TEMP. (DEG C)	1.390	-5.000	-11.200	-14.900	-9.500	-6.050	2.170	7.390	12.390	14.720	13.560	8.780
CLOUD CVR (FRAC.)	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
REL. HUM.(FRAC.)	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
ALBEDO (-)	0.180	0.320	0.480	0.510	0.480	0.420	0.210	0.150	0.150	0.150	0.150	0.150
EVAPOT. (CM/DAY)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
PRECIP. (CM)	3.690	1.350	3.150	2.030	1.170	0.990	0.660	0.790	3.450	4.060	7.210	6.530
M.TIME RAIN(DAYS)	0.430	0.500	0.430	0.480	0.370	0.310	0.310	0.320	0.380	0.470	0.590	0.420
M. STORM NO. (-)	2.170	2.170	1.520	1.410	1.040	0.910	1.180	1.520	3.320	4.240	4.180	2.000
M. SEASON (DAYS)	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400	30.400

-- POLLUTANT INPUT PARAMETERS --

POL. INP-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
SURFACE RUNOFF MULT.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. IN RAIN (FRAC-SL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. INP-2 (UG/CM**2)	6.24E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-2	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
POL. INP-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
POL. INP-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0
TRNSFORMD-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-L	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

1

YEAR - 2 MONTHLY INPUT PARAMETERS

-- CLIMATIC INPUT PARAMETERS ARR SAME AS LAST YEAR

-- POLLUTANT INPUT PARAMETERS --

POL. INP-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-1 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-1	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
SURFACE RUNOFF MULT.	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. IN RAIN (FRAC-SL)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POL. INP-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-2 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-2	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
POL. INP-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TRNSFORMD-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SINKS-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LIG.INPUT-3 (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VOLATILIZATION MULT.-3	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
POL. INP-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0
TRNSFORMD-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0
SINKS-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.0
LIG.INPUT-L (UG/CM**2)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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 VOLATILIZATION MULT.-L 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00 1.00E+00
1
      YEAR - 3     MONTHLY INPUT PARAMETERS
      ========     ========================

      -- CLIMATIC INPUT PARAMETERS ARE SAME AS LAST YEAR

      -- POLLUTANT INPUT PARAMETERS ARE SAME AS LAST YEAR

.
.   (etc....)
.
1
      YEAR -90     MONTHLY INPUT PARAMETERS
      ========     ========================

      -- CLIMATIC INPUT PARAMETERS ARE SAME AS LAST YEAR

      -- POLLUTANT INPUT PARAMETERS ARE SAME AS LAST YEAR
1




      YEAR - 1     MONTHLY RESULTS (OUTPUT)
      ========     ========================



      -- HYDROLOGIC CYCLE COMPONENTS --

                          OCT       NOV       DEC       JAN       FEB       MAR       APR       MAY       JUN       JUL       AUG       SEP

 MOIS. IN L1 (%)        5.851     5.822     6.257     6.315     6.141     5.793     5.213     4.749     4.807     4.865     5.532     6.054
 MOIS. BELOW L1 (%)     5.851     5.822     6.257     6.315     6.141     5.793     5.213     4.749     4.807     4.865     5.532     6.054
 PRECIPATION (CM)       3.668     1.375     3.143     2.100     1.269     1.024     0.750     0.899     3.461     4.025     7.271     6.475
 NET INFILT. (CM)       3.668     1.375     3.139     2.100     1.269     1.024     0.750     0.899     3.461     4.025     7.271     6.470
 EVAPOTRANS. (CM)       0.510     0.304     0.304     0.304     0.304     0.721     1.305     1.345     2.189     2.620     3.271     2.318
 MOIS. RETEN (CM)       1.355    -0.085     1.271     0.169    -0.508    -1.016    -1.694    -1.355     0.169     0.169     1.948     1.525
 SUR. RUNOFF (CM)       0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
 GRW. RUNOFF (CM)       1.803     1.156     1.564     1.626     1.473     1.319     1.139     0.909     1.102     1.236     2.052     2.626
 YIELD (CM)             1.803     1.156     1.568     1.626     1.473     1.319     1.139     0.909     1.102     1.236     2.052     2.632

 PAU/MPA (GZU)          0.994     1.019     0.998     1.034     1.084     1.034     1.137     1.137     1.003     0.991     1.008     0.992
 PA/MPA (GZ)            0.994     1.019     0.998     1.034     1.084     1.034     1.137     1.137     1.003     0.991     1.008     0.992

1                                        -- POLLUTANT MASS INPUT TO COLUMN (UG) --
                                         ----------------------------------------

                  OCT         NOV         DEC         JAN         FEB         MAR         APR         MAY         JUN         JUL         AUG         SEP

 PRECIP.      0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
 LOAD UPPER   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
 LOAD ZONE 2  2.622E+10   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
 LOAD ZONE 3  0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
 LOAD LOWER   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00

 TOTAL INPUT  2.622E+10   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00   0.000E+00
0          -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED
           ------------------------------------------------------------------------------------------------------------

      UPPER SOIL ZONE:

