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3d Inf Div (Mech)

PHASE II RCRA FACILITY INVESTIGATION REPORT

FOR

16 SOLID WASTE MANAGEMENT UNITS AT FORT STEWART, GEORGIA

VOLUME I OF III

Prepared for

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-95-D-0022
Delivery Order 0009

April 2000

99-183P(PPT)/021600

SAIC®

DOCUMENT 7

9.4 SWMU 27A: 3D SQUADRON 7TH CAVALRY MOTORPOOL, BUILDING 1339A

9.4.1 History and Description of SWMU 27A, 3d Squadron 7th Cavalry Motorpool, Bnilding 1339A

SWMU 27A, Building 1339A is one of four OWSs located within the 3d Squadron 7th Cavalry Motorpool. The OWS is located north/northwest of Building 1339A, a covered maintenance pad. Maintenance activities for military vehicles are performed at the maintenance pad. Floor drains from the maintenance pad are piped to the OWS. In addition, residual oil from collection and storage containers, filters, and such are allowed to drain onto the grating that covers the OWS. The effluent from the OWS discharges to the IWTP, and the oil is pumped out of the holding unit and burned at the Central Energy Plant. No previous investigations have been performed at the site.

9.4.2 Snmmary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 9.4-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead. Soil at GP1 and GP4 and groundwater at GP2 were resampled on May 6, 1998, because the analytical laboratory exceeded the holding times for VOCs. VOC and SVOC analyses were performed on the resampled media.

9.4.3 Physical Characteristics of the Site

9.4.3.1 Topography

The topography of the site is essentially flat, with concrete maintenance and parking areas adjacent to the southeast. The OWS is located in the grass between the concreted maintenance facilities and parking area and the fenced site boundary. The surface elevation is approximately 69 feet amsl.

9.4.3.2 Surface drainage

A drainage ditch is located approximately 25 feet north/northwest of the site. The drainage ditch is approximately 6 feet in depth and receives runoff from the vehicle parking area southeast of the OWS and the adjacent asphalt road (18th Street) northwest of the OWS. Surface water is present in the drainage ditch only after rainfall events. The drainage ditch ultimately discharges to Mill or Taylors Creek. The effluent from the OWS discharges directly to the IWTP; therefore, there are no surface water/sediment pathways.

9.4.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.4.3.4 Hydrogeology

Groundwater was encountered at approximately 8 feet to 10 feet bgs.

9.4.3.5 Ecology

As stated in Section 8.2, SWMU 27A is classified as an "industrialized area with managed grasslands." The site lies within the industrialized garrison area and contains little habitat. Grasses are present just off the edge of the concrete before the fence and from the fence to the road. A storm water ditch parallels the road. The site comprises approximately 0.01 acre (Figure 9.4-1).

9.4.4 Nature and Extent of Contamination

9.4.4.1 Surface soil

One surface soil sample (GP1) was collected based on field VOC screening results. The analytical laboratory missed the holding times for VOCs and SVOCs for soil at GP1 during the initial sampling endeavor (January 1998), so the surface soil was resampled in May 1998. The results of the surface soil analysis are presented in Table 9.4-1.

VOCs. No VOCs were detected in surface soil.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected below the reference background criterion and is not an SRC.

9.4.4.2 Subsurface soil

Four subsurface soil samples were collected based on field headspace screening for VOCs. The analytical laboratory missed the holding times for VOCs and SVOCs for soil collected at GP4 during the initial sampling endeavor (January 1998), so the subsurface soil was resampled in May 1998. The results of the subsurface soil analysis are presented in Table 9.4-2 and Figure 9.4-2.

VOCs. Acetone and total xylenes were detected in subsurface soil. Total xylenes were detected in one of the four subsurface soil samples at a concentration of 0.0042 mg/kg in GP4. Acetone was detected in one of the four samples at a concentration of 0.544 mg/kg in GP3. Acetone and total xylenes are SRCs in subsurface soil.

SVOCs. Three SVOCs were detected in the subsurface soil. All three compounds were detected at GP1. 2-Methylnaphthalene, fluorene, and phenanthrene were detected at 0.359 mg/kg, 0.251 mg/kg, and 0.23 mg/kg, respectively. These compounds are SRCs in subsurface soil.

Lead. Lead was detected in all four subsurface soil samples; however, lead was not detected above the reference background criterion and is not considered to be an SRC in subsurface soil.

9.4.4.3 Groundwater

Four groundwater samples were collected at three locations using DPT techniques. One location, GP4, had insufficient groundwater available for sample collection. In addition, the analytical laboratory missed the holding times for VOCs and SVOCs for groundwater at GP2 during the initial sampling endeavor (January 1998), so the groundwater was resampled in May 1998. The results of the groundwater analyses are presented in Table 9.4-3 and Figure 9.4-2.

VOCs. 2-Butanone, ethylbenzene, and total xylenes were detected in groundwater. Total xylenes were detected in GP1 at a concentration of 3.9 µg/L. 2-Butanone was detected in GP2 at a concentration of 8.9 µg/L. Ethylbenzene was detected in GP1 at a concentration of 2 µg/L. None of the VOCs were detected at concentrations above their respective MCLs. 2-Butanone, ethylbenzene, and total xylenes are considered to be SRCs in groundwater.

SVOCs. Bis(2-ethylhexyl)phthalate was detected at a concentration of 5.5 µg/L in GP1 and is considered to be an SRC; however, it did not exceed its respective MCL.

Lead. Lead was not detected above the reference background criterion and is not considered to be an SRC.

9.4.4.4 Surface water and sediment

There are no surface water pathways at the site; therefore, no surface water/sediment samples were collected.

9.4.4.5 Site-related contaminant summary

A summary of the SRCs and their maximum concentrations by medium are presented in Table 9.4-4.

9.4.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface soil and subsurface soil SRCs to their respective GSSLs.

None of the SRCs identified in subsurface soil exceeded their respective GSSLs (Table 9.4-5); therefore, there are no CMCOPCs in soil based on leaching to groundwater.

9.4.6 Human Health Preliminary Risk Evaluation of SWMU 27A, Building 1339A

SRCs were identified for the following media: surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.4.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. Contamination at this site is limited to subsurface soils and groundwater; therefore, direct exposure of a receptor to contaminants in soils would be limited to individuals working within an excavation (i.e., a construction worker).

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

The site is relatively flat and consists primarily of concrete. An area of grasses exists between the concrete and the fence and from the fence to the road. In addition, a storm water ditch parallels the road. Potential migration pathways for soils include leaching into groundwater. Soil contamination at the site is limited to subsurface soils; therefore, air migration pathways (volatilization, fugitive dust, etc.) and surface water runoff are not viable migration pathways.

Because groundwater is lower than the adjacent drainage ditch and there are no other surface bodies nearby, groundwater at the site does not discharge into any nearby surface waters. Therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.4-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.4.6.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for subsurface soils consisted of the two volatile organics and three SVOCs (PAHs). None of the concentrations for these contaminants exceeded their respective screening values for soil ingestion (Table 9.4-6); therefore, there are no HHCOPCs in subsurface soil.

The SRCs for groundwater consisted of three volatile organics and bis(2-ethylhexyl)phthalate. None of the VOCs exceeded their respective screening values; however, the maximum concentration of bis(2-ethylhexyl)phthalate did exceed its respective screening value (Table 9.4-6). Bis(2-ethylhexyl)phthalate had a maximum concentration of 5.5 µg/L as compared to a screening value of 4.8 µg/L and is considered to be an SRC in groundwater.

9.4.6.3 Uncertainties

Human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.4.7 Ecological Preliminary Risk Evaluation of SWMU 27A, Building 1339A

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.4.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

Lead was not detected in groundwater at concentrations exceeding the reference background criterion. Three VOCs and one SVOC were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.4-7. The ECOPCs identified by the ESV comparison for groundwater were total xylenes and bis(2-ethylhexyl)phthalate because they were detected at concentrations exceeding ESVs.

Because there were no SRCs in surface soil, that medium was not evaluated further in EPRE Steps ii through v.

9.4.7.2 Preliminary problem formulation (Step ii)

The ecological habitat of the site is described in Section 9.4.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.4.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

9.4.7.4 Preliminary exposure (Step iv)

Ecological receptors at the site are probably exposed by ingestion of drinking water. The exposure parameters for the surrogate species, raccoons, are presented in Table 8-7.

9.4.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. There are no SRCs identified in surface soil.

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 9.4-8. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for this receptor. No ECOPCs were present in groundwater at concentrations resulting in ADDs exceeding the TRV for the surrogate species.

9.4.8 Conclusions and Risk Management and Site Recommendations for SWMU 27A, Building 1339A

9.4.8.1 Conclusions

Nature and Extent of Contamination

- There are no SRCs in surface soil. No VOCs and/or SVOCs were detected in surface soil. Lead was detected below the reference background criterion.

- Acetone and total xylenes were detected in subsurface soil and are SRCs in subsurface soil. Three SVOCs—2-methylnaphthalene, fluorene, and phenanthrene—are SRCs in subsurface soils. Lead was not detected above the reference background criterion and is not an SRC in subsurface soil.

- 2-Butanone, ethylbenzene, total xylenes, and bis(2-ethylhexyl)phthalate were detected in groundwater and are SRCs in groundwater. None of the contaminants were detected above their respective MCLs.

Fate and Transport

- There are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- No SRCs were identified in surface soil; therefore, no HHPRE of surface soil was performed.

- There are no HHCOPCs for subsurface soils.

- Bis(2-ethylhexyl)phthalate was identified as a possible HHCOPC in groundwater.

Ecological Preliminary Risk Evaluation

- No SRCs were identified in surface soil; therefore, no EPRE of surface soil was performed.

- There are no surface water or sediment pathways at the site.

- The ECOPCs in groundwater are total xylenes and bis(2-ethylhexyl)phthalate. These ECOPCs are potential hazards to aquatic biota if groundwater discharges to nearby surface water bodies.

- No ECOPCs for terrestrial receptors were identified in groundwater.

9.4.8.2 Risk management and site recommendations

- Bis(2-ethylhexyl)phthalate was the only SVOC detected in groundwater and is considered to be an HHCOPC in groundwater. Bis(2-ethylhexyl)phthalate was detected in one out of three groundwater samples at a concentration below its MCL. The maximum concentration of bis(2-ethylhexyl)phthalate was only slightly greater than the screening value: 5.5 µg/L as compared to 4.8 µg/L. Bis(2-ethylhexyl)phthalate was detected in only one groundwater well at a slightly elevated concentration that was below its MCL (6 µg/L); therefore, bis(2-ethylhexyl)phthalate is unlikely to have adverse effects on human health and is eliminated as an HHCOPC for SWMU 27A, Building 1339A.

- Total xylenes and bis(2-ethylhexyl)phthalate were identified as potential ECOPCs in groundwater. It is unlikely that the groundwater in this area will migrate to surface water, resulting in a potential impact to ecological receptors, because groundwater occurs at approximately 8 feet to 10 feet bgs and the drainage ditch is approximately 6 feet deep; therefore, groundwater is unlikely to intercept the surface water.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27A, Building 1339A regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.4-1. Summary of Analytes Detected in Surface Soil, SWMU 27A (Building 1339A)

Station	Reference Background Criteria	7BGP1[a]
Sample ID		7B1112
Date		05/06/98
Depth (feet)		0 to 2
Sample Type		Grab
Metals (mg/kg)		
Lead	8.81	4.2

[a]Because the holding times for VOCs were missed, GP1 was resampled on May 6, 1998.

Table 9.4-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27A (Building 1339A)

Station	Reference Background Criteria	7BGP1[a]	7BGP2	7BGP3	7BGP4[a]
Sample ID		7B1111	7B1211	7B1311	7B1412
Date		01/17/98	01/30/98	01/17/98	05/06/98
Depth (feet)		6 to 8	4 to 6	10 to 12	4 to 6
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Acetone	0.00	NA		**0.544**	
Xylenes, total	0.00	NA			**0.0042**
Semivolatile Organic Compounds (mg/kg)					
2-Methylnaphthalene	0.00	**0.359**			
Fluorene	0.00	**0.251**			
Phenanthrene	0.00	**0.23**			
Metals (mg/kg)					
Lead	11.10	4.3	2.5	6.2	5.2

[a]Because the holding times for VOCs were missed, GP1 and GP4 were resampled on May 6, 1998. During the initial sampling endeavor, subsurface soil exhibited the highest PID reading, and that interval was sent for analysis. During the May 6, 1998, sampling endeavor, surface soil at GP1 indicated the highest PID reading (see Table 9.4-1).

NA = Not analyzed because holding times for VOCs were missed.

Bold indicates concentrations above reference background criteria.

Table 9.4-3. Summary of Analytes Detected in Groundwater, SWMU 27A (Building 1339A)

Station	Reference Background Criteria	MCL	7BGP1	7BGP2[a]	7BGP3
Sample ID			7B4111	7B1212	7B4311
Date			01/17/98	05/06/98	01/17/98
Sample Type			Grab	Grab	Grab
Volatile Organic Compounds (µg/L)					
2-Butanone	0.00			**8.9**	
Xylenes, total	0.00	10,000	3.9		
Semivolatile Organic Compounds (µg/L)					
Bis(2-ethylhexyl)phthalate	0.00	6		**5.5**	

Note: Groundwater at GP4 could not be sampled because of insufficient recovery.

[a]Because the holding times for VOCs were missed by the analytical laboratory, GP2 was resampled for VOCs and SVOCs on May 6, 1998.

Bold indicates concentrations above reference background criteria.

Table 9.4-4. Summary of Site-related Contaminants, SWMU 27A (Building 1339A)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
2-Butanone	ND	ND	NP	8.9	NP
Acetone	ND	0.544	NP	ND	NP
Xylenes, total	ND	0.0042	NP	3.9	NP
Semivolatile Organic Compounds					
2-Methylnaphthalene	ND	0.359	NP	ND	NP
Bis(2-ethylhexyl)phthalate	ND	ND	NP	5.5	NP
Fluorene	ND	0.251	NP	ND	NP
Phenanthrene	ND	0.23	NP	ND	NP
Metals					
Lead	BRBC	BRBC	NP	ND	NP

BRBC = Below reference background criteria.

ND = Not detected.

NP = No pathway exists.

Table 9.4-5. GSSL Screening of Site-related Contaminants in Soil, SWMU 27A (Building 1339A)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Acetone	0.544	16	No
Xylenes, total	0.0042	190	No
Semivolatile Organic Compounds (mg/kg)			
2-Methylnaphthalene	0.359	22.574	No
Fluorene	0.251	560	No
Phenanthrene[b,c]	0.23	80.4	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

[c]RBC of surrogate pyrene is used to develop GSSL for phenanthrene.

Table 9.4-6. Human Healtb Risk Screening for Subsurface Soil and Groundwater, SWMU 27A (Building 1339A)

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Acetone	1/2	0.544	0.544	780	No	Max Detect < Risk Criteria
Xylenes, total	1/3	0.0042	0.0042	16,000	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
2-Methylnaphthalene	1/4	0.359	0.359	12	No	Max Detect < Risk Criteria
Fluorene	1/4	0.251	0.251	310	No	Max Detect < Risk Criteria
Phenanthrene	1/4	0.23	0.23	2,300	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Results > Detection Limit**	**Minimum Detected**	**Maximum Detected**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
2-Butanone	1/4	8.9	8.9	190	No	Max Detect < Risk Criteria
Xylenes, total	1/4	3.9	3.9	1,200	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (µg/L)						
Bis(2-ethylhexyl)phthalate	1/4	5.5	5.5	4.8	Yes	Max Detect > Risk Criteria

Table 9.4-7. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27A (Building 1339A)

Analyte	SWMU 27A, Building 1339A Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
2-Butanone	8.9	14,000[a]	No	Max Detect < ESV
Xylenes, total	3.9	1.8[a]	Yes	Max Detect > ESV
Semivolatile Organic Compounds (µg/L)				
Bis(2-ethylhexyl)phthalate	5.5	0.3	Yes	Max Detect > ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.

ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 9.4-8. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27A (Building 1339A)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = $C_{Max} \times 0.001 \times IR_W$	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds				
Xylenes, total	3.9	3.12E-04	5.48E-01	5.69E-04
Semivolatile Organic Compounds				
Bis(2-ethylhexyl)phthalate	5.5	4.40E-04	4.87E+00	9.04E-05

0.001 (mg/µg) = Conversion from µg to mg.

ADD = Average daily dose (mg/kg/d).

C_{Max} = Maximum detected concentration (µg/L).

HQ = Hazard quotient; HI = hazard index = sum of HQs.

IR_W = Raccoon water ingestion rate (L/kg/d) =0.080.

TRV = NOAEL (mg/kg/d).

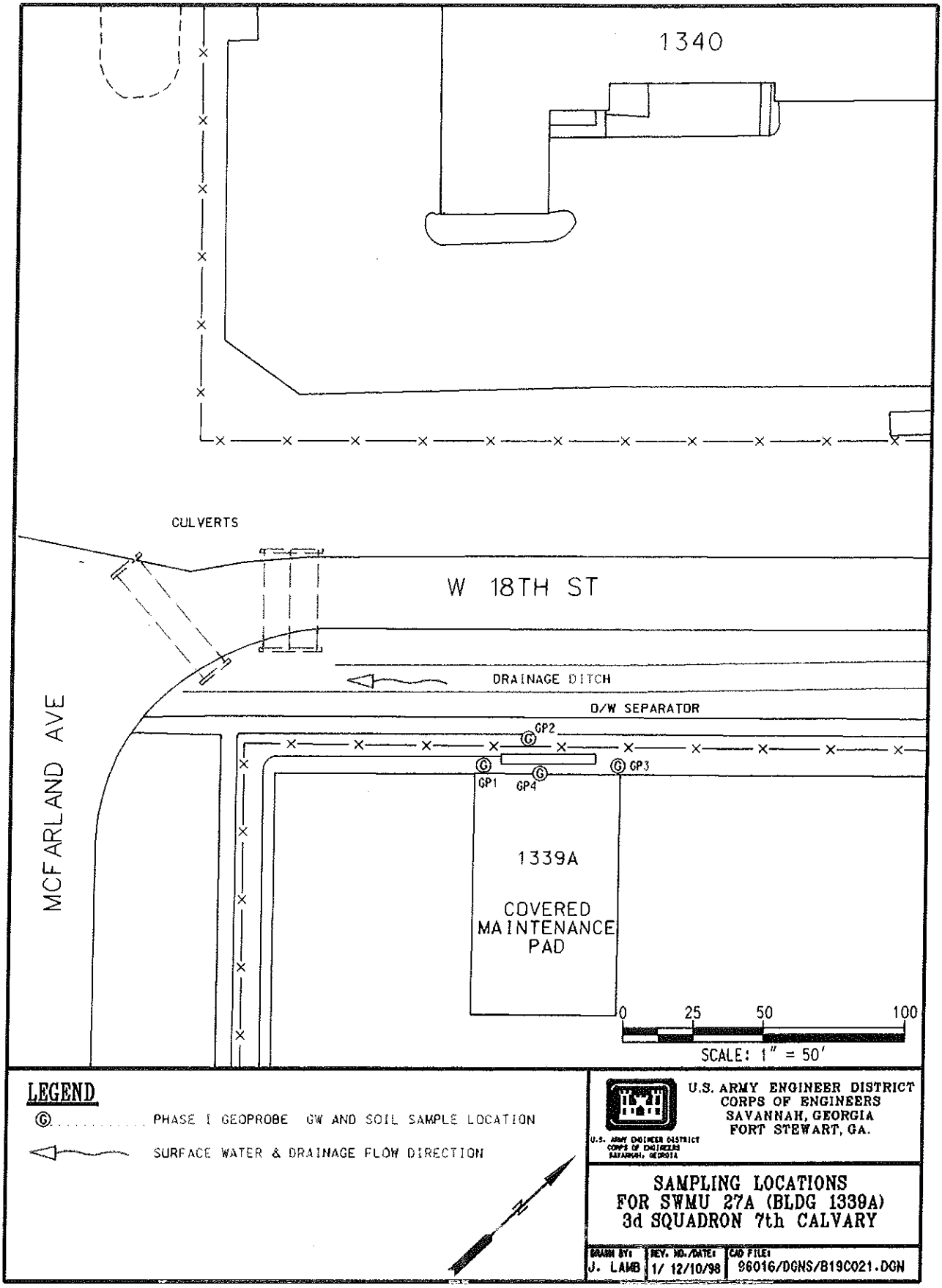

Figure 9.4-1. Sampling Locations, SWMU 27A (Building 1339A)

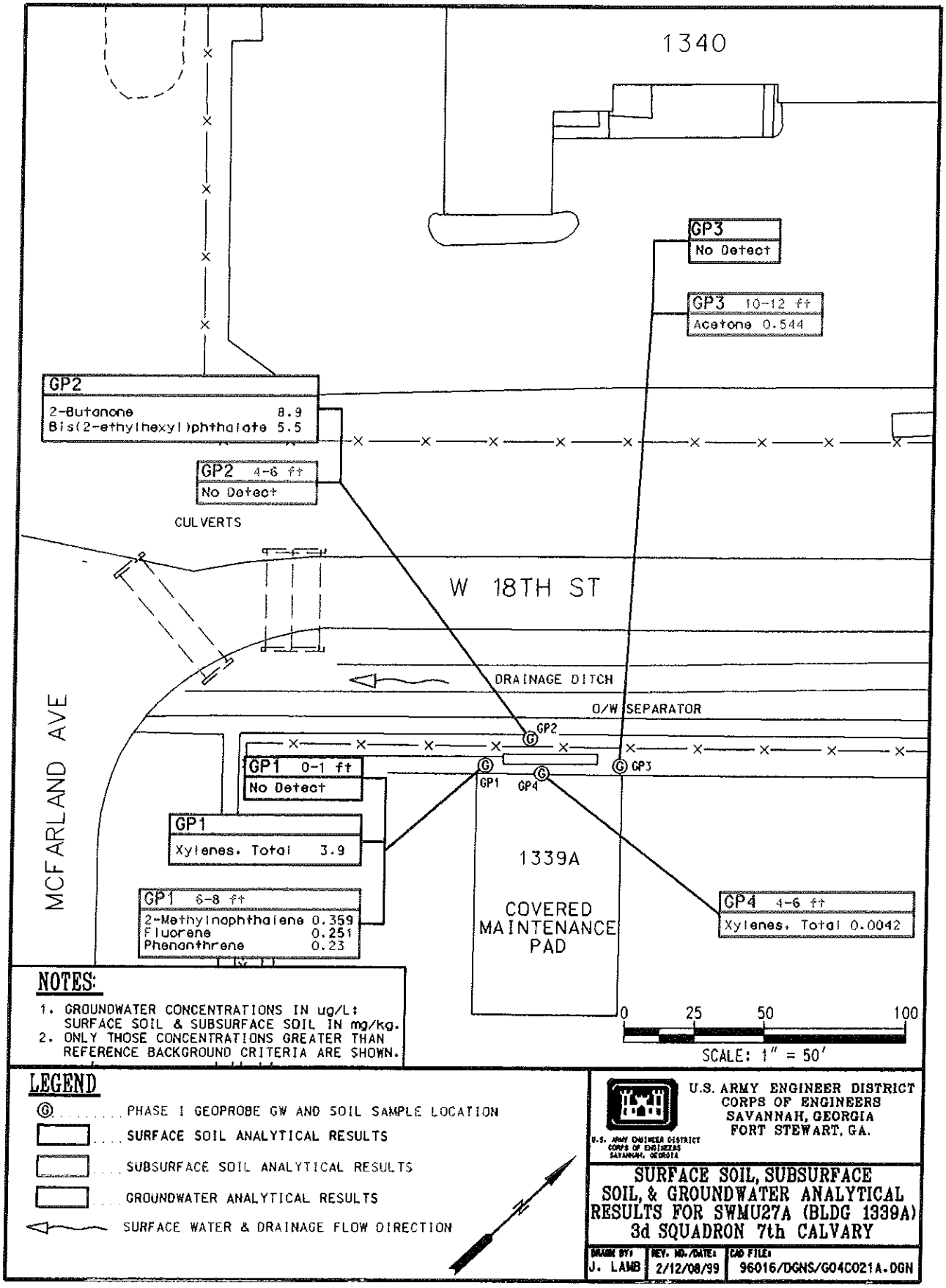

Figure 9.4-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27A (Building 1339A)

☐ = Exposure pathway not complete.
* = Exposure pathway complete.
1 = This scenario is used to derive screening values. It is not a viable scenario for this site.

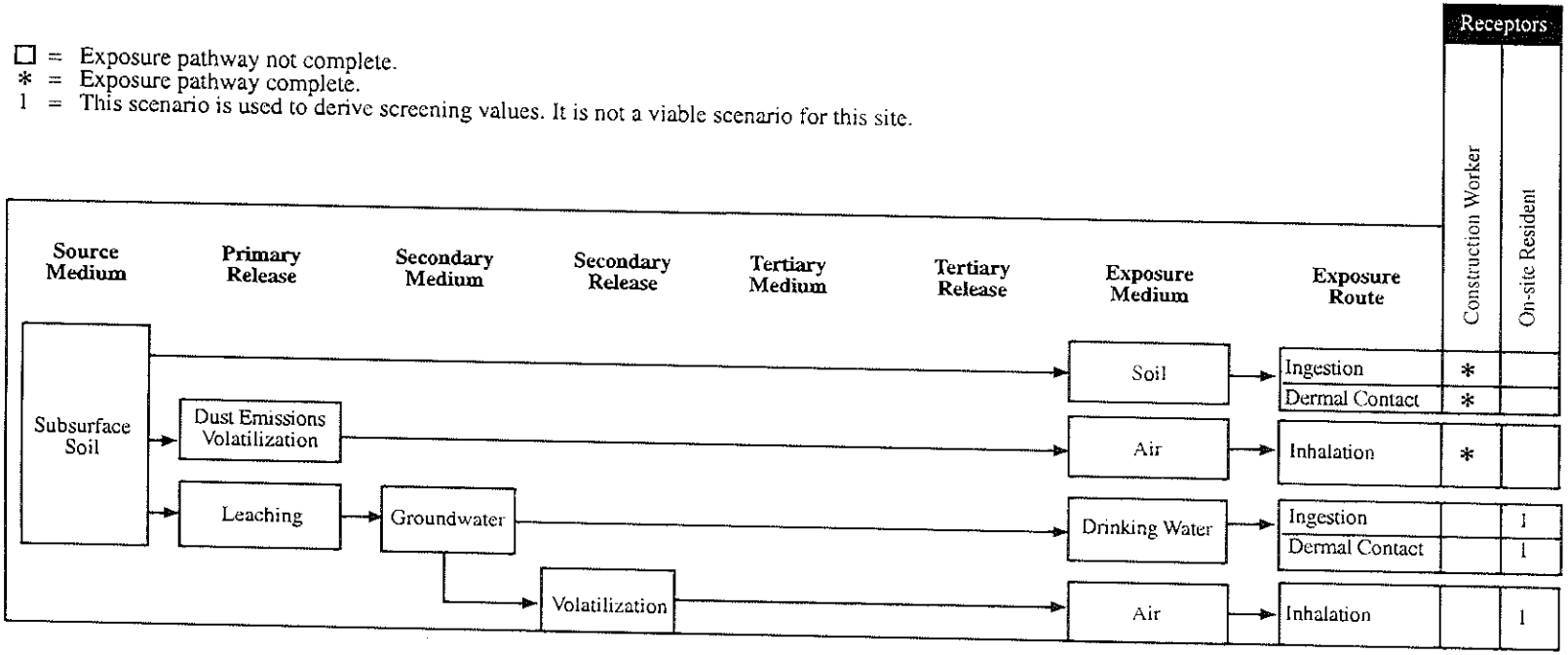

Figure 9.4-3. Potential Migration and Exposure Pathways, SWMU 27A (Building 1339A)

9.5 SWMU 27A: 3D SQUADRON 7TH CAVALRY MOTORPOOL, BUILDING 1339B

9.5.1 History and Description of SWMU 27A, 3d Squadron 7th Cavalry Motorpool, Building 1339B

SWMU 27A, Building 1339B is one of four OWSs located within the 3d Squadron 7th Cavalry Motorpool. The OWS is located north/northwest of Building 1339B, a covered maintenance pad. The site is in the northeastern corner of the motorpool area along the intersection of Wilson Avenue and West 18th Street, two heavily trafficked roads. Maintenance activities for military vehicles are performed at the maintenance pad. Floor drains from the maintenance pad are piped to the OWS. In addition, residual oil from collection and storage containers, filters, and such is allowed to drain onto the grating covering the OWS. No previous investigations have been performed at the site.

9.5.2 Summary of Investigative Activities

In January and February 1998, DPT techniques were used to collect four subsurface soil and four groundwater samples. The soil and groundwater sampling locations are presented in Figure 9.5-1. The soil samples were collected based on field headspace readings for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead. Unfortunately, the contract laboratory exceeded the holding times for the analyses of VOCs and SVOCs in the subsurface soil sample from GP1 and for analysis of VOCs from the groundwater sample collected at GP2. Therefore, soil at GP1 was resampled on May 6, 1998, and based on field headspace readings for VOCs, a surface soil sample was submitted to the laboratory for VOC and SVOC analyses. In addition, GP2 was resampled on May 12, 1998, and a groundwater sample was collected and submitted to the laboratory for VOC analysis.

9.5.3 Physical Characteristics of the Site

9.5.3.1 Topography

The topography of the site is essentially flat, with concrete maintenance and parking areas adjacent to the southeast. The OWS is located in the grass between the concreted maintenance facilities and parking area and the fenced site boundary. The surface elevation is approximately 69 feet amsl.

9.5.3.2 Surface drainage

A drainage ditch is located approximately 25 feet north/northwest of the site. The drainage ditch is approximately 6 feet in depth and receives runoff from the vehicle parking area southeast of the OWS and the adjacent asphalt roads (18th Street and Wilson Avenue) northwest and north of the OWS. Surface water is primarily present in the drainage ditch only after rainfall events. The drainage ditch ultimately discharges to Mill or Taylors Creek. The effluent from the OWS discharges directly to the IWTP; therefore, there are no surface water/sediment pathways.

9.5.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.5.3.4 Hydrogeology

Groundwater was encountered at approximately 8 feet to 10 feet bgs.

9.5.3.5 Ecology

As stated in Section 8.2, SWMU 27A, Building 1339B, is classified as an "industrialized area with managed grasslands." The site comprises approximately 0.01 acre (Figure 9.5-1). A storm water ditch parallels the road.

9.5.4 Nature and Extent of Contamination

9.5.4.1 Surface Soil

The analytical laboratory missed the holding times for VOCs and SVOCs for soils at GP1 during the initial sampling endeavor (January 1998), so the surface soil was resampled in May 1998. One surface soil sample (GP1) was collected based on field headspace screening for VOCs. The results of the surface soil analyses are presented in Table 9.5-1 and Figure 9.5-2.

VOCs. No VOCs were detected in the surface soil sample.

SVOCs. Bis(2-ethylhexyl)phthalate was detected at GP1 at a concentration of 0.534 mg/kg and is considered to be an SRC.

Lead. Lead was detected in the surface soil at GP1 at a concentration of 24.8 mg/kg. This concentration was greater than the reference background criterion; therefore, lead is an SRC in surface soil.

9.5.4.2 Subsurfaee soil

Four subsurface soil samples were collected based on field headspace sereening for VOCs. The results of the soil analyses are presented in Table 9.5-2 and Figure 9.5-2.

VOCs. Acetone was detected at 0.0302 mg/kg at GP3. Toluene was detected at GP2 at a concentration of 0.0274 mg/kg. No other VOCs were detected. Acetone and toluene are SRCs in subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in all four subsurface soil samples at concentrations ranging from 5 mg/kg at GP4 to 8 mg/kg at GP1. None of the concentrations were above the reference background criterion; therefore, lead is not considered to be an SRC.

9.5.4.3 Groundwater

Four groundwater samples were collected using DPT techniques. Groundwater at GP4 could not be sampled because of insufficient recovery. The results of the groundwater analyses are presented in Table 9.5-3 and Figure 9.5-2.

VOCs. Total xylenes were detected in GP2 at a concentration of 4.3 µg/L. Total xylenes are considered to be SRCs in groundwater.

SVOCs. No SVOCs were detected in groundwater.

Lead. Lead was not detected in groundwater.

9.5.4.4 Surface water

There are no surface water pathways at the site; therefore, no surface water samples were collected.

9.5.4.5 Sediment

There are no sediment pathways at the site; therefore, no sediment samples were collected.

9.5.4.6 Site-related contaminant summary

Table 9.5-4 presents a summary of the SRCs and their maximum concentrations by medium.

9.5.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface soil and subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in surface soil and subsurface soil, none of the analytes exceeded their respective GSSLs (Table 9.5-5); therefore, there are no CMCOPCs in soil at SWMU 27A based on leaching to groundwater.

9.5.6 Human Health Preliminary Risk Evaluation of SWMU 27A, Building 1339B

SRCs were identified for the following media: surface soil, subsurfaee soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.5.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is comprised primarily of concrete, with small areas of grasses located between the concrete and the fence and from the fence to the road; therefore, soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway.

Because groundwater is lower (i.e., at a greater depth below ground surface) than the adjacent drainage ditch and there are no other surface water bodies nearby, groundwater at the site does not discharge into any nearby surface waters. Therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.5-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.5.6.2 Risk evaluation

The results of the human health risk screening are given below.

Bis(2-ethylhexyl)phthalate and lead were identified as SRCs in surface soils. The concentrations of these contaminants were below their respective screening values (Table 9.5-6); therefore, there are no HHCOPCs in surface soil.

The SRCs for subsurface soils consisted of the volatile organics acetone and toluene. The concentrations of these contaminants were below their respective screening values (Table 9.5-6); therefore, there are no HHCOPCs in subsurface soil.

Total xylenes are the only SRCs for groundwater. The maximum concentration of total xylenes was below the risk-based screening value (Table 9.5-6); therefore, there are no HHCOPCs in groundwater.

9.5.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.5.7 Ecological Preliminary Risk Evaluation of SWMU 27A, Building 1339B

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.5.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

Total xylenes (VOCs) were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.5-7. The only ECOPCs identified by the ESV comparison for groundwater were total xylenes because they were detected at concentrations exceeding the ESV.

Because there are no ESVs for soil, all analytes detected in that medium were evaluated further in EPRE Steps ii through v.

9.5.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 9.5.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.5.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

9.5.7.4 Preliminary exposure (Step iv)

Ecological receptors at the site are probably exposed by ingestion of contaminated soil or of biota exposed to contaminated soil or by ingestion of drinking water. The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

9.5.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil at the site are presented in Table 9.5-8. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. HQs exceeding one are shown bordered by a double line.

Lead is the only ECOPC present in surface soil at concentrations resulting in an ADD exceeding a TRV for the surrogate species. The robin has a preliminary HQ for lead in surface soil that exceeds one. The lead HQ is 13.3 for the robin.

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 9.5-9. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species.

9.5.8 Conclusions and Risk Management and Site Recommendations for SWMU 27A, Building 1339B

9.5.8.1 Conclusions

Nature and Extent of Contamination

- Bis(2-ethylhexyl)phthalate was detected at one location in surface soil and, therefore, is considered to be an SRC. Lead was detected above the reference background level in surface soil and is an SRC in that medium.

- Acetone and toluene are SRCs in subsurface soils. Lead is not an SRC in subsurface soils.

- Total xylenes were detected in groundwater and are SRCs in that medium.

Fate and Transport

- SRCs identified in surface soil and subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for surface soil, subsurface soil, or groundwater at this site.

Ecological Preliminary Risk Evaluation

- The only ECOPCs in groundwater are total xylenes. Total xylenes are unlikely to be a potential hazard to aquatic biota because groundwater does not discharge to nearby surface water bodies. There are no ECOPCs in groundwater for terrestrial receptors.

- Lead is the only ECOPC in surface soil at the site.

9.5.8.2 Risk management and site recommendations

- Total xylenes were identified as possible ECOPCs to aquatic biota if groundwater discharges to nearby surface waters. Total xylenes were detected in only two of four groundwater samples, and only one of the detections (4.3 µg/L) was slightly elevated above the conservative ESV (1.8 µg/L). This low concentration and the natural attenuation processes in the subsurface combine to make it unlikely that total xylenes in groundwater would discharge to any nearby surface waters at concentrations that would pose a risk to aquatic biota. Therefore, total xylenes are eliminated as ECOPCs for SWMU 27A, Building 1339B.

- Lead was identified as an ECOPC in surface soil. The lead concentration was at the low end of the concentration range (less than 10 mg/kg to 300 mg/kg) of lead observed in the eastern United States (UGSG 1984). This site is a heavily industrialized and trafficked area (near a main intersection), and the lead might not be associated with any potential releases from the OWS. In addition, little habitat is available to support ecological receptors; therefore, lead is not considered to be an ECOPC requiring further investigation for this site.

- Based on the information provided in this section, Fort Stewart respectfully requests that SWMU 27A, Building 1339B be assigned an NFA status. If approved by GEPD, Fort Stewart respectfully requests that the Installation's Subpart B permit be amended to annotate this change in investigative status.

