CLOSURE PLAN
FOR
HUNTER ARMY AIRFIELD FIRE TRAINING AREA (AAFTA)
FORT STEWART, GEORGIA

Prepared for:

U.S. ARMY CORPS OF ENGINEERS (USACE)
Kansas City, Missouri

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DOCUMENT 2

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LIST OF ACRONYMS

AAFTA	Army Airfield Fire Training Area
ASTM	American Society for Testing and Materials
CDAP	Chemical Data Acquisition Plan
cm/sec	centimeters per second
CME	Central Mine Equipment
COC	contaminant of concern
°	degree
°C	degrees Celsius
°F	degrees Fahrenheit
DI	deionized
DNR	Department of Natural Resources
DOT	U.S. Department of Transportation
EMC	EMC Engineering Services, Inc.
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science & Engineering, Inc.
FCT	final cleanup target
FID	flame ionization detector
ft	feet
ft^2	square foot
ft-bls	feet below land surface
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
gal	gallon
GDNR	Georgia Department of Natural Resources
gpd	gallons per day
ID	inside diameter
MCL	maximum contaminant level

LIST OF ACRONYMS

(Continued, Page 2 of 3)

mgd	million gallons per day
mg/kg	milligrams per kilogram
Ml	milliliter
MRD	Missouri River District
NGVD	National Geodetic Vertical Datum
PAH	polynuclear aromatic hydrocarbon
PID	photoionization detector
ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
SC	clayey sand
SM	silty sand
SOC	scope of work
SOW	scope of work
SP	poorly graded sand
SSHP	site safety and health plan
TOV	total organic vapors
μg/kg	microgram per kilogram
μg/L	micrograms per liter
U.S. 82	U.S. Highway 82
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USAF	U.S. Air Force
USCS	Unified Soil Classification System

LIST OF ACRONYMS

(Continued, Page 3 of 3)

VOA	volatile organic analyte
VOC	volatile organic compound
WP	work plan
yd^3	cubic yards

1.0 SITE DESCRIPTION

1.1 SITE LOCATION AND LOCAL CONDITIONS

Hunter Army Airfield is located on 5,400 acres of land in Chatham County, Georgia, just southwest of Savannah (Figures 1-1 and 1-2). The airfield is bounded on the north by lightly populated areas, on the east and south by residential and light commercial areas, and on the west by the Little Ogeechee River. The Hunter Army Airfield Fire Training Area (AAFTA) is located on the northwest portion of the airfield, approximately 800 feet (ft) north-northwest of the control tower and 2200 feet north of the center of the airfield's east-west runway (Figure 1-3). A topographic survey of the site is also provided as Appendix A.

Fort Stewart and Hunter Army Airfield are located within the Southern Atlantic Coastal Plain Physiographic Province. Most of the land within Fort Stewart is flat, planted pine woods interfingered with freshwater swamps and tidal creeks with elevations ranging from approximately 10 to 100 feet above mean sea level (ft-msl). However, the northwestern portion of the reservation is characterized by rolling hills that rise to a maximum elevation of approximately 180 ft-msl.

The ground surface at the Hunter AAFTA, at an elevation of approximately 30 ft, slopes gently to the west and drains toward a small canal. The canal runs west approximately 400 ft then southeast approximately 1,500 ft, where it empties into the Little Ogeechee River tidal floodplain.

1.2 SITE FEATURES AND USAGE

The Hunter AAFTA consists of a grassy cleared area measuring approximately 400 feet by 200 feet, bounded on the north and south by drainage ditches, by the airfield pavement on the east, and by trees on the west. The training area features a 6,400-ft^2 bermed, soil-covered concrete pad (hereafter referred to as "the pad" or "the fire training pad") with a simulated aircraft constructed from a used steel storage tank.

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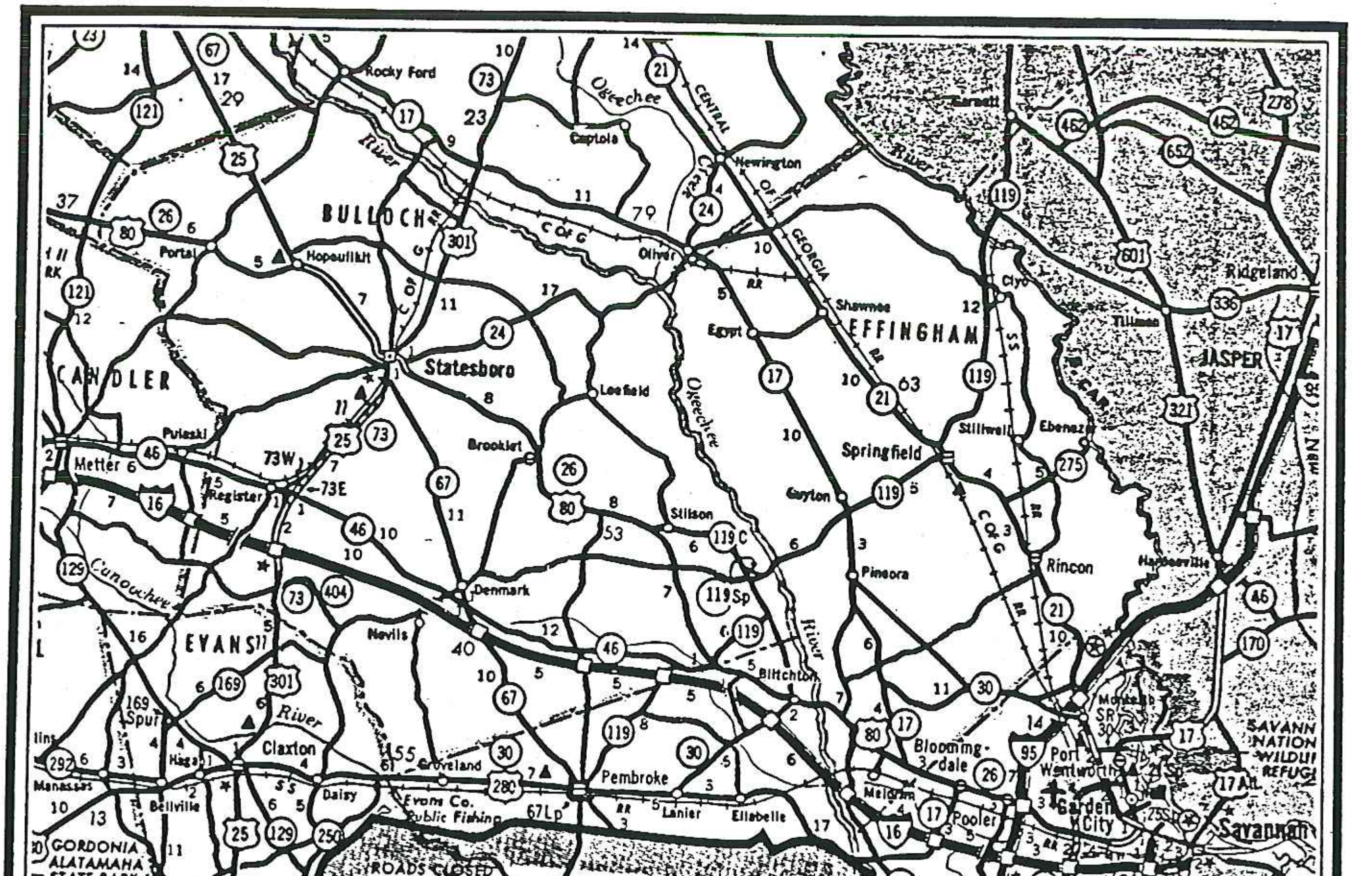

Figure 1-1
FORT STEWART LOCATION MAP

SOURCE: ESE.

ESE Environmental Science & Engineering, Inc.

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FT. STEWART-HUNTER SC 5/92MH

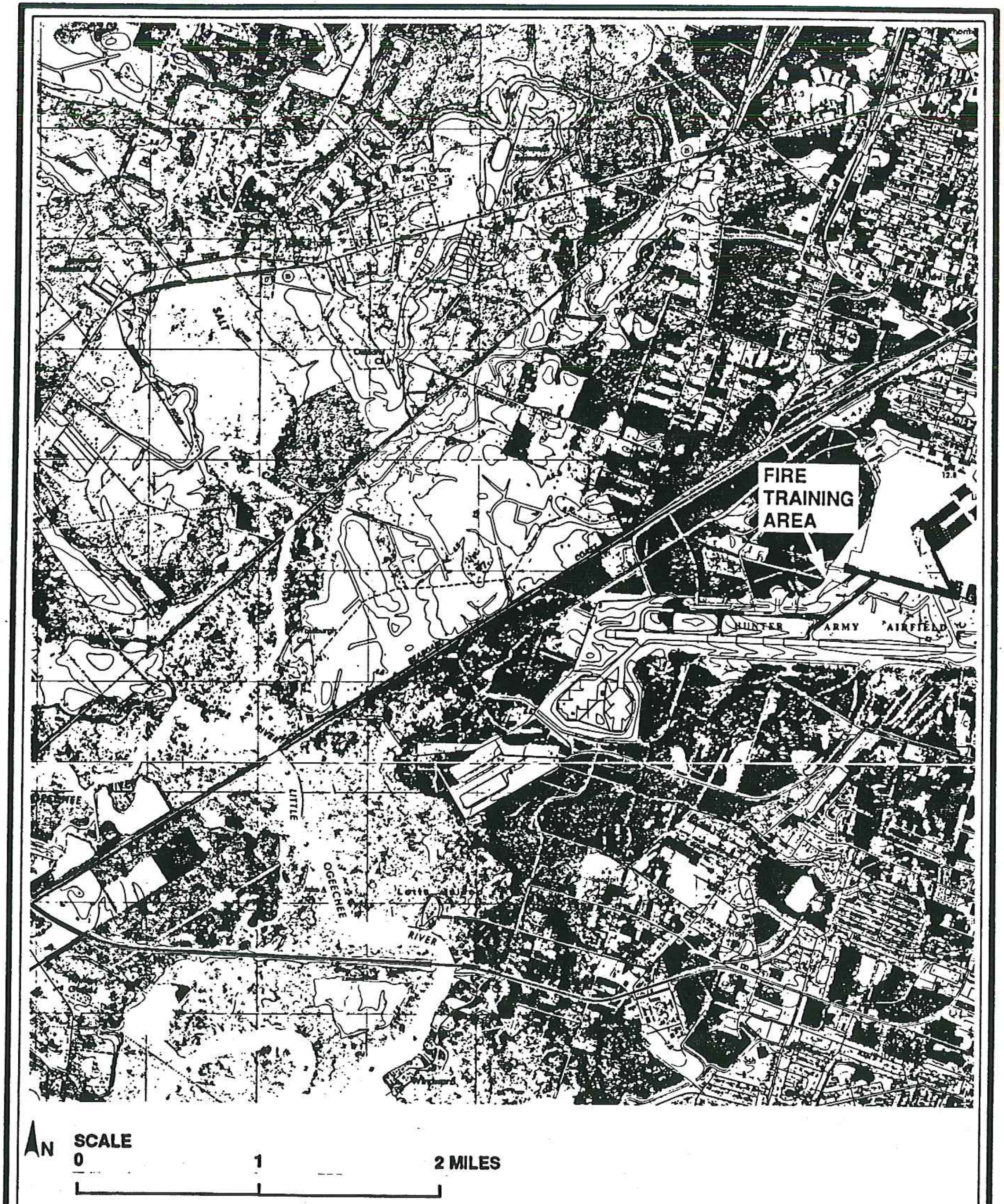

Figure 1-2
HUNTER AAFTA
LOCATION MAP

SOURCE: ESE.

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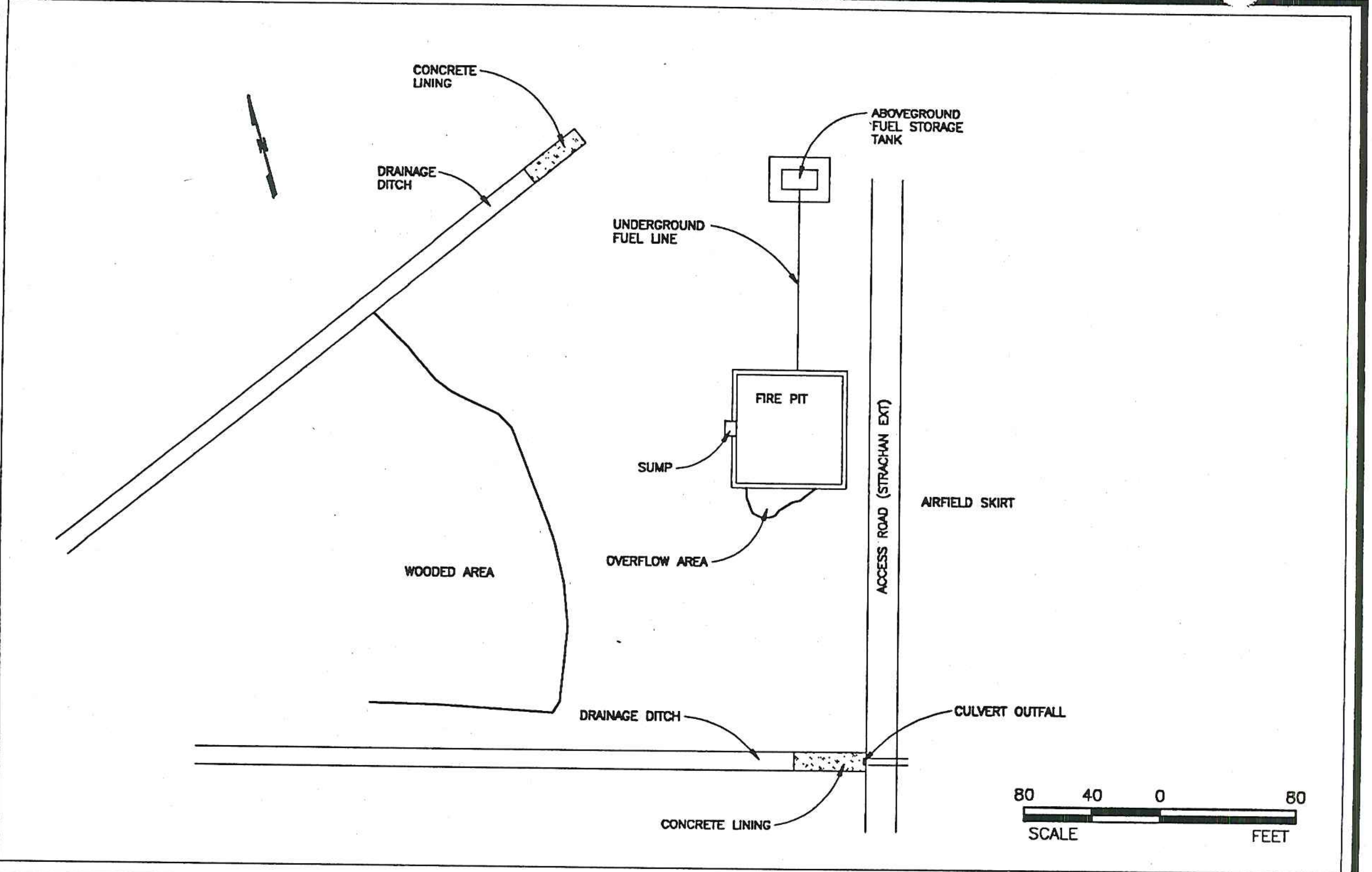

Figure 1–3
SITE LAYOUT
HUNTER AAFTA
FORT STEWART, GEORGIA

SOURCE: ESE, 1991

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The AAFTA was used from the time of its construction until burning was halted in approximately 1990 for training of the airfield's firefighters in extinguishing live fires. Fuel for training fires was provided by underground piping from an above-ground fuel storage tank located approximately 100 feet north of the training pad. Fuels were mostly water-contaminated jet fuel (JP-4) and diesel fuel; however, waste oils and solvents have reportedly also been used (USAEHA, 1987). During training exercises, jet fuel (JP-4) was pumped onto the surfaces of the simulated aircraft and ignited. Firefighting trainees then extinguished the fire with water or foam. The water was contained by the concrete berms around the fire training pad and sump. Some of the water (and fuel) occasionally ran over the concrete berms onto the adjacent soil, and some may have been splashed over the berms by the spray from the firefighting hoses.

1.3 SHALLOW SITE GEOLOGY

The coastal plain region of Georgia is underlain by a thick wedge of unconsolidated and semiconsolidated sediments that range in age from Recent to Cretaceous (Herrick and Vorhis, 1963). This sedimentary wedge thickens and slopes toward the east with a dip of less than 1 degree (°). Underlying these sediments in the Savannah area is a basement of crystalline igneous rocks of the Piedmont Formation, and various metamorphic and consolidated sedimentary rocks of Triassic to Precambrian age.

From youngest to oldest, the Recent and Pleistocene deposits consist of discontinuous units of sand, silt, and clay. These units are undifferentiated in the site region, with thicknesses of approximately 60 feet. Underlying the Pleistocene deposits is the Duplin Marl (Upper Miocene), consisting of green, stiff, phosphatic and calcareous sandy clay. The Duplin Marl is approximately 60 feet thick at the site region. The Hawthorn Formation (Middle Miocene) consists of green to buff phosphatic sandy clay and dolomitic limestone. The Hawthorn Formation is approximately 50 feet thick in the site region. The Tampa Limestone equivalent underlies the Hawthorn Formation and is of Lower Miocene age. The Tampa

Limestone is approximately 10 feet thick and is dolomitic with seams of green sandy clay at its base. Underlying the Tampa Limestone is a thick sequence of limestone units (the Floridan Aquifer) which include an undifferentiated Oligocene unit,the Ocala Limestone, the gosport sand, and the lisbon formation. These units extend to approximately 850 feet below the ground surface in the vicinity of the site. Figure 1-4 is a composite geologic column for the Savannah area.

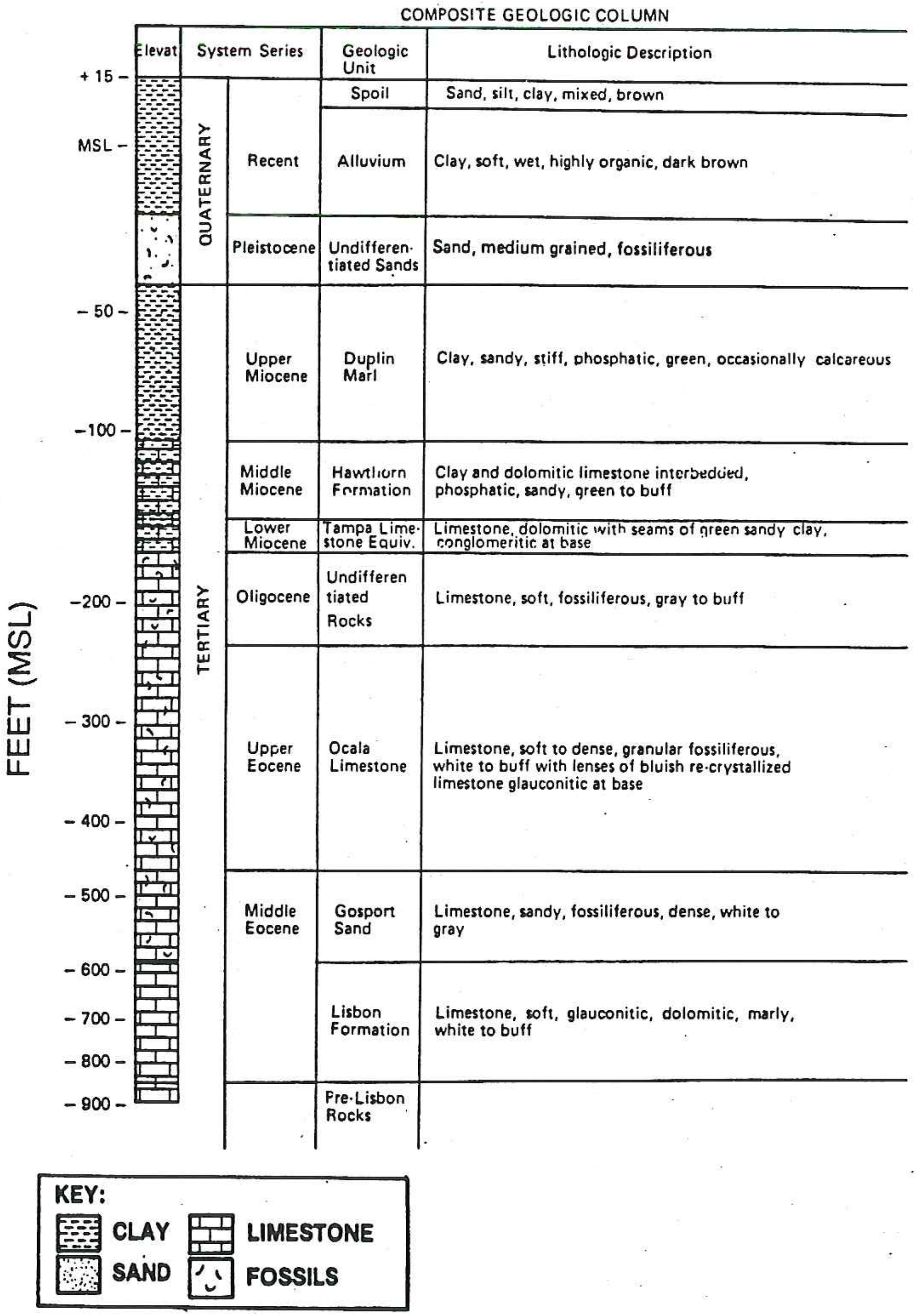
Deep borings performed during previous investigations [ESE, 1982; U.S. Army Environmental Hygiene Agency (USAEHA), 1987, Hunter/ESE 1990, ESE 1993a] at or in the vicinity of Hunter AAFTA indicate that the site is underlain predominantly by sand, silty-sand, and some clayey sand deposits to a depth of at least 50 feet below land surface (ft-bls). Shallow borings performed during previous investigations (USAEHA, 1987; ESE, 1990; ESE 1993a) at the Hunter AAFTA indicate that the site is underlain predominantly by fine-grained sand deposits to a depth of at least 10 ft.

1.4 HYDROGEOLOGY

The two principal aquifer systems in the Georgia coastal plain are the artesian Floridan aquifer and the overlying (younger) surficial aquifer (water-table aquifer). The Floridan aquifer is comprised of Middle-Upper Eocene (Ocala Group) and Oligocene (undifferentiated) limestones. The overlying Lower-Miocene Tampa Limestone, which may include beds of sandy clay, may also form part of the Floridan aquifer. In the Savannah area, the top of the Floridan aquifer is approximately 150 to 20 ft-bls.

The Floridan aquifer is the major source of groundwater for the Coastal Plain of Georgia and adjoining states (Krause and Gregg, 1972). The Floridan aquifer in Georgia provides the majority of water for industrial and domestic use [500 million gallons per day (mgd) statewide in 1978].

COMPOSITE GEOLOGIC COLUMN



System Series		Geologic Unit	Lithologic Description
QUATERNARY	Recent	Spoil	Sand, silt, clay, mixed, brown
		Alluvium	Clay, soft, wet, highly organic, dark brown
	Pleistocene	Undifferentiated Sands	Sand, medium grained, fossiliferous
TERTIARY	Upper Miocene	Duplin Marl	Clay, sandy, stiff, phosphatic, green, occasionally calcareous
	Middle Miocene	Hawthorn Formation	Clay and dolomitic limestone interbedded, phosphatic, sandy, green to buff
	Lower Miocene	Tampa Limestone Equiv.	Limestone, dolomitic with seams of green sandy clay, conglomeritic at base
	Oligocene	Undifferentiated Rocks	Limestone, soft, fossiliferous, gray to buff
	Upper Eocene	Ocala Limestone	Limestone, soft to dense, granular fossiliferous, white to buff with lenses of bluish re-crystallized limestone glauconitic at base
	Middle Eocene	Gosport Sand	Limestone, sandy, fossiliferous, dense, white to gray
		Lisbon Formation	Limestone, soft, glauconitic, dolomitic, marly, white to buff
		Pre-Lisbon Rocks	

Figure 1-4
COMPOSITE GEOLOGIC COLUMN

SOURCE: HERRICK AND VORHIS, 1963.

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The Middle and Upper-Miocene Hawthorn Group and Duplin Marl, comprised of clay with occasional limestone beds, forms a confining unit that hydraulically separates the Floridan aquifer from the overlying surficial aquifer.

The Pleistocene to Recent deposits above the Miocene deposits consist of discontinuous units of sand, silt, and clay. The surficial aquifer is comprised of discontinuous beds and lenses of sand within these deposits. The depth to the water table in the Savannah area is approximately 3 to 10 ft-bls. The vertical extent of the surficial aquifer is not known, though Kundell (1978) reports that the aquifer may be up to 120-ft thick in the study area. Approximately 5-feet of soil fill was brought to the Hunter Army Airfield to raise the airfield and fire training pad above the level of the swamp which existed in the area prior to the construction of the Airfield.

There is no record of extended usage of the surficial aquifer in the study area; however, statewide usage amounted to 500,000 gallons per day (gpd) in 1978.

2.0 REGULATORY FRAMEWORK

The Hunter Army Airfield Fire Training Area (AAFTA) was identified as a potential contamination site during a 1982 ESE investigation related to the Resource Conservation and Recovery Act (RCRA) closure of three landfills at Fort Stewart. Follow-up investigations by USAEHA in 1987 and ESE in 1990 and 1992 found toxic metals contamination in the surface soils immediately adjacent to the fire training pad, carcinogenic semi-volatile organics in nearly all surface soil samples (0-1 foot bgs), and petroleum fuel related organics in deeper soils (3-6 feet bgs) on the north and south sides of the pad. These investigations found no evidence that site soils exhibited any hazardous characteristics, with the probable exception of toxic metal-contaminated soils on and immediately adjacent to the fire training pad. Although the fire training area was not a hazardous waste management facility, hazardous constituents (40CFR261, Appendix VIII) have been released to the environment (see Section 3.0), requiring corrective action for a "continuing release" under Section 3004(u) of RCRA. This closure plan is being developed in response to this requirement.

3.0 SITE CONTAMINATION

The nature and extent of contamination in the site soils, groundwater, and surface sediments has been investigated in three separate sampling events in 1987, 1990, and 1992. The analytical results of these investigations are provided in Appendix E and a complete description of the efforts (USAEHA, 1987; ESE, 1990; and ESE 1992) can be found in the Significance of Contamination Report (SCR), Hunter Army Airfield Fire Training Area (ESE, June, 1993). Contamination, for the purposes of this closure plan, is defined as the presence of pollutants in concentrations greater than or equal to the preliminary cleanup target (PCT) concentrations developed in Section 4 of the SCR. Contamination was found to be present in three media, soils, ditch sediments, and groundwater.

3.1 SOIL CONTAMINATION

Available data on contamination in soils was collected in three efforts spanning 5 years. Soil sampling locations are shown in Figure 3-1 and results of analysis are shown in Table 3.1. The BH-series soil borings were completed by USAEHA in 1987, the HSB-series borings by ESE in 1990, and the PSB series by ESE in 1992. The BH-series samples were taken immediately adjacent to the fire training pad and did not indicate any significant organic contamination, but did detect elevated levels of lead. The 1990 HSB samples were concentrated mainly on the south side of the training pad because of visual evidence that water from the pad overflowed in that direction. Only one boring, HSB-2, was placed to the north of the fire training pad and samples from it were found to be highly contaminated with PAHs. The 1992 PSB series of borings were mainly grouped to the north of the pad to delineate the contamination previously detected in HSB-2. In addition to the soil sampling performed in these three investigations, an underground electrical line was being installed between the fire training pad and the access road during the 1992 field investigation. Cursory examination of the excavated soils revealed a black, oily appearance and a strong petroleum odor, resembling the JP-5 aviation fuel used in the training exercises.

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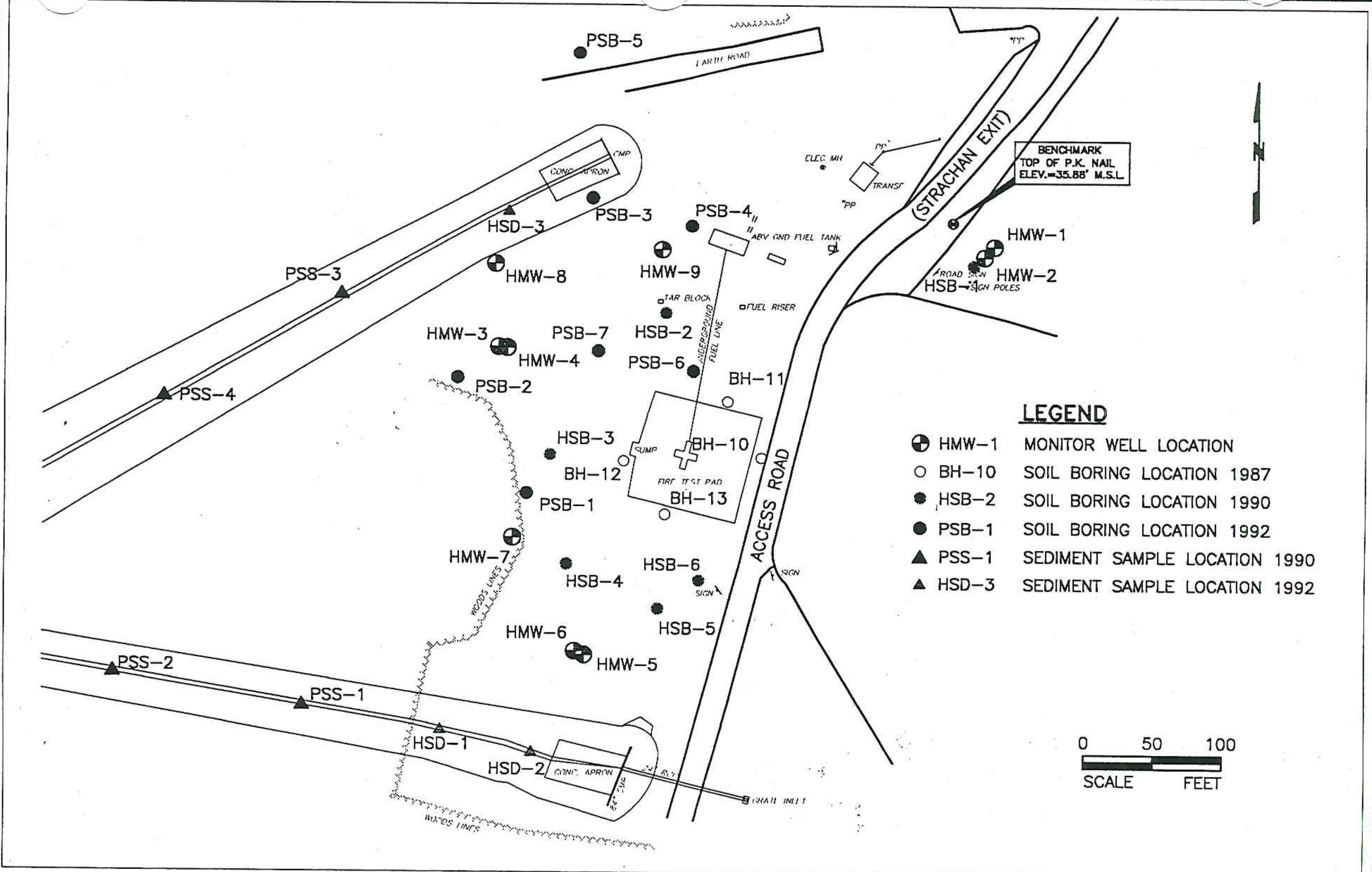

Figure 3-1
SOIL AND SEDIMENT SAMPLING LOCATIONS

HUNTER ARMY AIRFIELD
FORT STEWART, GA

SOURCE: ESE, 1993.

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Table 3.1 Comparison of Soil Concentrations Detected at Hunter AAFTA to PCTs

	PCT		Regional Background	1992 SOIL SAMPLES							1992 SEDIMENT				1990 SOIL SAMPLES						1987 SOIL SAMPLES			
Chemical	Systemic	Carc.	SE Georgia	PSB-1	PSB-2	PSB-3	PSB-4	PSB-5	PSB-6	PSB-7	PSS-1	PSS-2	PSS-3	PSS-4	HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	BH-10	BH-11	BS-12	BS-13
INORGANICS																								
Arsenic	80,000	400	<100-6,500	1,020.00	2,440.00	510.00	590.00	610.00	930.00	1,610.00	490.00	370.00	<310.00	1,050.00	<480.00	<520.00	<540.00	650.00	850.00	<550.00	5,990.00	1,390.00	4,000.00	11,980.00
Barium	4,000,000	NA	10,000-200,000	12,800.00	23,400.00	18,300.00	17,700.00	19, 100.00	23,700.00	47,600.00	15,600.00	9,950.00	7,970.00	12,000.00	3,830.00	5,970.00	6,210.00	4,440.00	15,400.00	11,200.00	64,400.00	33,500.00	8,120.00	27.100.00
Cadmium	80,000	NA	NA	<570.00	<550.00	<510.00	<540.00	<550.00	<540.00	<540.00	<620.00	<620.00	<620.00	<630.00	<370.00	<400.00	<420.00	<410.00	<450.00	<420.00	<1,980.00	1,990.00	<1,980.00	3,870.00
Chromium, total**	400,000	NA	1,000-20,000	5,610.00	5,880.00	3,550.00	3,020.00	3,980.00	4,970.00	6,100.00	5,660.00	2,860.00	1,090.00	3,540.00	780.00	3,490.00	3,850.00	5,870.00	1,930.00	2,390.00	12,800.00	4,160.00	5,190.00	9,100.00
Lead	500,000	NA	<10,000	28,000.00	17,300.00	7,390.00	<7,270.00	<7,310.00	23,900.00	107,000.00	29,400.00	22,900.00	<8,360.00	<8,460.00	<5,260.00	<5,710.00	<5,970.00	<5,810.00	7,400.00	<5,970.00	645,000.00	1,163,700.00	102,000.00	1,185,000.00
Mercury	24,000	NA	3-10	<100.00	<100.00	<900.00	<100.00	<100.00	<100.00	<90.00	<110.00	<120.00	<110.00	<110.00	<100.00	<110.00	<110.00	<110.00	<120.00	<120.00	400.00	380.00	400.00	790.00
Selenium	400,000	NA	100-500	<290.00	<290.00	<280.00	<280.00	<280.00	<280.00	<280.00	<330.00	<330.00	<320.00	<340.00	<420.00	<450.00	<470.00	<460.00	670.00	<470.00	<200.00	<200.00	790.00	330.00
PAHs																								
Acenaphthene	4,800,000	NA	NA	<850.00	<84.00	<380.00	<81.00	<82.00	<3,900.00	<80.00	<190.00	<960.00	<94.00	110.00	<130.00	300.00	<150.00	<150.00	<160.00	<150.00	–	–	–	–
Acenaphthylene	2,400,000	NA	NA	<1,800.00	<180.00	<810.00	<170.00	<82.00	390.00	210.00	<190.00	<960.00	<94.00	<96.00	<96.00	400.00	<110.00	<110.00	<120.00	<110.00	–	–	–	–
Anthracene	24,000,000	NA	NA	<850.00	<84.00	670.00	<81.00	<82.00	440.00	210.00	210.00	2,400.00	<94.00	130.00	<25.00	1,300.00	<85.00	<83.00	<91.00	<85.00	–	–	–	–
Benz(a)anthracene	ND	1,200	NA	370.00	170.00	5,300.00	160.00	<120.00	370.00	970.00	760.00	13,000.00	160.00	510.00	<62.00	4,900.00	<70.00	<68.00	<75.00	<20.00	–	–	–	–
Benzo(a)pyrene	ND	120	NA	320.00	220.00	4,800.00	180.00	<160.00	690.00	1,300.00	850.00	12,000.00	<190.00	400.00	<180.00	3,400.00	<210.00	<200.00	<220.00	<210.00	–	–	–	–
Benzo(b)fluoranthene	ND	1,200	NA	560.00	370.00	6,900.00	260.00	<120.00	830.00	2,000.00	760.00	13,000.00	<130.00	450.00	<130.00	5,000.00	<150.00	<150.00	<160.00	<150.00	–	–	–	–
Benzo(ghi)perylene	2,400,000	NA	NA	<1,900.00	<190.00	<870.00	<190.00	<190.00	<9,000.00	<180.00	<440.00	5,100.00	<210.00	<220.00	<74.00	2,200.00	<84.00	<81.00	<89.00	<84.00	–	–	–	–
Benzo(k)fluoranthene	ND	1,200	NA	250.00	150.00	2,700.00	<120.00	<120.00	240.00	620.00	890.00	7,200.00	280.00	390.00	<170.00	2,500.00	<190.00	<180.00	<200.00	<190.00	–	–	–	–
Chrysene	ND	12,000	NA	560.00	200.00	5,300.00	170.00	<120.00	220.00	1,000.00	930.00	7,600.00	180.00	670.00	<97.00	5,100.00	<110.00	<110.00	<120.00	<110.00	–	–	–	–
Dibenz(ah)anthracene	ND	120	NA	<1,900.00	<190.00	<870.00	<190.00	<190.00	<9,000.00	<180.00	<440.00	<2,200.00	<210.00	<220.00	<63.00	1,100.00	<72.00	<70.00	<77.00	<72.00	–	–	–	–
Fluoranthene	3,200,000	NA	NA	690.00	120.00	8,100.00	170.00	77.00	360.00	980.00	2,200.00	34,000.00	190.00	1,200.00	<110.00	13,000.00	140.00	<130.00	360.00	<130.00	–	–	–	–
Fluorene	3,200,000	NA	NA	<850.00	<84.00	<380.00	<81.00	<82.00	<3,900.00	<80.00	<190.00	1,200.00	<94.00	130.00	<110.00	720.00	<120.00	<120.00	<130.00	<120.00	400.00	<1.0	200.00	<3.0
Indeno(1,2,3-cd)pyrene	ND	1,200	NA	<1,900.00	<190.00	<870.00	<190.00	<190.00	570.00	<180.00	440.00	7,600.00	<210.00	<220.00	<95.00	2,900.00	<110.00	<110.00	<120.00	<110.00	–	–	–	–
Naphthalene	320,000	NA	NA	3,500.00	<84.00	<380.00	<81.00	<82.00	41,000.00	<80.00	<190.00	<960.00	<94.00	<96.00	<210.00	<230.00	5,700.00	<230.00	11,000.00	<240.00	10.00	7.00	5.80	<1.00
Phenanthrene	2,400,000	NA	NA	<850.00	<84.00	670.00	<81.00	<82.00	170.00	100.00	810.00	19,000.00	<94.00	1,400.00	<67.00	8,100.00	150.00	<74.00	290.00	<76.00	0.90	<1.00	0.20	<3.00
Pyrene	2,400,000	NA	NA	<850.00	190.00	5,200.00	140.00	<82.00	230.00	810.00	1,400.00	21,000.00	220.00	990.00	<72.00	9,400.00	140.00	<79.00	340.00	<81.00	–	–	–	–
VOCs																								
Benzene	1,600,000	24,000	NA	<30.00	<6.00	<5.70	<5.80	<5.80	39.00	<5.70	<6.80	<6.90	<6.70	<6.80	<1.20	<1.3	<170.00	<1.3	<1,800.00	<1.3	–	–	–	–
Ethylbenzene	8,000,000	ND	NA	36.00	<6.00	<5.70	9.90	<5.80	540.00	<5.70	<6.80	<6.90	<6.70	<6.80	1.1	1.1	1,500.00	1.2	10,000.00	1.2	–	–	–	–
Methylene chloride	4,800,000	93,000	NA	<60.00	25.00	<11.00	<12.00	<12.00	<58.00	<11.00	<14.00	<14.00	<13.00	<14.00	1.7	1.8	240.00	1.9	<2,600.00	6.7	–	–	–	–
Methyl ethyl ketone	4,000,000	ND	NA	<30.00	<6.00	<5.70	<5.80	<5.80	<29.00	<5.70	<6.80	<6.90	<6.70	<6.80	–	–	–	–	–	–	–	–	–	–
Toluene	16,000,000	ND	NA	<30.00	<6.00	<5.70	<5.80	<5.80	<29.00	<5.70	<6.80	<6.90	<6.70	<6.80	2.8	2.9	<1,100.00	<0.82	<1,100.00	5.5	–	–	–	–
Trichlorofluoromethane	24,000,000	ND	NA	14.00	12.00	10.00	10.00	<5.80	31.00	7.00	6.90	7.40	<6.70	<6.80	–	–	–	–	–	–	–	–	–	–
Xylenes (total)	160,000,000	ND	NA	200.00	<6.00	<5.70	60.00	<5.80	990.00	<5.70	<6.80	<6.90	<6.70	<6.80	<1.1	<1.2	<150.00	<1.2	57,000.00	<1.2	–	–	–	–

Note: all units in µg/L.
Carc. = carcinogenic effects.
NA = not applicable.
ND = not determined.
– = information not available.

Source: ESB.

The areal extent and volume of soils requiring remediation are dependent upon the selection of a preliminary cleanup target or PCT. The PCTs for the organic contaminants of concern at this site were developed in the "Significance of Contamination Report for Hunter Army Airfield Fire Training Area" (ESE, 1993). The PCT analysis used conservative assumptions of a residential exposure duration of 70 years, per the RCRA closure guidance. A less conservative method uses a 20-year exposure for the risk assessment, per CERCLA guidance, and results in significantly higher PCTs. PCTs for metals in soils are taken from EPA guidelines for RCRA cleanups. The selected PCTs for each contaminant of concern are shown in Table 3.1 and are compared to the concentrations detected.

An estimated 2,500 to 11,000 cubic yards (yd^3) of soils are contaminated with volatile and semi-volatile organics. The majority of this soil is at the ground surface [0-1 foot below ground surface (bgs)]. Approximately 200 to 300 yd^3 of soils on and around the fire training pad have total lead concentrations in excess of the 500 mg/kg PCT. The total extent of soils contamination and volume of contaminated soils will be determined by confirmatory sampling during closure, as described in Section 4.2.3.

3.1.1 ORGANIC CONSTITUENTS

3.1.1.1 Semi-volatiles

Organic soil contamination consists primarily of benzo(a)pyrene, a carcinogenic semi-volatile petroleum hydrocarbon which was detected at levels above its PCT of 120 μg/kg in most ground-surface soil samples. Other carcinogenic semi-volatiles (benzo(a)anthracene, benzo(b)fluoranthene, and benzo(k)fluoranthene) were also detected, but not usually at concentration levels exceeding their PCTs. These carcinogenic semi-volatiles were most frequently detected in the surficial soils (0 to 1 foot below ground surface or "bgs") on the northern and western sides of the site (PSB-1, 2, 3, and 4). Some semi-volatile contamination was also found at depths of 3 to 6 feet in the area immediately to the north of the pad (PSB-6, PSB-7, and HSB-2). The pattern of contamination in soils and the lack of semi-volatile contamination in groundwater appears to indicate two modes of transport. The first mode is airborne soot and spray droplet dispersion and deposition onto the ground surface where the contamination is then washed by runoff over the ground surface, and eventually into the ditches, while attached to fine particulate matter (silt and soot). The second mode is flushing into the soil of semi-volatiles dissolved into other more mobile hydrocarbons, such as naphthalene and xylene.

Anticipating the results of the first-mentioned transport mechanism, the ground surface to the south of the pad (HSB-4, 5, and 6) is highly likely to be contaminated, since drainage conditions here are similar to those on the north. No surface samples have yet been taken from this area. Since the westernmost surface soil samples (PSB-1 and PSB-2) are contaminated with benzo(a)pyrene, it is possible that the remaining area west of the "woods line" and between the drainage ditches (up to 4,000 yd^3) could also be contaminated with benzo(a)pyrene and could require remediation. This area is not likely to be extensively contaminated, since the heavy undergrowth would present an effective barrier to overland migration of contaminated silt and soot fines and the magnitude of soot deposition should decrease substantially with distance from the pad. Remediation of soils in the area west of the "woods line," if necessary, is complicated by the presence of medium-sized trees and construction debris.

3.1.1.2 **Volatiles**. Volatile hydrocarbons (benzene, ethyl-benzene, and xylene), where detected, were far below their PCTs, except for one benzene detection in PSB-6 (39 μg/kg detected vs. a 24 μg/kg PCT). This contamination is intermingled with the deeper semi-volatile contamination in the same vicinity and requires no additional excavation. The presence of benzene contamination is also likely in the vicinity of HSB-5, since elevated levels of xylene, ethylbenzene, and naphthalene (which usually accompany benzene) resulted in a benzene detection limit of 1800 μg/kg. Elevated benzene levels in groundwater samples from HMW-6 and HMW-7 would also tend to indicate a benzene source area to the south of the pad. This contaminated soil volume is estimated at 500 to 1,000 yd^3.

3.1.2 METALS

In 1987, lead was detected at levels in excess of the 500 milligrams per kilogram (mg/kg) PCT at the ground surface in borings BH-10, BH-11, and BH-13, immediately adjacent to the pad. USAEHA tested these soils for extraction procedure toxicity in 1987, in accordance with the requirements of 40 CFR 262 at that time, and found no detectable lead in the leachate. For this reason, these soils are not believed to exhibit a characteristic hazard due to leachable lead, but this must be confirmed prior to disposal by TCLP analysis. The soils on the pad are assumed to also contain elevated levels of lead. No other soil samples indicated metal concentrations at levels of concern. It is estimated that 50 to 100 yd^3 of lead-contaminated surficial soils are present adjacent to the pad plus 150 to 200 yd^3 on the pad.

3.1.3 SUMMARY. Based on interpretation of soils analytical results, the total area and volume of soils requiring remediation is summarized in Table 3.2. A visual representation of these interpretations is provided in Figures 3-2 through 3-4. Figure 3-2 shows the site plan with areas of known, probable, and possible benzo(a)pyrene surface soils contamination. Figure 3-3 shows the areas of known and possible contamination of deeper soils (to 6 feet). Figure 3-4 shows the estimated areas of lead contamination of surface soils adjacent to the pad and the cover soils on the pad.

Table 3.2 Summary of Known and Potential Soils Remediation Volumes

AREA	KNOWN VOLUME	KNOWN PLUS PROBABLE	TOTAL POSSIBLE VOLUME
Surface Soils (0-1' bgs)			
North of the pad to ditch and west to "woods line"	1,500	2,000(1)	2,000
South of pad to ditch and west to "woods line"	-	1,000	1,000
West of "woods line" to ditch confluence	-	-	4,000
Deeper Soils (1-6' bgs)			
North of pad around HSB-2, PSB-6, & PSB-7	1,000	1,000	3,000
South of pad around HSB-5	-	500	1,000
TOTAL ORGANIC-CONTAMINATED	2,500	4,500	11,000
Toxic Metals-Contaminated Surface Soils (0-1' bgs)			
On pad	150	150	200
Adjacent to pad (BH-10, 11, & 13)	50	50	100
TOTAL METALS-CONTAMINATED	200	200	300

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(1) Includes area of PSB-6, PSB-7, and HSB-2, where no contamination was detected at the ground surface, but soils would be difficult to segregate from deeper contaminated soils.

Source ESE, 1993

9324CG01

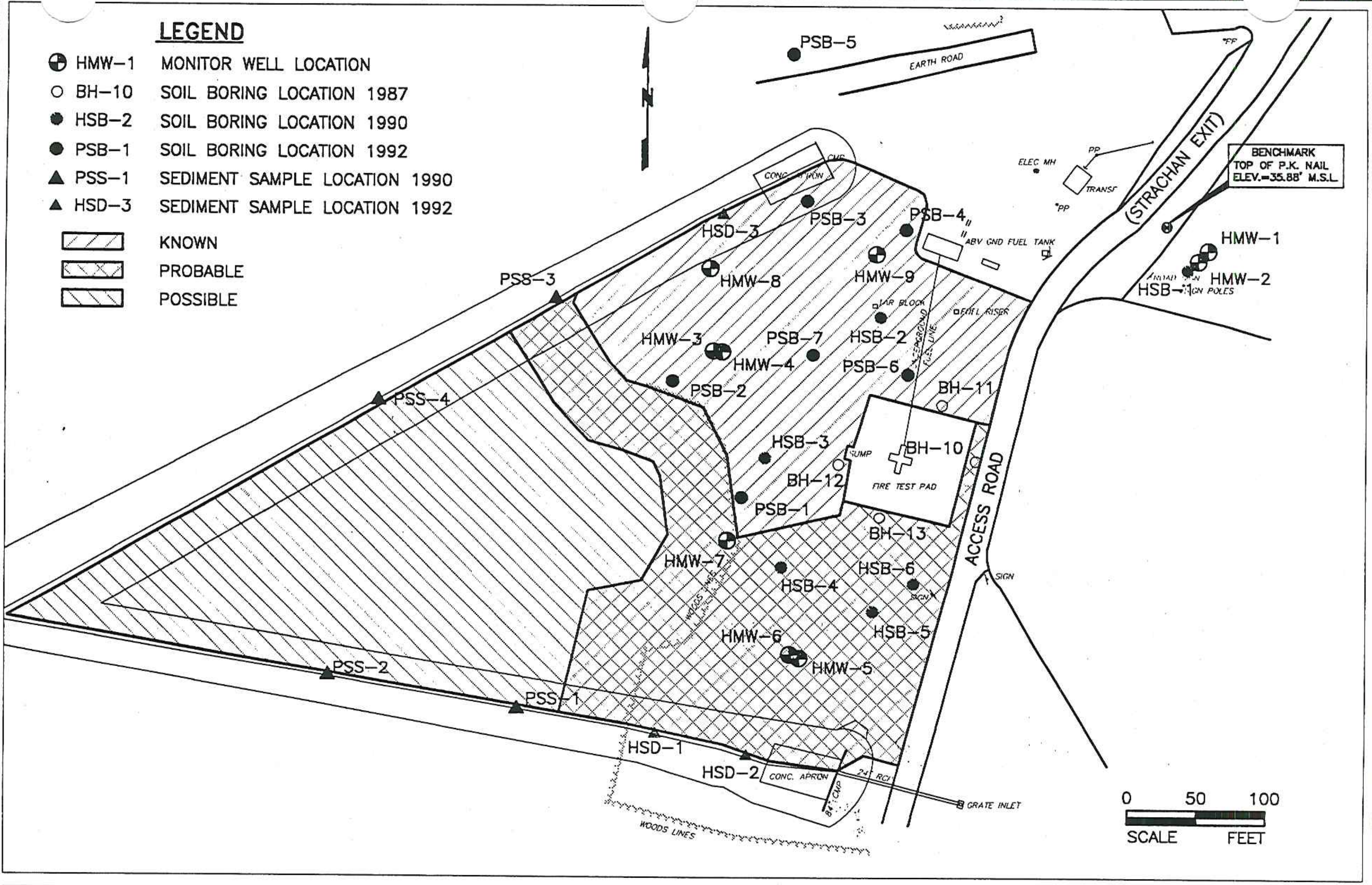

Figure 3-2
ESTIMATED EXTENT OF ORGANIC CONTAMINATION
OF SURFACE SOILS (0-1'bgs)
HUNTER ARMY AIRFIELD
FORT STEWART, GA

SOURCE: ESE, 1993.