           SUBLAYER  1

 VOLATILIZED  3.787E+00   2.370E+01   4.539E+01   6.602E+01   8.848E+01   1.155E+02   1.493E+02   1.849E+02   2.083E+02   2.298E+02   2.328E+02   2.389E+02
 IN SOIL MOI  2.051E+05   6.374E+05   1.132E+06   1.584E+06   1.974E+06   2.289E+06   2.469E+06   2.640E+06   3.055E+06   3.468E+06   4.330E+06   5.135E+06
 ADS ON SOIL  2.402E+07   7.501E+07   1.239E+08   1.718E+08   2.202E+08   2.707E+08   3.245E+08   3.808E+08   4.354E+08   4.884E+08   5.363E+08   5.812E+08
 IN SOIL AIR  4.125E+04   1.321E+05   2.194E+05   3.002E+05   3.826E+05   4.734E+05   5.716E+05   6.705E+05   7.507E+05   8.259E+05   8.848E+05   9.508E+05

      SOIL ZONE 2:

           SUBLAYER  1

 DIFFUSED UP  2.594E+07   5.157E+07   4.945E+07   4.842E+07   4.893E+07   5.095E+07   5.428E+07   5.667E+07   5.507E+07   5.358E+07   4.883E+07   4.582E+07
 IN SOIL MOI  2.215E+08   2.199E+08   2.357E+08   2.375E+08   2.305E+08   2.171E+08   1.951E+08   1.775E+08   1.793E+08   1.810E+08   2.053E+08   2.241E+08
 ADS ON SOIL  2.593E+10   2.588E+10   2.581E+10   2.576E+10   2.572E+10   2.568E+10   2.565E+10   2.561E+10   2.555E+10   2.550E+10   2.542E+10   2.536E+10
```

IN SOIL AIR 4.454E+07 4.559E+07 4.570E+07 4.501E+07 4.469E+07 4.492E+07 4.517E+07 4.508E+07 4.405E+07 4.311E+07 4.194E+07 4.149E+07

SOIL ZONE 3:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

-- POLLUTANT CONCENTRATIONS (UG/ML) OR (UG/G) -- NOTE: IF CONCENTRATIONS ARE ZERO FOR EACH MONTH, THEY ARE NOT PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

MOISTURE	4.278E-04	1.336E-03	2.207E-03	3.061E-03	3.923E-03	4.822E-03	5.781E-03	6.784E-03	7.756E-03	8.701E-03	9.554E-03	1.035E-02
%SOLUBILITY	1.350E-03	4.215E-03	6.964E-03	9.655E-03	1.238E-02	1.521E-02	1.824E-02	2.140E-02	2.447E-02	2.745E-02	3.014E-02	3.266E-02
ADSORBED	1.724E-03	5.385E-03	8.896E-03	1.233E-02	1.581E-02	1.943E-02	2.330E-02	2.734E-02	3.126E-02	3.506E-02	3.850E-02	4.172E-02
SOIL AIR	2.175E-05	6.957E-05	1.177E-04	1.615E-04	2.043E-04	2.490E-04	2.932E-04	3.374E-04	3.786E-04	4.176E-04	4.601E-04	5.057E-04

SOIL ZONE 2:

SUBLAYER 1

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MOISTURE    3.004E+01 2.998E+01 2.990E+01 2.985E+01 2.980E+01 2.975E+01 2.971E+01 2.967E+01 2.960E+01 2.954E+01 2.945E+01 2.938E+01
%SOLUBILITY 9.477E+01 9.458E+01 9.434E+01 9.415E+01 9.399E+01 9.385E+01 9.373E+01 9.359E+01 9.338E+01 9.317E+01 9.291E+01 9.267E+01
ADSORBED    1.211E+02 1.208E+02 1.205E+02 1.203E+02 1.201E+02 1.199E+02 1.197E+02 1.196E+02 1.193E+02 1.190E+02 1.187E+02 1.184E+02
SOIL AIR    1.527E+00 1.561E+00 1.595E+00 1.575E+00 1.551E+00 1.536E+00 1.507E+00 1.475E+00 1.445E+00 1.418E+00 1.418E+00 1.435E+00

     SOIL ZONE 3:

     LOWER SOIL ZONE:


POL DEP CM  1.966E+03 1.967E+03 1.967E+03 1.967E+03 1.967E+03 1.968E+03 1.968E+03 1.968E+03 1.968E+03 1.968E+03 1.969E+03 1.970E+03
1                          YEAR -   1 ANNUAL SUMMARY REPORT
                           ==================================


       -- TOTAL INPUTS (UG) --


UPPER SOIL ZONE              0.000E+00
SOIL ZONE 2                  2.622E+10
SOIL ZONE 3                  0.000E+00
LOWER SOIL ZONE              0.000E+00


          -- HYDROLOGIC CYCLE COMPONENTS --

AVERAGE SOIL MOISTURE ZONE 1 (%)              5.616
AVERAGE SOIL MOISTURE BELOW ZONE 1 (%)        5.616