Table 9.5-1. Summary of Analytes Detected in Surface Soil, SWMU 27A (Building 1339B)

Station	Reference Background Criteria	7AGP1
Sample ID		7A1112
Date		05/06/98[a]
Depth (feet)		0 to 1
Sample Type		Grab
Semivolatile Organic Compounds (mg/kg)		
Bis(2-ethylhexyl)phthalate	0.00	**0.534**
Metals (mg/kg)		
Lead	8.81	**24.8**

[a]Because the holding times for VOCs and SVOCs were missed by the analytical laboratory, soil was resampled on May 6, 1998.
Bold indicates concentrations above reference background criteria.

Table 9.5-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27A (Building 1339B)

Station	Reference Background Criteria	7AGP1[a]	7AGP2	7AGP3	7AGP4
Sample ID		7A1111	7A1211	7A1311	7A1411
Date		01/17/98	01/31/98	02/03/98	02/03/98
Depth (feet)		16 to 18	2 to 4	5 to 7	4 to 6
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Acetone	0.00	NA		**0.0302**	
Toluene	0.00	NA	**0.0274**		
Metals (mg/kg)					
Lead	11.10	8	7.4	6.4	5

[a]The analytical laboratory missed the holding times for VOCs and SVOCs for the soil samples collected in January 1998. The GP1 location was resampled on May 5, 1998 (see Table 9.5-1), and the surface soil interval indicated the highest VOC concentration from the field screening (i.e., PID readings).
NA = Not analyzed.
Bold indicates concentrations above reference background criteria.

Table 9.5-3. Summary of Analytes Detected in Groundwater, SWMU 27A (Building 1339B)

Station	Reference Background Criteria	MCL	7AGP1	7AGP2	7AGP2	7AGP3
Sample ID			7A4111	7A4211	7A4211	7A4311
Date			01/17/98	01/31/98[a]	05/12/98[a]	02/03/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
Xylenes, total	0.00	10,000		NA	**4.3**	

Note: Groundwater at GP4 could not be resampled because of insufficient recovery.
[a]The analytical laboratory missed the holding times for VOCs and SVOCs at GP2. The location was resampled on May 12, 1998.
NA = Not analyzed because holding times for VOCs were missed.
Bold indicates concentrations above reference background criteria.

Table 9.5-4. Summary of Site-related Contaminants, SWMU 27A (Building 1339B)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Acetone	ND	0.0302	NP	ND	NP
Toluene	ND	0.0274	NP	ND	NP
Xylenes, total	ND	ND	NP	4.3	NP
Semivolatile Organic Compounds					
Bis(2-ethylhexyl)phthalate	0.534	ND	NP	ND	NP
Metals					
Lead	24.8	BRBC	NP	ND	NP

BRBC = Below reference background criteria.
ND = Not detected.
NP = No pathway exists.

Table 9.5-5. GSSL Screening of Site-related Contaminants in Soil, SWMU 27A (Building 1339B)

Site-related Contaminant	Maximum Detection	GSSL[a]	CMCOPC?
SURFACE SOIL			
Semivolatile Organic Compounds (mg/kg)			
Bis(2-ethylhexyl)phthalate	0.534	3,600	No
Metals (mg/kg)			
Lead[b]	24.8	400	No
SUBSURFACE SOIL			
Volatile Organic Compounds			
Acetone	0.0302	16	No
Toluene	0.0274	12	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).
[b]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.5-6. Human Health Risk Screening for Surface Soil, Subsurface Soil, and Groundwater, SWMU 27A (Building 1339B)

SURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Semivolatile Organic Compounds (mg/kg)						
Bis(2-ethylhexyl)phthalate	1/1	0.534	0.534	46	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	1/1	24.8	24.8	400	No	Max Detect < Risk Criteria

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Acetone	1/2	0.0302	0.0302	780	No	Max Detect < Risk Criteria
Toluene	1/3	0.0274	0.0274	1,600	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Freq. of Detection**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
Xylenes, total	1/3	4.3	4.3	1,200	No	Max Detect < Risk Criteria

Table 9.5-7. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27A (Building 1339B)

Analyte	SWMU 27A, Building 1339B Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Xylenes, total	4.3	1.8[a]	Yes	Max Detect > ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESV (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.
Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 9.5-8. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27A (Building 1339B)

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Semivolatile Organic Compounds								
Bis(2-ethylhexyl)phthalate	0.534	5.00E-02	1.42E-02	2.18E+01	6.50E-04	4.06E-02	1.10E+00	3.69E-02
Metals								
Lead[a]	24.8	4.00E-01	5.26E+00	1.76E+01	2.99E-01	1.51E+01	1.13E+00	1.33E+01

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration > 1 mg/kg.
ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.
Cells with double borders indicate HQ > 1.

Table 9.5-9. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27A (Building 1339B)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds				
Xylenes, total	4.3	3.44E-04	5.48E-01	6.28E-04

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).

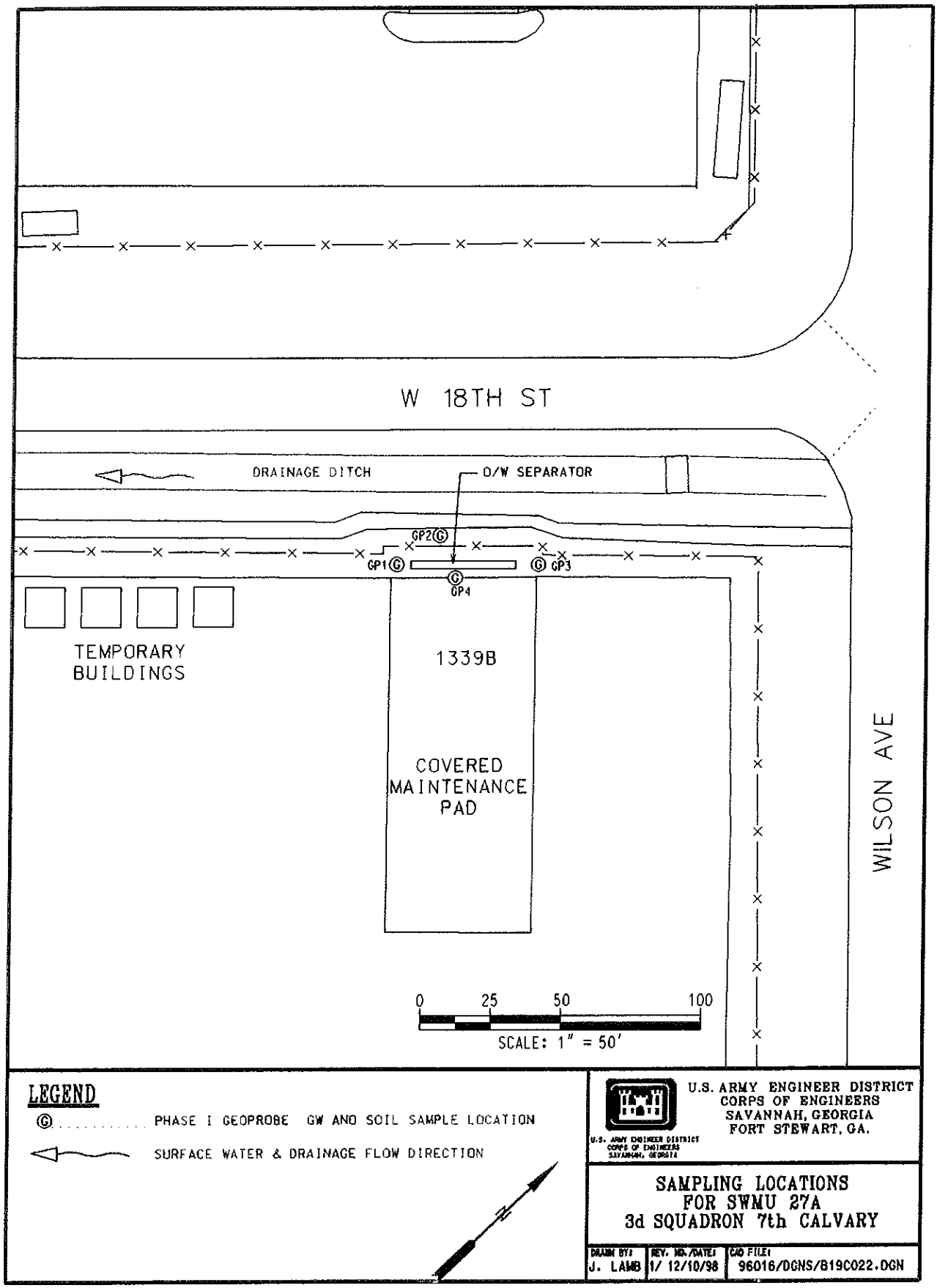

Figure 9.5-1. Sampling Locations, SWMU 27A (Building 1339B)

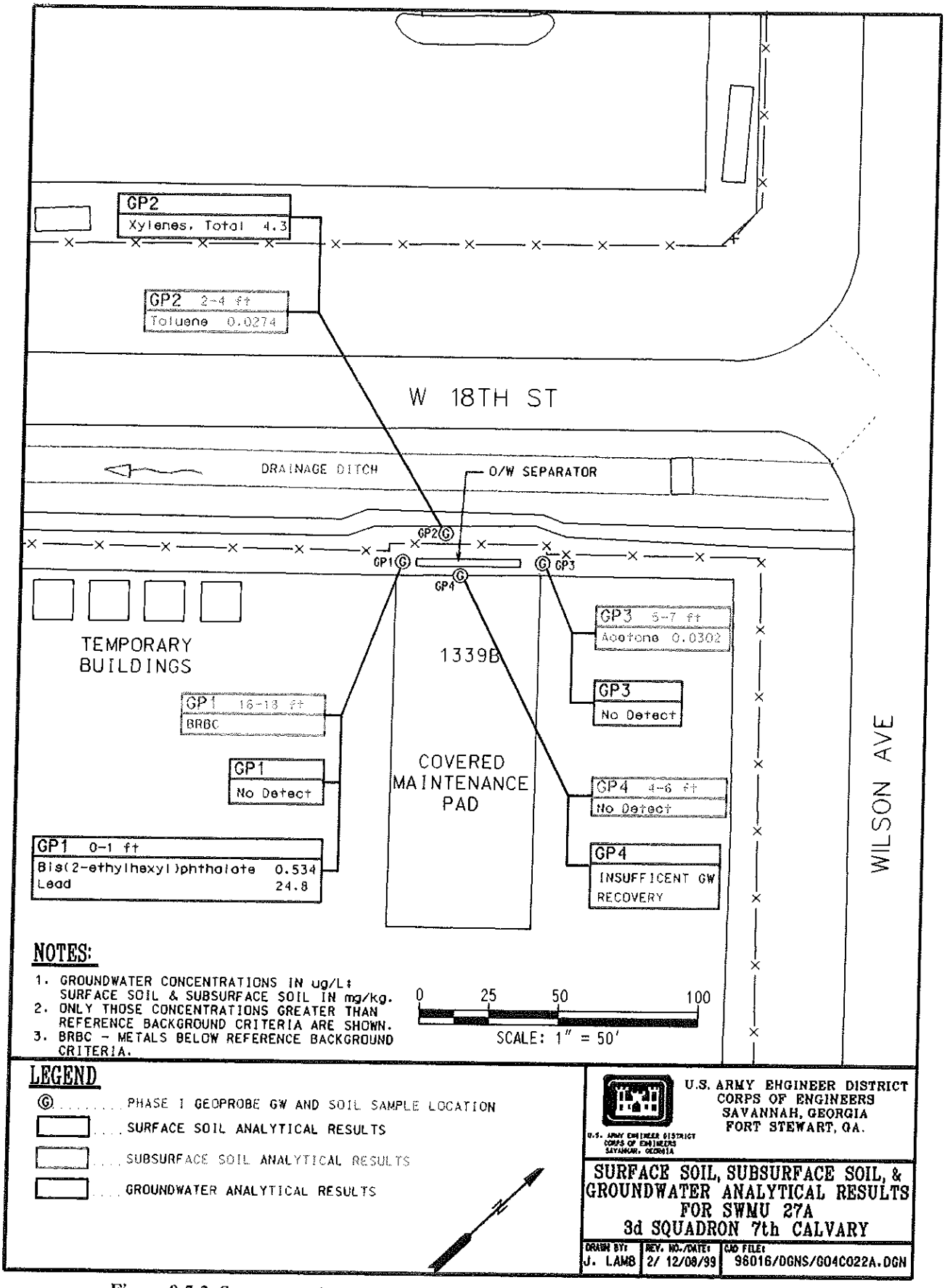

Figure 9.5-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27A (Building 1339B)

□ = Exposure pathway not complete.
* = Exposure pathway complete.
1 = Exposure pathway evaluated for future scenario only.
2 = This scenario is used to derive screening values. It is not a viable scenario for this site.

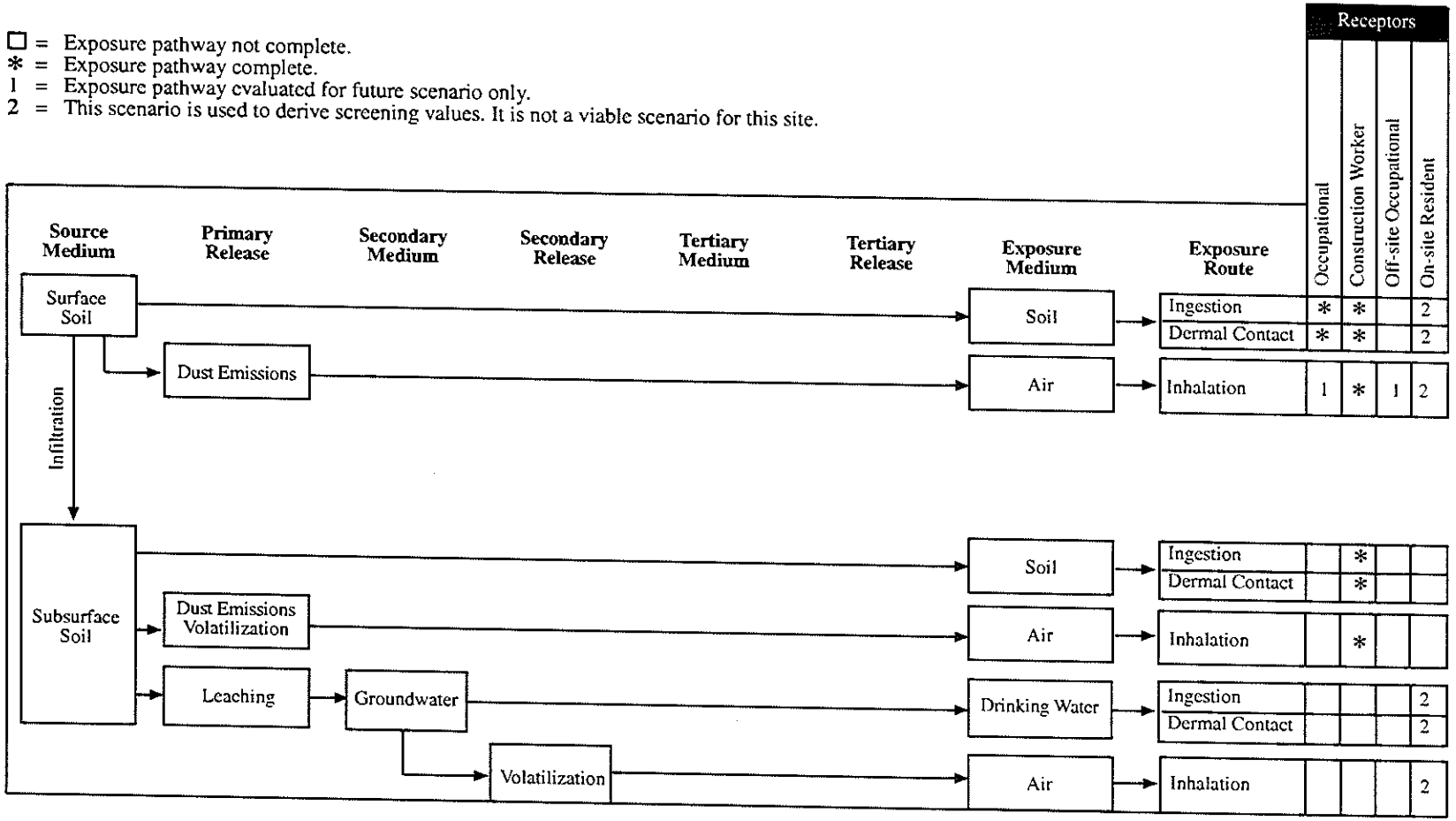

Figure 9.5-3. Potential Migration and Exposure Pathways, SWMU 27A (Building 1339B)

9.6 SWMU 27A: 3D SQUADRON 7TH CAVALRY MOTORPOOL, BUILDING 1322

9.6.1 History and Description of SWMU 27A, 3d Squadron 7th Cavalry Motorpool, Building 1322

SWMU 27A, Building 1322 consists of two of the four OWSs located within the 3d Squadron 7th Cavalry Motorpool (Figure 9.6-1). The two OWSs support adjacent wash racks. The effluent from the OWSs is piped to the IWTP. No previous investigations have been performed at the site.

9.6.2 Summary of Investigative Activities

DPT techniques were used to collect three surface soil, two subsurface soil, and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 9.6-1. The soil samples were collected in the surface and subsurface based on field headspace screening for VOCs. The soil and groundwater were analyzed for VOCs, SVOCs, and lead.

9.6.3 Physical Characteristics of the Site

9.6.3.1 Topography

The topography of the site is essentially flat, with a concrete parking area adjacent to the north. The OWS is located in the grass between the concrete parking area and the fenced site boundary. The surface elevation is approximately 69 feet amsl.

9.6.3.2 Surface drainage

A drainage ditch is located approximately 50 feet west and northwest/southwest of the site. The effluent from the OWS discharges directly to the IWTP; therefore, there are no surface water/sediment pathways for this site. Surface water drainage is allowed to percolate into the soil; however, during heavy rainfall events, the surface water in the adjacent drainage ditch may reach Mill or Taylors Creek.

9.6.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.6.3.4 Hydrogeology

Groundwater was encountered at approximately 8 feet to 10 feet bgs.

9.6.3.5 Ecology

As stated in Section 8.2, SWMU 27A, Building 1322 is classified as an "industrial area with managed grassland." Managed grasses are present just off the edge of the concrete before the fence and from the fence to the road. A storm water ditch parallels the road. The site comprises approximately 0.1 acre (Figure 9.6-1).

9.6.4 Nature and Extent of Contamination

9.6.4.1 Surface soil

Three surface soil samples (from GP2, GP3, and GP4) were collected based on field headspace screening for VOCs. The results of the soil analyses are presented in Table 9.6-1 and Figure 9.6-2.

VOCs. 2-Butanone, acetone, and toluene were detected in surface soil. 2-Butanone was detected at a concentration of 0.0032 mg/kg at GP3. Acetone was detected at a concentration of 0.0319 mg/kg at GP3. Toluene was detected in two out of three surface soil samples at concentrations of 0.0998 mg/kg at GP2 and 0.107 mg/kg at GP4. 2-Butanone, acetone, and toluene are SRCs in surface soil.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected in three out of three surface soil samples. Lead was detected at GP2 at a concentration of 14.8 mg/kg, which is slightly above the reference background criterion; therefore, lead is an SRC in surface soil.

9.6.4.2 Subsurface soil

Two subsurface soil samples (from GP1 and GP5) were collected based on field headspace screening for VOCs. The results of the soil analyses are presented in Table 9.6-2 and Figure 9.6-2.

VOCs. 2-Butanone, acetone, and toluene were detected in subsurface soil. 2-Butanone was detected at concentrations of 0.006 mg/kg at GP1 and 0.0068 mg/kg at GP5. Acetone was detected at concentrations of 0.0348 mg/kg at GP1 and 0.0451 mg/kg at GP5. Toluene was detected at concentrations of 0.0446 mg/kg at GP1 and 0.103 mg/kg at GP5. 2-Butanone, acetone, and toluene are SRCs in subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected at concentrations of 1.4 mg/kg at GP1 and 7.1 mg/kg in GP5. Lead was not detected above the reference background criterion and is not an SRC for subsurface soil.

9.6.4.3 Groundwater

Five groundwater samples were collected using DPT techniques. The results of the groundwater analyses are presented in Table 9.6-3 and Figure 9.6-2.

VOCs. Acetone and methylene chloride were detected in groundwater. Acetone was detected at a concentration of 150 µg/L in GP3. Methylene chloride was initially detected in two of the four samples at concentrations of 5 µg/L at GP2 and 8.2 µg/L at GP5. Both of these concentrations of methylene chloride were believed to be the result of laboratory contamination because the concentrations were below the existing blank level (less than 15 µg/L). Therefore, the methylene chloride concentrations (less than 15 µg/L) could not be positively attributed to site contaminants (see Section 4.2). With the concurrence of GEPD (SAIC 1999a), the groundwater at GP2 and GP5 was resampled for methylene chloride only on August 26, 1999. The groundwater was collected from a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack installed to intersect the water table. The resampled monitoring point was installed approximately 1 foot away from the previous sampling location. Methylene chloride was not detected in either resampling location during the resampling event. The initial elevated concentrations of methylene chloride at GP2 and GP5 are considered to be the result of field or laboratory

contamination; therefore, methylene chloride is not an SRC at SWMU 27A, Building 1322. Acetone is considered to be the only SRC in groundwater at the site.

SVOCs. No SVOCs were detected in groundwater.

Lead. Lead concentrations were nondetect or less than or equal to 1 µg/L. Lead was not detected above the reference background criterion; therefore, lead is not an SRC in groundwater.

9.6.4.4 Surface water

There are no surface water pathways at the site; therefore, no surface water samples were collected.

9.6.4.5 Sediment

There are no sediment pathways at the site; therefore, no sediment samples were collected.

9.6.4.6 Site-related contaminant summary

Table 9.6-4 presents a summary of the SRCs and their maximum concentrations by medium.

9.6.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface soil and subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in surface and subsurface soil, none of the analytes exceeded their respective GSSLs (Table 9.6-5); therefore, there are no CMCOPCs in soil at SWMU 27A, Building 1322.

9.6.6 Human Health Preliminary Risk Evaluation of SWMU 27A, Building 1322

SRCs were identified for surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.6.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is comprised primarily of concrete, with small areas of grasses located between the concrete and the fence and from the fence to the road. In addition, a storm water ditch parallels the road. Therefore, soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway.

Because groundwater is lower (i.e., at a greater depth below the ground surface) than the adjacent drainage ditch and there are no other surface water bodies nearby, groundwater at the site does not discharge into any nearby surface waters. Therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.6-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.6.6.2 Risk evaluation

The results of the human health risk screening are given below.

Volatile organics (2-butanone, acetone, and toluene) and lead were identified as SRCs in surface soils. The concentrations of these contaminants were below their respective screening values (Table 9.6-6); therefore, there are no HHCOPCs for surface soils.

Volatile organics (2-butanone, acetone, and toluene) were identified as SRCs in subsurface soils. The concentrations of these contaminants were below their respective screening values (Table 9.6-6); therefore, there are no HHCOPCs for subsurface soils.

Acetone was the only SRC in groundwater. The maximum concentration of acetone (150 µg/L) exceeded its risk-based screening value (61 µg/L) (Table 9.6-6); therefore, acetone is an HHCOPC in groundwater.

9.6.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.6.7 Ecological Preliminary Risk Evaluation of SWMU 27A, Building 1322

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.6.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

Acetone was detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.6-7. No ECOPCs were identified by the ESV comparison for groundwater.

Because there are no ESVs for soil, all analytes detected in soil at the site were evaluated further in EPRE Steps ii through v.

9.6.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 9.6.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.6.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil at the site. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

9.6.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated soil or of biota exposed to contaminated soil. The exposure parameters for the surrogate species—shrews and robins—are presented in Table 8-7.

9.6.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil at the site are presented in Table 9.6-8. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. HQs exceeding one are shown bordered by a double line.

Lead is the only ECOPC present in surface soil at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. Only the robin has a preliminary HQ for lead in surface soil that exceeds one. The lead HQ for robins is 7.96.

9.6.8 Conclusions and Risk Management and Site Recommendations for SWMU 27A, Building 1322

9.6.8.1 Conclusions

Nature and Extent of Contamination

- 2-Butanone, acetone, and toluene were detected in surface soil and are SRCs. Lead was detected above the reference background criterion and, therefore, is also considered to be an SRC in surface soil.

- 2-Butanone, acetone, and toluene were detected in subsurface soil and are SRCs. Lead was not detected above the reference background criterion and is not an SRC in subsurface soil.

- Acetone is the only SRC in groundwater. Methylene chloride was initially detected above its MCL at two Geoprobe groundwater locations (GP2 and GP5), but below the concentration that can be positively attributed to site conditions (i.e., existing blank level of 15 µg/L). Additional groundwater sampling (3/4-inch-diameter monitoring point) was performed at GP2 and GP5. Methylene chloride was not detected during the resampling event (August 1999), indicating that the initial methylene chloride detections at GP2 and GP5 were due to field or laboratory contamination. Methylene chloride is not an SRC in groundwater at SWMU 27A, Building 1322.

Fate and Transport

- SRCs identified in surface and subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil at SWMU 27A based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for surface soil or subsurface soil at this site.

- Acetone is an HHCOPC for groundwater.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in groundwater at the site.

- Lead is the only ECOPC in surface soil.

9.6.8.2 Risk management and site recommendations

- Lead, at a concentration of 14.8 mg/kg, was indicated as a potential ECOPC in surface soil (GP2). This value is only slightly above the reference background criterion of 8.81 mg/kg and is below the average concentration (17 mg/kg) for soils of the eastern United States. In addition, the site has limited ecological habitat because it is small, is surrounded on three sides by concrete, and is located in a heavily industrialized and trafficked area. Therefore, lead is not considered to be an ECOPC requiring further investigation for this site.

- Acetone was identified as an HHCOPC in groundwater. Acetone was detected at one location at a concentration of 150 µg/L. A baseline risk assessment was performed (see Attachment 9.6A) for SWMU 27A, Building 1322, to quantify the risk imposed by acetone in groundwater. Groundwater at

the site is not currently being used for any purpose and is unlikely to be used in the future both because the surficial aquifer is not considered to be a source of potable water and because of the probability that the site will remain industrial throughout the foreseeable future. Nevertheless, an evaluation was performed to quantify the risk to a resident child and a future Installation worker ingesting groundwater. The baseline risk assessment is presented as Attachment 9.6A. No cancer toxicity values are available for acetone; therefore, only systemic toxicity was calculated. The highest HI was for the resident child at 0.096, a full order of magnitude beneath the level at which adverse effects could be expected from exposure to acetone in drinking water. Therefore, acetone in groundwater does not require further investigation and/or evaluation.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27A, Building 1322, regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.6-1. Summary of Analytes Detected in Surface Soil, SWMU 27A (Building 1322)

Station	Reference Background Criteria	7CGP2	7CGP3	7CGP4
Sample ID		7C1211	7C1311	7C1411
Date		01/17/98	01/17/98	01/17/98
Depth (feet)		1 to 3[a,b]	1 to 4[a,b]	1 to 4[b]
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
2-Butanone	0.00		**0.0032**	
Acetone	0.00		**0.0319**	
Toluene	0.00	**0.0998**		**0.107**
Metals (mg/kg)				
Lead	8.81	**14.8**	3.9	5.5

[a]Surface soil was collected from below the concrete.
[b]The soil was collected across the surface/subsurface interval; therefore, the soil sample was considered to be surface soil because of the more conservative risk-based analysis.
Bold indicates concentrations above reference background criteria.

Table 9.6-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27A (Building 1322)

Station	Reference Backgronnd Criteria	7CGP1	7CGP5
Sample ID		7C1111	7C1511
Date		01/17/98	01/17/98
Depth (feet)		4 to 6	2 to 4
Sample Type		Grab	Grab
Volatile Organic Compounds (mg/kg)			
2-Butanone	0.00	**0.006**	**0.0068**
Acetone	0.00	**0.0348**	**0.0451**
Toluene	0.00	**0.0446**	**0.103**
Metals (mg/kg)			
Lead	11.1	1.4	7.1

Bold indicates concentrations above reference background criteria.

Table 9.6-3. Summary of Analytes Detected in Groundwater, SWMU 27A (Building 1322)

Station	Reference Background Criteria	MCL	7CGP1	7CGP2	7CGP2[a]	7CGP3	7CGP4	7CGP5	7CGP5[a]
Sample ID			7C4111	7C4211	7C4212	7C4311	7C4411	7C4511	7C4512
Date			01/17/98	01/17/98	08/26/99	01/17/98	01/17/98	01/17/98	08/26/99
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)									
Acetone	0.00				NA	**150**			NA
Methylene chloride	0.00	5		***5***[b]				***8.2***[b]	
Metals (µg/L)									
Lead	4.69	15	0.83		NA				NA

[a]The GP2 and GP5 locations were resampled in August 1999 to determine if methylene chloride detections were the result of field or laboratory contamination.

[b]The methylene chloride concentrations were below the existing blank value (<15 µg/L); therefore, the detected methylene chloride concentration could not be positively attributed to site conditions.

NA = Not analyzed.

Bold indicates concentrations above reference background criteria.

Boxed *italic* indicates concentrations above MCLs.

Table 9.6-4. Summary of Site-related Contaminants, SWMU 27A (Building 1322)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
2-Butanone	0.0032	0.0068	NP	ND	NP
Acetone	0.0319	0.0451	NP	150	NP
Toluene	0.107	0.103	NP	ND	NP
Metals					
Lead	14.8	BRBC	NP	BRBC	NP

BRBC = Below reference background criteria.

ND = Not detected.

NP = No pathway exists.

Table 9.6-5. GSSL Screening of Site-related Contaminants in Soil, SWMU 27A (Building 1322)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
2-Butanone[b]	0.0068	7.685	No
Acetone	0.0451	16	No
Toluene	0.107	12	No
Metals (mg/kg)			
Lead[c]	14.8	400	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

[c]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.6-6. Human Health Risk Screening for Surface Soil, Subsurface Soil, and Groundwater, SWMU 27A (Building 1322)

SURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
2-Butanone	1/3	0.0032	0.0032	4,700	No	Max Detect < Risk Criteria
Acetone	1/2	0.0319	0.0319	780	No	Max Detect < Risk Criteria
Toluene	2/3	0.0998	0.107	1,600	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	3/3	3.9	14.8	400	No	Max Detect < Risk Criteria

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
2-Butanone	2/2	0.006	0.0068	4,700	No	Max Detect < Risk Criteria
Acetone	2/2	0.0348	0.0451	780	No	Max Detect < Risk Criteria
Toluene	2/2	0.0446	0.103	1,600	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Freq. of Detection**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
Acetone	1/4	150	150	61	Yes	Max Detect > Risk Criteria

Table 9.6-7. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27A (Building 1322)

Analyte	SWMU 27A (Building 1322) Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Acetone	150	1,500[a]	No	Max Detect < ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.

Table 9.6-8. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27A (Building 1322)

ECOPC	CMax (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
2-Butanone	0.0032	5.00E-02	8.48E-05	3.89E+03	2.18E-08	2.43E-04	No TRV	No HQ
Acetone	0.0319	5.00E-02	8.45E-04	2.20E+01	3.85E-05	2.42E-03	No TRV	No HQ
Toluene	0.107	5.00E-02	2.84E-03	3.09E+01	9.18E-05	8.13E-03	No TRV	No HQ
				HI=	1.30E-04		**HI=**	0.00E+00
Metals								
Lead[a]	14.8	4.0E-01	3.14E+00	1.76E+01	1.78E-01	9.00E+00	1.13E+00	7.96E+00

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration > 1 mg/kg.
ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

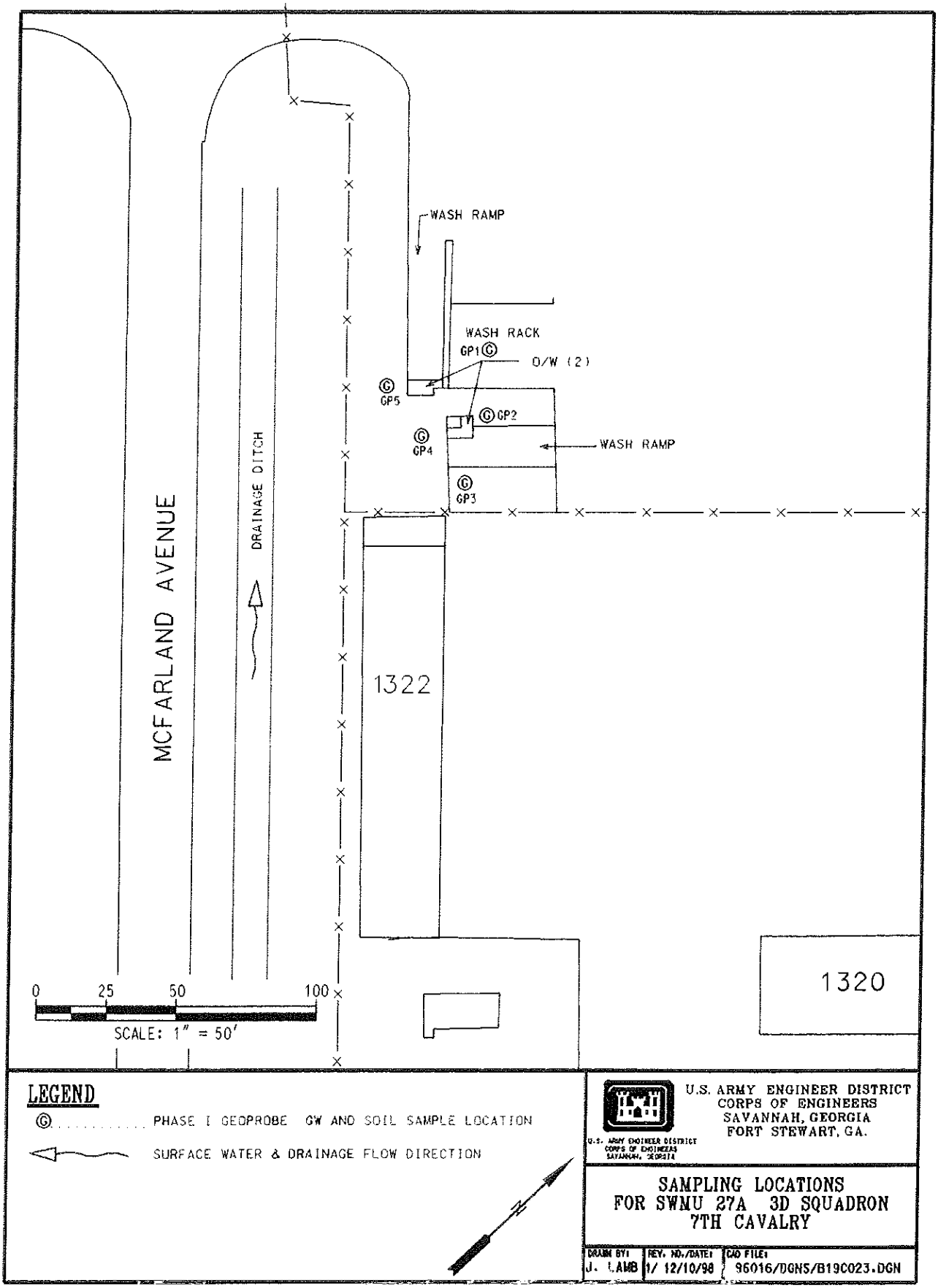

Figure 9.6-1. Sampling Locations, SWMU 27A (Building 1322)