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Jul 22, 1993 - 16:09:19

9324CG03

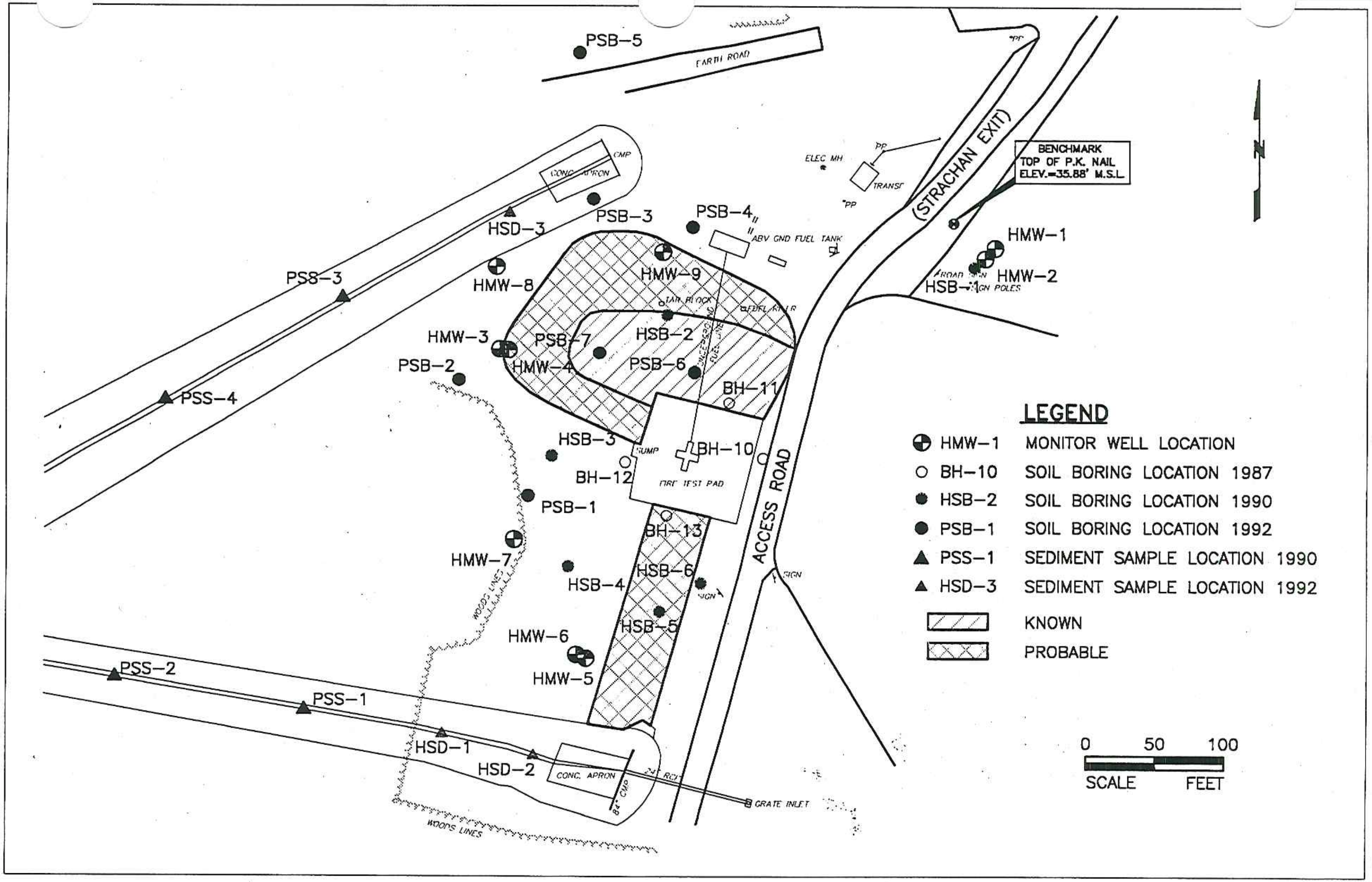

Figure 3-3
ESTIMATED EXTENT OF ORGANIC CONTAMINATION
OF SUBSURFACE SOILS (1-6'bgs)
HUNTER ARMY AIRFIELD
FORT STEWART, GA

SOURCE: ESE, 1993.

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Jul 23, 1993 - 09:42:40

9324CG02

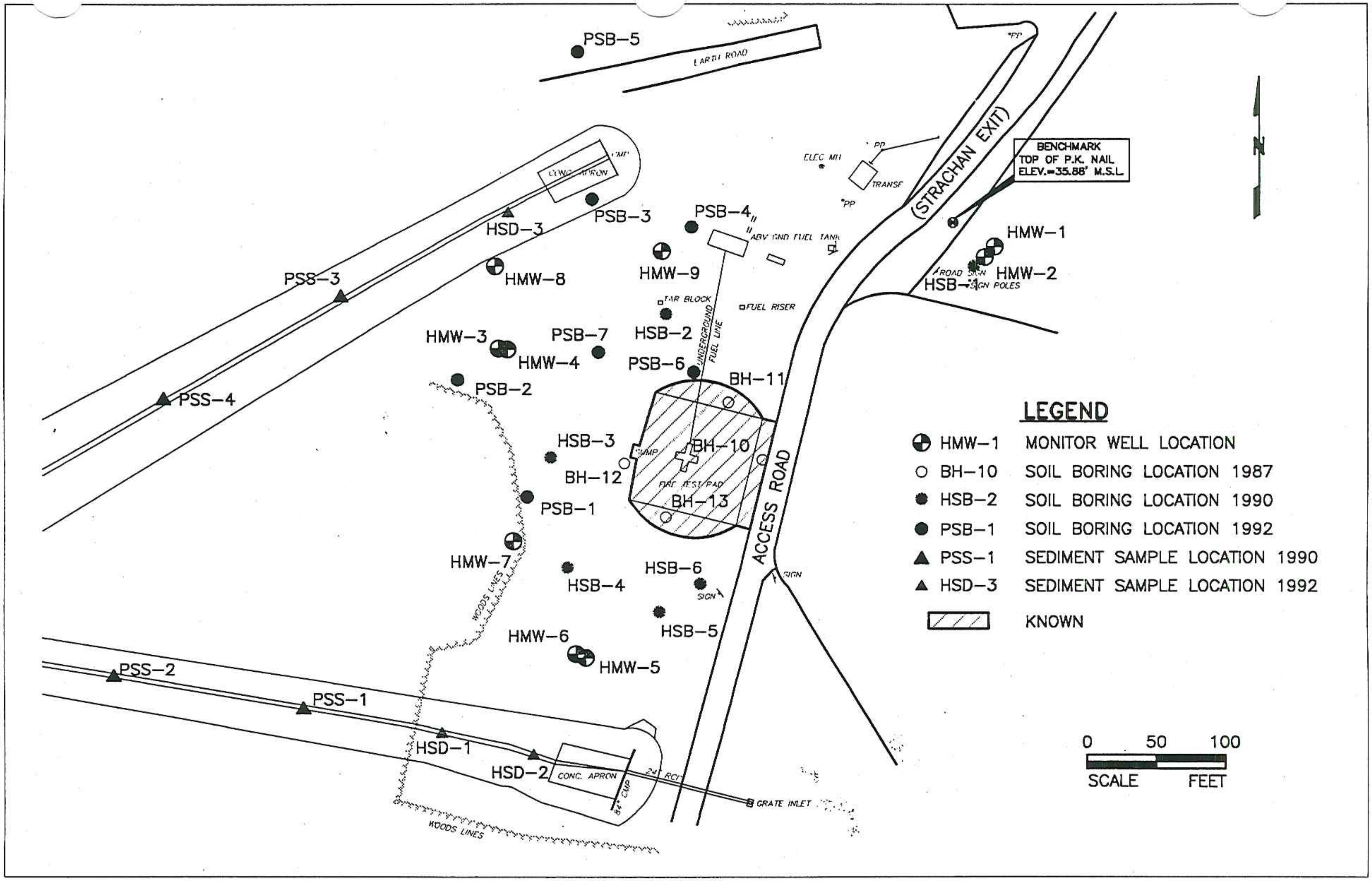

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Figure 3-4
ESTIMATED EXTENT OF METALS CONTAMINATION
OF SURFACE SOILS (0-1'bgs)
HUNTER ARMY AIRFIELD
FORT STEWART, GA

SOURCE: ESE, 1993.

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3.2 SEDIMENT CONTAMINATION

Ditch sediments were sampled during both the 1990 and 1992 site investigations. Sample locations are shown in Figure 3-5 and analytical results are can be seen in Table 3.3. In 1990, sediment sample HSD-1 in the south ditch and HSD-3 in the north ditch were found to be contaminated with benzo(a)pyrene at concentrations of 9,200 and 18,000 μg/kg, respectively, as well as other semi-volatiles. Samples HSD-1 and HSD-2 also had detectable levels of methylene chloride. In 1992, sediments were sampled in four locations (PSS-1 and -2 in the south ditch and PSS-3 and -4 in the north ditch) and were found to be contaminated in three of the four samples by semi-volatile hydrocarbons, primarily benzo(a)pyrene. Both sediment samples from the south ditch were found to be contaminated (850 μg/kg benzo(a)pyrene in PSS-1 and 12,000 μg/kg in PSS-2). In the north ditch only the western-most (downstream) sediment sample (400 μg/kg benzo(a)pyrene in PSS-4) was found to be contaminated, possibly indicating a downstream migration of sediments due to stormwater flows since the last training exercise. The only volatile detected in 1992 was trichlorofluoromethane, which was detected at levels nearly equal to the detection limit (7.0 μg/kg in PSS-1, 6.9 in PSS-2, and 7.4 in PSS-3, compared to detection limits of 5.7 to 6.8 μg/kg). Because the ditch bottom elevations (approximately 15 ft msl) are significantly lower than both the ground surface and the local groundwater piezometric surface (30 ft msl, and 25 ft msl, respectively), the ditches act as interception trenches for both surface runoff and groundwater seepage. No sediment samples were taken further west than approximately 400 feet from the culvert outfalls into each ditch, but due to the levels of contaminants in these samples, it is presumed that contaminated sediments are present to at least the ditch confluence.

3.3 GROUNDWATER

3.3.1 METALS

The concentrations of arsenic, chromium, and selenium detected in a 1990

Table 3.3 Comparison of Maximum Sediment Concentrations Detected at Hunter AAFTA to PCTs

	PCT (mg/kg)		Background (mg/kg)	Drainage Ditch Southwest of Fire Pit (mg/kg)		Drainage Ditch Northwest of Fire Pit (mg/kg)		Exceedance of PCT
Chemical	Systemic Effects	Carcinogenic Effects	Southeastern Georgia (a)	HSD-1, HSD-2	PSS-1, PSS-2	HSD-3	PSS-3, PSS-4	
INORGANICS								
Arsenic	80	0.4	*<0.1 - 6.5*	*0.76*	*0.499*	BDL	*1.05*	1,2
Barium	4,000	NA	10 - 200	19.8	15.6	229	12	3
Chromium, total**	400	NA	1.0 - 20	3.38	5.66	69.7	3.54	3
Lead	500 ***	NA	<10 - 10	7.71	29.4	362	BDL	3
PAHs								
Acenaphthene	4,800	ND	NA	1.1	BDL	4.9	0.11	
Acenaphthylene	2,400 +	ND	NA	BDL	BDL	3.1	BDL	
Anthracene	24,000	ND	NA	3	2.4	9.3	0.13	
Benz(a)anthracene	ND	1.2 ++	NA	*13*	*13*	*33*	0.51	1
Benzo(a)pyrene	ND	0.12	NA	*9.2*	*12*	*27*	*0.4*	1
Benzo(b)fluoranthene	ND	1.2 ++	NA	*16*	*13*	*27*	0.45	1
Benzo(ghi)perylene	2,400 +	ND	NA	6.2	5.1	17	BDL	
Benzo(k)fluoranthene	ND	1.2 ++	NA	*7.2*	*12*	*29*	0.39	1
Chrysene	ND	12 ++	NA	*22*	*15*	*52*	0.67	1
Dibenz(ah)anthracene	ND	0.12 ++	NA	*4.2*	BDL	*11*	BDL	1
Fluoranthene	3,200	ND	NA	36	34	62	1.2	
Fluorene	3,200	ND	NA	1.5	1.2	8.3	0.13	
Indeno(1,2,3-cd)pyrene	ND	1.2 ++	NA	*7.9*	*7.6*	*23*	BDL	1
Naphthalene	320	ND	NA	BDL	BDL	0.39	BDL	
Phenanthrene	2,400 +	ND	NA	20	19	62	1.4	
Pyrene	2,400	ND	NA	27	21	58	0.99	
VOLATILE ORGANICS								
Acetone	8,000	ND	NA	0.11	BDL	0.12	BDL	
Benzene	1,600	24	NA	BDL	BDL	0.031	BDL	
Carbon disulfide	8,000	ND	NA	0.023	BDL	BDL	BDL	
Methylene chloride	4,800	93	NA	0.012	BDL	BDL	BDL	
Toluene	16,000	ND	NA	0.0032	BDL	BDL	BDL	
Trichlorofluoromethane	24,000	ND	NA	BDL	7.4	BDL	BDL	
Xylenes, total	160,000	ND	NA	BDL	BDL	0.0024	BDL	

Note:
ND = not determined.
NA = not applicable.
PAH = polycyclic aromatic hydrocarbon.
BDL = below detection limit.
NRQ = not required.
mg/kg = milligrams per kilogram.

(a) Average metal concentration in soils southwest of Savannah, Georgia (Shacklette and Boerngen, 1984).
(1) Site levels exceed carcinogenic PCT (highlighted in table).
(2) Regional background value exceeds carcinogenic PCT (highlighted in table).
(3) Some site levels exceed background but are within PCT.

*Sediment samples were collected from the drainage ditches in 1990 (HSD) and 1992 (PSS).
**Assumes chromium is present as the more potent hexavalent species.
***Interim cleanup level established by EPA (1991).
+No RfD is available for this PAH; the RfD for the most potent non-naphthalene PAH (pyrene) is used for comparison, only.
++Interim Region IV Guidance on Toxicity Equivalency Factor (TEF) methodology for carcinogenic PAHs based on each compounds relative potency to the potency of benzo(a)pyrene (EPA, February 1992). The following TEFs were used to convert the CSF for benzo(a)pyrene to an equivalent CSF for the particular carcinogenic PAH: benz(a)anthracene = 0.1, benzo(b)fluoranthene = 0.1, benzo(k)fluoranthene (0.1), chrysene (0.01), dibenz(ah)anthracene = 1.0, and indeno(1,2,3-cd)pyrene = 0.1.

Source: ESE.

3.3 GROUNDWATER

3.3.1 METALS

The concentrations of arsenic, chromium, and selenium detected in a 1990 groundwater sample from a shallow downgradient well (HMW-6) exceed Federal and State of Georgia MCLs. Lead levels detected in the 1990 samples from the same well, in addition to shallow downgradient well HMW-4 are above the EPA action level for lead. The 1990 concentrations of arsenic, barium, chromium, and lead detected in the shallow upgradient well (HMW-2) also exceed (or are equivalent to) their respective PCTs. No metals were detected above their PCTs in 1992. The results of sediment analyses are summarized in Table 3.4.

3.3.2 ORGANICS

Benzene was detected above its MCL (5 μg/L) in several wells [HMW-3 (1990), HMW-4 (1992), HMW-6 (1990 and 1992), HMW-7 (1992), and HMW-9 (1992)]. Table 3.4 presents the results of analysis of groundwater samples taken during the 1992 field effort. The analytical results of both the 1990 and 1992 field investigations are provided in Appendix E. The lateral extent of benzene contamination was not delineated during this field effort. In addition to benzene, vinyl chloride was detected above its MCL in the 1992 sample from HMW-6. The only other chemicals measured in groundwater above PCTs were three PAHs, which were detected in the 1990 sample from HMW-6. PAHs were not detected above PCTs in any of the wells during the 1992 field effort (ESE,1993a). A site plan showing the location of monitoring wells with a superimposed visual interpretation of the extent of groundwater benzene contamination is provided as Figure 3-5.

Table 3.4 ical Parameters Detected in Groundwater Samples in 1992

PARAMETERS	UNITS	HMW-1	HMW-2	HMW-3	HMW-4	HMW-5	HMW-6	HMW-7	HMW-8	HMW-9	HMW-5DUP	HSOURCE	TRPBLK	EQPBLK
		03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92
		13:30	13:40	14:20	14:30	13:50	14:00	14:10	14:40	15:00		16:30		13:15
1,1,1-TRICHL'ETHANE	UG/L	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<25.00	<2.50	<13.00	<2.50	<2.50	<2.50	<2.50
1,1,2,2-TETRACHLORO- ETHANE	UG/L	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<15.00	<1.50	<7.50	<1.50	<1.50	<1.50	<1.50
1,1,2-TRICHL'ETHANE	UG/L	<2.80	<2.80	<2.80	<2.80	<2.80	<2.80	<28.00	<2.80	<14.00	<2.80	<2.80	<2.80	<2.80
1,1-DICHLOROETHANE	UG/L	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<25.00	<2.50	<13.00	<2.50	<2.50	<2.50	<2.50
1,1-DICHLOROETHYLENE	UG/L	<3.20	<3.20	<3.20	<3.20	<3.20	<3.20	<32.00	<3.20	<16.00	<3.20	<3.20	<3.20	<3.20
1,2-DICHLOROETHANE	UG/L	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<25.00	<2.50	<13.00	<2.50	<2.50	<2.50	<2.50
1,2-DICHLOROETHENE(TOTAL)	UG/L	<2.40	<2.40	<2.40	<2.40	<2.40	3.50	<24.00	<2.40	<12.00	<2.40	<2.40	<2.40	<2.40
1,2-DICHLOROPROPANE	UG/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<20.00	<2.00	<10.00	<2.00	<2.00	<2.00	<2.00
2-CHLOROETHYLVINYL- ETHER	UG/L	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10	<31.00	<3.10	<16.00	<3.10	<3.10	<3.10	<3.10
ACENAPHTHENE	UG/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<1.00	<1.00	<1.00	<1.00	NRQ	<1.00
ACENAPHTHYLENE	UG/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<1.00	<1.00	<1.00	<1.00	NRQ	<1.00
ANTHRACENE	UG/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<1.00	<1.00	<1.00	<1.00	NRQ	<1.00
ARSENIC,TOTAL	UG/L	9.40	<2.30	<2.30	2.30	2.70	14.70	11.30	<2.30	5.20	<2.30	<2.30	NRQ	<2.30
BARIUM,TOTAL	UG/L	76.60	46.50	88.10	54.40	56.60	57.20	147.00	65.00	113.00	56.50	14.90	NRQ	<1.10
BENZENE	UG/L	<1.00	<1.00	<1.00	18.00	<1.00	120.00	660.00	3.50	15.00	<1.00	<1.00	<1.00	<1.00
BENZO(A)ANTHRACENE	UG/L	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<15.00	<1.50	<1.50	<1.50	<1.50	NRQ	<1.50
BENZO(A)PYRENE	UG/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<20.00	<2.00	<2.00	<2.00	<2.00	NRQ	<2.00
BENZO(B)FLUORANTHENE	UG/L	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<15.00	<1.50	<1.50	<1.50	<1.50	NRQ	<1.50
BENZO(GHI)PERYLENE	UG/L	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<25.00	<2.50	<2.50	<2.50	<2.50	NRQ	<2.50
BENZO(K)FLUORANTHENE	UG/L	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<15.00	<1.50	<1.50	<1.50	<1.50	NRQ	<1.50
BROMODICHLOROMETHANE	UG/L	<2.20	<2.20	<2.20	<2.20	<2.20	<2.20	<22.00	<2.20	<11.00	<2.20	<2.20	<2.20	<2.20
BROMOFORM	UG/L	<2.60	<2.60	<2.60	<2.60	<2.60	<2.60	<26.00	<2.60	<13.00	<2.60	<2.60	<2.60	<2.60

Table 3- . ,cical Parameters Detected in Groundwater Samples in 1992, Hunter AAF ntinued, Page 2 of 3

PARAMETERS	UNITS	HMW-1	HMW-2	HMW-3	HMW-4	HMW-5	HMW-6	HMW-7	HMW-8	HMW-9	HMW-5DUP	HSOURCE	TRPBLK	EQPBLK
		03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92
		13:30	13:40	14:20	14:30	13:50	14:00	14:10	14:40	15:00		16:30		13:15
BROMOMETHANE	UG/L	<3.50	<3.50	<3.50	<3.50	<3.50	<3.50	<35.00	<3.50	<18.00	<3.50	<3.50	<3.50	<3.50
CADMIUM,TOTAL	UG/L	<4.40	<4.40	<4.40	<4.40	<4.40	<4.40	<4.40	<4.40	<4.40	<4.40	<4.40	NRQ	<4.40
CARBON DISULFIDE	UG/L	<4.40	<4.40	<4.40	<4.40	<4.40	<4.40	<44.00	<4.40	<22.00	<4.40	<4.40	<4.40	<4.40
CARBON TETRACHLORIDE	UG/L	<2.60	<2.60	<2.60	<2.60	<2.60	<2.60	<26.00	<2.60	<13.00	<2.60	<2.60	<2.60	<2.60
CHLOROBENZENE	UG/L	<1.40	<1.40	<1.40	<1.40	<1.40	<1.40	<14.00	<1.40	<7.00	<1.40	<1.40	<1.40	<1.40
CHLOROETHANE	UG/L	<8.20	<8.20	<8.20	<8.20	<8.20	<8.20	<82.00	<8.20	<41.00	<8.20	<8.20	<8.20	<8.20
CHLOROFORM	UG/L	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<25.00	<2.50	<13.00	<2.50	<2.50	<2.50	<2.50
CHLOROMETHANE	UG/L	<4.40	<4.40	<4.40	<4.40	<4.40	<4.40	<44.00	<4.40	<22.00	<4.40	<4.40	<4.40	<4.40
CHROMIUM,TOTAL	UG/L	17.60	<7.40	<7.40	<7.40	<7.40	<7.40	18.60	<7.40	9.10	<7.40	<7.40	NRQ	<7.40
CHRYSENE	UG/L	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<15.00	<1.50	<1.50	<1.50	<1.50	NRQ	<1.50
CIS-1,3-DICHLORO- PROPENE	UG/L	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<20.00	<2.00	<10.00	<2.00	<2.00	<2.00	<2.00
DIBEN'(A,H)ANTH'CENE	UG/L	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<25.00	<2.50	<2.50	<2.50	<2.50	NRQ	<2.50
DIBROMOCHLOROMETHANE	UG/L	<2.30	<2.30	<2.30	<2.30	<2.30	<2.30	<23.00	<2.30	<12.00	<2.30	<2.30	<2.30	<2.30
DICHLOROBENZENE,TOT.	UG/L	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<40.00	<4.00	<20.00	<4.00	<4.00	<4.00	<4.00
DIETHYL ETHER, TOTAL	UG/L	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	<50.00	<5.00	<30.00	<5.00	<5.00	<5.00	<5.00
ETHYLBENZENE	UG/L	<1.30	<1.30	<1.30	<1.30	<1.30	82.00	130.00	<1.30	180.00	<1.30	<1.30	<1.30	<1.30
FLUORANTHENE	UG/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<1.00	<1.00	<1.00	<1.00	NRQ	<1.00
FLUORENE	UG/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<1.00	<1.00	<1.00	<1.00	NRQ	<1.00
INDENO(1,2,3-CD) PYRENE	UG/L	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<25.00	<2.50	<2.50	<2.50	<2.50	NRQ	<2.50
LEAD,TOTAL	UG/L	<63.80	<63.80	<63.80	<63.80	<63.80	<63.80	<63.80	<63.80	<63.80	<63.80	<63.80	NRQ	<63.80
MERCURY,TOTAL	UG/L	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	NRQ	<0.18
METHYL ETHYL KETONE	UG/L	<10.00	<10.00	<10.00	<10.00	<10.00	<10.00	<100.00	<10.00	<50.00	<10.00	<10.00	<10.00	<10.00

Table 3- . cal Parameters Detected in Groundwater Samples in 1992, Hunter AAF ontinued, Page 3 of 3

PARAMETERS	UNITS	HMW-1	HMW-2	HMW-3	HMW-4	HMW-5	HMW-6	HMW-7	HMW-8	HMW-9	HMW-5DUP	HSOURCE	TRPBLK	EQPBLK
		03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92	03/12/92
		13:30	13:40	14:20	14:30	13:50	14:00	14:10	14:40	15:00		16:30		13:15
METHYL ISOBUT'KETONE	UG/L	<12.00	<12.00	<12.00	<12.00	<12.00	<12.00	<120.00	<12.00	<60.00	<12.00	<12.00	<12.00	<12.00
METHYLENE CHLORIDE	UG/L	<6.40	<6.40	<6.40	<6.40	<6.40	<6.40	<64.00	<6.40	<32.00	<6.40	<6.40	<6.40	<6.40
NAPHTHALENE	UG/L	<1.00	<1.00	<1.00	<1.00	<1.00	14.00	13.00	<1.00	33.00	<1.00	<1.00	NRQ	<1.00
PHENANTHRENE	UG/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<1.00	<1.00	<1.00	<1.00	NRQ	<1.00
PYRENE	UG/L	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<10.00	<1.00	<1.00	<1.00	<1.00	NRQ	<1.00
SELENIUM,TOTAL	UG/L	<2.00	<2.00	<2.00	<2.00	<2.00	2.10	6.50	<2.00	<2.00	<2.00	<2.00	NRQ	<2.00
SILVER,TOTAL	UG/L	<6.10	<6.10	<6.10	<6.10	<6.10	<6.10	<6.10	<6.10	<6.10	<6.10	<6.10	NRQ	<6.10
TETRACHLOROETHENE	UG/L	<1.90	<1.90	<1.90	<1.90	<1.90	<1.90	<19.00	<1.90	<9.50	<1.90	<1.90	<1.90	<1.90
TOLUENE	UG/L	<1.70	<1.70	<1.70	<1.70	<1.70	1.80	<17.00	<1.70	<8.50	<1.70	<1.70	<1.70	<1.70
TRANS-1,3-DICHLORO- PROPENE	UG/L	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	<16.00	<1.60	<8.00	<1.60	<1.60	<1.60	<1.60
TRICHLOROETHENE	UG/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<30.00	<3.00	<15.00	<3.00	<3.00	<3.00	<3.00
TRICHLOROFLUORO- METHANE	UG/L	<4.60	<4.60	<4.60	<4.60	<4.60	<4.60	<46.00	<4.60	<23.00	<4.60	<4.60	<4.60	<4.60
VINYL CHLORIDE	UG/L	<4.60	<4.60	<4.60	<4.60	<4.60	12.00	<46.00	<4.60	<23.00	<4.60	<4.60	<4.60	<4.60
XYLENES,TOTAL	UG/L	<3.70	<3.70	<3.70	<3.70	<3.70	<3.70	820.00	<3.70	950.00	<3.70	<3.70	<3.70	<3.70

Source: ESE.

4.0 CLOSURE ACTIVITIES

Pursuant to Section 3004(u) of RCRA and 40 CFR 264.101, the fire training area will be closed to remove the source of a continuing release to the environment and contaminated environmental media (soils, sediments, and groundwater) will be remediated to achieve the cleanup targets presented in Section 3.0. Successful treatment of contaminated soils and sediments will reduce levels of volatiles to non-detect and semi-volatiles to less than the preliminary cleanup target (PCT). Soils contaminated with metals in excess of the selected PCTs (soils on and adjacent to the fire training pad) will be stabilized, as necessary, and disposed of off-site. Closure of the fire fighting training area will be accomplished in the following phases:

a) Phase I	-	Site Preparation
b) Phase II	-	Contaminated Soil and Sediment Remediation
c) Phase III	-	Groundwater Remediation
d) Phase IV	-	Site Restoration

4.1 PREPARATION

4.1.1 TEMPORARY FACILITIES AND SITE CONTROL

Prior to any disturbance of site soils, temporary facilities will be set up and boundaries will be marked to prevent the spread of contamination and exposure of personnel by construction activities. Temporary facilities include the equipment and personnel decontamination area, excavated soil staging area, and thermal treatment area. Since the site is on a military reservation, adequate site control can be achieved by marking the work site boundaries with tape and rubber cones. The arrangement of remediation work areas is shown in Figure 4-1.

4.1.2 FUEL TANK CLOSURE

4.1.2.1 Tank Contents:

Tank contents will be sampled and analyzed for evidence of hazardous constituents (total halogens and total metals). The tank contents will be drained and disposed of

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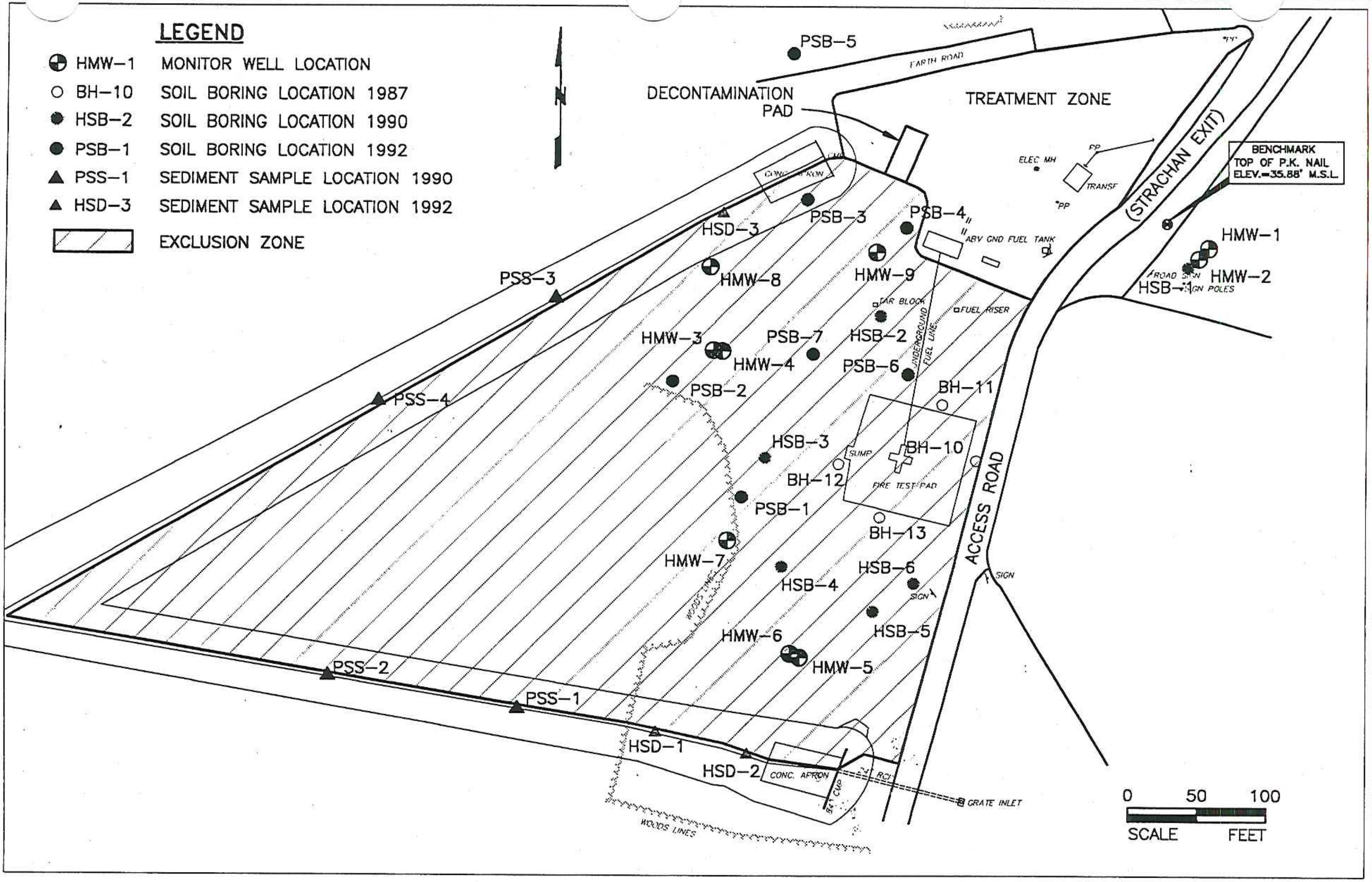

Figure 4-1
REMEDIATION WORK AREAS

HUNTER ARMY AIRFIELD
FORT STEWART, GA

SOURCE: ESE, 1993.

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at a licensed commercial facility as either off-specification fuel or hazardous waste, depending upon the results of the characterization analyses. The tank atmosphere will be inerted by forced ventilation until the tank interior registers less than 10 percent of the lower explosive limit (LEL), as measured by an explosimeter. The tank interior will be steam cleaned and the residue will be disposed of at a licensed commercial facility.

4.1.2.2 Tank:

The emptied and cleaned tank will be cut up and disposed of as scrap steel through the Defense Reutilization and Marketing Office (DRMO).

4.1.2.3 Fuel Piping:

The fuel piping will be flushed with a small quantity of water and the residue disposed of along with the tank-cleaning residues. The entire length of piping will be excavated and removed (after demolition of the fire training pad, as described in Paragraph 4.1.3). The piping will be visually inspected for leaks after excavation. All joints and fittings will be inspected for evidence of holes or leakage. All revealed surfaces of the pipe trench excavation will be inspected for evidence of leakage. Evidence of leakage would include stained soil, areas of free product, etc. Where evidence of a release from the piping is uncovered, the contaminated soils will be identified and excavated as described in Paragraphs 4.2.5.2. All excavated soils will be stockpiled for thermal treatment as described in Paragraph 4.2.7.

4.1.2.4 Tank Pad:

The tank pad will be demolished and the rubble disposed of in the on-site construction debris landfill.

4.1.3 FIRE TRAINING PAD CLOSURE

4.1.3.1 Simulated Aircraft:

The simulated aircraft, constructed of a steel tank, will be steam cleaned (to remove petroleum residues), cut up, and disposed of as scrap steel through DRMO.

4.1.3.2 Pad Cover Soils:

All cover soils will be consolidated onto one corner of the pad. The lead-contaminated soils will be excavated from the areas shown in Figure 3-4 and will be combined with the cover soils. The soils will be blended by mixing with a front-loading tractor or other excavation equipment until a homogeneous-appearance is achieved. The stockpile will then be relocated onto plastic sheeting on the adjacent runway pavement in preparation for pad decontamination. Sediments from the sump, after pad decontamination per Paragraph 4.1.3.3, will be added to the pad cover-soil stockpile. A representative sample will than be taken and analyzed by Toxicity Characteristic Leaching Procedure (TCLP). Depending upon the outcome of the characterization analysis, the soils will be treated and/or disposed of separately from other site soils, as described in the applicable portions of Paragraphs 4.2.7 through 4.2.9. Prior to treatment or disposal, the stockpiled soils will be covered with 10-mil "visqueen" except when being handled or sampled.

4.1.3.3 Pad Decontamination and Demolition:

After all bulk soils have been removed from the pad, the pad surface will be decontaminated by pressure-washing or steam-cleaning. All wash water will be swept into the pad's drain sump, pumped out, and disposed of by a licensed commercial waste facility. Sediments from the sump will be added to the cover-soil stockpile per Paragraph 4.1.3.2. Concrete samples will be taken from four randomly selected locations on the pad surface by means a hand-held pin scabbler with a high-efficiency particulate absolute (HEPA) vacuum attachment (Pentek or equivalent). The consolidated sample will be analyzed by TCLP for hazardous characteristics. If non-hazardous, the pad will then be demolished. If the sample is found to be hazardous, 1/2 inch of the concrete surface will be removed by vacuum scabbling. The scabbling residue will be disposed of as hazardous waste. The pad will then be demolished and the rubble disposed of in the on-site construction debris landfill.

4.2 SEDIMENT/SOIL REMEDIATION

4.2.1 TREATABILITY TESTING

Samples of soils and sediments which are representative of the most highly contaminated areas (soils from the vicinity of HSB-2, PSB-6, and PSB-7 and sediments from the vicinity of PSS-2) will be bench-treatability tested prior to mobilization of construction equipment and the thermal treatment systems. Testing will determine the required temperature and residence time to achieve non-detect levels of the volatile and semi-volatile contaminants of concern in the soil and sediment samples.

4.2.2 PRELIMINARY GROUND SURFACE SAMPLING

Soil samples will be taken from the ground surface to the west of the "woods line" to determine the westward extent of semi-volatile contamination of surface soils. Sampling procedures, documentation, and quality control will be as presented in Section 5.0 and the existing CDAP. Samples will be taken at 50-foot intervals along three east-west lines and at four locations to the south of the pad, as shown in Figure 4-2. Sample locations will be staked and labeled to facilitate the identification of the limits of clearing and grubbing and limits of excavation after analysis. If two or more of the samples from the south side of the pad are found to be uncontaminated, further sampling will be performed to better define the limits of contamination. If three or more samples are contaminated, the entire ground surface will be assumed to be contaminated to the ditch on the south and to the first uncontaminated sample to the west of the "woods line" on the west.

4.2.3 EROSION AND SEDIMENT CONTROL

Prior to disturbance of any soils or sediments, silt fences will be installed across the north and south ditches every 200 feet, starting just west of the limits of excavation and continuing at least to the location of the first uncontaminated ditch sample to the

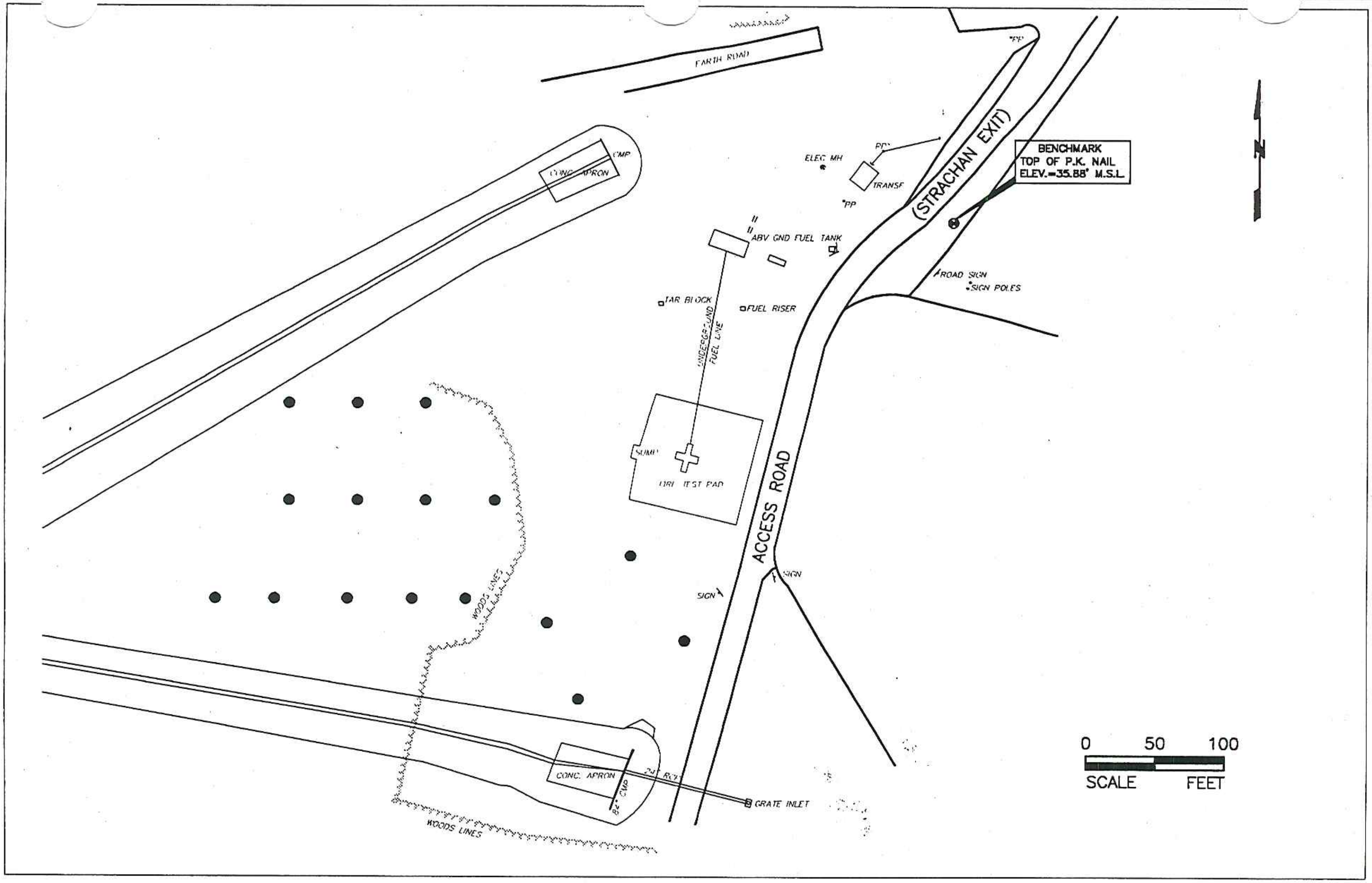

Figure 4-2
PRELIMINARY GROUND SURFACE SAMPLING LOCATIONS
HUNTER ARMY AIRFIELD
FORT STEWART, GA

SOURCE: ESE, 1993.

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west. Immediately after clearing and grubbing in the wooded area, silt fencing, hay bales, and other erosion protection will be installed along the down-slope edge of the cleared and grubbed area.

4.2.4 CLEARING AND GRUBBING

Clearing and grubbing, separate from excavation, will only be required for site soils to be excavated beyond the "woods line" shown in Figure 3.1. The limits of clearing and grubbing will be from the "woods line" to a line drawn between locations of the nearest westward soil samples which contain less than the PCT of all volatile and semi-volatile contaminants of concern. Trees, brush, and other vegetative matter will be cut down to as close to the ground surface as possible. This material will be disposed of as solid waste. Large roots and vegetative material (over 1/4 inch diameter) taken from beneath the soil will be separated from the soils by vibratory screening. The roots will be chipped and disposed of as solid waste. Soils containing only grass and smaller roots can be thermally treated without separating out vegetative matter. Where debris or wreckage is encountered, it will be steam cleaned on the equipment decontamination pad, to remove any adhering soils, and transferred to DRMO for disposal as scrap or solid waste.

4.2.5 EXCAVATION OF CONTAMINATED SOILS

4.2.5.1 Excavation of Surface Soils

Surface contamination has been identified by previous sampling to be present in the interval of 0-1'bgs over the majority of the land surface in the closure area. Contamination with toxic metals is closely confined to the area immediately around the fire training pad. Semi-volatile contamination is expected to be present over the ground surface of most of the remainder of the closure area. Because the semi-volatile surface contamination is closely associated with soot, it is highly likely that the contamination is actually confined to the interval of 0-6" bgs. To minimize the volume excavated and treated, all surface soils within the confirmed limits of surface contamination will initially be excavated to a depth of 6 inches. The exposed ground surface (except where deeper excavation is known to be required) will be sampled as described in Section 5.0. Each grid area where contamination is detected in excess of PCTs will be excavated an additional 6 inches in depth and the excavated surface resampled and analyzed. The known and probable extents of surface contamination are shown in Figure 3.2. Excavation and transport equipment will not leave the contaminated area without being decontaminated as described in paragraph 4.4. Excavated soils will be transported to stockpiles in the thermal treatment area or will be directly transferred to the feed hopper of the thermal treatment unit. To minimize erosion problems and maintain manageable stockpile volumes, the entire ground surface will not be excavated in one single operation. The site surface will be divided into 3 areas: the area south of the pad centerline west to the "woods line," the cleared area north of the pad centerline, and the area west of the "woods line" determined to be contaminated by preliminary ground surface sampling. Excavation will proceed from the south ditch to the north and west. Contaminated soils will be hauled to the treatment zone across the unexcavated northern area and over the decontamination pad. Once all contaminated soils have been removed from an adequate portion of the south area, treated soils from the LTVS will be transported down the paved road and staged on the clean portions of the south area. Backfilling will proceed by pushing clean soils to the north in 8- to 12-inch loose lifts onto adjacent areas where removal of contaminated soils has been certified as complete.

4.2.5.2 <u>Excavation of Deeper Soils (1-6 feet bgs)</u>

Excavation of deeper soils must be performed in the vicinity of HSB-2 on the north side of the pad and HSB-5 on the south. The limits of soil contamination will be determined by a three-step process. First, visual and olfactory examination (if conditions prevent this due to risk of exposing workers to hazardous vapor concentrations, an FID can be used to "sniff" a newly-exposed soil surface) will be made of the sides of the excavation. When the excavation has proceeded into soils which no longer appear contaminated to the senses, a screening sample will be taken and tested for headspace vapor concentration using a flame ionization detector (FID) per paragraph 4.2.7. Where the excavation has been completed to groundwater, samples will be taken from the backhoe bucket at 25-foot intervals along the side and from near the bottom of the excavation. In areas where the excavation stops short of groundwater, samples will also be taken from the bottom of the excavation on 25-foot centers. The samples will be placed in pint jars and covered with aluminum foil. After the soil temperature is allowed to equilibrate for a period of approximately 5 minutes, the sample headspace vapors will be field-analyzed by puncturing the aluminum foil with the tip of a FID probe. If the sample headspace reading is less than 10 ppm non-methane TOV, the sample will be presumed clean, pending confirmatory laboratory analysis. If the headspace reading exceeds 10 ppm, the excavation will be advanced by a distance selected by the site manager and another headspace sample will be analyzed.

4.2.5.3 Excavation Hazards

No elevated organic vapor levels have been detected in surface soils, but worker protection from exposure to dust-borne toxic metals and carcinogenic semi-volatiles must be provided during surface excavation. During deeper excavation, the potential exists for elevated levels of contaminant vapors in the excavation. Soil gas levels were measured in excess of 1,000 ppm total organic vapor (TOV) during the 1990 field investigation at most locations within approximately 20 feet of the edge of the pad and also near HSB-4. Soil headspace vapor concentrations (see boring logs attached to Appendix B) ranged up to 500 ppm TOV in HSB-2, with HSB-2, -3, and -4 and PSB-1, -4, and -6 reading in excess of 100 ppm. Levels of breathing protection required during excavation must be determined by the site safety officer in response to real-time air monitoring of the excavation area.

4.2.6 EXCAVATION OF CONTAMINATED DITCH SEDIMENTS

After all contaminated soils have been excavated, contaminated ditch sediments will be removed to a depth of 6 inches. If necessary, base flows due to surface drainage and upstream seepage will be diverted around the contaminated reaches of the ditches by installation of sandbag coffer-dams at the culvert outfalls and by piping the base flows around the excavation areas. During dry weather conditions, it may be possible to excavate the majority of the ditch bottoms without any water diversion. Excavation will begin at the edges of the concrete aprons at the culvert outlets and proceed westward. Excavation will be completed upon reaching the first silt fence beyond the sample point where contaminant levels are below the PCTs or are non-detectable (termination point), as determined by preliminary sediment sampling per paragraph 4.2.6. Silt fences will remain in place in the ditches during excavation, with each successive fence removed as the excavation reaches it. When the excavation of sediments has been completed to the termination point, excavation will stop and confirmatory samples will be taken. One sample will be taken from immediately downstream of the silt fence at the termination point and another from immediately upstream of the next downstream fence. Since low levels of semi-volatiles, which comprise the primary sediment contamination, are not detectable by field methods, samples must be analyzed in the laboratory and excavation must be halted until results of analyses are available. If the samples are found to be uncontaminated (no contaminants present in excess of PCTs) the excavation is complete. If contamination is detected downstream of the termination point, excavation will continue to the next fence and confirmatory sampling will be repeated. Silt fences will remain in place until site restoration has established adequate vegetative cover of the site to prevent significant erosion.

Sediments present very little hazard to workers, since only dilute concentrations of semi-volatiles are present. The primary exposure pathway is by ingestion, unless the sediments are permitted to dry to the point where respirable dusts can be generated.

4.2.7 THERMAL TREATMENT OF SOILS AND SEDIMENTS

4.2.7.1 Treatment System Description

Soils will be treated by a low-temperature volatilization system (LTVS), similar to a rotary kiln, which indirectly heats soils to a maximum exit temperature of 600°F, to vaporize and remove volatile and semi-volatile organic contaminants. The system is an integrated process, which includes all air emissions control processes, instrumentation, piping, utilities and material handling equipment necessary to successfully treat soils. The LTVS may include, but is not limited to, the following components: feed hopper and screening equipment, conveyor system, desorption processing unit, appropriate air pollution control devices, continuous emissions monitors, cyclone, afterburner, evaporator, cooler, condensers, baghouse, fans, connective ductwork, ancillary piping, wiring, and controls. Typical throughput capacities of available systems range from 1,000 to 15,000 lb per hour (0.4 to 5 cy per hour). A flow diagram for a typical system is shown in Figure 4-3. Since remediation must be performed under a competitively bid contract and the government cannot unnecessarily restrict competition, the actual configuration, size, and throughput capacity of the system which will be used cannot be predicted at this time.