TOTAL PRECIPITATION (CM)                     35.459
TOTAL INFILTRATION (CM)                      35.449
TOTAL EVAPOTRANSPIRATION (CM)                15.496
TOTAL SURFACE RUNOFF (CM)                     0.000
TOTAL GRW RUNOFF (CM)                        18.005
TOTAL MOISTURE RETENTION (CM)                 1.949
TOTAL YIELD (CM)                             18.014
0          -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED
           ---------------------------------------------------------------------------------------------------------
FOR FINAL MASS IN SOIL MOI., ADS. ON SOIL, SOIL AIR, IMMOBIL CEC, COMPLEXED, AND PURE PHASE FOR EACH SUBLAYER, SEE ABOVE (MONTH SEP)
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     UPPER SOIL ZONE:

          SUBLAYER  1

               TOTAL VOLATILIZED              1.587E+03

     SOIL ZONE 2:

          SUBLAYER  1

               TOTAL DIFFUSED (UP)            5.895E+08

     SOIL ZONE 3:

          SUBLAYER  1

          SUBLAYER  2

          SUBLAYER  3

          SUBLAYER  4

          SUBLAYER  5

          SUBLAYER  6

          SUBLAYER  7

          SUBLAYER  8

          SUBLAYER  9

          SUBLAYER 10
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LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

1 -- AVERAGE POLLUTANT CONCENTRATIONS -- NOTE: ONLY NON-ZERO VALUES ARE PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	5.392E-03
ADSORBED SOIL (UG/G)	2.173E-02
SOIL AIR (UG/ML)	2.680E-04

SOIL ZONE 2:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	2.972E+01
ADSORBED SOIL (UG/G)	1.198E+02
SOIL AIR (UG/ML)	1.504E+00

SOIL ZONE 3:

LOWER SOIL ZONE:

MAX. POLL. DEPTH (M)	1.970E+01

1

1

YEAR -10 MONTHLY RESULTS (OUTPUT)

-- HYDROLOGIC CYCLE COMPONENTS --

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP

MOIS. IN L1 (%)	6.315	6.170	6.518	6.489	6.257	5.880	5.271	4.778	4.836	4.894	5.532	6.054
MOIS. BELOW L1 (%)	6.315	6.170	6.518	6.489	6.257	5.880	5.271	4.778	4.836	4.894	5.532	6.054
PRECIPATION (CM)	3.757	1.356	3.182	2.042	1.220	1.030	0.751	0.856	3.518	4.089	7.186	6.475
NET INFILT. (CM)	3.757	1.356	3.178	2.042	1.220	1.030	0.751	0.856	3.518	4.089	7.186	6.470
EVAPOTRANS. (CM)	0.510	0.304	0.304	0.304	0.304	0.727	1.336	1.364	2.218	2.653	3.271	2.318
MOIS. RETEN (CM)	0.762	-0.424	1.016	-0.085	-0.678	-1.101	-1.779	-1.440	0.169	0.169	1.864	1.525
SUR. RUNOFF (CM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRW. RUNOFF (CM)	2.485	1.475	1.857	1.823	1.593	1.405	1.193	0.932	1.130	1.267	2.052	2.626
YIELD (CM)	2.485	1.475	1.861	1.823	1.593	1.405	1.193	0.932	1.130	1.267	2.052	2.632
PAU/MPA (GZU)	1.018	1.004	1.010	1.006	1.042	1.041	1.137	1.083	1.020	1.007	0.997	0.992
PA/MPA (GZ)	1.018	1.004	1.010	1.006	1.042	1.041	1.137	1.083	1.020	1.007	0.997	0.992

1 -- POLLUTANT MASS INPUT TO COLUMN (UG) --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PRECIP.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD UPPER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD LOWER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
TOTAL INPUT	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

UPPER SOIL ZONE:

SUBLAYER 1

VOLATILIZED	1.777E+03	1.868E+03	1.825E+03	1.821E+03	1.869E+03	1.967E+03	2.119E+03	2.238E+03	2.190E+03	2.145E+03	1.975E+03	1.864E+03