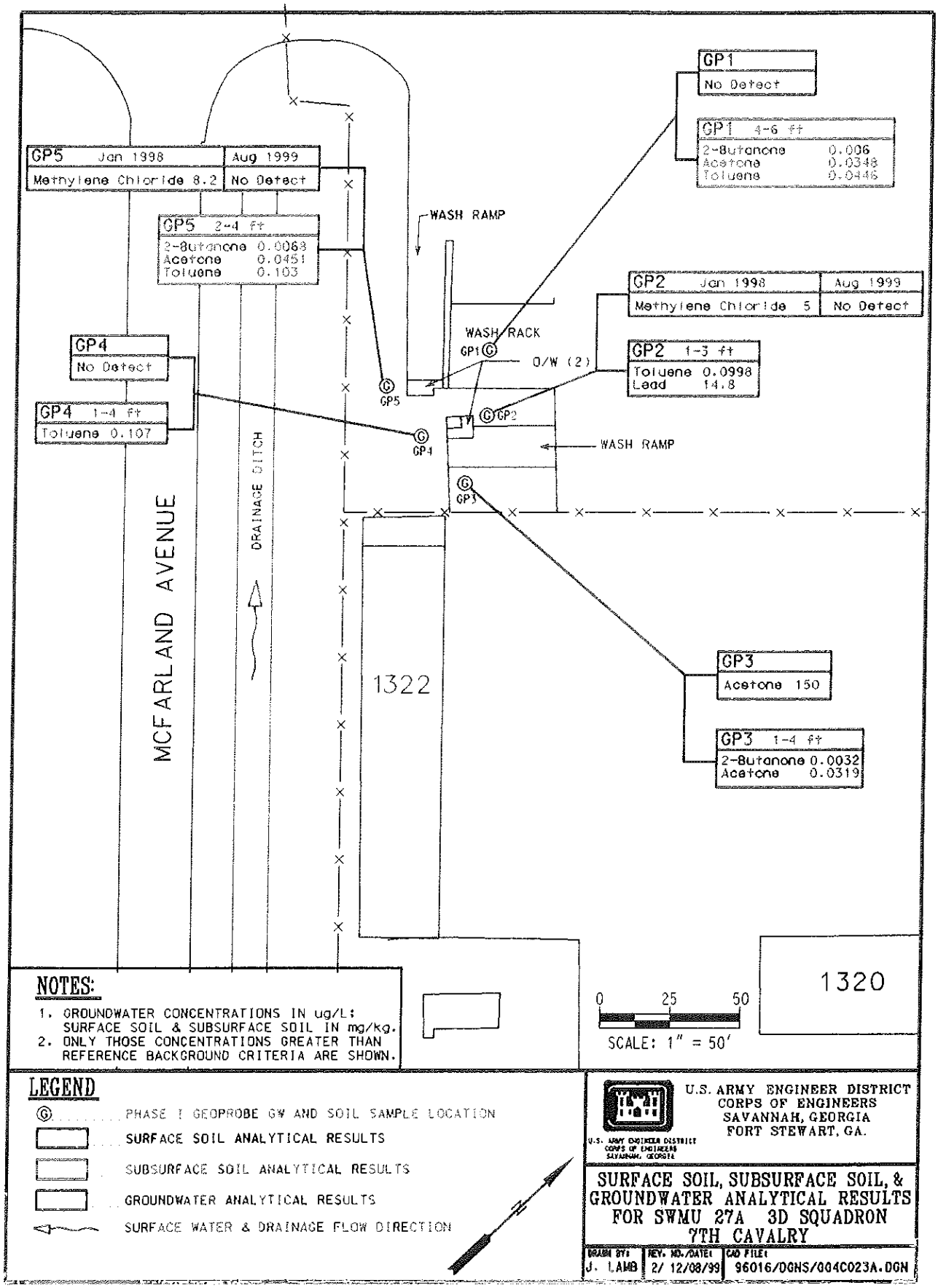

Figure 9.6-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27A (Building 1322)

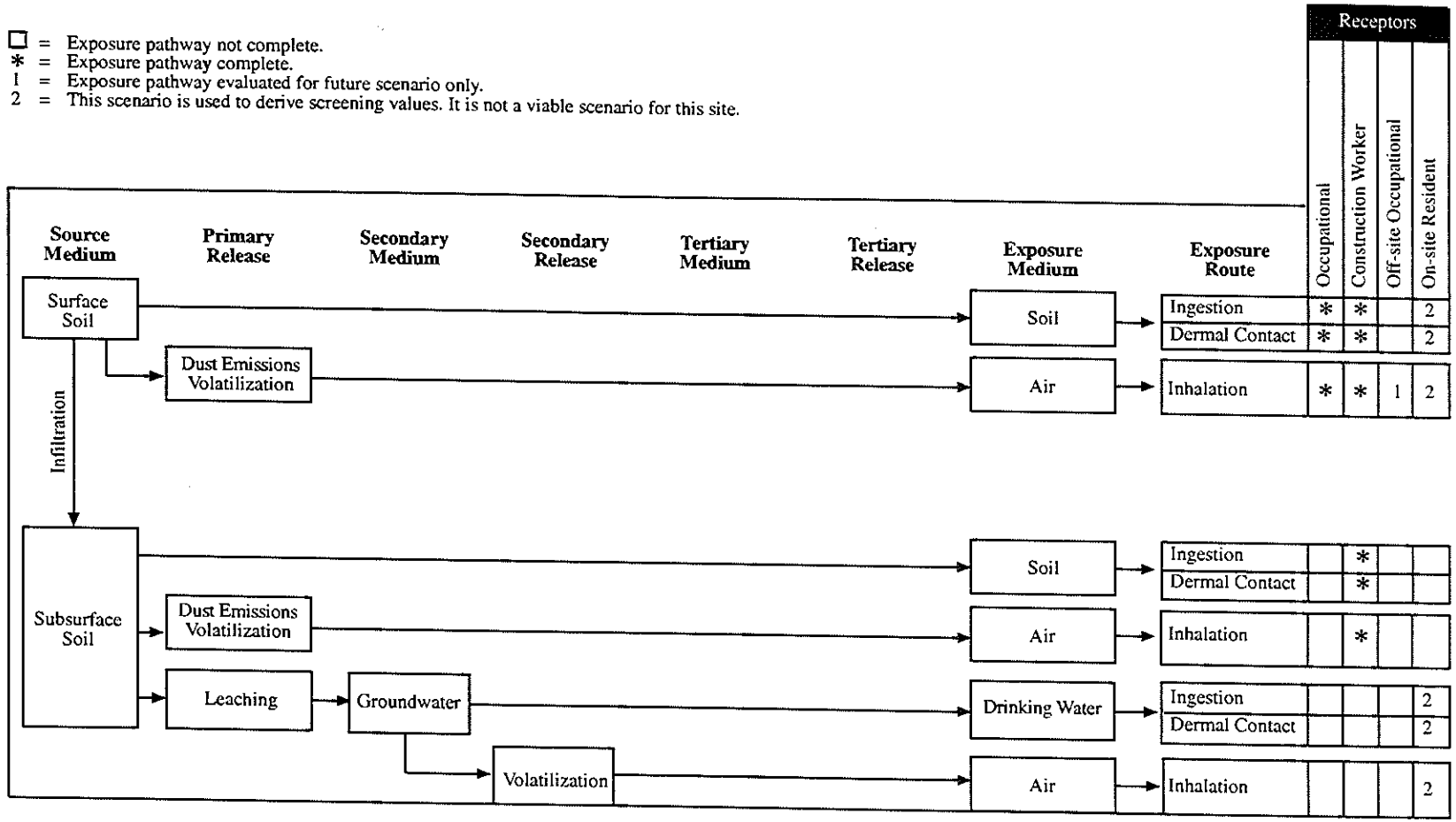

Figure 9.6-3. Potential Migration and Exposure Pathways, SWMU 27A (Building 1322)

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ATTACHMENT 9.6A
SWMU 27A: 3D SQUADRON 7TH CAVALRY MOTORPOOL, BUILDING 1322

HUMAN HEALTH BASELINE RISK ASSESSMENT

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ATTACHMENT 9.6A
SWMU 27A: 3D SQUADRON 7TH CAVALRY MOTORPOOL, BUILDING 1322
HUMAN HEALTH BASELINE RISK ASSESSMENT

The human health baseline risk assessment consists of five elements: (1) identification of COPCs, (2) exposure assessment, (3) toxicity assessment, (4) risk characterization, and (5) assessment of uncertainty.

9.6A.1 IDENTIFICATION OF COPCS

The CMCOPCs and HHCOPCs have been discussed in the sections on contaminant fate and transport (Section 9.6.5) and the HHPRE (Section 9.6.6), respectively. There are no CMCOPCs or HHCOPCs in soils. Acetone was identified as an HHCOPC in groundwater.

9.6A.2 EXPOSURE ASSESSMENT

The exposure assessment quantifies the amount of a COPC an individual may come in contact with at each site. The exposure assessment considers all pathways of potential human exposure, the magnitude of exposure, and the frequency and duration of exposure. The process for estimating exposure consists of the following elements: (1) characterization of the exposure setting in terms of the physical and demographic characteristics of the site, (2) identification of receptor populations, (3) identification of the exposure pathways by which an individual may come in contact with a COPC, (4) estimation of the exposure point concentration, and (5) quantification of the intake or dose to which an individual may be exposed.

9.6A.2.1 Exposure Setting

The exposure setting describes the physical features at the site that are important when identifying the human populations that may be exposed to COPCs, either currently or in the future.

The OWSs are located within a fenced area adjacent to the wash racks. The site is mostly covered with concrete, with small grassy areas located between the concrete and the fence and from the fence to the road (see Figure 9.6-1). A drainage ditch lies to the southwest about 50 feet from the OWSs. The effluent from the OWSs discharges directly to the IWTP; therefore, there are no surface water/sediment pathways for this SWMU. The drainage ditch is unlikely to receive groundwater discharges because of its shallow depth relative to that of groundwater (8 feet to 10 feet bgs).

9.6A.2.2 Identification of Potential Receptor Populations and Exposure Pathways

A complete exposure pathway consists of four elements: (1) a source of contamination, (2) a transport or retention medium, (3) a point of contact with the chemical, and (4) a route of exposure (ingestion, dermal absorption, or inhalation) at the point of contact through which the chemical may be taken into the body. When all of these elements are present, the pathway is considered to be complete.

The COPC at this site is limited to groundwater. Given that groundwater is not currently used for any purpose at this site, there are no current on-site or off-site receptor populations.

The potential on-site receptor populations for the future land-use scenario include an Installation worker and a resident. For the purposes of this risk assessment, it was assumed that groundwater drinking wells had been placed at the site. The potential exposure pathway for the on-site Installation worker would be ingestion of drinking water.

The on-site resident is presented for baseline purposes and is not considered to be a likely receptor population. Potential exposure pathways for the on-site resident include ingestion, dermal contact, and inhalation of volatile organics. Acetone does not have a toxicity value for the inhalation pathway; consequently, only ingestion and dermal contact are considered in the assessment. Acetone is not considered a likely carcinogen; therefore, no cancer slope factors are available for acetone. Systemic toxicity factors are available for acetone. Only the child receptor is considered because the child is an upperbound case for systemic toxicity.

For the purposes of this human health baseline risk assessment, an off-site receptor is defined as a receptor population that is located outside of the boundaries of the SWMU. Future land use at this site may involve groundwater drinking wells, theoretically located adjacent to the SWMU's boundary. However, given the limited size of this site (i.e., 0.1 acre), it is unlikely that groundwater concentrations would change significantly between the on-site and off-site locations. Therefore, off-site risks associated with the use of groundwater as a drinking water source will not be quantified.

9.6A.2.3 Estimation of Exposure Concentrations

The estimation of exposure concentrations for on-site receptors to HHCOPCs in groundwater is discussed in Appendix I, Section I.2.3. For the purposes of estimating the concentration of acetone in groundwater, the groundwater sampling results were used to estimate exposure concentrations. Acetone was detected only once in the groundwater at a concentration of 150 µg/L (0.15 mg/L). Because only one sample above the detection limit was available, the concentration in the one sample was used as the exposure concentration to estimate the risk.

9.6A.2.4 Quantification of Exposure

The equations and exposure factors used to estimate exposures to receptor populations are discussed in Appendix I, Section I.2.4. The exposure parameter values used to estimate potential exposure are given in Table 9.6A-1.

There are no carcinogenic slope factors for acetone; therefore, carcinogenic intake values were not calculated for the potential receptor populations. For the purposes of assessing risk associated with COPCs in groundwater, the resident child was used to evaluate noncarcinogenic risks associated with oral and dermal exposures because the potential risks to this receptor are greater than the noncarcinogenic risks to an adult. The resident adult was used to evaluate the noncarcinogenic risks associated with exposure via inhalation of volatile organics because this receptor is likely to receive a higher dose via inhalation during showering than is a resident child, who generally takes a bath. Acetone does not have an inhalation reference concentration; therefore, the potential noncarcinogenic risks to the resident adult were not evaluated.

The estimated intakes for the Installation worker and resident child are given in Tables 9.6A-2 and 9.6A-3, respectively.

9.6A.3 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to determine the increased likelihood and magnitude of adverse human health effects based on the extent of exposure to contamination. The toxicity assessment for SWMU 27A, Building 1322, was carried out as described in Appendix I, Section I.3. Acetone has an oral reference dose of 0.1 mg/kg/day and a calculated dermal reference dose of 0.083 mg/kg/day (EPA 1999a). There are no cancer slope factors calculated for acetone (EPA 1999a; EPA 1997c).

9.6A.4 RISK CHARACTERIZATION RESULTS

The risk characterization follows the procedures outlined in Appendix I, Section I.4. Quantitative estimates of noncarcinogenic risks are calculated for acetone for each potentially complete exposure pathway.

9.6A.4.1 Current Land-use Scenarios

There is no current use of groundwater at this site; therefore, current land-use receptors are not at risk from exposure to acetone in groundwater.

9.6A.4.2 Future Land-use Scenarios

Future potential on-site receptors are an Installation worker and a resident child. The potential risk to the on-site resident was evaluated for only a child, given that the child is at greater potential risk than an adult from exposure to noncarcinogenic constituents in groundwater. The potential risks to each of these receptor populations are discussed below.

On-site Installation Worker. The total HI for the Installation worker is 1.47×10^{-2}, which is more than an order of magnitude below the target value of 1.0 (Table 9.6A-4); therefore, adverse systemic health risks are not expected for this receptor population.

On-site Resident Child. The total HI for the resident child is 9.59×10^{-2}, which is more than an order of magnitude below the target value of 1.0 (Table 9.6A-5); therefore, adverse systemic health risks are not expected for this receptor population.

Off-site Receptors. The potential off-site receptors would include an off-site Installation worker and an off-site resident. The HIs for these receptors would not be greater than those for the on-site receptors; therefore, the HIs for these receptors would be less than one, and adverse systemic health risks would not be expected for these receptor populations.

9.6A.5 UNCERTAINTY ASSESSMENT

A discussion of the general uncertainties associated with the analysis of risks at sites within the 16 SWMUs is given in Appendix I, Section I.5.

It was conservatively assumed that the surficial aquifer that was sampled would be used as a source of drinking water. However, the surficial aquifer is not considered to be a source of potable water, and drinking water wells at the FSMR are likely to use the deeper Floridan aquifer.

An inhalation reference dose was not available for acetone; therefore, the potential risks associated with exposure via the inhalation pathway could not be quantified.

9.6A.6 RISK SUMMARY

The HIs for the potential exposure of the Installation worker and the resident child to acetone in groundwater are 1.5×10^{-2} and 9.6×10^{-2}, respectively. All of these risk values are below the target value of 1.0; therefore, acetone in groundwater is not likely to present a significant risk to potential receptors at this site.

Table 9.6A-1. Exposure Parameters for Potential Receptor Populations, SWMU 27A (Building 1322)

Parameter	Units	Installation Worker	On-site Resident Child
GROUNDWATER			
Drinking Water Ingestion			
Drinking water ingestion	L/day	1	1
Fraction ingested from area	unitless	1	1
Exposure frequency	days/year	250	350
Exposure duration	years	25	6
Body weight	kg	70	15
Carcinogen averaging time	days	NA[a]	NA[b]
Noncarcinogen averaging time	days	9,125	2,190
Dermal Contact while Bathing			
Skin area	m^2	NA[b]	0.170
Exposure time	hours/day	NA[b]	0.33
Exposure frequency	days/year	NA[b]	350
Exposure duration	years	NA[b]	6
Body weight	kg	NA[b]	15
Carcinogen averaging time	days	NA[b]	NA[b]
Noncarcinogen averaging time	days	NA[b]	2,190

[a]NA = The HHCOPC of concern, acetone, is not classified as a human carcinogen (Class D carcinogen).
[b]NA = Not applicable.

Table 9.6A-2. Estimated Intakes for Installation Worker, SWMU 27A (Building 1322)

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a] Average Daily Dose for Noncarcinogens (mg/kg/d)
Groundwater	Acetone	0.150[b]	mg/L	1.47E-03

[a]The equation used to calculate oral exposure in groundwater is presented in Appendix I, Section I.2.4.3.
[b]The exposure point concentration is equal to the maximum detected concentration (see Section 9.6A.2.3).

Table 9.6A-3. Estimated Intakes for Resident Child, SWMU 27A (Building 1322)

Environmental Medium	Chemical	Exposure Concentration[a]	Units	Oral Exposure[b] Average Daily Dose for Noncarcinogens (mg/kg/d)	Dermal Exposure[b] Average Daily Dose for Noncarcinogens (mg/kg/d)
Groundwater	Acetone	0.150	mg/L	9.59E-03	3.10E-06

[a]The exposure point concentration is equal to the maximum detected concentration (see Section 9.6A.2.3).
[b]The equations used to calculate oral and dermal exposures in groundwater are presented in Appendix I, Section I.2.4.3.

Table 9.6A-4. Hazard Indices for Installation Worker, SWMU 27A (Building 1322)

Chemical	Groundwater[a] Oral HQ	Groundwater[a] Total Hazard Index
Acetone	1.47E-02	1.47E-02

[a]The equation used to calculate noncarcinogenic risk is presented in Appendix I, Section I.4.2.

Table 9.6A-5. Hazard Indices for Resident Child, SWMU 27A (Building 1322)

Chemical	Groundwater[a] Oral HQ	Groundwater[a] Dermal HQ	Groundwater[a] Total Hazard Index
Acetone	9.59E-02	3.73E-05	9.59E-02

[a]The equation used to calculate noncarcinogenic risk is presented in Appendix I, Section I.4.2.

9.7 SWMU 27B: 1ST BN 3D ADA

9.7.1 History and Description of SWMU 27B, 1st BN 3d ADA

SWMU 27B is an OWS that supports vehicle maintenance activities within the 1st Battalion (BN), 3d Air Defense Artillery (ADA) Motorpool (Building 1809). The OWS is located along the southwestern fenced boundary of the motorpool, adjacent to a covered maintenance pad identified as Building 1809. Maintenance activities for military vehicles are performed at the maintenance pad. Floor drains from the maintenance pad are piped to the OWS. In addition, residual oil from collection and storage containers, filters, and such is allowed to drain onto the grating that covers the OWS. No previous investigations have been performed at the site. The effluent from the OWS discharges to the IWTP, and the oil is pumped out of the holding unit and burned at the Central Energy Plant.

9.7.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at SWMU 27B at Building 1809. The locations of the soil and groundwater samples are presented in Figure 9.7-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead. The analytical laboratory missed the holding times for VOCs and SVOCs for soil collected at GP2 during the initial sampling endeavor. The soil was resampled on May 7, 1998.

9.7.3 Physical Characteristics of the Site

9.7.3.1 Topography

The topography is essentially flat, with concrete maintenance and parking areas adjacent to the northeast. The OWS is located in the grass between the concreted maintenance pad and parking area and the site's fenced boundary. The surface elevation is approximately 68 feet amsl.

9.7.3.2 Surface drainage

A surface drainage ditch is located about 10 feet west-southwest of the maintenance pad (Figure 9.7-1). Effluent from the OWS discharges to the IWTP, so there is no surface water/sediment migration pathway. Therefore, surface water and sediment samples were not collected during this investigation.

Surface drainage continues to the south and west of the pad, running parallel to a tank route located about 100 feet south of the pad. Surface water is present in the drainage ditches only during rainfall events.

9.7.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.7.3.4 Hydrogeology

Groundwater was encountered at approximately 3.3 feet to 3.9 feet bgs.

9.7.3.5 Ecology

As stated in Section 8.2, SWMU 27B is classified as an "industrialized area with managed grassland." SWMU 27B lies within the industrialized garrison area and comprises approximately 0.01 acre (Figure 9.7-1).

Specifically, the habitat of SWMU 27B consists of a concrete maintenance pad and a managed grass area. To the west of the SWMU is a wooded area.

9.7.4 Nature and Extent of Contamination

9.7.4.1 Surface soil

Two surface soil samples were collected at depths of less than 3 feet bgs and 2 feet bgs at sampling locations GP1 and GP2, respectively. Groundwater was encountered at 3 feet bgs at GP1; therefore, the soil sample interval was taken from 2 feet above the water table. Because the sample interval bounded both the surface soil and subsurface soil intervals, the soil sample was treated as surface soil to be conservative. The analytical laboratory missed the holding times for VOCs and SVOCs for soils at GP2 during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. The results of the surface soil analysis are presented in Table 9.7-1 and Figure 9.7-2.

VOCs. No VOCs were detected in surface soil.

SVOCs. No SVOCs were detected in surface soil above the detection limits.

Lead. Lead was not detected at either surface soil sampling location at levels above the site reference background level and is not considered to be an SRC.

9.7.4.2 Subsurface soil

Two subsurface soil samples were collected at locations GP3 and GP4. The results of the subsurface soil analysis are presented in Table 9.7-2 and Figure 9.7-2.

VOCs. Toluene was detected at concentrations of 0.0247 mg/kg at GP4 and 0.0793 mg/kg at GP3. Toluene is an SRC in subsurface soil.

SVOCs. No SVOCs were detected above detection limits in subsurface soil samples.

Lead. Lead was not detected at levels exceeding the site reference background criterion in either subsurface sample and is not considered to be an SRC.

9.7.4.3 Groundwater

With the use of DPT techniques, groundwater samples were collected from the four locations. The results of the groundwater analyses are presented in Table 9.7-3 and Figure 9.7-2.

VOCs. Methylene chloride was initially detected in two of four samples at concentrations of 3.1 µg/L at GP4 and 11.0 µg/L at GP1. Both of these concentrations of methylene chloride were believed to be the result of laboratory contamination because concentrations below 15 µg/L cannot be positively attributed to site contaminants. Therefore, with the concurrence of GEPD (SAIC 1999a), only the groundwater at GP1 (the concentration that exceeded the MCL of 5 µg/L) was resampled for methylene chloride on August 26, 1999. The groundwater was collected from a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack installed to intersect the water table. The resampling monitoring point was installed approximately 1 foot away from the previous sampling location (GP1). Methylene chloride was not detected at GP1, the location at which the concentration exceeded the MCL. The initial elevated concentrations of methylene chloride at GP1 and GP4 were considered to be the result of field or laboratory contamination;

therefore, methylene chloride is not an SRC at SWMU 27B because no other VOCs were detected in groundwater.

SVOCs. Phenol was the only SVOC detected in groundwater, and it was detected at only one sample location, GP2, at a concentration of 11.6 µg/L. Phenol is considered to be an SRC.

Lead. Lead was detected in GP4 at a concentration of 2 µg/L. This concentration is below the reference background criterion. Lead is not considered to be an SRC in groundwater.

9.7.4.4 Surface water

No surface water samples were collected at this SWMU because no surface water pathway exists.

9.7.4.5 Sediment

No sediment samples were collected at this SWMU because no sediment pathway exists.

9.7.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.7-4.

9.7.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of soil SRCs to the respective GSSLs.

The maximum concentrations of SRCs in soil did not exceed the respective GSSLs (Table 9.7-5); therefore, there are no CMCOPCs in soil.

9.7.6 Human Health Preliminary Risk Evaluation of SWMU 27B

SRCs were identified for the following media: surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.7.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The OWS discharges to the IWTP. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and

- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is covered by vegetation and concrete structures; therefore, soil erosion via fugitive dust or surface water runoff is not a viable migration pathway.

Because groundwater is lower than the adjacent drainage ditch and there are no other surface water bodies nearby, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.7-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening valves. The exposure pathways associated with this scenario are presented to show what pathways are taken into consideration when deriving the screening values.

9.7.6.2 Risk evaluation

The results of the human health risk screening are given below.

Toluene is an SRC for subsurface soil. The maximum concentration of toluene was below its screening value (Table 9.7-6). There are no HHCOPCs for subsurface soil.

Phenol is the only SRC for groundwater. The maximum concentration of phenol did not exceed its risk-based screening value (Table 9.7-6); therefore, there are no HHCOPCs for groundwater at this site.

9.7.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.7.7 Ecological Preliminary Risk Evaluation of SWMU 27B

The EPRE of SWMU 27B was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the EPRE are presented below.

9.7.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

Phenol (an SVOC) was detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.7-7. There are no ECOPCs in groundwater at the site; therefore, groundwater was not evaluated further in EPRE Steps ii through v.

Because there were no SRCs in surface soil, that medium was not evaluated further in EPRE Steps ii through v.

9.7.8 Conclusions and Risk Management and Site Recommendations for SWMU 27B

9.7.8.1 Conclusions

Nature and Extent of Contamination

- No VOCs or SVOCs were detected in surface soil.
- Toluene was detected in subsurface soil and is an SRC.
- Lead was not detected in either surface soil or subsurface soil samples at levels exceeding the reference background criterion; therefore, lead is not an SRC in soil.
- Methylene chloride was initially detected at two Geoprobe groundwater locations (GP1 and GP4), with the concentration at one location (GP1) being above its MCL but below the concentration (i.e., method blank of 15 µg/L) that can be positively attributed to site contamination. Additional groundwater sampling (3/4-inch-diameter monitoring point) was performed at GP1 in August 1999. Methylene chloride was not detected, indicating that the initial methylene chloride detection above the MCL at GP4 was the result of field or laboratory contamination. The concentration at GP4 (3.1 µg/L) was determined to be estimated and undetected ("UJ"). Methylene chloride is not considered to be an SRC in groundwater at SWMU 27B.

Fate and Transport

- The maximum concentration of the only SRC in soil (toluene) did not exceed its GSSL; therefore, there are no CMCOPCs in soil.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for surface soil, subsurface soil, or groundwater at this site.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in groundwater or surface soil at this site.

9.7.8.2 Risk management and site recommendations

- No ECOPCs were identified in groundwater or surface soil at the site.
- There are no HHCOPCs in surface soil, subsurface soil, or groundwater.
- Based on the information presented above, SWMU 27B is recommended for an NFA status. If approved by GEPD, Fort Stewart respectfully requests that the Subpart B permit be amended to reflect this change in investigative status.

Table 9.7-1. Summary of Analytes Detected in Surface Soil, SWMU 27B

Station	Reference Background Criteria	7DGP1	7DGP2[b]
Sample ID		7D1111	7D1212
Date		01/18/98	05/07/98
Depth (feet)		1 to 3[a]	0 to 2
Sample Type		Grab	Grab
Metals (mg/kg)			
Lead	8.81	3.8	4.7

[a]Groundwater was encountered at 3 feet bgs. The sample interval was taken from 2 feet above the water table. Because the sample bounded both surface soil and subsurface soil intervals, the sample was treated as surface soil to be more conservative.

[b]The analytical laboratory missed the holding times for VOCs and SVOCs during the January 1998 sampling endeavor. The soil was resampled on May 7, 1998.

Bold indicates concentrations above reference background criteria.

Table 9.7-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27B

Station	Refereuce Backgrouud Criteria	7DGP3	7DGP4
Sample ID		7D1311	7D1411
Date		01/18/98	02/01/98
Depth (feet)		4 to 6	2 to 4
Sample Type		Grab	Grab
Volatile Organic Compounds (mg/kg)			
Toluene	0.00	**0.0793**	**0.0247**
Metals (mg/kg)			
Lead	11.10	4.4	5.3

Bold indicates concentrations above reference background criteria.

Table 9.7-3. Summary of Analytes Detected in Groundwater, SWMU 27B

Station	Reference Background Criteria	MCL	7DGP1	7DGP1[a]	7DGP2	7FGP3	7DGP4
Sample ID			7D4111	7D4112	7D4211	7D4311	7D4411
Date			01/18/98	08/26/99	01/18/98	01/18/98	01/18/98
Sample Type			Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)							
Methylene chloride	0.00	5	*11*[b]				3.1[b]
Semivolatile Organic Compounds (µg/L)							
Phenol	0.00			NA	**11.6**		
Metals (µg/L)							
Lead	4.69	15		NA			2

[a]The GP1 location was resampled in August 1999 to determine if the methylene chloride detection was the result of field or laboratory contamination.

[b]The methylene chloride concentration was below the existing laboratory blank value (<15 µg/L); therefore, the detected methylene chloride concentrations cannot be positively attributed to site conditions.

NA = Not analyzed.

Bold indicates concentrations above reference background criteria.

Boxed *italic* indicates concentrations above MCLs.

Table 9.7-4. Summary of Site-relatcd Contaminants, SWMU 27B

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Toluene	ND	0.0793	NP	ND	NP
Semivolatile Organic Compounds					
Phenol	ND	ND	NP	11.6	NP

ND = Not detected.

NP = No pathway exists.

Table 9.7-5. GSSL Screening of Site-related Contaminants in Soil, SWMU 27B

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Toluene	0.0793	12	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

Table 9.7-6. Human Health Risk Screening for Subsurface Soil and Groundwater, SWMU 27B

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organics Compounds (mg/kg)						
Toluene	2/2	0.0247	0.0793	1,600	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Freq. of Detection**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Semivolatile Organic Compounds (mg/kg)						
Phenol	1/3	11.6	11.6	2,200	No	Max Detect < Risk Criteria

Table 9.7-7. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27B

Analyte	**SWMU 27B Maximum**	**ESV**	**ECOPC Aquatic Biota?**	**Justification**
Semivolatile Organic Compounds (µg/L)				
Phenol	11.6	256	No	Max Detect < ESV

ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.

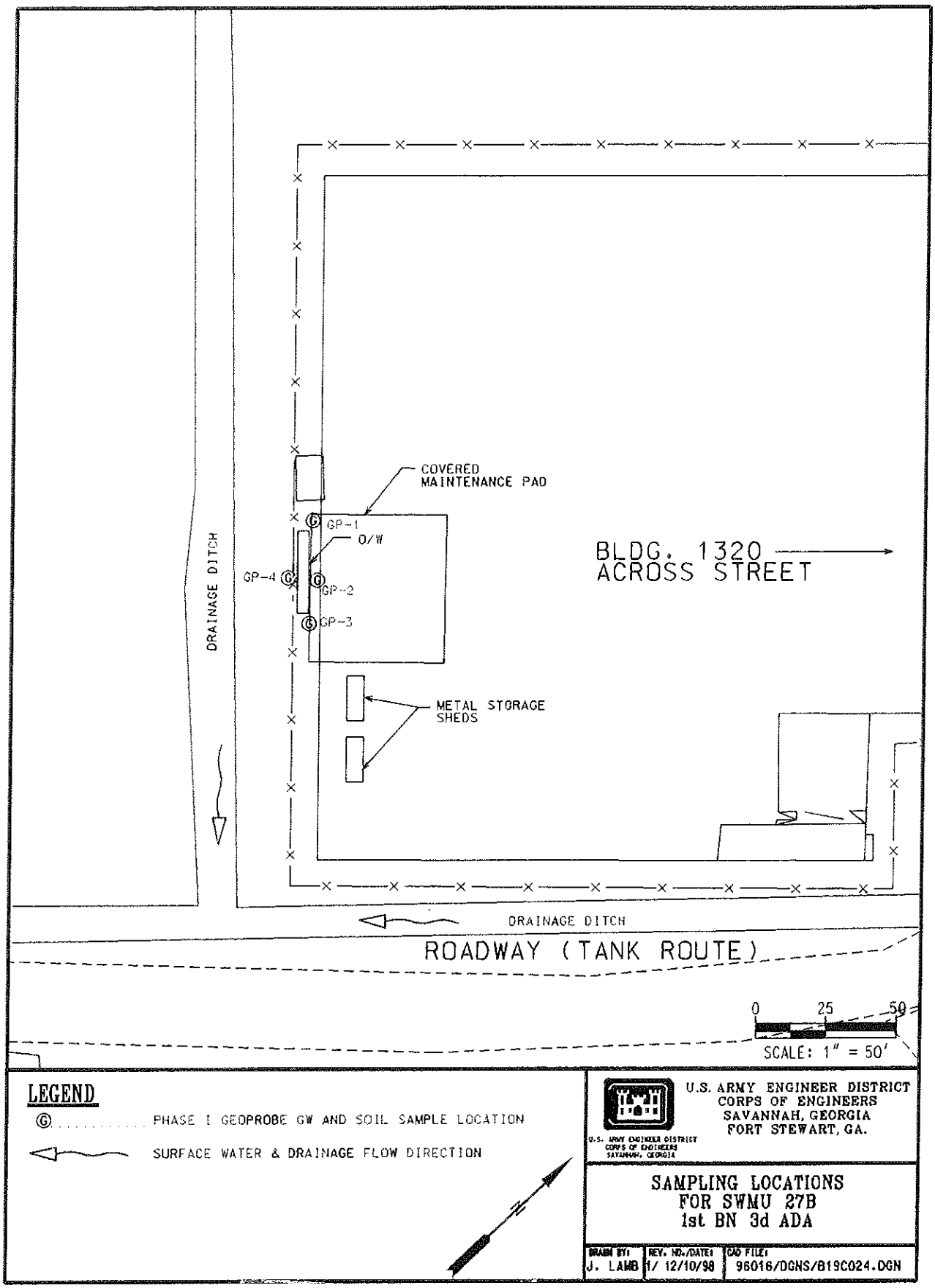

Figure 9.7-1. Sampling Locations, SWMU 27B

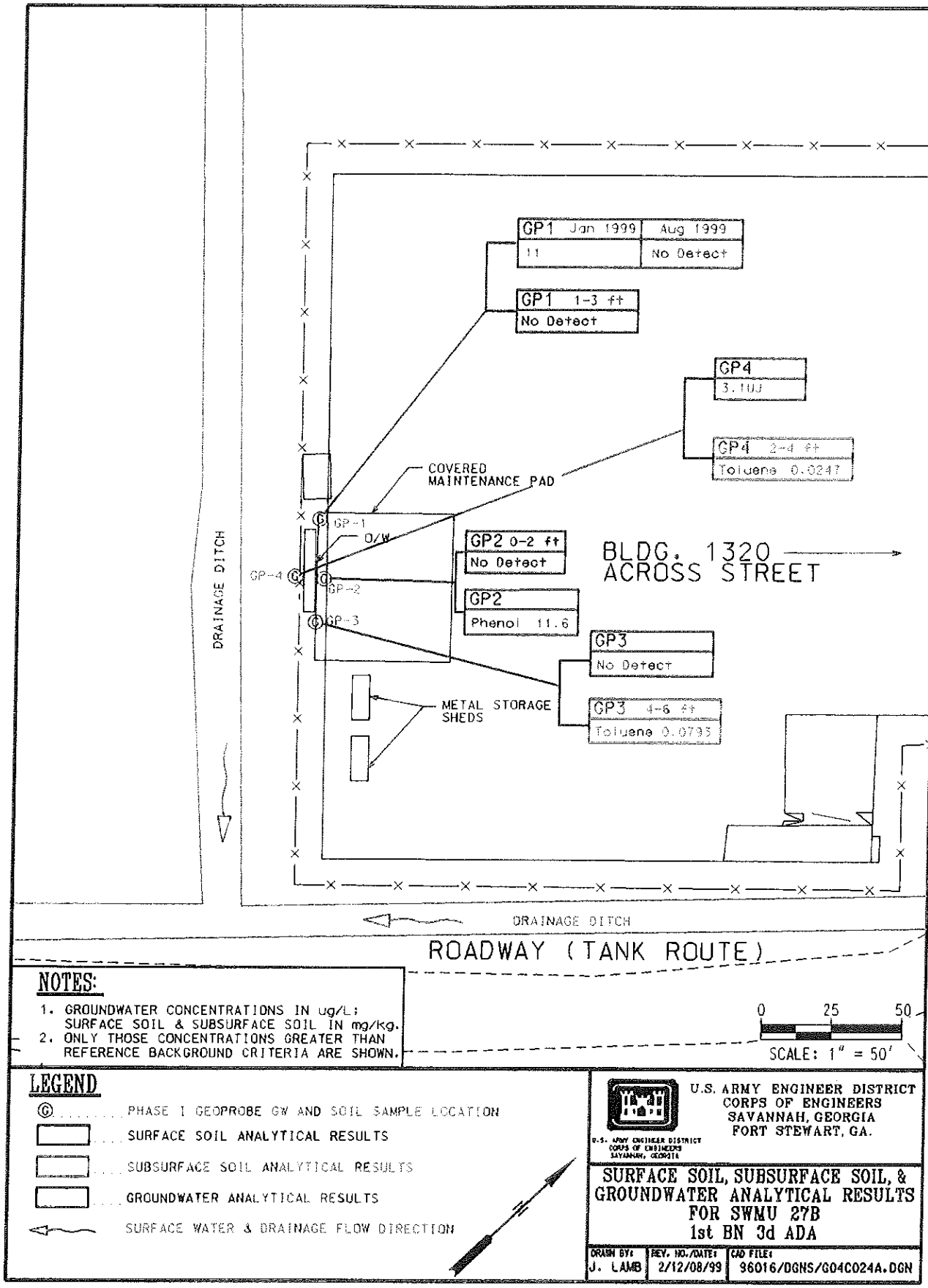

Figure 9.7-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27B

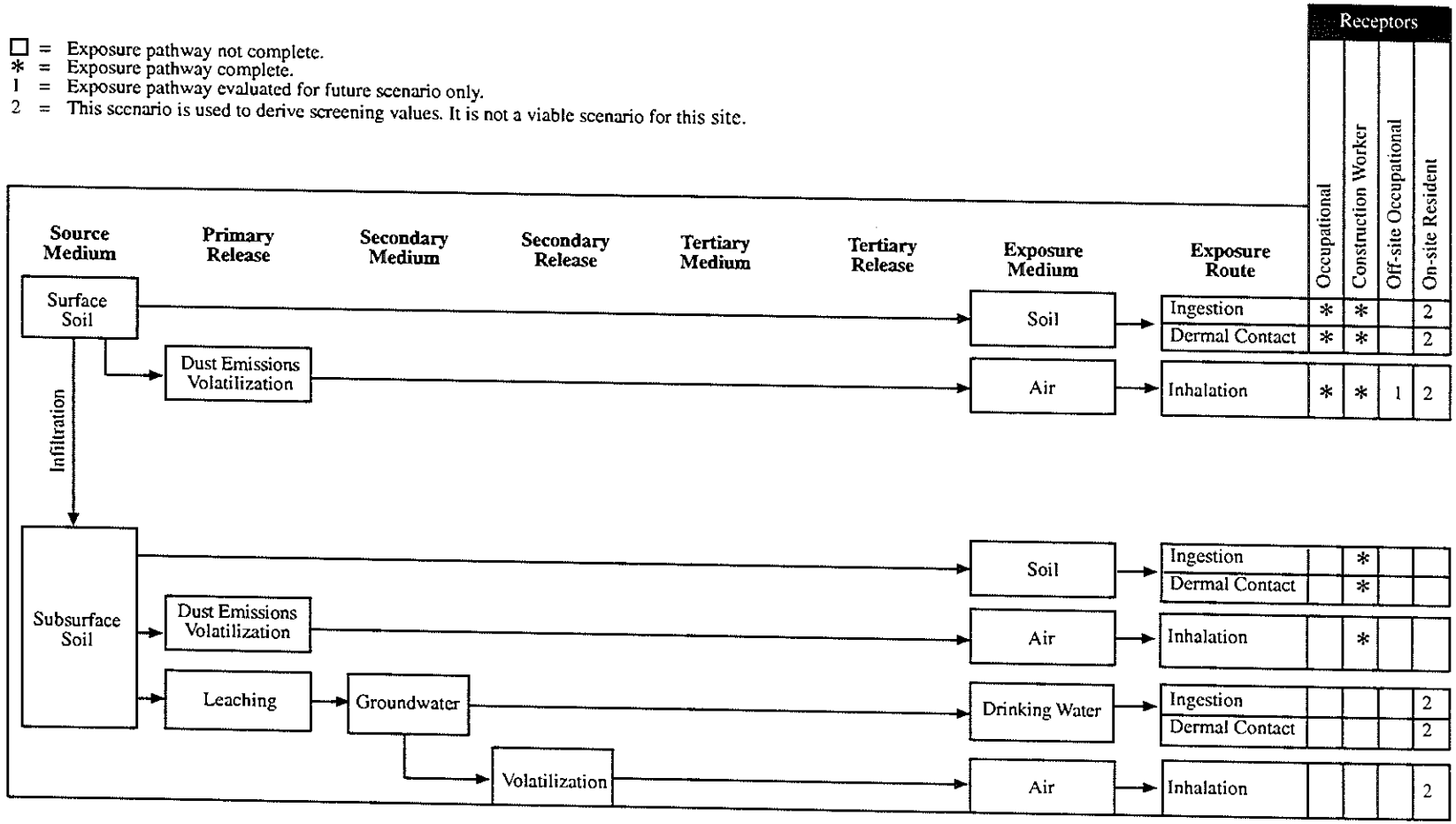

Figure 9.7-3. Potential Migration and Exposure Pathways, SWMU 27B

9.8 SWMU 27C: 92D ECB (H)

9.8.1 History and Description of SWMU 27C, 92d ECB (H)

SWMU 27C is an OWS that supports vehicle maintenance activities within the 92d ECB (H) Motorpool. The OWS is located adjacent to a covered maintenance pad identified as Building 4584 and a storage shed identified as Building 4581 (Figure 9.8-1). Maintenance activities for military vehicles are performed at the maintenance pad. Floor drains from the maintenance pad are piped to the OWS. In addition, residual oil from collection and storage containers, filters, and other items is allowed to drain on the grating that covers the OWS. No previous investigations have been performed at the site. The effluent from the OWS discharges to the IWTP, and the oil is pumped out of the holding unit and burned at the Central Energy Plant.