The system will be located in the uncontaminated grassy area to the north of the fire training area, as shown in Figure 4-2. Stockpiles of soils to be treated will be maintained in covered roll-off containers or placed on a 60-mil HDPE liner and covered with a 10-mil plastic cover to prevent erosion and creation of contaminated runoff and to minimize volatilization of contaminants from the stockpiles to the atmosphere. After completion of treatment of all excavated and stockpiled soils, and

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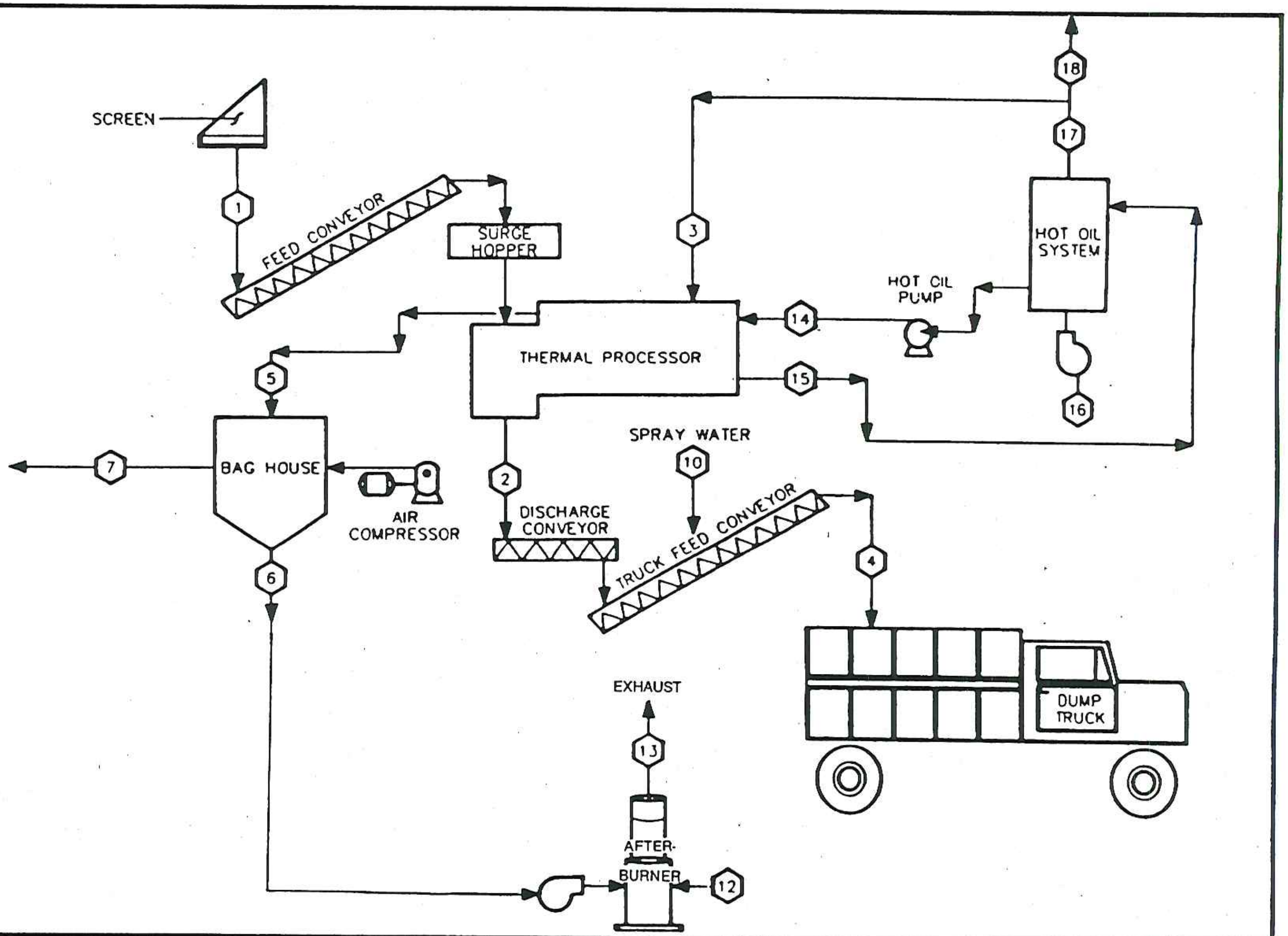

Figure 4-3
PROCESS SCHEMATIC FOR THE MOBILE
LOW TEMPERATURE VOLATILIZATION SYSTEM (LTVS)

SOURCE: WESTON, 1987.

FORT STEWART, HUNTER ARMY AIRFIELD
FIRE TRAINING AREA
SAVANNAH, GEORGIA

prior to demobilization of the thermal treatment system, the exposed ground surface in the treatment area and the ground surface in the stockpiling area will be sampled and analyzed. Any areas with contaminant levels exceeding PCTs will be excavated to a depth of 3 to 6 inches and resampled. The excavated material will be treated in the LTVS and returned to the area from which it was taken. Soils which are only accessible after dismantling the LTVS will be tested after removal of the system, and if found to be contaminated, will be excavated and transported for off-site disposal.

4.2.7.2 System Performance

The system selected must be capable of treating site soils and reducing concentrations of hazardous waste constituents (40 CFR 262, Appendix VIII: benzene, ethylbenzene, xylene, toluene, trichlorofluoromethane, methyl-ethyl ketone, and methylene chloride) to non-detectable levels (less than approximately 5 μg/kg for most constituents) while meeting all applicable air emission standards with its treated off-gas. Semi-volatile contaminant concentrations must be reduced to less than PCTs. The operating temperature and residence time derived from treatability testing under paragraph 4.2.1 will be provided to bidders as a guideline for how successful treatment might be achieved, but the treatment system operator will be free to operate at other temperatures and speeds, provided that he adequately demonstrates that the system meets the treatment goals under the proposed operating conditions. The preceding is provided for general information only. Specific treatment system performance parameters and compound-specific treatment goals will be developed during system design. Treatment system capability will be demonstrated in two steps prior to commencement of full-scale operation:

Clean Soils Demonstration:

The LTVS will be set up on site completely as it would be for actual contaminated soils treatment. The operator will demonstrate the mechanical operation of LTVS, complete in all respects, while operating at design parameters with clean borrow soil from offsite for a period of 48 hours. The operator will add sufficient water to the soils to arrive at a moisture range of 20 to 30 percent, to be representative of the soils at the site. After successful demonstration, the clean soils will be stockpiled for use as backfill to replace metals-contaminated soils which must be disposed of off site.

Contaminated Soils Demonstration:
After successful demonstration of mechanical operation with clean soils, the operator will then operate the system for a limited period, using contaminated site soils, to demonstrate satisfactory operation of the LTVS, including the removal of organic compounds from soils to acceptable concentrations and compliance with air emission control requirements. Approximately 500 cy of contaminated soils from the vicinity of HSB-2 and PSB-6 will be used for this demonstration, as representative of the worst-case concentrations of most organic contaminants likely to be encountered in any portion of the site.

4.2.7.3 Air Emissions Control

The LTVS will contain a unit process or processes to remove the organic contaminants from the exhaust gas to meet EPA and the State of Georgia requirements for emission of the detected contaminants listed in Table 3.1. Usually this consists of an afterburner, which operates with a gas residence time of at least 0.5 second at a minimum temperature of 1800°F. The LTVS provides additional emission control by incorporation of an induced draft fan that maintains a negative pressure at all times throughout the system in order to minimize fugitive emissions. Particulate emission controls are provided by use of a baghouse, cyclone, or electrostatic precipitator. Permitting and air monitoring conditions cannot be determined until after a system is selected and its configuration, emission control equipment, and throughput are known. An air emission sampling plan will be developed as part of the permitting process, after selection of a system.

4.2.7.4 Treatment:

Contaminated soils will be treated and then temporarily stored in the post-treatment storage area until analytical results indicate that the soils meet the criteria for placement back into the excavation area.

4.2.7.5 Post-treatment:

Sampling:

Analyses for volatile and semi-volatile organic compounds and metals will be performed at the frequency indicated by Table 5.1 on a randomly obtained discrete sample. Soils will be tested and certified as clean if they are found to contain less than the maximum allowable contaminant levels stated in paragraph 4.2.7.2. Higher contaminant levels will result in retreatment of the soil batch from which the sample was taken.

Retreatment:

The operator will reprocess, retreat and reanalyze soils which do not meet the criteria for organic compounds to be backfilled into the excavation area. The reprocessing and retreating of these soils or sediments will be continued repetitively until analytical results indicate the residual organic compounds present in the soils or sediments are below criteria established for onsite use as backfill.

Segregation:

Soils requiring retreatment will be segregated from treated soils. The quantity requiring retreatment will be reported and subtracted from the daily production rate when calculating treatment volumes for the day to prevent double-accounting. Soils which exceed inorganic PCTs will be segregated for off-site disposal.

4.2.8 Disposal of Clean Treated Soils and Sediments

Soils which have been adequately treated (RCRA Appendix VIII constituents non-detectable and all other contaminant concentrations below PCTs per paragraph 4.2.7.2) will be backfilled into the completed areas of the excavation. Backfilled soils will be protected from contamination by unexcavated soils by maintaining a 20-foot buffer zone between clean backfill material and soils requiring further excavation. Excess quantities of clean fill can be placed temporarily on areas where only surface soils required excavation and no deeper contamination exists.

4.2.9 Disposal of Metals-Contaminated Soils

Soils contaminated with inorganics in excess of PCTs will be transported for off-site disposal in a licensed solid- or hazardous-waste facility. Characterization of the soils will be made pending the results of TCLP analyses.

4.3 GROUNDWATER REMEDIATION

4.3.1 GROUNDWATER MONITORING

An expanded groundwater monitoring program must be performed both to determine the westward limit of existing groundwater contamination and to monitor the effectiveness of groundwater remediation. Groundwater monitoring will be performed per the Groundwater Monitoring Plan, which is included in this plan as Appendix B.

4.3.2 RECOVERY SYSTEM DESIGN

Groundwater flow past the site is estimated based on the hydraulic conductivity of the shallow aquifer, as determined by slug testing, and the average groundwater gradient,

Table 4.1 Summary of Groundwater Elevations, March 1992, Hunter AAFTA

Well Number	NORTHING	EASTING	Top of Casing Elevation (ft-msl)	Depth to Water 3/92 (ft toc)	Groundwater Elevation 3/92 (msl)
HMW-1	734794.34	816370.12	38.51	12.94	25.57
HMW-2	734786.58	816363.02	38.02	11.12	26.90
HMW-3	734719.25	816011.95	29.85	7.24	22.61
HMW-4	734718.68	816018.22	30.49	6.51	23.98
HMW-5	734494.62	816074.63	32.02	8.05	23.97
HMW-6	734497.34	816067.77	31.60	6.15	25.45
HMW-7	734579.79	816022.48	29.95	4.70	25.25
HMW-8	734779.81	816009.36	27.59	7.32	20.27
HMW-9	734790.68	816129.62	34.50	8.10	26.40

Notes: ft-msl = feet mean sea level
ft toc = feet below the top of casing

based on measured static water levels in the existing monitoring wells (Table 4.1) and the surveyed ditch-bottom elevations (see Figure 1-5 in Appendix B). Groundwater flow calculations presented in Appendix D predict a groundwater flow velocity of 7 x 10^{-5} feet per minute. Assuming a soil porosity of 0.30, a conservative 50-foot thickness for the contaminated groundwater layer, and a 400-foot plume width (the distance between the ditch outfalls), the flow rate in the contaminated zone is estimated at less than 5 gpm. This is the minimum recovery rate required to capture all contaminated flows passing through the site, with no recovery of any plume which might be present to the west of the ditch confluence. The actual recovery system flow rate will be determined after the westward extent of the groundwater benzene contamination has been determined by implementing the monitoring plan. A preliminary assumption of a recovery system flow rate of 25 gpm is made for this closure plan until further monitoring can be performed. This assumption is made to account for uncontaminated flows from the north and south, and increased infiltration after precipitation. The recovery system is presently assumed to consist of two horizontal wells, paralleling the two drainage ditches to capture surface seepage before it can enter the ditches, and one 50-foot recovery well near the ditches' confluence to recover contaminated water from the deeper strata.

4.3.3 GROUNDWATER TREATMENT

Recovered groundwater will be treated by air stripping to remove benzene contamination, which has been detected at concentrations up to 660 μg/L. Air stripping passes an air stream over the surface of the water to be treated, removing volatiles with the air stream. This closure plan incorporates a vertical packed tower where contaminated water flows downward over the packing media and air is blown upward counter to the direction of water flow. Removal of benzene and other volatile petroleum hydrocarbons has been well established over recent years of experience remediating gasoline releases from underground storage tanks. Depending upon the treatment rate, and contaminant concentrations, air emission permits are sometimes required. The relatively low concentrations encountered at this site (660 μg/L maximum, with perhaps 50 μg/L as an average treatment influent concentration) will result in low daily mass emission rates for benzene (0.2 pounds per day at 660 μg/L and 25 gpm). The AIRSTRIP model calculations are presented in Appendix C. In spite of the low estimated emissions, benzene is a toxic air pollutant and GDNR may require best-available-control-technology (BACT), i.e. vapor-phase carbon adsorption or off-gas combustion. An air emission permit-to-construct will be required prior to commencement of groundwater treatment.

Operation and maintenance (O&M) will include routine repair of pumps and ancillary equipment, influent and effluent quality monitoring, and routine adjustment and checking by a qualified operator. Average life for pumps, blowers, and packing is estimated at 5 to 10 years. Since the extent of groundwater contamination is not yet known, the duration of treatment cannot be estimated, but it is highly likely to be less than 5 years. It is assumed that acid washing of the media will be required every 6 months. Treatment system influent and effluent will be sampled and analyzed monthly for the duration of the remediation, with daily samples required during system startup (approximately 2 weeks). All water samples will be analyzed by the methods and for the parameters specified in Appendix B to monitor the performance of the treatment system and determine when cessation of treatment is appropriate. If, during the course of remediation, it can be established that only benzene has been encountered at levels of concern, a request will be made to GDNR to reduce the number of analytical parameters for routine monitoring to volatiles only, with an annual test for the full range of priority pollutants. When groundwater treatment is completed, the system will be decontaminated, dismantled, and disposed of as non-hazardous scrap.

4.3.4 DISPOSAL OF TREATED GROUNDWATER

Disposal of treated groundwater will be provided by a percolation pond located on the north side of the training area, adjacent to the soils treatment area.

4.4 EQUIPMENT CONTROL AND DECONTAMINATION

All equipment which operates in the closure area after excavation begins and before an area is certified as having all contaminated soils removed, will be considered to be contaminated and will not leave the excavation area without decontamination. Decontamination will be performed by steam- or high-pressure water-cleaning to remove all adhering soils. A reinforced-concrete decontamination pad will be constructed at the northern boundary of the exclusion zone, where it adjoins the treatment zone (see Figure 4-1). The pad will be designed to collect all water and sediments in a sump and pump the contaminated water to a storage tank for off-site disposal. Sediments will be added to the contaminated soils for treatment in the LTVS. At the conclusion of closure activities, the pad surface and collection sump will be pressure-washed and the pad will then be demolished and disposed of in the on-site construction debris landfill.

4.5 SITE RESTORATION

After all treatment and backfilling of soils has been completed, the site soils will be regraded to within 1 foot of the contours existing prior to remediation. The upper 6 inches of the treated and replaced soils will be mixed with peat to create a suitable topsoil and the area will be seeded with quick-rooting grass species. Erosion control measures on the area side slopes and drainage ditches will be maintained until sufficient growth is achieved to prevent erosion. Areas damaged by erosion will be repaired and reseeded as necessary.

5.0 ENVIRONMENTAL MONITORING

5.1 CONFIRMATORY SOIL SAMPLING AND ANALYSIS

Sampling, analysis, and analytical quality assurance/quality control (QA/QC) will be in accordance with the existing Chemical Data Acquisition Plan for Fort Stewart Fire Training Areas, Savannah, Georgia (ESE, 1989), except as follows (The number of samples anticipated is shown in Table 5.1.):

5.1.1 SOIL SAMPLING

5.1.1.1 Sampling and Sample Custody Procedures

Soil samples to be taken are environmental (dilute) rather than hazardous (or concentrated) samples. Grab sampling techniques will be used to collect environmental samples.

Quality Control (QC) samples (sent to the AE lab) consisting of duplicates and field controls will be taken in the same sample containers and handled in the same manner as the field samples. The duplicate sample ratio is one in ten. Soil sample duplicates are actually split samples taken from one sampling location. Travel blanks will be containers filled with deionized water, transported to the site and handled like a sample. Deionized water will be added to compensate for any loss. Sampling blanks will be made with reagent water which is passed through the sampling equipment and transferred to sample containers.

Quality Assurance (QA) samples (sent to the USACE MRD lab) will consist of duplicates and field controls for the appropriate matrix type (i.e., soil) taken in the same sample containers and handled in the same manner as the field samples. The duplicate sample ratio is one in ten. As with the QC sample, the soil sample duplicates are actually split samples taken from one sample location.

TABLE 5.1

TYPE, LOCATION, METHOD OF ANALYSIS, AND NUMBER OF SOIL SAMPLES TO BE COLLECTED FOR ANALYSIS FOR THE HUNTER AAFTA CLOSURE

Type	EPA Method (SW-846)	Estimated Total Quantity (CY/SF)	Total No. of Field Samples	No. of QC Samples		No. of QA Samples	
				EB	DUP	EB	FD
UNTREATED SOILS AND SEDIMENTS							
"Woods Line" Delineation Samples							
Semi-volatiles	8270	NA	12	1	1	1	1
Training Pad Cover and Surrounding Area Characterization Soil Samples (**)							
Metals	TCLP	300	3	0	0	0	0
Semi-volatiles	8270	CY	3	0	0	0	0
Training Pad and Surrounding Area Confirmatory Soil Samples							
Metals	(1)		18	2	2	2	2
VOCs	8240		18	2	2	2	2
Semi-volatiles	8270		18	2	2	2	2
Ground Surface Excavation Confirmatory Soil Samples							
Metals	(1)		120	12	12	12	12
VOCs	8240		120	12	12	12	12
Semi-volatiles	8270		120	12	12	12	12
Deeper Excavation Perimeter Confirmatory Samples							
Metals	(1)		24	2	2	2	2
VOCs	8240		24	2	2	2	2
Semi-volatiles	8270		24	2	2	2	2
THERMALLY TREATED SOILS AND SEDIMENTS (*)							
TCLP Metals	TCLP	10,000	33	3	3	3	3
VOCs	8240		33	3	3	3	3
Semivolatiles	8270		33	3	3	3	3
OFFSITE BORROW SOILS (**)							
Total Metals	(1)	300	3	0	0	0	0
VOCs	8240		3	0	0	0	0
Pesticides/PCBs	8080		3	0	0	0	0
Semivolatiles	8270		3	0	0	0	0

*Frequency is 1 per 300 CY at a minimum of once per LTVS operating day.
**Frequency is 1 per 100 CY per soil type per source.

Notes:

CY = cubic yard.
EB = equipment blank.
FD = field duplicate.
SF = square feet.

(1) Metals shall consist of arsenic (SW 7060), chromium, (SW 6010), lead (SW 7421), mercury (SW7470/7471), nickel (SW6010), zinc (SW 6010), barium (SW 6010), and cadmium (SW 6010).

Sample chain-of-custody procedures and packaging guidelines will be followed explicitly. The QA samples will be sent to a laboratory selected by the USACE.

5.1.1.2 Sample Location

Samples will be collected in the locations specified in Section 4.2 and in Table 5.1. The precise location of samples will be left to the discretion of the Site Manager.

5.1.1.3 Sampling Procedures

Grab samples will be collected using a stainless steel hand auger. Each piece of stainless steel soil sampling equipment will be pre-cleaned before use to minimize potential cross-contamination. Pre-cleaning will consist of steam cleaning or the following procedure: (1) remove gross contamination from the auger using scrapers, (2) wash the auger with a brush in a bucket filled with an Alconox soap solution, (3) rinse in a second bucket containing tap water and a brush, (4) spray the auger with methanol, (5) rinse with deionized water, and (6) air dry. Sampling will follow the procedure outlined below.

a. Collect Sample - The samples will be collected with the hand auger from a depth of approximately six inches. Auguring will proceed until sufficient soil has been collected to satisfy sampling requirement. Soil samples for volatiles analysis will not be mixed; these samples will be duplicates. QA and QC samples for volatiles analysis will be taken in the same manner. The sampler will check that a Teflon liner is present in the cap and secure the cap tightly. After each sample has been collected, all of the sampling equipment, hand auger, mixing bowl, and spoon, will be cleaned to prevent cross contamination.

b. Label Sample - Once the sample is collected, each container will be labeled with the following data: sample identification number, project number, date, time, analysis requested, preservation, and person sampling. The label will be covered with transparent plastic tape. Sample containers will be sealed with custody tape. Sample identification information will be recorded in the bound site log book and complete all chain-of-custody documents. The bound field note book will have prenumbered pages and entries will be made in indelible ink.

c. Custody, Handling and Shipping - The properly labeled and sealed containers will be sealed in a plastic "Ziplock" type bag. Approximately three inches of inert cushioning and absorbing material (i.e. vermiculite) will be placed in the bottom of the cooler. Sample bags will be arranged in the metal cooler so that they do not touch. The remaining space will be packed with ice (also in bags) and styrofoam packing beads, bubble wrap or vermiculite. Samples should be packed so as to maintain a temperature of 4°C. Chain-of-custody and request for analysis documents will be sealed in air-tight plastic bags and taped to the inside of the cooler's lid. "This side up" and "Fragile" labels will be placed on the cooler, and it's drain will be taped shut. The lid of the container should be taped shut with custody seals. Samples will be shipped on the day they are collected from the site directly to the laboratory by overnight courier. The laboratory will be notified by phone of the sample shipment.

5.1.2 Sediment Sampling

Preliminary samples will be taken at 200-foot intervals in the north and south ditches, beginning at a point 100 feet west of PSS-2 and PSS-4 (450 feet west of the edges of the culvert outfall concrete aprons). All sediment samples will be taken using a stainless steel Oakfield sampler. The sampler will be advanced approximately 6 inches into the sediment, between the submerged edge and the deepest portion of the ditch at the locations described above.

The sample sequence will be such that stations farthest downstream will be sampled first to prevent any upstream sediment from compromising the downstream sample quality. All sample locations will be approached from the downstream side for the same reason.

5.2 GROUNDWATER SAMPLING AND ANALYSIS

The monitoring of groundwater elevations and contaminant concentrations within and adjacent to the closure area is necessary to identify the extent of groundwater contamination and its rate of migration, to determine the sizing and placement of the elements of the groundwater recovery system, and to gauge the effectiveness of the closure in protecting groundwater resources. All elements of groundwater monitoring for this closure are presented in the Groundwater Monitoring Plan, which is Appendix B to this closure plan.

6.0 RECORD KEEPING AND SCHEDULE

6.1 RECORDS AND REPORTS

6.1.1 RECORDS

Daily reports will be kept in a logbook at the site during closure. The logbook will be permanently bound with numbered pages. Copies of log pages may be made for inclusion in reports, but the current original log will remain at the site until completion of closure. As logbooks are filled and a new log is started, the completed books will be stored either in the field office at the closure site or at the Fort Stewart Environmental Affairs Office. The daily log entry will include, as a minimum, the following:

- The current excavation area (eg. south, west, or north sector),
- The quantity excavated that day (truckload volumes or calculated volume from an excavation quantity survey),
- The cumulative quantity excavated from project start,
- Hours of operation and times of shift changes,
- Names of equipment operators,
- Weather conditions,
- Confirmatory soil samples and treated soil samples,
  - locations (relative site coordinates for confirmatory samples),
  - sample identification numbers,
  - chain-of-custody sheet reference (actual custody sheets will be kept and filed in accordance with the CDAP),
- Waste shipments sent off-site with manifest numbers, as applicable,
- Reports of accidents, near misses, or other events with notable site safety implications.

6.1.2 CLOSURE CERTIFICATION REPORT

A closure certification report will be produced including a summary of closure activities, copies of analytical results and QC reports, and stating whether all closure goals have been met for soils and groundwater.

6.2 SCHEDULE OF CLOSURE

The following schedule of closure has been based upon the model timetable presented in 40 CFR 265.113 and EPA's "Clean Closure Guidance Manual for Hazardous Waste Management Units," except that time intervals and events has been inserted between agency approval and commencement of physical closure to allow for conversion of the approved closure plan to contract plans and specifications and the advertisement and award of a closure construction contract. The schedule is shown in Table 6.1.

Table 6.1: Schedule for Clean Closure of Hunter Army Airfield Fire Training Area

Time	Event
Day 1 --	Closure plan submitted to GDNR
30 --	GDNR requests public comments
90 --	GDNR approves, modifies, or disapproves plan
120 --	Army submits revised plan, if necessary
180 --	GDNR approves or modifies closure plan; clean closure begins
210 --	Army develops contract plans and specifications from the approved closure plan
270 --	Closure construction contract advertisement period begins
315 --	Closure construction contract is awarded and contractor begins mobilization
360 --	Closure construction begins
540 --	Clean closure is completed in accordance with approved plan or post-closure begins
600 --	Closure is certified

APPENDIX A

TOPOGRAPHIC SURVEY

REPLACE
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SCANNED
MAP!

APPENDIX B

GROUNDWATER MONITORING PLAN

GROUNDWATER MONITORING PLAN
FOR
HUNTER ARMY AIRFIELD FIRE TRAINING AREA (AAFTA)
FORT STEWART, GEORGIA

Prepared for:

UNITED STATES ARMY CORP OF ENGINEERS (USAEC)
Kansas City, Missouri

Prepared by:

ENVIRONMENTAL SCIENCE & ENGINEERS, INC.
Gainesville, Florida

ESE No. 3912015G

July 1993

Note: Wherever "Appendices" are referred to in the text of this document, only the appendices to this Groundwater Monitoring Plan are intended and not those of overall Closure Plan.

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Note: Wherever "Appendices" are referred to in the text of this document, only the appendices to this Groundwater Monitoring Plan are intended and not those of overall Closure Plan.

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LIST OF FIGURES

1.0 SITE SPECIFIC CONDITIONS

This groundwater monitoring plan describes protocol for groundwater monitoring at the Fort Stewart, Hunter Army Airfield Fire Training Area (AAFTA) as required by the State of Georgia Department of Natural Resources, Environmental Protection Division. This report includes the groundwater sampling and analytical methodologies used to determine the impact of the facility on the groundwater in the vicinity of Hunter AAFTA. Included in this plan are:

1. A brief physical description of the site including geology and hydrogeology;
2. A brief discussion of a previous groundwater analytical sampling event;
3. Selected monitor well network description;
4. Groundwater sampling methodology, parameter list, and sampling frequencies;
5. Chain of Custody and shipping procedures;
5. Groundwater analytical procedures;
6. Groundwater data analysis and reporting procedures; and
7. Corrective action program.

This groundwater monitoring plan is divided into three sections. Section 1.0 presents the site-specific conditions at the Hunter AAFTA and presents a description of the groundwater monitoring system. Section 2.0 presents the groundwater monitoring protocol and sampling procedures including Quality Assurance (QA) procedures. Section 3.0 presents groundwater analytical data evaluation and reporting protocol including corrective measure procedures.

This groundwater monitoring plan meets RCRA and State of Georgia Department of Natural Resources; Environmental Protection Division (Chapter 391-3-4-.14 of the Solid Waste Management Rules) closure and monitoring requirements for solid waste management unit (SWMU). The sampling procedures presented in this document are in accordance with Environmental Protection Agency (EPA) Region IV Engineering Support Branch Standard Operating Procedures and QA Manual, dated February 1, 1991.

1.1 SITE DESCRIPTION

The following subsections summarize site conditions at the Hunter AAFTA. This summary includes a brief description of the site location, site specific subsurface and surface conditions, and a description of the groundwater monitoring system.

1.1.1 SITE CONDITIONS

Hunter Army Airfield is located on 5,400 acres of land in Chatham County, Georgia, just southwest of Savannah (Figures 1-1 and 1-2). The airfield is bounded on the north by lightly populated areas, on the east and south by residential and light commercial areas, and on the west by the Little Ogeechee River. The Hunter AAFTA consists of a 6,400-square foot (ft^2) concrete pad, located on the northwest portion of the airfield, approximately 800 feet (ft) north-northwest of the control tower (Figure 1-3).

The study area is located within the Southern Atlantic Coastal Plain Physiographic Province. Most of the land within Fort Stewart is flat, planted pine woods interfingered with freshwater swamps and tidal creeks with elevations ranging from 10 to nearly 100 feet above mean sea level (ft-msl). However, the northwestern portion of the reservation is characterized by rolling hills that rise to an elevation of approximately 180 ft-msl.

The ground surface at the Hunter AAFTA, at an elevation of approximately 30 ft, slopes gently to the west and drains toward a small canal. The canal runs west approximately 400 ft then southeast approximately 1,500 ft, where it empties into the Little Ogeechee River tidal floodplain.

1.1.2 SITE HISTORY AND FEATURES

The Hunter AAFTA consists of a bermed, soil-covered concrete pad with a simulated aircraft constructed from a used steel storage tank. The fire training pad is located on a grassy slope approximately 2200 feet north of the center of the airfield's east-west runway. The area was used for training of the airfield's firefighters from its construction until 1992.

Fuel for training fires is provided by underground piping from an above-ground fuel storage tank located approximately 100 feet north of the training pad. Fuels are mostly water-contaminated jet

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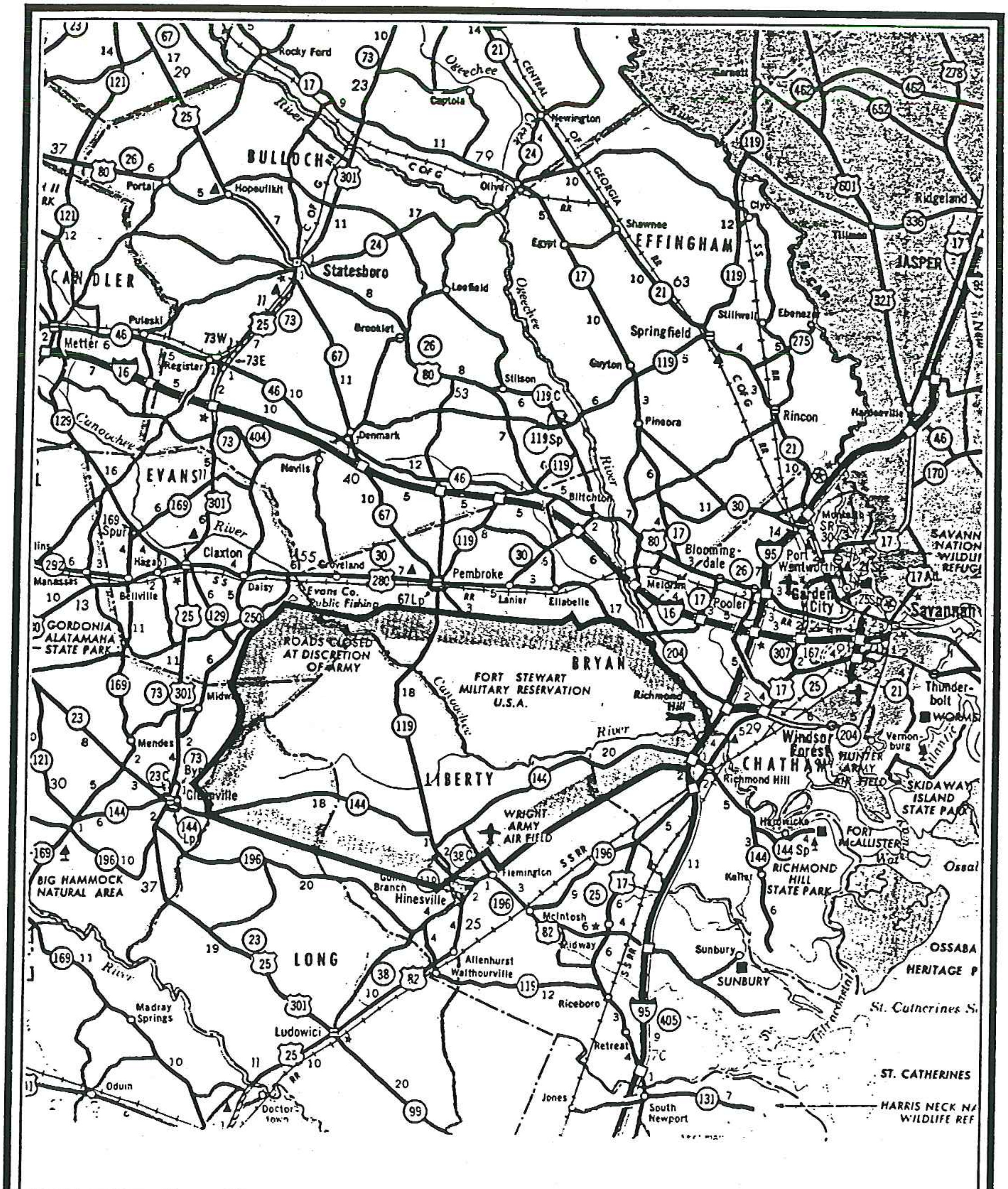

Figure 1-1
FORT STEWART LOCATION MAP

SOURCE: ESE.

ESE Environmental Science & Engineering, Inc.
A QILCORP Company

Figure 1-2
HUNTER AAFTA
LOCATION MAP

SOURCE: ESE.

ESE
Environmental
Science &
Engineering, Inc.
A CILCORP Company

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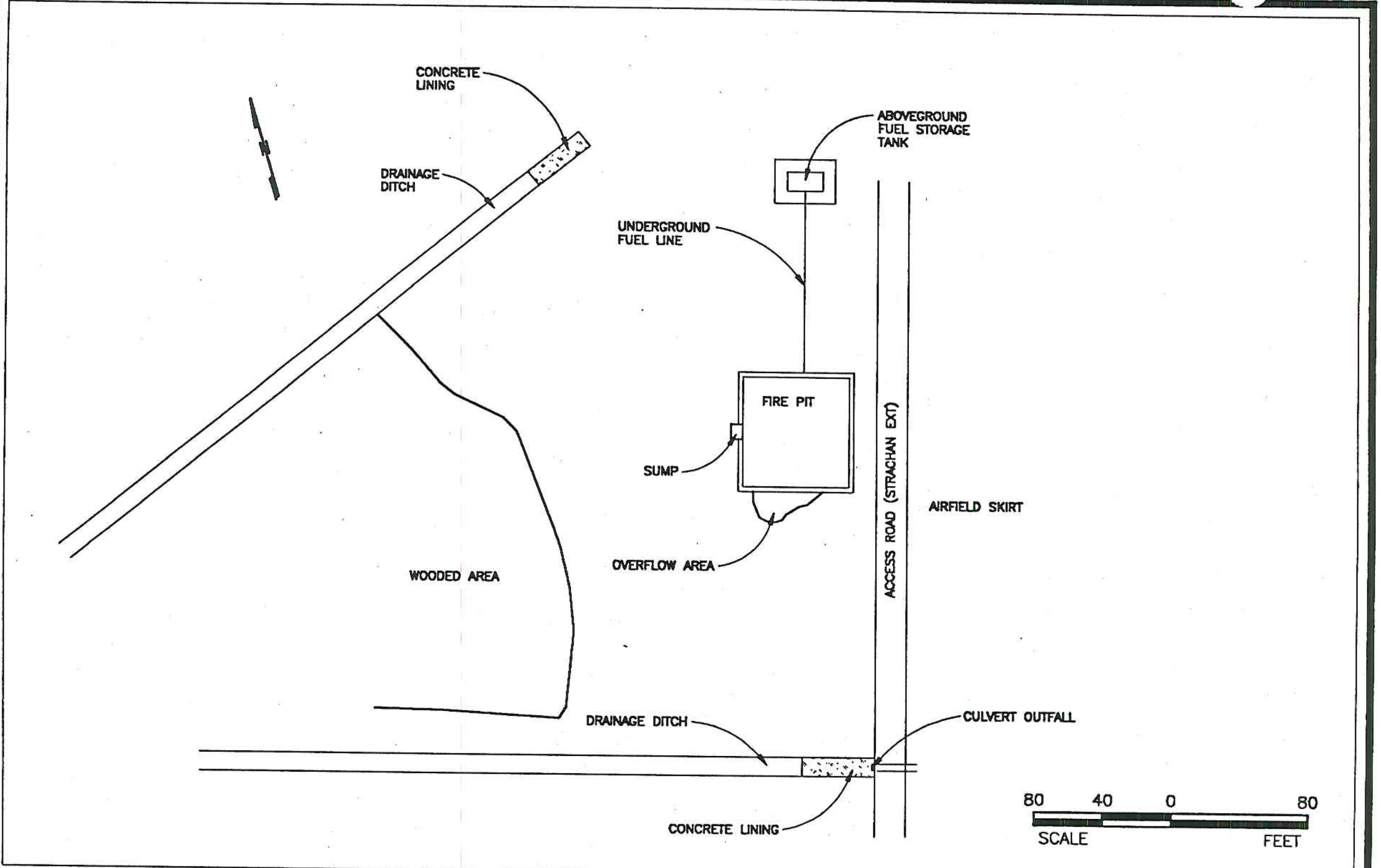


Figure 1–3
SITE LAYOUT
HUNTER AAFTA
FORT STEWART, GEORGIA

SOURCE: ESE, 1991

Environmental
Science &
Engineering, Inc.
A CILCORP Company

May 21, 1992 – 14:59:06

fuel (JP-4) and diesel fuel; however, waste oils have reportedly also been used (USAEHA, 1987). During training exercises, jet fuel (JP-4) was pumped onto the surfaces of the simulated aircraft and ignited. Firefighting trainees extinguished the fire with water or foam. The water was contained by the berms around the fire training pad and sump. Some of the water (and fuel) occasionally ran over the concrete berms onto the adjacent soil, and some may have been splashed over the berms by the spray from the firefighting hoses. The AAFTA has apparently been used for fire training in the interim between 1990 and 1992, although the fire department personnel interviewed had no first-hand knowledge of such use.

1.2 CLIMATE

The study area has a moist and temperate climate year round. Average temperatures range from 52 degrees Fahrenheit (°F) in winter to 80°F in summer. Average annual rainfall is approximately 48 inches (Headquarters, 24th Infantry Division, 1977), 60 percent of which usually falls during the period April through September. Prolonged drought is rare in the study area.

Climatic data for the period July through December 1991 was presented in Appendix A of the Significance of Contamination Report. The data include the minimum and maximum temperature, daily mean temperature, total precipitation water equivalent, and maximum windspeed and direction.

1.3 REGIONAL GEOLOGY

The coastal plain region of Georgia is underlain by a thick wedge of unconsolidated and semiconsolidated sediments that range in age from Recent to Cretaceous (Herrick and Vorhis, 1963). This sedimentary wedge thickens and slopes toward the east with a dip of less than 1 degree (°). Underlying these sediments in the Savannah area is a basement of crystalline igneous rocks of the Piedmont Formation, and various metamorphic and consolidated sedimentary rocks of Triassic to Precambrian age.

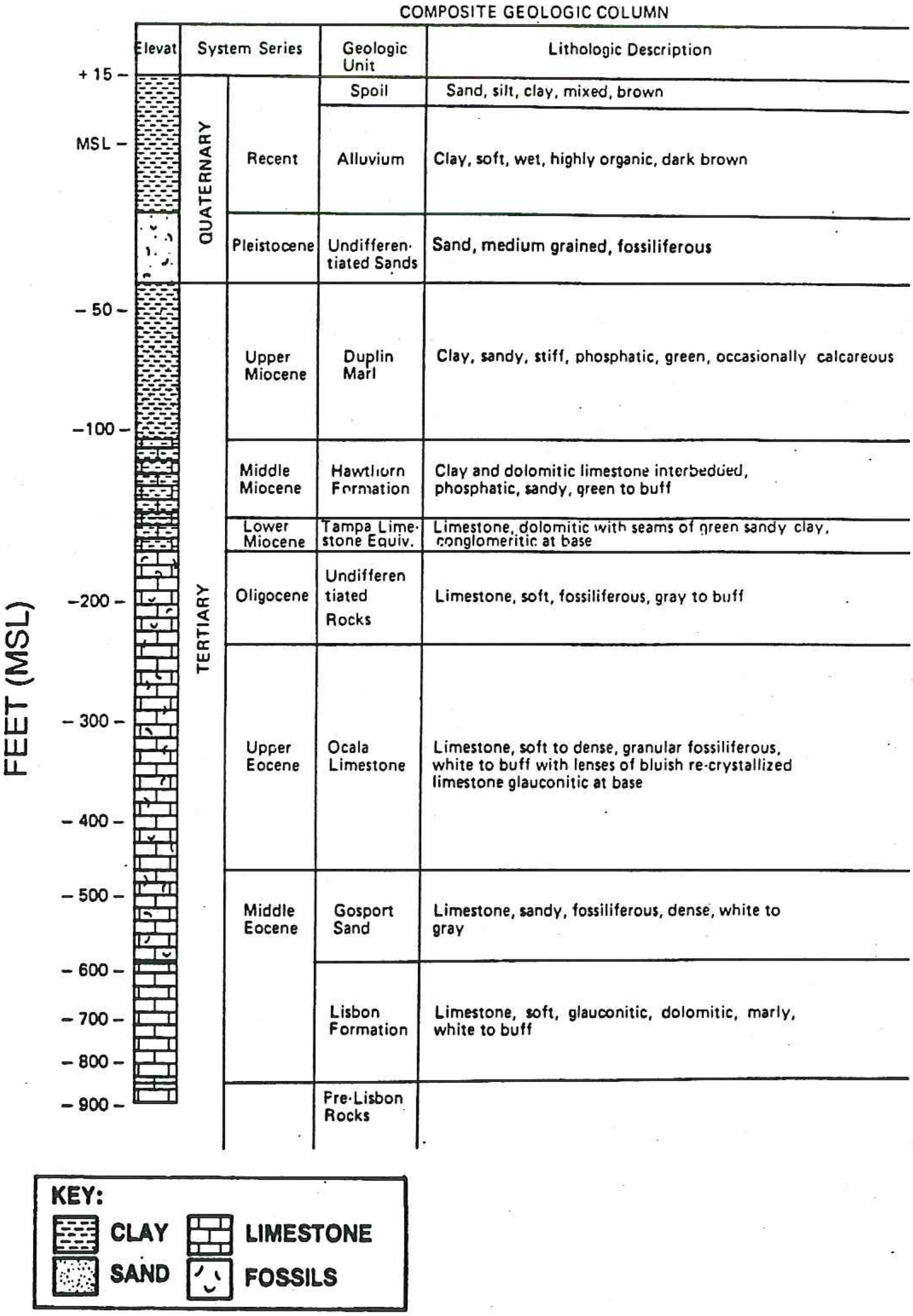
From youngest to oldest, the Recent and Pleistocene deposits consist of discontinuous units of sand, silt, and clay. These units are undifferentiated in the site region, with thicknesses of

approximately 60 feet. Underlying the Pleistocene deposits is the Duplin Marl (Upper Miocene), consisting of green, stiff, phosphatic and calcareous sandy clay. The Duplin Marl is approximately 60 feet thick at the site region. The Hawthorn Formation (Middle Miocene) consists of green to buff phosphatic sandy clay and dolomitic limestone. The Hawthorn Formation is approximately 50 feet thick in the site region. The Tampa Limestone equivalent underlies the Hawthorn Formation and is of Lower Miocene age. The Tampa Limestone is approximately 10 feet thick and is dolomitic with seams of green sandy clay at its base. Underlying the Tampa Limestone is a thick sequence of limestone units (The Floridan Aquifer) which include an undifferentiated Oligocene unit,the Ocala Limestone, the gosport sand, and the lisbon formation. These units extend to approximately 850 feet below the ground surface in the vicinity of the site. Figure 1-4 is a composite geologic column for the Savannah area.
Deep borings performed during previous investigations [ESE, 1982; U.S. Army Environmental Hygiene Agency (USAEHA), 1987, Hunter/ESE 1990, ESE 1993a] at or in the vicinity of Hunter AAFTA indicate that the site is underlain predominantly by sand, silty-sand, and some clayey sand deposits to a depth of at least 50 feet below land surface (ft-bls). Shallow borings performed during previous investigations (USAEHA, 1987; ESE, 1990; ESE 1993a) at the Hunter AAFTA indicate that the site is underlain predominantly by fine-grained sand deposits to a depth of at least 10 ft.

1.4 HYDROGEOLOGY

The two principal aquifer systems in the Georgia coastal plain are the artesian Floridan aquifer and the overlying (younger) surficial aquifer (water-table aquifer). The Floridan aquifer is comprised of Middle-Upper Eocene (Ocala Group) and Oligocene (undifferentiated) limestones. The overlying Lower-Miocene Tampa Limestone, which may include beds of sandy clay, may also form part of the Floridan aquifer. In the Savannah area, the top of the Floridan aquifer is approximately 150 to 200 ft-bls.

The Floridan aquifer is the major source of groundwater for the Coastal Plain of Georgia and adjoining states (Krause and Gregg, 1972). The Floridan aquifer in Georgia provides the



System Series		Geologic Unit	Lithologic Description
QUATERNARY	Recent	Spoil	Sand, silt, clay, mixed, brown
		Alluvium	Clay, soft, wet, highly organic, dark brown
	Pleistocene	Undifferentiated Sands	Sand, medium grained, fossiliferous
TERTIARY	Upper Miocene	Duplin Marl	Clay, sandy, stiff, phosphatic, green, occasionally calcareous
	Middle Miocene	Hawthorn Formation	Clay and dolomitic limestone interbedded, phosphatic, sandy, green to buff
	Lower Miocene	Tampa Limestone Equiv.	Limestone, dolomitic with seams of green sandy clay, conglomeritic at base
	Oligocene	Undifferentiated Rocks	Limestone, soft, fossiliferous, gray to buff
	Upper Eocene	Ocala Limestone	Limestone, soft to dense, granular fossiliferous, white to buff with lenses of bluish re-crystallized limestone glauconitic at base
	Middle Eocene	Gosport Sand	Limestone, sandy, fossiliferous, dense, white to gray
		Lisbon Formation	Limestone, soft, glauconitic, dolomitic, marly, white to buff
		Pre-Lisbon Rocks	

Figure 1-4
COMPOSITE GEOLOGIC COLUMN

SOURCE: HERRICK AND VORHIS, 1963.

majority of water for industrial and domestic use [500 million gallons per day (mgd) statewide in 1978].

The Middle and Upper-Miocene Hawthorn Group and Duplin Marl, comprised of clay with occasional limestone beds, forms a confining unit that hydraulically separates the Floridan aquifer from the overlying surficial aquifer.

The Pleistocene to Recent deposits above the Miocene deposits consist of discontinuous units of sand, silt, and clay. The surficial aquifer is comprised of discontinuous beds and lenses of sand within these deposits. The depth to the water table in the Savannah area is approximately 3 to 10 ft-bls. The vertical extent of the surficial aquifer is not known, though Kundell (1978) reports that the aquifer may be up to 120-ft thick in the study area. Approximately 5-feet of soil fill was brought to the Hunter Army Airfield to raise the airfield and fire training pad above the level swamp which existed in the area prior to the construction of the Airfield.

There is no record of extended usage of the surficial aquifer in the study area; however, statewide usage amounted to 500,000 gallons per day (gpd) in 1978.

1.5 SUMMARY OF AQUIFER CHARACTERISTICS

Groundwater levels were monitored continuously from July through December 1991 with a Telog® logging device which was installed at HMW-6 to take hourly records of the water level fluctuations. The water level records were retrieved from the data logger once a month while water level data from each well were manually collected once a month by ESE personnel. July, August, and September generally have the most precipitation at the Hunter AAFTA, and October, November, and December are generally dry (Hunter/ESE, 1989). Rainfall data for the 6-month period were received from the Hunter Army Airfield weather station for comparison with groundwater fluctuations.

The Telog® data, presented in the Significance of Contamination Report (ESE, 1993) shows a slight cyclic fluctuation recurring less than 24 hours between crests. These fluctuations, possibly due to tidal influences, are minor [approximately 0.2 foot per day (ft/day)], and have little effect on the overall groundwater gradient. The data also show sudden water-level increases over short periods of time, followed by gradual decreases. These fluctuations appear related to rainfall events that occur periodically at the site.

The maximum water height above the Telog® pressure transducer in HMW-6 was 9.42 ft measured July 21, 1991; the lowest height of water was 5.63 ft measured December 19, 1991. The maximum groundwater fluctuation as determined by the Telog® data was 3.79 ft.

1.5.1 HYDRAULIC GRADIENT IN MARCH 1992

Water-table elevations for the March 1992 field effort were calculated using the new survey data for the monitor wells. The data are summarized in Table 1-1. A water-table contour map for the upper part of the surficial aquifer at Hunter AAFTA is presented in Figure 1-5. A similar map for the deeper portion of the aquifer is presented in Figure 1-6. The maps show that groundwater flow in both the upper and deeper zones of the surficial aquifer is to the northwest, which is consistent with the previous site reports.

1.5.2 GROUNDWATER FLOW DIRECTION AND VELOCITY

The results of the hydrogeologic evaluation indicate the water table gradient is generally toward the northwest at the Hunter AAFTA site. The gradient was fairly constant to the northwest in both the deep and shallow zones, with the shallow zone showing slightly greater seasonal fluctuations.

Based on the data from HMW-2, HMW-4, and HMW-6, the average shallow groundwater gradient is approximately 0.015 feet per foot (ft/ft) to the northwest. Assuming an aquifer porosity of 30 percent and a hydraulic conductivity of 0.0013 ft/min (based on the slug tests) the linear groundwater flow velocity is estimated to be 35.9 feet per year (ft/yr). The formulae and calculations are included in Appendix E of the Significance of Contamination Report (ESE, 1993a).

Table 1-1. Summary of Groundwater Elevations, March 1992, Hunter AAFTA.