IN SOIL MOI	3.837E+07	3.767E+07	3.995E+07	3.994E+07	3.870E+07	3.655E+07	3.295E+07	3.004E+07	3.055E+07	3.105E+07	3.521E+07	3.864E+07
ADS ON SOIL	4.163E+09	4.183E+09	4.199E+09	4.217E+09	4.237E+09	4.259E+09	4.283E+09	4.308E+09	4.328E+09	4.347E+09	4.361E+09	4.373E+09
IN SOIL AIR	7.007E+06	7.257E+06	7.348E+06	7.312E+06	7.324E+06	7.421E+06	7.525E+06	7.575E+06	7.453E+06	7.342E+06	7.194E+06	7.154E+06

SOIL ZONE 2:

SUBLAYER 1

DIFFUSED UP	1.951E+07	2.016E+07	1.939E+07	1.903E+07	1.925E+07	2.000E+07	2.128E+07	2.221E+07	2.142E+07	2.061E+07	1.855E+07	1.705E+07
IN SOIL MOI	9.921E+07	9.610E+07	1.001E+08	9.856E+07	9.424E+07	8.790E+07	7.831E+07	7.057E+07	7.052E+07	7.037E+07	7.770E+07	8.309E+07
ADS ON SOIL	1.076E+10	1.067E+10	1.052E+10	1.041E+10	1.032E+10	1.024E+10	1.018E+10	1.012E+10	9.992E+09	9.851E+09	9.624E+09	9.403E+09
IN SOIL AIR	1.812E+07	1.852E+07	1.841E+07	1.804E+07	1.784E+07	1.785E+07	1.788E+07	1.779E+07	1.721E+07	1.664E+07	1.588E+07	1.538E+07

SOIL ZONE 3:

SUBLAYER 1

IN SOIL MOI	1.001E+08	9.844E+07	1.051E+08	1.056E+08	1.025E+08	9.687E+07	8.729E+07	7.949E+07	8.119E+07	8.301E+07	9.537E+07	1.060E+08
ADS ON SOIL	1.086E+10	1.093E+10	1.105E+10	1.115E+10	1.122E+10	1.129E+10	1.135E+10	1.140E+10	1.150E+10	1.162E+10	1.181E+10	1.200E+10
IN SOIL AIR	1.827E+07	1.897E+07	1.933E+07	1.932E+07	1.940E+07	1.967E+07	1.993E+07	2.004E+07	1.981E+07	1.963E+07	1.949E+07	1.963E+07

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

-- POLLUTANT CONCENTRATIONS (UG/ML) OR (UG/G) -- NOTE: IF CONCENTRATIONS ARE ZERO FOR EACH MONTH, THEY ARE NOT PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

MOISTURE	7.415E-02	7.451E-02	7.480E-02	7.512E-02	7.548E-02	7.586E-02	7.630E-02	7.674E-02	7.710E-02	7.744E-02	7.767E-02	7.78[illegible]-02
%SOLUBILITY	2.339E-01	2.350E-01	2.359E-01	2.370E-01	2.381E-01	2.393E-01	2.407E-01	2.421E-01	2.432E-01	2.443E-01	2.450E-01	2.4[illegible]1
ADSORBED	2.988E-01	3.003E-01	3.014E-01	3.027E-01	3.042E-01	3.057E-01	3.075E-01	3.092E-01	3.107E-01	3.121E-01	3.130E-01	3.1[illegible]1
SOIL AIR	3.769E-03	3.879E-03	3.988E-03	3.964E-03	3.930E-03	3.917E-03	3.870E-03	3.816E-03	3.764E-03	3.717E-03	3.741E-03	3.80[illegible]-03

SOIL ZONE 2:

SUBLAYER 1

MOISTURE	1.247E+01	1.236E+01	1.219E+01	1.206E+01	1.195E+01	1.187E+01	1.179E+01	1.172E+01	1.158E+01	1.141E+01	1.115E+01	1.089E+01
%SOLUBILITY	3.933E+01	3.900E+01	3.845E+01	3.803E+01	3.771E+01	3.743E+01	3.720E+01	3.698E+01	3.651E+01	3.600E+01	3.517E+01	3.436E+01
ADSORBED	5.025E+01	4.982E+01	4.912E+01	4.858E+01	4.818E+01	4.782E+01	4.752E+01	4.724E+01	4.665E+01	4.599E+01	4.493E+01	4.390E+01
SOIL AIR	6.338E-01	6.437E-01	6.500E-01	6.361E-01	6.225E-01	6.126E-01	5.981E-01	5.830E-01	5.651E-01	5.478E-01	5.369E-01	5.321E-01

SOIL ZONE 3:

SUBLAYER 1

MOISTURE	4.951E+00	4.985E+00	5.039E+00	5.083E+00	5.118E+00	5.148E+00	5.175E+00	5.199E+00	5.246E+00	5.300E+00	5.387E+00	5.472E+00
%SOLUBILITY	1.562E+01	1.573E+01	1.590E+01	1.604E+01	1.614E+01	1.624E+01	1.632E+01	1.640E+01	1.655E+01	1.672E+01	1.699E+01	1.726E+01
ADSORBED	1.995E+01	2.009E+01	2.031E+01	2.049E+01	2.062E+01	2.075E+01	2.086E+01	2.095E+01	2.114E+01	2.136E+01	2.171E+01	2.205E+01
SOIL AIR	2.517E-01	2.596E-01	2.687E-01	2.682E-01	2.665E-01	2.658E-01	2.625E-01	2.585E-01	2.561E-01	2.544E-01	2.594E-01	2.673E-01

LOWER SOIL ZONE:

POL DEP CM	2.000E+03	2.000E+03	2.000E+03	2.000E+03	2.001E+03	2.001E+03	2.001E+03	2.001E+03	2.001E+03	2.002E+03	2.002E+03	2.003E+03

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-- TOTAL INPUTS (UG) --

UPPER SOIL ZONE	0.000E+00
SOIL ZONE 2	0.000E+00
SOIL ZONE 3	0.000E+00
LOWER SOIL ZONE	0.000E+00

-- HYDROLOGIC CYCLE COMPONENTS --

AVERAGE SOIL MOISTURE ZONE 1 (%)	5.749
AVERAGE SOIL MOISTURE BELOW ZONE 1 (%)	5.749

TOTAL PRECIPITATION (CM)	35.461
TOTAL INFILTRATION (CM)	35.451
TOTAL EVAPOTRANSPIRATION (CM)	15.613
TOTAL SURFACE RUNOFF (CM)	0.000
TOTAL GRW RUNOFF (CM)	19.838
TOTAL MOISTURE RETENTION (CM)	0.000
TOTAL YIELD (CM)	19.848

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

FOR FINAL MASS IN SOIL MOI., ADS. ON SOIL, SOIL AIR, IMMOBIL CEC, COMPLEXED, AND PURE PHASE FOR EACH SUBLAYER, SEE ABOVE (MONTH SEP)

UPPER SOIL ZONE:

SUBLAYER 1

TOTAL VOLATILIZED 2.366E+04

SOIL ZONE 2:

SUBLAYER 1

TOTAL DIFFUSED (UP) 2.385E+08

SOIL ZONE 3:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

1 -- AVERAGE POLLUTANT CONCENTRATIONS -- NOTE: ONLY NON-ZERO VALUES ARE PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	7.609E-02
ADSORBED SOIL (UG/G)	3.066E-01
SOIL AIR (UG/ML)	3.847E-03

SOIL ZONE 2:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	1.179E+01
ADSORBED SOIL (UG/G)	4.750E+01
SOIL AIR (UG/ML)	5.968E-01

SOIL ZONE 3:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	5.175E+00
ADSORBED SOIL (UG/G)	2.086E+01
SOIL AIR (UG/ML)	2.616E-01

LOWER SOIL ZONE:

MAX. POLL. DEPTH (M)	2.003E+01

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YEAR -90 MONTHLY RESULTS (OUTPUT)

-- HYDROLOGIC CYCLE COMPONENTS --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MOIS. IN L1 (%)	6.315	6.170	6.518	6.489	6.257	5.880	5.271	4.778	4.836	4.894	5.532	6.054
MOIS. BELOW L1 (%)	6.315	6.170	6.518	6.489	6.257	5.880	5.271	4.778	4.836	4.894	5.532	6.054
PRECIPATION (CM)	3.757	1.356	3.182	2.042	1.220	1.030	0.751	0.856	3.518	4.089	7.186	6.475
NET INFILT. (CM)	3.757	1.356	3.178	2.042	1.220	1.030	0.751	0.856	3.518	4.089	7.186	6.470
EVAPOTRANS. (CM)	0.510	0.304	0.304	0.304	0.304	0.727	1.336	1.364	2.218	2.653	3.271	2.318
MOIS. RETEN (CM)	0.762	-0.424	1.016	-0.085	-0.678	-1.101	-1.779	-1.440	0.169	0.169	1.864	1.525
SUR. RUNOFF (CM)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRW. RUNOFF (CM)	2.485	1.475	1.857	1.823	1.593	1.405	1.193	0.932	1.130	1.267	2.052	2.626
YIELD (CM)	2.485	1.475	1.861	1.823	1.593	1.405	1.193	0.932	1.130	1.267	2.052	2.632
PAU/MPA (GZU)	1.018	1.004	1.010	1.006	1.042	1.041	1.137	1.083	1.020	1.007	0.997	0.992
PA/MPA (GZ)	1.018	1.004	1.010	1.006	1.042	1.041	1.137	1.083	1.020	1.007	0.997	0.992

1 -- POLLUTANT MASS INPUT TO COLUMN (UG) --

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
PRECIP.	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD UPPER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 2	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD ZONE 3	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
LOAD LOWER	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

TOTAL INPUT 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00 0.000E+00
0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

UPPER SOIL ZONE:

SUBLAYER 1

VOLATILIZED 2.194E+03 2.296E+03 2.232E+03 2.218E+03 2.266E+03 2.374E+03 2.545E+03 2.675E+03 2.604E+03 2.539E+03 2.327E+03 2.188E+03