9.8.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at SWMU 27C at Building 4584. The locations of the soil and groundwater samples are presented in Figure 9.8-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

9.8.3 Physical Characteristics of the Site

9.8.3.1 Topography

The topography of the OWS site is essentially level. The OWS is surrounded by a concrete maintenance area to the southeast, Building 4581 to the west, and a concrete parking area over the remaining portions (Figure 9.8-1). The surface elevation is approximately 69 feet amsl.

9.8.3.2 Surface drainage

There are no surface water/sediment pathways at this site.

9.8.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.8.3.4 Hydrogeology

Groundwater was encountered at approximately 6 feet to 7 feet bgs.

9.8.3.5 Ecology

As stated in Section 8.2, SWMU 27C is classified as an "industrialized area." The 92d ECB (H) Motorpool OWS comprises approximately 0.01 acre (Figure 9.8-1), all of which is covered by concrete. Wooded areas border the motorpool to the north.

9.8.4 Nature and Extent of Contamination

9.8.4.1 Surface soil

One surface soil sample was collected based on field headspace screening for VOCs. The results of the surface soil analysis are presented in Table 9.8-1 and Figure 9.8-2.

VOCs. Toluene was detected in surface soil at GP1 at a concentration of 0.058 mg/kg; therefore, toluene is an SRC in surface soil.

SVOCs. No SVOCs were detected in surface soil above the detection limits.

Lead. Lead was not detected in surface soil above the site reference background criterion.

9.8.4.2 Subsurface soil

Three subsurface soil samples were collected for analysis from GP2, GP3, and GP4. The analytical laboratory missed the holding times for VOCs and SVOCs for soils at GP3 during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. The analytical results are summarized in Table 9.8-2 and Figure 9.8-2.

VOCs. Acetone and 2-butanone were detected at GP4 at concentrations of 0.0364 mg/kg and 0.0026 mg/kg, respectively. The SRCs in subsurface soil include 2-butanone and acetone.

SVOCs. Di-*N*-butyl phthalate was detected above the analytical detection limit at GP3 at a concentration of 0.0193 mg/kg; therefore, di-*N*-butyl phthalate is an SRC in subsurface soil.

Lead. Lead was not detected above the site reference background criterion in subsurface soil.

9.8.4.3 Groundwater

With the use of DPT techniques, groundwater samples were collected from the four Geoprobe locations. The results of the groundwater analyses are presented in Table 9.8-3 and Figure 9.8-2.

VOCs. Although no VOCs were detected above MCLs, four VOCs were detected in groundwater samples at concentrations above the analytical detection limits. Ethylbenzene was detected at a concentration of 2.1 µg/L at GP2. Total xylenes concentrations ranged from 2.4 µg/L at GP1 and GP2 to 2.5 µg/L at GP4; 1,1-dichloroethane concentrations ranged from 2.7 µg/L at GP1 to 22.1 µg/L at GP2. Chloroethane was detected at GP2 at a concentration of 3.2 µg/L. The SRCs in groundwater include the following VOCs: total xylenes; 1,1-dichloroethane; chloroethane; and ethylbenzene.

SVOCs. No SVOCs were detected in groundwater above the analytical detection limits.

Lead. Lead was not detected in any of the groundwater samples; therefore, lead is not considered to be an SRC in groundwater at the site.

9.8.4.4 Surface water

No surface water samples were collected at this SWMU because no surface water pathway exists.

9.8.4.5 Sediment

No sediment samples were collected at this SWMU because no sediment pathway exists.

9.8.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations detected are presented in Table 9.8-4.

9.8.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations in soil SRCs to the respective GSSLs.

Of the SRCs identified in surface soil and subsurface soil, none of the analytes exceeded its respective GSSL (Table 9.8-5); therefore, there are no CMCOPCs in soil at SWMU 27C based on leaching to groundwater.

9.8.6 Human Health Preliminary Risk Evaluation of SWMU 27C

SRCs were identified for the following media: surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.8.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is covered by concrete structures; therefore, soil erosion via fugitive dust or surface water runoff is not a viable migration pathway.

Groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.8-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.8.6.2 Risk evaluation

The results of the human health risk screening are given below.

Toluene was identified as an SRC for surface soil. The concentration of toluene was below its screening value (Table 9.8-6); therefore, toluene is not an HHCOPC in surface soil.

The SRCs for subsurface soils consisted of two volatile organics and di-*N*-butyl phthalate. The concentrations of these contaminants were below their respective screening values (Table 9.8-6); therefore, these contaminants are not HHCOPCs in subsurface soil.

The SRCs for groundwater consisted of four volatile organics. The maximum concentrations of these constituents were below their respective screening values (Table 9.8-6). There are no HHCOPCs in groundwater.

9.8.6.3 Uncertainties

The uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.8.7 Ecological Preliminary Risk Evaluation of SWMU 27C

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.8.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

Four VOCs were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.8-7. The ECOPCs identified by the ESV comparison for groundwater were chloroethane and total xylenes. Total xylenes were detected at a concentration exceeding the ESV. There is no ESV for chloroethane, so it is an ECOPC by default (GEPD 1997a).

SWMU 27C is an industrialized area with no vegetated surface soil; therefore, surface soil was not evaluated in the EPRE.

9.8.7.2 Preliminary problem formulation (Step ii)

The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.8.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water in drainage ditches. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

9.8.7.4 Preliminary exposure (Step iv)

Ecological receptors at SWMU 27C are probably exposed by ingestion of drinking water. There is no ecological habitat at SWMU 27C, so receptors are not exposed to substances in surface soil, surface water, or sediment, and these media are not evaluated further. The exposure parameters for the surrogate species—raccoons—are presented in Table 8-7.

9.8.7.5 Preliminary risk caleulation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Groundwater. The preliminary risk calculations for raccoons potentially exposed to ECOPCs detected in groundwater are presented in Table 9.8-8. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for VOCs (3.65E-04) does not exceed one.

9.8.8 Conclusions and Risk Management and Site Recommendations for SWMU 27C

9.8.8.1 Conclusions

Nature and Extent of Contamination

- Only one VOC, toluene, is an organic SRC in surface soil collected from below approximately 6 inches of concrete.

- The SRCs in subsurface soil include the following VOCs: 2-butanone and acetone. One SVOC compound, di-*N*-butyl phthalate, is also an SRC in subsurface soil.

- The organic SRCs in groundwater include the following VOCs: total xylenes; 1,1-dichloroethane; chloroethane; and ethylbenzene. None of the contaminants was detected above its respective MCL. No SVOCs were detected in groundwater above the analytical detection limits.

- Lead was not detected in the groundwater samples; therefore, lead is not considered to be an SRC in groundwater.

Fate and Transport

- SRCs identified in surface soil and subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for surface soil, subsurface soil, or groundwater at this site.

Ecological Preliminary Risk Evaluation

- The ECOPCs in groundwater are chloroethane and total xylenes. These ECOPCs are a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies. There are no ECOPCs in groundwater for terrestrial receptors.

9.8.8.2 Risk management and site recommendations

- Although chloroethane and total xylenes in groundwater were identified as potential ECOPCs for aquatic biota, it is highly unlikely that the groundwater in this area will migrate to a surface water body because the nearest surface water body is located more than 500 feet from the site. Therefore, chloroethane and total xylenes are not considered to be ECOPCs for this site.

- Based on the information presented above, SWMU 27C is recommended for NFA; if approved by GEPD, Fort Stewart respectfully requests that the Installation's Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.8-1. Summary of Analytes Detected in Surface Soil, SWMU 27C

Station	Reference Background Criteria	7EGP1
Sample ID		7E1111
Date		01/18/98
Depth (feet)		0 to 2
Sample Type		Grab
Volatile Organic Compounds (mg/kg)		
Toluene	0.00	**0.058**
Metals (mg/kg)		
Lead	8.81	4.5

Bold indicates concentrations above reference background criteria.

Table 9.8-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27C

Station	Reference Background Criteria	7EGP2	7EGP3	7EGP4
Sample ID		7E1211	7EI312	7E1411
Date		01/18/98	05/9/98	01/18/98
Depth (feet)		6 to 8	2 to 3	10 to 12
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
2-Butanone	0.00			**0.0026**
Acetone	0.00			**0.0364**
Semivolatile Organic Compounds (mg/kg)				
Di-*N*-butyl phthalate	0.00		**0.0193**	
Metals (mg/kg)				
Lead	11.10	5.3	4.5	3.3

Bold indicates concentrations above reference background criteria.

Table 9.8-3. Summary of Analytes Detected in Groundwater, SWMU 27C

Station	Reference Background Criteria	MCL	7EGP1	7EGP2	7EGP3	7EGP4
Sample ID			7E4111	7E4211	7E4311	7E4411
Date			01/18/98	01/18/98	01/18/98	01/18/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organics Compounds (µg/L)						
1,1-Dichloroethane	0.00		**2.7**	**22.1**		**2.9**
Chloroethane	0.00			**3.2**		
Ethylbenzene	0.00	700		**2.1**		
Xylenes, total	0.00	10,000	**2.4**	**2.4**		**2.5**

Bold indicates concentrations greater than reference background criteria.

Table 9.8-4. Summary of Site-related Contaminants, SWMU 27C

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
1,1-Dichloroethane	ND	ND	NP	22.1	NP
2-Butanone	ND	0.0026	NP	ND	NP
Acetone	ND	0.0364	NP	ND	NP
Chloroethane	ND	ND	NP	3.2	NP
Ethylbenzene	ND	ND	NP	2.1	NP
Toluene	0.058	ND	NP	ND	NP
Xylenes, total	ND	ND	NP	2.5	NP
Semivolatile Organic Compounds					
Di-*N*-butyl phthalate	ND	0.0193	NP	ND	NP

ND = Not detected.
NP = No pathway exists.

Table 9.8-5. GSSL Screening of Site-related Contaminants in Soil, SWMU 27C

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMOPC?
Volatile Organic Compounds (mg/kg)			
2-Butanone[b]	0.0026	7.685	No
Acetone	0.0364	16	No
Toluene	0.058	12	No
Semivolatile Organic Compounds (mg/kg)			
Di-*N*-butyl phthalate	0.0193	2,300	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA-suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

Table 9.8-6. Human Health Risk Screening for Surface Soil, Subsurface Soil, and Groundwater, SWMU 27C

SURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Toluene	1/1	0.058	0.058	1,600	No	Max Detect < Risk Criteria

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
2-Butanone	1/2	0.0026	0.0026	4,700	No	Max Detect < Risk Criteria
Acetone	1/2	0.0364	0.0364	780	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Di-*N*-butyl phthalate	1/3	0.0193	0.0193	780	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Volatile Organic Compounds (µg/L)						
1,1-Dichloroethane	3/4	2.7	22.1	81	No	Max Detect < Risk Criteria
Chloroethane	1/4	3.2	3.2	3.6	No	Max Detect < Risk Criteria
Ethylbenzene	1/4	2.1	2.1	130	No	Max Detect < Risk Criteria
Xylenes, total	3/4	2.4	2.5	1,200	No	Max Detect < Risk Criteria

Table 9.8-7. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27C

Analyte	SWMU 27C Maximum Detect	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
1,1-Dichloroethane	22.1	47[a]	No	Max Detect < ESV
Chloroethane	3.2	No ESV	Yes	ECOPC by Default
Ethylbenzene	2.1	453	No	Max Detect < ESV
Xylenes, total	2.5	1.8[a]	Yes	Max Detect > ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.
Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 9.8-8. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27C

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds (µg/L)				
Chloroethane	3.2	2.56E-04	No TRV	--
Xylenes, total	2.5	2.00E-04	5.48E-01	3.65E-04
			HI =	3.65E-04

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).
-- = Cannot be calculated due to the lack of data.

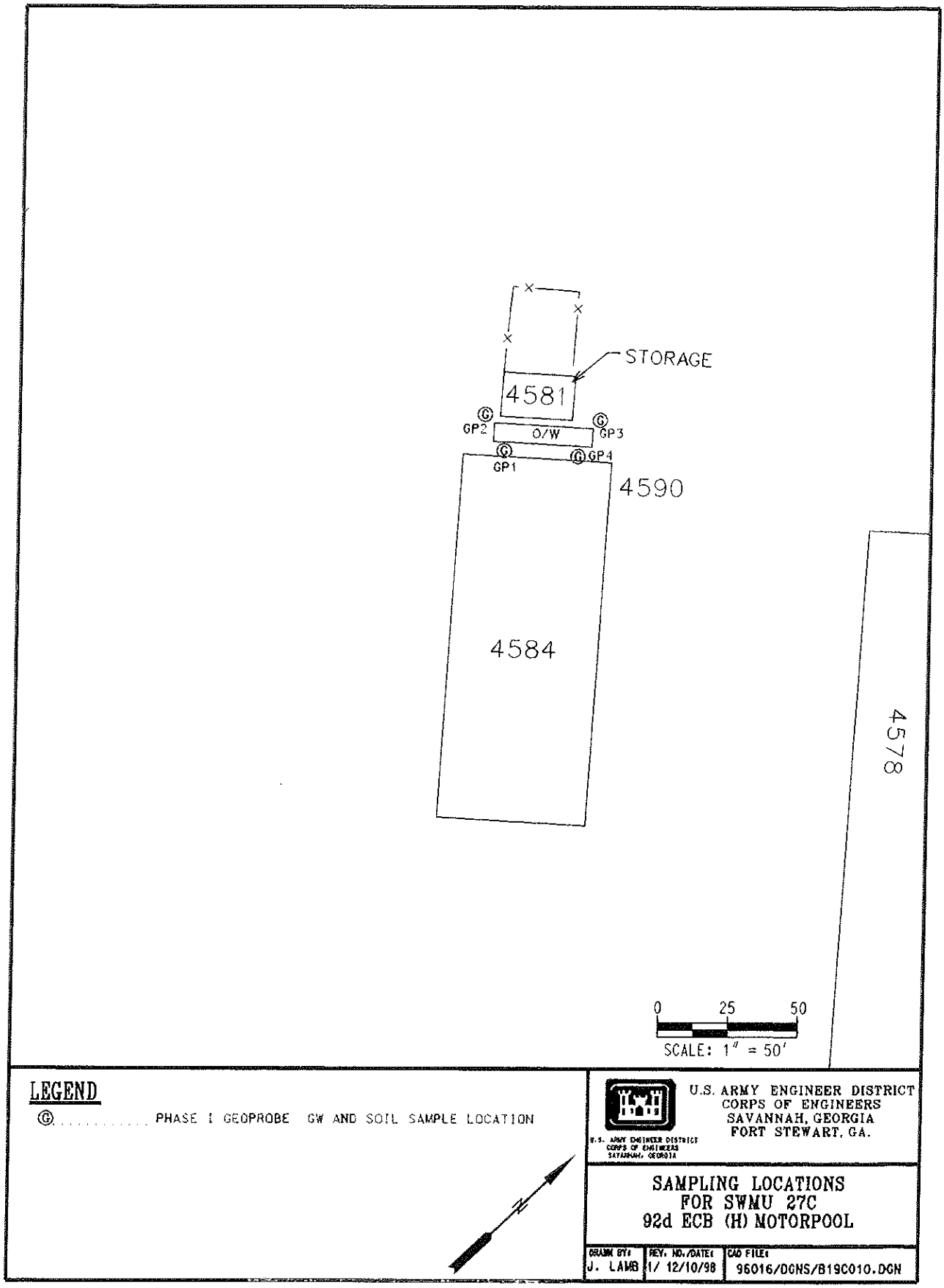

Figure 9.8-1. Sampling Locations, SWMU 27C

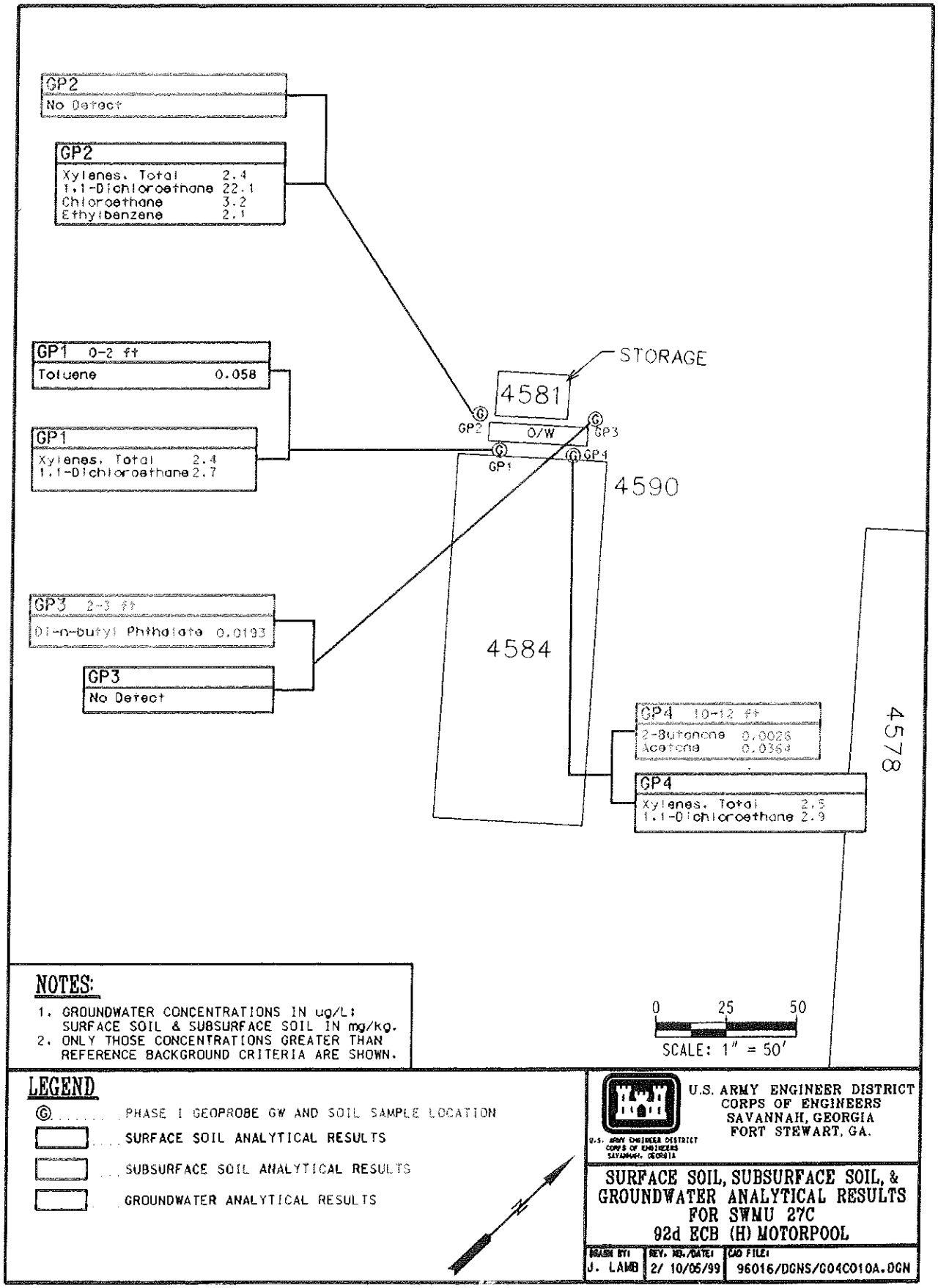

Figure 9.8-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27C

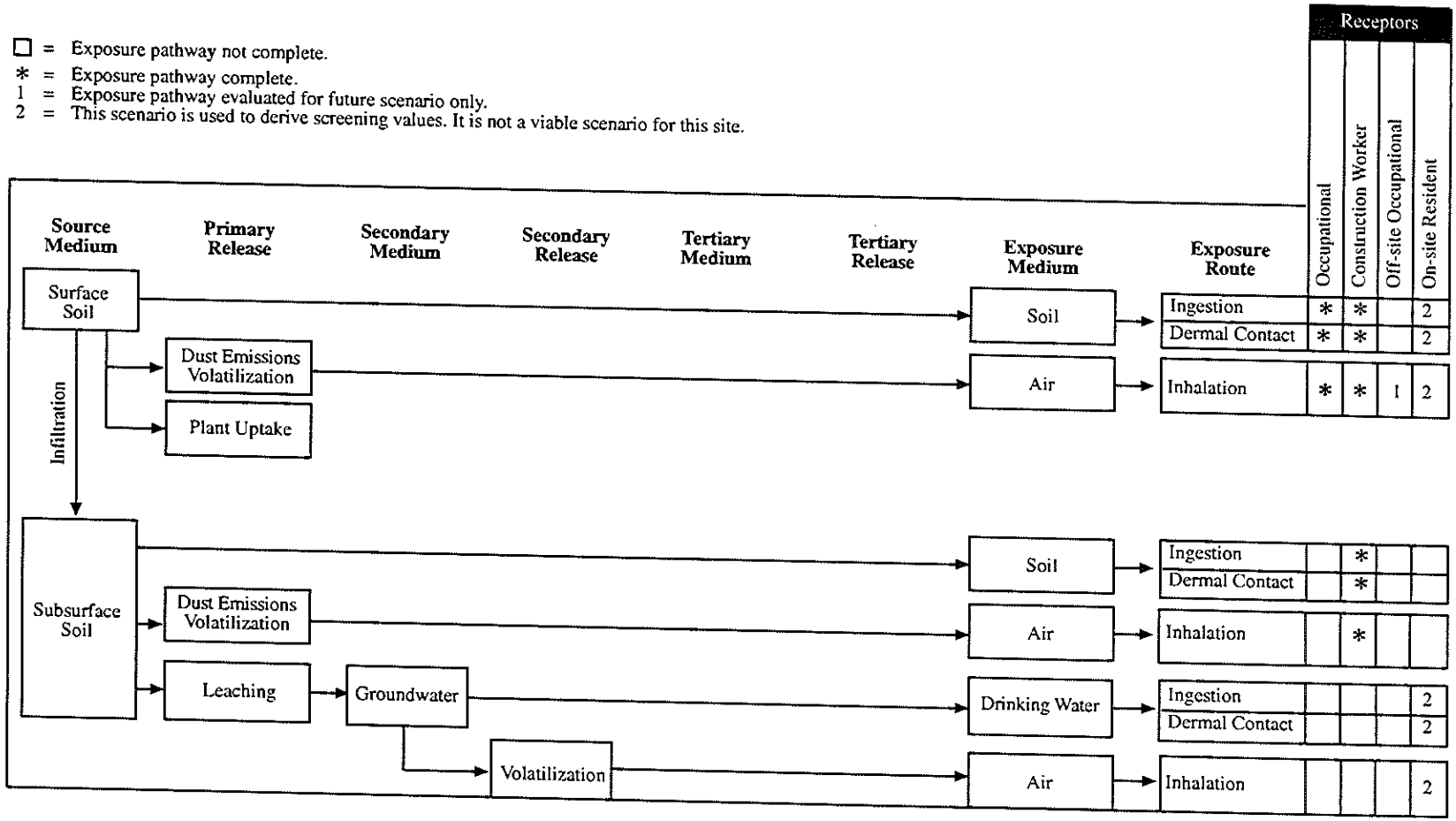

Figure 9.8-3. Potential Migration and Exposure Pathways, SWMU 27C

9.9 SWMU 27D: 26TH SPT BN

9.9.1 History and Description of SWMU 27D, 26th SPT BN

SWMU 27D is an OWS that supports vehicle maintenance activities within the 26th Support Battalion (SPT BN) Motorpool. The OWS is located adjacent to the northwestern side of Building 4502 (Figure 9.9-1). Floor drains from Building 4502 are piped to the OWS. No previous investigations have been performed at the site. The OWS discharges into the IWTP.

9.9.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at SWMU 27D adjacent to Building 4502. The locations of the soil and groundwater samples are presented in Figure 9.9-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater were analyzed for VOCs, SVOCs, and lead.

9.9.3 Physical Characteristics of the Site

9.9.3.1 Topography

The surface topography of the OWS site is essentially level. The OWS is located on a gravel island on the northwest side of Building 4502. The remaining area is a concrete parking area (Figure 9.9-1). The surface elevation is approximately 68 feet amsl.

9.9.3.2 Surface drainage

There are no surface water/sediment pathways at this site.

9.9.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.9.3.4 Hydrogeology

Groundwater was encountered at approximately 5.6 feet to 5.9 feet bgs.

9.9.3.5 Ecology

As stated in Section 8.2, SWMU 27D is classified as an "industrialized area." SWMU 27D is located within the industrialized garrison area and comprises approximately 0.01 acre (Figure 9.9-1). The surface is covered by gravel and concrete structures. A wooded area borders the motorpool approximately 300 feet to the northwest.

9.9.4 Nature and Extent of Contamination

9.9.4.1 Surface soil

Three surface soil samples were collected based on field screening results at sampling locations GP1, GP2, and GP3. The results of the surface soil analyses are presented in Table 9.9-1 and Figure 9.9-2.

VOCs. Three VOCs were detected in surface soil samples: 2-butanone (0.0374 mg/kg at GP1), acetone (0.358 mg/kg at GP1), and toluene (0.0366 mg/kg at GP3). Acetone, 2-butanone, and toluene are SRCs in surface soil.

SVOCs. No SVOCs were detected in surfaee soil.

Lead. Lead was not detected in surface soil at a level exceeding the reference background criterion and is not considered to be an SRC in surface soil.

9.9.4.2 Subsurface soil

One subsurface soil sample was collected at GP4 for analysis. This sample was selected for analysis based on field headspace screening for VOCs; the analytical results are summarized in Table 9.9-2 and Figure 9.9-2.

VOCs. Only 2-butanone (0.003 mg/kg) was detected in the only subsurface soil sample collected. 2-Butanone is considered to be an SRC in subsurface soil at SWMU 27D.

SVOCs. No SVOCs were detected in subsurface soil samples.

Lead. Lead was not detected at levels exceeding the reference background criterion in subsurface soil.

9.9.4.3 Groundwater

With the use of DPT techniques, groundwater samples were collected from the four Geoprobe locations at SWMU 27D. The results of the groundwater analyses are presented in Table 9.9-3 and Figure 9.9-2.

VOCs. No VOCs were detected in groundwater samples.

SVOCs. No SVOCs were detected in groundwater samples.

Lead. Lead was not detected above the reference background criterion and is not an SRC in groundwater.

9.9.4.4 Surface water

No surface water samples were collected because no surface water pathway exists.

9.9.4.5 Sediment

No sediment samples were collected because no sediment pathway exists.

9.9.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.9-4.

9.9.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface soil and subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in surface soil and subsurface soil, none of the analytes exceeded their respective GSSLs (Table 9.9-5); therefore, there are no CMCOPCs in soil at SWMU 27D based on leaching to groundwater.

9.9.6 Human Health Preliminary Risk Evaluation of SWMU 27D

SRCs for the OWS at SWMU 27D were identified for the following media: surface soil and subsurface soil. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.9.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This OWS is located within a secured motorpool inside the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is covered by gravel and concrete structures; therefore, soil erosion, fugitive dust emissions, or surface water runoff is not a currently viable migration pathway.

Groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.9-3. The on-site scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.9.6.2 Risk evalnation

The results of the human health risk screening are given below.

The volatile organics 2-butanone, acetone, and toluene were identified as SRCs for surface soil. The concentrations of these contaminants were below their respective screening values (Table 9.9-6); therefore, there are no HHCOPCs in surface soil.

2-Butanone was the only SRC identified in subsurface soil. The maximum concentration of 2-butanone was below its screening value (Table 9.9-6); therefore, it is not an HHCOPC in subsurface soil.

9.9.6.3 Uncertainties

The uncertainties in the human health risk assessment have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.9.7 Ecological Preliminary Risk Evaluation of SWMU 27D

The EPRE of SWMU 27D was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the EPRE are presented below.

9.9.7.1 Ecological screening value comparison (Step i)

No EPRE was required at SWMU 27D because (1) there is no surface water or sediment at SWMU 27D; (2) SWMU 27D is an industrial area with no vegetated surface soil (i.e., site is covered with gravel and concrete); and (3) no SRCs were identified in groundwater.

9.9.8 Conclusions and Risk Management and Site Recommendations for SWMU 27D

9.9.8.1 Conclusions

Nature and Extent of Contamination

- Acetone, 2-butanone, and toluene are SRCs in surface soil.
- 2-Butanone was detected in subsurface soil samples and, therefore, is an SRC for that medium.
- No SRCs were indicated in the groundwater.

Fate and Transport

- SRCs identified in surface soil and subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for surface soil or subsurface soil at this site.

Ecological Preliminary Risk Evaluation

- There are no SRCs in groundwater. The site is covered by gravel or concrete; therefore, there is no surface soil pathway for ecological receptors.

9.9.8.2 Risk management and site recommendations

- No CMCOPCs were indicated in soil. No HHCOPCs were indicated in soil. Surface soil is segregated from potential ecological receptors by large gravel or concrete. No SRCs were indicated in groundwater; therefore, an NFA status is recommended for SWMU 27D regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.9-1. Summary of Analytes Detected in Surface Soil, SWMU 27D

Station	Reference Background Criteria	7FGP1	7FGP2	7FGP3
Sample ID		7F1111	7F1211	7F1311
Date		01/20/98	01/19/98	01/19/98
Depth (feet)		0 to 2	0 to 2	0 to 3
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
2-Butanone	0.00	**0.0374**		
Acetone	0.00	**0.358**		
Toluene	0.00			**0.0366**
Metals (mg/kg)				
Lead	8.81	5	2.7	3.7

Bold indicates concentrations above reference background criteria.

Table 9.9-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27D

Station	Reference Background Criteria	7FGP4
Sample ID		7F1411
Date		01/19/98
Depth (feet)		2 to 4
Sample Type		Grab
Volatile Organic Compounds (mg/kg)		
2-Butanone	0.00	**0.003**
Metals (mg/kg)		
Lead	11.10	6.7

Bold indicates concentrations above reference background criteria.

Table 9.9-3. Summary of Analytes Detected in Groundwater, SWMU 27D

Station	Reference Background Criteria	MCL	7FGP1	7FGP2	7FGP3	7FGP4
Sample ID			7F4111	7F4211	7F4311	7F4411
Date			01/20/98	01/19/98	01/19/98	01/19/98
Sample Type			Grab	Grab	Grab	Grab
Metals (µg/L)						
Lead	4.69	15		1.1		

Table 9.9-4. Summary of Site-related Contaminants, SWMU 27D

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
2-Butanone	0.0374	0.003	NP	ND	NP
Acetone	0.358	ND	NP	ND	NP
Toluene	0.0366	ND	NP	ND	NP
Metals					
Lead	BRBC	BRBC	NP	BRBC	NP

BRBC = Below reference background criteria.
ND = Not detected.
NP = No pathway exists.