Well Number	NORTHING	EASTING	Top of Casing Elevation (ft-msl)	Depth to Water 3/92 (ft toc)	Groundwater Elevation 3/92 (msl)
HMW-1	734794.34	816370.12	38.51	12.94	25.57
HMW-2	734786.58	816363.02	38.02	11.12	26.90
HMW-3	734719.25	816011.95	29.85	7.24	22.61
HMW-4	734718.68	816018.22	30.49	6.51	23.98
HMW-5	734494.62	816074.63	32.02	8.05	23.97
HMW-6	734497.34	816067.77	31.60	6.15	25.45
HMW-7	734579.79	816022.48	29.95	4.70	25.25
HMW-8	734779.81	816009.36	27.59	7.32	20.27
HMW-9	734790.68	816129.62	34.50	8.10	26.40

Notes: ft-msl = feet mean sea level
ft toc = feet below the top of casing

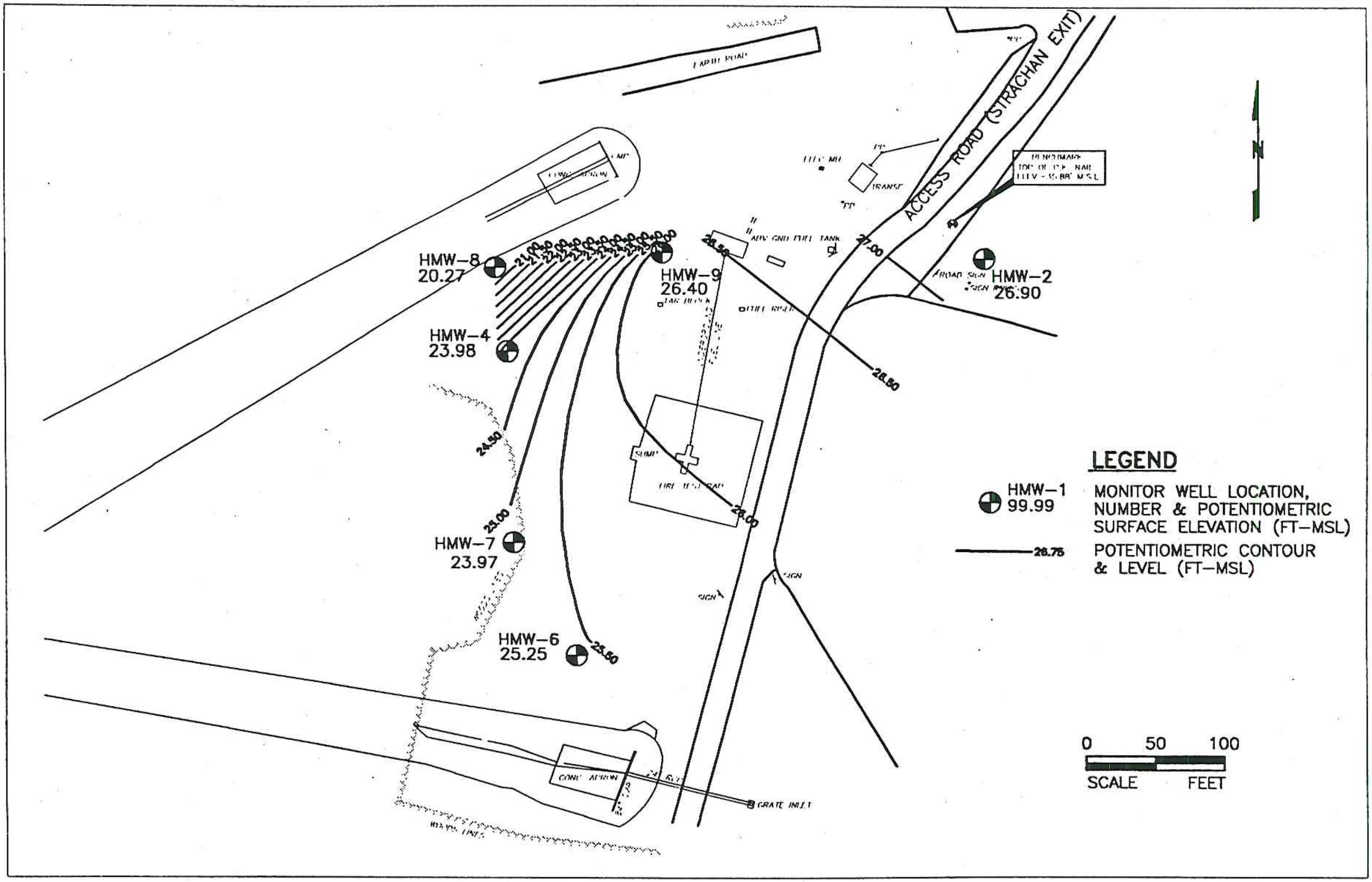


Figure 1-5
UPPER POTENTIOMETRIC SURFACE CONTOUR MAP – 3/92
HUNTER ARMY AIRFIELD
FIRE TRAINING AREA – FORT STEWART, GA

SOURCE: ESE, 1991

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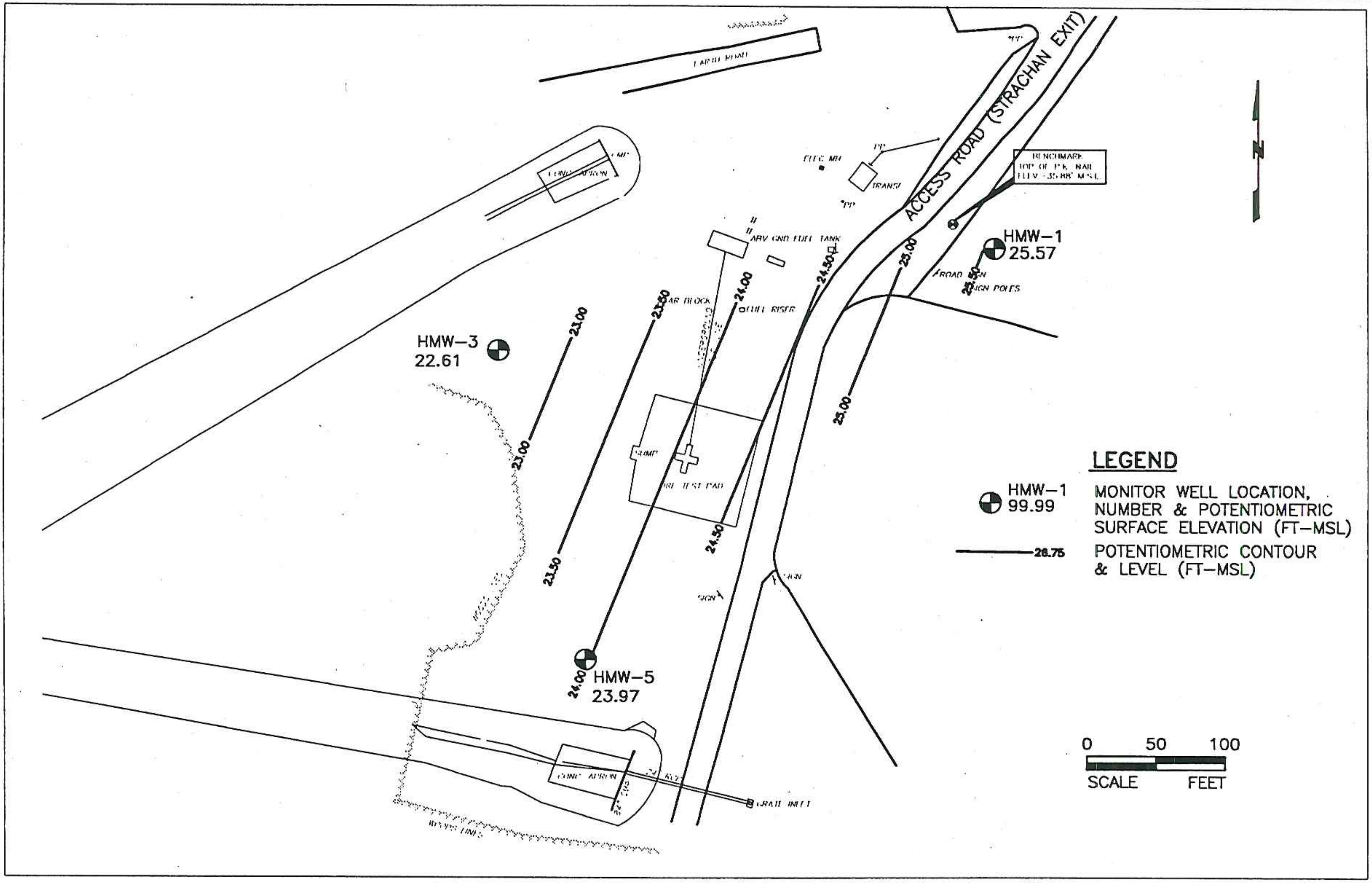

Figure 1-6
LOWER POTENTIOMETRIC SURFACE CONTOUR MAP – 3/92
HUNTER ARMY AIRFIELD
FIRE TRAINING AREA – FORT STEWART, GA

SOURCE: ESE, 1991

Environmental
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1.5.3 SUBSURFACE LITHOLOGY

The subsurface soil conditions encountered during this investigation and the previous investigation (Hunter/ESE, 1990) may be categorized into two general strata based on geologic and engineering characteristics. Stratum I soils extend from the surface to approximately 35 ft-bls and consist of gray to brown, medium to coarse-grained, loose to medium-dense silty sand, with interbedded layers of clayey sand and poorly graded sand. The sand contains approximately 6 to 13 weight-percent particles finer than No. 200 mesh. The fines are generally nonplastic, and the soil is classified as silty sand according to Unified Soil Classification System (USCS). Moisture contents in the Stratum I soils ranged from 36 to 40 percent. For a typical clean, poorly graded sand as found in the stratum, the estimated conductivity between 1 x 10^{-2} and 1 x 10^{-4} cm/sec (Peck, Hanson, and Thornburn, 1974). Slug testing confirmed a conductivity of 6 x 10^{-4} cm/sec (1.2 x 10^{-3} ft/min).

Stratum II soils begin at approximately 35 ft-bls and continue to an unknown depth; the soils consist of gray, fine to medium-grained, loose to medium-dense, poorly graded sand. The sand contains approximately 2 to 3 weight-percent particles finer than No. 200 mesh. The soil is classified as poorly graded sand (SP) according to the USCS. Moisture contents in the Stratum II soils ranged from 32 to 44 percent. For a typical loose to medium-dense, poorly graded sand as found in this stratum, the estimated conductivity is between 1 x 10^{-2} and 1 x 10^{-4} cm/sec (Peck, Hanson, and Thornburn, 1974). Slug testing confirmed a conductivity of 9 x 10^{-4} cm/sec (1.8 x 10^{-3} ft/min). Both Stratum I and Stratum II are of undifferentiated Pleistocene to Recent age.

1.6 SUMMARY OF PREVIOUS GROUNDWATER ANALYTICAL RESULTS

The concentrations of arsenic, chromium, and selenium detected in a 1990 groundwater sample from a shallow downgradient well (HMW-6) exceed Federal and State of Georgia MCLs. Lead levels detected in the 1990 samples from the same well, as well as shallow downgradient well HMW-4 are above the EPA action level for lead. The concentrations of arsenic, barium, chromium, and lead detected in the shallow upgradient well (HMW-2) also exceed or are equivalent to their respective PCTs.

Benzene was detected above its MCL in several wells [HMW-3 (1990), HMW-4 (1992), HMW-6 (1990 and 1992), HMW-7 (1992), and HMW-9 (1992)]. Fig. 1-7 presents benzene concentrations detected in groundwater samples during the 1992 field effort. The lateral extent of benzene contamination was not delineated during this field effort. Also, vinyl chloride was detected above its MCL in the 1992 sample from HMW-6. The only other chemicals measured in groundwater above PCTs were three PAHs, which were detected in the 1990 sample from HMW-6 PAHs were not detected above PCTs in any of the wells during the 1992 field effort (ESE,1993a).

1.7 PROPOSED MONITORING NETWORK

The groundwater monitoring network at the Hunter AAFTA consists of 2 (HMW-1(deep) and HMW-2(shallow)) upgradient and 7 downgradient monitor wells. Monitor wells HMW-3 and HMW-5 were constructed downgradient of the fire training pad and are screened at an approximate depth of 49 feet below the ground surface (STRATUM II). Monitor wells HMW-4, HMW-6, HMW-7, HMW-8, and HMW-9 were constructed downgradient of the fire training pad and were all screened at an approximate depth of 3 to 13 feet below the ground surface, except for HMW-9 which is screened from 5 to 15 feet below the ground surface (STRATUM I). Well construction details for these existing wells are summarized in Table 1-2. Boring logs and well construction details for all the wells existing at the site are included in Appendix **B** of the Operations and Maintenance Plan.

Additionally, the construction of at least two wells may be needed to determine the horizontal extent of contamination. The locations of these new wells will be determined based on the results of field screening activities to be implemented as part of this groundwater monitoring plan. A description of the field screening activities and well construction details are provided in Section 2 of this groundwater monitoring plan. The locations of the existing and preliminary locations of proposed monitor wells are shown in Figure 1-8.

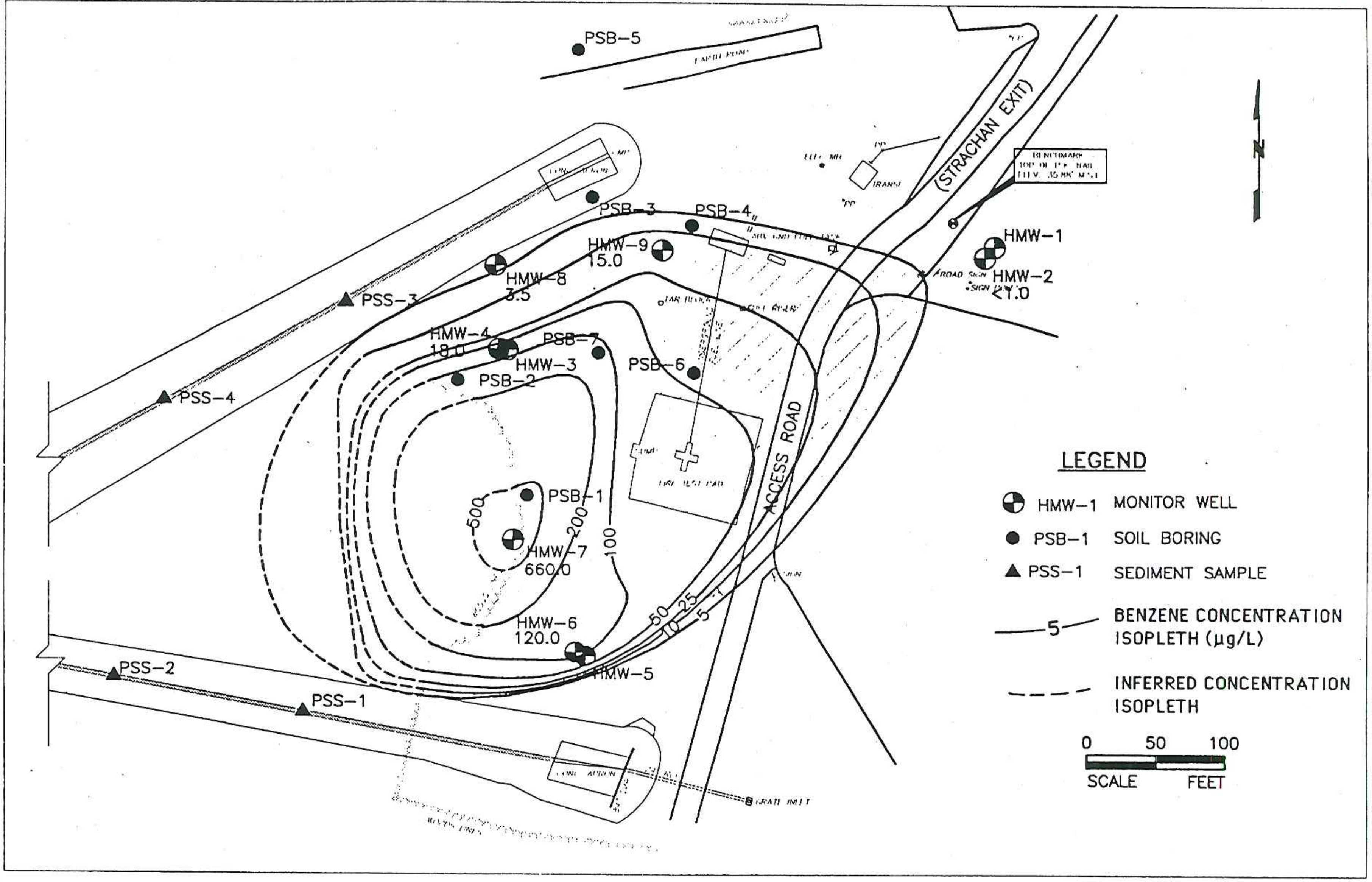

Figure 1-7
1992 BENZENE CONCENTRATIONS (ug/L) IN SURFICIAL GROUNDWATER (0-15FT BLS)
HUNTER ARMY AIRFIELD
FIRE TRAINING AREA - FORT STEWART, GA

SOURCE: ESE, 1992

Environmental Science & Engineering, Inc.
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C-FTSTEWART92.3/TAB2-2H.WK1
10/08/92

Table 1-2 Monitor Well Completion and Location Survey Summary, Hunter AAFTA

Well Number	Northing	Easting	Top of Casing Elevation (ft-msl)	Boring Diameter (inches)	Boring Depth (ft bls)	Sandpack Interval (ft bls)	Bentonite Seal (ft bls)	Screen Interval (ft bls)	Well Diameter (inches)	Grout Interval (ft bls)
HMW-1	734794.34	816370.12	38.51	10.25	50.00	35.0 - 50.0	33.0 - 35.0	38.0 - 48.0	2	0.0 - 33.0
HMW-2	734786.58	816363.02	38.02	10.25	15.00	3.1 - 15.0	2.1 - 3.1	4.6 - 14.6	2	0.0 - 2.1
HMW-3	734719.25	816011.95	29.85	10.25	50.00	37.0 - 50.0	35.0 - 37.0	39.0 - 49.0	2	0.0 - 35.0
HMW-4	734718.68	816018.22	30.49	10.25	15.00	2.0 - 15.0	1.0 - 2.0	3.0 - 13.0	2	0.0 - 1.0
HMW-5	734494.62	816074.63	32.02	10.25	50.00	35.0 - 50.0	33.0 - 35.0	39.0 - 49.0	2	0.0 - 33.0
HMW-6	734497.34	816067.77	31.60	10.25	15.00	2.0 - 15.0	1.0 - 2.0	3.0 - 13.0	2	0.0 - 1.0
HMW-7	734579.79	816022.48	29.95	8	14.00	1.5 - 14.0	0.0 - 1.5	3.0 - 13.0	2	--
HMW-8	734779.81	816009.36	27.59	8	15.00	1.5 - 15.0	0.0 - 1.5	3.0 - 13.0	2	--
HMW-9	734790.68	816129.62	34.50	8	15.00	3.0 - 15.0	0.5 - 3.0	5.0 - 15.0	2	--

Note: ft bls = feet below land surface.
ft-msl = feet mean sea level.
-- = bentonite seal installed to surface.

*Boring diameter presented is the diameter of the boring in the sand pack zone only.

Source: ESE.

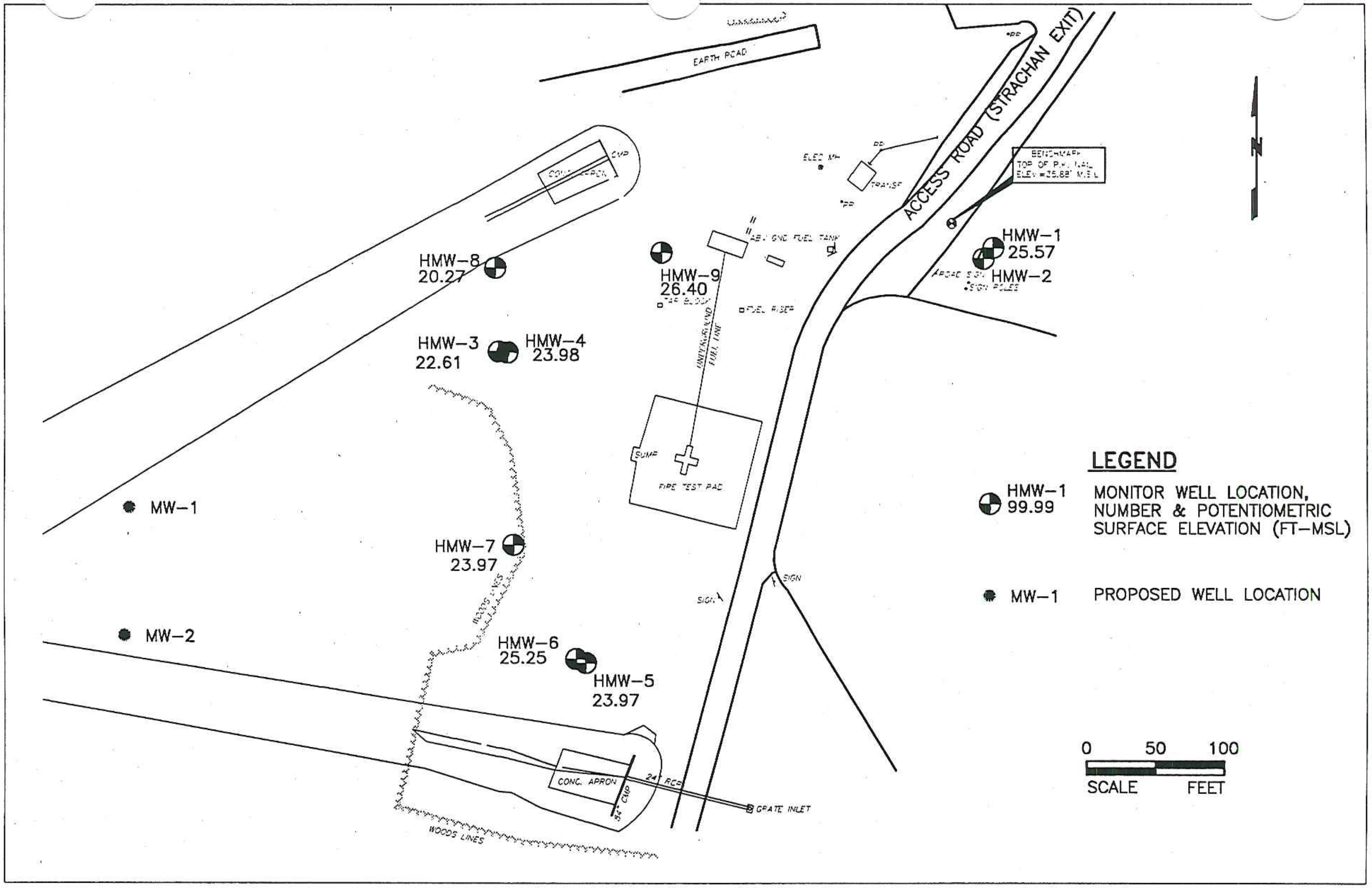

Figure 1-8
EXISTING AND PROPOSED WELL LOCATIONS
HUNTER ARMY AIRFIELD
FORT STEWART, GA

SOURCE: ESE, 1991

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2.0 GROUNDWATER MONITORING

2.1 DETERMINATION OF THE EXTENT OF CONTAMINATION

The extent of groundwater contamination will be determined using temporary well points, a geoprobe groundwater sampling system, or other temporary groundwater sampling system. The system will be purged and groundwater samples will be taken from the sampling location and analyzed in the field using a Photovac portable Photoionization Detector (PID)/Gas Chromatograph (GC). The samples will be analyzed for benzene, toluene, ethylbenzene,and total xyllenes (BTEX).

QA samples will be collected at this site to verify the results of the groundwater screening. These samples will include VOA trip blanks, field equipment blanks, duplicate samples, and sample splits to be sent to the USACE Missouri River District Laboratory. A discussion of the QA samples is provided in section 2.5.6 of this groundwater monitoring plan.

The first groundwater sampling points will be located at the locations provided for the two additional wells at the site (See Figure 1.8). If these locations are found free of BTEX contamination, the wells will be installed at these locations. If contamination is found during the screening, an alternate location will be tested in the field. After two downgradient locations free of contamination are found, wells will be installed at these locations as per Section 2.2 of this monitoring plan.

2.2 ADDITIONAL MONITOR WELL CONSTRUCTION

The locations of two additional groundwater monitor wells will be determined based on the data presented in the Significance of Contamination Report (ESE, 1993a) and the results of the groundwater screening (Section 2.2). These locations will be downgradient of the plume and are expected to be free of contamination.

The monitor well boreholes will be drilled using 4-7/8-inch inside-diameter (ID) hollow-stem augers. Soil samples will be obtained from the well boreholes using a CME continuous splitbarrel sampler or using a 1-7/8-inch ID split-spoon sampler in accordance with American Society for Testing and Materials (ASTM) D-1586. The soil samples obtained during the drilling process will be used to prepare lithologic logs of the boreholes. Copies of typical field lithologic logsheets and well construction detail logsheets are presented in Appendix C of the Closure Plan.

Groundwater monitor wells will be constructed inside the hollow-stem augers. The wells will be constructed of 2-inch-diameter Schedule 40 PVC casing with threaded joints and 10 ft of 0.010-inch slot well screen. The top of the well screen will be placed above the water table and approximately 3 or 5 ft-bls (depending upon the depth of the water table) to intercept phase-separated hydrocarbons (if present) on the water table.

The annular space surrounding the screen will be backfilled with clean, 20/30 silica sand to at least 1.5 ft above the top of the screen using a tremmie pipe. As the sand will fill the augers, the augers will be slowly lifted, allowing the sand to empty from the augers and flow into the annulus between the borehole and the well casing.

A seal consisting of Volclay® bentonite grout or other commercially acceptable pure bentonite grout will be placed above the sand pack. The grout was mixed according to the manufacturer's specifications and allowed to cure at least 24 hours prior to the installation of the antipercolation pad.

The monitor wells will be completed at the ground surface with 3-ft by 3-ft concrete antipercolation pads and protected abovegrade with locking steel protective casings. One-eighth-inch-diameter drain holes will be drilled in the protective casings approximately 6 inches above the concrete pads. The tops of the pads will be sloped away from the protective casings to prevent water from ponding and infiltrating the joints between the protective casings and the pads. The tops of the wells will be capped inside the protective casings to keep airborne particulates and insects from entering the wells. The caps were vented to prevent air pressure buildup in the wells due to water-level changes. The general well construction details are presented in Figure 2-1.

Three protective posts will be installed around each well. The posts will be 5-ft long by 2 1/2-inch-diameter steel pipe, and are set in concrete in 1 ft-deep by 4.5-inch-diameter holes. The pipes will be filled with concrete and painted to make them visible to traffic.
State Plane Coordinates and elevations of the monitor wells at Hunter AAFTA will be measured during a control survey performed by a State of Georgia Registered Surveyor.

The monitor well development will be performed no sooner than 48 hours after well installation. The monitor wells will be developed using a surge block with alternate purging using a submersible pump, centrifugal pump fitted with a check valve, a bailer, or other purging equipment. The following procedures will be followed:

1. The initial sand and silt in the bottom of the well will be removed by pumping.
2. The surge block will be lowered to approximately 3 to 5 ft below the water table and gently moved up and down in 3-ft strokes.
3. The surge block will be removed from the well and sand and fines allowed to settle.
4. The well will be pumped to remove the sand and fines from the bottom and pH, temperature, and conductivity readings were taken.
5. Surging will be continued at a slightly lower level with an increase in the surging force.
6. The surging and pumping will be continued for a minimum of 4 hours and until the pH and conductivity stabilize and the sediment is no longer present in the discharge water.

Temperature, pH, and specific conductance will be monitored to ensure the water quality had stabilized. The total amount of water purged, pH, specific conductance, and temperature will be measured and recorded on well development forms in the field notebook. A copy of a Typical well development form is included in Appendix C of the Closure Plan.

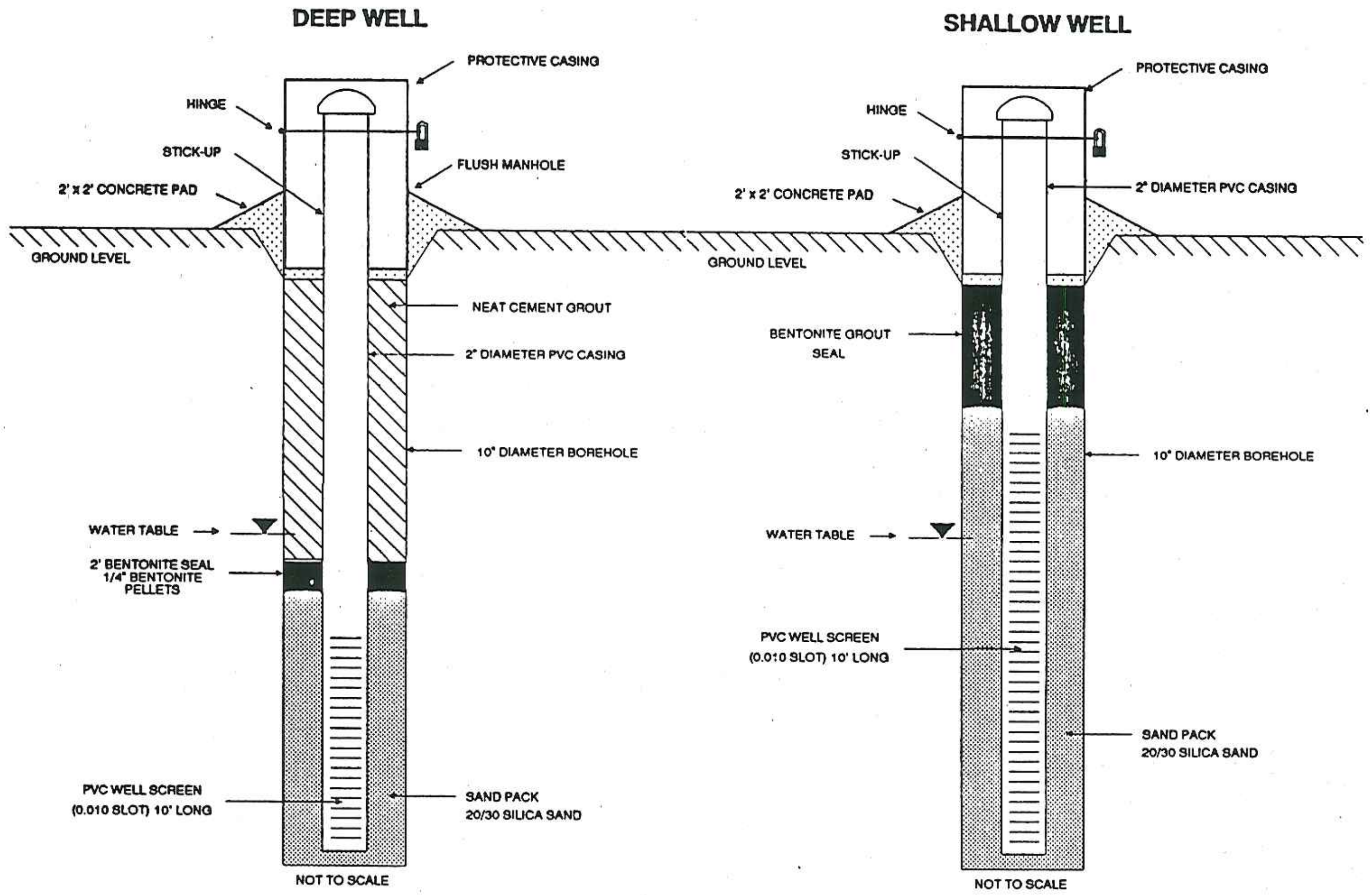

Figure 2-1
MONITOR WELL DIAGRAM.
HUNTER AAFTA
FIRE TRAINING AREA - FT. STEWART, GA

SOURCE: ESE.

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Each new well to be added to the groundwater monitoring system will be sampled for all EPA Appendix IX parameters to verify the wells were installed downgradient of the plume.

2.3 MAINTENANCE OF THE GROUNDWATER MONITORING NETWORK

Each well in the groundwater monitoring network will be maintained in operational condition for the full monitoring period. Each well will be inspected quarterly for tampering, surficial damage, silting, and screen damage. If damage or evidence of tampering of a well in the monitoring system is observed, the damage will be described in a letter addressed to the Fort Stewart Department of Environmental Health in care of Mr. Thomas Huston. The letter will include a description of the damage and the effect the damage will have on the operation of the well, and a plan to repair or replace the well.

If a monitor well is found dry during sampling, it should be noted in the field logbook and immediately reported to The Hunter Army Airfield Department of Environmental Health and the Georgia Department of Natural Resources, Environmental Protection Department (GDNREPD). GDNREPD will review the monitoring system to determine whether the well will be replaced with another groundwater monitoring well installed in a deeper aquifer. If levels of monitored constituents fall to background levels and remain at these levels for at least three years, the Ft. Stewart Department of Environmental Health may petition the GDNREPD to discontinue monitoring of this site. The SWMV permit is for a ten year period. A new permit must be obtained if the monitoring period exceeds ten years due to the continued detection of elevated dissolved constituents in the groundwater.

If it is necessary to replace an existing monitor well, the well will be abandoned using methods approved by the GDNREPD and the ACOE.

Typical groundwater monitoring costs are calculated based on a yearly rate escalated at a rate of 3 percent for the 10-year monitoring period. This cost includes projected O&M and sampling costs. ESE estimates groundwater monitoring costs, of approximately $527,000/10 year monitoring period. The cost for additional groundwater screening, installation of two wells, and sampling the groundwater for Appendix IX paramaters will be approximately $15,000.

2.4 SAMPLING FREQUENCY AND ANALYTICAL PARAMETERS

The analytical parameters used for groundwater sampling was determined based on requirements for solid waste management unit closure monitoring as required in 40CFR 264 Subpart F and based on the findings reported in the Significance of Contamination Report (ESE, 1993a). Table 2-1 presents three groups of analytical parameters which will be sampled.

Group 1 includes general groundwater contamination detection parameters.

Group 2 includes site-specific contaminants and appropriate groundwater quality parameters. Included in this Group are parameters found above ambient water quality criteria detected in the March 1990 sampling event.

Group 3 parameters comprise VOCs included in the Clean Water Act Priority Pollutant List. These parameters must be analyzed annually.

Groundwater analytical samples will be obtained quarterly from each well of the groundwater monitoring network. One quarterly groundwater sample will be obtained during each of the 4 periods from January to March, April to June, July to September, and October to December. Subsequent samples will not be collected for at least 60 days following a previous sampling event. The quarterly groundwater samples obtained at each well will be analyzed for all parameters presented from Groups 1 and 2 in Table 2-1. Group 3 parameters will be analyzed annually.

After the initial four quarters of background sampling has been analyzed, The Georgia Environmental Protection Division will review the results to determine whether the frequency of sampling may be reduced and prepare a reduced parameters list to be analyzed.

Table 2-1. Groundwater Monitoring Parameters

BACKGROUND WATER QUALITY PARAMETERS

Group 1

Arsenic
Barium
Cadmium
Calcium
Chloride
Chromium
Hardness as $CaCO_3$
Lead
Mercury
pH
Selenium
Silver
Specific Conductance
Total Organic Carbon
Total Organic Halogen
Total Dissolved Solids
Total Suspended Solids
Total Alkalinity
Total Phenols

SITE-SPECIFIC GROUNDWATER PARAMETERS

Group 2

Benzene
Vinyl Chloride

Group 3

Acrolein
Acrylonitrile
Benzene
Bromoform
Carbon tetrachloride
Chlorobenzene
Chlorodibromomethane
Chloroethane
2-Chloroethylvinyl ether
Chloroform
Dichlorobromomethane
1,1-Dichloroethane

Table 2-1. Groundwater Monitoring Parameters (Continued, Page 2 of 2)

1,2-Dichloroethane
1,1-Dichloroethylene
1,2-Dichloropropane
1,3-Dichloropropylene
Ethylbenzene
Methyl bromide
Methyl chloride
Methylene chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethylene
Toluene
1,2-Trans-dichloroethylene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
Vinyl chloride

Source: ESE

2.5 SAMPLING METHODOLOGY

Included in this subsection are procedures for equipment decontamination; groundwater sampling; quality assurance sampling; and the preservation, handling, and shipment of samples. All procedures in this section are in accordance with EPA Region IV Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual dated February 1, 1991.

2.5.1 DEFINITIONS

The following definitions will be referenced throughout this section:

Deionized (DI) Water--Water which has been treated by being passed through a standard water column and an activated carbon unit. The water contains no detectable heavy metals or inorganic compounds of analytical interest and is relatively free of organic compounds.

Tap Water-- Potable water from an approved source which meets or exceeds EPA Drinking Waster Standards.

Ultra Pure Water--Water that has been additionally treated through a barnstead carbon treatment system and contains no organic compounds of analytical interest above the analytical laboratories routine detection limits.

2.5.2 SAMPLE CONTAINER CLEANING PROCEDURES AND LABELING

Standard sample container cleaning will be performed by the analytic laboratory in accordance with Section B-9 of the EPA Region IV Engineering Support Branch Standard Operating Procedures (and Quality Assurance Manual) dated February 1, 1991. Sample container cleaning procedures are presented in Table 2-2. Commercially cleaned containers using the referenced methods will be acceptable for sample containment.

A label must be placed securely on all groundwater sample containers in order to identify each sample fraction. The following information shall be included on each sample label:

1. Project number,

5,B3.

Table 2-2. Sample Container Cleaning Procedures Within the Laboratory

Analysis/Parameter	Container Type	Matrix	Cleaning Protocol*
Organic extractables	Glass jar with Teflon -lined cap	Water	A
Organic purgeables	Glass septum vial with Teflon -lined septum	Water	B
Metals	Linear polyethylene cubitainer with polyethylene cap	Water	C
Inorganics	Linear Polyethylene cubitainer with polyethylene cap.	Water	D

Note: Glass = amber for all water analyses.
TOX = total organic halide

*Cleaning Protocol

A	B	C	D	
X	X	X		Wash with hot tap water using laboratory-grade, nonphosphate detergent.
X	X	X		Rinse 3 times with tap water.
X		X		Rinse with 1:1 nitric acid (reagent-grade nitric acid diluted with ASTM Type 1 deionized water).
X	X	X		Rinse 3 times with ASTM Type 1 deionized water.
X				Rinse with pesticide-grade methylene chloride using 20 mL per 64-oz bottle, 10 mL per 32- or 16-oz bottle, or 5 mL per 8- or 4-oz bottle. Methylene chloride is used as oganics rinse.
X	X			Oven dry, using a forced air oven, at 105 to 125 C for 1 hour.
		X		Invert and air dry in contaminant-free environment.
			X	No cleaning required; use new cubitainers only.

Source: ESE, 1991.

2. Sample station identification number,
3. Type of sample (groundwater),
4. Signature(s) of the sampling technician(s),
5. Sample Preservation Method,
6. Analyses to be conducted on sample,
7. Time and date of collection, and
8. Any comments (filtration, pH, spec. conductance, etc.).

2.5.3 FIELD DECONTAMINATION

Decontamination procedures presented in the following subsections will be followed for all non-dedicated sampling equipment that contacts the sample matrices.

2.5.3.1 Decontamination Procedures for Groundwater Purging Equipment

All downhole purging equipment including submersible pumps, drop pipe, hoses, and water level sounding equipment will be decontaminated using the following procedure:

1. Using a brush, wash with standard nonphosphate laboratory detergent mixed in tap water; acceptable phosphate-free substitutes shall be Detergent 8 and Citranox available from Baxter Scientific or equal products from other sources;
2. Rinse with tap water;
3. Rinse with Deionized water;
4. Equipment should be placed in a polyethylene bag or wrapped with polyethylene film to prevent contamination during storage or transit.

2.5.3.2 Decontamination Procedure for Groundwater Sampling Equipment

Teflon Bailers will be used to obtain samples. Decontamination procedures for the bailers will include:

1. Rinse equipment thoroughly with tap water in the field as soon as possible after use.
2. The equipment will be washed thoroughly with laboratory detergent and tap water using a brush to remove any particulate matter or surface film;
3. The equipment will be rinsed thoroughly with tap water;

4. Rinse the equipment with at least 10 percent nitric acid solution;
5. Rinse equipment thoroughly with tap water;
6. Rinse equipment thoroughly with deionized water;
7. Rinse equipment twice with pesticide grade isopropanol and allow to air dry;
8. Wrap equipment completely with aluminum foil to prevent contamination during storage and/or transport to the field; and

2.5.4 GROUNDWATER SAMPLING

The following procedures will be used in the collection of groundwater samples:

1. pH, conductivity, and temperature meters will be calibrated in accordance with the manufacturers instructions and documented on calibration forms in the field notebook.
2. Immediately prior to purging a well, the static water level below the top of the well casing will be measured to the nearest 0.01 ft using an electric (conductive) well probe. The probe cable will include electric wire which will conduct electricity to the conductivity probe tip. When the tip encounters water, the circuit will be completed, setting off a visual and audible signal. The cable will be calibrated in 0.1-ft increments. The depth to water will be read directly from where the tape contacts the top of casing mark on each well and recorded in the field notebook. A typical groundwater sampling form is included in Appendix C of the closure plan.
3. The volume of water in the well, including the saturated pore volume (assumed 30%) of the sand packed annulus, will be calculated based on the static water level and the well construction information. Well volume calculations will be placed in the field notebook.
4. The monitor well will be purged a minimum of five well volumes until pH and specific conductance measurements stabilize. Purging will be performed using a centrifugal pump with stainless steel drop pipe, stainless steel submersible pump, or a bailer. The pump must be equipped with a check valve to prevent water from running back down into the well when the pump is shut off. The hose or tubing used with the pump and the drop pipe must be adequately decontaminated prior to use at

each well site. Temperature, pH, and specific conductance will be monitored to ensure the water quality has stabilized to within 10 percent of the previous reading for at least three readings taken at least 0.5 well volumes apart. If a pump is used the rate of pumping must be determined and noted in the field logbook. The total amount of water purged, pH, specific conductance, and temperature will be measured and recorded in the field notebook. Purging equipment other than that stated above may be used with the approval of the ACOE project manager.

5. Extremely slow recharging wells will be purged dry, allowed to recharge at least 80 % of its initial depth,and purged dry a second time, and then purged dry a third time prior to sampling. If excessive time is required for the well to recharge to 80 percent, the consultant's project manager and the ACOE project manager will be notified prior to classifying the well as dry. If a well has insufficient recharge water after being purged dry, that well will be sampled as soon as enough water is in the well to obtain a sample. The total amount of fluid purged will be measured and recorded in the field notebook.
6. Monitor wells will be sampled immediately after purging using decontaminated closed top teflon bailers. The bailers will be decontaminated in accordance with Section 2.4.3 of this document. No glue or solvents may be used for bailer construction. The type of bailer used for sampling (closed top) must be noted in the field notebook. A teflon coated wire leader shall be used to prevent the rope from coming into contact with the water.
7. All sampling equipment will be protected from contaminated soil surfaces to prevent contamination of the samples (e.g., equipment may be placed on disposable polyethylene plastic sheeting).
8. The bailer will be rinsed at least once with well water (i.e. the first bail is discarded) prior to collecting a sample.

Groundwater sampling data (including sample number, location, quantity of water purged, field parameters, site conditions, etc.) must be documented in a field notebook.

2.5.5 PURGE WATER AND DECONTAMINATION WATER DISPOSAL

During each sampling event all purge water and decontamination water will be disposed of on the ground downgradient from the wellsite. Containerization of the water will not be necessary.

2.5.6 QUALITY CONTROL SAMPLES AND SAMPLING PROCEDURES

The following subsections will describe quality control sampling as required in the EPA Region IV Engineering Branch Standard Operating Procedures and Quality Assurance Manual. Quality Control samples required at each monitored area include: duplicate samples, preserved and unpreserved field blanks, volatile organic aromatic trip blanks, metals and inorganic preservative blanks, rinse water blanks, equipment blanks, and spike and blank samples.

2.5.6.1 Duplicate Samples

Two sets of duplicate samples will be obtained as a measure of the precision of the sample collection process. One set will be placed in sample containers supplied by, and the samples submitted to the ACOE Missouri Division Laboratory (MRDL). A second duplicate sample will be sent to the contracting laboratory for analysis. These samples will be collected at the same time, using the same procedures, and the same equipment as the required samples. No more than 10 percent of all required samples will be duplicated during any sampling event. The MRDL point of contact will be:

Laura Percifield
Missouri River Division Laboratory
HTRW Chemistry Branch
CEMRD-ED-LC
420 S. 18th Street
Omaha, Nebraska 68102
(402) 444-4314

The MRDL point of contact must be notified at least 1 week prior to sample collection.

2.5.6.2 Metals and Inorganic Preservative Blank

Metals and general inorganic sample containers will be filled with ultra-pure water and preserved in the field to check the preservatives for analyzed parameters. These blank samples will be preserved using the same batch of preservatives as used to preserve the samples collected. No more than one preservation blank will be necessary per 10 percent of all sample fractions requiring preservation per field sampling event.

2.5.6.3 Rinse Water Blank

A minimum of one sample of the deionized water used to decontaminate the sampling equipment will be taken per sampling event. The samples will be taken directly from the sprayer or container used to decontaminate the equipment and submitted to the analytical testing laboratory for a standard ICP scan. When field deionized water is used, one sample will be submitted to the analytic laboratory per week of sampling.

2.5.6.4 VOA Trip Blank

Trip blanks will be prepared in the laboratory prior to sending field kits into the field. VOA sample jars will be decontaminated and filled with ultra-pure water. One sample per day will be shipped back to the office each day VOA samples are obtained. One VOA trip blank will be shipped with each cooler containing water samples for VOA analysis. These jars are not to be tampered with and will be used as a check of the VOA sample bottle decontamination procedures.

2.5.6.5 Equipment Blank

The effectiveness of the field decontamination procedures will be monitored by rinsing field cleaned equipment with ultra-pure water and collecting the rinse water in standard sample containers. The equipment blank will be analyzed for the same parameters as required by the well sampling. At least one sample and no more than 5% of the equipment cleaned during the field sampling effort will be sampled.

2.5.6.6 Spike and Blank Samples

Spike and blank samples will be provided by the ACOE Missouri River Division laboratory in Omaha Nebraska. These samples will be sent along with the field samples to the appropriate contracting laboratory. These samples will be given fictitious sample identification similar to the actual well designations found on all sampling forms and labels. The samples will be only identified as a blank or a spike in the field notebook.

2.6 ANALYTICAL PROCEDURES, SAMPLE PRESERVATION, AND HOLDING TIMES

Table 2-3 identifies the analytical methods, proper containers, preservation techniques, and maximum holding times established by EPA (50 Federal Register, January 1985). These procedures and holding times must be met to validate the analytical data.

2.7 CHAIN OF CUSTODY, HANDLING, AND CUSTODY SEALS

The primary purpose of sample chain of custody is to create an accurate, written, verified record which can be used to trace possession and handling of the samples from the moment of collection until receipt by the laboratory. Adequate sample custody will be achieved by means of an approved chain-of-custody form. A typical chain-of-custody form is enclosed in Appendix C.

The chain of custody form will be filled out at each well site immediately after the sample fractions are taken. The following information must be included on the Chain-of Custody form:

1. Project name and number,
2. Sample station identification number,
3. Type of sample (groundwater),
4. The sampler's signature,
5. Whether sample was preserved,
6. Analyses to be conducted on sample,
7. Time and date of collection, and
8. Any comments (filtration, pH, spec. conductance, etc.).

After each sample container is filled, the samples will be preserved in accordance with Section 2.5 of this groundwater monitoring plan. The containers will be subsequently sealed with appropriate custody seals and immediately iced down in a secured ice chest and prepared for shipment. A water proof, insulated, plastic ice chest will be used for sample shipment.

Table 2-3. Chemical Analysis Procedures

Parameter	Analytical Method	Sample Preservation*	Sample Containers	Holding Times
Background Water Quality Parameters (Group 1)				
Arsenic	7060	HNO_3, pH<2	1 L, P	6 months
Barium	6010	HNO_3, pH<2	1 L, P	6 months
Chloride	300	None	P, G	28 days
Cadmium	6010	HNO_3, pH<2	1 L, P	6 months
Chromium	6010	HNO_3, pH<2	1 L, P	6 months
Lead	7421	HNO_3, pH<2	1 L, P	6 months
Mercury	7470	HNO_3, pH<2	1 L, P	28 days
Selenium	7740	HNO_3, pH<2	1 L, P	6 months
Silver	6010	HNO_3, pH<2	1 L, P	6 months
Specific Conductance	120.1	None	1 L, P	N/A
Total Organic Carbon	415.2**	H_2SO_4, pH<2	1 L, P	28 days
Total Organic Halogen	450.1	H_2SO_4, pH<2	250 mL, GS	7 days
pH	150.1**	None	1 L, P	N/A
Total Phenols	420**	H_2SO_4, pH<2	1 L, G, T	28 days
Site-Specific Groundwater Parameters (Group 2)				
Benzene	8240	HCL, pH<2	60ml, GS	14 days
Vinyl Chloride	8240	HCL, pH<2	60ml, GS	14 days
Annual Groundwater Parameters (Group 3)				
Benzene	8240	HCL, pH<2	60ml, GS	14 days

Table 2-3. Chemical Analysis Procedures

Parameter	Analytical Method	Sample Preservation*	Sample Containers	Holding Times
Bromoform	8240	HCL, pH<2	60ml, GS	14 days
Carbon tetrachloride	8240	HCL, pH<2	60ml, GS	14 days
Chlorobenzene	8240	HCL, pH<2	60ml, GS	14 days
Chlorodibromomethane	8240	HCL, pH<2	60ml, GS	14 days
Chloroethane	8240	HCL, pH<2	60ml, GS	14 days
2-Chloroethylvinyl ether	8240	HCL, pH<2	60ml, GS	14 days
Chloroform	8240	HCL, pH<2	60ml, GS	14 days
Dichlorobromomethane	8240	HCL, pH<2	60ml, GS	14 days
1,1-Dichloroethane	8240	HCL, pH<2	60ml, GS	14 days
1,2-Dichloroethane	8240	HCL, pH<2	60ml, GS	14 days
1,1-Dichloroethylene	8240	HCL, pH<2	60ml, GS	14 days
1,2-Dichloropropane	8240	HCL, pH<2	60ml, GS	14 days
1,3-Dichloropropylene	8240	HCL, pH<2	60ml, GS	14 days
Ethylbenzene	8240	HCL, pH<2	60ml, GS	14 days
Methyl bromide	8240	HCL, pH<2	60ml, GS	14 days
Methyl chloride	8240	HCL, pH<2	60ml, GS	14 days
Methylene chloride	8240	HCL, pH<2	60ml, GS	14 days
1,1,2,2-Tetrachloroethane	8240	HCL, pH<2	60ml, GS	14 days
Tetrachloroethylene	8240	HCL, pH<2	60ml, GS	14 days
Toluene	8240	HCL, pH<2	60ml, GS	14 days
1,2-Trans-dichloroethylene	8240	HCL, pH<2	60ml, GS	14 days
1,1,1-Trichloroethane	8240	HCL, pH<2	60ml, GS	14 days
1,1,2-Trichloroethane	8240	HCL, pH<2	60ml, GS	14 days
Trichloroethylene	8240	HCL, pH<2	60ml, GS	14 days
Vinyl chloride	8240	HCL, pH<2	60ml, GS	14 days

Note: P = Polyethylene.
pp = Polypropylene.
G = glass.
T = Teflon®-lined cap.
GS = glass container with Teflon®-lined septa, no headspace.