IN SOIL MOI 4.728E+07 4.619E+07 4.876E+07 4.854E+07 4.682E+07 4.402E+07 3.949E+07 3.582E+07 3.624E+07 3.667E+07 4.140E+07 4.526E+07
ADS ON SOIL 5.129E+09 5.129E+09 5.126E+09 5.125E+09 5.127E+09 5.129E+09 5.133E+09 5.136E+09 5.135E+09 5.134E+09 5.128E+09 5.122E+09
IN SOIL AIR 8.633E+06 8.900E+06 8.969E+06 8.886E+06 8.861E+06 8.937E+06 9.018E+06 9.031E+06 8.843E+06 8.670E+06 8.459E+06 8.380E+06

SOIL ZONE 2:

SUBLAYER 1

DIFFUSED UP 5.741E+04 5.986E+04 5.809E+04 5.752E+04 5.865E+04 6.149E+04 6.605E+04 6.962E+04 6.781E+04 6.589E+04 5.989E+04 5.558E+04
IN SOIL MOI 1.018E+06 9.951E+05 1.049E+06 1.044E+06 1.006E+06 9.465E+05 8.498E+05 7.716E+05 7.802E+05 7.884E+05 8.870E+05 9.661E+05
ADS ON SOIL 1.105E+08 1.105E+08 1.103E+08 1.102E+08 1.102E+08 1.103E+08 1.105E+08 1.106E+08 1.105E+08 1.104E+08 1.099E+08 1.093E+08
IN SOIL AIR 1.860E+05 1.917E+05 1.930E+05 1.910E+05 1.905E+05 1.922E+05 1.941E+05 1.945E+05 1.903E+05 1.864E+05 1.812E+05 1.789E+05

SOIL ZONE 3:

SUBLAYER 1

DIFFUSED UP 2.688E+05 2.803E+05 2.718E+05 2.692E+05 2.742E+05 2.868E+05 3.069E+05 3.220E+05 3.128E+05 3.040E+05 2.773E+05 2.590E+05
IN SOIL MOI 1.140E+07 1.112E+07 1.170E+07 1.162E+07 1.119E+07 1.051E+07 9.415E+06 8.532E+06 8.612E+06 8.687E+06 9.755E+06 1.061E+07
ADS ON SOIL 1.237E+09 1.235E+09 1.230E+09 1.227E+09 1.226E+09 1.224E+09 1.224E+09 1.224E+09 1.220E+09 1.216E+09 1.208E+09 1.200E+09
IN SOIL AIR 2.082E+06 2.143E+06 2.153E+06 2.128E+06 2.118E+06 2.133E+06 2.150E+06 2.151E+06 2.101E+06 2.054E+06 1.993E+06 1.964E+06

SUBLAYER 2

DIFFUSED UP 6.408E+05 6.688E+05 6.488E+05 6.431E+05 6.555E+05 6.859E+05 7.344E+05 7.707E+05 7.491E+05 7.288E+05 6.657E+05 6.231E+05
IN SOIL MOI 3.243E+07 3.163E+07 3.330E+07 3.307E+07 3.184E+07 2.989E+07 2.678E+07 2.427E+07 2.450E+07 2.472E+07 2.778E+07 3.023E+07
ADS ON SOIL 3.518E+09 3.512E+09 3.500E+09 3.492E+09 3.486E+09 3.483E+09 3.481E+09 3.480E+09 3.471E+09 3.461E+09 3.441E+09 3.421E+09
IN SOIL AIR 5.922E+06 6.094E+06 6.125E+06 6.054E+06 6.026E+06 6.069E+06 6.116E+06 6.119E+06 5.977E+06 5.845E+06 5.677E+06 5.597E+06

SUBLAYER 3

DIFFUSED UP 8.138E+05 8.508E+05 8.267E+05 8.209E+05 8.378E+05 8.774E+05 9.401E+05 9.872E+05 9.606E+05 9.358E+05 8.567E+05 8.042E+05
IN SOIL MOI 5.916E+07 5.774E+07 6.084E+07 6.046E+07 5.824E+07 5.469E+07 4.902E+07 4.443E+07 4.488E+07 4.533E+07 5.102E+07 5.559E+07
ADS ON SOIL 6.419E+09 6.411E+09 6.395E+09 6.384E+09 6.378E+09 6.373E+09 6.372E+09 6.371E+09 6.359E+09 6.346E+09 6.319E+09 6.292E+09
IN SOIL AIR 1.080E+07 1.112E+07 1.119E+07 1.107E+07 1.102E+07 1.111E+07 1.119E+07 1.120E+07 1.095E+07 1.072E+07 1.042E+07 1.029E+07

SUBLAYER 4

DIFFUSED UP 5.230E+05 5.485E+05 5.345E+05 5.323E+05 5.447E+05 5.717E+05 6.137E+05 6.455E+05 6.296E+05 6.154E+05 5.662E+05 5.346E+05
IN SOIL MOI 7.638E+07 7.458E+07 7.867E+07 7.825E+07 7.543E+07 7.087E+07 6.355E+07 5.762E+07 5.827E+07 5.890E+07 6.642E+07 7.250E+07
ADS ON SOIL 8.287E+09 8.282E+09 8.269E+09 8.262E+09 8.259E+09 8.258E+09 8.261E+09 8.263E+09 8.255E+09 8.246E+09 8.226E+09 8.205E+09
IN SOIL AIR 1.395E+07 1.437E+07 1.447E+07 1.432E+07 1.428E+07 1.439E+07 1.451E+07 1.453E+07 1.422E+07 1.393E+07 1.357E+07 1.342E+07

SUBLAYER 5

IN SOIL MOI 2.161E+06 2.314E+06 2.789E+06 3.058E+06 3.159E+06 3.141E+06 2.943E+06 2.769E+06 3.019E+06 3.306E+06 4.218E+06 5.157E+06