Table 9.9-5. GSSL Screening of Site-related Contaminants in Soil, SWMU 27D

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
2-Butanone[b]	0.0374	7.685	No
Acetone	0.358	16	No
Toluene	0.0366	12	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

Table 9.9-6. Human Health Risk Screening for Surface Soil and Subsurface Soil, SWMU 27D

SURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
2-Butanone	1/3	0.0374	0.0374	4,700	No	Max Detect < Risk Criteria
Acetone	1/2	0.358	0.358	780	No	Max Detect < Risk Criteria
Toluene	1/3	0.0366	0.0366	1,600	No	Max Detect < Risk Criteria

SUBSURFACE SOIL						
Analyte	Results> Detection Limit	Minimum Detect	Maximum Deteet	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
2-Butanone	1/1	0.003	0.003	4,700	No	Max Detect < Risk Criteria

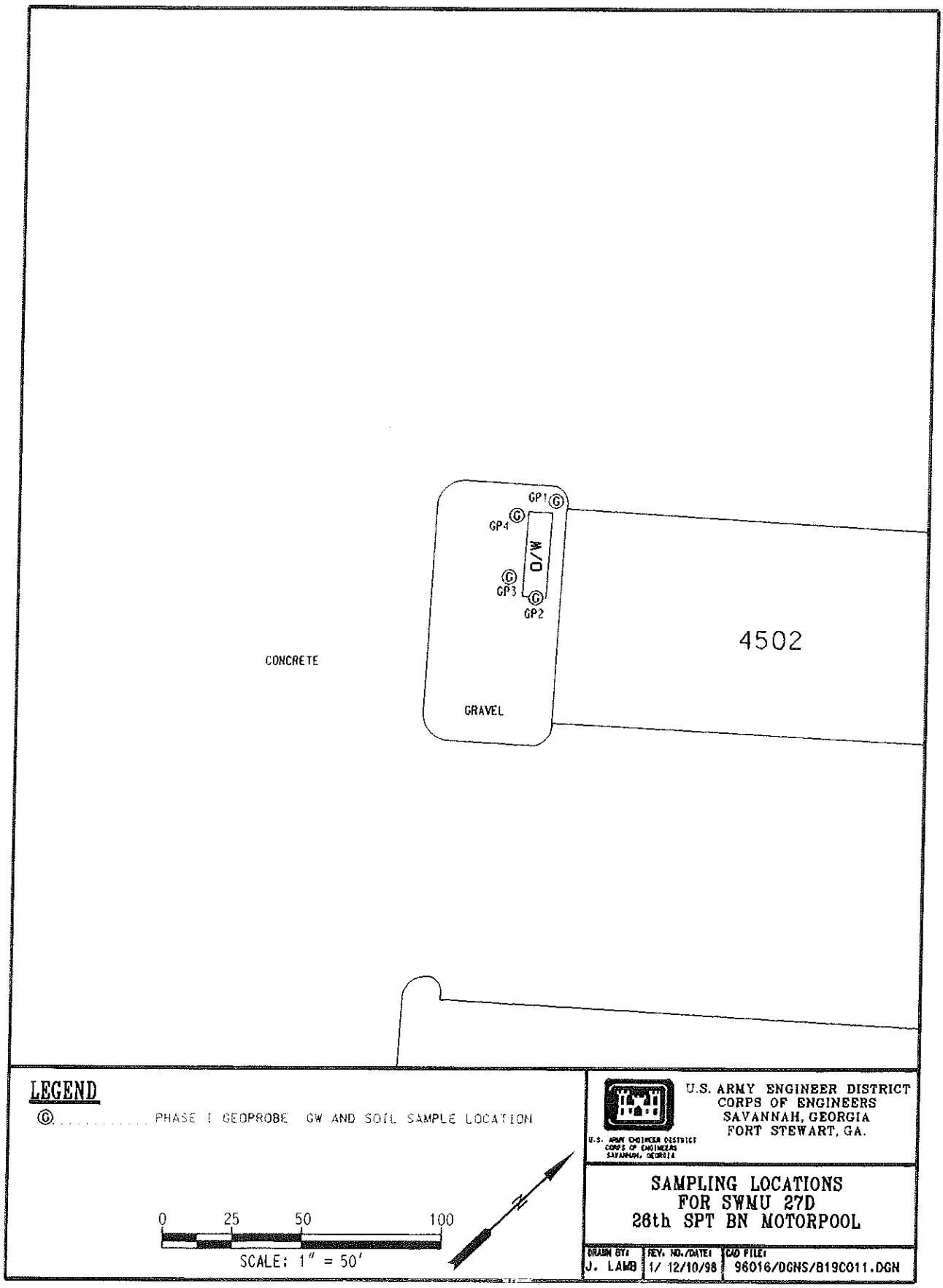

Figure 9.9-1. Sampliug Locations, SWMU 27D

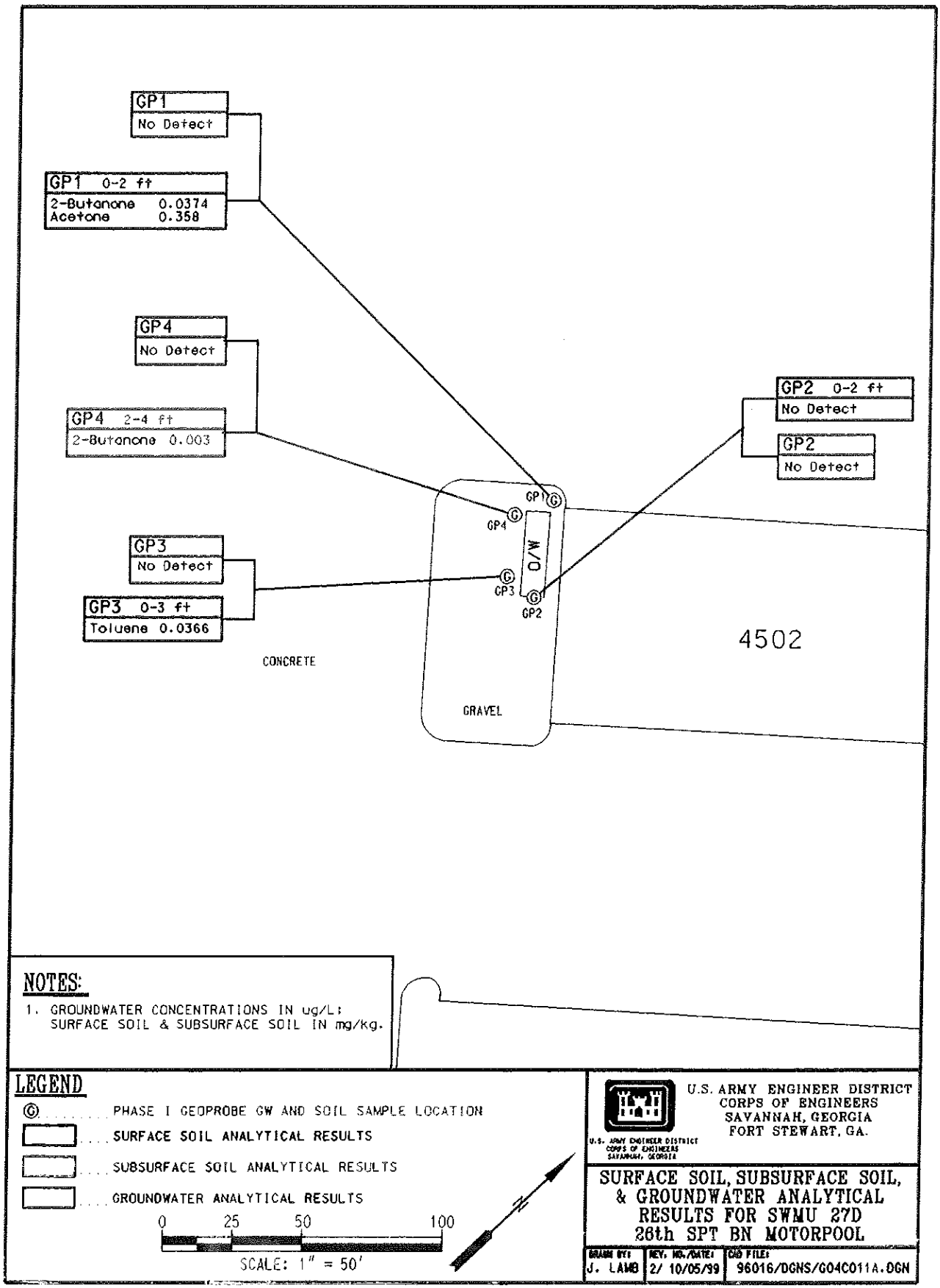

Figure 9.9-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27D

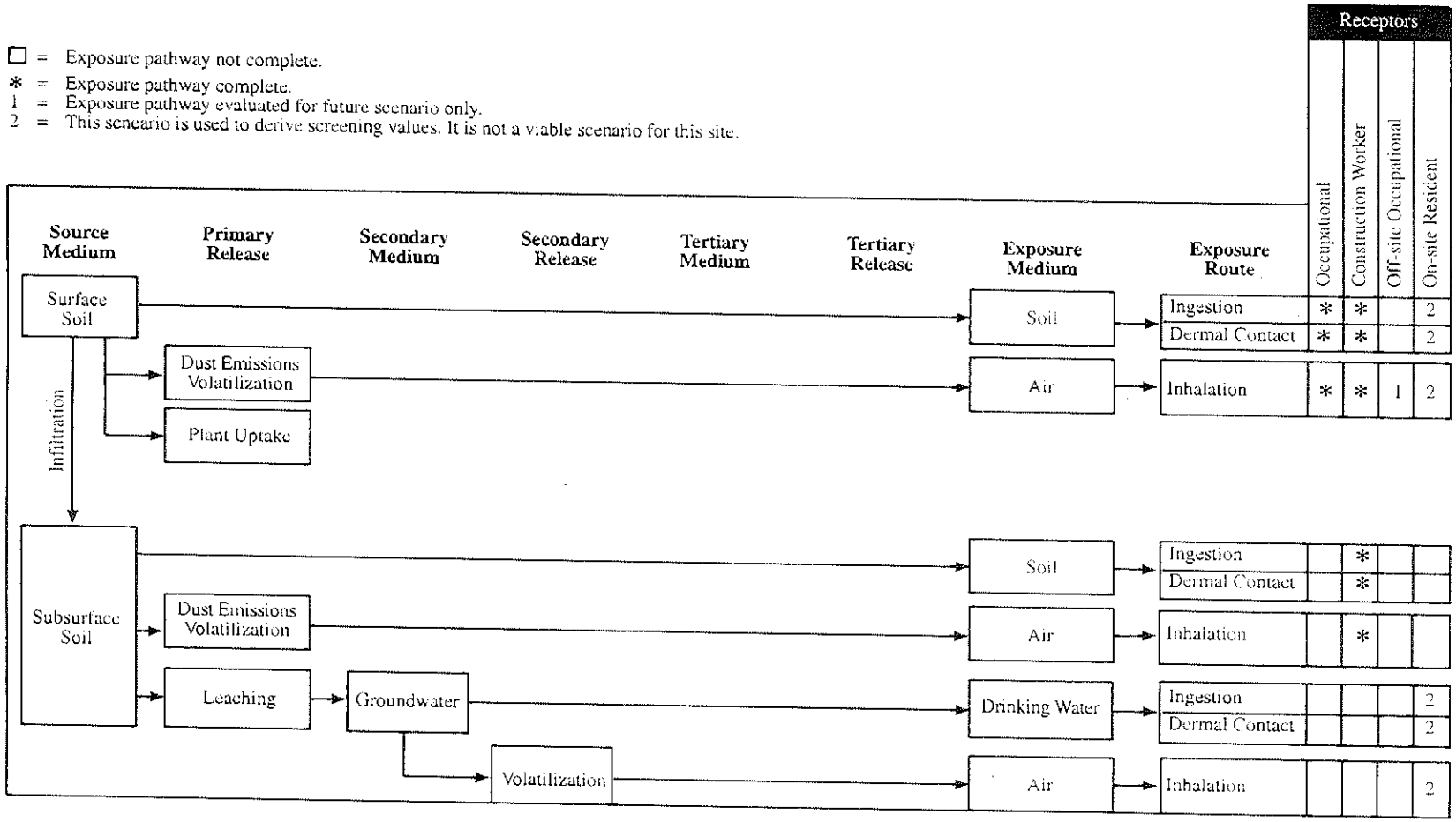

Figure 9.9-3. Potential Migration and Exposure Pathways, SWMU 27D

9.10 SWMU 27E:703D SPT BN (MAIN), BUILDING 1628

9.10.1 History and Description of SWMU 27E, 703d SPT BN (Main), Building 1628

SWMU 27E (Building 1628) is one of two OWSs that support vehicle maintenance activities within the 703d SPT BN (Main) Motorpool. The OWS supports a building identified as Building 1628 located in the southwestern corner of the motorpool area (Figure 9.10-1). The OWS is located within a fenced storage area. A grated trough directs wastewater from the buildings and the purging facility to a sedimentation basin. The effluent from the sedimentation basin is piped to the OWS, and the waste oil is pumped out and burned at the Central Energy Plant. No previous investigations have been performed at the site. The OWS discharges into the IWTP.

9.10.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at SWMU 27E (Building 1628). The locations of the soil and groundwater samples are presented in Figure 9.10-1. Based on field headspace screening for VOCs, one surface soil sample and three subsurface soil samples were collected. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

9.10.3 Physical Characteristics of the Site

9.10.3.1 Topography

The surface topography of the OWS site is essentially level (Figure 9.10-1). The OWS is located in the grass border between the concrete storage pad and parking area and the boundary fence. The grassy area continues southwest of the site to a surface drainage swale. The surface elevation is approximately 70.5 feet amsl.

9.10.3.2 Surface drainage

A drainage ditch is located approximately 35 feet southwest of the OWS. This drainage ditch receives runoff from the vehicle parking area and outside storage area northeast of the OWS and from the adjacent gravel/dirt roads southwest of the OWS. Surface water is present in the drainage ditch only after rainfall events. The surface water is allowed to percolate into the soil (see Section 3.3). During periods of heavy rainfall events, the surface water may potentially make it to Mill or Taylors Creek. However, because the discharge from the OWS is directed to the IWTP, there are no surface water/sediment pathways at this site.

9.10.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.10.3.4 Hydrogeology

Groundwater was encountered at approximately 4 feet bgs.

9.10.3.5 Ecology

As stated in Section 8.2, SWMU 27E is classified as an "industrialized area with managed grasslands." SWMU 27E (Building 1628) lies on the outer perimeter of the industrialized garrison area and comprises approximately 0.03 acre (Figure 9.10-1). A wooded area lies beyond the fence toward the west.

9.10.4 Nature and Extent of Contamination

9.10.4.1 Surface soil

One soil sample was collected at GP3. This sample was selected for analysis based on field headspace screening for VOCs (Table 9.10-1).

VOCs. No VOCs were detected in surface soil above the analytical detection limits.

SVOCs. No SVOCs were detected in surface soil above the analytical detection limits.

Lead. Lead was not detected in surface soil above the reference background criterion.

9.10.4.2 Subsurface soil

Three subsurface soil samples were collected at locations GP1, GP2, and GP4 (Figure 9.10-2). These samples were selected for analysis based on field headspace screening for VOCs. Analytical results are summarized in Table 9.10-2 and Figure 9.10-2.

VOCs. Acetone was detected above its analytical detection limit in subsurface soil. Acetone was detected in all three soil samples at concentrations ranging from 0.0368 mg/kg at GP2 to 0.141 mg/kg at GP4. Acetone is an SRC in subsurface soil.

SVOCs. No SVOCs were detected above analytical detection limits in subsurface soil samples.

Lead. Lead was not detected at levels exceeding the reference background criterion in subsurface soil samples.

9.10.4.3 Groundwater

With the use of DPT techniques, groundwater samples were collected from the four locations at the site. The results of the groundwater analyses are presented in Table 9.10-3 and Figure 9.10-2.

VOCs. No VOCs were detected above analytical detection limits in groundwater samples.

SVOCs. No SVOCs were detected above analytical detection limits in groundwater samples.

Lead. Lead was detected below the reference background criterion in the groundwater sample collected from GP3.

9.10.4.4 Surface water

No surface water samples were collected during this investigation because no surface water pathway exists.

9.10.4.5 Sediment

No sediment samples were collected during this investigation because no sediment pathway exists.

9.10.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.10-4.

9.10.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil SRCs to their respective GSSLs.

The only SRC—acetone in subsurface soil—did not exceed its GSSL (Table 9.10-4); therefore, there is no CMCOPC in soil at SWMU 27E (Building 1628) based on leaching to groundwater.

9.10.6 Human Health Preliminary Risk Evaluation of SWMU 27E, Building 1628

SRCs for SWMU 27E (Building 1628) were identified for subsurface soil. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.10.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. Given that SRCs at this site are limited to subsurface soil, the construction worker would be the only potential receptor population.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air within an excavation.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.10-3.

9.10.6.2 Risk evaluation

No SRCs were identified in surface soil or groundwater. The results of the human health risk screening for subsurface soil are given below.

Acetone is an SRC for subsurface soils; however, the concentration of acetone was below its screening value (Table 9.10-6).

9.10.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.10.7 Ecological Preliminary Risk Evaluation of SWMU 27E, Building 1628

The EPRE of SWMU 27E (Building 1628) was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was

conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the EPRE are presented below.

9.10.7.1 Ecological screening value comparison (Step i)

An EPRE was not conducted at SWMU 27E (Building 1628) because (1) there is no surface water or sediment at SWMU 27E (Building 1628), and (2) no SRCs were indicated in surface soil or groundwater.

9.10.8 Conclusions and Risk Management and Site Recommendations for SWMU 27E, Building 1628

9.10.8.1 Conclusions

Nature and Extent of Contamination

- No SRCs were identified in surface soil.
- Acetone is an SRC in subsurface soil.
- Lead was not detected in either surface soil or subsurface soil samples at levels exceeding the reference background criterion.
- No SRCs were identified in groundwater.

Fate and Transport

- The only SRC in soil, acetone, was not identified as a CMCOPC in subsurface soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no SRCs in surface soil or groundwater. Acetone was not identified as an HHCOPC for subsurface soil at this site.

Ecological Preliminary Risk Evaluation

- There are no SRCs in groundwater or surface soil at this site.

9.10.8.2 Risk management and site recommendations

- Acetone in subsurface soil was the only SRC identified at SWMU 27E (Building 1628), and it was not indicated as a CMCOPC or HHCOPC; therefore, based on the information presented in this section, an NFA status is recommended for SWMU 27E regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.10-1. Summary of Analytes Detected in Surface Soil, SWMU 27E (Building 1628)

Station	Reference Background Criteria	7GGP3
Sample ID		7G1311
Date		02/01/98
Depth (feet)		1 to 3
Sample Type		Grab
Metals (mg/kg)		
Lead	8.81	3.6

Table 9.10-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27E (Building 1628)

Station	Reference Background Criteria	7GGP1	7GGP2	7GGP4
Sample ID		7G1111	7G1211	7G1411
Date		02/03/98	01/20/98	02/01/98
Depth (feet)		2 to 3	2 to 4	7 to 9
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
Acetone	0.00	**0.0515**	**0.0368**	**0.141**
Metals (mg/kg)				
Lead	11.10	4.5	4.9	4.8

Bold indicates concentrations above reference background criteria.

Table 9.10-3. Summary of Analytes Detected in Groundwater, SWMU 27E (Building 1628)

Station	Reference Background Criteria	MCL	7GGP1	7GGP2	7GGP3	7GGP4
Sample ID			7G4111	7G4211	7G4311	7G4411
Date			02/03/98	01/20/98	02/01/98	02/01/98
Sample Type			Grab	Grab	Grab	Grab
Metals(µg/L)						
Lead	4.69	15			1.4	

Table 9.10-4. Summary of Site-related Contaminants, SWMU 27E (Building 1628)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Acetone	ND	0.141	NP	ND	NP

ND = Not detected.
NP = No pathway exists.

Table 9.10-5. GSSL Screening of Site-related Contaminants in Soil, SWMU 27E (Building 1628)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Acetone	0.141	16	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

Table 9.10-6. Human Health Risk Screening for Subsurface Soil, SWMU 27E (Building 1628)

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Acetone	3/3	0.0368	0.141	780	No	Max Detect < Risk Criteria

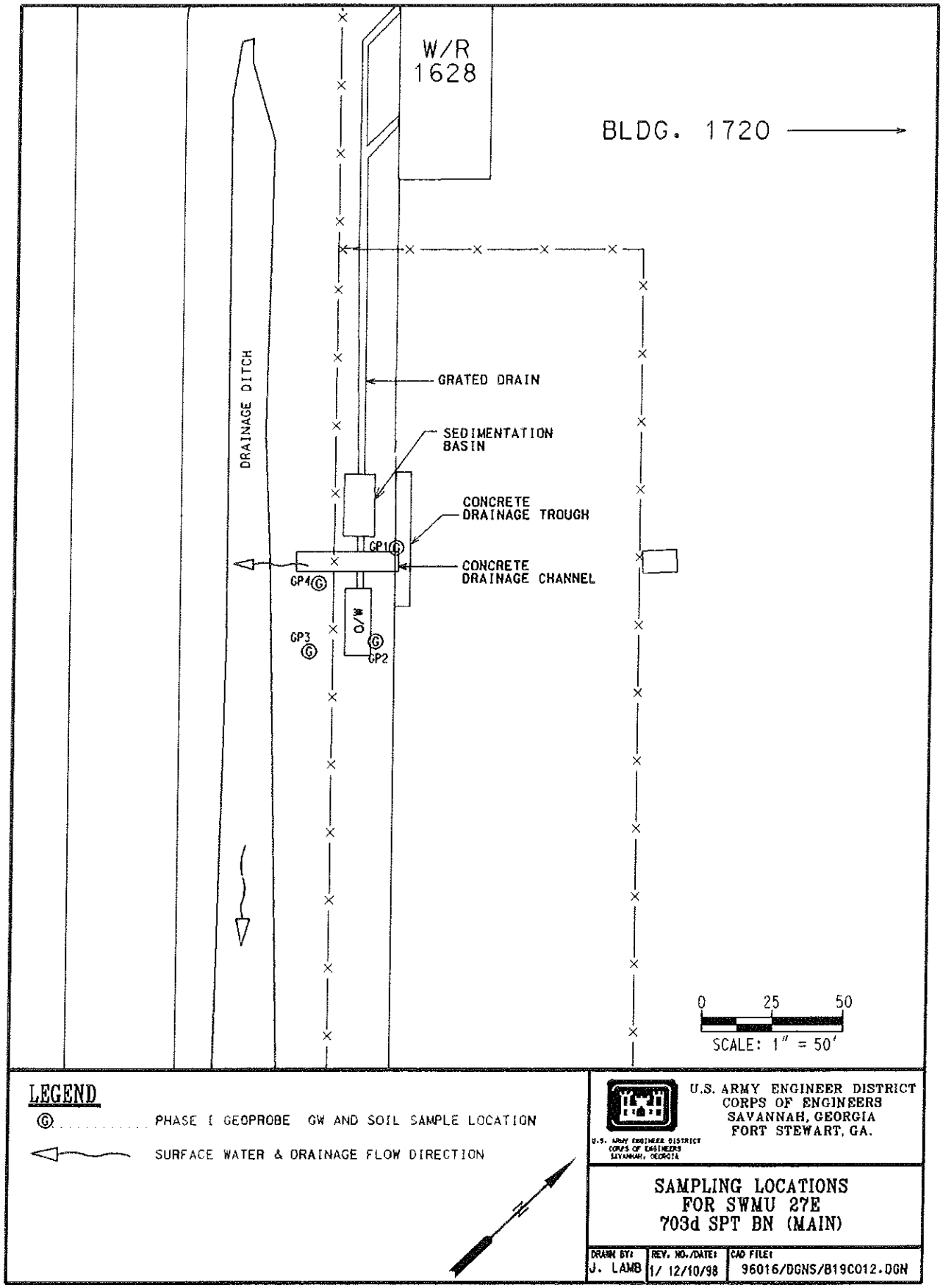

Figure 9.10-1. Sampling Locations, SWMU 27E (Building 1628)

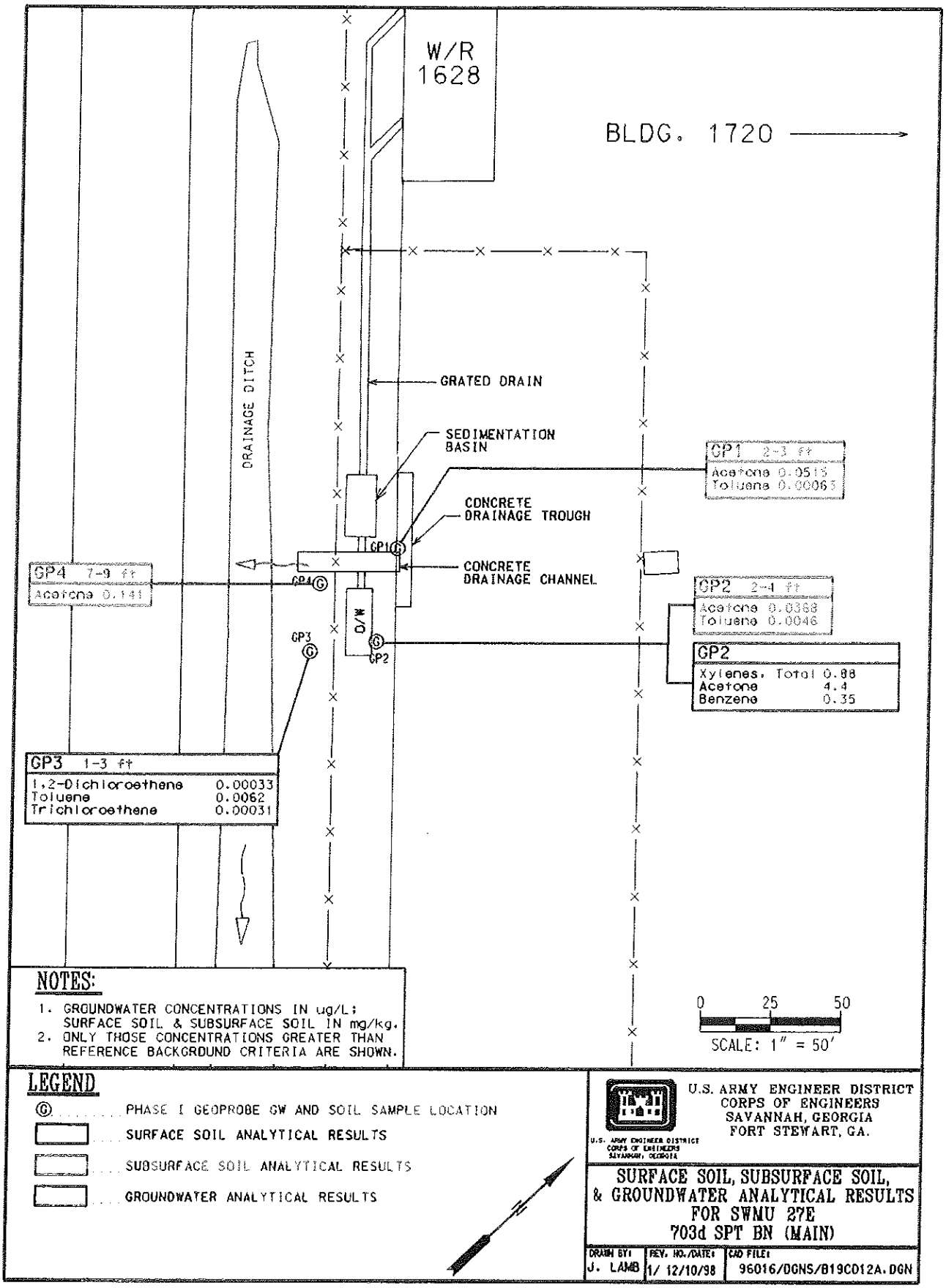

Figure 9.10-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27E (Building 1628)

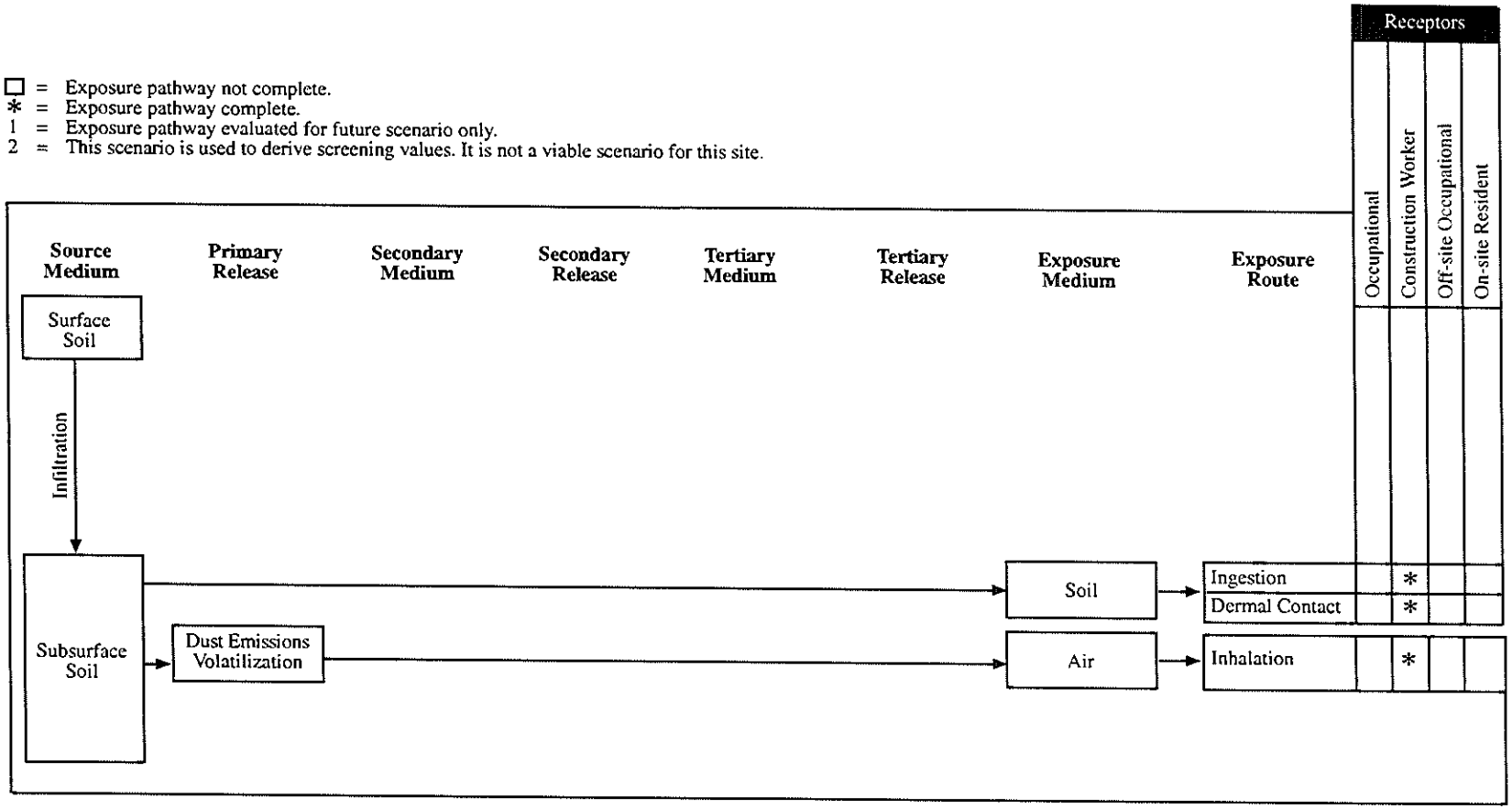

Figure 9.10-3. Potential Migration and Exposure Pathways, SWMU 27E (Building 1628)

9.11 SWMU 27E: 703D SPT BN (MAIN), BUILDING 1720

9.11.1 History and Description of SWMU 27E, 703d SPT BN (Main), Building 1720

SWMU 27E (Building 1720) is one of two OWSs that support vehicle maintenance activities of the 703d SPT BN (Main) Motorpool. The OWS is located along the eastern boundary of the motorpool area, approximately 200 feet northeast of Building 1720 (Figure 9.11-1). The OWS receives wastewater from an adjacent vehicle wash rack. Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges to the IWTP, and the waste oil is pumped out and burned at the Central Energy Plant. No previous investigations have been performed at the site.

9.11.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at SWMU 27E (Building 1720). The locations of the soil and groundwater samples are presented in Figure 9.11-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

9.11.3 Physical Characteristics of the Site

9.11.3.1 Topography

The topography of the site is essentially flat. The surface elevation is approximately 66 feet amsl. The OWS is located in a grassy area that extends to the northeast to the motorpool's fence line. The area to the south/southwest is concreted for vehicle parking.

9.11.3.2 Surface drainage

A drainage ditch is located approximately 50 feet northeast of the OWS (Figure 9.11-1). This drainage ditch receives runoff from the vehicle parking area west of the OWS and other upstream motorpools. Surface water is primarily present in the drainage ditch only after rainfall events. During periods of heavy rainfall, the surface water may potentially make it to Mill or Taylors Creek. Because the effluent from the OWS discharges to the IWTP and the waste oil is pumped out, there are no surface water/sediment migration pathways.

9.11.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.11.3.4 Hydrogeology

Groundwater was encountered at approximately 6.6 feet to 7.3 feet bgs.

9.11.3.5 Ecology

As stated in Section 8.2, SWMU 27E is classified as an "industrialized area with managed grasslands." SWMU 27E (Building 1720) lies on the outer perimeter of the industrialized garrison area and comprises approximately 0.03 acre (Figure 9.11-1). A wooded area lies beyond the fence toward the west.

9.11.4 Nature and Extent of Contamination

9.11.4.1 Surface soil

Based on field headspace screening for VOCs (i.e., no hits), no surface soil samples were collected for analysis.

9.11.4.2 Subsurface soil

Four subsurface soil samples were collected (see Figure 9.11-1). These samples were selected for analysis based on field headspace screening for VOCs. Subsurface analytical results are summarized in Table 9.11-1 and Figure 9.11-2.

VOCs. No VOCs were detected in GP1 or GP3. Acetone was detected at GP2 at 0.0335 mg/kg. Toluene was detected at GP2 at a concentration of 0.0558 mg/kg and at GP4 at a concentration of 0.0174 mg/kg. The SRCs in subsurface soil are acetone and toluene.

SVOCs. Bis(2-ethylhexyl)phthalate was detected at a concentration of 0.254 mg/kg in the subsurface soil sample from GP1; therefore, bis(2-ethylhexyl)phthalate is an SRC in subsurface soil.

Lead. Lead was not detected at levels exceeding the reference background criterion in subsurface soil samples.

9.11.4.3 Groundwater

With the use of DPT techniques, groundwater samples were collected from the four Geoprobe locations. The results of the groundwater analyses are presented in Table 9.11-2 and Figure 9.11-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. 4-Chloro-3-methylphenol was detected at GP1 at a concentration of 16.2 µg/L; therefore, 4-chloro-3-methylphenol is an SRC in groundwater.

Lead. Lead was not detected above the reference background criterion in groundwater samples.

9.11.4.4 Surface water

No surface water samples were collected because no surface water pathway exists.

9.11.4.5 Sediment

No sediment samples were collected because no sediment pathway exists.

9.11.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.11-3.

9.11.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in subsurface soil, none of the analytes exceeded their respective GSSLs (Table 9.11-4); therefore, there are no CMCOPCs in soil based on leaching to groundwater.

9.11.6 Human Health Preliminary Risk Evaluation of SWMU 27E, Building 1720

SRCs for SWMU 27E (Building 1720) were identified for subsurface soil and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.11.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for subsurface soils include leaching into groundwater and release of volatile compounds into the air within an excavation.

Because groundwater is lower than the adjacent drainage ditch and there are no other surface water bodies nearby, groundwater at the site does not discharge into any nearby surface waters. Therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.11-3. The on-site resident scenario is not considered to be a viable scenario for the site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.11.6.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for subsurface soils included acetone, toluene, and bis(2-ethylhexyl)phthalate. The concentrations of these contaminants were below their respective screening values for soil ingestion (Table 9.11-5).

4-Chloro-3-methylphenol is an SRC in groundwater. There is no available screening value for 4-chloro-3-methylphenol (Table 9.11-5).

9.11.6.3 Uncertainties

The potential human health risks associated with 4-chloro-3-methylphenol could not be evaluated. This compound might have an impact upon human health. Other human health uncertainties have been addressed in Section 7.5 of HHPRE (Chapter 7.0).

9.11.7 Ecological Preliminary Risk Evaluation of SWMU 27E, Building 1720

The EPRE of SWMU 27E (Building 1720) was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface water was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.11.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

Surface soil was not evaluated because no surface soil samples were collected at this SWMU.

4-Chloro-3-methylphenol was detected in groundwater. The result of the ESV comparison for groundwater is presented in Table 9.11-6. There is no ESV for 4-chloro-3-methylphenol, so it is an ECOPC by default (GEPD 1997a).

Because there are no ESVs for soil, all analytes detected in soil were evaluated further in EPRE Steps ii through v.

9.11.7.2 Preliminary problem formulation (Step ii)

Ecological habitat is described in Section 9.11.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation for SWMU 27E (Building 1720) are described in Section 8.2.

9.11.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

9.11.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of drinking water. The exposure parameters for the surrogate species—raccoons—are presented in Table 8-7.

9.11.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratio of the measured maximum concentration and the TRV, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints. Therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater at SWMU 27E (Building 1720) are presented in Table 9.11-7. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species; therefore, there are no ECOPCs in groundwater.

9.11.8 Conclusions and Risk Management and Site Recommendations for SWMU 27E, Building 1720

9.11.8.1 Conclusions

Nature and Extent of Contamination

- Based on field headspace screening for VOCs, no surface soil samples were collected for analysis.
- The SRCs in subsurface soil are acetone and toluene. One SVOC, bis(2-ethylhexyl)phthalate, is also an organic SRC in subsurface soil.
- 4-Chloro-3-methylphenol is an organic SRC in groundwater.

Fate and Transport

- SRCs identified in subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs in subsurface soil or groundwater.

Ecological Preliminary Risk Evaluation

- The only ECOPC in groundwater (aquatic biota) is 4-chloro-3-methylphenol. This ECOPC is a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.
- There are no ECOPCs in groundwater for terrestrial receptors.
- There are no ECOPCs in surface soil because the medium was not sampled.

9.11.8.2 Risk management and site recommendations

- 4-Chloro-3-methylphenol was indicated as an ECOPC in groundwater for aquatic biota by default and only if groundwater discharges to nearby surface water bodies. As stated in Section 9.11.6.1, groundwater at this site does not discharge to any nearby surface water bodies. In addition, given the typical groundwater flow rates in the garrison area, 4-chloro-3-methylphenol is probably being removed through the natural attenuation processes of biodegradation and volatilization prior to reaching any receptors. Therefore, 4-chloro-3-methylphenol is not considered to be an ECOPC for this site and does not require further investigation and/or evaluation.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27E (Building 1720) regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.11-1. Summary of Analytes Detected in Subsurface Soil, SWMU 27E (Building 1720)

Station	Reference Background Criteria	7HGP1	7HGP2	7HGP3	7HGP4
Sample ID		7H1111	7H1211	7H1311	7H1411
Date		01/16/98	01/18/98	01/17/98	01/18/98
Depth (feet)		2 to 4	4 to 6	4 to 6	4 to 6
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Acetone	0.00		**0.0335**		
Toluene	0.00		**0.0558**		**0.0174**
Semivolatile Organic Compounds (mg/kg)					
Bis(2-ethylhexyl)phthalate	0.00	**0.254**			
Metals (mg/kg)					
Lead	11.10	8.5	9.4	4.5	4

Bold indicates concentrations above reference background criteria.