U.S. Environmental Protection Agency, SW-846, "Test Methods for Solid Waste"
*Standard Method for the Examination of Water and Wastewater, 16th ed., 1985.
+All samples chilled to 4°C.
**Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020.

Source: ESE

Once the ice chest is filled with sample containers, the void spaces between the sample containers will be packed with vermiculite or other absorbent packing material and ice will be added to the ice chest so that the samples remain at 4°C. The chain of custody forms will be signed and placed into the ice chests. The ice chest will be subsequently sealed with Department of Transportation (DOT) approved shipping tape. Custody seals will be placed on each sample cooler, signed, and dated in a manner which will indicate if the cooler was tampered with during shipment. The samples will be shipped to the contracted laboratory for overnight delivery.

3.0 GROUNDWATER ANALYTICAL EVALUATION AND REPORT

Within one month of the receipt of analytical data, a report will be sent to the ACOE project manager. The report will include a discussion of the sampling methodology, an evaluation of the groundwater analytical data, and the conclusions including necessary corrective actions. The following subsections will discuss the reporting protocol.

3.1 EVALUATION OF GROUNDWATER ANALYTICAL DATA

The evaluation of groundwater data will be performed in accordance with 40 CFR 264.97 and 264.98 for detection monitoring systems. Background data from the upgradient wells will be based on quarterly data obtained during the first year of detection monitoring.

For all indicator parameters (See Table 2-1, Group 1) for which the background (upgradient well data) data coefficient of variation is less than 1.0, groundwater analytical data will be analyzed to determine statistical changes in groundwater quality parameters between the background (upgradient) wells and mean of the each sampled well. The analytical results will be evaluated using the Cochran's Approximation to the Behren's-Fisher Student's T-test at the 0.05 level of significance as described in 40 Code of Federal Regulations (CFR) Part 264, Appendix IV. All parameters analyzed will be subjected to a one-tailed analysis except pH which will be analyzed using the two-tailed analysis.

If the coefficient of variance in the background (upgradient well) data is equal or greater than 1.0, an alternate statistical procedure will be used to provide reasonable assurance that the groundwater quality was not impacted by the facility. One such statistical procedure is the ANOVA Parametric Analysis of Variance. Prior to implementing an alternative statistical procedure, the procedure must be approved by ACOE and the Georgia Department of Natural Resources.

For all groundwater quality parameters presented in Table 2-1, Group 2, the data obtained will be compared with the water quality parameters presented in 40 CFR 264.94; Table 1. The data obtained for parameters listed in Table 2-1, Group 2 must not exceed the associated maximum values for groundwater quality from 40 CFR 264.94.

3.2 ANALYTICAL REPORT CONTENTS

The results of the groundwater sampling and analyses will be due to the ACOE project manager within 30 days after the analytical data have been received by the reporting party.

The final report will include, as a minimum:

1. Monitor well location map;
2. Well construction details;
3. Potentiometric surface map of the uppermost aquifer below each monitored area;
4. Results of chemical analyses;
5. Results of Cochran's Approximation to the Behren's-Fisher Student's T-Test as described in 40 CFR Part 264, Appendix IV; and
6. Results of comparison between well data and Ambient groundwater quality criteria.

The report shall indicate which parameters, if any, exhibit statistical changes or do not meet groundwater quality requirements and a brief discussion of the results.

3.3 CORRECTIVE ACTION PROGRAM

Statistically significant changes for individual parameters do not necessarily indicate contamination problems at any site. Groundwater quality fluctuations often occur in response to changes of the potentiometric surface between periods of extreme groundwater fluctuations. Background data obtained during the first four calendar quarters of monitoring will be used to determine an annual range of concentrations observed in wells at the site. Subsequent analyses will be compared with the background and other previously obtained data to determine if statistically significant changes had occurred.

The monitoring report sent to the ACOE project manager will include an analysis of statistically significant changes detected at the site and levels of constituents found above maximum levels as indicated in the permit. A recommendation of whether a replicate round of sampling will be necessary will be included in the report. If it is determined that replicate samples should be obtained to verify the previous results, the specific parameters to be analyzed will be based upon only those parameters exhibiting statistically significant changes.

Within seven days of assessment of a statistically significant change or elevated constituent levels, a written report of the assessment will be sent to the Fort Stewart Department of Environmental Health. If the supplemental analytical results verify the existence of contamination in the monitoring zone, the appropriate remedial action will be taken.

REFERENCES

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APPENDIX A

to

Groundwater Monitoring Plan - Appendix B to Closure Plan

HUNTER AAF--SOIL BORING LOGS, SOIL SAMPLING LOGS, MONITOR WELL CONSTRUCTION, AND MONITOR WELL DEVELOPMENT AND GROUNDWATER SAMPLING LOGS

ATTACHMENT A

SOIL BORING AND MONITOR WELL LOGS

Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HSB-01

Sheet No.
1 of 1

Client:	U.S. Army Corps of Engineers	Boring Started:	2/12/90
Project Number:	3902018	Boring Completed:	2/12/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	N/A
Driller:	M. Barton	Well Casing Diameter:	N/A
Logged By:	T. Trent	Surface Elevation:	N/A
Drilling Method:	CME Continuous Sampler	Elevation Datum:	N/A
Boring Location:	97' North of Northwest Corner of Pit	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. Len Core	Sample Rec. Core Rec.	Sample Blows "N" % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 / PL ❙ LL ❙ 20 40 60 80
		CS	5'	5'			▥	(SM) SAND, silty, medium to coarse grained, black, with trace organics, wet (PID = 0)	
							▥	3 ft - fine grained, light brown (PID = 0)	
	5	CS	5'	5'			▥	5 ft - gray, saturated (PID = 0)	
							▨	(SC) SAND, clayey, gray and reddish-brown	
							░	(SP) SAND, poorly graded, fine to medium grained, light brown, saturated (PID = 0)	
	10							BORING TERMINATED AT 10.0 FT BGS	

CS = CME® Continuous Sampler
∇ = Water Level Encountered During Drilling ▼ = Water Level After Well Development

LL = Liquid Limit
PL = Plastic Limit

HunTer/ESE

Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HSB-02

Sheet No.
1 of 1

Client:	U.S. Army Corps of Engineers	Boring Started:	2/13/90
Project Number:	3902018	Boring Completed:	2/13/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	N/A
Driller:	M. Barton	Well Casing Diameter:	N/A
Logged By:	T. Trent	Surface Elevation:	N/A
Drilling Method:	CME Continuous Sampler	Elevation Datum:	N/A
Boring Location:	42' Southwest of Northwest Corner of Pit	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. / Len Core	Sample Rec. / Core Rec.	Sample Blows "N" / % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 / PL ǀ LL ǀ 20 40 60 80
	0	CS	5'	5'				(SM) SAND, silty, fine to medium grained, brown, moist (PID = 50 - 100) 2 ft - black (PID = 500) 4 ft - light brown and gray, wet	
	5	CS	5'	5'				(SW) SAND, well graded, fine to coarse grained, gray and white, saturated (PID = 360) 8 ft - light gray (PID = 240)	
	10							BORING TERMINATED AT 10.0 FT BGS	

CS = CME® Continuous Sampler
∇ = Water Level Encountered During Drilling
▼ = Water Level After Well Development
LL = Liquid Limit
PL = Plastic Limit

Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HSB-03

Sheet No. 1 of 1

Client:	U.S. Army Corps of Engineers	Boring Started:	2/13/90
Project Number:	3902018	Boring Completed:	2/13/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	N/A
Driller:	M. Barton	Well Casing Diameter:	N/A
Logged By:	T. Trent	Surface Elevation:	N/A
Drilling Method:	CME Continuous Sampler	Elevation Datum:	N/A
Boring Location:	75' West Northwest of Southwest Corner of Pit	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. Len Core	Sample Rec. Core Rec.	Sample Blows "N" % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 / PL ❙ LL ❙ 20 40 60 80
		CS	5'	5'				(SM) SAND, silty, fine to medium grained, black and brown, with little organics, moist (PID = 0)	
								3 ft - fine to coarse grained, light gray and brown, wet	
								4 ft - gray and black, wet (PID = 0)	
	5	CS	5'	5'				5 ft - black	
								(SP) SAND, poorly graded, coarse grained, light gray, saturated (PID = 186)	
								8 ft - light gray and brown (PID = 84)	
	10							BORING TERMINATED AT 10.0 FT BGS	

CS = CME® Continuous Sampler

∇ = Water Level Encountered During Drilling   ▼ = Water Level After Well Development

LL = Liquid Limit
PL = Plastic Limit

Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HSB-04

Sheet No.
1 of 1

Client:	U.S. Army Corps of Engineers
Project Number:	3902018
Drilling Contractor:	Layne Environmental, Inc.
Driller:	M. Barton
Logged By:	T. Trent
Drilling Method:	CME Continuous Sampler
Boring Location:	122' Southwest of Southwest Corner of Pit

Boring Started:	2/13/90
Boring Completed:	2/13/90
Boring Diameter:	N/A
Well Casing Diameter:	N/A
Surface Elevation:	N/A
Elevation Datum:	N/A
Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. / Len Core	Sample Rec. / Core Rec.	Sample Blows "N" / % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 / PL ǀ LL ǀ 20 40 60 80
		CS	5'	5'			▨	(SC) SAND, clayey, fine to medium grained, red and brown, moist (PID = 4)	
								(SM) SAND, silty, fine to medium grained, black and gray, wet (PID = 166)	
	5	CS	5'	5'				5 ft - fine to coarse grained, saturated (PID = 61)	
								(PID = 53)	
	10							BORING TERMINATED AT 10.0 FT BGS	

CS = CME ® Continuous Sampler

∇ = Water Level Encountered During Drilling

▼ = Water Level After Well Development

LL = Liquid Limit
PL = Plastic Limit

Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HSB-05

Sheet No. 1 of 1

Client:	U.S. Army Corps of Engineers	Boring Started:	2/13/90
Project Number:	3902018	Boring Completed:	2/13/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	N/A
Driller:	M. Barton	Well Casing Diameter:	N/A
Logged By:	T. Trent	Surface Elevation:	N/A
Drilling Method:	CME Continuous Sampler	Elevation Datum:	N/A
Boring Location:	34' Southwest of Southeast Corner of Pit	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. / Len Core	Sample Rec. / Core Rec.	Sample Blows "N" / % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 / PL | LL | 20 40 60 80
		CS	5'	5'				(SM) SAND, silty, fine to medium grained, brown, with trace organics, moist (PID = 0)	
								2 ft - gray and black, wet (PID = 5)	
	5	CS	5'	5'				5 ft - fine to coarse grained, saturated (PID = 25)	
								8 ft - brown (PID = 20)	
	10							BORING TERMINATED AT 10.0 FT BGS	

CS = CME® Continuous Sampler

$\underline{\nabla}$ = Water Level Encountered During Drilling $\underline{\blacktriangledown}$ = Water Level After Well Development

LL = Liquid Limit
PL = Plastic Limit

Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HSB-06

Sheet No.
1 of 1

Client:	U.S. Army Corps of Engineers	Boring Started:	2/13/90
Project Number:	3902018	Boring Completed:	2/13/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	N/A
Driller:	M. Barton	Well Casing Diameter:	N/A
Logged By:	T. Trent	Surface Elevation:	N/A
Drilling Method:	CME Continuous Sampler	Elevation Datum:	N/A
Boring Location:	75' Southwest of Southeast Corner of Pit	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. / Len Core	Sample Rec. / Core Rec.	Sample Blows "N" / % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 / PL | LL | 20 40 60 80
		CS	5'	5'			▨	(SC) SAND, clayey, fine to medium grained, reddish-brown, moist (PID = 4)	
								(SM) SAND, silty, fine to coarse grained, gray and black, wet (PID = 31)	
	5	CS	5'	5'				5 ft - white and brown, saturated (PID = 27)	
								(PID = 36)	
	10							BORING TERMINATED AT 10.0 FT BGS	

CS = CME® Continuous Sampler
⊻ = Water Level Encountered During Drilling ⊻ = Water Level After Well Development
LL = Liquid Limit
PL = Plastic Limit

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Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HMW-03

Sheet No.
1 of 2

Client:	U.S. Army Corps of Engineers	Boring Started:	2/8/90
Project Number:	3902018	Boring Completed:	2/9/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	10 inch
Driller:	M. Barton	Well Casing Diameter:	2 inch
Logged By:	T. Trent	Surface Elevation:	26.6 ft
Drilling Method:	Hollow-Stem Auger	Elevation Datum:	NGVD
Boring Location:	N734719.69 E816011.23	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. Len Core	Sample Rec. Core Rec.	Sample Blows "N" % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 / PL | LL | 20 40 60 80
		SS	1.5	1.5	2-3-5			(SM) SAND,silty, fine grained, with organics, black, loose, moist (PID=0)	
25									
	5	SS	1.5	0.8	1-3-3			5 ft - fine to medium grained, black and gray (PID=0)	
20									
	10	SS	1.5	1.1	4-5-4			9 ft - light brown and black (PID=0)	×
15									
	15	SS	1.5	0.8	3-4-7			14 ft - gray, black, and brown, medium dense, saturated (PID=0)	
10									
	20	SS	1.5	1.1	0-4-6			19 ft - medium to coarse grained, gray (PID=0)	
5									
	25	SS	1.5		3-4-3			24 ft - loose, moist (PID=0)	
0									
	30	SS	1.5		3-3-3			29 ft - wet (PID=0)	
-5									
		SS	1.5		3-4-4			(SP) SAND, poorly graded, fine to medium grained,	

SS = Splitspoon
⊻ = Water Level Encountered During Drilling
⊻ = Water Level After Well Development
LL = Liquid Limit
PL = Plastic Limit

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Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HMW-03

Sheet No.
2 of 2

Client:	U.S. Army Corps of Engineers	Boring Started:	2/8/90
Project Number:	3902018	Boring Completed:	2/9/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	10 inch
Driller:	M. Barton	Well Casing Diameter:	2 inch
Logged By:	T. Trent	Surface Elevation:	26.6 ft
Drilling Method:	Hollow-Stem Auger	Elevation Datum:	NGVD
Boring Location:	N734719.69 E816011.23	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. Len Core	Sample Rec. Core Rec.	Sample Blows "N" % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 PL I LL I 20 40 60 80
								loose, wet (PID=0)	
-10									
		SS	1.5		2-4-9			39 ft - medium dense	×
	40								
-15									
		SS	1.5						
	45								
-20									
	50							BORING TERMINATED AT 50.0 FT BGS	

SS = Splitspoon
∇ = Water Level Encountered During Drilling
▼ = Water Level After Well Development

LL = Liquid Limit
PL = Plastic Limit

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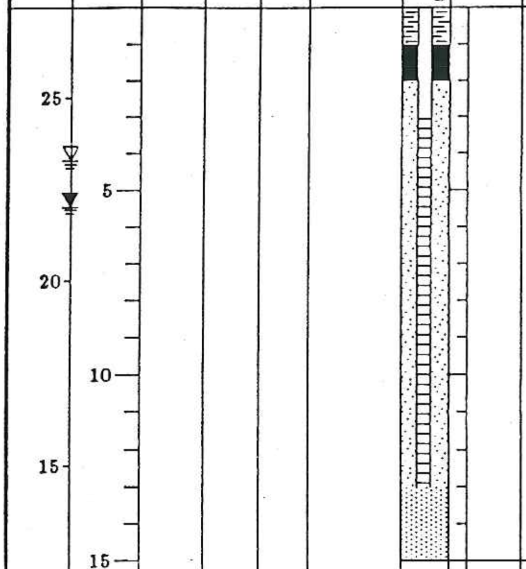
Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HMW-04

Sheet No.
1 of 1

Client:	U.S. Army Corps of Engineers	Boring Started:	2/12/90
Project Number:	3902018	Boring Completed:	2/12/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	10 inch
Driller:	M. Barton	Well Casing Diameter:	2 inch
Logged By:	T. Trent	Surface Elevation:	27.2 ft
Drilling Method:	Hollow-Stem Auger	Elevation Datum:	NGVD
Boring Location:	N734718.92 E816017.56	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. / Len Core	Sample Rec. / Core Rec.	Sample Blows "N" / % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 / PL | LL | 20 40 60 80
								NO SAMPLES COLLECTED	
	15							BORING TERMINATED AT 15.0 FT BGS	



SS = Splitspoon
▽ = Water Level Encountered During Drilling ▼ = Water Level After Well Development
LL = Liquid Limit
PL = Plastic Limit

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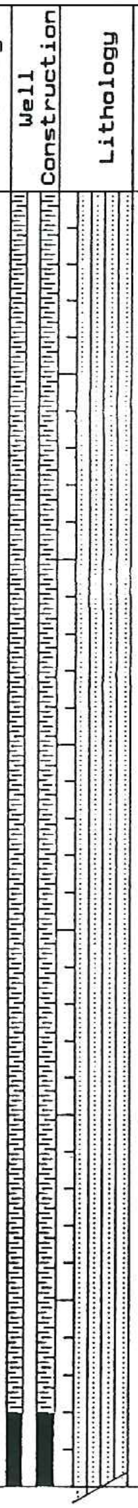
Hunter AAF, Fire Training Area
Fort Stewart, GA

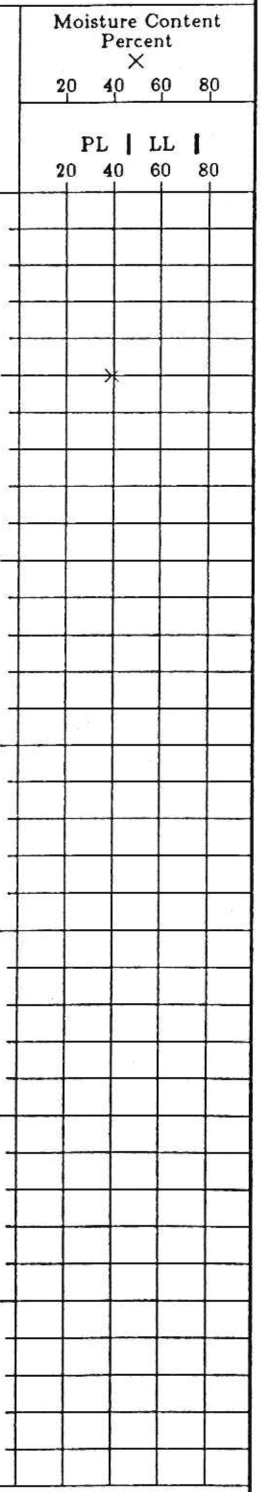
Log of Boring No. HMW-05

Sheet No. 1 of 2

Client:	U.S. Army Corps of Engineers	Boring Started:	2/11/90
Project Number:	3902018	Boring Completed:	2/11/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	10 inch
Driller:	M. Barton	Well Casing Diameter:	2 inch
Logged By:	T. Trent	Surface Elevation:	28.8 ft
Drilling Method:	Hollow-Stem Auger	Elevation Datum:	NGVD
Boring Location:	N734495.13 E816073.98	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. Len Core	Sample Rec. Core Rec.	Sample Blows "N" / % Core Recovery	MATERIAL DESCRIPTION
		SS	1.5		3-5-8	(SM) SAND, silty, fine grained, with some organics, black, medium dense, moist (PID=0)
25						
	5	SS	1.5	1.1	5-8-9	5 ft - medium to coarse grained, light gray, wet (PID=1)
20						
	10	SS	1.5	0.8	2-2-3	10 ft - fine to medium grained, light brown, loose, saturated (PID=2)
15						
	15	SS	1.5		2-3-0	
10						
	20	SS	1.5	0.8	1-2-7	20 ft - gray (PID=1)
5						
	25	SS	1.5		5-4-3	25 ft - (PID=0)
0						
	30	SS	1.5		2-3-5	30 ft - (PID=0)
-5						





SS = Splitspoon
⊻ = Water Level Encountered During Drilling
⊻ = Water Level After Well Development
LL = Liquid Limit
PL = Plastic Limit

HunTER/ESE

Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HMW-05

Sheet No.
2 of 2

Client:	U.S. Army Corps of Engineers	Boring Started:	2/11/90
Project Number:	3902018	Boring Completed:	2/11/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	10 inch
Driller:	M. Barton	Well Casing Diameter:	2 inch
Logged By:	T. Trent	Surface Elevation:	28.8 ft
Drilling Method:	Hollow-Stem Auger	Elevation Datum:	NGVD
Boring Location:	N734495.13 E816073.98	Type of Drill Rig:	Mobile B-57

Elevation	Depth	Samp. Type and Diam.	Samp. Adv. Len Core	Sample Rec. Core Rec.	Sample Blows "N" % Core Recovery	Well Construction	Lithology	MATERIAL DESCRIPTION	Moisture Content Percent × 20 40 60 80 / PL ❙ LL ❙ 20 40 60 80
		SS	1.5	1.5	2-2-7			(SP) SAND, poorly graded, fine to medium grained, gray, loose, saturated (PID=0)	
-10	40	SS	1.5	1.1	3-5-9			40 ft - medium dense (PID=0)	×
-15	45	SS	1.5		3-3-5			45 ft - loose (PID=0)	
-20	50							BORING TERMINATED AT 50.0 FT BGS	

SS = Splitspoon
$\underline{\nabla}$ = Water Level Encountered During Drilling
$\underline{\blacktriangledown}$ = Water Level After Well Development
LL = Liquid Limit
PL = Plastic Limit

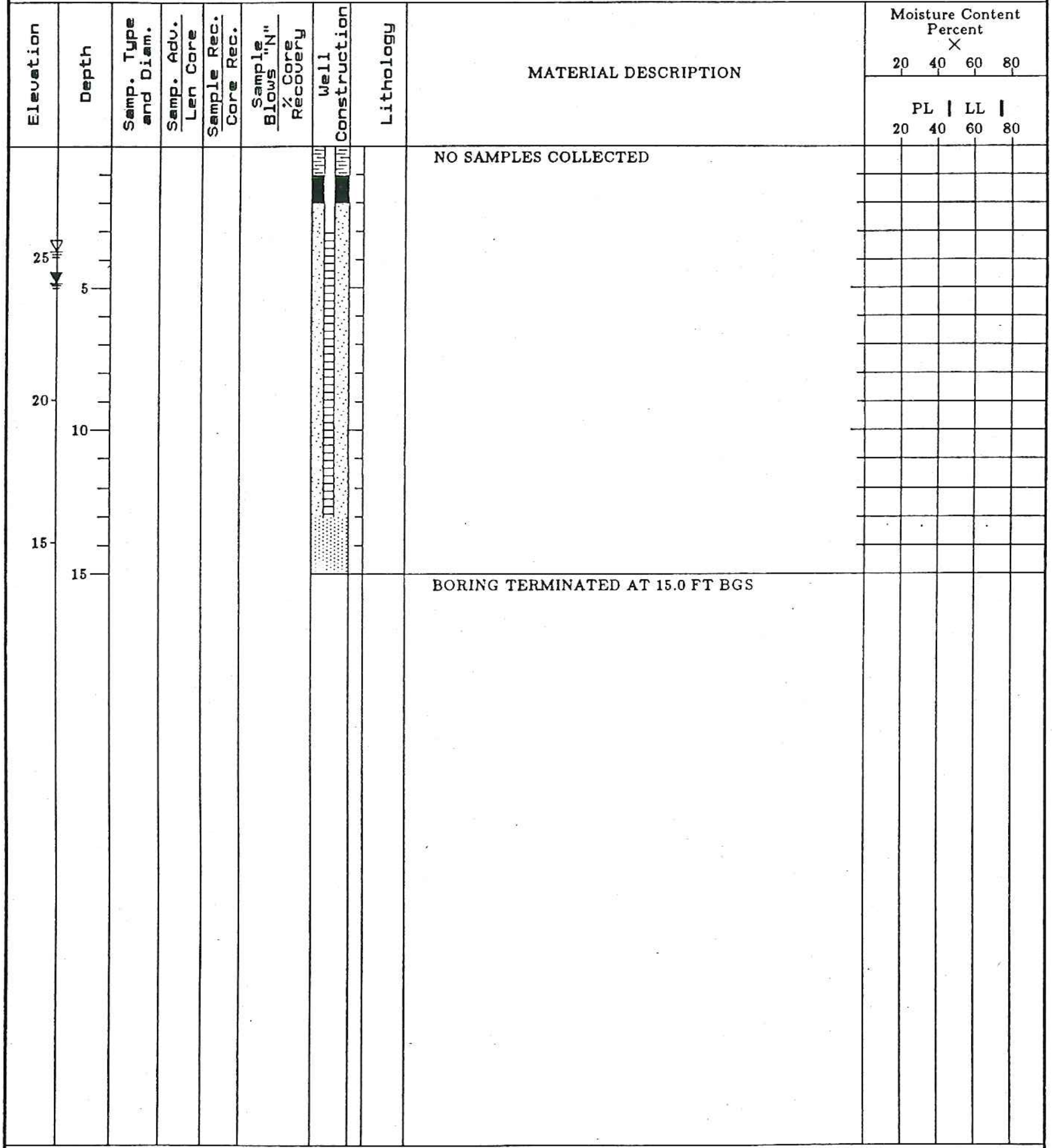
HunTER/ESE

Hunter AAF, Fire Training Area
Fort Stewart, GA

Log of Boring No. HMW-06

Sheet No.
1 of 1

Client:	U.S. Army Corps of Engineers	Boring Started:	2/12/90
Project Number:	3902018	Boring Completed:	2/12/90
Drilling Contractor:	Layne Environmental, Inc.	Boring Diameter:	10 inch
Driller:	M. Barton	Well Casing Diameter:	2 inch
Logged By:	T. Trent	Surface Elevation:	28.3 ft
Drilling Method:	Hollow-Stem Auger	Elevation Datum:	NGVD
Boring Location:	N734497.93 E816067.08	Type of Drill Rig:	Mobile B-57



NO SAMPLES COLLECTED

BORING TERMINATED AT 15.0 FT BGS

SS = Splitspoon
∇ = Water Level Encountered During Drilling
▼ = Water Level After Well Development

LL = Liquid Limit
PL = Plastic Limit

ATTACHMENT B

SOIL SAMPLING LOGS

DATA FORM
SOIL SAMPLING

Project: FT. STEWART - HUNTER AAF Date: 2-12-90

Station I.D.: HSB-1 Time: 1705

Sample No.: 1

Approximate Ground Surface Elevation : 35.7' N.G.V.D.

Depth of Sample: 8-10'

Sampling Method: CME CONTINUOUS SAMPLER

Sample Description: LT. BROWN SAND, FINE TO MEDIUM GRAINED, SATURATED

Miscellaneous Observations:

Fractions: SS, SV
VOLATILES & PAH's
(A Key to Fractions is provided on the last page of this Attachment)

Signed Date 2-12-90

DATA FORM
SOIL SAMPLING

Project: FT. STEWART - HUNTER AAF Date: 2-13-90
Station I.D.: HSB-2 Time: 0745
Sample No.: 2
Approximate Ground Surface Elevation : 29' N.G.V.D.
Depth of Sample: 3-5
Sampling Method: CME CONTINUOUS SAMPER

Sample Description: SAND, LT. BROWN, GREY, WET, FINE TO MEDIUM GRAINED

Miscellaneous Observations:

Fractions: SS, SV
VOLATILES & PAH's

Signed Date 2-13-90

DATA FORM
SOIL SAMPLING

Project: FT. STEWART - HUNTER AAF Date: 2-13-90
Station I.D.: HSR-3 Time: 0835
Sample No.: 3
Approximate Ground Surface Elevation : 28' N.G.V.D
Depth of Sample: 6-8
Sampling Method: CME CONTINUOUS SAMPLER

Sample Description: SAND, LT. GREY, COARSE GRAINED, SATURATED, SP

Miscellaneous Observations:

Fractions: SS, SV
VOLATILES, PAH'S

Signed Date 2-13-90

DATA FORM
SOIL SAMPLING

Project: FT. STEWART - HUNTER AAF Date: 2-13-90
Station I.D.: HSB-4 Time: 0935
Sample No.: 4
Approximate Ground Surface Elevation : 27' N.G.V.D.
Depth of Sample: 2-4'
Sampling Method: CME CONTINUOUS SAMPLER

Sample Description: SAND, FINE TO MEDIUM GRAINED, BLACK, GREY, WET, SP

Miscellaneous Observations:

Fractions: SS, SV
VOLATILES, PAH'S

Signed Date 2-13-90

DATA FORM
SOIL SAMPLING

Project: FT. STEWART-HUNTER AAF   Date: 2-13-90

Station I.D.: SB-5   Time: 1135

Sample No.: 5

Approximate Ground Surface Elevation : 29.5' N.G.V.D.

Depth of Sample: 5-8'

Sampling Method: CME CONTINUOUS SAMPLER

Sample Description: SAND, FINE TO COARSE GRAINED, SATURATED
BLACK, GREY, SW

Miscellaneous Observations:

Fractions: SS, SV
VOLATILES, PAH'S

Signed   Date 2-13-90

WRD2144.1/TOBY.1
10/01/87

DATA FORM
SOIL SAMPLING

Project: Ft. STEWART - HUNTER AAF Date: 2-13-90

Station I.D.: SB-6 Time: 1245

Sample No.: 6

Approximate Ground Surface Elevation : 30' N.G.V.D.

Depth of Sample: 8-10'

Sampling Method: CME CONTINUOUS SAMPLER

Sample Description: SAND, WHITE, BROWN, FINE TO COARSE GRAINED, SATURATED, SW

Miscellaneous Observations:

Fractions: SS, SV

VOLATILES, PAH'S

Signed Date 2-13-90

DATA FORM
SOIL SAMPLING

Project: FT. STEWART - HUNTER AAF
Date: 2-13-90
Station I.D.: TRIP BLANK
Time: 1200
Sample No.:
Approximate Ground Surface Elevation : NA
Depth of Sample: N/A
Sampling Method:

Sample Description: 3 40ml BOTTLES, DI WATER

Miscellaneous Observations:

Fractions: V, V, V

VOLATILES

Signed
Date 2-13-90

ESE KEY TO FRACTION CODES 3/90

	CODE	PRESERVATIVE	CONTAINER	ANALYSIS TYPE	HOLDING TIMES
AIR:	AA	4-Deg-C	Various	Various	Various
	AO	Exclude Light	Sorbent	Organic	14 Days
	AV	Exclude Light	Charcoal	Volatiles	14 Days
	FL	Keep Upright	Cassette	Various	Various
SOILS:	SS	4-Deg-C	G, 500 mL	All excl. Vol.	7-28 Days
	SV	4-Deg-C	G, 60 mL	Volatiles	7-14 Days
WATER:	AL	4-Deg-C(T)	G,2x60 mL*	Aldicarb	14 Days
	B	4-Deg-C;NaOH,pH>12	P, 1-4 L	Cyanides	14 Days
	C	4-Deg-C	P, 1-4 L	Var.Inorganic	1-28 Days
	CL	4-Deg-C	G, 1-4 L	Chlorophyll	1 Day
		(Pref'd Filtered & Frozen at <0-Deg-C)			
	EC	4-Deg-C(T)g	G, 1 L	Chlor'd Pests	7 Days
	ED	4-Deg-C(T)	G,2x60 mL*	EDB, DBCP	14 Days
	F	-	P, 4 L	Collection prior to Field Filtering	
	FI	4-Deg-C(T)	G, 1 L	GC/FI Organic	7 Days
	FM	Formaldehyde	P/G,500mL	"Quats"	28 Days
	FP	4-Deg-C(T)	G,3x60 mL*	GC/FP Organic	14 Days
	H	Zn-Acet;NaOH,pH>10	P, 1 L	Sulfides	7 Days
	HB	4-Deg-C(T)	G, 1 L	Chlor'd Herbs	7 Days
	LC	4-Deg-C	G, 1 L	HPLC Organics	7 Days
	M	4-Deg-C(T)	P, 250 mL	Bacteriologic	1 Day
	MS	4-Deg-C(T)	G, 1 L	GCMS Extr.Org.	7 Days
	N	HNO_3,pH<2	P, 1 L	Metals (Total)	180 Days
				Mercury (Total)	28 Days
	NF	HNO_3,pH<2	P, 1 L	Metals (Dissolved)	180 Days
				Mercury (Dissolved)	28 Days
	NC	4-Deg-C	G, 1 L	Nitrocellulose	7 Days
	NP	4-Deg-C	G, 1 L	GC/NP Organic	7 Days
	O	4-Deg-C;H_2SO_4,pH<2	G, 1 L	Oil&Grease, TRPH	28 Days
	OD	4-Deg-C	G, 1 L	Odor	2 Days
	R	HNO_3,pH<2	P, 1-4 L	Radionuclides	180 Days
	S	4-Deg-C;H_2SO_4,pH<2	P, 1 L	Nutrients	28 Days
	(UP)	4-Deg-C(T)	G, 1 L	Pest(Antiq'd)	7 Days
	V	4-Deg-C(T)	G,3x60 mL*	Halogen, Vols	14 Days
	VP	4-Deg-C;HCL,pH<2(T)	G,3x60 mL*	Aromatic Vols	14 Days
	(W)	4-Deg-C(T)	G, 1 L	Orgs, FPD Extr's	7 Days
	X	4-Deg-C(S)	G,2x250mL*	TOX(USATHAMA)	7 Days
	XP	4-Deg-C;H_2SO_4,pH<2(S)	G,2x250mL*	TOX	7 Days
	Z	4-Deg-C;H_2SO_4,pH<2	G, 1 L	Total Phenols	28 Days
OTHER:	OL	None	G,10-100mL	Organic-Oil	14 Days
	TS	-20-Deg-C	Various	Frozen Tissue	Various

FOOTNOTES: (T) - Add Sodium Thiosulfate ($Na_2S_2O_3$) If Res.Cl Present (0.25g/L)
(S) - Add Sodium Sulfite (Na_2SO_3) If Res.Cl Present (0.1M, 1 mL/L).
* - Volatiles Bottles (VOAs) With Teflon-Lined Rubber Septa.

INSTRUCTIONS FOR SAMPLING AND SHIPPING

- -Plastic (P) Containers May Be Rinsed With Sample; Do Not rinse Glass (G)
- -Fill Completely, Especially For Volatiles (Fill These Slowly; Achieve Positive Meniscus; Cap; Invert; Check for Air Bubbles; Top Off If Needed.
- -Preserve With Reagents Provided As Instructed Above (VP's Are Pre-Preserved)
- -Fill-out Logsheet/Chain-of-Custody. Indicate: Sample Number (*) and Fractions Collected; Dates/Times of Collection & Shipment; Appropriate Field Notes; Be Sure To Sign Bottom of Each Page Where and As Indicated.
- -Ship With Bagged Ice in Ice-chest By Express Carrier To Lab Coordinator's Attention.

Source: ESE, 1990.

File: JMH01\Fraction.Key

ATTACHMENT C
MONITOR WELL CONSTRUCTION LOGS

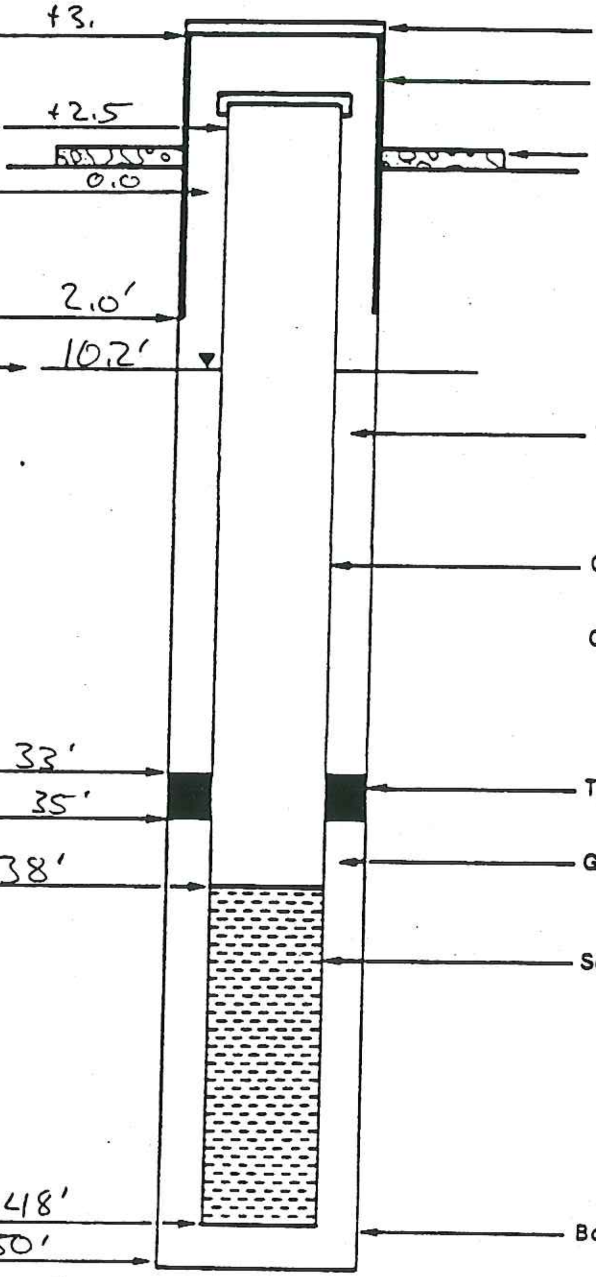
AAAP 10/4/85

MONITOR WELL CONSTRUCTION

Logged By: Tom Trent
Drilling Contractor: Layne Environmental
Driller's Name: Mark Barton
Well Number: HMW-1
Client: Army Corps of Engineers
Location: Ft Stewart - Hunter AAF
Job Number: 3902018
Date/Time: Start 2-7-90/1515 Finish 2-7-90/1830

Comments (Lost circulation interval, Water level changes, Hole collapse interval, etc.):
Complete Grout : 1830 , 2-7
Begin Development : 1600 , 2-12
Elapsed Time : 117.5
Method of Development : Pumping
Total Volume of Water Extracted : 60 gal.

Depths in Reference to Ground Level



Top of Protective Casing +3.
Top of Well Casing +2.5
Top of Cement 0.0
Bottom of Protective Casing 2.0'
Ground Water 10.2'
Top of Bentonite Seal 33'
Top of Gravel Pack 35'
Top of Screen 38'
Bottom of Screen 48'
Total Depth of Bore Hole 50'

Locking Cap
Protective Pipe Type, Diameter Steel 4x4
Cement/Gravel Pad , Height = 4"
Extends 2" into borehole
Type of Grout Lonestar Portland Cement w/Bentonite Type I
Casing:
Type PVC Schedule 40
Diameter 2"
Couplings:
Type Threaded Flush-Joint
Number 4
Depths 38, 28, 18, 8
Type of Plug Enviroplug Bentonite
Gravel Pack:
Material Sand 20/30 mesh
Placed with 2" PVC Tremie
Screen:
Type PVC Schedule 40
Diameter 2"
Length 10'
Slot Size 0.010
Bore Hole Diameter 10 1/4"

NOT TO SCALE

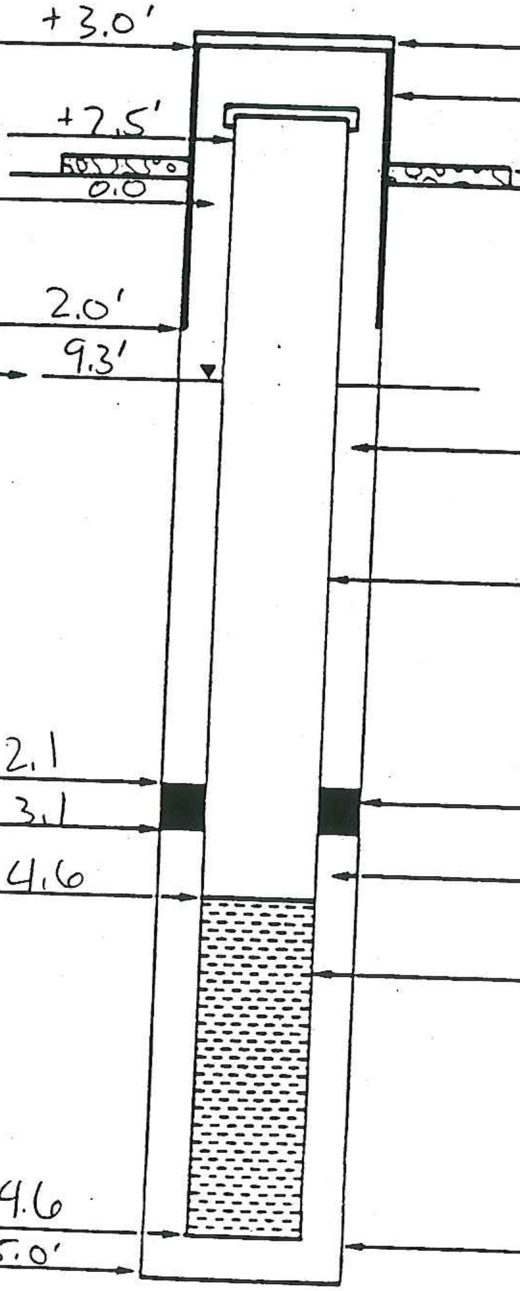
AAAP 10/4/85

MONITOR WELL CONSTRUCTION

Logged By: T. TRENT
Drilling Contractor: LAYNE ENVIRONMENTAL
Driller's Name: ~~Jim~~ MARK BARTON
Well Number: HMW-2
Client: ARMY CORPS OF ENGINEERS
Location: FT. STEWART - HUNTER AAF
Job Number: 3902018
Date/Time: Start 1600/2-9-90 Finish 1820/2-9-90

Comments (Lost circulation interval, Water level changes, Hole collapse interval, etc.):
Complete Grout : 1820, 2-9
Begin Development: 740, 2-13
Elapsed Time : 85.3 hrs.
Method of Development : Pumping
Total Volume of Water Extracted : 115 gal.

Depths in Reference to Ground Level



Top of Protective Casing +3.0'
Top of Well Casing +2.5'
Top of Cement 0.0
Bottom of Protective Casing 2.0'
Ground Water 9.3'
Top of Bentonite Seal 2.1
Top of Gravel Pack 3.1
Top of Screen 4.6
Bottom of Screen 14.6
Total Depth of Bore Hole 15.0'

Locking Cap
Protective Pipe Type, Diameter STEEL, 4"X4"
Cement/Gravel Pad, Height = 4" Extends 2" into borehole.
Type of Grout LONESTAR PORTLAND TYPE I CEMENT w/ BENTONITE POWDER

Casing:
Type PVC SCHEDULE 40
Diameter 2" I.D.

Couplings:
Type THREADED, FLUSH JOINT
Number 1
Depths 5

Type of Plug BENTONITE

Gravel Pack:
Material SAND 20/30 MESH
Placed with 2" PVC Tremie

Screen:
Type PVC SCHEDULE 40
Diameter 2"
Length 10'
Slot Size 0.010

Bore Hole Diameter 10 1/4"

NOT TO SCALE

AAAP 10/4/85

MONITOR WELL CONSTRUCTION

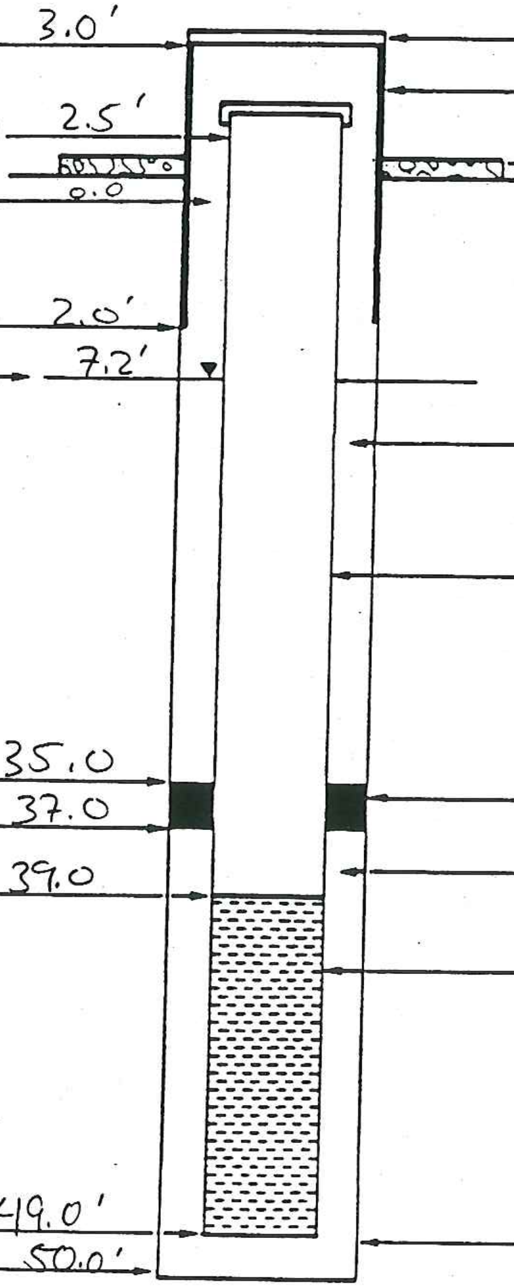
Logged By: TORENT
Drilling Contractor: LAYNE ENVIRONMENTAL
Driller's Name: MARL BARTON
Well Number: H MW-3
Client: ARMY CORPS OF ENGINEERS
Location: FT. STEWART - HUNTER AAF
Job Number: 3902018
Date/Time: Start 2-10-90/1200 Finish 2-10-90/1630

Comments (Lost circulation interval, Water level changes, Hole collapse interval, etc.):

Complete Grout : 1630, 2-10
Begin Development : 1300, 2-13
Elapsed time : 68.5 hr

Method of Development : Pumping
Total Volume of Water Extracted : 260gal.

Depths in Reference to Ground Level



Top of Protective Casing 3.0'
Top of Well Casing 2.5'
Top of Cement 0.0
Bottom of Protective Casing 2.0'
Ground Water 7.2'
Top of Bentonite Seal 35.0
Top of Gravel Pack 37.0
Top of Screen 39.0
Bottom of Screen 49.0'
Total Depth of Bore Hole 50.0'

Locking Cap
Protective Pipe Type, Diameter STEEL, 4"X4"
Cement/Gravel Pad, Height = 4" Extends 2" into borehole
Type of Grout LONESTAR PORTLAND TYPE I CEMENT W/ BENTONITE POWDER

Casing:
Type PVC
Diameter 2"

Couplings:
Type THREADED, FLUSH JOINT
Number
Depths 9, 19, 29, 39, 49

Type of Plug ENVIROPLUG BENTONITE

Gravel Pack:
Material SAND 20/30 MESH

Screen:
Type PVC
Diameter 2"
Length 10.0'
Slot Size 0.010

Bore Hole Diameter 10¼

NOT TO SCALE

AAAP 10/4/85

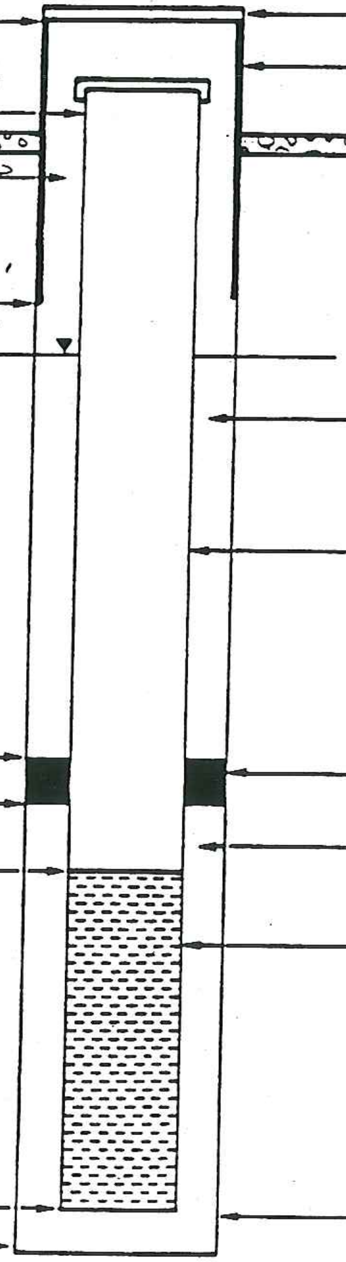
MONITOR WELL CONSTRUCTION

Logged By: T. TRENT
Drilling Contractor: LAYNE ENVIRONMENTAL
Driller's Name: MARK BARTON
Well Number: HMW-4

Client: ARMY CORPS OF ENGINEERS
Location: FT. STEWART - HUNTER AAF
Job Number: 3902018
Date/Time: Start 2-12-90/1430 Finish 2-12-90/1530

Comments (Lost circulation interval, Water level changes, Hole collapse interval, etc.):
Complete Grout : 1530, 2:12
Begin Well Development : 1500, 2-13
Elapsed Time : 23.5 hr.
Method of Development : Pumping
Total Volume of Water Extracted : 150 gal

Depths in Reference
to Ground Level



Top of Protective Casing +3.0'
Top of Well Casing +2.5'
Top of Cement 0.0
Bottom of Protective Casing 2.0'
Ground Water 4.2'
Top of Bentonite Seal 1.0'
Top of Gravel Pack 2.0'
Top of Screen 3.0'
Bottom of Screen 13.0'
Total Depth of Bore Hole 15.0'

Locking Cap
Protective Pipe Type, Diameter STEEL, 4X4
Cement/Gravel Pad, Height, 4"
Extends 2" into borehole
Type of Grout LONESTAR PORTLAND TYPE I CEMENT W/ BENTONITE POWDER

Casing:
Type PVC
Diameter 2"

Couplings:
Type THREADED, FLUSH JOINT
Number 1
Depths 3

Type of Plug ENVIROPLUG BENTONITE

Gravel Pack:
Material SAND 20/30 MESH
Placed with 2" PVC Tremie

Screen:
Type PVC
Diameter 2"
Length 10'
Slot Size 0.010"

Bore Hole Diameter 10 1/4

NOT TO SCALE

AAAP 10/4/85

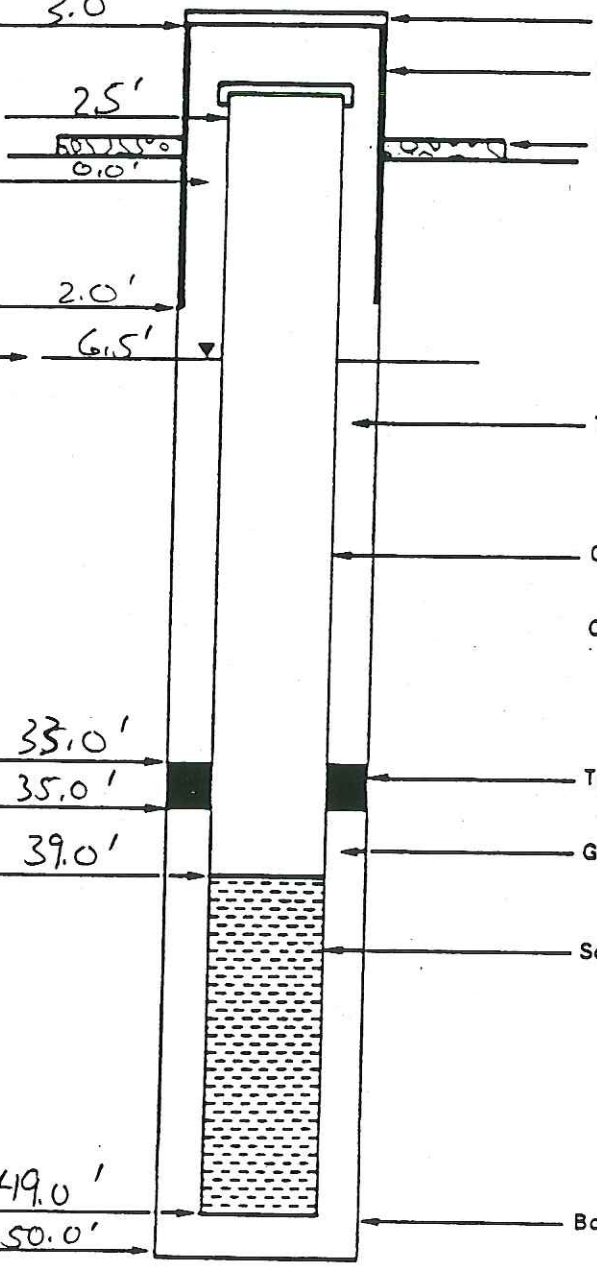
MONITOR WELL CONSTRUCTION

Logged By: I. TRENT
Drilling Contractor: LAYNE ENVIRONMENTAL
Driller's Name: MARK BARTON
Well Number: A MW-5

Client: ARMY CORPS OF ENGINEERS
Location: FT. STEWART - HUNTER AAF
Job Number: 3902018
Date/Time: Start 2-11-90/1530 Finish 2-11-90/1800

Comments (Lost circulation interval, Water level changes, Hole collapse interval, etc.):
Complete Grout : 1800, 2-11
Begin Well Development : 0950, 2-13
Elapsed Time : 39.8 hr.
Method of Development : Pumping
Total Volume of Water Extracted : 220 gal.