ADS ON SOIL 2.345E+08 2.570E+08 2.931E+08 3.229E+08 3.459E+08 3.660E+08 3.826E+08 3.970E+08 4.277E+08 4.629E+08 5.224E+08 5.837E+08
IN SOIL AIR 3.946E+05 4.459E+05 5.130E+05 5.598E+05 5.978E+05 6.377E+05 6.721E+05 6.981E+05 7.366E+05 7.818E+05 8.618E+05 9.549E+05

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

-- POLLUTANT CONCENTRATIONS (UG/ML) OR (UG/G) -- NOTE: IF CONCENTRATIONS ARE ZERO FOR EACH MONTH, THEY ARE NOT PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

MOISTURE	9.137E-02	9.137E-02	9.131E-02	9.130E-02	9.132E-02	9.136E-02	9.143E-02	9.149E-02	9.147E-02	9.145E-02	9.134E-02	9.124E-02
%SOLUBILITY	2.882E-01	2.882E-01	2.880E-01	2.880E-01	2.881E-01	2.882E-01	2.884E-01	2.886E-01	2.886E-01	2.885E-01	2.881E-01	2.878E-01
ADSORBED	3.682E-01	3.682E-01	3.680E-01	3.679E-01	3.680E-01	3.682E-01	3.685E-01	3.687E-01	3.686E-01	3.685E-01	3.681E-01	3.677E-01
SOIL AIR	4.644E-03	4.757E-03	4.869E-03	4.817E-03	4.755E-03	4.717E-03	4.638E-03	4.550E-03	4.466E-03	4.389E-03	4.399E-03	4.457E-03

SOIL ZONE 2:

SUBLAYER 1

MOISTURE	1.280E-01	1.280E-01	1.278E-01	1.277E-01	1.277E-01	1.278E-01	1.280E-01	1.282E-01	1.280E-01	1.279E-01	1.273E-01	1.26[illegible]-01
%SOLUBILITY	4.038E-01	4.038E-01	4.030E-01	4.027E-01	4.027E-01	4.030E-01	4.037E-01	4.043E-01	4.039E-01	4.033E-01	4.015E-01	3.[illegible]
ADSORBED	5.158E-01	5.159E-01	5.149E-01	5.144E-01	5.145E-01	5.149E-01	5.157E-01	5.165E-01	5.160E-01	5.153E-01	5.129E-01	5.[illegible]
SOIL AIR	6.506E-03	6.665E-03	6.813E-03	6.735E-03	6.647E-03	6.597E-03	6.490E-03	6.374E-03	6.252E-03	6.137E-03	6.129E-03	6.18[illegible]

SOIL ZONE 3:

SUBLAYER 1

MOISTURE	5.642E-01	5.632E-01	5.611E-01	5.598E-01	5.589E-01	5.584E-01	5.582E-01	5.580E-01	5.565E-01	5.547E-01	5.510E-01	5.474E-01
%SOLUBILITY	1.780E+00	1.777E+00	1.770E+00	1.766E+00	1.763E+00	1.761E+00	1.761E+00	1.760E+00	1.755E+00	1.750E+00	1.738E+00	1.727E+00
ADSORBED	2.274E+00	2.270E+00	2.261E+00	2.256E+00	2.252E+00	2.250E+00	2.249E+00	2.249E+00	2.243E+00	2.235E+00	2.221E+00	2.206E+00
SOIL AIR	2.868E-02	2.933E-02	2.992E-02	2.953E-02	2.910E-02	2.883E-02	2.831E-02	2.775E-02	2.717E-02	2.662E-02	2.654E-02	2.674E-02

SUBLAYER 2

MOISTURE	1.605E+00	1.602E+00	1.596E+00	1.592E+00	1.590E+00	1.588E+00	1.588E+00	1.587E+00	1.583E+00	1.579E+00	1.569E+00	1.560E+00
%SOLUBILITY	5.062E+00	5.053E+00	5.036E+00	5.024E+00	5.016E+00	5.011E+00	5.009E+00	5.007E+00	4.994E+00	4.980E+00	4.951E+00	4.922E+00
ADSORBED	6.467E+00	6.456E+00	6.433E+00	6.418E+00	6.408E+00	6.402E+00	6.399E+00	6.396E+00	6.380E+00	6.361E+00	6.324E+00	6.288E+00
SOIL AIR	8.157E-02	8.341E-02	8.512E-02	8.402E-02	8.279E-02	8.202E-02	8.053E-02	7.893E-02	7.729E-02	7.576E-02	7.558E-02	7.622E-02

SUBLAYER 3

MOISTURE	2.927E+00	2.924E+00	2.917E+00	2.912E+00	2.909E+00	2.907E+00	2.906E+00	2.906E+00	2.900E+00	2.894E+00	2.882E+00	2.869E+00
%SOLUBILITY	9.235E+00	9.224E+00	9.200E+00	9.185E+00	9.176E+00	9.169E+00	9.168E+00	9.166E+00	9.149E+00	9.130E+00	9.091E+00	9.052E+00
ADSORBED	1.180E+01	1.178E+01	1.175E+01	1.173E+01	1.172E+01	1.171E+01	1.171E+01	1.171E+01	1.169E+01	1.166E+01	1.161E+01	1.156E+01
SOIL AIR	1.488E-01	1.522E-01	1.555E-01	1.536E-01	1.514E-01	1.501E-01	1.474E-01	1.445E-01	1.416E-01	1.389E-01	1.388E-01	1.402E-01

SUBLAYER 4

MOISTURE	3.779E+00	3.777E+00	3.771E+00	3.768E+00	3.767E+00	3.766E+00	3.768E+00	3.768E+00	3.765E+00	3.761E+00	3.752E+00	3.742E+00