Table 9.11-2. Summary of Detected Analytes in Gronndwater, SWMU 27E (Building 1720)

Station	Reference Background Criteria	MCL	7HGP1	7HGP2	7HGP3	7HGP4
Sample ID			7H4111	7H4211	7H4311	7H4411
Date			01/16/98	01/18/98	1/17/98	01/18/98
Sample Type			Grab	Grab	Grab	Grab
Semivolatile Organics Compounds (µg/L)						
4-Chloro-3-methylphenol	0.00		**16.2**			

Bold indicates concentrations above reference background criteria.

Table 9.11-3. Summary of Site-related Contaminants, SWMU 27E (Building 1720)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Acetone	NC	0.0335	NP	ND	NP
Toluene	NC	0.0558	NP	ND	NP
Semivolatile Organic Compounds					
4-Chloro-3-methylphenol	NC	ND	NP	16.2	NP
Bis(2-ethylhexyl)phthalate	NC	0.254	NP	ND	NP
Metals					
Lead	NC	BRBC	NP	ND	NP

BRBC = Below reference background criteria.
NC = Soil samples not collected based on field headspace analysis.
ND = Not detected.
NP = No pathway exists.

Table 9.11-4. GSSL Screening of Site-related Contaminants in Soil, SWMU 27E (Building 1720)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Acetone	0.0335	16	No
Toluene	0.0558	12	No
Semivolatile Organic Compounds (mg/kg)			
Bis(2-ethylhexyl)phthalate	0.254	3,600	No

[a]GSSL = EPA GSSL with a DAF of 20 volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

Table 9.11-5. Human Health Risk Screening for Subsurface Soil and Groundwater, SWMU 27E (Building 1720)

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Acetone	1/2	0.0335	0.0335	780	No	Max Detect < Risk Criteria
Toluene	2/4	0.0174	0.0558	1,600	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Bis(2-ethylhexyl)phthalate	1/4	0.254	0.254	46	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Semivolatile Organic Compounds (µg/L)						
4-Chloro-3-methylphenol	1/4	16.2	16.2	ND	None	Max Detect < Risk Criteria

ND = No data available.

Table 9.11-6. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27E (Building 1720)

Analyte	SWMU 27E (Building 1720) Maximum	ESV	ECOPC Aquatic Biota?	Justification
Semivolatile Organic Compounds (µg/L)				
4-Chloro-3-methylphenol	16.2	No ESV	Yes	ECOPC by Default

ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 9.11-7. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27E (Building 1720)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/TRV
Semivolatile Organic Compounds (µg/L)				
4-Chloro-3-methylphenol	16.2	1.30E-03	No TRV	--

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).
-- = Cannot be calculated due to the lack of data.

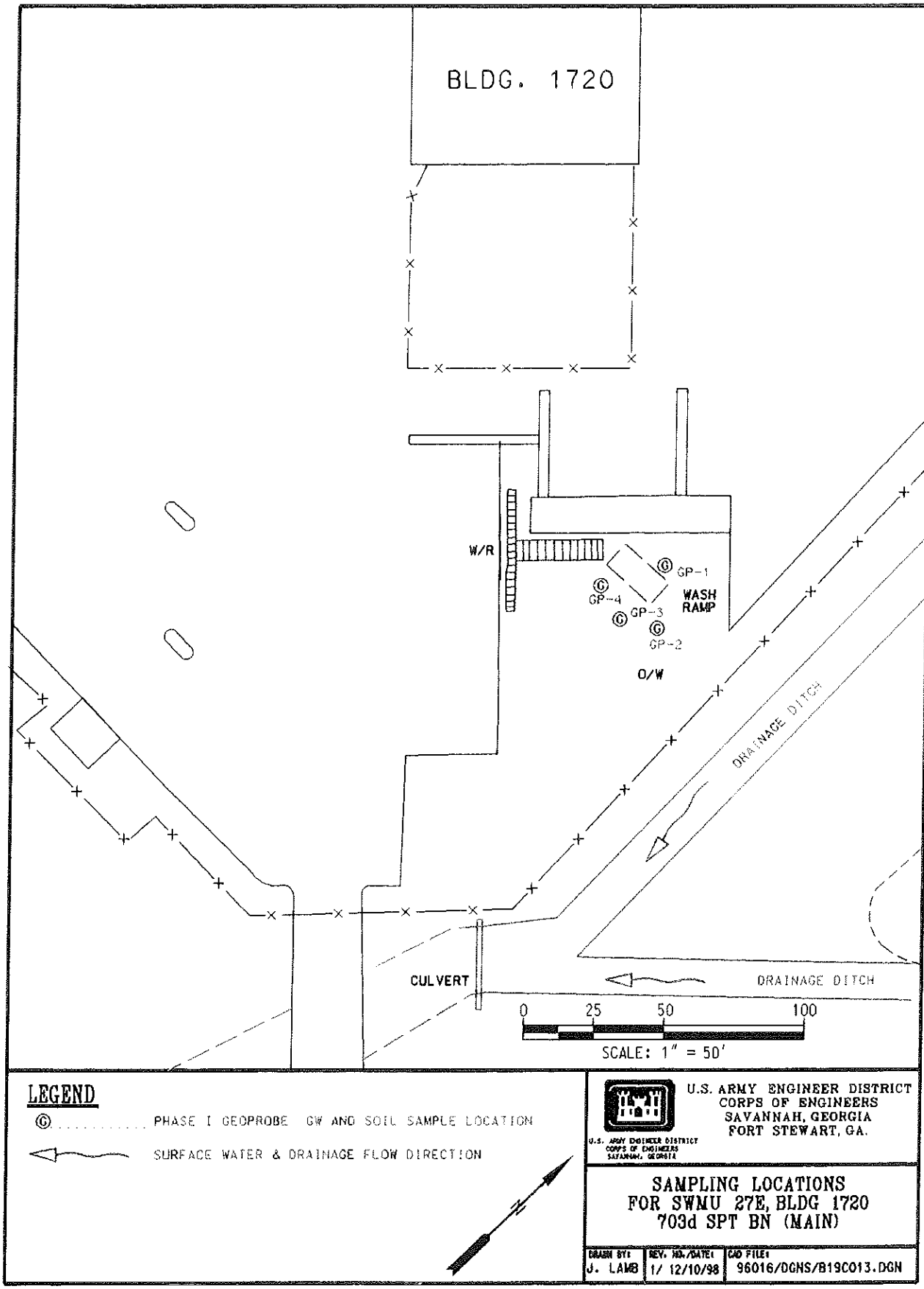

Figure 9.11-1. Sampling Locations, SWMU 27E (Building 1720)

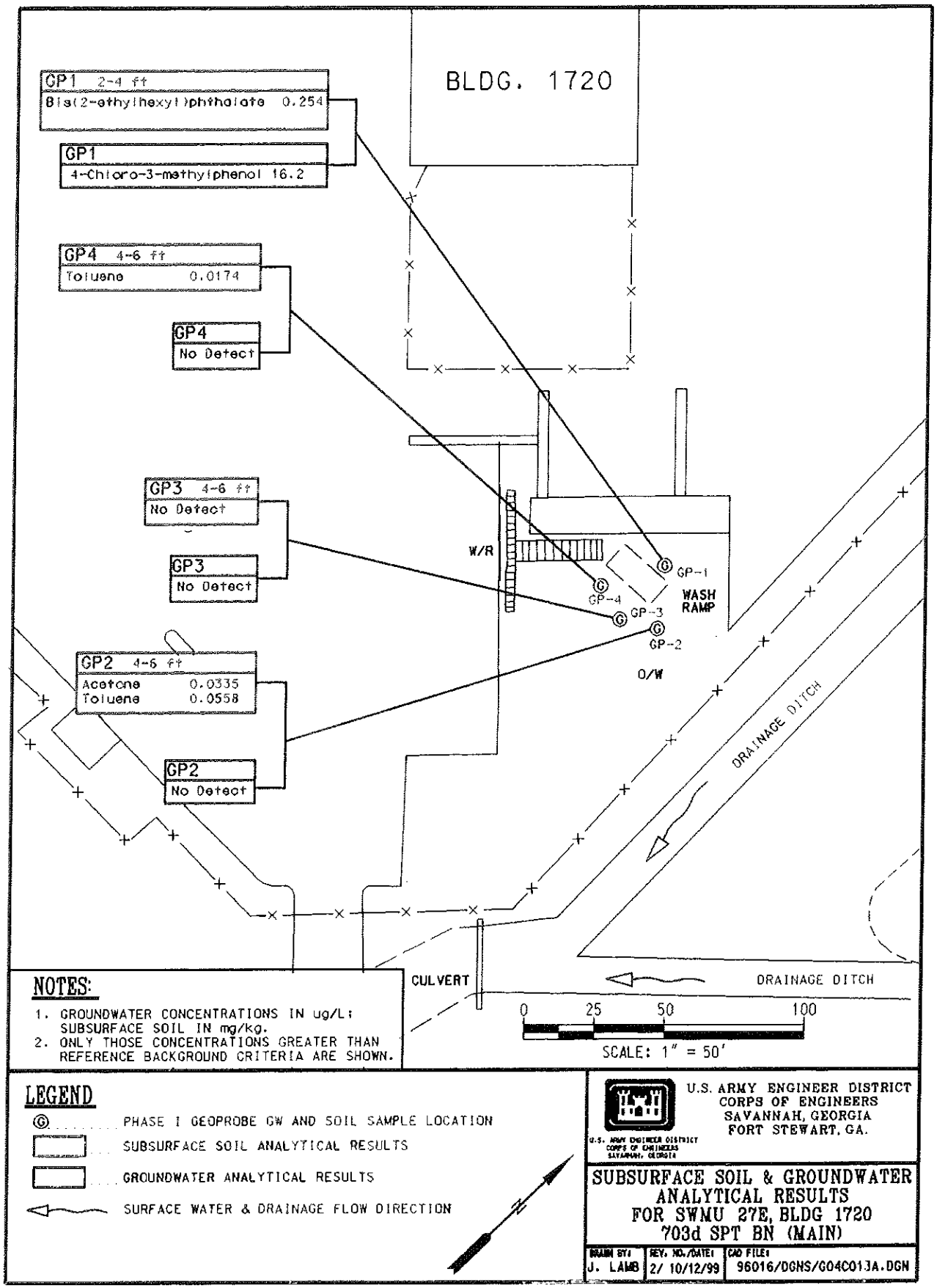

Figure 9.11-2. Summary of Analytical Results in Subsurface Soil and Groundwater, SWMU 27E (Building 1720)

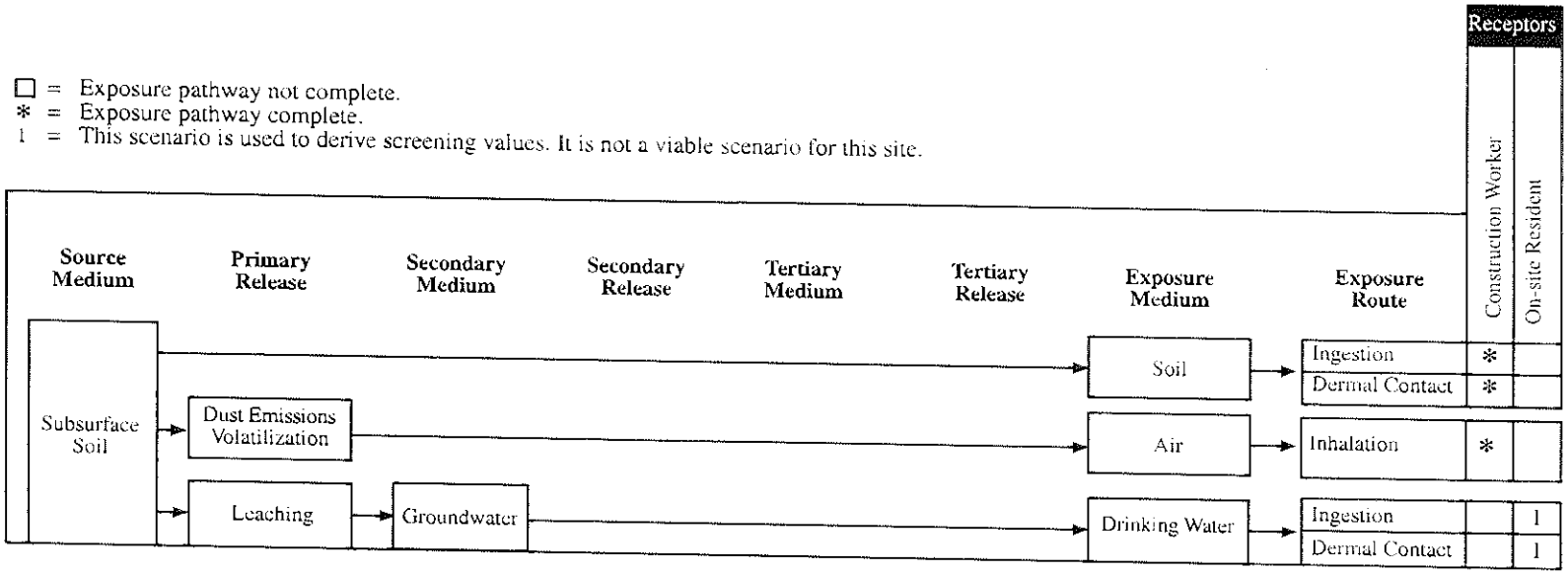

Figure 9.11-3. Potential Migration and Exposure Pathways, SWMU 27E (Building 1720)

9.12 SWMU 27F: 3D ENGINEER BRIGADE, NORTHEAST OF BUILDING 1340

9.12.1 History and Description of SWMU 27F, 3d Engineer Brigade, Northeast of Building 1340

SWMU 27F, northeast of Building 1340, is one of two OWSs that support vehicle maintenance activities of the 3d Engineer Brigade. The OWS is located along the northeastern boundary of the motorpool area, approximately 200 feet northeast of Building 1340 (Figure 9.12-1). The OWS receives wastewater from an adjacent, covered maintenance pad. Maintenance activities for military vehicles are performed at the maintenance pad. Floor drains from the maintenance pad are piped to the OWS. The effluent from the OWS discharges to the IWTP, and the oil is pumped out of the holding unit and bumed at the Central Energy Plant. No previous investigations have been performed at the site.

9.12.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. In addition, with the concurrence of GEPD, DPT techniques were used to install a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack that was installed to intersect the water table at the GP1 and GP2 locations (SAIC 1999a). The resampling monitoring points (GP1 and GP2) were installed approximately 1 foot away from the previous sampling locations. In addition, with the concurrence of GEPD, a 2-inch-diameter monitoring well was installed at the GP1 location, and the groundwater was resampled using low-flow techniques. The well construction, geotechnical results, well development, and field parameter measurements for MW1 are presented in Table 9.12-1. The soil and groundwater from the DPT–collected samples were analyzed for VOCs, SVOCs, and lead. The groundwater from the two monitoring points and one monitoring well was analyzed for bis(2-ethylhexyl)phthalate. The soil sampling, DPT groundwater sampling, and monitoring well locations are presented in Figure 9.12-1.

9.12.3 Physical Characteristics of the Site

9.12.3.1 Topography

The topography of the site is essentially flat. The surface elevation is approximately 68 feet amsl. The OWS is located in a small, grassy area that extends to the northeastern edge of the motorpool's fenced boundary. West/southwest of the site are the concrete vehicle parking area/road and the maintenance pad.

9.12.3.2 Surface drainage

A drainage swale is located approximately 50 feet north of the OWS, north of the fence line (Figure 9.12-1). However, because the effluent from the OWS discharges directly to the IWTP, the drainage swale is not considered a surface water/sediment pathway for this site. Potential surface water drainage collecting in the drainage swale from the adjacent motorpool is allowed to percolate into the soil.

9.12.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.12.3.4 Hydrogeology

Groundwater was encountered at approximately 8 feet to 10 feet bgs.

9.12.3.5 Ecology

As stated in Section 8.2, SWMU 27F is classified as an "industrialized area with managed grassland." The site is located within the industrialized area and comprises approximately 0.01 acre (Figure 9.12-1). The surface of this SWMU is primarily concrete and contains man-made structures; however, a small area of managed grass does exist between the concrete and the fence as well as north of the fence.

9.12.4 Nature and Extent of Contamination

9.12.4.1 Surface soil

One surface soil sample was collected at GP2 based on field headspace analysis for VOCs. The analytical laboratory missed the holding times for VOCs and SVOCs for soils at GP2 during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. The analytical results are summarized in Table 9.12-2 and Figure 9.12-2.

VOCs. Three VOCs—ethylbenzene at 0.0138 mg/kg, toluene at 0.0292 mg/kg, and total xylenes at 0.0632 mg/kg—were detected in a surface soil sample collected from GP2; therefore, the volatile organic SRCs in surface soil include ethylbenzene, toluene, and total xylenes.

SVOCs. SVOCs were not detected above analytical detection limits in the surface soil sample.

Lead. Lead was not detected at levels exceeding the respective reference background criterion in surface soil.

9.12.4.2 Subsurface soil

Three subsurface soil samples were collected at the site. The analytical laboratory missed the holding times for VOCs and SVOCs for soils at GP3 during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. These samples were selected for analysis based on field headspace screening for VOCs. The analytical results are summarized in Table 9.12-3 and Figure 9.12-2.

VOCs. VOCs were detected in all three subsurface soil samples; however, the sample from GP3 contained the majority of the VOCs detected. VOCs that were detected only at GP3 include: 1,1-dichloroethane (0.0045 mg/kg); 2-butanone (0.0304 mg/kg); benzene (0.0728 mg/kg); ethylbenzene (0.573 mg/kg); styrene (0.0284 mg/kg); toluene (1.11 mg/kg); and total xylenes (2.5 mg/kg). Acetone was detected at all three subsurface soil sampling locations at concentrations of 0.056 mg/kg at GP4, 0.101 mg/kg at GP3, and 0.625 mg/kg at GP1. The SRCs in subsurface soil included the following VOCs: 1,1-dichloroethane; 2-butanone; acetone; benzene; ethylbenzene; styrene; toluene; and total xylenes.

SVOCs. Four SVOCs were detected only in subsurface soil samples from GP3 at concentrations above the limits of the analytical detection methods. Anthracene was detected at 0.235 mg/kg, naphthalene was detected at 0.279 mg/kg, phenanthrene was detected at 0.716 mg/kg, and 2-methylnaphthalene was detected at 1.18 mg/kg. The SRCs for subsurface soil include the following SVOCs: anthracene, phenanthrene, 2-methylnaphthalene, and naphthalene.

Lead. Lead was not detected at levels exceeding the respective reference background criterion for subsurface soil samples.

9.12.4.3 Groundwater

With the use of DPT techniques, groundwater samples were collected from four locations. The results of the groundwater analyses are presented in Table 9.12-4 and Figure 9.12-2.

VOCs. Methylene chloride was detected slightly above its respective MCL (5 µg/L) at a concentration of 5.2 µg/L at GP2. The methylene chloride concentration was believed to be the result of field or laboratory contamination. With the concurrence of GEPD, DPT techniques were used to install a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack that was installed to intersect the water table at the GP2 location (SAIC 1999a). The resampling monitoring point (GP2) was installed approximately 1 foot away from the previous sampling location. The groundwater from the monitoring point was analyzed for methylene chloride. Methylene chloride was not detected in the resampled groundwater from GP2, confirming that the initial methylene chloride detected was the result of field or laboratory contamination. Methylene chloride is not an SRC in groundwater.

SVOCs. Bis(2-ethylhexyl)phthalate was detected in the groundwater samples from GP1 and GP2 at concentrations of 6.9 µg/L and 5.5 µg/L, respectively. The bis(2-ethylhexyl)phthalate at both locations was believed to be the result of field or laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), the groundwater at each location was resampled for only bis(2-ethylhexyl)phthalate on August 26, 1999. The groundwater was collected from a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack that was installed to intersect the water table. The resampling monitoring points were installed approximately 1 foot away from the previous sampling locations. Bis(2-ethylhexyl)phthalate was not detected at the GP2 location. However, bis(2-ethylhexyl)phthalate was detected at GP1 at a concentration of 6.5 µg/L. A 2-inch-diameter monitoring well was installed at the GP1 location, and on November 2, 1999, the groundwater was sampled using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected in the groundwater from the monitoring well. The elevated concentrations of bis(2-ethylhexyl)phthalate initially detected at GP1 and GP2 were considered to be the results of field or laboratory contamination. Bis(2-ethylhexyl)phthalate is not considered to be an SRC at SWMU 27F.

Lead. Lead was not detected in the groundwater samples collected; therefore, lead is not an SRC in groundwater.

9.12.4.4 Surface water

No surface water samples were collected at this SWMU because no surface water pathway exists.

9.12.4.5 Sediment

No sediment samples were collected at the SWMU because no sediment pathway exists.

9.12.4.6 Site-related contaminant summary

Table 9.12-5 presents a summary of SRCs and their maximum concentrations by medium.

9.12.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations in soil to the respective GSSLs (Table 9.12-6).

Among the VOCs, only benzene exceeded its respective GSSL and was identified as a CMCOPC based on leaching to groundwater. None of the SVOCs exceeded their respective GSSLs. Because the maximum concentration of benzene (the only CMCOPC) in soil was detected at a shallow depth of 4 feet to 6 feet and it is volatile, it is expected that the concentration of benzene in soil will be depleted due to volatilization. Benzene did not exceed its respective MCL in groundwater. Because there is no potential receptor of groundwater in the vicinity (more than 1,000 feet) of the site, it is expected that the benzene will naturally attenuate before reaching a receptor through the groundwater pathway.

9.12.6 Human Health Preliminary Risk Evaluation of SWMU 27F, Northeast of Building 1340

SRCs were identified for the following media: surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.12.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat, is primarily covered by concrete, and contains man-made structures; however, a small area of managed grass does exist between the concrete and the fence. Consequently, soil erosion via fugitive dust or surface water runoff is not a viable migration pathway.

Because groundwater is lower than the adjacent drainage ditch and there are no other surface water bodies nearby, groundwater at the site does not discharge into any nearby surface waters. Therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.12-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways are taken into consideration when deriving the screening values.

9.12.6.2 Risk evaluation

The results of the human health risk screening are given below.

Three volatile organics (toluene, ethylbenzene, and total xylenes) were identified as SRCs for surface soil. The concentrations of these contaminants were below their respective screening values (Table 9.12-7); therefore, there are no HHCOPCs in surface soil.

The SRCs for subsurface soils included eight VOCs and four SVOCs (PAHs). The concentrations of all these contaminants were below their respective screening values (Table 9.12-7). Therefore, there are no HHCOPCs in subsurface soil.

9.12.6.3 Uncertainties

Potential uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.12.7 Ecological Preliminary Risk Evaluation of SWMU 27F, Northeast of Building 1340

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.12.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

Because there are no ESVs for soil, all analytes detected in soil were evaluated further in EPRE Steps ii through v.

9.12.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 9.12.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.12.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

9.12.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated soil or biota exposed to contaminated soil or by ingestion of drinking water. The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

9.12.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil are presented in Table 9.12-8. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. There are no ECOPCs present in surface soil at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for VOCs does not exceed one.

9.12.8 Conclusions and Risk Management and Site Recommendations for SWMU 27F, Northeast of Building 1340

9.12.8.1 Conclusions

Nature and Extent of Contamination

- The SRCs in surface soil include ethylbenzene, toluene, and total xylenes.

- The SRCs in subsurface soil include the following VOCs: 1,1-dichloroethane; 2-butanone; acetone; benzene; ethylbenzene; styrene; toluene; and total xylenes. SVOCs that are SRCs in subsurface soil include anthracene, phenanthrene, 2-methylnaphthalene, and naphthalene. These organic SRCs were most frequently detected at GP3.

- No VOCs were detected in groundwater.

- Methylene chloride was detected at one Geoprobe location (GP1) at a concentration (5.2 µg/L) slightly above its MCL (5 µg/L). The location was resampled, and methylene chloride was not detected, indicating that the initial methylene chloride concentration was due to field or laboratory contamination. Methylene chloride is not an SRC in groundwater.

- Bis(2-ethylhexyl)phthalate was detected at two Geoprobe locations (GP1 and GP2); however, bis(2-ethylhexyl)phthalate was not detected in a second groundwater sample collected from a monitoring point at the GP2 location or the monitoring well installed at the GP1 location. The initial bis(2-ethylhexyl)phthalate concentration was confirmed to be due to field or laboratory contamination; therefore, bis(2-ethylhexyl)phthalate is not an SRC in groundwater at SWMU 27J.

Fate and Transport

- Benzene exceeded its GSSL and is considered to be a CMCOPC in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for surface or subsurface soils.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in surface soil for terrestrial receptors.

9.12.8.2 Risk management and site recommendations

- Benzene is considered to be a CMCOPC in soils based on its potential to leach into groundwater. Benzene was detected in only one of four soil samples (surface and subsurface). Benzene was not detected in groundwater. The model used to identify CMCOPCs is extremely conservative, and organic contaminants migrating to groundwater are likely to be removed by natural attenuation processes (e.g., biodegradation and Redox). Therefore, benzene is not expected to present a significant risk to human health and does not require further investigation and/or evaluation.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27F, northeast of Building 1340 regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's Subpart B permit be modified to reflect an NFA status for this SWMU. Permanent monitoring points GP1 and GP2 located at the site will be properly abandoned within 90 days of approval of this report. MW1 will remain in place to support the former UST 100B (Facility 9-089081) investigation (SAIC 1999d).

Table 9.12-1. Monitoring Well Construction, Summary of Geotechnical Analyses, Well Development Summary, and Field Parameter Measurements during Groundwater Sampliug for Monitoring Well MW1, SWMU 27F (Northeast of Building 1340)

MONITORING WELL CONSTRUCTION							
Well No.	Date Installed	Size/Type	Coordinates	Total Depth (feet)	Screen Interval (feet bgs)	Top of Filter Pack Elevation (feet bgs)	Top of Casing Elevation (feet)
27F-MW1	10/11/99	2-inch PVC	N 684695.62 E 821829.93	15.0	3.15 to 13.15	2.0	68.33

Note: All elevations are NGVD 1929.

SUMMARY OF GEOTECHNICAL ANALYSES						
Station	Sample ID	Depth (feet)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
27F-MW1	7K1173	10 to 12	25.39	21.5	21.4	0.1
Station	Sample ID	Depth (feet)	Class	Gravel (%)	Sand (%)	Fines (%)
27F-MW1	7K1173	10 to 12	ML	0.35	82.55	17.10

WELL DEVELOPMENT SUMMARY					
Well No.	Date	Total Development Time (hours)	Total Volume Removed (gallons)	Final Turbidity Reading (NTUs)	Total Well Depth (feet)
27F-MW1	10/14/99	3 hours	55	3.5	13.10

FIELD PARAMETER MEASUREMENTS DURING GROUNDWATER SAMPLING							
Parameter	Date	pH (su)	Condnctivity (mS/cm)	Temperature (°C)	Turbidity (NTUs)	DO (mg/L)	Redox (mV)
27F-MW1	11/01/99	5.68	85.0	22.86	8.9	1.26	111.3

Table 9.12-2. Summary of Analytes Detected in Surface Soil, SWMU 27F (Northeast of Building 1340)

Station	Reference Background Criteria	7KGP2
Sample ID		7K1212
Date		05/07/98
Depth (feet)		0 to 2
Sample Type		Grab
Volatile Organic Compounds (mg/kg)		
Ethylbenzene	0.00	**0.0138**
Toluene	0.00	**0.0292**
Xylenes, total	0.00	**0.0632**
Metals (mg/kg)		
Lead	8.81	6.4

Bold indicates concentrations above reference background criteria.

Table 9.12-3. Summary of Analytes Detected in Subsurface Soil, SWMU 27F (Northeast of Building 1340)

Station	Reference Background Criteria	7KGP1	7KGP3	7KGP4
Sample ID		7K1111	7K1312	7K1411
Date		01/17/98	05/06/98	2/03/98
Depth (feet)		10 to 12	4 to 6	6 to 7
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
1,1-Dichloroethane	0.00		**0.0045**	
2-Butanone	0.00		**0.0304**	
Acetone	0.00	**0.0625**	**0.101**	**0.056**
Benzene	0.00		**0.0728**	
Ethylbenzene	0.00		**0.573**	
Styrene	0.00		**0.0284**	
Toluene	0.00		**1.11**	
Xylenes, total	0.00		**2.5**	
Semivolatile Organic Compounds (mg/kg)				
2-Methylnaphthalene	0.00		**1.18**	
Anthracene	0.00		**0.235**	
Naphthalene	0.00		**0.279**	
Phenanthrene	0.00		**0.716**	
Metals (mg/kg)				
Lead	11.10	7	4.9	6.3

Bold indicates concentrations above reference background criteria.

Table 9.12-4. Summary of Detected Analytes in Groundwater, SWMU 27F (Northeast of Building 1340)

Station	Reference Background Criteria	MCL	7KGP1	7KGP1	7KGP2	7KGP2	7KGP3	7KGP4	7KMW1
Sample ID			7K4111	7K4212	7K4211	7K4112	7K4311	7K4411	7K4171
Date			01/17/98	08/26/99	01/17/98	08/26/99	01/17/98	02/03/98	11/02/99
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)									
Methylene chloride	0.00	5			5.2[b]				NA
Semivolatile Organic Compounds (µg/L)									
Bis(2-ethylhexyl)phthalate	0.00	6	**6.9[a]**	**6.5[a]**	**5.5[b]**				

[a]A monitoring well (MW1) was installed at the GP1 sample location, and the groundwater was resampled using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected in the groundwater from the monitoring well, indicating that the initial detection was the result of field or laboratory contamination.

[b]A 3/4-inch-diameter monitoring point was installed at the GP2 sample location, and the groundwater was resampled. Methylene chloride and bis(2-ethylhexyl)phthalate were not detected in the groundwater from the monitoring point, indicating that the initial detections were the result of field or laboratory contamination.

Bold indicates concentrations above reference background criteria.

Boxed *italic* indicates concentrations above MCLs.

NA = Not analyzed.

Table 9.12-5. Summary of Site-related Contaminants, SWMU 27F (Northeast of Building 1340)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
1,1-Dichloroethane	ND	0.0045	NP	ND	NP
2-Butanone	ND	0.0304	NP	ND	NP
Acetone	ND	0.101	NP	ND	NP
Benzene	ND	0.0728	NP	ND	NP
Ethylbenzene	0.0138	0.573	NP	ND	NP
Styrene	ND	0.0284	NP	ND	NP
Toluene	0.0292	1.11	NP	ND	NP
Xylenes, total	0.0632	2.5	NP	ND	NP
Semivolatile Organic Compounds					
2-Methylnaphthalene	ND	1.18	NP	ND	NP
Anthracene	ND	0.235	NP	ND	NP
Naphthalene	ND	0.279	NP	ND	NP
Phenanthrene	ND	0.716	NP	ND	NP

ND = Not detected.

NP = No pathway exists.

Table 9.12-6. GSSL Screening of Site-related Contaminants in Soil, SWMU 27F (Northeast of Building 1340)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
1,1-Dichloroethane	0.0045	23	No
2-Butanone[b]	0.0304	7.685	No
Acetone	0.101	16	No
Benzene	0.0728	0.03	Yes
Ethylbenzene	0.573	13	No
Styrene	0.0284	4	No
Toluene	1.11	12	No
Xylenes, total	2.5	190	No
Semivolatile Organic Compounds (mg/kg)			
2-Methylnaphthalene[b]	1.18	22.574	No
Anthracene	0.235	12,000	No
Naphthalene	0.279	84	No
Phenanthrene[b, c]	0.716	80.4	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

[c]RBC of surrogate pyrene is used to develop GSSL for phenanthrene.