Depths in Reference to Ground Level



Top of Protective Casing 3.0'
Top of Well Casing 2.5'
Top of Cement 0.0'
Bottom of Protective Casing 2.0'
Ground Water 6.5'
Top of Bentonite Seal 33.0'
Top of Gravel Pack 35.0'
Top of Screen 39.0'
Bottom of Screen 49.0'
Total Depth of Bore Hole 50.0'

Locking Cap
Protective Pipe Type, Diameter STEEL, 4"X4"
Cement/Gravel Pad, Height = 4"
Extends 2" into borehole
Type of Grout LONESTAR PORTLAND TYPE I CEMENT w/ BENTONITE POWDER
Casing:
Type PVC
Diameter 2"
Couplings:
Type THREADED, FLUSH JOINT
Number 9, 19, 29, 39,
Depths 4
Type of Plug ENVIROPLUG BENTONITE
Gravel Pack:
Material SAND 20/30 MESH
Placed with 2" PVC Tremie
Screen:
Type PVC
Diameter 2"
Length 10'
Slot Size 0.010"
Bore Hole Diameter 10¼"

NOT TO SCALE

AAAP 10/4/85

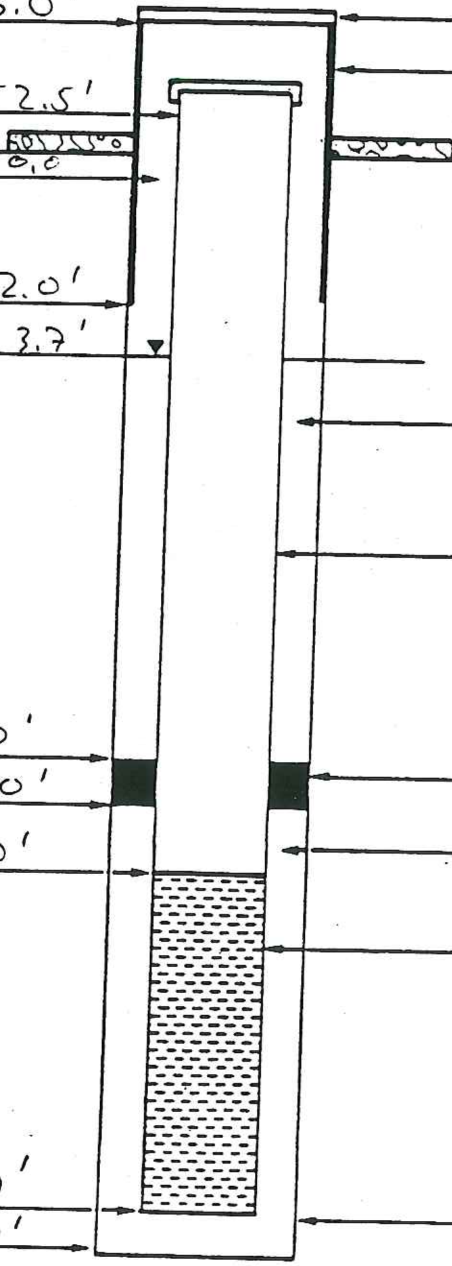
MONITOR WELL CONSTRUCTION

Logged By: T. TRENT
Drilling Contractor: LAYNE ENVIRONMENTAL
Driller's Name: MARK BARTON
Well Number: H MW-6

Client: ARMY CORPS OF ENGINEERS
Location: FT. STEWART - HUNTER AAF
Job Number: 3902018
Date/Time: Start 2-12-90/1315 Finish 2-12-90/1415

Comments (Lost circulation interval, Water level changes, Hole collapse interval, etc.):
Complete Grout : 1415, 2-12
Begin Development : 0915, 2-13
Elapsed Time : 19.0 hr.
Method of Development : Pumping
Total Volome of Water Extracted : 85 gal.

Depths in Reference to Ground Level



Top of Protective Casing +3.0'
Top of Well Casing +2.5'
Top of Cement 0.0
Bottom of Protective Casing 2.0'
Ground Water 3.7'
Top of Bentonite Seal 1.0'
Top of Gravel Pack 2.0'
Top of Screen 3.0'
Bottom of Screen 13.0'
Total Depth of Bore Hole 15.0'

Locking Cap
Protective Pipe Type, Diameter STEEL, 4" x 4"
Cement/Gravel Pad, Height = 4" Extends 2" into borehole
Type of Grout LONESTAR PORTLAND TYPE I CEMENT, w/ BENTONITE POWDER

Casing:
Type PVC
Diameter 2"
Couplings:
Type THREADED, FLUSH JOINT
Number 1
Depths

Type of Plug ENVIROPLUG BENTONITE

Gravel Pack:
Material SAND 20/30 MESH
Placed with 2" PVC Tremie

Screen:
Type PVC
Diameter 2"
Length 10'
Slot Size 0.010"

Bore Hole Diameter 10¼"

NOT TO SCALE

ATTACHMENT D

MONITOR WELL DEVELOPMENT LOGS AND MONITOR WELL SAMPLING LOGS

D-ECSWVOW.2/FIELDFORM.1
10/22/84

MONITOR WELL DEVELOPMENT

Sheet 1 of 9

Site: Hunter AAF   Well Designation: H-MW-1   Installation Date: 2-7-90

Well construction details from boring log:

Total depth (top of casing): 50.5   Screened interval: 40-38   Borehole diameter: 10 1/4"

Water losses during drilling: ______   Fluid purging: ______

Height of well casing (ground surface): ______   Well diameter: 2"

Standing water: Well casing/screen: 47.7

(From Chart) Annulus (volume x 30%): 1.17

Date and time of development: 2-12-90/1600

Method of development (pump/bailer): Pump   Pumping rate: 1/4/~~2~~ gpm

Depth(s) of pumping and elapsed time at each depth: ______

Water level   Before development: 10.2   During: ______   24 HR After: 10.6

Well depth (sounded)   Before: 47.5   After: 48.8

Physical appearance of water (clarity, color, particulates, odor)

Initial: Cloudy, Grey

During development: ______

Final: Clear

Field analysis	Initial	During (2)		Final	
Time	1610	1631	1646	1719	17
Conductivity	280	151	138	128	118
pH	6.45	6.62	6.37	6.27	6.3
Temperature	24.3	23.1	22.5	21.6	21.

Quantity of water removed/time for removal (both incremental and total)

0/1600, 10/1640, 20/1720, 30/1800, 60/2000

Collect a 1-pint sample of last water removed. ______

Comments: ______

Signed   2-12-90
B-1D Date

Approved ______ Date ______

D-ECSWVOW.2/FIELDFORM.1
10/22/84

MONITOR WELL DEVELOPMENT

Sheet 2 of 9

Site: Hunter AAF
Well Designation: H-MW-2
Installation Date: 2-9-90

Well construction details from boring log:

Total depth (top of casing): 17.1
Screened interval: 4.6-14.6
Borehole diameter: 10¼

Water losses during drilling: ______
Fluid purging: ______

Height of well casing (ground surface): ______
Well diameter: 2"

Standing water: Well casing/screen: 5.2

(From Chart) Annulus (volume x 30%): 1.17

Date and time of development: 2-13-90 0740

Method of development (pump/bailer): Pump
Pumping rate: 5 gal/min

Depth(s) of pumping and elapsed time at each depth: ______

Water level Before development: 9.3 During: ______ 24 HR After: 9.3

Well depth (sounded) Before: 14.5 After: ~~16.6~~ 16.15

Physical appearance of water (clarity, color, particulates, odor)

Initial: Grey, Murky
During development: ______
Final: Clear, Few Fine Sediments

Field analysis	Initial	During (2)		Final
Time	0741	0746	0755	0805
Conductivity	27	28	28	28
pH	6.65	6.22	5.98	6.02
Temperature	17.4	19.2	18.6	19.0

Quantity of water removed/time for removal (both incremental and total)

0/0740, 20/746, 65/0755, 115/0805

Collect a 1-pint sample of last water removed. ______

Comments: ______

Thomas D

Signed B-2D Date Approved Date

MONITOR WELL DEVELOPMENT

Sheet 3 of 9

Site: HUNTER AAF   Well Designation: H-MW-3   Installation Date: 2-10-90

Well construction details from boring log:

Total depth (top of casing): 51.5   Screened interval: 390-490   Borehole diameter: 10 1/4

Water losses during drilling: ______   Fluid purging: ______

Height of well casing (ground surface): ______   Well diameter: 2"

Standing water: Well casing/screen: 39.8

(From Chart) Annulus (volume x 30%): 1.17

Date and time of development: 2-13-90/1300

Method of development (pump/bailer): PUMP   Pumping rate: 5gal/min

Depth(s) of pumping and elapsed time at each depth: ______

Water level Before development: 5.4   During: ______   24 HR After: 7.2

Well depth (sounded) Before: 47.0   After: 49.26

Physical appearance of water (clarity, color, particulates, odor)

Initial: CLOUDY, BLACK, ODGY

During development: ______

Final: CLEAR, FINE SEDIMENTS

Field analysis	Initial	During (2)		Final	
Time	1313	1333	1412	1439	150
Conductivity	190	140	125	140	11
pH	6.34	6.20	7.32	7.30	7.0
Temperature	21.8	22.2	23.7	22.4	22.

Quantity of water removed/time for removal (both incremental and total)

0/1310, 100/1333, 150/1410, 230/1435, 260/1500

Collect a 1-pint sample of last water removed. ______

Comments: ______

2-13-90

Signed   Approved   Date

MONITOR WELL DEVELOPMENT

Sheet 4 of 9

Site: HUNTER AAF
Well Designation: H-MW-4
Installation Date: 2-12-90

Well construction details from boring log:

Total depth (top of casing): 15.4
Screened interval: 3-13
Borehole diameter: 10¼"

Water losses during drilling: ______ Fluid purging: ______

Height of well casing (ground surface): ______ Well diameter: 2"

Standing water: Well casing/screen: 8.7

(From Chart) Annulus (volume x 30%): 1.17

Date and time of development: 2-13-90/1500

Method of development (pump/bailer): PUMP Pumping rate: ______

Depth(s) of pumping and elapsed time at each depth: ______

Water level Before development: 4.2 During: ______ 24 HR After: 4.2

Well depth (sounded) Before: 12.9 After: ~~18.73~~ 15.22

Physical appearance of water (clarity, color, particulates, odor)

Initial: GREY, CLOUDY

During development: ______

Final: CLEAR

Field analysis	Initial	During (2)		Final
Time	1507	1522	1551	1603
Conductivity	280	295	362	362
pH	6.87	7.05	6.57	6.47
Temperature	19.5	19.6	19.6	19.0

Quantity of water removed/time for removal (both incremental and total)

0/1505, 75/1522, 110/1530, 150/1603

Collect a 1-pint sample of last water removed. ______

Comments: ______

2-13-90

Signed B-4D Date Approved Date

D-ECSWVOW.2/FIELDFORM.1
10/22/84

MONITOR WELL DEVELOPMENT

Sheet 5 of 9

Site: HUNTER AAF
Well Designation: H-MW-5
Installation Date: 2-11-90

Well construction details from boring log:

Total depth (top of casing): 51.5
Screened interval: 39-49
Borehole diameter: 10 1/4

Water losses during drilling: ______ Fluid purging: ______
Height of well casing (ground surface): ______ Well diameter: 2"
Standing water: Well casing/screen: 39.9
(From Chart) Annulus (volume x 30%): 1.17

Date and time of development: 2-13-90/0950
Method of development (pump/bailer): PUMP Pumping rate: ______
Depth(s) of pumping and elapsed time at each depth: ______

Water level Before development: 6.5 During: ______ 24 HR After: 6.5

Well depth (sounded) Before: 46.4 After: 48.77

Physical appearance of water (clarity, color, particulates, odor)
Initial: GREY, BLACK, DENSELY, CLOUDY SEDIMENTS
During development: ORANGE, SEMI CLEAR, FINES
Final: CLEAR w/ FEW SEDIMENTS

Field analysis	Initial	During (2)		Final	
Time	0948	1004	1023	1055	112
Conductivity	225	160	150	145	145
pH	6.54	6.42	6.40	6.11	6.0
Temperature °C	28.5	22.2	22.0	23.8	23.

Quantity of water removed/time for removal (both incremental and total)
0/0945, 70/1000, 165/1020, 220/1055

Collect a 1-pint sample of last water removed. ______

Comments: ______

Signed 2-13-90 B-5D Date
Approved ______ Date ______

D-ECSWVOW.2/FIELDFORM.1
10/22/84

MONITOR WELL DEVELOPMENT

Sheet 6 of 9

Site: HUNTER AAF
Well Designation: H-MW-6
Installation Date: 2-12-90

Well construction details from boring log:

Total depth (top of casing): 15.4
Screened interval: 3-13
Borehole diameter: 10 1/4

Water losses during drilling: ______
Fluid purging: ______
Height of well casing (ground surface): ______
Well diameter: 2"
Standing water: Well casing/screen: 6.9
(From Chart) Annulus (volume x 30%): 1.17

Date and time of development: 2-13-90/0915
Method of development (pump/bailer): PUMP
Pumping rate: 5 g/min
Depth(s) of pumping and elapsed time at each depth: ______

Water level Before development: 3.7
During: ______
24 HR After: 3.7

Well depth (sounded) Before: 10.6
After: 14.59

Physical appearance of water (clarity, color, particulates, odor)
Initial: REDDISH GREY, MURKY SEDIMENTS
During development: ______
Final: CLEAR, FEW SEDIMENTS

Field analysis	Initial	During (2)		Final
Time	0916	0926	1152	1253
Conductivity	235	223	240	270
pH	6.30	6.37	6.35	6.21
Temperature	18.7	18.3	21.1	21.2

Quantity of water removed/time for removal (both incremental and total)
0/915, 55/0925, 75/1150, 85/1253

Collect a 1-pint sample of last water removed. ______

Comments: ______

Signed 2-13-90 Date
Approved ______ Date ______

WELL SAMPLING DATA FORM

Well Number: HMW-1 Date: 3-7-90 Time: 0845

Boring Diameter: 10¼ Well Casing Diameter: 2"

Annular Space Length: 46.78 Stickup: 2.5'

WATER LEVEL

Held: ______

Cut: ______

DTW: ______ Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 48.28

DTW Top of Casing: 12.30

Column of Water in Well: 35.98

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from chart)	=	1.17
Column of Water or Length of A.S. (whichever is less)	x	35.98
Volume of Annular Space	=	42.09
Gallons per foot of Casing	=	.163
Column of Water	x	35.98
Volume of Casing	=	6.06
Total Volume (Volume of A.S. + Volume of Casing)	=	48.15
Number of Volumes to be Evacuated	x	5
Total Volume to be Evacuated	=	240.75

Method of Purging (pump, bailer, etc.): Pump

FIELD ANALYSES	Start	Mid	End
Time	1322	1352	1640
pH	5.26	5.37	5.40
Conductivity	212	200	170
Temperature	24°C	24°C	23°C

Total Volume Purged: 260 gallons

Sample Time: ______ Sample Number: HMW-1 * 1

FRACTIONS V x 3, W x 2

B	C	CF	CL	F	H	M	[✓ N]	NF
O	P	R	RP	RS	S	T	UP	Z

NOTES
(A Key to Fraction codes is provided on the last page of this Attachment)

Signed/Sampler: ______ Date: 3-7-90

Signed/Reviewer: ______ Date: ______

WELL SAMPLING DATA FORM

Well Number: HMW-2 Date: 3-7-90 Time: 0848

Boring Diameter: 10 Well Casing Diameter: 2"

Annular Space Length: ______ Stickup: 2.5'

WATER LEVEL

Held: ______

Cut: ______

DTW: ______ Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 16.15

DTW Top of Casing: 10.32

Column of Water in Well: 5.83

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from chart)	=	1.17
Column of Water or Length of A.S. (whichever is less)	X	5.83
Volume of Annular Space	=	6.82
Gallons per foot of Casing	=	.163
Column of Water	X	5.83
Volume of Casing	=	.95
Total Volume (Volume of A.S. + Volume of Casing)	=	7.77
Number of Volumes to be Evacuated	X	5
Total Volume to be Evacuated	=	38.85

Method of Purging (pump, bailer, etc.): Bailer

FIELD ANALYSES	Start	Mid	End
Time	0920	0945	1015
pH	5.21	5.12	5.22
Conductivity	33	30	30
Temperature	18°	18°	18°

Total Volume Purged: 40 gallons

Sample Time: 1620 Sample Number: HMW-2 #2

FRACTIONS V×3, W×2

B C CF CL F H M [✓ N] NF

O P R RP RS S T UP Z

NOTES W, W, V, V, V

Signed/Sampler: ______ Date: 3-7-90

Signed/Reviewer: ______ Date: ______

D-WR85.1/SAMPFORM.1
03/15/85

WELL SAMPLING DATA FORM

Well Number: HMW-3 Date: 3-8-90 Time: 0825
Boring Diameter: 10" Well Casing Diameter: 2"
Annular Space Length: ______ Stickup: 2.5'

WATER LEVEL

Held: ______
Cut: ______
DTW: ______ Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 49.26
DTW Top of Casing: 7.13
Column of Water in Well: 42.13

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from chart)	=	1.17
Column of Water or Length of A.S. (whichever is less)	X	42.13
Volume of Annular Space	=	49.29
Gallons per foot of Casing	=	.163
Column of Water	X	42.13
Volume of Casing	=	6.86
Total Volume (Volume of A.S. + Volume of Casing)	=	56.15
Number of Volumes to be Evacuated	X	5
Total Volume to be Evacuated	=	280.75

Method of Purging (pump, bailer, etc.): Pump

FIELD ANALYSES	Start	Mid	End
Time	825	851	915
pH	6.03	6.17	6.05
Conductivity	90	90	90
Temperature	19.5°C	20.5°C	20.0°C

Total Volume Purged: 300 gallons
Sample Time: – Sample Number: HMW-3*3

FRACTIONS V×3, W×2

B C CF CL F H M [✓ N] NF
O P R RP RS S T UP Z

NOTES

Signed/Sampler: ______ Date: 3-8-90
Signed/Reviewer: ______ Date: ______

03/15/85

WELL SAMPLING DATA FORM

Well Number: Hmw-4 Date: 3-8-90 Time: 0845

Boring Diameter: 10 Well Casing Diameter: 2"

Annular Space Length: ____ Stickup: 2.4

WATER LEVEL

Held: ____

Cut: ____

DTW: ____ Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 15.22

DTW Top of Casing: 7.50

Column of Water in Well: 7.72

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from chart) = 1.17

Column of Water or Length of A.S. (whichever is less) x 7.72

Volume of Annular Space = 9.03

Gallons per foot of Casing = .163

Column of Water x 7.72

Volume of Casing = 1.25

Total Volume (Volume of A.S. + Volume of Casing) = 10.2

Number of Volumes to be Evacuated x 5

Total Volume to be Evacuated = 51.0

Method of Purging (pump, bailer, etc.): Pump

FIELD ANALYSES

	Start	Mid	End
Time	845	920	930
pH	6.45	6.41	6.56
Conductivity	290	320	335
Temperature	15°C	19°C	20.5°C

Total Volume Purged: 55 gallons

Sample Time: –

Sample Number: HMW-4*4

FRACTIONS V x 3, W x 2

B C CF CL F H M [✓ N] NF

O P R RP RS S T UP Z

NOTES

Signed/Sampler: ____ Date: 3-8-90

Signed/Reviewer: ____ Date: ____

WELL SAMPLING DATA FORM

Well Number: Hmw-5 Date: 3-7-90 Time: 0945

Boring Diameter: 10" Well Casing Diameter: 2"

Annular Space Length: ______ Stickup: 2.5'

WATER LEVEL

Held: ______

Cut: ______

DTW: ______ Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 48.77

DTW Top of Casing: 7.88

Column of Water in Well: 40.89

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from chart) = 1.17

Column of Water or Length of A.S. (whichever is less) X 40.89

Volume of Annular Space = 47.84

Gallons per foot of Casing = .163

Column of Water X 40.89

Volume of Casing = 6.66

Total Volume (Volume of A.S. + Volume of Casing) = 54.50

Number of Volumes to be Evacuated X 5

Total Volume to be Evacuated = 272.5

Method of Purging (pump, bailer, etc.): Pump

FIELD ANALYSES	Start	Mid	End
Time	950	1000	1030
pH	6.40	6.14	5.96
Conductivity	140	132	130
Temperature	19°C	~~19.5°C~~ 20.5°C	21°C

Total Volume Purged: 280 gallons

Sample Time: – Sample Number: HMW-5*5

FRACTIONS V×3, W×2

B C CF CL F H M [✓ N] NF

O P R RP RS S T UP Z

NOTES

Signed/Sampler: ______ Date: 3-7-90

Signed/Reviewer: ______ Date: ______

03/15/85

WELL SAMPLING DATA FORM

Well Number: HMW-6 Date: 3-8-90 Time: 1040

Boring Diameter: 10" Well Casing Diameter: 2"

Annular Space Length: ______ Stickup: 2.4

WATER LEVEL

Held: ______

Cut: ______

DTW: ______ Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 14.59

DTW Top of Casing: 6.55

Column of Water in Well: 8.04

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from chart)	=	1.17
Column of Water or Length of A.S. (whichever is less)	X	8.04
Volume of Annular Space	=	9.40
Gallons per foot of Casing	=	.163
Column of Water	X	8.04
Volume of Casing	=	1.31
Total Volume (Volume of A.S. + Volume of Casing)	=	10.71
Number of Volumes to be Evacuated	X	5
Total Volume to be Evacuated	=	53.55

Method of Purging (pump, bailer, etc.): PUMP

FIELD ANALYSES	Start	Mid	End
Time	1040	1045	1100
pH	6.44	6.51	6.59
Conductivity	320	340	335
Temperature	17.5°C	20°C	19°C

Total Volume Purged: 60 gallons

Sample Time: – Sample Number: HMW-6 * 6

FRACTIONS V×3, W×2

B C CF CL F H M [✓ N] NF

O P R RP RS S T UP Z

NOTES

Signed/Sampler: ______ Date: 3-8-90

Signed/Reviewer: ______ Date: ______

D-ECSWVOW.2/FIELDFORM.2
01/03/85

MONITOR WELL WATER LEVEL MEASUREMENTS

Sheet 1 of ___

Site Ft. Stewart - Hunter AAF
Client Army Corps of Engineers
Project Number 3902015

Measured By J. Trent
Reference Mark:
Top of well casing X*
Ground surface X

Well	Date	Time	Tape Reading Held Length	Tape Reading Wet Length	Depth To Water	Comments
H mw-1	2-9-90	1600			10.2	
H mw-2	2-10-90	0800			9.3	
H mw-5	2-12-90	1233			5.2	
H mw-3	2-12-90	1250			5.4	
H mw-1	2-13-90	0723			10.6	✓
H mw-2	2-13-90	0854			9.3	
H mw-3	2-13-90	1505			7.2	
H mw-4	2-13-90	0848			4.2	
H mw-5	2-13-90	1136			6.5	
H mw-6	2-13-90	0817			3.7	
H mw-1	3-7-90	0845			12.3	*
H mw-2	3-7-90	0848			10.32	*
H mw-3	3-7-90	0853			7.13	*
H mw-4	3-7-90	0855			7.50	*
H mw-5	3-7-90	0900			7.88	*
H mw-6	3-7-90	0905			6.55	*

ESE KEY TO FRACTION CODES 3/90

	CODE	PRESERVATIVE	CONTAINER	ANALYSIS TYPE	HOLDING TIMES
AIR:	AA	4-Deg-C	Various	Various	Various
	AO	Exclude Light	Sorbent	Organic	14 Days
	AV	Exclude Light	Charcoal	Volatiles	14 Days
	FL	Keep Upright	Cassette	Various	Various
SOILS:	SS	4-Deg-C	G, 500 mL	All excl. Vol.	7-28 Days
	SV	4-Deg-C	G, 60 mL	Volatiles	7-14 Days
WATER:	AL	4-Deg-C(T)	G,2x60 mL*	Aldicarb	14 Days
	B	4-Deg-C;NaOH,pH>12	P, 1-4 L	Cyanides	14 Days
	C	4-Deg-C	P, 1-4 L	Var.Inorganic	1-28 Days
	CL	4-Deg-C	G, 1-4 L	Chlorophyll	1 Day
		(Pref'd Filtered & Frozen at <0-Deg-C)			
	EC	4-Deg-C(T)g	G, 1 L	Chlor'd Pests	7 Days
	ED	4-Deg-C(T)	G,2x60 mL*	EDB, DBCP	14 Days
	F	-	P, 4 L	Collection prior to Field Filtering	
	FI	4-Deg-C(T)	G, 1 L	GC/FI Organic	7 Days
	FM	Formaldehyde	P/G,500mL	"Quats"	28 Days
	FP	4-Deg-C(T)	G,3x60 mL*	GC/FP Organic	14 Days
	H	Zn-Acet;NaOH,pH>10	P, 1 L	Sulfides	7 Days
	HB	4-Deg-C(T)	G, 1 L	Chlor'd Herbs	7 Days
	LC	4-Deg-C	G, 1 L	HPLC Organics	7 Days
	M	4-Deg-C(T)	P, 250 mL	Bacteriologic	1 Day
	MS	4-Deg-C(T)	G, 1 L	GCMS Extr.Org.	7 Days
	N	HNO_3,pH<2	P, 1 L	Metals (Total)	180 Days
				Mercury (Total)	28 Days
	NF	HNO_3,pH<2	P, 1 L	Metals (Dissolved)	180 Days
				Mercury (Dissolved)	28 Days
	NC	4-Deg-C	G, 1 L	Nitrocellulose	7 Days
	NP	4-Deg-C	G, 1 L	GC/NP Organic	7 Days
	O	4-Deg-C;H_2SO_4,pH<2	G, 1 L	Oil&Grease, TRPH	28 Days
	OD	4-Deg-C	G, 1 L	Odor	2 Days
	R	HNO_3,pH<2	P, 1-4 L	Radionuclides	180 Days
	S	4-Deg-C;H_2SO_4,pH<2	P, 1 L	Nutrients	28 Days
	(UP)	4-Deg-C(T)	G, 1 L	Pest(Antiq'd)	7 Days
	V	4-Deg-C(T)	G,3x60 mL*	Halogen, Vols	14 Days
	VP	4-Deg-C;HCL,pH<2(T)	G,3x60 mL*	Aromatic Vols	14 Days
	(W)	4-Deg-C(T)	G, 1 L	Orgs, FPD Extr's	7 Days
	X	4-Deg-C(S)	G,2x250mL*	TOX(USATHAMA)	7 Days
	XP	4-Deg-C;H_2SO_4,pH<2(S)	G,2x250mL*	TOX	7 Days
	Z	4-Deg-C;H_2SO_4,pH<2	G, 1 L	Total Phenols	28 Days
OTHER:	OL	None	G,10-100mL	Organic-Oil	14 Days
	TS	-20-Deg-C	Various	Frozen Tissue	Various

FOOTNOTES: (T) - Add Sodium Thiosulfate ($Na_2S_2O_3$) If Res.Cl Present (0.25g/L)
(S) - Add Sodium Sulfite (Na_2SO_3) If Res.Cl Present (0.1M, 1 mL/L).
* - Volatiles Bottles (VOAs) With Teflon-Lined Rubber Septa.

INSTRUCTIONS FOR SAMPLING AND SHIPPING

-Plastic (P) Containers May Be Rinsed With Sample; Do <u>Not</u> rinse Glass (G)
-Fill Completely, Especially For Volatiles (Fill These Slowly; Achieve Positive Meniscus; Cap; Invert; Check for Air Bubbles; Top Off If Needed.
-Preserve With Reagents Provided As Instructed Above (VP's Are Pre-Preserved)
-Fill-out Logsheet/Chain-of-Custody. Indicate: Sample Number (*) and Fractions Collected; Dates/Times of Collection & Shipment; Appropriate Field Notes; Be Sure To Sign Bottom of Each Page Where and As Indicated.
-Ship With Bagged Ice in Ice-chest By Express Carrier To Lab Coordinator's Attention.

Source: ESE, 1990.

ATTACHMENT E
SEDIMENT SAMPLING LOGS

FIELD DATA FORM
Sediment Sampling

Station # SD-1

Sample # 1

Date 2-12-90

Project FT. STEWART - HUNTER AAF

Field Personnel T. TRENT & J. BUTTRUFF

STATION DESCRIPTION:

Sample Method: STAINLESS STEEL SPOON & BOWL

Water Quality Conditions: CLEAR

Depth to Sediment 8"

Sediment Type: GRAVEL & SAND

Time of Sampling 0900

Fraction	Preservative/Amount	Container Type
SS	NA, ICE	G, 500mL
SU	NA, ICE	G, 60mL

Remarks:
A Key to Fraction codes is provided on the last page of this Attachment.

Signature

Date 2-12-90

FIELD DATA FORM
Sediment Sampling

Station # SD-2

Sample # 2

Date 2-12-90

Project FT. STEWART - HUNTER AAF

Field Personnel T. TRENT & J. BUTTRUFF

STATION DESCRIPTION:

Sample Method: STAINLESS STEEL SPOON & BOWL

Water Quality Conditions: CLEAR

Depth to Sediment 2'

Sediment Type: SAND

Time of Sampling 0920

Fraction	Preservative/Amount	Container Type
SS	NA, ICE	G, 500mL
SV	NA, ICE	G, 60mL

Remarks:

Signature

Date 2-12-90

FIELD DATA FORM
Sediment Sampling

Station # SD-3

Sample # 3

Date 2-12-90

Project: FT. STEWART - HUNTER AAF

Field Personnel T. TRENT & J. BUTTRUFF

STATION DESCRIPTION:

Sample Method: STAINLESS STEEL BOWL & SPOON

Water Quality Conditions: CLEAR

Depth to Sediment 1'

Sediment Type: SAND & GRAVEL

Time of Sampling 0930

Fraction	Preservative/Amount	Container Type
SS	ICE	G, 500mL
SV	ICE	G, 60mL

Remarks:

Signature

Date 2-12-90

FIELD DATA FORM
Sediment Sampling

Station # SD-3 REPLICATE

Sample # 4

Date 2-12-90

Project FT. STEWART-HUNTER AAF

Field Personnel T. TROUT & J. BUTTRUFF

STATION DESCRIPTION:

Sample Method: STAINLESS STEEL BOWL & SPOON

Water Quality Conditions: CLEAR

Depth to Sediment 1'

Sediment Type: SAND & GRAVEL

Time of Sampling 0930

Fraction	Preservative/Amount	Container Type
SS	ICE	G, 500mL
SV	ICE	G, 60mL

Remarks:

Signature

Date 2-12-90

FIELD DATA FORM
Sediment Sampling

Station # NA
Sample # 6

Date 2-12-90
Project Ft. Stewart - Hunter AAF
Field Personnel T. Trent / J. Buturff

STATION DESCRIPTION:

Sample Method:

Water Quality Conditions: NA

Depth to Sediment NA

Sediment Type:
NA

Time of Sampling 1030

Fraction	Preservative/Amount	Container Type
✓	ICE	G, 60 mL
✓	ICE	G, 60 mL
✓	ICE	G, 60 mL

Remarks: Trip Blank

Signature

Date 2-12-90

FIELD DATA FORM
Sediment Sampling

Station # NA

Sample # 5

Date 2-12-90

Project: FT. STEWART - HUNTER AAF

Field Personnel T. TRENT/J. BUTURFF

STATION DESCRIPTION:

Sample Method:

Water Quality Conditions: N/A

Depth to Sediment N/A

Sediment Type: N/A

Time of Sampling 1045

Fraction	Preservative/Amount	Container Type
W	ICE	G, 1L
N	HNO_3	P, 1L
V	ICE	G, 60mL
V	ICE	G, 60mL
V	ICE	G, 60 mL

Remarks: RINSE BLANK

Signature

Date 2-12-90

FIELD DATA FORM
Sediment Sampling

Station # SD-3
Sample # 8

Date 2-12-90
Project: FT. STEWART - HUNTER AAF
Field Personnel T. TRENT / J. BUTORFF

STATION DESCRIPTION:

Sample Method: STAINLESS STEEL BOWL & SPOON

Water Quality Conditions: CLEAR

Depth to Sediment 1'

Sediment Type: SAND & GRAVEL

Time of Sampling 0930

Fraction	Preservative/Amount	Container Type
SS	ICE	G, 8oz.
SV	ICE	G, 4oz.

Remarks: SAMPLE FOR MRD LAB OMAHA, NE

Signature

Date 2-12-90

FIELD DATA FORM
Sediment Sampling

Station # Trip Blank
Sample # 9

Date 2-13-90
Project: Ft. Stewart-Hunter AAF
Field Personnel T. Trent/S. Buturff

STATION DESCRIPTION: N/A

Sample Method: NA

Water Quality Conditions: NA

Depth to Sediment NA

Sediment Type: NA

Time of Sampling 1600

Fraction	Preservative/Amount	Container Type
V	ICE	G, 60 mL
V	ICE	G, 60 mL
V	ICE	G, 60 mL

Remarks: Sample for MRD Lab Omaha, NE

Signature

Date 2-13-90

ESE KEY TO FRACTION CODES 3/90

	CODE	PRESERVATIVE	CONTAINER	ANALYSIS TYPE	HOLDING TIMES
AIR:	AA	4-Deg-C	Various	Various	Various
	AO	Exclude Light	Sorbent	Organic	14 Days
	AV	Exclude Light	Charcoal	Volatiles	14 Days
	FL	Keep Upright	Cassette	Various	Various
SOILS:	SS	4-Deg-C	G, 500 mL	All excl. Vol.	7-28 Days
	SV	4-Deg-C	G, 60 mL	Volatiles	7-14 Days
WATER:	AL	4-Deg-C(T)	G,2x60 mL*	Aldicarb	14 Days
	B	4-Deg-C;NaOH,pH>12	P, 1-4 L	Cyanides	14 Days
	C	4-Deg-C	P, 1-4 L	Var.Inorganic	1-28 Days
	CL	4-Deg-C (Pref'd Filtered & Frozen at <0-Deg-C)	G, 1-4 L	Chlorophyll	1 Day
	EC	4-Deg-C(T)g	G, 1 L	Chlor'd Pests	7 Days
	ED	4-Deg-C(T)	G,2x60 mL*	EDB, DBCP	14 Days
	F	-	P, 4 L	Collection prior to Field Filtering	
	FI	4-Deg-C(T)	G, 1 L	GC/FI Organic	7 Days
	FM	Formaldehyde	P/G,500mL	"Quats"	28 Days
	FP	4-Deg-C(T)	G,3x60 mL*	GC/FP Organic	14 Days
	H	Zn-Acet;NaOH,pH>10	P, 1 L	Sulfides	7 Days
	HB	4-Deg-C(T)	G, 1 L	Chlor'd Herbs	7 Days
	LC	4-Deg-C	G, 1 L	HPLC Organics	7 Days
	M	4-Deg-C(T)	P, 250 mL	Bacteriologic	1 Day
	MS	4-Deg-C(T)	G, 1 L	GCMS Extr.Org.	7 Days
	N	HNO_3,pH<2	P, 1 L	Metals (Total) Mercury (Total)	180 Days 28 Days
	NF	HNO_3,pH<2	P, 1 L	Metals (Dissolved) Mercury (Dissolved)	180 Days 28 Days
	NC	4-Deg-C	G, 1 L	Nitrocellulose	7 Days
	NP	4-Deg-C	G, 1 L	GC/NP Organic	7 Days
	O	4-Deg-C;H_2S0_4,pH<2	G, 1 L	Oil&Grease, TRPH	28 Days
	OD	4-Deg-C	G, 1 L	Odor	2 Days
	R	HNO_3,pH<2	P, 1-4 L	Radionuclides	180 Days
	S	4-Deg-C;H_2S0_4,pH<2	P, 1 L	Nutrients	28 Days
	(UP)	4-Deg-C(T)	G, 1 L	Pest(Antiq'd)	7 Days
	V	4-Deg-C(T)	G,3x60 mL*	Halogen, Vols	14 Days
	VP	4-Deg-C;HCL,pH<2(T)	G,3x60 mL*	Aromatic Vols	14 Days
	(W)	4-Deg-C(T)	G, 1 L	Orgs, FPD Extr's	7 Days
	X	4-Deg-C(S)	G,2x250mL*	TOX(USATHAMA)	7 Days
	XP	4-Deg-C;H_2SO_4,pH<2(S)	G,2x250mL*	TOX	7 Days
	Z	4-Deg-C;H_2S0_4,pH<2	G, 1 L	Total Phenols	28 Days
OTHER:	OL	None	G,10-100mL	Organic-Oil	14 Days
	TS	-20-Deg-C	Various	Frozen Tissue	Various

FOOTNOTES: (T) - Add Sodium Thiosulfate ($Na_2S_2O_3$) If Res.Cl Present (0.25g/L)
(S) - Add Sodium Sulfite (Na_2SO_3) If Res.Cl Present (0.1M, 1 mL/L).
* - Volatiles Bottles (VOAs) With Teflon-Lined Rubber Septa.

INSTRUCTIONS FOR SAMPLING AND SHIPPING

-Plastic (P) Containers May Be Rinsed With Sample; Do Not rinse Glass (G)
-Fill Completely, Especially For Volatiles (Fill These Slowly; Achieve Positive Meniscus; Cap; Invert; Check for Air Bubbles; Top Off If Needed.
-Preserve With Reagents Provided As Instructed Above (VP's Are Pre-Preserved)
-Fill-out Logsheet/Chain-of-Custody. Indicate: Sample Number (*) and Fractions Collected; Dates/Times of Collection & Shipment; Appropriate Field Notes; Be Sure To Sign Bottom of Each Page Where and As Indicated.
-Ship With Bagged Ice in Ice-chest By Express Carrier To Lab Coordinator's Attention.

Source: ESE, 1990.

APPENDIX B

to

Groundwater Monitoring Plan - Appendix B to Closure Plan

BORING LOGS

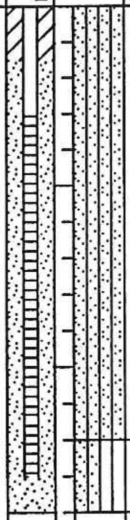
Hunter Army Airfield
Fort Stewart, Savannah, GA

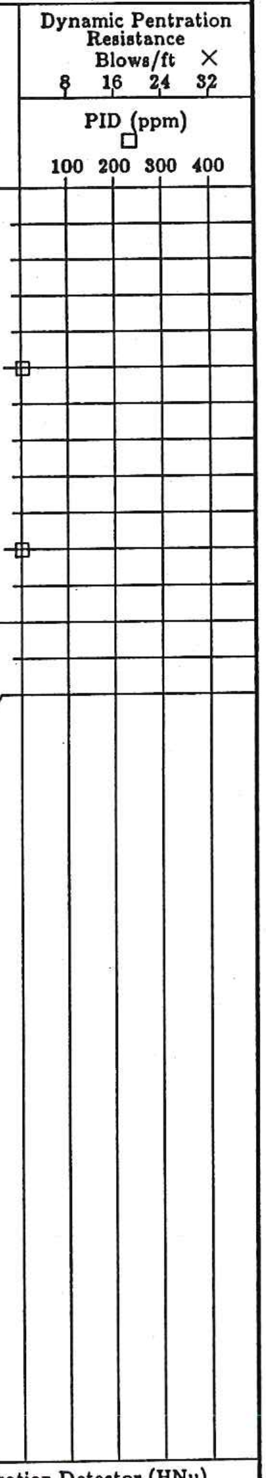
Log of Boring No. HMW-7

Sheet No. 1 of 1

Client:	US Army Corps of Engineers, Kansas City Division	Boring Started:	3/4/92
Project Number:	3912015G	Boring Completed:	3/4/92
Drilling Contractor:	Layne Environmental Services	Boring Diameter:	8 inch
Driller:	D. Nichols	Well Casing Diameter:	2 inch
Logged By:	G. Foster	Type of Drill Rig:	Mobile B-57
Location:		Drilling Method:	Hollow Stem Auger

Elevation	Depth	Samp Type	Samp Rec ft	PID ppm	Blows Per 6"	MATERIAL DESCRIPTION
						(SM) SAND, silty, fine-grained, dark brown, moist
						4 ft - becomes orangish-yellow, wet
	5	CS	5.0	3		
	10	CS	5.0	0		
						(SM-ML) SAND AND SILT, intermixed silty sand and sandy silt, fine-grained sand, bluish-gray, wet, micaceous
						BORING TERMINATED AT 14 FT BGS





WELL CONSTRUCTION DETAILS
Well stickup from surface to 2.0 ft AGS
Volclay grout interval from surface to 1.5 ft BGS
Sand filter pack from 1.5 to 14.0 ft BGS
Well screen interval from 3.0 to 13.0 ft BGS
Pipe and well screen material = Sch 40 PVC
Pipe and well screen diameter = 2 inch
Well screen slot size = 0.010 inch

SS = Splitspoon
CS = CMS Continous Sampler
PID = Photoionization Detector (HNu)

5/5/92

ESE

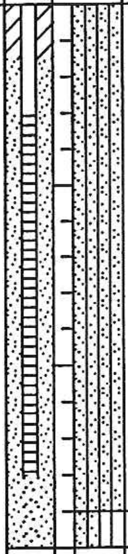
Hunter Army Airfield
Fort Stewart, Savannah, GA

Log of Boring No. HMW-8

Sheet No.
1 of 1

Client:	US Army Corps of Engineers, Kansas City Division	Boring Started:	3/3/92
Project Number:	3912015G	Boring Completed:	3/3/92
Drilling Contractor:	Layne Environmental Services	Boring Diameter:	8 inch
Driller:	D. Nichols	Well Casing Diameter:	2 inch
Logged By:	G. Foster	Type of Drill Rig:	Mobile B-57
Location:		Drilling Method:	Hollow Stem Auger

Elevation	Depth	Samp Type	Samp Rec ft	PID ppm	Blows Per 6"
		CS	4.1	3	
	5	CS	3.9	0	
	10	CS	3.5	0	
	15				



MATERIAL DESCRIPTION

(SM) SAND, silty, dark brown, fine-grained, moist

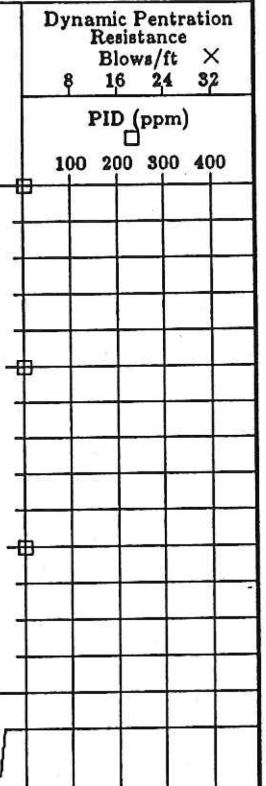
4 to 5 ft - becomes tan mottled with gray

5 ft - becomes fine- to medium-grained, light to medium gray, wet

(SM-ML) SAND-SILT, intermixed silty sand and sandy silt, fine-grained sand, greenish-gray, wet, micaceous

BORING TERMINATED AT 15 FT BGS

WELL CONSTRUCTION DETAILS
Well stickup from surface to 2.0 ft AGS
Volclay grout interval from surface to 1.5 ft BGS
Sand filter pack from 1.5 to 15.0 ft BGS
Well screen interval from 3.0 to 13.0 ft BGS
Pipe and well screen diameter = 2 inch
Pipe and well screen material = Sch 40 PVC
Well screen slot size = 0.010 inch



SS = Splitspoon CS = CMS Continous Sampler PID = Photoionization Detector (HNu)

ESE

5/5/92

Hunter Army Airfield
Fort Stewart, Savannah, GA

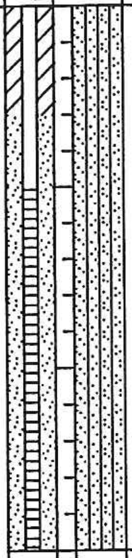
Log of Boring No. HMW-9

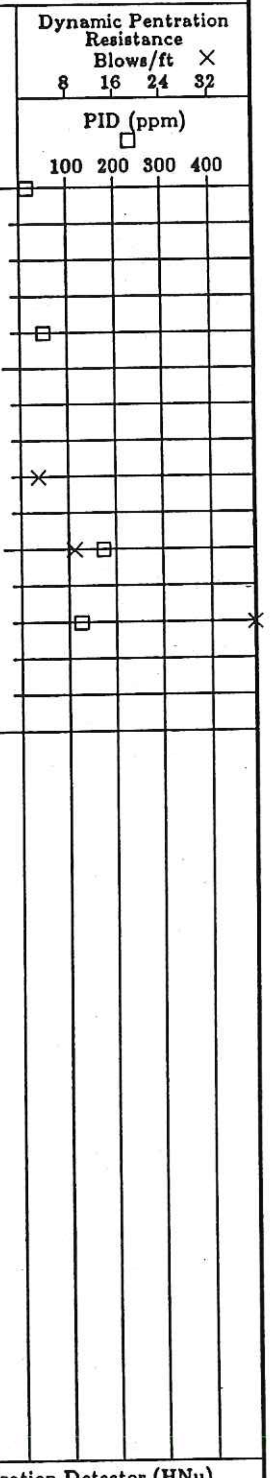
Sheet No. 1 of 1

Client:	US Army Corps of Engineers, Kansas City Division
Project Number:	3912015G
Drilling Contractor:	Layne Environmental Services
Driller:	D. Nichols
Logged By:	G. Foster
Location:	

Boring Started:	3/2/92
Boring Completed:	3/2/92
Boring Diameter:	8 inch
Well Casing Diameter:	2 inch
Type of Drill Rig:	Mobile B-57
Drilling Method:	Hollow Stem Auger

Elevation	Depth	Samp Type	Samp Rec-ft	PID ppm	Blows Per 6"	MATERIAL DESCRIPTION
	0	CS	2.2	15		(SM) SAND, silty, medium-brown becoming dark brown with depth, fine-grained, moist
	4	CS	3.0	50		4 ft - grades to medium gray
	5 ▽					
	8	SS			1-1 2-3	9 to 10 ft - wood in sample interval
	10	SS	2.0	175	1-4 5-6	10 ft - becomes brown to orangish-brown, wet
	12	SS	2.0	125	6-11 29-14	
	15					BORING TERMINATED AT 15 FT BGS





WELL CONSTRUCTION DETAILS
Well stickup from surface to 2.5 ft AGS
Volclay grout interval from 2.5 to 3.0 ft BGS
Sand filter pack from 3.0 to 15.0 ft BGS
Well screen interval from 5.0 to 15.0 ft BGS
Pipe and well screen diameter = 2 inch Pipe and well screen material = Sch 40 PVC
Well screen slot size = 0.010 inch

SS = Splitspoon
CS = CMS Continous Sampler
PID = Photoionization Detector (HNu)

ESE

5/5/92

APPENDIX C

to

Groundwater Monitoring Plan - Appendix B to Closure Plan

MISCELLANEOUS FORMS

Well Development Well No. ____________

Date ____________________ Time ____________________

Well Installation Date ________________ Screen length _______ ft

Depth of Well ________________________ ft

Diameter of Well ______________________ inches

Method of Evacuation _________________

Depth from which well was pumped ____________________________ ft

Distance from top of pipe to ground _________________________ ft

	Before	After	24 hours After	
Held length	________	________	________	ft
Wet length	________	________	________	ft
Distance to water	________	________	________	ft
Depth to sediment	________	________	________	ft
Appearance of water	________	________		
Approx. pumping rate	________	________	gpm	

Characteristics of sediment ______________________________________

Field Analyses	Before	Bucket No.___	Bucket No.___	After
pH	______	________	________	_____
Conductivity	______	________	________	_____
Temperature	______	________	________	_____

No. of 2-1/2 gal buckets pumped 1 2 3 4 5 6 7 8 9 10 ________

Total well volume before pumping ______________________ gal

Total volume pumped ______________________________ gal

Sample collected - 1 cubitainer after pumping labeled ______________

Description of surge technique ___________________________________

____

Read and Understood By:

________________________ ________________ __________

Signed Signed Date

MONITOR WELL WATER LEVEL MEASUREMENTS

Sheet ___ of ___

Site________________________

Client________________________

Project Number________________

Measured By________________________

Reference Mark:

Top of well casing _____

Ground surface _____

Well	Date	Time	Tape Reading		Depth To Water	Comments
			Held Length	Wet Length		

WELL SAMPLING DATA FORM

Well Number: ______________ Date: ____________ Time: ____________

Boring Diameter: ____________ Well Casing Diameter: ____________

Annular Space Length: ______________ Stickup: ______________

WATER LEVEL

Held: ____

Cut: ____

DTW: ________________ Top of Casing

COLUMN OF WATER IN WELL

Casing Length: ________________

DTW Top of Casing: ________________

Column of Water in Well: ________________

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from chart)	=	________
Column of Water or Length of A.S. (whichever is less)	X	________
Volume of Annular Space	=	________
Gallons per foot of Casing	=	________
Column of Water	X	________
Volume of Casing	=	________
Total Volume (Volume of A.S. + Volume of Casing)	=	________
Number of Volumes to be Evacuated	X	________
Total Volume to be Evacuated	=	________

Method of Purging (pump, bailer, etc.): ______________________

FIELD ANALYSES	Start	Mid	End
Time			
pH			
Conductivity			
Temperature			

Total Volume Purged: __________ gallons

Sample Date/Time: ______________ Sample Number: ______________

FRACTIONS

VP	V	N	NF	C	O	S	UP	Z	B
CF	F	H	CL	M	P	R	RP	T	RS

Signed/Sampler: ______________________ Date: __________

Signed/Reviewer: ______________________ Date: __________

ENVIRONMENTAL SCIENCE & ENGINEERING
WATER RESOURCES DIVISION
Hydrolab Calibration Form II

Date

Instrument Serial Number

Battery (Voltage) Vdc.