%SOLUBILITY	1.192E+01	1.192E+01	1.190E+01	1.189E+01	1.188E+01	1.188E+01	1.189E+01	1.189E+01	1.188E+01	1.186E+01	1.183E+01	1.181E+01
ADSORBED	1.523E+01	1.522E+01	1.520E+01	1.519E+01	1.518E+01	1.518E+01	1.518E+01	1.519E+01	1.517E+01	1.516E+01	1.512E+01	1.508E+01
SOIL AIR	1.921E-01	1.967E-01	2.011E-01	1.988E-01	1.961E-01	1.945E-01	1.911E-01	1.874E-01	1.838E-01	1.805E-01	1.807E-01	1.828E-01

SUBLAYER 5

MOISTURE	1.069E-01	1.172E-01	1.337E-01	1.473E-01	1.577E-01	1.669E-01	1.745E-01	1.811E-01	1.951E-01	2.111E-01	2.382E-01	2.662E-01
%SOLUBILITY	3.373E-01	3.698E-01	4.218E-01	4.645E-01	4.976E-01	5.266E-01	5.504E-01	5.712E-01	6.154E-01	6.660E-01	7.516E-01	8.397E-01
ADSORBED	4.309E-01	4.724E-01	5.388E-01	5.934E-01	6.357E-01	6.727E-01	7.031E-01	7.297E-01	7.862E-01	8.508E-01	9.601E-01	1.073E+00
SOIL AIR	5.436E-03	6.103E-03	7.129E-03	7.770E-03	8.214E-03	8.619E-03	8.850E-03	9.006E-03	9.524E-03	1.013E-02	1.147E-02	1.3[illegible]-02

LOWER SOIL ZONE:

POL DEP CM 2.288E+03 2.288E+03 2.288E+03 2.289E+03 2.289E+03 2.289E+03 2.289E+03 2.289E+03 2.290E+03 2.290E+03 2.291E+03 2.291E+03
1 YEAR - 90 ANNUAL SUMMARY REPORT

-- TOTAL INPUTS (UG) --

UPPER SOIL ZONE	0.000E+00
SOIL ZONE 2	0.000E+00
SOIL ZONE 3	0.000E+00
LOWER SOIL ZONE	0.000E+00

-- HYDROLOGIC CYCLE COMPONENTS --

AVERAGE SOIL MOISTURE ZONE 1 (%)	5.749
AVERAGE SOIL MOISTURE BELOW ZONE 1 (%)	5.749
TOTAL PRECIPITATION (CM)	35.461
TOTAL INFILTRATION (CM)	35.451
TOTAL EVAPOTRANSPIRATION (CM)	15.613
TOTAL SURFACE RUNOFF (CM)	0.000
TOTAL GRW RUNOFF (CM)	19.838
TOTAL MOISTURE RETENTION (CM)	0.000
TOTAL YIELD (CM)	19.848

0 -- POLLUTANT MASS DISTRIBUTION IN COLUMN (UG) -- NOTE: IF COMPONENT IS ZERO EACH MONTH, IT IS NOT PRINTED

FOR FINAL MASS IN SOIL MOI., ADS. ON SOIL, SOIL AIR, IMMOBIL CEC, COMPLEXED, AND PURE PHASE FOR EACH SUBLAYER, SEE ABOVE (MONTH SEP)

UPPER SOIL ZONE:

SUBLAYER 1

TOTAL VOLATILIZED 2.846E+04

SOIL ZONE 2:

SUBLAYER 1

TOTAL DIFFUSED (UP) 7.378E+05

SOIL ZONE 3:

SUBLAYER 1

TOTAL DIFFUSED (UP) 3.433E+06

SUBLAYER 2

TOTAL DIFFUSED (UP) 8.215E+06

SUBLAYER 3

TOTAL DIFFUSED (UP) 1.051E+07

SUBLAYER 4

TOTAL DIFFUSED (UP) 6.860E+06

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

LOWER SOIL ZONE:

SUBLAYER 1

SUBLAYER 2

SUBLAYER 3

SUBLAYER 4

SUBLAYER 5

SUBLAYER 6

SUBLAYER 7

SUBLAYER 8

SUBLAYER 9

SUBLAYER 10

1 -- AVERAGE POLLUTANT CONCENTRATIONS -- NOTE: ONLY NON-ZERO VALUES ARE PRINTED --

UPPER SOIL ZONE:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	9.137E-02
ADSORBED SOIL (UG/G)	3.682E-01
SOIL AIR (UG/ML)	4.622E-03

SOIL ZONE 2:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	1.277E-01
ADSORBED SOIL (UG/G)	5.148E-01
SOIL AIR (UG/ML)	6.461E-03

SOIL ZONE 3:

SUBLAYER 1

SOIL MOISTURE (UG/ML)	5.576E-01
ADSORBED SOIL (UG/G)	2.247E+00
SOIL AIR (UG/ML)	2.821E-02

SUBLAYER 2

SOIL MOISTURE (UG/ML)	1.587E+00
ADSORBED SOIL (UG/G)	6.394E+00
SOIL AIR (UG/ML)	8.027E-02

SUBLAYER 3

SOIL MOISTURE (UG/ML)	2.904E+00
ADSORBED SOIL (UG/G)	1.170E+01
SOIL AIR (UG/ML)	1.469E-01

SUBLAYER 4

SOIL MOISTURE (UG/ML)	3.765E+00
ADSORBED SOIL (UG/G)	1.517E+01
SOIL AIR (UG/ML)	1.905E-01

SUBLAYER 5

SOIL MOISTURE (UG/ML)	1.747E-01
ADSORBED SOIL (UG/G)	7.039E-01
SOIL AIR (UG/ML)	8.772E-03

LOWER SOIL ZONE:

MAX. POLL. DEPTH (M)	2.291E+01