Table 9.12-7. Human Health Risk Screening for Surface Soil and Subsurface Soil, SWMU 27F (Northeast of Building 1340)

SURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Ethylbenzene	1/1	0.0138	0.0138	780	No	Max Detect < Risk Criteria
Toluene	1/1	0.0292	0.0292	1,600	No	Max Detect < Risk Criteria
Xylenes, total	1/1	0.0632	0.0632	16,000	No	Max Detect < Risk Criteria

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
1,1-Dichloroethane	1/3	0.0045	0.0045	780	No	Max Detect < Risk Criteria
2-Butanone	1/1	0.0304	0.0304	4,700	No	Max Detect < Risk Criteria
Acetone	3/3	0.056	0.101	780	No	Max Detect < Risk Criteria
Benzene	1/3	0.0728	0.0728	22	No	Max Detect < Risk Criteria
Ethylbenzene	1/3	0.573	0.573	780	No	Max Detect < Risk Criteria
Styrene	1/3	0.0284	0.0284	1,600	No	Max Detect < Risk Criteria
Toluene	1/3	1.11	1.11	1,600	No	Max Detect < Risk Criteria
Xylenes, total	1/3	2.5	2.5	16,000	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
2-Methylnaphthalene	1/3	1.18	1.18	160	No	Max Detect < Background
Anthracene	1/3	0.235	0.235	2,300	No	Max Detect < Risk Criteria
Naphthalene	1/3	0.279	0.279	156	No	Max Detect < Risk Criteria
Phenanthrene	1/3	0.716	0.716	2,300	No	Max Detect < Risk Criteria

Table 9.12-8. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27F (Northeast of Building 1340)

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = C_{Max} × BAF_i × IR_S	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = C_{Max} × BAF_i × IR_R	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
Ethylbenzene	0.0138	5.00E-02	3.66E-04	2.13E+01	1.71E-05	1.05E-03	No TRV	No HQ
Toluene	0.0292	5.00E-02	7.74E-04	3.09E+01	2.50E-05	2.22E-03	No TRV	No HQ
Xylenes, total	0.0632	5.00E-02	1.67E-03	2.45E+00	6.84E-04	4.80E-03	No TRV	No HQ
				HI=	7.26E-04		**HI=**	0.00E+00

ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

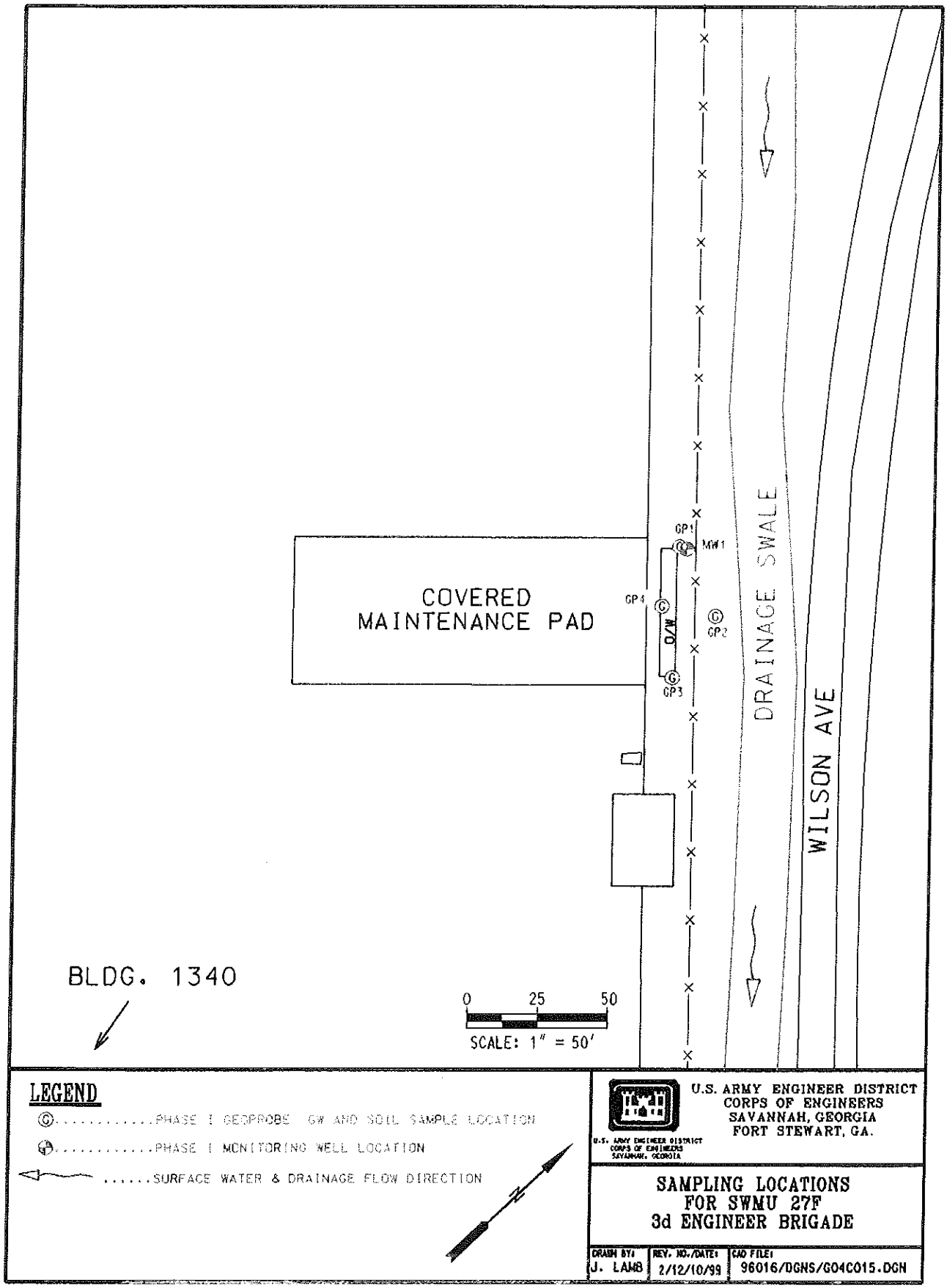

Figure 9.12-1. Sampling Locations, SWMU 27F (Northeast of Building 1340)

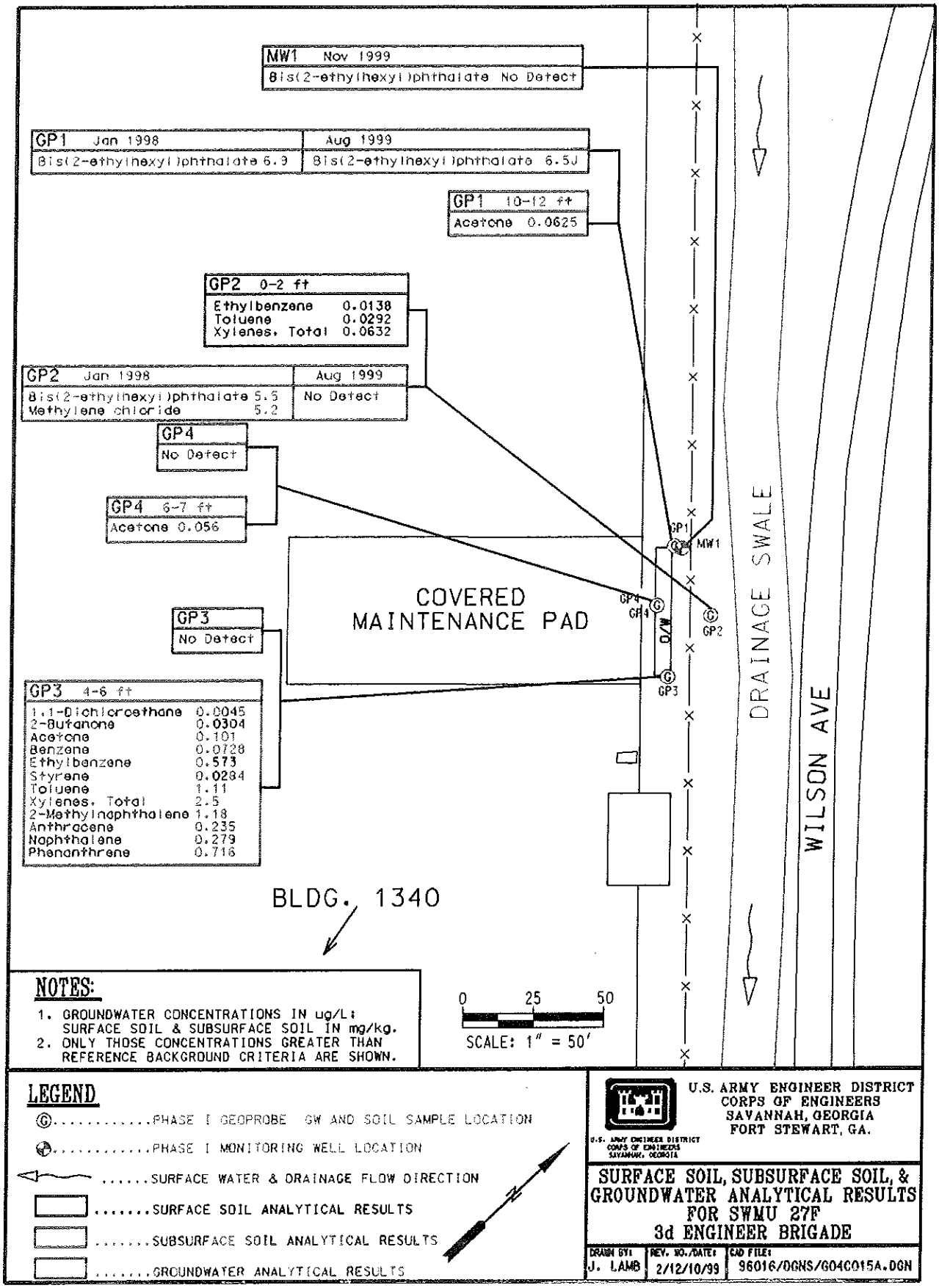

Figure 9.12-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27F (Northeast of Building 1340)

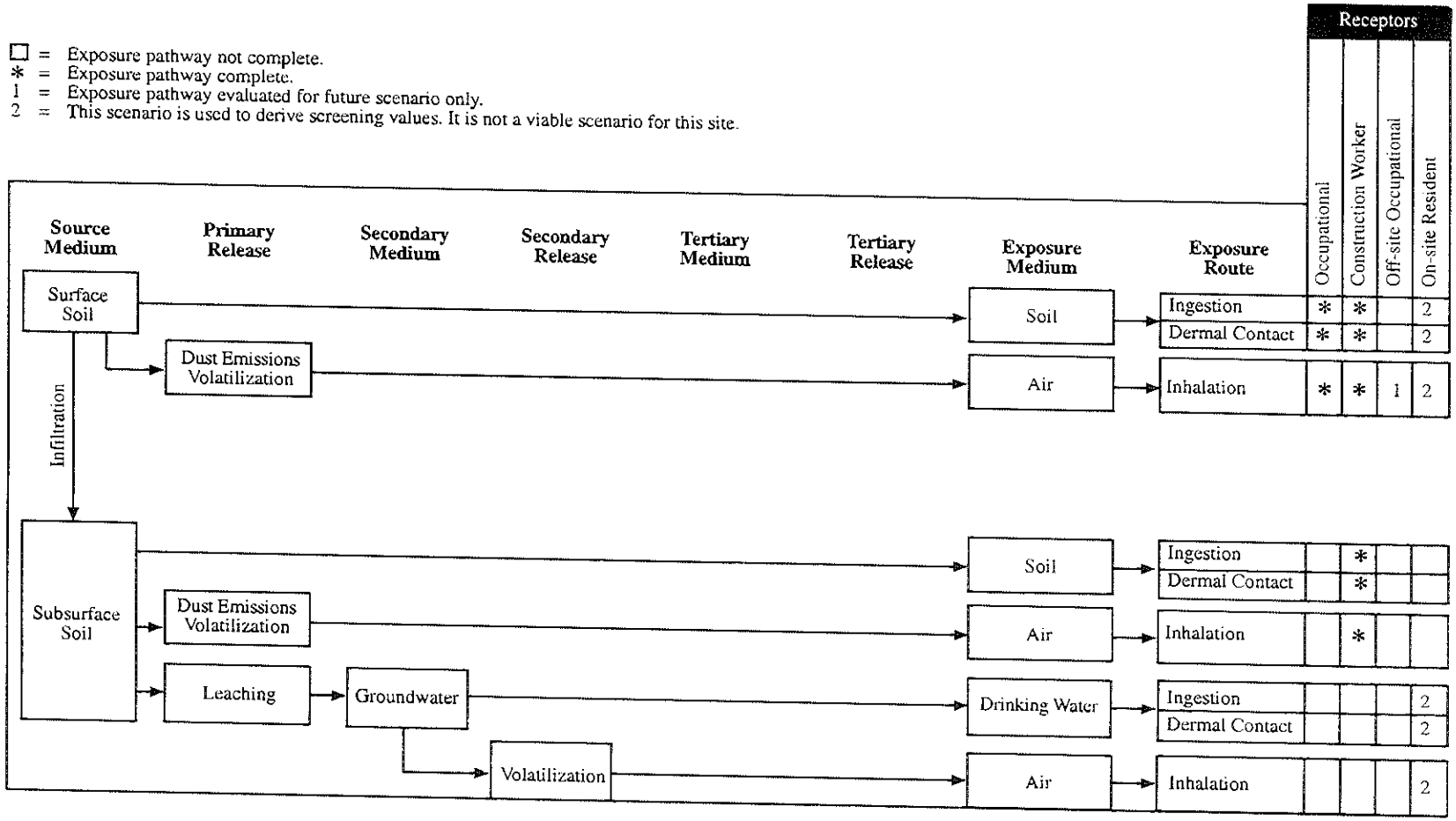

Figure 9.12-3. Potential Migration and Exposure Pathways, SWMU 27F (Northeast of Building 1340)

9.13 SWMU 27G: DISCOM MAINTENANCE FACILITY

9.13.1 History and Description of SWMU 27G, DISCOM Maintenance Facility

SWMU 27G is an OWS that supports vehicle maintenance activities within the DISCOM Maintenance Facility. The OWS is located adjacent to a covered maintenance pad identified as Building 4531 (Figure 9.13-1). Maintenance activities for military vehicles are performed at the maintenance pad. Floor drains from the maintenance pad are piped to the OWS. In addition, residual oil from collection and storage containers, filters, and such is allowed to drain onto the grating that covers the OWS. The effluent from the OWS discharges to the IWTP, and the oil is pumped out of the holding unit and burned at the Central Energy Plant. No previous investigations have been performed at the site.

9.13.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater samples are presented in Figure 9.13-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

9.13.3 Physical Characteristics of the Site

9.13.3.1 Topography

The topography of the OWS site is essentially flat. The OWS is located in the gravel border between the covered maintenance shed and the motorpool boundary fence. The west side of the OWS is a covered, concrete maintenance area and concrete vehicle parking area. The surface elevation is approximately 69.5 feet amsl.

9.13.3.2 Surface drainage

There is a drainage ditch southeast of the OWS and the motorpool boundary fence. The drainage ditch receives runoff from the vehicle parking area and outside storage area west of the OWS. Surface water is primarily present in the drainage ditch only after rainfall events. During periods of heavy rainfall, the surface water may potentially make it to Mill or Taylors Creek. The OWS discharges to the IWTP; therefore, there are no surface water/sediment pathways at this site.

9.13.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.13.3.4 Hydrogeology

Groundwater was encountered at approximately 4.5 feet bgs.

9.13.3.5 Ecology

As stated in Section 8.2, SWMU 27G is classified as an "industrialized area with managed grassland." The site is comprised of approximately 0.01 acre and contains little in the way of habitat. A wooded area exists beyond the SWMU boundaries to the west and south. A small strip of gravel and sporadic patches of grass occur along the fence line.

9.13.4 Nature and Extent of Contamination

9.13.4.1 Surface soil

The surface soil interval did not indicate elevated VOC concentrations based on PID field headspace readings; therefore, no surface soil samples were collected at the site.

9.13.4.2 Subsurface soil

Subsurface soil samples were collected at all locations (see Figure 9.13-2). These samples were selected for analysis based on field headspace screening for VOCs. Analytical results are summarized in Table 9.13-1 and Figure 9.13-2.

VOCs. Acetone, 2-butanone, and total xylenes were detected above the analytical detection limits in subsurface soil. Acetone and 2-butanone were detected at only GP3 at concentrations of 0.085 mg/kg and 0.0118 mg/kg, respectively. Total xylenes were detected at only GP4 at a concentration of 0.0031 mg/kg. No VOCs were detected above the analytical detection limits at GP1 or GP2. The SRCs in subsurface soil include 2-butanone, acetone, and total xylenes.

SVOCs. No SVOCs were detected above the analytical detection limits in subsurface soil samples.

Lead. Lead was not detected at levels exceeding the reference background criterion in subsurface soil samples.

9.13.4.3 Groundwater

With the use of DPT techniques, groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analyses are presented in Table 9.13-2 and Figure 9.13-2.

VOCs. No VOCs were detected above the analytical detection limits in subsurface soil samples.

SVOCs. SVOCs detected above the analytical detection limits in groundwater samples include bis(2-ethylhexyl)phthalate and naphthalene. Bis(2-ethylhexyl)phthalate was detected above its respective MCL at GP2 at a concentration of 160 µg/L. Bis(2-ethylhexyl)phthalate was believed to be the result of laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), the groundwater at GP2 was resampled for only bis(2-ethylhexyl)phthalate on August 26, 1999. The groundwater was collected from a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack that was installed to intersect the water table. The resampling monitoring point was installed approximately 1 foot away from the previous sampling location (GP2). Bis(2-ethylhexyl)phthalate was not detected during the resampling event. The elevated concentration of bis(2-ethylhexyl)phthalate initially detected was considered to be the result of field or laboratory contamination; therefore, bis(2-ethylhexyl)phthalate is not an SRC at SWMU 27G. Naphthalene was detected at GP3 at a concentration of 6.1 µg/L. Naphthalene is the only SRC in groundwater at the site.

Lead. Lead was not detected in the groundwater samples collected; therefore, lead is not an SRC.

9.13.4.4 Surface water

No surface water samples were collected at this SWMU because no surface water pathway exists, as the OWS discharges directly to the IWTP.

9.13.4.5 Sediment

No sediment samples were collected at this SWMU because no sediment pathway exists, as the OWS discharges directly to the IWTP.

9.13.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are summarized in Table 9.13-3.

9.13.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in subsurface soil, none of the analytes exceeded their respective GSSLs (Table 9.13-4); therefore, there are no CMCOPCs in soil at SWMU 27G.

9.13.6 Human Health Preliminary Risk Evaluation of SWMU 27G

SRCs were identified for subsurface soil and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.13.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. Soil contamination at this site is limited to subsurface soil; therefore, only a construction worker or other individuals working within an excavation are likely to be exposed to contaminants.

Groundwater at this site is not currently used, and groundwater does not discharge to surface waters; therefore, exposure to constituents in groundwater is unlikely.

Given that contamination in soils is limited to subsurface soils and that land use at the site is not likely to change, the future potential receptor populations will probably be the same as the current ones. Similarly, groundwater at this site is not likely to be used for any purpose in the future.

Migration and Exposure Pathway Analysis

The site is relatively flat and is surrounded by gravel and concrete pads and structures. Sporadic patches of grass occur in the small strip of gravel located along the fence line. Potential migration pathways for soils include leaching into groundwater. Soil contamination at the site is limited to subsurface soils; therefore, air migration pathways (e.g., volatilization, fugitive dust) and surface water runoff are not viable migration pathways.

Because of the shallow depth of the adjacent drainage ditch, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.13-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.13.6.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for subsurface soils included three VOCs: 2-butanone, acetone, and total xylenes. The concentrations of these contaminants were below their respective screening values (Table 9.13-5); therefore, there are no HHCOPCs in subsurface soils.

Naphthalene was the only SRC for groundwater. The maximum concentration of naphthalene, 6.1 µg/L, exceeded its screening value of 0.65 µg/L (Table 9.13-5); therefore, naphthalene is an HHCOPC for groundwater at this site.

9.13.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.13.7 Ecological Preliminary Risk Evaluation of SWMU 27G

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the EPRE are presented below.

9.13.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site. Surface soils were not evaluated because no surface soil samples were collected.

One SVOC (naphthalene) was detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.13-6. The maximum concentration of naphthalene was less than the ESV; therefore, naphthalene is not an ECOPC.

9.13.8 Conclusions and Risk Management and Site Recommendations of SWMU 27G

9.13.8.1 Conclusions

Nature and Extent of Contamination

- Field VOC screening did not indicate any contamination in surface soil; therefore, surface soil samples were not collected.

- The SRCs in subsurface soil include the following VOCs: 2-butanone, acetone, and total xylenes. Lead was not detected in subsurface soils at levels exceeding the reference background criterion.

- Bis(2-ethylhexyl)phthalate was detected above its MCL in one of four groundwater samples. The location (GP2) was resampled in August 1999, and bis(2-ethylhexyl)phthalate was not detected, indicating that the initial bis(2-ethylhexyl)phthalate concentration was due to field or laboratory contamination. Bis(2-ethylhexyl)phthalate is not an SRC in groundwater.

- Naphthalene was detected in one of four groundwater samples and is considered to be the only SRC in groundwater.

Fate and Transport

- SRCs identified in subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for subsurface soils.

- Naphthalene is an HHCOPC in groundwater.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in groundwater at the site.

9.13.8.2 Risk management and site recommendations

- No CMCOPCs were identified in soil. No HHCOPCs were identified in surface or subsurface soil. No ECOPCs were identified in surface soil or groundwater. Naphthalene was identified as the only HHCOPC in groundwater. The results of the human health baseline risk assessment (Attachment 9.13A) for naphthalene indicate that exposure to naphthalene in groundwater is not likely to result in significant adverse health effects; therefore, further investigation and/or evaluation of naphthalene at SWMU 27G is not warranted.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27G regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU. Upon GEPD approval of this report, Fort Stewart will properly abandon the monitoring point at the GP2 location within 90 days.

Table 9.13-1. Summary of Analytes Detected in Subsurface Soil, SWMU 27G

Station	Reference Background Criteria	7MGP1	7MGP2	7MGP3	7MGP4
Sample ID		7M1111	7M1211	7M1311	7M1411
Date		01/27/98	01/27/98	01/27/98	01/27/98
Depth (feet)		2 to 4	2 to 4	2 to 4	5 to 7
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
2-Butanone	0.00			**0.0118**	
Acetone	0.00			**0.085**	
Xylenes, total	0.00				**0.0031**
Metals (mg/kg)					
Lead	11.10	4.2	3.5	4.5	2.7

Bold indicates concentrations above reference background criteria.

Table 9.13-2. Summary of Analytes Detected in Groundwater, SWMU 27G

Station	Reference Background Criteria	MCL	7MGP1	7MGP2	7MGP2	7MGP3	7MGP4
Sample ID			7M4111	7M4211	7M4212	7M4311	7M4411
Date			01/27/98	01/27/98	08/26/99	01/27/98	01/28/98
Sample Type			Grab	Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (µg/L)							
Bis(2-ethylhexyl)phthalate	0.00	6		***160***[a]			
Naphthalene	0.00				NA	6.1	

[a]With the concurrence of GEPD, a 3/4-inch-inside-diameter monitoring point was installed at GP2, and the groundwater was resampled for bis(2-ethylhexyl)phthalate in August 1999. Bis(2-ethylhexyl)phthalate was not detected during the resampling; therefore, the initial bis(2-ethylhexyl)phthalate is considered to have been the result of field or laboratory contamination.

Bold indicates concentrations above reference background criteria.

Boxed *italic* indicates concentrations above MCLs.

NA = Not analyzed.

Table 9.13-3. Summary of Site-related Contaminants, SWMU 27G

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
2-Butanone	NC	0.0118	NP	ND	NP
Acetone	NC	0.085	NP	ND	NP
Xylenes, total	NC	0.0031	NP	ND	NP
Semivolatile Organic Compounds					
Naphthalene	NC	ND	NP	6.1	NP
Metals					
Lead	NC	ND	NP	ND	NP

NC = Not collected based on field screening results.

ND = Not detected above reference background criteria.

NP = No pathway exists.

Table 9.13-4. GSSL Screening of Site-related Contaminants in Soil, SWMU 27G

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
2-Butanone[b]	0.0118	7.685	No
Acetone	0.085	16	No
Xylenes, total	0.0031	190	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

Table 9.13-5. Human Health Risk Screening for Subsurface Soil and Groundwater, SWMU 27G

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Deteet	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
2-Butanone	1/1	0.0118	0.0118	4,700	No	Max Detect < Risk Criteria
Acetone	1/1	0.085	0.085	780	No	Max Detect < Risk Criteria
Xylenes, total	1/4	0.0031	0.0031	16,000	No	Max Detect < Risk Criteria

GROUNDWATER						
Analysis	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Semivolatile Organic Compounds (µg/L)						
Naphthalene	1/4	6.1	6.1	0.65	Yes	Max Detect >Risk Criteria

Table 9.13-6. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27G

Analyte	SWMU 27G Maximum	ESV	ECOPC Aquatic Biota?	Justification
Semivolatile Organic Compounds (µg/L)				
Naphthalene	6.1	62	No	Max Detect < ESV

ESV = EPA Region IV ESVs (EPA 1996a) and, where indicated, alternative values for analytes without ESVs.

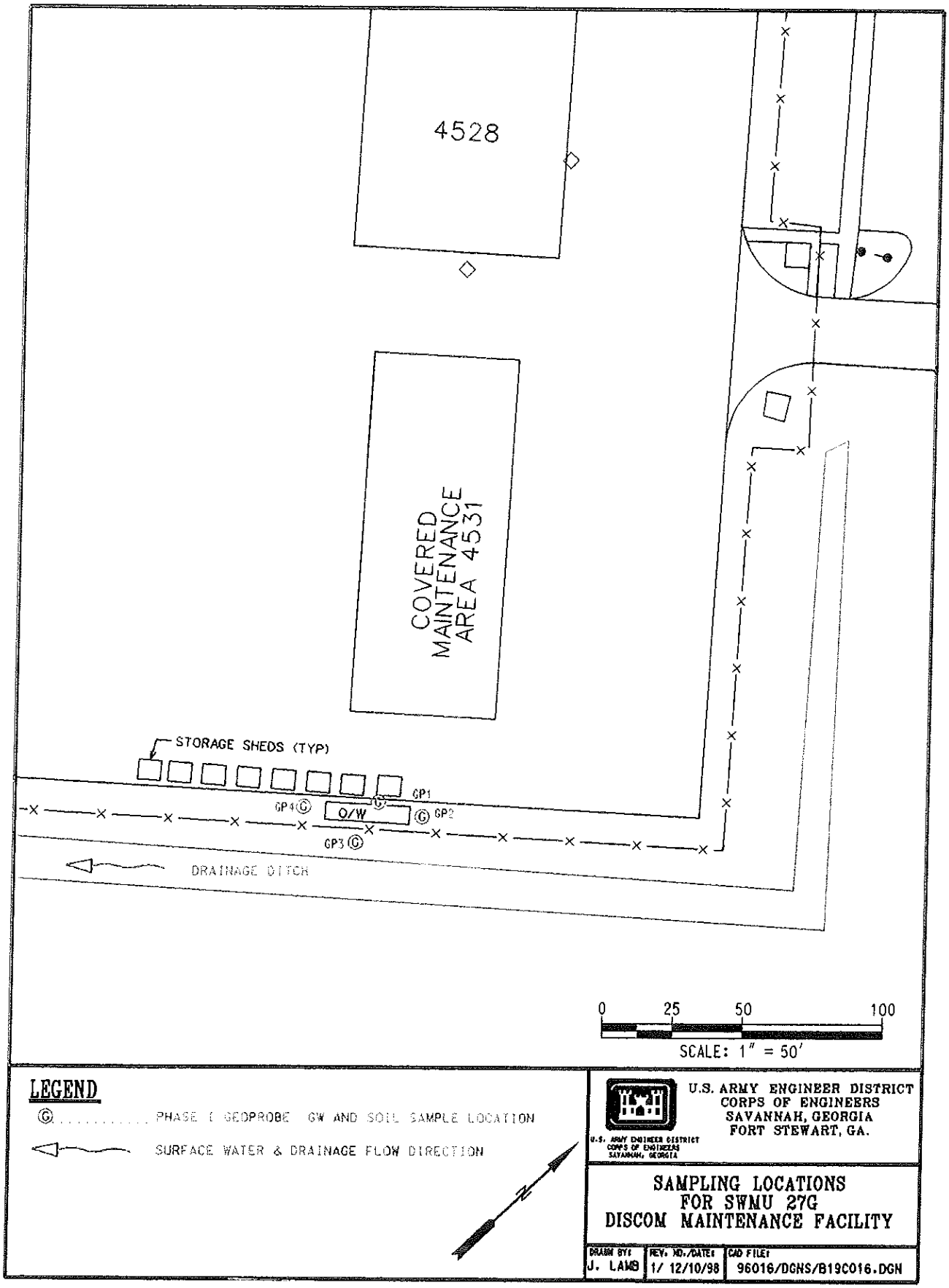

Figure 9.13-1. Sampling Locations, SWMU 27G

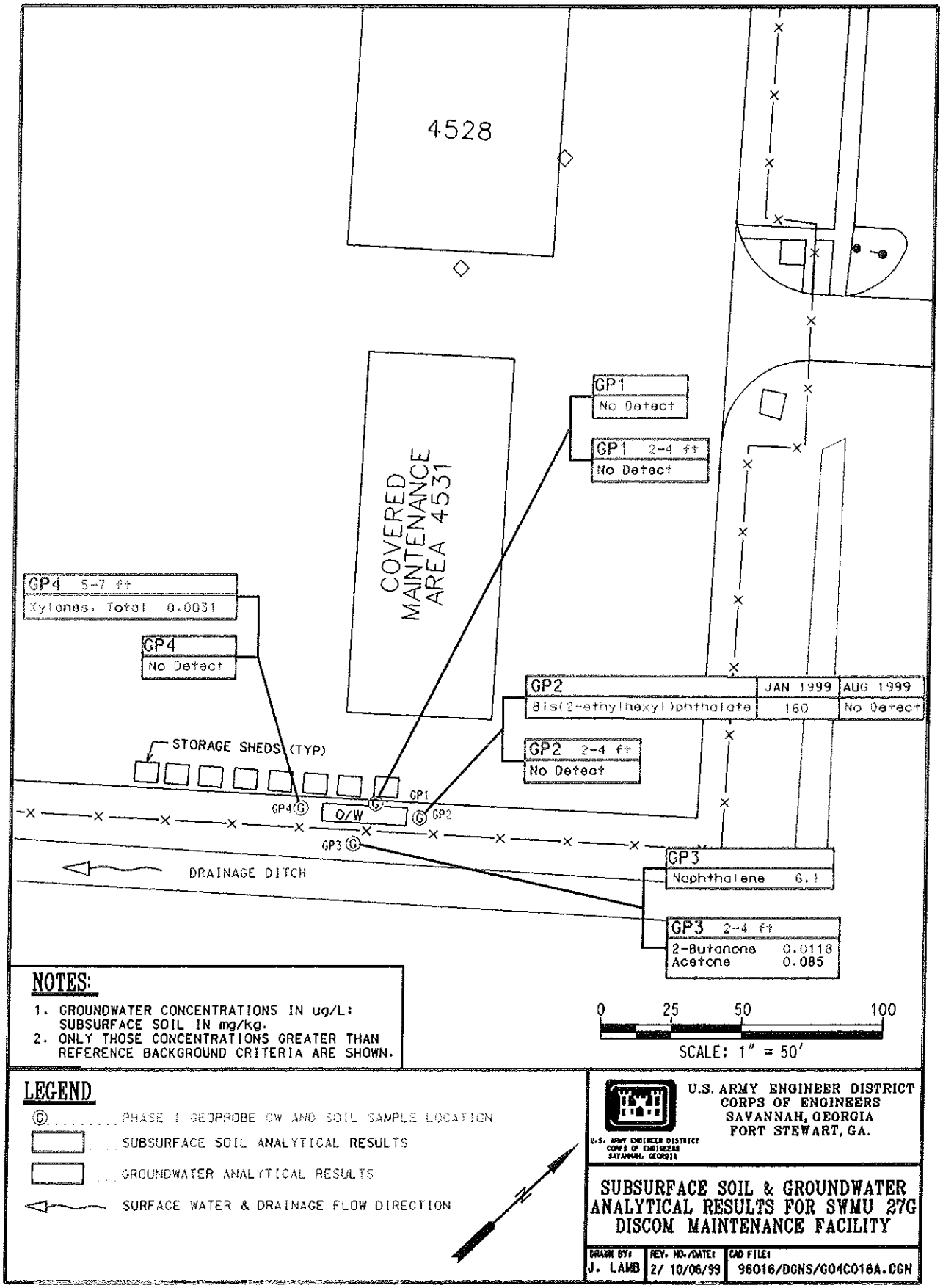

Figure 9.13-2. Summary of Analytical Results in Subsurface Soil and Groundwater, SWMU 27G

☐ = Exposure pathway not complete.
* = Exposure pathway complete.
1 = Exposure pathway evaluated for future scenario only.
2 = This scenario is used to derive screening values. It is not a viable scenario for this site.

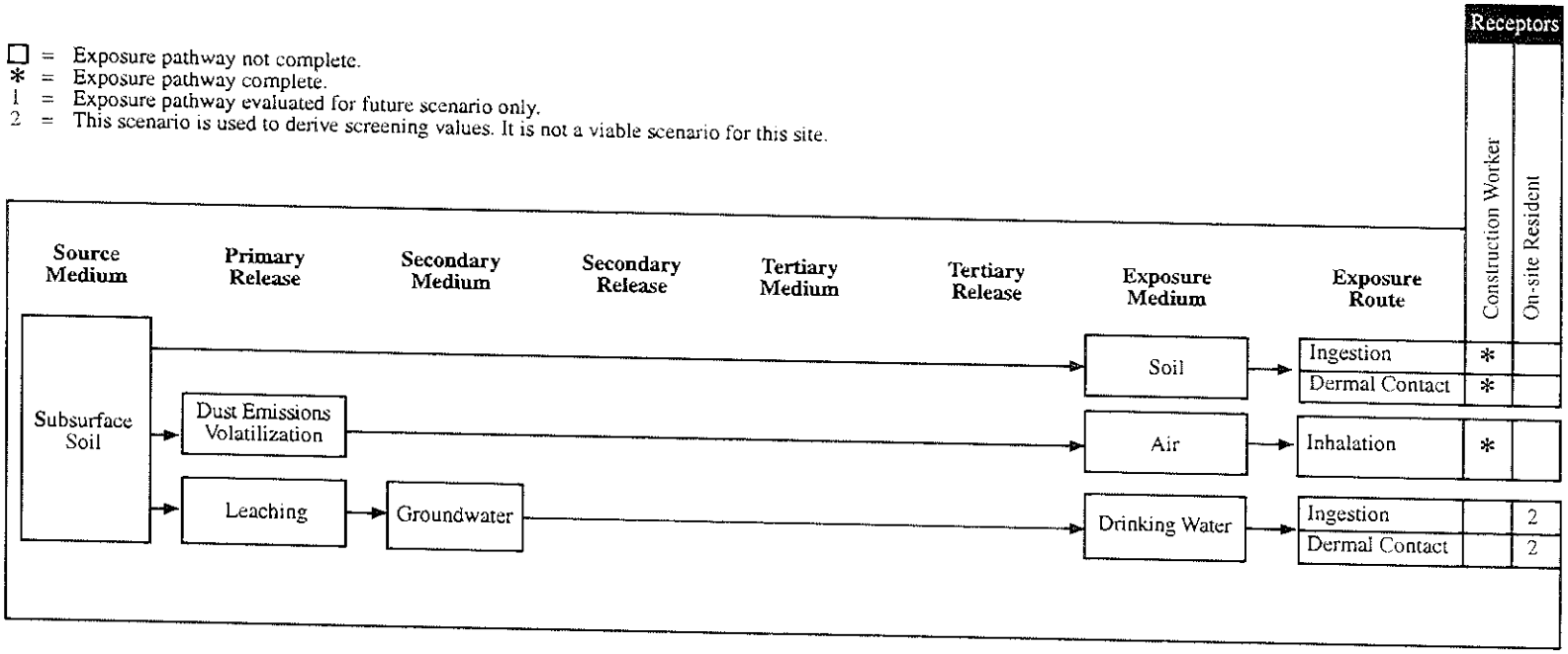

Figure 9.13-3. Potential Migration and Exposure Pathways, SWMU 27G

ATTACHMENT 9.13A
SWMU 27G: DISCOM MAINTENANCE FACILITY

HUMAN HEALTH BASELINE RISK ASSESSMENT

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ATTACHMENT 9.13A
SWMU 27G: DISCOM MAINTENANCE FACILITY
HUMAN HEALTH BASELINE RISK ASSESSMENT

The human health baseline risk assessment consists of five elements: (1) identification of COPCs, (2) exposure assessment, (3) toxicity assessment, (4) risk characterization, and (5) assessment of uncertainty.

9.13A.1 IDENTIFICATION OF COPCS

The CMCOPCs and HHCOPCs have been discussed in the sections on contaminant fate and transport (Section 9.13.5) and the HHPRE (Section 9.13.6), respectively. There are no CMCOPCs or HHCOPCs in soils. Naphthalene was identified as an HHCOPC in groundwater.

9.13A.2 EXPOSURE ASSESSMENT

The exposure assessment quantifies the amount of a COPC an individual may come in contact with at each site. The exposure assessment considers all pathways of potential human exposure, the magnitude of exposure, and the frequency and duration of exposure. The process for estimating exposure consists of the following elements: (1) characterization of the exposure setting in terms of the physical and demographic characteristics of the site, (2) identification of receptor populations, (3) identification of the exposure pathways by which an individual may come in contact with a COPC, (4) estimation of the exposure point concentration, and (5) quantification of the intake or dose to which an individual may be exposed.

9.13A.2.1 Exposure Setting

The exposure setting describes the physical features at the site that are important when identifying the human populations that may be exposed to COPCs, either currently or in the future.

This OWS site is comprised of approximately 0.01 acre in the southwestern portion of the garrison area. The site is surrounded by grass on three sides, with the remaining (northwest) side being concrete. A drainage ditch is located approximately 25 feet southeast of the site. The ditch is shallow (less than 2 feet bgs), and groundwater (located at 4.5 feet bgs) is unlikely to discharge into the drainage ditch.

9.13A.2.2 Identification of Potential Receptor Populations and Exposure Pathways

A complete exposure pathway consists of four elements: (1) a source of contamination, (2) a transport or retention medium, (3) a point of contact with the chemical, and (4) a route of exposure (ingestion, dermal absorption, or inhalation) at the point of contact through which the chemical may be taken into the body. When all of these elements are present, the pathway is considered to be complete.

The COPCs at this site are limited to groundwater. Given that groundwater is not currently used for any purpose at this site, there are no current on-site or off-site receptor populations.

The potential on-site receptor populations for the future land-use scenario include an Installation worker and a resident. For the purposes of this risk assessment, it was assumed that groundwater drinking wells

had been placed at the site. The potential exposure pathway for the on-site Installation worker would be ingestion of drinking water.

The on-site resident is presented for baseline purposes and is not considered to be a viable receptor population. Potential exposure pathways for the on-site resident include ingestion and dermal contact. Given that naphthalene is not a volatile constituent, exposure via inhalation is not considered to be a viable pathway.

For the purposes of this human health baseline risk assessment, an off-site receptor is defined as a receptor population that is located outside of the boundaries of the SWMU. There are no surface water bodies in the area. The adjacent drainage ditch is too shallow to intercept groundwater at the site. Therefore, off-site exposure to COPCs in groundwater will be limited to use of groundwater drinking wells, theoretically located adjacent to the SWMU boundary. However, given the limited size of this site, less than 0.1 acre, it is unlikely that groundwater concentrations would change significantly between the on-site and off-site locations. Therefore, off-site risks associated with the use of groundwater as a drinking water source will not be quantified.

9.13A.2.3 Estimation of Exposure Concentrations

The estimation of exposure concentrations for on-site receptors to HHCOPCs in groundwater is discussed in Appendix I, Section I.2.3. The concentration of naphthalene in groundwater was calculated using the analytical groundwater results. The maximum concentration of naphthalene [6.1 µg/L (0.0061 mg/L)] detected in groundwater was used as the exposure concentration.

9.13A.2.4 Quantification of Exposure

The equations and exposure factors used to estimate exposures to receptor populations are discussed in Appendix I, Section I.2.4. The exposure parameter values used to estimate potential exposures are given in Table 9.13A-1.

The adult resident is used to evaluate potential carcinogenic risks associated with exposure to COPCs in groundwater. Naphthalene is classified as a Class C carcinogen (possible human carcinogen); however, naphthalene does not have an oral slope factor (EPA 1999a). Therefore, the oral and dermal pathways were not quantified for an adult resident because the potential risks to the adult resident cannot be quantified.

The estimated intakes for the Installation worker and the child resident are given in Tables 9.13A-2 and 9.13A-3, respectively.

9.13A.3 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to determine the increased likelihood and magnitude of adverse human health effects based on the extent of exposure to contamination. The toxicity assessment for SWMU 27G was carried out as described in Appendix I, Section I.3. Naphthalene has an oral reference dose of 0.02 mg/kg/day and a calculated dermal reference dose of 0.016 mg/kg/day (EPA 1999a). There are no slope factors calculated for naphthalene (EPA 1999a; EPA 1997c).