Parameter		Initial Reading	Final Reading
Temperature		°C	
Conductivity: (uS/cm) High Conc. Strnd	1413		
Middle Conc. Strnd	718		718
Low Conc. Strnd	147		
pH: 7.00 Buffer			
4.00 Buffer			
10.00 Buffer			
Dissolved Oxygen: (ppm)			

Air Temperature °C

Saturation at Air Temperature for

Conditions ppm

For Office Use Only!
Clean Conductivity Probes ? Yes/No
Change pH Buffer ? Yes/No
Change D.O. Membrane ? Yes/No

Having performed a full calibration of this instrument, I certify that to the best of my knowledge this unit is completely operational and accurate. The only exceptions are those explicitly defined in the comments below.

Comments:

Signature

Date / /89

ESE ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

PAGE ____ OF ____

BORING NUMBER ____________ CLIENT ____________

DATE DRILLED ____________ PROJECT ____________

ELEVATION ____________ GEOLOGIST ____________

DEPTH, FT.	SAMPLE INTERVAL	SAMPLE # AND TYPE	BLOWS PER 6 INCHES	DESCRIPTION AND REMARKS	DEPTH, FT.	USCS SYMBOL AND INTERVAL	WELL SKETCH

METHOD OF DRILLING ____________ WELL DIAMETER ____________

HOLE DIAMETER ____________ WELL MATERIAL ____________

COMPLETION DEPTH ____________ WELL DEVELOPMENT ____________

WATER LEVEL WATER LEVEL INITIAL FINAL

ESE Environmental Science & Engineering, Inc.

A CILCORP Company

5 miles west of I-75 on State Road 26, Gainesville, FL 32607
Telephone: (904) 332-3318 — Fax: (904) 332-0507

0053

Chain of Custody Record

FOR LAB USE ONLY

Project Number: ______________

Client: ______________
Address: ______________
Phone #: ( ) ___-___ Fax #: ( ) ___-___
P.O. #: ______________
Client Contact: ______________
Project # / Location: ______________

Sample Type:
1. Water
2. Soil
3. Sludge
4. Oil
5. Tissue
Other: ______________

Container Type:
P - Plastic
G - Glass
V - VOC

Preservative:
1. None
2. H2SO4
3. HNO3
4. NaOH
5. HCl

Analyses

Sample I.D. (10 Characters ONLY)	Sample Type	Container			Sampling		Preser-vative	Lab I.D.												pH	Specific Conductivity	Temperature	Comments
		Size	Type	No.	Date	Time																	

Relinquished By:	Date: – – Time: :	Received By:	Date: – – Time: :
Relinquished By:	Date: – – Time: :	Received For Lab By:	Date: – – Time: :

FOR LAB USE ONLY
Samples Received Chilled
☐ Yes ☐ No
______ °C

Copies: White - Client Canary - Lab Receiving Pink - Lab File Goldenrod - Retained by Sampler

SPECIAL INSTRUCTIONS:

APPENDIX C

AIRSTRIP MODELING

ESE Environmental Science & Engineering, Inc.
A CILCORP Company

P.O. Box 1703 Gainesville, Florida 32602-1703
904-332-3318 Fax 904-332-0507

JOB HUNTER AAFTA
SHEET NO. 1 OF 4
CALCULATED BY GWise DATE 7/23/93
CHECKED BY ____ DATE ____
SCALE ____

AIRSTRIP Design Model

PURPOSE: Estimate the packed tower size and operating paramters required to provide adequate treatment of benzene-contaminated groundwater.

Assumptions: Influent - 660 ug/l benzene
65°F

Flow = 25 gpm

AIRSTRIP will only allow a minimum Flow of 0.264 MGD (183 gpm), so a 5.1-ft diameter tower is input to give the same liquid loading rate as 25 gpm in a 1.9 ft diameter tower.

15 ft of packing at an A/W ration of 50:1 provides adequate treatment.

$$660\ \mathrm{ug/l} = 660\ \frac{\mathrm{lb\ benzene}}{10^9\ \mathrm{lb\ H_2O}}$$

$$25\ \frac{\mathrm{gal}}{\mathrm{min}} \times 60\ \frac{\mathrm{min}}{\mathrm{hr}} \times 8.2\ \frac{\mathrm{lb\ H_2O}}{\mathrm{gal}} \times 660\ \frac{\mathrm{lb}}{10^9\ \mathrm{lb\ H_2O}} = 0.008\ \frac{\mathrm{lb\ Benzene}}{\mathrm{hr}}$$

$$= 0.2\ \frac{\mathrm{lb}}{\mathrm{day}}\ \text{benzene}$$

2/4

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¤ Benzene                              °Concentration In       : 660.0 ug/L      ¤
¤ P-Jaeger Tripacks  2.0 inch          °Atmospheric Pressure   :   1.0 atm       ¤
¤ Design Temperature      :  65.0 deg F °Liquid Loading Rate    :   9.0 gpm/ft^2 ¤
¤ Minimum Packing Depth :   5.0 feet   °Minimum A/W Ratio      :  10.0           ¤
¤ Maximum Packing Depth :  25.0 feet   °Maximum A/W Ratio      :  50.0           ¤
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¤                                                                                ¤
¤                           Concentration Remaining (ug/L)                       ¤
¤                                                                                ¤
¤ Packing Depth  A/W =  10   A/W =  20   A/W =  30   A/W =  40   A/W =  50       ¤
¤    (feet)                                                                      ¤
¤                                                                                ¤
¤     5.0            191.0       135.2       114.5       103.6        96.8       ¤
¤    10.0             72.4        32.5        22.3        17.8        15.3       ¤
¤    15.0             29.8         8.1         4.4         3.1         2.4       ¤
¤    20.0             12.7         2.0         0.9         0.5         0.4       ¤
¤    25.0              5.4         0.5         0.2         0.1         0.1       ¤
¤                                                                                ¤
¤ R                    2.1         4.3         6.4         8.5        10.6       ¤
¤ dP (" H2O/ft)       <.06        <.06        <.06        <.06        <.06       ¤
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¤ F10 Toggle to Metric units           ° F1 Help           ° F7 Quit program     ¤
¤ F9 Continue with design procedure    ° F3 Main menu      ° Esc to go back      ¤
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¤  AIRSTRIP Release 1.2                                          Copyright 1988  ¤
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¤                                     Summary of Selected Design                 ¤
¤                                                                                ¤
¤ Contaminant            : Benzene                                               ¤
¤ Concentration In       :  660.0 ug/L                                           ¤
¤ Concentration Out      :    2.4 ug/L                                           ¤
¤ Percentage Removed     :   99.6 %                                              ¤
¤ Packing                : P-Jaeger Tripacks  2.0 inch                           ¤
¤ Water Temperature      :  65.0 deg F.                                          ¤
¤ Atmospheric Pressure   :   1.0 atm                                             ¤
¤ Packing Depth          :  15.0 feet                                            ¤
¤ Liquid Loading Rate    :   9.0 gpm/ft^2                                        ¤
¤ Air/Water Ratio        :   50                                                  ¤
¤ Stripping Factor       :  10.6                                                 ¤
¤ Air Pressure Gradient  :  <.06  " H2O/ft                                       ¤
¤                                                                                ¤
¤                                                                                ¤
¤                                                                                ¤
¤                                                                                ¤
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¤ F10 Toggle to Metric units           ° F1 Help           ° F7 Quit program     ¤
¤ F6 Save design   "P" print report    ° F3 Main menu      ° Esc to go back      ¤
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3/4

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******* ANALYSIS   OF   STRIPPING   TOWER *******


PROJECT  : Hunter AAFTA                           DATE :  7/23/1993

ENGINEER : Gary Wise                              PAGE :  1/2


                        PHYSICAL CONSTANTS

Design temperature                :      65.0 degrees F.
Density of water                  :      62.3 lb/ft^3
Density of air                    :    0.0756 lb/ft^3
Viscosity of water                :  7.03E-04 lb/ft.s
Viscosity of air                  :  1.19E-05 lb/ft.s
Surface tension of water          :        73 dyne/cm
Atmospheric pressure              :      1.00 atm


                      CONTAMINANT PROPERTIES

Name                              :    Benzene
Molecular weight                  :       78.1 g/mol
Boiling point                     :        176 degrees F.
Molal volume at boiling point     :     0.0960 L/mol
Henry's Constant                  :    0.23000
Temperature constant              :       1849 deg K
Molecular diffusivity in air      :   9.98E-05 ft^2/s
Molecular diffusivity in water    :   9.15E-09 ft^2/s


                       PACKING PROPERTIES

Name                              :   Jaeger Tripacks
Packing Material                  :   Plastic
Nominal Size                      :    2.00 inch
Specific Area                     :    47.9 ft^2/ft^3
Critical surface tension          :      33 dyne/cm
Packing depth                     :    15.0 ft
Air friction factor               :      15
```

```
******* A N A L Y S I S   OF   S T R I P P I N G   T O W E R *******


PROJECT  : Hunter AAFTA                              DATE :  7/23/1993

ENGINEER : Gary Wise                                 PAGE :  2/2


                             LOADING RATES

Water mass loading rate            :      1.2 lb/ft^2.s                   *
Air mass loading rate              :    0.076 lb/ft^2.s                   *
Water volumetric loading rate      :     8.98 gpm/ft^2                    *
Air volumetric loading rate        :      449 gpm/ft^2                    *
Air pressure gradient              :     <.06 " H2O/ft                    #
Volumetric air/water ratio         :     50.0
Stripping factor                   :     10.6


                          MASS TRANSFER PARAMETERS

Percentage of packing area wetted  :      41.0 %
Wetted packing area                :      19.6 ft^2/ft^3                  *
Transfer rate constant in water    :  0.000479 ft/s
Transfer rate constant in air      :  0.014023 ft/s
Overall transfer rate constant     :  0.000413 ft/s
Overall mass transfer coefficient  :    0.0081 1/s
NTU                                :    6.0799
HTU                                :    2.4671 ft


                            CONTAMINANT REMOVAL

Influent concentration             :     660.0 ug/L
Effluent concentration             :       2.4 ug/L
Fraction removed                   :      99.6 %
Mass of contaminant removed        :     0.07086 lb/ft^2.day              *
Concentration in airstream         :    0.03459 mg/ft^2.ft^3


*   Expressed per unit of stripping tower cross-sectional area
#   Expressed per unit of tower length
```

APPENDIX D

HYDROGEOLOGIC CALCULATIONS

ESE Environmental Science & Engineering, Inc.
A CILCORP Company

P.O. Box 1703
904-332-3318
Gainesville, Florida 32602-1703
Fax 904-332-0507

JOB HUNTER 3912015G-0100-3130
SHEET NO. 1 OF
CALCULATED BY G Wise DATE 8/7/92
CHECKED BY DATE
SCALE

Purpose: Calculate groundwater velocities from available slug test data and piezometric surface elevation data.

Reference: Peck, Hanson, & Thornburn, 1974

Calculation: Linear groundwater flow velocity.

I = gradient

K = hydraulic conductivity

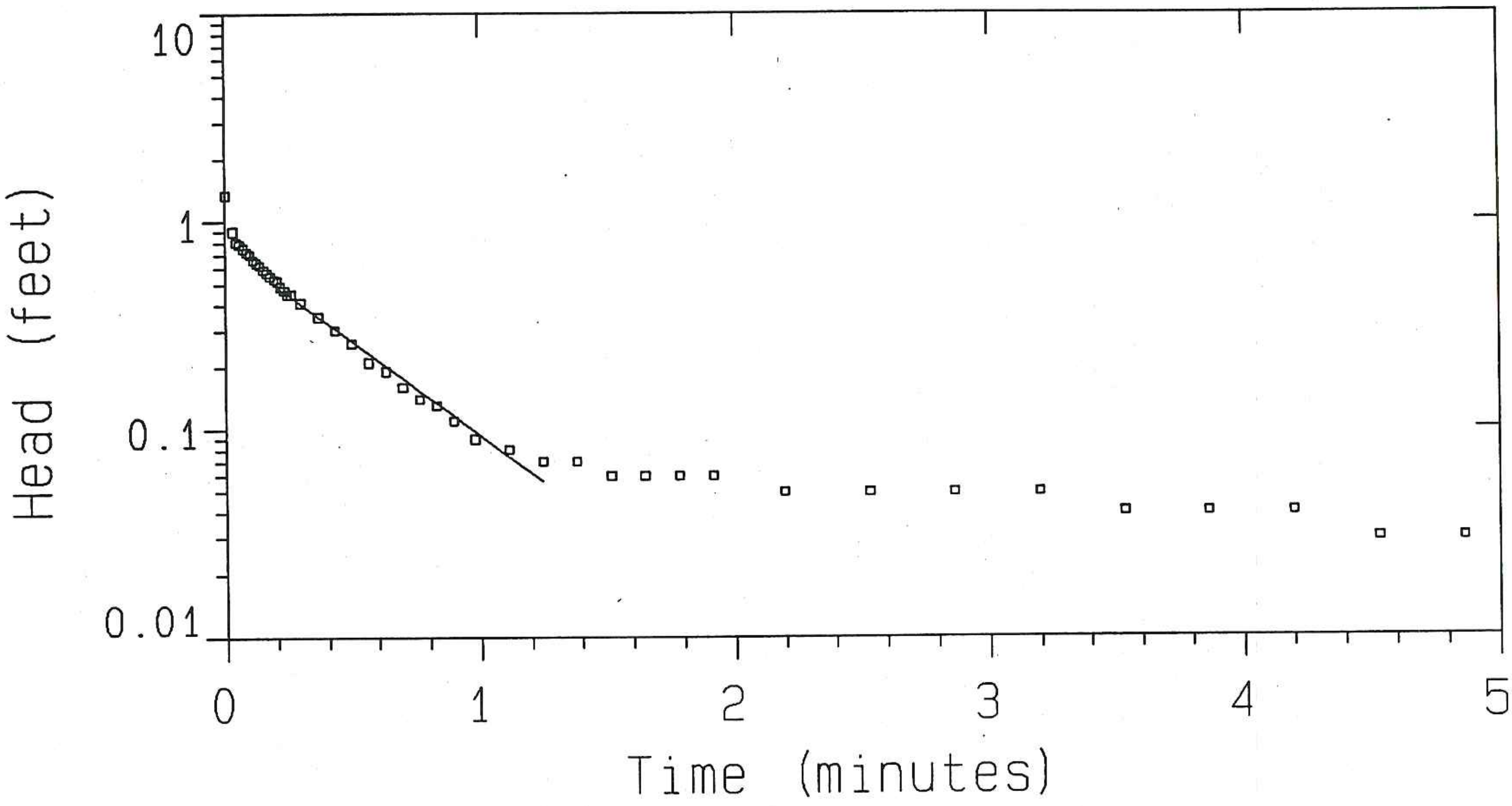
n = porosity (assumed to be 30%)

V = linear flow velocity

$$V = KI/n$$

$$V\,(\text{ft/min}) \times 60\,\text{min/hr} \times 24\,\text{hr/day} \times 365\,\text{day/yr} \equiv \text{ft/yr}$$

WELL NO.	I (ft/ft)	K (ft/min)	V (ft/min)	V (ft/yr)
HMW-4 (shallow)	0.0097 (low)	0.00111 (low)	3.6×10^{-5}	18.8
	0.0154 (avg)	0.00133 (avg)	6.8×10^{-5}	35.9
	0.0187 (high)	0.00155 (high)	9.7×10^{-5}	50.7
HMW-3 (deep)	0.0097 (low)	0.00169 (low)	5.5×10^{-5}	28.7
	0.0119 (avg)	0.00177 (avg)	7.0×10^{-5}	36.8
	0.0131 (high)	0.00184 (high)	8.0×10^{-5}	42.2



MODEL TYPE: BOUWER and RICE

CONDUCTIVITY: .001840 ft/min

TRANSMISSIVITY: .07768 sq. ft/min

INITIAL HEAD: 1.340 ft

Data Set: HMW3-1I

Date: 08/06/92

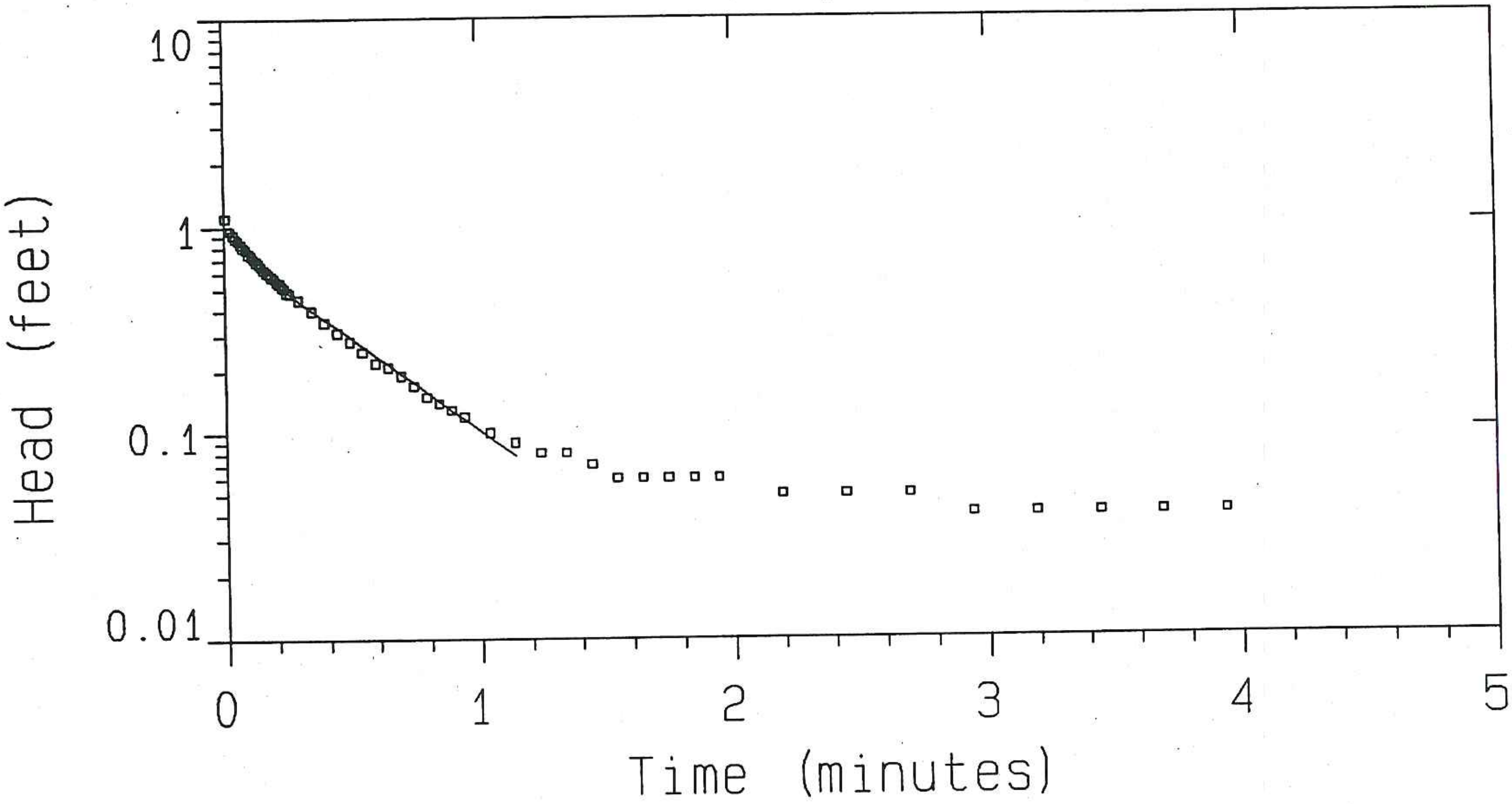
for: U.S. Army Corps of Engineers

by: Environmental Science & Engineering

WELL DATA: Units: ft
AQUIFER: Water Table
THICKNESS: 42.20
SCREEN: top: 39.00 base: 49.00
DIAMETER: casing: .1666 intake: 1.708
DEPTH: Water Table: 9.300 TD: 49.00

Slug Test Data (Slug-In)

Well: HMW-3
Hunter A.A.F.
Savannah, GA



MODEL TYPE: BOUWER and RICE

CONDUCTIVITY: .001691 ft/min

TRANSMISSIVITY: .07137 sq. ft/min

INITIAL HEAD: 1.110 ft

Data Set: HMW3-10

Date: 08/06/92

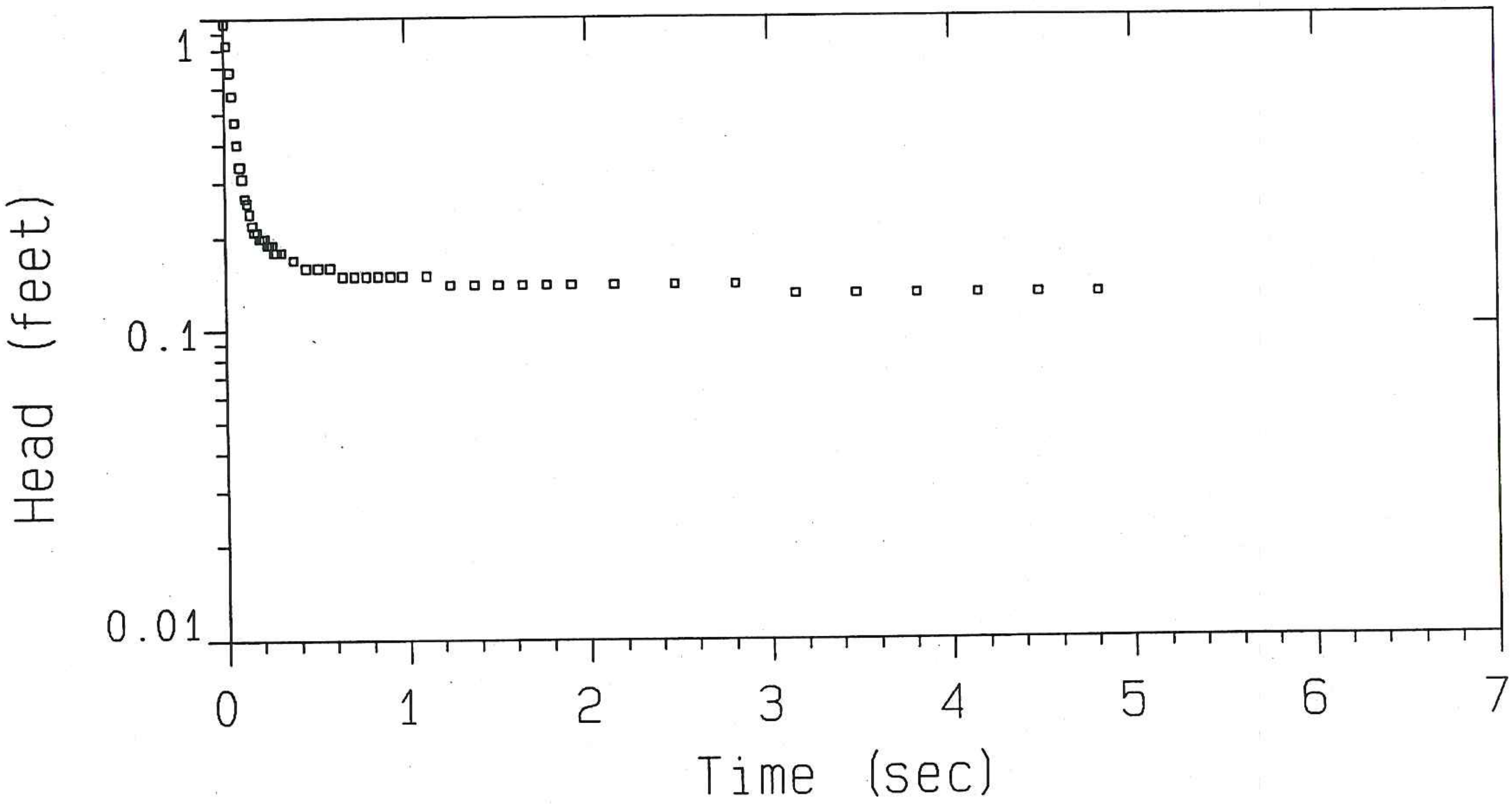
for: U.S. Army Corps of Engineers

by: Environmental Science & Engineering

WELL DATA: Units: ft
AQUIFER: Water Table
THICKNESS: 42.20
SCREEN: top: 39.00 base: 49.00
DIAMETER: casing: .1666 intake: 1.708
DEPTH: Water Table: 9.300 TD: 49.00

Slug Test Data (Slug-Out)

Well: HMW-3
Hunter A.A.F.
Savannah, GA



MODEL TYPE: BOUWER and RICE

CONDUCTIVITY: .001110 ft/min

TRANSMISSIVITY: .006859 sq. ft/min

INITIAL HEAD: .9700 ft

Data Set: HMW4-10

Date: 08/06/92

for: U.S. Army Corps of Engineers

by: Environmental Science & Engineering

WELL DATA: Units: ft

AQUIFER: Water Table

THICKNESS: 6.180

SCREEN: top: 3.000 base: 13.00

DIAMETER: casing: .1666 intake: 1.708

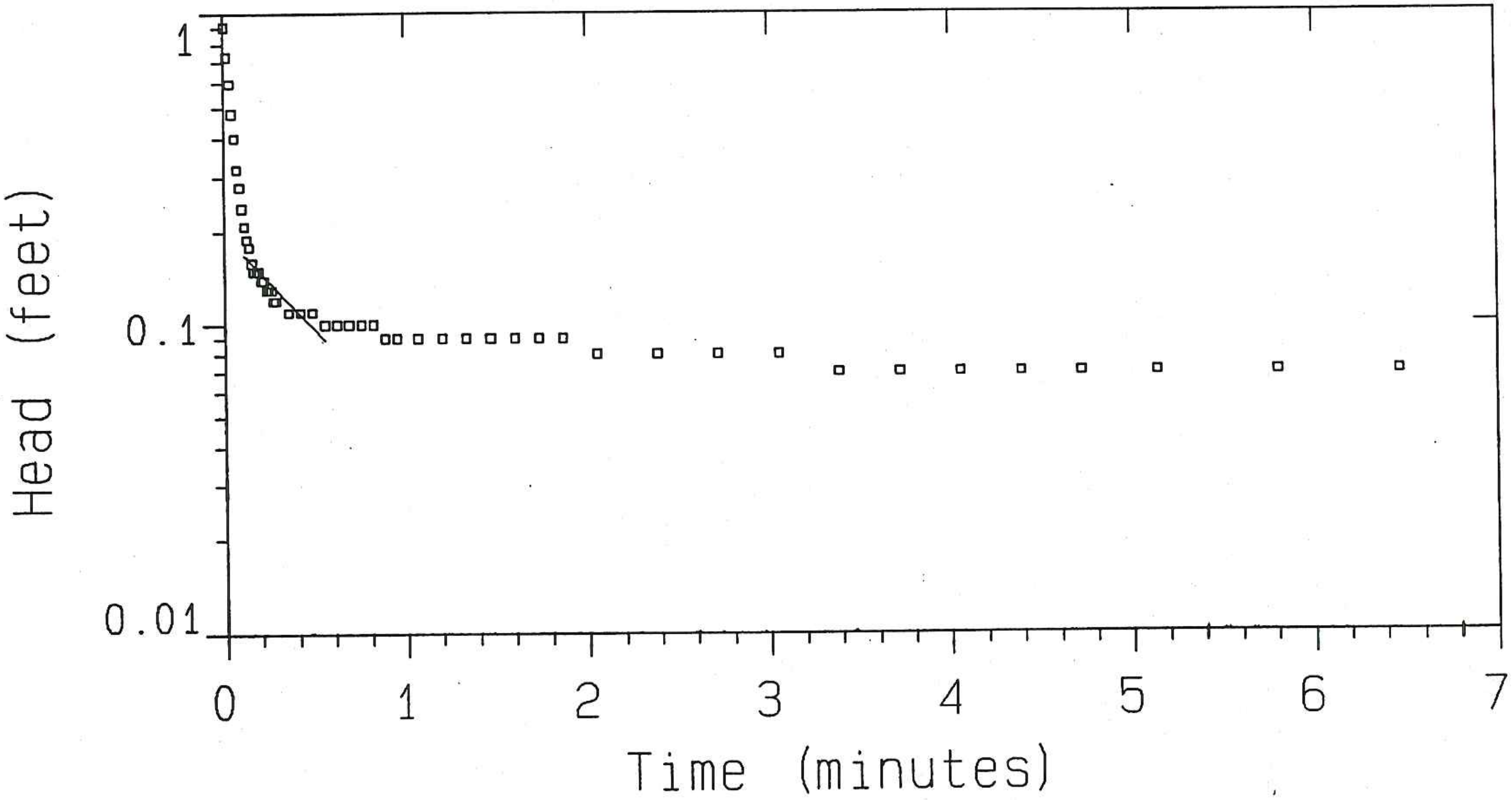
DEPTH: Water Table: 9.320 TD: 13.00

Slug Test Data (Slug-Out)

Well: HMW-4

Hunter A.A.F.

Savannah, GA



MODEL TYPE: BOUWER and RICE
CONDUCTIVITY: .001546 ft/min
TRANSMISSIVITY: .009556 sq. ft/min
INITIAL HEAD: .9100 ft
Data Set: HMW4-20
Date: 08/06/92

for: U.S. Army Corps of Engineers
by: Environmental Science & Engineering
WELL DATA: Units: ft
AQUIFER: Water Table
THICKNESS: 6.180
SCREEN: top: 3.000 base: 13.00
DIAMETER: casing: .1666 intake: 1.708
DEPTH: Water Table: 9.320 TD: 13.00

Slug Test Data (Slug-Out)

Well: HMW-4
Hunter A.A.F.
Savannah, GA

APPENDIX E

ANALYTICAL RESULTS

Soil/Sediments

Table 1-1. Analytical Parameters Detected in Soil Samples in 1987, Hunter AAFTA

PARAMETERS UNITS		BH-10		BH-11		BH-12		BH-13			QA ALCOHOL	QA WASH
		0-1 FT.	7.5-8.5 FT.	0-1 FT.	7.5-8.5 FT.	0-1 FT.	6.5-7.5 FT.		0-1 FT.	6.0-7.5 FT.		
2 METHYLNAPHTHALENE	UG/KG	<1.00	19000.00	<1.00	12000.00	<1.00	10000.00	<2.00	<1.00	<1.00	<1.00	<1.00
ARSENIC	UG/G	5.99	2.00	13.90	3.88	4.00	<1.96	11.98	7.75	3.94	<1.96	<1.96
BARIUM	UG/G	64.40	9.19	33.50	18.10	7.19	8.12	27.10	19.80	8.28	<0.01	<0.01
BIS (2 ETHYLHEXYL) PHTHALATE	UG/KG	<1.00	1.70	<1.00	900.00	<1.00	300.00	<3.00	<1.00	NRQ	<1.00	<1.00
CADMIUM	UG/G	<1.98	<1.98	1.99	<1.98	<1.98	<1.98	0.02	3.87	<1.98	<1.98	<1.98
CHROMIUM	UG/G	12.80	<3.96	4.16	<3.96	5.19	<3.96	2.84	9.10	<3.96	<3.96	<3.96
DI-N-LATEBUTYLPHTHALATE	UG/KG	<1.00	1300.00	<1.00	600.00	<1.00	2400.00	<2.00	<1.00	<1.00	<1.00	<1.00
DIETHYLPHTHALATE	UG/KG	<1.00	<1.00	<1.00	<1.00	<1.00	200.00	<2.00	<1.00	<1.00	<1.00	<1.00
FLUORENE	UG/KG	<1.00	400.00	<1.00	<1.00	<1.00	200.00	<3.00	<1.00	NRQ	<1.00	<1.00
LEAD	UG/G	645.00	35.90	1163.70	NRQ	102.00	19.30	1179.80	1185.00	13.80	<1.98	<1.98
MERCURY	UG/G	0.40	0.39	0.38	0.38	0.40	0.38	0.79	0.38	0.39	<0.04	<0.04
NAPHTHALENE	UG/KG	<1.00	10000.00	<1.00	7000.00	<1.00	5800.00	<2.00	<1.00	<1.00	<1.00	<1.00
PHENANTHRENE	UG/KG	<1.00	900.00	<1.00	<1.00	<1.00	200.00	<3.00	<1.00	NRQ	<1.00	<1.00
SELENIUM	UG/G	<0.20	<0.20	<0.20	<0.20	0.79	0.60	0.22	0.33	<0.20	<0.20	<0.20
SILVER	UG/G	<3.99	<3.99	<3.99	<3.99	<3.99	<3.99	<7.98	<3.99	<3.99	<3.99	<3.99

Source: ESE.

Table 1-2. Analytical Parameters Detected in Soil/Sediment Samples in 1990, Hunter AAFTA

PARAMETERS	UNITS	SOIL							SEDIMENT					
		HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	TRPBLK	SD-1	SD-2	SD-3	SD-3DUP	TRPBLK	RINSEBLK
		8-10 FT.	3-5 FT.	6-8 FT.	2-4 FT.	5-8 FT.	8-10 FT.							
		02/12/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90
		17:05	07:45	08:35	09:35	11:35	12:45	12:00	09:00	09:20	09:30	09:30	10:30	10:45
%MOISTURE	%WET WT	5.00	12.40	16.20	14.00	21.60	16.30	NRQ	13.90	26.20	19.70	19.80	NRQ	NRQ
1,1,1-TRICHL'ETHANE	UG/KG-DRY	<1.40	<1.50	<200.00	<1.60	<2100.00	<1.60	NRQ	<1.50	<1.80	<1.60	<1.60	NRQ	NRQ
1,1,1-TRICHL'ETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.60	NRQ	NRQ	NRQ	NRQ	<1.60	<1.60
1,1,2,2-TETRACHLORO ETHANE	UG/KG-DRY	<1.60	<1.70	<230.00	<1.80	<2400.00	<1.80	NRQ	<1.70	<2.10	<1.90	<1.90	NRQ	NRQ
1,1,2,2-TETRACHLORO ETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.50	NRQ	NRQ	NRQ	NRQ	<1.50	<1.50
1,1,2-TRICHL'ETHANE	UG/KG-DRY	<1.70	<1.80	<240.00	<1.90	<2500.00	<1.90	NRQ	<1.80	<2.20	<2.00	<2.00	NRQ	NRQ
1,1,2-TRICHL'ETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.87	NRQ	NRQ	NRQ	NRQ	<0.87	<0.87
1,1-DICHLOROETHANE	UG/KG-DRY	<0.90	<0.97	<130.00	<1.00	<1400.00	<1.00	NRQ	<0.98	<1.20	<1.00	<1.00	NRQ	NRQ
1,1-DICHLOROETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.85	NRQ	NRQ	NRQ	NRQ	<0.85	<0.85
1,1-DICHLOROETHENE	UG/G-DRY	<1.30	<1.40	<180.00	<1.40	<1900.00	<1.40	NRQ	<1.40	<1.60	<1.50	<1.50	NRQ	NRQ
1,1-DICHLOROETHYLENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.20	NRQ	NRQ	NRQ	NRQ	<1.20	<1.20
1,2-DICHLOROETHANE	UG/KG-DRY	<0.92	<1.00	<130.00	<1.00	<1400.00	<1.00	NRQ	<1.00	<1.20	<1.10	<1.10	NRQ	NRQ
1,2-DICHLOROETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.87	NRQ	NRQ	NRQ	NRQ	<0.87	<0.87
1,2-DICHLOROETHANE-D4	UG/KG-DRY	58.00	60.00	54.00	61.00	48.00	62.00	NRQ	59.00	72.00	59.00	58.00	NRQ	NRQ
1,2-DICHLOROETHANE-D4 (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	47.00
1,2-DICHLOROETHENE, TOTAL	UG/KG-DRY	<1.37	<1.49	<194.00	<1.53	<2070.00	<1.54	NRQ	<1.49	<1.76	<1.60	<1.60	NRQ	NRQ

Table 1-2. Analytical Parameters Detected in Soil/Sediment Samples in 1990, Hunter AAFTA, Continued, Page 2 of 9

PARAMETERS	UNITS	SOIL							SEDIMENT					
		HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	TRPBLK	SD-1	SD-2	SD-3	SD-3DUP	TRPBLK	RINSEBLK
		8-10 FT.	3-5 FT.	6-8 FT.	2-4 FT.	5-8 FT.	8-10 FT.							
		02/12/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90
		17:05	07:45	08:35	09:35	11:35	12:45	12:00	09:00	09:20	09:30	09:30	10:30	10:45
1,2-DICHLOROETHENE, TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.30	NRQ	NRQ	NRQ	NRQ	<1.30	<1.30
1,2-DICHLOROPROPANE	UG/KG-DRY	<1.00	<1.10	<140.00	<1.10	<1500.00	<1.10	NRQ	<1.10	<1.30	<1.20	<1.20	NRQ	NRQ
1,2-DICHLOROPROPANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.97	NRQ	NRQ	NRQ	NRQ	<0.97	<0.97
2,4,6-TRIBROMOPHENOL	MG/KG-DRY	6750.00	7620.00	9150.00	8940.00	9730.00	8490.00	NRQ	7200.00	7820.00	7370.00	1530.00	NRQ	NRQ
2,4,6-TRIBROMOPHENOL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	120.00
2-BUTANONE	UG/KG-DRY	<9.96	<10.80	<1410.00	<11.10	15100.00	<11.20	NRQ	<10.90	<12.80	<11.60	<11.70	NRQ	NRQ
2-BUTANONE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<9.44	NRQ	NRQ	NRQ	NRQ	<9.44	<9.44
2-FLUORBIPHENYL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	75.00
2-FLUOROBIPHENYL	UG/KG-DRY	3300.00	3880.00	4510.00	4250.00	4490.00	3640.00	NRQ	4030.00	3990.00	4460.00	4530.00	NRQ	NRQ
2-FLUOROPHENOL	UG/KG-DRY	8940.00	9410.00	10200.00	10600.00	10400.00	10300.00	NRQ	8610.00	10000.00	9870.00	9500.00	NRQ	NRQ
2-FLUOROPHENOL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	110.00
2-HEXANONE	UG/KG-DRY	<3.30	<3.60	<470.00	<3.70	<5000.00	<3.70	NRQ	<3.60	<4.20	<3.90	<3.90	NRQ	NRQ
2-HEXANONE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.10	NRQ	NRQ	NRQ	NRQ	<3.10	<3.10
4-METHYL-2-PENTANONE	UG/KG-DRY	<2.83	<3.07	<400.00	<3.15	<4270.00	<3.17	NRQ	<3.08	<3.63	<3.30	<3.31	NRQ	NRQ
4-METHYL-2-PENTANONE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.00	NRQ	NRQ	NRQ	NRQ	<3.00	<3.00
ACENAPHTHENE	UG/KG-DRY	<130.00	300.00	<150.00	<150.00	<160.00	<150.00	NRQ	1100.00	<170.00	<1600.00	4900.00	NRQ	NRQ

Table 1-2. Analytical Parameters Detected in Soil/Sediment Samples in 1990, Hunter AAFTA, Continued, Page 3 of 9

PARAMETERS	UNITS	SOIL							SEDIMENT					
		HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	TRPBLK	SD-1	SD-2	SD-3	SD-3DUP	TRPBLK	RINSEBLK
		8-10 FT.	3-5 FT.	6-8 FT.	2-4 FT.	5-8 FT.	8-10 FT.							
		02/12/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90
		17:05	07:45	08:35	09:35	11:35	12:45	12:00	09:00	09:20	09:30	09:30	10:30	10:45
ACENAPHTHENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.80
ACENAPHTHYLENE	UG/KG-DRY	<96.00	400.00	<110.00	<110.00	<120.00	<110.00	NRQ	<530.00	<120.00	3100.00	2000.00	NRQ	NRQ
ACENAPHTHYLENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.70
ACETONE	UG/KG-DRY	<18.00	<19.00	<2500.00	<20.00	27000.00	<20.00	NRQ	40.00	110.00	120.00	<21.00	NRQ	NRQ
ACETONE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<17.00	NRQ	NRQ	NRQ	NRQ	<17.00	<17.00
ANTHRACENE	UG/KG-DRY	<75.00	1300.00	<85.00	<83.00	<91.00	<85.00	NRQ	3000.00	<97.00	8200.00	9300.00	NRQ	NRQ
ANTHRACENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.10
ARSENIC,SED	MG/KG-DRY	<0.48	<0.52	<0.54	0.65	0.85	<0.55	NRQ	<0.53	0.76	<0.57	<0.57	NRQ	NRQ
ARSENIC,TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.30
BARIUM,SED	MG/KG-DRY	3.83	5.97	6.21	4.44	15.40	11.20	NRQ	19.80	8.46	13.40	229.00	NRQ	NRQ
BARIUM,TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.70
BENZENE	UG/KG-DRY	<1.20	<1.30	<170.00	<1.30	<1800.00	<1.30	NRQ	<1.30	<1.50	15.00	31.00	NRQ	NRQ
BENZENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.10	NRQ	NRQ	NRQ	NRQ	<1.10	<1.10
BENZO(A)ANTHRACENE	UG/KG-DRY	<62.00	4900.00	<70.00	<68.00	<75.00	<70.00	NRQ	13000.00	<79.00	26000.00	33000.00	NRQ	NRQ
BENZO(A)ANTHRACENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.80
BENZO(A)PYRENE	UG/KG-DRY	<180.00	3400.00	<210.00	<200.00	<220.00	<210.00	NRQ	9200.00	<230.00	18000.00	27000.00	NRQ	NRQ

Table 1-2. Analytical Parameters Detected in Soil/Sediment Samples in 1990, Hunter AAFTA, Continued, Page 4 Of 9

PARAMETERS	UNITS	SOIL							SEDIMENT					
		HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	TRPBLK	SD-1	SD-2	SD-3	SD-3DUP	TRPBLK	RINSEBLK
		8-10 FT.	3-5 FT.	6-8 FT.	2-4 FT.	5-8 FT.	8-10 FT.							
		02/12/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90
		17:05	07:45	08:35	09:35	11:35	12:45	12:00	09:00	09:20	09:30	09:30	10:30	10:45
BENZO(A)PYRENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<5.20
BENZO(B)FLUORANTHENE	UG/KG-DRY	<130.00	5000.00	<150.00	<150.00	<160.00	<150.00	NRQ	16000.00	<170.00	21000.00	27000.00	NRQ	NRQ
BENZO(B)FLUORANTHENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.80
BENZO(GHI)PERYLENE	UG/KG-DRY	<74.00	2200.00	<84.00	<81.00	<89.00	<84.00	NRQ	6200.00	<95.00	13000.00	17000.00	NRQ	NRQ
BENZO(GHI)PERYLENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.10
BENZO(K)FLUORANTHENE	UG/KG-DRY	<170.00	2500.00	<190.00	<180.00	<200.00	<190.00	NRQ	7200.00	<210.00	17000.00	29000.00	NRQ	NRQ
BENZO(K)FLUORANTHENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<4.70
BROMODICHLOROMETHANE	UG/KG-DRY	<1.00	<1.10	<150.00	<1.20	<1600.00	<1.20	NRQ	<1.10	<1.30	<1.20	<1.20	NRQ	NRQ
BROMODICHLOROMETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.98	NRQ	NRQ	NRQ	NRQ	<0.98	<0.98
BROMOFLUOROBENZENE	UG/KG-DRY	52.00	46.00	62.00	50.00	54.00	50.00	NRQ	54.00	61.00	67.00	65.00	NRQ	NRQ
BROMOFLUOROBENZENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	45.00
BROMOFORM	UG/KG-DRY	<2.60	<2.80	<370.00	<2.90	<3900.00	<2.90	NRQ	<2.80	<3.30	<3.00	<3.00	NRQ	NRQ
BROMOFORM (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.50	NRQ	NRQ	NRQ	NRQ	<2.50	<2.50
BROMOMETHANE	UG/KG-DRY	<1.20	<1.30	<170.00	<1.40	<1900.00	<1.40	NRQ	<1.30	<1.60	<1.40	<1.40	NRQ	NRQ
BROMOMETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.20	NRQ	NRQ	NRQ	NRQ	<1.20	<1.20
CADMIUM,SED	MG/KG-DRY	<0.37	<0.40	<0.42	<0.41	<0.45	<0.42	NRQ	<0.41	<0.47	<0.44	<0.44	NRQ	NRQ

Table 1-2. Analytical Parameters Detected in Soil/Sediment Samples in 1990, Hunter AAFTA, Continued, Page 5 of 9

PARAMETERS	UNITS	SOIL							SEDIMENT					
		HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	TRPBLK	SD-1	SD-2	SD-3	SD-3DUP	TRPBLK	RINSEBLK
		8-10 FT.	3-5 FT.	6-8 FT.	2-4 FT.	5-8 FT.	8-10 FT.							
		02/12/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90
		17:05	07:45	08:35	09:35	11:35	12:45	12:00	09:00	09:20	09:30	09:30	10:30	10:45
CADMIUM,TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.50
CARBON DISULFIDE	UG/KG-DRY	<3.30	<3.60	<460.00	<3.70	<5000.00	<3.70	NRQ	<3.60	23.00	<3.80	<3.80	NRQ	NRQ
CARBON DISULFIDE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.10	NRQ	NRQ	NRQ	NRQ	<3.10	<3.10
CARBON TETRACHLORIDE	UG/KG-DRY	<1.00	<1.10	<140.00	<1.10	<1500.00	<1.10	NRQ	<1.10	<1.30	<1.20	<1.20	NRQ	NRQ
CARBON TETRACHLORIDE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.97	NRQ	NRQ	NRQ	NRQ	<0.97	<0.97
CHLOROBENZENE	UG/KG-DRY	<0.69	<0.74	<97.00	<0.76	<1000.00	<0.77	NRQ	<0.75	<0.88	<0.80	<0.80	NRQ	NRQ
CHLOROBENZENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.65	NRQ	NRQ	NRQ	NRQ	<0.65	<0.65
CHLOROETHANE	UG/KG-DRY	<1.80	<2.00	<260.00	<2.10	<2800.00	<2.10	NRQ	<2.00	<2.40	<2.20	<2.20	NRQ	NRQ
CHLOROETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.80	NRQ	NRQ	NRQ	NRQ	<1.80	<1.80
CHLOROFORM	UG/KG-DRY	<1.20	<1.30	<180.00	<1.40	<1900.00	<1.40	NRQ	<1.40	<1.60	<1.50	<1.50	NRQ	NRQ
CHLOROFORM (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.20	NRQ	NRQ	NRQ	NRQ	<1.20	<1.20
CHLOROMETHANE	UG/KG-DRY	<26.00	<28.00	<3600.00	<28.00	39000.00	<29.00	NRQ	<28.00	<33.00	<30.00	<30.00	NRQ	NRQ
CHLOROMETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<24.00	NRQ	NRQ	NRQ	NRQ	<24.00	<24.00
CHROMIUM,SED	MG/KG-DRY	0.78	3.49	3.85	5.87	1.93	2.39	NRQ	3.38	2.20	69.70	52.00	NRQ	NRQ
CHROMIUM,TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<7.00
CHRYSENE	UG/KG-DRY	<97.00	5100.00	<110.00	<110.00	<120.00	<110.00	NRQ	22000.00	<120.00	40000.00	52000.00	NRQ	NRQ

Table 1-2. Analytical Parameters Detected in Soil/Sediment Samples in 1990, Hunter AAFTA, Continued, Page 6 of 9

PARAMETERS	UNITS	SOIL							SEDIMENT					
		HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	TRPBLK	SD-1	SD-2	SD-3	SD-3DUP	TRPBLK	RINSEBLK
		8-10 FT.	3-5 FT.	6-8 FT.	2-4 FT.	5-8 FT.	8-10 FT.							
		02/12/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90
		17:05	07:45	08:35	09:35	11:35	12:45	12:00	09:00	09:20	09:30	09:30	10:30	10:45
CHRYSENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.80
CIS-1,3-DICHLOROPROPENE	UG/KG-DRY	<1.60	<1.80	<230.00	<1.80	<2400.00	<1.80	NRQ	<1.80	<2.10	<1.90	<1.90	NRQ	NRQ
CIS-1,3-DICHLOROPROPENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.50	NRQ	NRQ	NRQ	NRQ	<1.50	<1.50
DIBEN'(A,H)ANTH'CENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.80
DIBEN(A,H)ANTHRACENE	UG/KG-DRY	<63.00	1100.00	<72.00	<70.00	<77.00	<72.00	NRQ	4200.00	<81.00	8100.00	11000.00	NRQ	NRQ
DIBROMOCHLOROMETHANE	UG/KG-DRY	<1.40	<1.50	<200.00	<1.50	<2100.00	<1.50	NRQ	<1.50	<1.80	<1.60	<1.60	NRQ	NRQ
DIBROMOCHLOROMETHANE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.30	NRQ	NRQ	NRQ	NRQ	<1.30	<1.30
ETHYLBENZENE	UG/KG-DRY	<1.10	<1.10	1500.00	<1.20	10000.00	<1.20	NRQ	<1.10	<1.40	<1.20	<1.20	NRQ	NRQ
ETHYLBENZENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.00	NRQ	NRQ	NRQ	NRQ	<1.00	<1.00
FLUORANTHENE	UG/KG-DRY	<110.00	13000.00	140.00	<130.00	360.00	<130.00	NRQ	36000.00	<150.00	54000.00	62000.00	NRQ	NRQ
FLUORANTHENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.20
FLUORENE	UG/KG-DRY	<110.00	720.00	<120.00	<120.00	<130.00	<120.00	NRQ	1500.00	<140.00	2500.00	8300.00	NRQ	NRQ
FLUORENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<3.10
INDENO(1,2,3-CD)PYRENE	UG/KG-DRY	<95.00	2900.00	<110.00	<110.00	<120.00	<110.00	NRQ	7900.00	<120.00	15000.00	23000.00	NRQ	NRQ
INDENO(1,2,3-CD)PYRENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.70
LEAD,SED	MG/KG-DRY	<5.26	<5.71	<5.97	<5.81	7.40	<5.97	NRQ	7.65	7.71	275.00	362.00	NRQ	NRQ

Table 1-2. Analytical Parameters Detected in Soil/Sediment Samples in 1990, Hunter AAFTA, Continued, Page 7 of 9

PARAMETERS	UNITS	SOIL							SEDIMENT					
		HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	TRPBLK	SD-1	SD-2	SD-3	SD-3DUP	TRPBLK	RINSEBLK
		8-10 FT.	3-5 FT.	6-8 FT.	2-4 FT.	5-8 FT.	8-10 FT.							
		02/12/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90
		17:05	07:45	08:35	09:35	11:35	12:45	12:00	09:00	09:20	09:30	09:30	10:30	10:45
LEAD,TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<25.00
MERCURY,SED	MG/KG-DRY	<0.10	<0.11	<0.11	<0.11	<0.12	<0.12	NRQ	<0.11	<0.13	<0.12	<0.12	NRQ	NRQ
MERCURY,TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.20
METHYLENE CHLORIDE	UG/KG-DRY	<1.70	<1.80	<240.00	<1.90	<2600.00	6.70	NRQ	7.00	12.00	<2.00	<2.00	NRQ	NRQ
METHYLENE CHLORIDE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	2.60	NRQ	NRQ	NRQ	NRQ	<1.60	<1.60
NAPHTHALENE	UG/KG-DRY	<210.00	<230.00	5700.00	<230.00	11000.00	<240.00	NRQ	<230.00	<270.00	<250.00	390.00	NRQ	NRQ
NAPHTHALENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<5.90
NITROBENZENE-D(5)	UG/KG-DRY	3670.00	3910.00	4180.00	4130.00	3740.00	4060.00	NRQ	3790.00	4310.00	4270.00	4070.00	NRQ	NRQ
NITROBENZENE-D(5) (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	87.00
PHENANTHRENE	UG/KG-DRY	<67.00	8100.00	150.00	<74.00	290.00	<76.00	NRQ	20000.00	<87.00	33000.00	62000.00	NRQ	NRQ
PHENANTHRENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.90
PHENOL-D(5)	UG/KG-DRY	9640.00	9660.00	10800.00	10000.00	11000.00	10700.00	NRQ	7980.00	9510.00	8650.00	8780.00	NRQ	NRQ
PHENOL-D(5) (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	77.00
PYRENE	UG/KG-DRY	<72.00	9700.00	140.00	<79.00	340.00	<81.00	NRQ	27000.00	<92.00	43000.00	58000.00	NRQ	NRQ
PYRENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.00
SELENIUM,SED	MG/KG-DRY	<0.42	<0.45	<0.47	<0.46	0.67	<0.47	NRQ	<0.46	<0.54	<0.49	<0.49	NRQ	NRQ

Table 1-2. Analytical Parameters Detected in Soil/Sediment Samples in 1990, Hunter AAFTA, Continued, Page 8 of 9

PARAMETERS	UNITS	SOIL							SEDIMENT					
		HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	TRPBLK	SD-1	SD-2	SD-3	SD-3DUP	TRPBLK	RINSEBLK
		8-10 FT.	3-5 FT.	6-8 FT.	2-4 FT.	5-8 FT.	8-10 FT.							
		02/12/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90
		17:05	07:45	08:35	09:35	11:35	12:45	12:00	09:00	09:20	09:30	09:30	10:30	10:45
SELENIUM,TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.00
SILVER,SED	MG/KG-DRY	<0.60	<0.65	<0.68	<0.66	<0.73	<0.68	NRQ	<0.66	<0.77	<0.71	<0.71	NRQ	NRQ
SILVER,TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<5.70
STYRENE	UG/KG-DRY	<1.70	<1.80	<240.00	<1.90	<2500.00	<1.90	NRQ	<1.80	<2.20	<2.00	<2.00	NRQ	NRQ
STYRENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.60	NRQ	NRQ	NRQ	NRQ	<1.60	<1.60
TERPHENYL-(D14)	MG/KG-DRY	5880.00	5940.00	4000.00	10600.00	5450.00	5260.00	NRQ	5430.00	4240.00	4890.00	4850.00	NRQ	NRQ
TERPHENYL-(D14) (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	73.00
TETRACHLOROETHENE	UG/KG-DRY	<0.54	<0.58	<76.00	<0.60	<810.00	<0.60	NRQ	<0.59	<0.69	<0.63	<0.63	NRQ	NRQ
TETRACHLOROETHENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.51	NRQ	NRQ	NRQ	NRQ	<0.51	<0.51
TOLUENE	UG/KG-DRY	2.80	2.90	<100.00	<0.82	<1100.00	5.50	NRQ	<0.81	3.20	<0.86	<0.86	NRQ	NRQ
TOLUENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.70	NRQ	NRQ	NRQ	NRQ	<0.70	<0.70
TOLUENE-D(8) (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	51.00
TOLUENE-D8	UG/KG-DRY	59.00	66.00	61.00	66.00	55.00	67.00	NRQ	63.00	73.00	68.00	54.00	NRQ	NRQ
TRANS-1,3-DICHLOROPROPENE	UG/KG-DRY	<0.91	<0.98	<130.00	<1.00	<1400.00	<1.00	NRQ	<0.99	<1.20	<1.10	<1.10	NRQ	NRQ
TRANS-1,3-DICHLOROPROPENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.86	NRQ	NRQ	NRQ	NRQ	<0.86	<0.86
TRICHLOROETHENE	UG/KG-DRY	<0.92	<1.00	<130.00	<1.00	<1400.00	<1.00	NRQ	<1.00	<1.20	<1.10	<1.10	NRQ	NRQ

Table 1-2. Analytical Parameters Detected in Soil/Sediment Samples in 1990, Hunter AAFTA, Continued, Page 9 of 9

PARAMETERS	UNITS	SOIL							SEDIMENT					
		HSB-1	HSB-2	HSB-3	HSB-4	HSB-5	HSB-6	TRPBLK	SD-1	SD-2	SD-3	SD-3DUP	TRPBLK	RINSEBLK
		8-10 FT.	3-5 FT.	6-8 FT.	2-4 FT.	5-8 FT.	8-10 FT.							
		02/12/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/13/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90	02/12/90
		17:05	07:45	08:35	09:35	11:35	12:45	12:00	09:00	09:20	09:30	09:30	10:30	10:45
TRICHLOROETHENE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<0.87	NRQ	NRQ	NRQ	NRQ	<0.87	<0.87
VINYL ACETATE	UG/KG-DRY	<2.70	<2.90	<380.00	<3.00	<4100.00	<3.00	NRQ	<3.00	<3.50	<3.20	<3.20	NRQ	NRQ
VINYL ACETATE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<2.60	NRQ	NRQ	NRQ	NRQ	<2.60	<2.60
VINYL CHLORIDE	UG/KG-DRY	<1.60	<1.80	<230.00	<1.80	<2500.00	<1.80	NRQ	<1.80	<2.10	<1.90	<1.90	NRQ	NRQ
VINYL CHLORIDE (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.60	NRQ	NRQ	NRQ	NRQ	<1.60	<1.60
XYLENE,SED	UG/KG-DRY	<1.10	<1.20	<150.00	<1.20	57000.00	<1.20	NRQ	<1.20	<1.40	2.40	<1.30	NRQ	NRQ
XYLENES,TOTAL (EPTOX)	UG/L	NRQ	NRQ	NRQ	NRQ	NRQ	NRQ	<1.00	NRQ	NRQ	NRQ	NRQ	<1.00	<1.00

Source: ESE.

Table 1-3. Analytical Parameters Detected in Groundwater Samples in 1990, Hunter AAFTA

PARAMETERS	UNITS	HMW-1	HMW-2	HMW-3	HMW-4	HMW-5	HMW-6
		03/07/90	03/07/90	03/08/90	03/08/90	03/08/90	03/08/90
		16:55	10:20	09:20	09:35	10:35	11:10
1,1,1-TRICHL'ETHANE	UG/L	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30
1,1,2,2-TETRACHLORO ETHANE	UG/L	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50
1,1,2-TRICHL'ETHANE	UG/L	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60
1,1-DICHLOROETHANE	UG/L	<0.85	<0.85	<0.85	<0.85	<0.85	<0.85
1,1-DICHLOROETHYLENE	UG/L	<1.20	<1.20	<1.20	<1.20	<1.20	<1.20
1,2-DICHLOROETHANE	UG/L	<0.87	<0.87	<0.87	<0.87	<0.87	<0.87
1,2-DICHLOROETHANE-D4	UG/L	49.00	55.00	46.00	47.00	46.00	46.00
1,2-DICHLOROETHENE, TOTAL	UG/L	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30
1,2-DICHLOROPROPANE	UG/L	<0.97	<0.97	<0.97	<0.97	<0.97	<0.97
2,4,6-TRIBROMOPHENOL	UG/L	180.00	170.00	190.00	180.00	160.00	180.00
2-BUTANONE	UG/L	<9.44	<9.44	<9.44	<9.44	<9.44	<9.44
2-FLUORBIPHENYL	UG/L	66.00	74.00	66.00	69.00	76.00	79.00
2-FLUOROPHENOL	UG/L	180.00	160.00	150.00	170.00	150.00	170.00
2-HEXANONE	UG/L	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10
4-METHYL-2-PENTANONE	UG/L	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
ACENAPHTHENE	UG/L	<3.80	<3.80	<3.80	<3.80	<3.80	<3.80
ACENAPHTHYLENE	UG/L	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70
ACETONE	UG/L	<17.00	<17.00	<17.00	<17.00	<17.00	<17.00
ANTHRACENE	UG/L	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10
ARSENIC,TOTAL	UG/L	3.10	51.60	2.40	8.50	8.90	77.30
BARIUM,TOTAL	UG/L	59.20	1000.00	36.80	166.00	104.00	864.00
BENZENE	UG/L	<1.10	<1.10	7.80	1.90	<1.10	44.00

Table 1-3. Analytical Parameters Detected in Groundwater Samples in 1990, Hunter AAFTA, Continued, Page 2 of 4

PARAMETERS	UNITS	HMW-1	HMW-2	HMW-3	HMW-4	HMW-5	HMW-6
		03/07/90	03/07/90	03/08/90	03/08/90	03/08/90	03/08/90
		16:55	10:20	09:20	09:35	10:35	11:10
BENZO(A)ANTHRACENE	UG/L	<1.80	<1.80	<1.80	<1.80	<1.80	3.20
BENZO(A)PYRENE	UG/L	<5.20	<5.20	<5.20	<5.20	<5.20	<5.20
BENZO(B)FLUORANTHENE	UG/L	<3.80	<3.80	<3.80	<3.80	<3.80	7.00
BENZO(GHI)PERYLENE	UG/L	<2.10	<2.10	<2.10	<2.10	<2.10	2.30
BENZO(K)FLUORANTHENE	UG/L	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70
BROMODICHLOROMETHANE	UG/L	<0.98	<0.98	<0.98	<0.98	<0.98	<0.98
BROMOFLUOROBENZENE	UG/L	49.00	52.00	52.00	53.00	50.00	47.00
BROMOFORM	UG/L	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50
BROMOMETHANE	UG/L	<1.20	<1.20	<1.20	<1.20	<1.20	<1.20
CADMIUM,TOTAL	UG/L	<3.50	<3.50	<3.50	<3.50	<3.50	3.96
CARBON DISULFIDE	UG/L	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10
CARBON TETRACHLORIDE	UG/L	<0.97	<0.97	<0.97	<0.97	<0.97	<0.97
CHLOROBENZENE	UG/L	<0.65	<0.65	<0.65	<0.65	<0.65	<0.65
CHLOROETHANE	UG/L	<1.80	<1.80	<1.80	<1.80	<1.80	<1.80
CHLOROFORM	UG/L	<1.20	<1.20	<1.20	<1.20	<1.20	<1.20
CHLOROMETHANE	UG/L	<24.00	<24.00	<24.00	<24.00	<24.00	<24.00
CHROMIUM,TOTAL	UG/L	11.20	217.00	12.00	46.70	46.80	239.00
CHRYSENE	UG/L	<2.80	<2.80	<2.80	<2.80	<2.80	5.30
CIS-1,3-DICHLOROPROPENE	UG/L	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50
DIBEN'(A,H)ANTH'CENE	UG/L	<1.80	<1.80	<1.80	<1.80	<1.80	<1.80
DIBROMOCHLOROMETHANE	UG/L	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30
ETHYLBENZENE	UG/L	<1.00	<1.00	<1.00	<1.00	<1.00	120.00

Table 1-3. Analytical Parameters Detected in Groundwater Samples in 1990, Hunter AAFTA, Continued, Page 3 of 4

PARAMETERS	UNITS	HMW-1	HMW-2	HMW-3	HMW-4	HMW-5	HMW-6
		03/07/90	03/07/90	03/08/90	03/08/90	03/08/90	03/08/90
		16:55	10:20	09:20	09:35	10:35	11:10
FLUORANTHENE	UG/L	<3.20	<3.20	<3.20	<3.20	<3.20	7.30
FLUORENE	UG/L	<3.10	<3.10	<3.10	<3.10	<3.10	<3.10
INDENO(1,2,3-CD)PYRENE	UG/L	<2.70	<2.70	<2.70	<2.70	<2.70	<2.70
LEAD,TOTAL	UG/L	<25.00	261.00	<25.00	28.60	<25.00	337.00
MERCURY,TOTAL	UG/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
METHYLENE CHLORIDE	UG/L	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60
NAPHTHALENE	UG/L	<5.90	<5.90	<5.90	<5.90	<5.90	43.00
NITROBENZENE-D(5)	UG/L	83.00	81.00	77.00	78.00	79.00	85.00
PHENANTHRENE	UG/L	<1.90	<1.90	<1.90	<1.90	<1.90	5.20
PHENOL-D(5)	UG/L	110.00	99.00	96.00	110.00	97.00	100.00
PYRENE	UG/L	<2.00	<2.00	<2.00	<2.00	<2.00	6.80
SELENIUM,TOTAL	UG/L	<2.00	2.80	<2.00	5.20	4.30	14.40
SILVER,TOTAL	UG/L	<5.70	<5.70	<5.70	<5.70	<5.70	<5.70
STYRENE	UG/L	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60
TERPHENYL-(D14)	UG/L	64.00	69.00	59.00	65.00	70.00	93.00
TETRACHLOROETHENE	UG/L	<0.51	<0.51	<0.51	<0.51	<0.51	<0.51
TOLUENE	UG/L	<0.70	1.60	0.74	<0.70	<0.70	1.70
TOLUENE-D(8)	UG/L	51.00	53.00	52.00	53.00	51.00	47.00
TRANS-1,3-DICHLOROPROPENE	UG/L	<0.86	<0.86	<0.86	<0.86	<0.86	<0.86
TRICHLOROETHENE	UG/L	<0.87	<0.87	<0.87	<0.87	<0.87	<0.87
VINYL ACETATE	UG/L	<2.60	<2.60	<2.60	<2.60	<2.60	<2.60
VINYL CHLORIDE	UG/L	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60

Table 1-3. Analytical Parameters Detected in Groundwater Samples in 1990, Hunter AAFTA, Continued, Page 4 of 4

PARAMETERS	UNITS	HMW-1	HMW-2	HMW-3	HMW-4	HMW-5	HMW-6
		03/07/90	03/07/90	03/08/90	03/08/90	03/08/90	03/08/90
		16:55	10:20	09:20	09:35	10:35	11:10
XYLENES,TOTAL	UG/L	<1.00	<1.00	3.30	<1.00	<1.00	9.40

Source: ESE.

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FIELD GROUP HUNTS1 PROJECT MANAGER S.P. WOODWARD
ALL LAB COORDINATOR SUZANNE WOODWARD

SAMPLE ID'S PARAMETERS UNITS	STORET METHOD	HS-1 HUNTS1 1	HS-2 HUNTS1 2	HS-3 HUNTS1 3	HS-4 HUNTS1 4	HS-7 HUNTS1 7	HS-8 HUNTS1 8	HS-9 HUNTS1 9	HS-10 HUNTS1 10	HS-11 HUNTS1 11	HS-12 HUNTS1 12	HS-13 HUNTS1 13	HS-14 HUNTS1 14	HS-15 HUNTS1 15	HS-16 HUNTS1 16	HS-17 HUNTS1 17
DATE TIME		03/03/92 10:15	03/03/92 10:30	03/03/92 11:15	03/03/92 11:30	03/03/92 14:05	03/03/92 14:10	03/03/92 14:25	03/04/92 08:40	03/04/92 08:45	03/04/92 09:30	03/04/92 09:35	03/04/92 10:00	03/04/92 10:55	03/04/92 11:00	03/04/92 11:15
MOISTURE %WET WT	70320 1	10.4	17.3	13.5	16.3	14.5	13.2	11.0	7.7	12.9	10.0	12.5	13.8	8.3	8.8	12.1
ARSENIC,SED MG/KG-DRY	1003 GFAA	1.02	0.630	1.28	2.44	0.503	0.938	0.375	0.516	0.340	0.330	0.540	0.596	1.61	1.10	0.855
BARIUM,SED MG/KG- DRY	1008 ICAP	11.4	12.8	14.9	23.4	23.7	15.0	17.1	18.3	13.9	9.60	14.7	17.7	47.6	38.4	17.6
CADMIUM,SED MG/KG-DRY	1028 ICAP	<0.521	<0.573	<0.540	<0.558	<0.546	<0.540	<0.539	<0.517	<0.548	<0.519	<0.548	<0.547	<0.511	<0.522	<0.541
CHROMIUM,SED MG/KG-DRY	1029 ICAP	5.61	2.81	5.88	5.51	4.97	2.80	1.94	3.55	2.16	3.02	2.44	2.22	5.29	6.10	2.86
LEAD,SED MG/KG-DRY	1052 ICAP	28.0	<7.62	17.3	8.82	23.9	8.83	<7.16	7.39	<7.28	<6.90	<7.29	<7.27	13.8	107	<7.19
MERCURY,SED MG/KG-DRY	71921 CVAA	<0.096	<0.108	<0.103	<0.104	<0.101	<0.100	<0.096	<0.093	<0.101	<0.097	<0.099	<0.104	<0.095	<0.098	<0.099
SELENIUM,SED MG/KG-DRY	1148 GFAA	<0.275	<0.297	<0.288	<0.296	<0.286	<0.286	<0.276	<0.263	<0.284	<0.275	<0.281	<0.287	<0.270	<0.267	<0.281
SILVER,SED MG/KG-DRY	1078 ICAP	<0.782	<0.860	<0.810	<0.838	<0.819	<0.809	<0.808	<0.775	<0.821	<0.779	<0.822	<0.821	<0.767	<0.783	<0.811
ACENAPHTHENE UG/KG-DRY	34208 GMS	<78	<850	<81	<84	<82	<81	<3900	<380	<80	<78	<80	<81	<76	<77	<80
ACENAPHTHYLENE UG/KG-DRY	34203 GMS	<170	<1800	<170	<180	<180	390	<8400	<810	<170	<170	<170	<170	<160	210	<80
ANTHRACENE UG/KG-DRY	34223 GMS	<78	<850	<81	<84	<82	440	<3900	670	<80	<78	<80	<81	<76	210	<80
BENZO(A)ANTHRACENE UG/KG-DRY	34529 GMS	370	<1200	170	<120	120	370	<5600	5300	<110	160	<110	<120	120	970	<110
BENZO(A)PYRENE UG/KG-DRY	34250 GMS	320	<1700	220	<170	<160	690	<7900	4800	<160	180	<160	<160	<150	1300	<160
BENZO(B)FLUORANTHENE UG/KG-DRY	34233 GMS	560	<1200	370	<120	270	830	<5600	6900	<110	260	<110	<120	210	2000	<110
BENZO(GHI)PERYLENE UG/KG-DRY	34524 GMS	<180	<1900	<180	<190	<190	<180	<9000	<870	<180	<180	<180	<190	<170	<180	<180
BENZO(K)FLUORANTHENE UG/KG-DRY	34245 GMS	250	<1200	150	<120	<120	240	<5600	2700	<110	<110	<110	<120	<110	620	<110
CHRYSENE UG/KG-DRY	34323 GMS	560	<1200	200	<120	220	210	<5600	5300	<110	170	<110	<120	150	1000	<110
DIBEN(A,H)ANTHRACENE UG/KG-DRY	34559 GMS	<180	<1900	<180	<190	<190	<180	<9000	<870	<180	<180	<180	<190	<170	<180	<180
FLUORANTHENE UG/KG-DRY	34379 GMS	690	<850	120	<84	360	320	<3900	8100	<80	170	<80	<81	180	980	<80
FLUORENE UG/KG-DRY	34384 GMS	<78	<850	<81	<84	<82	<81	<3900	<380	<80	<78	<80	<81	<76	<77	<80
INDENO(1,2,3-CD) PYRENE UG/KG-DRY	34406 GMS	<180	<1900	<180	<190	<190	570	<9000	<870	<180	<180	<180	<190	<170	<180	<180
NAPHTHALENE UG/KG-DRY	34445 GMS	<78	3500	<81	<84	<82	1400	41000	<380	<80	<78	<80	<81	<76	<77	<80
PHENANTHRENE UG/KG-DRY	34464 GMS	440	<850	<81	<84	170	90	<3900	670	<80	<78	<80	<81	<76	100	<80

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FIELD GROUP HUNTS1 PROJECT MANAGER S.P. WOODWARD
ALL LAB COORDINATOR SUZANNE WOODWARD

SAMPLE ID'S PARAMETERS UNITS	STORET METHOD	HS-1 HUNTS1 1	HS-2 HUNTS1 2	HS-3 HUNTS1 3	HS-4 HUNTS1 4	HS-7 HUNTS1 7	HS-8 HUNTS1 8	HS-9 HUNTS1 9	HS-10 HUNTS1 10	HS-11 HUNTS1 11	HS-12 HUNTS1 12	HS-13 HUNTS1 13	HS-14 HUNTS1 14	HS-15 HUNTS1 15	HS-16 HUNTS1 16	HS-17 HUNTS1 17
DATE TIME		03/03/92 10:15	03/03/92 10:30	03/03/92 11:15	03/03/92 11:30	03/03/92 14:05	03/03/92 14:10	03/03/92 14:25	03/04/92 08:40	03/04/92 08:45	03/04/92 09:30	03/04/92 09:35	03/04/92 10:00	03/04/92 10:55	03/04/92 11:00	03/04/92 11:15
PYRENE UG/KG-DRY	34472 GMS	580	<850	190	<84	170	230	<3900	5200	<80	140	<80	<81	110	810	<80
BENZENE UG/KG-DRY	34237 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	39	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
BROMODICHLOROMETHANE UG/KG-DRY	34330 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
BROMOFORM UG/KG-DRY	34290 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
BROMOMETHANE UG/KG-DRY	34416 GMS	<11	<60	<12	<12	<12	<58	<56	<11	<11	<11	<11	<12	<11	<11	<11
METHYL ETHYL KETONE UG/KG-DRY	75078 GMS	<11	<60	<12	13	<12	<58	<56	<11	<11	<11	<11	<12	<11	<11	<11
CARBON DISULFIDE UG/KG-DRY	78544 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
CARBON TETRACHLORIDE UG/KG-DRY	34299 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
CHLOROBENZENE UG/KG-DRY	34304 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
DIBROMOCHLOROMETHANE UG/KG-DRY	34309 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
CHLOROETHANE UG/KG-DRY	34314 GMS	<11	<60	<12	<12	<12	<58	<56	<11	<11	<11	<11	<12	<11	<11	<11
CHLOROFORM UG/KG-DRY	34318 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
2-CHLOROETHYLVINYL-ETHER UG/KG-DRY	34579 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
CHLOROMETHANE UG/KG-DRY	34421 GMS	<11	<60	<12	<12	<12	<58	<56	<11	<11	<11	<11	<12	<11	<11	<11
1,2-DICHLOROBENZENE UG/KG-DRY	34539 GMS	<78	<850	<81	<84	<82	<81	<3900	<380	<80	<78	<80	<81	<76	<77	<80
1,3-DICHLOROBENZENE UG/KG-DRY	34569 GMS	<78	<850	<81	<84	<82	<81	<3900	<380	<80	<78	<80	<81	<76	<77	<80
1,4-DICHLOROBENZENE UG/KG-DRY	34574 GMS	<78	<850	<81	<84	<82	<81	<3900	<380	<80	<78	<80	<81	<76	<77	<80
DICHLOROBENZENE,TOTAL UG/KG-DRY	98578 GMS	<11	<60	<12	<12	<12	<58	<56	<11	<11	<11	<11	<12	<11	<11	<11
1,1-DICHLOROETHANE UG/KG-DRY	34499 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
1,2-DICHLOROETHANE UG/KG-DRY	34534 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
1,1-DICHLOROETHYLENE UG/KG-DRY	34504 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
1,2-DICHLOROETHENE(TOTAL) UG/KG	96464 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
1,2-DICHLOROPROPANE UG/KG-DRY	34544 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
CIS-1,3-DICHLORO-PROPENE UG/KG-DRY	34702 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7

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SAMPLE ID'S PARAMETERS UNITS	STORET METHOD	HS-1 HUNTS1 1	HS-2 HUNTS1 2	HS-3 HUNTS1 3	HS-4 HUNTS1 4	HS-7 HUNTS1 7	HS-8 HUNTS1 8	HS-9 HUNTS1 9	HS-10 HUNTS1 10	HS-11 HUNTS1 11	HS-12 HUNTS1 12	HS-13 HUNTS1 13	HS-14 HUNTS1 14	HS-15 HUNTS1 15	HS-16 HUNTS1 16	HS-17 HUNTS1 17
DATE TIME		03/03/92 10:15	03/03/92 10:30	03/03/92 11:15	03/03/92 11:30	03/03/92 14:05	03/03/92 14:10	03/03/92 14:25	03/04/92 08:40	03/04/92 08:45	03/04/92 09:30	03/04/92 09:35	03/04/92 10:00	03/04/92 10:55	03/04/92 11:00	03/04/92 11:15
TRANS-1,3-DICHLORO-PROPENE UG/KG-DRY	34697 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
DIETHYL ETHER UG/KG-DRY	97201 GMS	<10	<60	<10	<10	<10	<60	<60	<10	<10	<10	<10	<10	<10	<10	<10
ETHYLBENZENE UG/KG-DRY	34374 GMS	<5.6	36	<5.8	<6.0	<5.8	65	540	<5.4	<5.7	<5.6	<5.7	9.9	<5.5	<5.5	<5.7
METHYLENE CHLORIDE UG/KG-DRY	34426 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
METHYLISOBUTYLKETONE UG/KG-DRY	75169 GMS	<11	<60	<12	<12	<12	<58	<56	<11	<11	<11	<11	<12	<11	<11	<11
1,1,2,2-TETRACHLORO-ETHANE UG/KG-DRY	34519 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
TETRACHLOROETHENE UG/KG-DRY	34478 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
TOLUENE UG/KG-DRY	34483 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
1,1,1-TRICHL'ETHANE UG/KG-DRY	34509 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
1,1,2-TRICHL'ETHANE UG/KG-DRY	34514 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
TRICHLOROETHENE UG/KG-DRY	34487 GMS	<5.6	<30	<5.8	<6.0	<5.8	<29	<28	<5.4	<5.7	<5.6	<5.7	<5.8	<5.5	<5.5	<5.7
TRICHLOROFLUOROMETHANE UG/KG-DRY	34491 GMS	14	<30	12	12	14	31	<28	10.0	5.8	7.3	10.0	8.9	<5.5	<5.5	7.0
VINYL CHLORIDE UG/KG-DRY	34495 GMS	<11	<60	<12	<12	<12	<58	<56	<11	<11	<11	<11	<12	<11	<11	<11
XYLENE,TOTAL UG/KG-DRY	45510 GMS	<5.6	200	<5.8	<6.0	<5.8	220	990	<5.4	<5.7	<5.6	24	60	<5.5	<5.5	<5.7

SAMPLE ID'S PARAMETERS UNITS	STORET METHOD	HS-18 HUNTS1 18	HS-19 HUNTS1 19	HS-DUP HUNTS1 22	HS-DUP HUNTS1 23	HSD-1 HUNTS1 26	HSD-2 HUNTS1 27	HSD-3 HUNTS1 28	HSD-4 HUNTS1 29	HSD-DUP HUNTS1 30
DATE TIME		03/04/92 13:35	03/04/92 13:40	03/03/92	03/03/92	03/03/92 16:00	03/03/92 15:15	03/04/92 15:15	03/04/92 15:00	03/03/92
MOISTURE %WET WT	70320 1	6.0	14.4	13.5	16.1	26.6	23.2	25.4	27.0	27.1
ARSENIC,SED MG/KG-DRY	1003 GFAA	0.612	0.563	1.32	1.31	0.499	<0.303	<0.312	1.05	0.372
BARIUM,SED MG/KG- DRY	1008 ICAP	16.2	19.1	19.1	23.6	15.6	8.70	7.97	12.0	9.95
CADMIUM,SED MG/KG-DRY	1028 ICAP	<0.504	<0.550	<0.540	<0.563	<0.623	<0.597	<0.629	<0.637	<0.627
CHROMIUM,SED MG/KG-DRY	1029 ICAP	3.68	3.98	6.64	6.03	5.66	2.55	1.09	3.54	2.86
LEAD,SED MG/KG-DRY	1052 ICAP	<6.70	<7.31	15.8	7.58	29.4	16.0	<8.36	<8.46	22.9
MERCURY,SED MG/KG-DRY	71921 CVAA	<0.092	<0.105	<0.100	<0.102	<0.117	<0.113	<0.117	<0.119	<0.123
SELENIUM,SED MG/KG-DRY	1148 GFAA	<0.264	<0.287	<0.287	<0.297	<0.337	<0.316	<0.325	<0.342	<0.332
SILVER,SED MG/KG-DRY	1078 ICAP	<0.756	<0.825	<0.810	<0.844	<0.935	<0.896	<0.944	<0.955	<0.940
ACENAPHTHENE UG/KG-DRY	34208 GMS	<74	<82	<81	<83	<190	<910	<94	110	<960
ACENAPHTHYLENE UG/KG-DRY	34203 GMS	<74	<82	<81	<83	<190	<910	<94	<96	<960
ANTHRACENE UG/KG-DRY	34223 GMS	<74	<82	<81	<83	210	2400	<94	130	1500
BENZO(A)ANTHRACENE UG/KG-DRY	34529 GMS	<110	<120	140	<120	760	13000	160	510	6400
BENZO(A)PYRENE UG/KG-DRY	34250 GMS	<150	<160	180	<170	850	12000	<190	400	7100
BENZO(B)FLUORANTHENE UG/KG-DRY	34233 GMS	<110	<120	160	<120	760	13000	<130	450	7200
BENZO(GHI)PERYLENE UG/KG-DRY	34524 GMS	<170	<190	<180	<190	<440	5100	<210	<220	<2200
BENZO(K)FLUORANTHENE UG/KG-DRY	34245 GMS	<110	<120	150	<120	890	12000	280	390	7200
CHRYSENE UG/KG-DRY	34323 GMS	<110	<120	130	<120	930	15000	180	670	7600
DIBEN(A,H)ANTHRACENE UG/KG-DRY	34559 GMS	<170	<190	<180	<190	<440	<2100	<210	<220	<2200
FLUORANTHENE UG/KG-DRY	34379 GMS	77	<82	160	<83	2200	34000	190	1200	15000
FLUORENE UG/KG-DRY	34384 GMS	<74	<82	<81	<83	<190	1200	<94	130	<960
INDENO(1,2,3-CD) PYRENE UG/KG-DRY	34406 GMS	<170	<190	<180	<190	440	7600	<210	<220	3300
NAPHTHALENE UG/KG-DRY	34445 GMS	<74	<82	<81	<83	<190	<910	<94	<96	<960
PHENANTHRENE UG/KG-DRY	34464 GMS	<74	<82	<81	<83	810	19000	<94	1400	7400

SAMPLE ID'S PARAMETERS UNITS	STORET METHOD	HS-18 HUNTS1 18	HS-19 HUNTS1 19	HS-DUP HUNTS1 22	HS-DUP HUNTS1 23	HSD-1 HUNTS1 26	HSD-2 HUNTS1 27	HSD-3 HUNTS1 28	HSD-4 HUNTS1 29	HSD-DUP HUNTS1 30
DATE TIME		03/04/92 13:35	03/04/92 13:40	03/03/92	03/03/92	03/03/92 16:00	03/03/92 15:15	03/04/92 15:15	03/04/92 15:00	03/03/92
PYRENE UG/KG-DRY	34472 GMS	<74	<82	130	<83	1400	21000	220	990	9100
BENZENE UG/KG-DRY	34237 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
BROMODICHLOROMETHANE UG/KG-DRY	34330 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
BROMOFORM UG/KG-DRY	34290 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
BROMOMETHANE UG/KG-DRY	34416 GMS	<11	<12	<12	<12	<14	<13	<13	<14	<14
METHYL ETHYL KETONE UG/KG-DRY	75078 GMS	<11	<12	<12	25	<14	<13	<13	<14	<14
CARBON DISULFIDE UG/KG-DRY	78544 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
CARBON TETRACHLORIDE UG/KG-DRY	34299 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
CHLOROBENZENE UG/KG-DRY	34304 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
DIBROMOCHLOROMETHANE UG/KG-DRY	34309 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
CHLOROETHANE UG/KG-DRY	34314 GMS	<11	<12	<12	<12	<14	<13	<13	<14	<14
CHLOROFORM UG/KG-DRY	34318 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
2-CHLOROETHYLVINYL-ETHER UG/KG-DRY	34579 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
CHLOROMETHANE UG/KG-DRY	34421 GMS	<11	<12	<12	<12	<14	<13	<13	<14	<14
1,2-DICHLOROBENZENE UG/KG-DRY	34539 GMS	<74	<82	<81	<83	<190	<910	<94	<96	<960
1,3-DICHLOROBENZENE UG/KG-DRY	34569 GMS	<74	<82	<81	<83	<190	<910	<94	<96	<960
1,4-DICHLOROBENZENE UG/KG-DRY	34574 GMS	<74	<82	<81	<83	<190	<910	<94	<96	<960
DICHLOROBENZENE,TOTAL UG/KG-DRY	98570 GMS	<11	<12	<12	<12	<14	<13	<13	<14	<14
1,1-DICHLOROETHANE UG/KG-DRY	34499 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
1,2-DICHLOROETHANE UG/KG-DRY	34534 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
1,1-DICHLOROETHYLENE UG/KG-DRY	34504 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
1,2-DICHLOROETHENE(TOTAL) UG/KG	96464 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
1,2-DICHLOROPROPANE UG/KG-DRY	34544 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
CIS-1,3-DICHLORO-PROPENE UG/KG-DRY	34702 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9

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PROJECT NUMBER 3924018G 0201 PROJECT NAME COE - FT. STEWART
FIELD GROUP HUNTS1 PROJECT MANAGER S.P. WOODWARD
ALL LAB COORDINATOR SUZANNE WOODWARD

SAMPLE ID'S PARAMETERS UNITS	STORET METHOD	HS-18 HUNTS1 18	HS-19 HUNTS1 19	HS-DUP HUNTS1 22	HS-DUP HUNTS1 23	HSD-1 HUNTS1 26	HSD-2 HUNTS1 27	HSD-3 HUNTS1 28	HSD-4 HUNTS1 29	HSD-DUP HUNTS1 30
DATE TIME		03/04/92 13:35	03/04/92 13:40	03/03/92	03/03/92	03/03/92 16:00	03/03/92 15:15	03/04/92 15:15	03/04/92 15:00	03/03/92
TRANS-1,3-DICHLORO-PROPENE UG/KG-DRY	34697 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
DIETHYL ETHER UG/KG-DRY	97201 GMS	<10	<10	<10	<10	<10	<10	<10	<10	<10
ETHYLBENZENE UG/KG-DRY	34374 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
METHYLENE CHLORIDE UG/KG-DRY	34426 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
METHYLISOBUTYLKETONE UG/KG-DRY	75169 GMS	<11	<12	<12	<12	<14	<13	<13	<14	<14
1,1,2,2-TETRACHLORO-ETHANE UG/KG-DRY	34519 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
TETRACHLOROETHENE UG/KG-DRY	34478 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
TOLUENE UG/KG-DRY	34483 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
1,1,1-TRICHL'ETHANE UG/KG-DRY	34509 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
1,1,2-TRICHL'ETHANE UG/KG-DRY	34514 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
TRICHLOROETHENE UG/KG-DRY	34487 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9
TRICHLOROFLUOROMETHANE UG/KG-DRY	34491 GMS	<5.3	<5.8	11	10.0	6.9	7.4	<6.7	<6.8	<6.9
VINYL CHLORIDE UG/KG-DRY	34495 GMS	<11	<12	<12	<12	<14	<13	<13	<14	<14
XYLENE,TOTAL UG/KG-DRY	45510 GMS	<5.3	<5.8	<5.8	<6.0	<6.8	<6.5	<6.7	<6.8	<6.9

Waters

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PROJECT NUMBER 3924018G 0201 PROJECT NAME COE - ST. STEWART
FIELD GROUP HUNTW1 PROJECT MANAGER S.P. WOODWARD
ALL LAB COORDINATOR SUZANNE WOODWARD

SAMPLE ID'S PARAMETERS UNITS	STORET METHOD	HMW-1 HUNTW1 1	HMW-2 HUNTW1 2	HMW-3 HUNTW1 3	HMW-4 HUNTW1 4	HMW-5 HUNTW1 5	HMW-6 HUNTW1 6	HMW-7 HUNTW1 7	HMW-8 HUNTW1 8	HMW-9 HUNTW1 9	HMW-DUP HUNTW1 10	HSOURCE HUNTW1 12	TRPBLK HUNTW1 13	EQPBLK HUNTW1 16
DATE TIME		03/12/92 13:30	03/12/92 13:40	03/12/92 14:20	03/12/92 14:30	03/12/92 13:50	03/12/92 14:00	03/12/92 14:10	03/12/92 14:40	03/12/92 15:00	03/12/92	03/12/92 16:30	03/12/92	03/12/92 13:15
ARSENIC, TOTAL UG/L	1002 GFAA	9.4	<2.3	<2.3	2.3	2.7	14.7	11.3	<2.3	5.2	<2.3	<2.3	NRQ	<2.3
BARIUM, TOTAL UG/L	1007 ICAP	76.6	46.5	88.1	54.4	56.6	57.2	147	65.0	113	56.5	14.9	NRQ	<1.1
CADMIUM, TOTAL UG/L	1027 ICAP	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	NRQ	<4.4
CHROMIUM, TOTAL UG/L	1034 ICAP	17.6	<7.4	<7.4	<7.4	<7.4	<7.4	18.6	<7.4	9.1	<7.4	<7.4	NRQ	<7.4
LEAD, TOTAL UG/L	1051 ICAP	<63.8	<63.8	<63.8	<63.8	<63.8	<63.8	<63.8	<63.8	<63.8	<63.8	<63.8	NRQ	<63.8
MERCURY, TOTAL UG/L	71900 CVAA	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	NRQ	<0.18
SELENIUM, TOTAL UG/L	1147 GFAA	<2.0	<2.0	<2.0	<2.0	<2.0	2.1	6.5	<2.0	<2.0	<2.0	<2.0	NRQ	<2.0
SILVER, TOTAL UG/L	1077 ICAP	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	<6.1	NRQ	<6.1
ACENAPHTHENE UG/L	34205 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<1.0	<1.0	NRQ	<1.0
ACENAPHTHYLENE UG/L	34200 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<1.0	<1.0	NRQ	<1.0
ANTHRACENE UG/L	34220 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<1.0	<1.0	NRQ	<1.0
BENZO(A)ANTHRACENE UG/L	34526 GMS	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<15	<1.5	<1.5	<1.5	<1.5	NRQ	<1.5
BENZO(A)PYRENE UG/L	34247 GMS	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<2.0	<2.0	<2.0	NRQ	<2.0
BENZO(B)FLUORANTHENE UG/L	34230 GMS	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<15	<1.5	<1.5	<1.5	<1.5	NRQ	<1.5
BENZO(GHI)PERYLENE UG/L	34521 GMS	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25	<2.5	<2.5	<2.5	<2.5	NRQ	<2.5
BENZO(K)FLUORANTHENE UG/L	34242 GMS	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<15	<1.5	<1.5	<1.5	<1.5	NRQ	<1.5
CHRYSENE UG/L	34320 GMS	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<15	<1.5	<1.5	<1.5	<1.5	NRQ	<1.5
DIBEN'(A,H)ANTH'CENE UG/L	34556 GMS	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25	<2.5	<2.5	<2.5	<2.5	NRQ	<2.5
FLUORANTHENE UG/L	34376 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<1.0	<1.0	NRQ	<1.0
FLUORENE UG/L	34381 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<1.0	<1.0	NRQ	<1.0
INDENO(1,2,3-CD) PYRENE UG/L	34403 GMS	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25	<2.5	<2.5	<2.5	<2.5	NRQ	<2.5
NAPHTHALENE UG/L	34696 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	14	13	<1.0	33	<1.0	<1.0	NRQ	<1.0
PHENANTHRENE UG/L	34461 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<1.0	<1.0	NRQ	<1.0
PYRENE UG/L	34469 GMS	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<10.0	<1.0	<1.0	<1.0	<1.0	NRQ	<1.0

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PROJECT NUMBER 3924018G 0201 PROJECT NAME COE - ST. STEWART
FIELD GROUP HUNTW1 PROJECT MANAGER S.P. WOODWARD
ALL LAB COORDINATOR SUZANNE WOODWARD

SAMPLE ID'S PARAMETERS UNITS	STORET METHOD	HMW-1 HUNTW1 1	HMW-2 HUNTW1 2	HMW-3 HUNTW1 3	HMW-4 HUNTW1 4	HMW-5 HUNTW1 5	HMW-6 HUNTW1 6	HMW-7 HUNTW1 7	HMW-8 HUNTW1 8	HMW-9 HUNTW1 9	HMW-DUP HUNTW1 10	HSOURCE HUNTW1 12	TRPBLK HUNTW1 13	EQPBLK HUNTW1 16
DATE TIME		03/12/92 13:30	03/12/92 13:40	03/12/92 14:20	03/12/92 14:30	03/12/92 13:50	03/12/92 14:00	03/12/92 14:10	03/12/92 14:40	03/12/92 15:00	03/12/92	03/12/92 16:30	03/12/92	03/12/92 13:15
BENZENE UG/L	34030 GMS	<1.0	<1.0	<1.0	18	<1.0	120	660	3.5	15	<1.0	<1.0	<1.0	<1.0
BROMODICHLOROMETHANE UG/L	32101 GMS	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<22	<2.2	<11	<2.2	<2.2	<2.2	<2.2
BROMOFORM UG/L	32104 GMS	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<26	<2.6	<13	<2.6	<2.6	<2.6	<2.6
BROMOMETHANE UG/L	34413 GMS	<3.5	<3.5	<3.5	<3.5	<3.5	<3.5	<35	<3.5	<18	<3.5	<3.5	<3.5	<3.5
CARBON DISULFIDE UG/L	77041 GMS	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<44	<4.4	<22	<4.4	<4.4	<4.4	<4.4
CARBON TETRACHLORIDE UG/L	32102 GMS	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<26	<2.6	<13	<2.6	<2.6	<2.6	<2.6
CHLOROBENZENE UG/L	34301 GMS	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<14	<1.4	<7.0	<1.4	<1.4	<1.4	<1.4
DIBROMOCHLOROMETHANE UG/L	32105 GMS	<2.3	<2.3	<2.3	<2.3	<2.3	<2.3	<23	<2.3	<12	<2.3	<2.3	<2.3	<2.3
CHLOROETHANE UG/L	34311 GMS	<8.2	<8.2	<8.2	<8.2	<8.2	<8.2	<82	<8.2	<41	<8.2	<8.2	<8.2	<8.2
CHLOROFORM UG/L	32106 GMS	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25	<2.5	<13	<2.5	<2.5	<2.5	<2.5
2-CHLOROETHYLVINYL-ETHER UG/L	34576 GMS	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	<31	<3.1	<16	<3.1	<3.1	<3.1	<3.1
CHLOROMETHANE UG/L	34418 GMS	<4.4	<4.4	<4.4	<4.4	<4.4	<4.4	<44	<4.4	<22	<4.4	<4.4	<4.4	<4.4
DICHLOROBENZENE,TOT. UG/L	81524 GMS	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<40	<4.0	<20	<4.0	<4.0	<4.0	<4.0
1,1-DICHLOROETHANE UG/L	34496 GMS	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25	<2.5	<13	<2.5	<2.5	<2.5	<2.5
1,2-DICHLOROETHANE UG/L	34531 GMS	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25	<2.5	<13	<2.5	<2.5	<2.5	<2.5
1,1-DICHLOROETHYLENE UG/L	34501 GMS	<3.2	<3.2	<3.2	<3.2	<3.2	<3.2	<32	<3.2	<16	<3.2	<3.2	<3.2	<3.2
1,2-DICHLOROETHENE(TOTAL) UG/L	96463 GMS	<2.4	<2.4	<2.4	<2.4	<2.4	3.5	<24	<2.4	<12	<2.4	<2.4	<2.4	<2.4
1,2-DICHLOROPROPANE UG/L	34541 GMS	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<10.0	<2.0	<2.0	<2.0	<2.0
CIS-1,3-DICHLORO-PROPENE UG/L	34704 GMS	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<20	<2.0	<10.0	<2.0	<2.0	<2.0	<2.0
TRANS-1,3-DICHLORO-PROPENE UG/L	34699 GMS	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<16	<1.6	<8.0	<1.6	<1.6	<1.6	<1.6
DIETHYL ETHER, TOTAL UG/L	81576 GMS	<5	<5	<5	<5	<5	<5	<50	<5	<30	<5	<5	<5	<5
ETHYLBENZENE UG/L	34371 GMS	<1.3	<1.3	<1.3	<1.3	<1.3	82	130	<1.3	180	<1.3	<1.3	<1.3	<1.3
METHYLENE CHLORIDE UG/L	34423 GMS	<6.4	<6.4	<6.4	<6.4	<6.4	<6.4	<64	<6.4	<32	<6.4	<6.4	<6.4	<6.4
METHYL ETHYL KETONE UG/L	81595 GMS	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<100	<10.0	<50	<10.0	<10.0	<10.0	<10.0

Environmental Science & Engineering DATE 04/06/92 STATUS : FINAL
PROJECT NUMBER 39240186 0201 PROJECT NAME COE - ST. STEWART
FIELD GROUP HUNTW1 PROJECT MANAGER S.P. WOODWARD
ALL LAB COORDINATOR SUZANNE WOODWARD

SAMPLE ID'S PARAMETERS UNITS •	STORET METHOD	HMW-1 HUNTW1 1	HMW-2 HUNTW1 2	HMW-3 HUNTW1 3	HMW-4 HUNTW1 4	HMW-5 HUNTW1 5	HMW-6 HUNTW1 6	HMW-7 HUNTW1 7	HMW-8 HUNTW1 8	HMW-9 HUNTW1 9	HMW-DUP HUNTW1 10	HSOURCE HUNTW1 12	TRPBLK HUNTW1 13	EQPBLK HUNTW1 16
DATE TIME		03/12/92 13:30	03/12/92 13:40	03/12/92 14:20	03/12/92 14:30	03/12/92 13:50	03/12/92 14:00	03/12/92 14:10	03/12/92 14:40	03/12/92 15:00	03/12/92	03/12/92 16:30	03/12/92	03/12/92 13:15
METHYL ISOBUT'KETONE UG/L	81596 GMS	<12	<12	<12	<12	<12	<12	<120	<12	<60	<12	<12	<12	<12
1,1,2,2-TETRACHLORO- ETHANE UG/L	34516 GMS	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<15	<1.5	<7.5	<1.5	<1.5	<1.5	<1.5
TETRACHLOROETHENE UG/L	34475 GMS	<1.9	<1.9	<1.9	<1.9	<1.9	<1.9	<19	<1.9	<9.5	<1.9	<1.9	<1.9	<1.9
TOLUENE UG/L	34010 GMS	<1.7	<1.7	<1.7	<1.7	<1.7	1.8	<17	<1.7	<8.5	<1.7	<1.7	<1.7	<1.7
1,1,1-TRICHL'ETHANE UG/L	34506 GMS	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<25	<2.5	<13	<2.5	<2.5	<2.5	<2.5
1,1,2-TRICHL'ETHANE UG/L	34511 GMS	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8	<28	<2.8	<14	<2.8	<2.8	<2.8	<2.8
TRICHLOROETHENE UG/L	39180 GMS	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<30	<3.0	<15	<3.0	<3.0	<3.0	<3.0
TRICHLOROFLUORO- METHANE UG/L	34488 GMS	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<46	<4.6	<23	<4.6	<4.6	<4.6	<4.6
VINYL CHLORIDE UG/L	39175 GMS	<4.6	<4.6	<4.6	<4.6	<4.6	12	<46	<4.6	<23	<4.6	<4.6	<4.6	<4.6
XYLENES,TOTAL UG/L	81551 GMS	<3.7	<3.7	<3.7	<3.7	<3.7	<3.7	820	<3.7	950	<3.7	<3.7	<3.7	<3.7