9.13A.4 RISK CHARACTERIZATION RESULTS

The risk characterization follows the procedures outlined in Appendix I, Section I.4. Quantitative estimates of noncarcinogenic risks for naphthalene were calculated for each potentially complete exposure pathway.

9.13A4.1 Current Land-use Scenarios

There is no current use of groundwater at this site; therefore, current land-use receptors are not at risk from exposure to naphthalene in groundwater.

9.13A.4.2 Future Land-use Scenarios

Future potential on-site receptors are an Installation worker and a resident child, both of which may be exposed to naphthalene as a result of using groundwater as a drinking water source. The potential risk to the on-site resident was evaluated for only a child, given that the child is at greater potential risk than an adult from exposure to noncarcinogenic constituents in groundwater. The potential risks to each of these receptor populations are discussed below.

On-site Installation Worker. The total HI for the Installation worker is 2.98×10^{-3}, which is more than two orders of magnitude below the target value of 1.0 (Table 9.13A-4); therefore, adverse systemic health risks are not expected for this receptor population.

On-site Resident Child. The total HI for the resident child is 2.04×10^{-2}, which is more than an order of magnitude below the target value (Table 9.13A-5); therefore, adverse systemic health risks are not expected for this receptor population.

Off-site Receptors. The potential off-site receptors would include an off-site Installation worker and an off-site resident. The HIs for these receptors would not be greater than those for the on-site receptors; therefore, the HIs for these receptors would be less than one, and adverse systemic health risks would not be expected for these receptor populations.

9.13A.5 UNCERTAINTY ASSESSMENT

A discussion of the general uncertainties associated with the analysis of risks at sites within the 16 SWMUs is provided in Appendix I, Section I.5.

It was conservatively assumed that the surficial aquifer that was sampled would be used as a source of drinking water. However, the surficial aquifer is not considered to be a source of potable water, and drinking water wells at FSMR are likely to use the deeper Floridan aquifer.

An oral carcinogenic slope factor was not available for naphthalene; therefore, the potential carcinogenic risks for this constituent could not be quantified.

9.13A.6 RISK SUMMARY

The HIs for the potential exposure of the Installation worker and the resident child to naphthalene in groundwater are 2.98×10^{-3} and 2.04×10^{-2}, respectively. Both values are below the target value of 1.0; therefore, naphthalene in groundwater is not likely to present a significant risk to potential receptors at this site.

Table 9.13A-1. Exposure Parameters for Potential Receptor Populations, SWMU 27G

Parameter	Units	Installation Worker	Resident Child
GROUNDWATER			
Drinking Water Ingestion			
Drinking water ingestion	L/day	1	1
Fraction ingested from area	unitless	1	1
Exposure frequency	days/year	250	350
Exposure duration	years	25	6
Body weight	kg	70	15
Carcinogen averaging time	days	25,550	NA
Noncarcinogen averaging time	days	9,125	2,190
Dermal Contact while Bathing			
Skin area	m^2	NA	0.170
Exposure time	hours/day	NA	0.33
Exposure frequency	days/year	NA	350
Exposure duration	years	NA	6
Body weight	kg	NA	15
Carcinogen averaging time	days	NA	NA
Noncarcinogen averaging time	days	NA	2,190

NA = Not applicable.

Table 9.13A-2. Estimated Intakes for Installation Worker, SWMU 27G

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a] Average Daily Dose for Noncarcinogens (mg/kg/d)
Groundwater	Naphthalene	0.0061	mg/L	5.97E-05

[a]The equation used to calculate oral exposure in groundwater is presented in Appendix I, Section I.2.4.3.

Table 9.13A-3. Estimated Intakes for Resident Child, SWMU 27G

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a] Average Daily Dose for Noncarcinogens (mg/kg/d)	Dermal Exposure[b] Average Daily Dose for Noncarcinogens (mg/kg/d)
Groundwater	Naphthalene	0.0061	mg/L	3.90E-04	1.51E-05

[a]The equations used to calculate oral and dermal exposures in groundwater are presented in Appendix I, Section I.2.4.3.

Table 9.13A-4. Hazard Indices for Installation Worker, SWMU 27G

Chemical	Groundwater	
	Oral HQ[a]	Total Hazard Index[a]
Naphthalene	2.98E-03	2.98E-03

[a]The equations used to calculate noncarcinogenic risks are presented in Appendix I, Section I.4.2.

Table 9.13A-5. Hazard Indices for Resident Child, SWMU 27G

Chemical	Groundwater		
	Oral HQ[a]	Dermal HQ[a]	Total Hazard Index[a]
Naphthalene	1.95E-02	9.43E-04	2.04E-02

[a]The equations used to calculate noncarcinogenic risks are presented in Appendix I, Section I.4.2.

9.14 SWMU 27I: NGTC BLOCK 9900

9.14.1 History and Description of SWMU 27I, Block 9900

SWMU 27I, Block 9900 is one of eight OWSs located in the NGTC along Troupe Avenue. The OWS is located in the southwestern corner of Block 9900. The OWS receives wastewater from an adjacent vehicle wash rack identified as Building 9960 (Figure 9.14-1). Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges into a drainage ditch located southeast of the OWS. The wash rack is not presently in use and is scheduled for removal during 2000. Units rarely use the motorpool, and when assigned to the facility, they are strictly forbidden from using the wash rack. All equipment and vehicles are washed at a centralized location in the National Guard area. Thus, only rainwater currently collects in the OWS, which is an open unit. No previous investigations have been performed at the site.

9.14.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 9.14-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

One sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch. The sediment sample was analyzed for VOCs, SVOCs, and lead. No surface water was present in the drainage ditch during the field investigation; therefore, a surface water sample was not collected during the field investigation of the site.

9.14.3 Physical Characteristics of the Site

9.14.3.1 Topography

The topography of the site is essentially flat, with a gravel vehicle parking area adjacent to the north and grass to the southeast/southwest between the OWS and wash rack and the fence. The surface elevation ranges from 76.6 feet to 77.1 feet amsl.

9.14.3.2 Surface drainage

Drainage ditches are located approximately 125 feet west and 25 feet southeast of the OWS. The effluent from the OWS discharges to the drainage ditch located to the southeast. Surface water is present in the drainage ditch only during rainfall events. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where it is allowed to percolate into the soil (see Section 3.3).

9.14.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.14.3.4 Hydrogeology

Groundwater was encountered at approximately 5 feet bgs.

9.14.3.5 Ecology

As stated in Section 8.2, SWMU 27I (Block 9900) is classified as an "industrialized area with managed grasslands." The site is comprised of approximately 0.01 acre, with a small area of managed grass surrounding the OWS at the site. A ditch borders the SWMU to the south approximately 12.5 feet from the site, and wooded areas are in close proximity to the east.

9.14.4 Nature and Extent of Contamination

9.14.4.1 Surface soil

Surface soil samples were not collected due to the 0 parts per million headspace results for the 0-foot to 2-foot sample interval.

9.14.4.2 Subsurface soil

Four subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Figure 9.14-2 and Table 9.14-1.

VOCs. Toluene was detected in the sample collected from GP1 at a concentration of 0.0152 mg/kg; therefore, toluene is considered to be an SRC.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in all subsurface soil samples at concentrations ranging from 3.8 mg/kg at GP2 to 20.2 mg/kg at GP3. The concentrations at GP3 and GP4 exceeded the reference background criterion (11.1 mg/kg); therefore, lead is considered to be an SRC for subsurface soil.

9.14.4.3 Groundwater

Four groundwater samples were collected using DPT techniques to investigate the nature and extent of potential groundwater contamination. The results of the groundwater analysis are presented in Figure 9.14-2 and Table 9.14-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. Bis(2-ethylhexyl)phthalate was detected above its MCL in the groundwater collected from GP3 at a concentration of 25 µg/L. Bis(2-ethylhexyl)phthalate was believed to be the result of laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), the groundwater at the location of GP3 was resampled for only bis(2-ethylhexyl)phthalate on August 27, 1999. The groundwater was collected from a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack that was installed to intersect the water table. The resampling monitoring point was installed approximately 1 foot away from the previous sampling location. Bis(2-ethylhexyl)phthalate was not detected during the resampling. The elevated concentration of bis(2-ethylhexyl)phthalate initially detected was considered to be the result of field or laboratory contamination; therefore, bis(2-ethylhexyl)phthalate is not an SRC at SWMU 27I, Block 9900.

Lead. Lead was not detected at GP1, GP2, and GP4 and was below the reference background criterion at GP3; therefore, lead is not considered to be an SRC.

9.14.4.4 Surface water

There was no surface water present in the drainage ditch during the field investigation.

9.14.4.5 Sediment

One sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch. The results of the sediment analysis are presented in Table 9.14-3 and Figure 9.14-2.

VOCs. No VOCs were detected in the sediment sample.

SVOCs. No SVOCs were detected in the sediment sample.

Lead. Lead was detected in the sediment sample at a concentration of 12.3 mg/kg, which exceeded the reference background criterion; therefore, lead is considered to be an SRC for sediment.

9.14.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.14-4.

9.14.5 Fate and Transport Considerations

The potential for soil and sediment contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil and sediment SRCs to their respective GSSLs.

Of the SRCs identified in subsurface soil and sediment, none of the analytes exceeded their respective GSSLs (Table 9.14-4); therefore, there are no CMCOPCs in soil or sediment at SWMU 27I based on leaching to groundwater.

9.14.6 Human Health Preliminary Risk Evaluation of SWMU 27I, Block 9900

SRCs were identified for the following media: subsurface soil, groundwater, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.14.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area; however, the wash rack is not currently used. The OWS discharges to an open ditch outside the fence. The potential reeeptor populations include:

- oceupational populations (individuals working on the site),

- construction workers,
- juvenile trespassers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and consists primarily of managed grass; therefore, soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway. However, the groundcover might be removed in the future for excavation of the OWS. Clean backfill material would be placed in the excavation area, and the area would be seeded.

Groundwater at the site does not discharge into any nearby surface waters. Groundwater may discharge into the drainage ditch during rain events, but groundwater is likely to be diluted by the surface water runoff, and the contribution from groundwater is likely to be insignificant. Therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.14-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

The OWS discharges to an open ditch. Water is present in the ditch only after heavy rains; therefore, for the purposes of this assessment, the sediments within the ditch were addressed as surface soils.

Given that water is present only during rain events, exposure, if any, to constituents in surface water would be sporadic; therefore, potential exposure to constituents in surface water is not considered to be a viable chronic exposure pathway.

9.14.6.2 Risk evaluation

The results of the human health risk screening are given below.

Toluene and lead were identified as SRCs for subsurface soil. The concentrations of these contaminants were below their respective screening values (Table 9.14-6); therefore, there are no HHCOPCs in subsurface soils.

Lead was identified as an SRC for sediment. The concentration of lead was below its screening value (Table 9.14-6); therefore, it is not an HHCOPC in sediment.

9.14.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.14.7 Ecological Preliminary Risk Evaluation of SWMU 27I, Block 9900

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites were surface soil was collected, substances detected in surface soil/sediment were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.14.7.1 Ecological screening value comparison (Step i)

There is no surface water at the site. The sediment is treated as surface soil (Section 9.14.7.5).

No SRCs were identified in groundwater.

Because there are no ESVs for soil, all analytes detected in drainage ditch sediment were evaluated further in EPRE Steps ii through v.

9.14.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 9.14.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.14.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to drainage ditch sediment at the site. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

9.14.7.4 Preliminary exposure (Step iv)

Ecological receptors at the site are probably exposed by ingestion of contaminated drainage ditch sediment or of biota exposed to contaminated drainage ditch sediment. The exposure parameters for the surrogate species—shrews and robins—are presented in Table 8-7.

9.14.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Sediment. There are no data for surface soil at the site. Sediment from the ditch was evaluated as surface soil. Lead was the only ECOPC in sediment from the drainage ditch that had an HQ that exceeded one (Table 9.14-7). The lead HQ for robins is 6.6.

9.14.8 Conclusions and Risk Management and Site Recommendations for SWMU 27I, Block 9900

9.14.8.1 Conclusions

Nature and Extent of Contamination

- Toluene was detected in subsurface soil samples and is considered to be an SRC in subsurface soil.
- Lead was detected in all subsurface soil samples. The concentrations in the samples collected from GP3 and GP4 exceeded the reference background criterion; therefore, lead is considered to be an SRC for subsurface soil.
- Bis(2-ethylhexyl)phthalate was detected above its MCL in one of four groundwater samples. The location (GP3) was resampled on August 27, 1999, and bis(2-ethylhexyl)phthalate was not detected, indicating that the initial bis(2-ethylhexyl)phthalate concentration was due to field or laboratory contamination. Bis(2-ethylhexyl)phthalate is not an SRC in groundwater.
- Lead was not detected in three of the four groundwater samples obtained at this site and was below the reference background criterion at the fourth location; therefore, lead is not considered to be an SRC for groundwater.
- The sediment sample indicated the presence of lead at a concentration that exceeded the reference background criterion; therefore, lead is considered to be an SRC for sediment.

Fate and Transport

- SRCs identified in subsurface soil and sediment did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil or sediment based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for subsurface soil or sediment.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in groundwater for ecological receptors.
- Lead is the only ECOPC in drainage ditch sediment.

9.14.8.2 Risk management and site recommendations

- Lead was indicated as an ECOPC in sediment. Lead was detected at a concentration of 12.3 mg/kg, which is slightly above (less than two times) the reference background criterion (8.81 mg/kg). The lead concentration was within the observed range (less than 10 mg/kg to 300 mg/kg) established by the USGS for lead concentrations in soils of the eastern United States (USGS 1984). In addition, because the drainage ditch is located adjacent to a heavily trafficked road, the slight elevation of the lead concentration above the reference background criterion is most likely attributable to runoff from the road and not associated with the OWS, so further investigation is not required.

- Based on the information presented in this section, an NFA status is recommended for SWMU 271 (Block 9900) regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.14-1. Summary of Analytes Detected in Subsurface Soil, SWMU 27I (Block 9900)

Station	Reference Background Criteria	7RGP1	7RGP2	7RGP3	7RGP4
Sample ID		7R1111	7R1211	7R1311	7R1411
Date		01/28/98	01/28/98	01/28/98	01/28/98
Depth (feet)		4 to 6	4 to 5	4 to 6	4 to 6
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Toluene	0.00	**0.0152**			
Metals (mg/kg)					
Lead	11.10	10.1	3.8	**20.2**	**14.6**

Bold indicates concentrations above reference background criteria.

Table 9.14-2. Summary of Analytes Detected in Groundwater, SWMU 27I (Block 9900)

Station	Reference Background Criteria	MCL	7RGP1	7RGP2	7RGP3	7RGP3	7RGP4
Sample ID			7R4111	7R4211	7R4311	7R4312	7R4411
Date			01/28/98	01/28/98	01/28/98	08/27/99	01/28/98
Sample Type			Grab	Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (µg/L)							
Bis(2-ethylhexyl)phthalate	0.00	6			*25*		
Metals (µg/L)							
Lead	4.69	15			1.1	NA	

Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.
NA = Not analyzed.

Table 9.14-3. Summary of Analytes Detected in Sediment, SWMU 27I (Block 9900)

SEDIMENT		
Station	Reference Background Criteria	7RSWS1
Sample ID		7R2111
Date		02/01/98
Depth (feet)		0 to 0
Sample Type		Grab
Metals (mg/kg)		
Lead	8.81	**12.3**

Bold indicates concentrations above reference background criteria.

Table 9.14-4. Summary of Site-related Contaminants, SWMU 27I (Block 9900)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Toluene	NC	0.0152	ND	ND	NC
Metals					
Lead	NC	20.2	12.3	BRBC	NC

BRBC = Below reference background criteria.
NC = Soil samples not collected based on field screening of soil or unavailability of surface water during Phase I RFI.
ND = Not detected.

Table 9.14-5. GSSL Screening of Site-related Contaminants in Soil, SWMU 27I (Block 9900)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
SUBSURFACE SOIL			
Volatile Organic Compounds (mg/kg)			
Toluene	0.0152	12	No
Metals (mg/kg)			
Lead[b]	20.2	400	No
SEDIMENT			
Metals (mg/kg)			
Lead[b]	12.3	400	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).
[b]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.14-6. Human Health Risk Screening for Subsurface Soil and Sediment, SWMU 27I (Block 9900)

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Toluene	1/4	0.0152	0.0152	1,600	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	4/4	3.8	20.2	400	No	Max Detect < Risk Criteria

SEDIMENT						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Metals (mg/kg)						
Lead	1/1	12.3	12.3	400	No	Max Detect < Risk Criteria

Table 9.14-7. Preliminary Risk Calculations for ECOPCs in Sediment, SWMU 27I (Block 9900)

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew: ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_S$	Short-tailed Shrew: TRV (mg/kg/d)	Short-tailed Shrew: HQ = ADD/TRV	American Robin: ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_R$	American Robin: TRV (mg/kg/d)	American Robin: HQ = ADD/TRV
Metals								
Lead[a]	12.3	4.0E-01	2.61E+00	1.76E+01	1.48E-01	7.48E+00	1.13E+00	6.62E+00

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration > 1 mg/kg.

ADD = Average daily dose (mg/kg/d).

BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).

C_{Max} = Maximum detected surface soil concentration (mg/kg).

HQ = Hazard quotient; HI = hazard index = sum of HQs.

IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.

IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.

TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

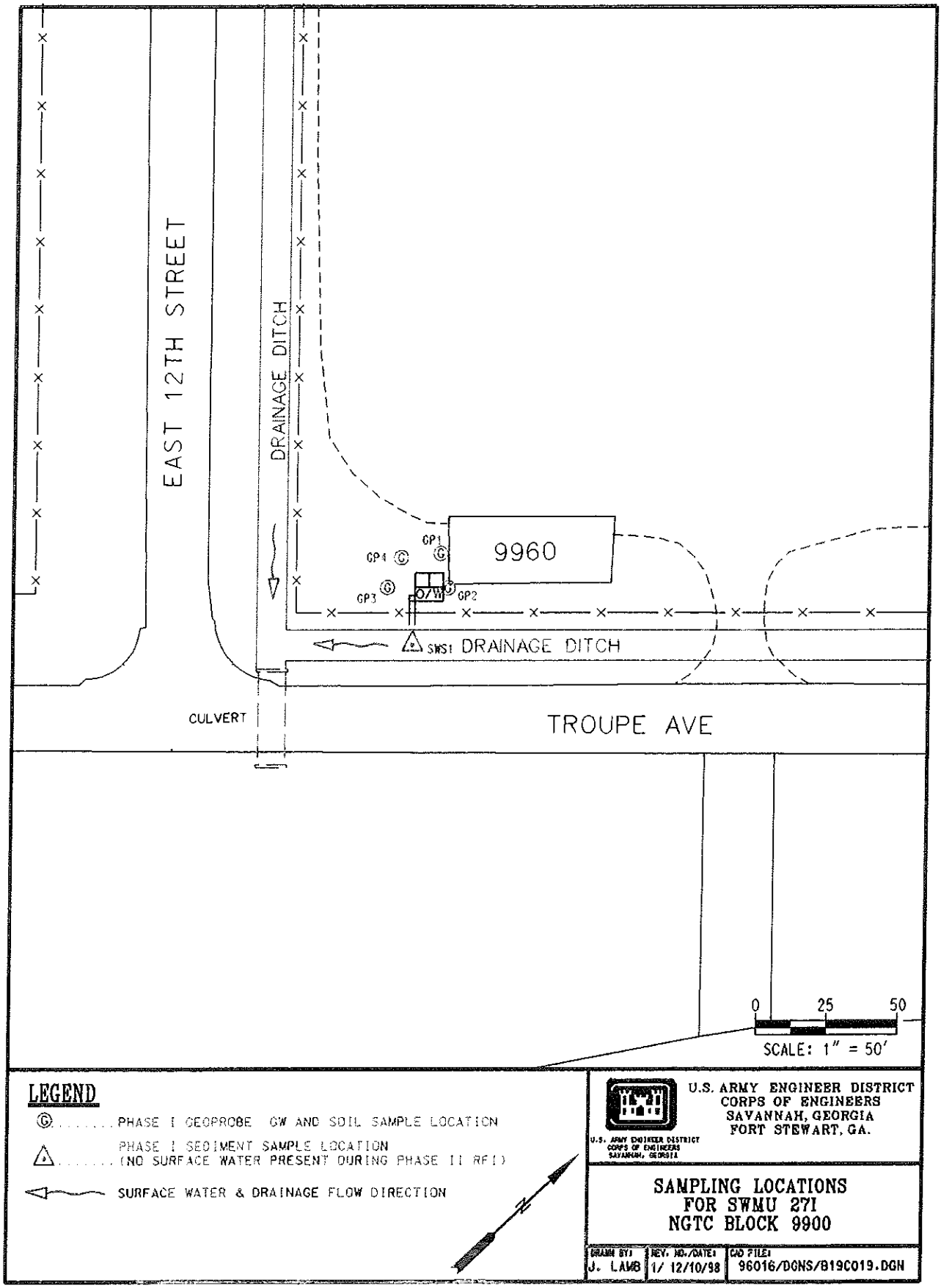

Figure 9.14-1. Sampling Locations, SWMU 27I (Block 9900)

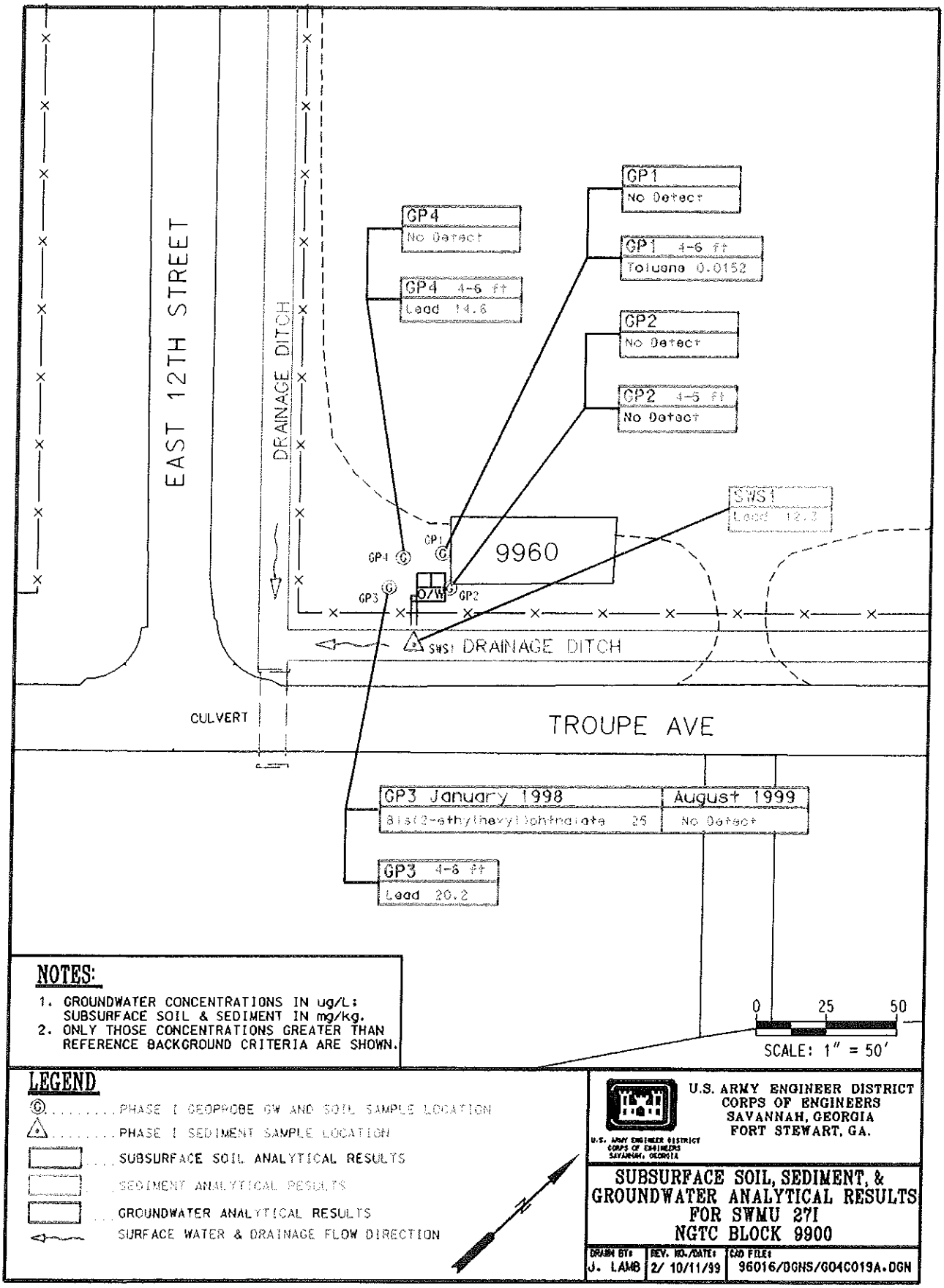

Figure 9.14-2. Summary of Analytical Results in Subsurface Soil, Groundwater, and Sediment, SWMU 27I (Block 9900)

□ = Exposure pathway not complete.
* = Exposure pathway complete.
1 = Exposure pathway evaluated for future scenario only.
2 = This scenario is used to derive screening values. It is not a viable scenario for this site.

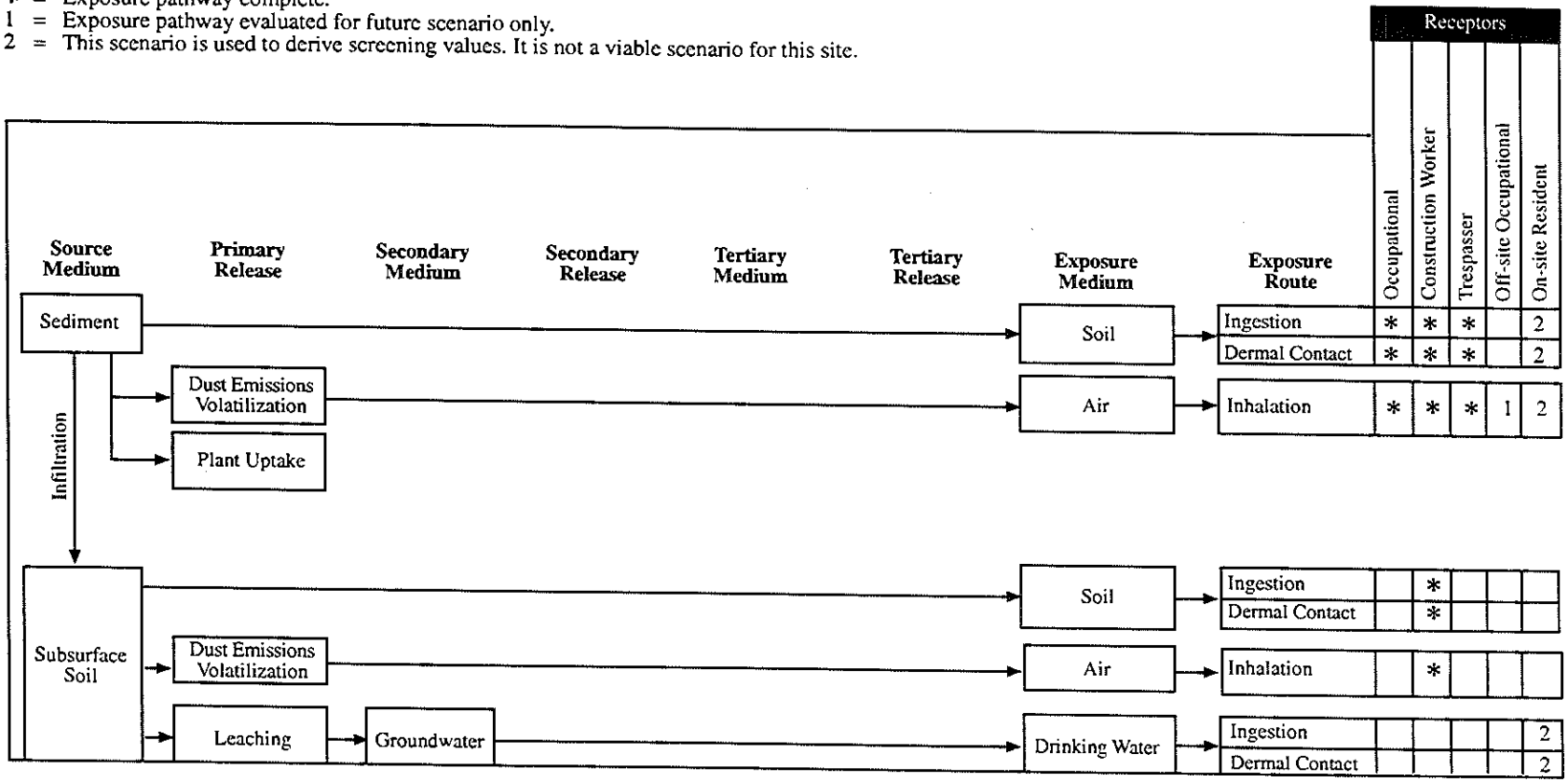

Figure 9.14-3. Potential Migration and Exposure Pathways, SWMU 27I (Block 9900)

9.15 SWMU 27I: NGTC BLOCK 10300

9.15.1 History and Description of SWMU 27I, Block 10300

SWMU 27I, Block 10300 is one of eight OWSs located in the NGTC along Troupe Avenue and is located in the southwestern corner of Block 10300 (Figure 9.15-1). The OWS receives wastewater from an adjacent vehicle wash rack. Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges into a drainage ditch located southwest of the OWS. The wash rack is not presently in use and is scheduled for removal during 2000. Units rarely use the motorpool, and when assigned to the facility, they are strictly forbidden from using the wash rack. All equipment and vehicles are washed at a centralized location in the National Guard area. Thus, only rainwater currently collects in the OWS, which is an open unit. No previous investigations have been performed at the site.

9.15.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 9.15-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

One surface water/sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch.

9.15.3 Physical Characteristics of the Site

9.15.3.I Topography

The topography of the site is essentially level, with a gravel parking area adjacent to the north and a grass border between the OWS and wash rack and the fence to the southwest and southeast. The surface elevation ranges from 66 feet to 67 feet amsl.

9.15.3.2 Surface drainage

Drainage ditches are located approximately 15 feet west and 75 feet south of the OWS. The effluent from the OWS discharges to the drainage ditch located to the south/southwest. Surface water is present in the drainage ditch only during rainfall events. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where it is allowed to percolate into the soil (see Section 3.3).

9.15.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.15.3.4 Hydrogeology

Groundwater was encountered at approximately 5.5 feet bgs.

9.15.3.5 Ecology

As stated in Section 8.2, SWMU 27I (NGTC Block 10300) is classified as "industrialized area with managed grasslands." The site is comprised of approximately 0.1 acre. A ditch parallels East 15th Street and is within 25 feet of the SWMU.

9.15.4 Nature and Extent of Contamination

9.15.4.1 Surface soil

No surface soil samples were collected because the PID readings from the 0-foot to 2-foot soil interval did not indicate the most elevated VOC concentration.

9.15.4.2 Subsurface soil

Four subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.15-1 and Figure 9.15-2.

VOCs. No VOCs were detected in subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in all four subsurface soil samples at concentrations ranging from 3.1 mg/kg at GP2 to 6 mg/kg at GP4. None of the concentrations were above the reference background criterion; therefore, lead is not considered to be an SRC in subsurface soil.

9.15.4.3 Groundwater

With the use of DPT techniques, four groundwater samples were collected from the four locations at the site. The results of the groundwater analysis are presented in Table 9.15-2 and Figure 9.15-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. Bis(2-ethylhexyl)phthalate was detected above its MCL (6 µg/L) in the groundwater samples from GP2 and GP3 at concentrations of 14.7 µg/L and 9.5 µg/L, respectively. Bis(2-ethylhexyl)phthalate was believed to be the result of laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), the groundwater at the GP2 and GP3 locations was resampled for only bis(2-ethylhexyl)phthalate on August 26, 1999. The groundwater was collected from a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack that was installed to intersect the water table. The resampling monitoring point was installed approximately 1 foot away from the previous sampling location. Bis(2-ethylhexyl)phthalate was not detected during the resampling. The elevated concentration of bis(2-ethylhexyl)phthalate initially detected was considered to be the result of field or laboratory contamination; therefore, bis(2-ethylhexyl)phthalate is not an SRC for SWMU 27I (NGTC Block 10300).

Lead. Lead was not detected at GP1, GP3, or GP4, and the level detected at GP2 was below the reference background criterion; therefore, lead is not considered to be an SRC in groundwater.

9.15.4.4 Surface water

One surface water sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch. The results of the surface water analysis are presented in Table 9.15-3 and Figure 9.15-2.

VOCs. No VOCs were detected in surface water.

SVOCs. No SVOCs were detected in surface water.

Lead. Lead was detected in the sample collected as SWS1 at a concentration of 48.8 µg/L, which exceeded the reference background criterion; therefore, lead is considered to be an SRC in surface water.

9.15.4.5 Sediment

One sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch.

VOCs. No VOCs were detected in sediment.

SVOCs. No SVOCs were detected in sediment.

Lead. Lead was detected at SWS1 at a concentration of 6.40 mg/kg, which is below the reference background criterion; therefore, lead is not considered to be an SRC in sediment.

9.15.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.15-4.

9.15.5 Fate and Transport Considerations

There are no SRCs in soil or sediment; therefore, the potential for soil and sediment contaminants to migrate (i.e., their leachability) to groundwater was not evaluated.

9.15.6 Human Health Preliminary Risk Evaluation of SWMU 271, Block 10300

Lead was identified as an SRC in surface water. A preliminary evaluation of the potential risks resulting from exposure to lead is given in this section.

9.15.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure for the various receptors.

Receptor Assessment

SRCs for this site are limited to the surface water located in an open ditch adjacent to the site. Water is generally present only during rain events. This ditch is located outside of the secured area of the site. A child might be exposed to lead in surface water as a result of playing in the ditch.

Migration and Exposure Pathway Analysis

SRCs at this site are limited to lead in surface water. Environmental sampling performed at the site indicates that lead is not migrating in significant quantities to other environmental media (Figure 9.15-3).

Given that water is present in the drainage ditch only during rain events, exposure, if any, to constituents in surface water would be sporadic; therefore, potential exposure to constituents in surface water is not considered to be a viable chronic exposure pathway.

However, surface water samples were taken at this site during a storm event. For the purposes of completeness, the risk characterization addressed potential risks associated with constituents identified in the surface water.

9.15.6.2 Risk evaluation

The results of the human health risk screening are given below.

No SRCs were identified in subsurface soil, sediment, or groundwater.

Lead was identified as an SRC in surface water. The maximum concentration of lead was 48.8 µg/L as compared to a screening value of 15 µg/L; therefore, lead is an HHCOPC in surface water (Table 9.15-5).

9.15.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.15.7 Ecological Preliminary Risk Evaluation of SWMU 27I, Block 10300

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil/sediment was collected, substances detected in surface soil/sediment were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.15.7.1 Ecological screening value comparison (Step i)

Lead was detected in surface water at the site. The results of the ESV comparison for surface water are presented in Table 9.15-6. Lead was identified as an ECOPC by the ESV comparison for aquatic biota in surface water. Surface water in the drainage ditch was evaluated (lead only) as drinking water for terrestrial mammals (Section 9.15.7.5).

Surface soil was not collected because field PID readings did not indicate elevated concentrations.

No SRCs were identified in sediment or groundwater.

9.15.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 9.15.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.15.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

9.15.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated drinking water. The exposure parameters for the surrogate species—raccoons—are presented in Table 8-7.

9.15.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Water. The preliminary risk calculations for raccoons exposed to ECOPCs detected in drinking water are presented in Table 9.15-7. This table shows the maximum detected concentration, ADD, TRV, and HQ for the receptor. Lead in surface water does not result in an ADD exceeding the TRV for the surrogate species; therefore, there are no ECOPCs in surface water.

9.15.8 Conclusions and Risk Management and Site Recommendations for SWMU 27I, Block 10300

9.15.8.1 Conclusions

Nature and Extent of Contamination

- Field PID readings did not indicate elevated VOC concentrations in surface soil. No VOCs or SVOCs were detected in subsurface soil samples. Lead was not detected above the reference background criterion. Therefore, there are no SRCs in surface or subsurface soil.

- Bis(2-ethylhexyl)phthalate was initially detected above its MCL in two of four groundwater samples. The two locations (GP2 and GP3) were resampled in August 1999, and bis(2-ethylhexyl)phthalate was not detected, indicating that the initial bis(2-ethylhexyl)phthalate concentrations were due to field or laboratory contamination; therefore, bis(2-ethylhexyl)phthalate is not considered to be an SRC in groundwater.

- Lead was not detected or was below the reference background criterion in sediment, subsurface soil, and groundwater; therefore, lead is not considered to be an SRC in sediment, subsurface soil, or groundwater.

- The surface water sample indicated the presence of lead at a concentration that exceeded the reference background criterion; therefore, lead is considered to be an SRC in surface water.

Fate and Transport

- There are no SRCs in soil or sediment; therefore, the potential for soil and sediment contaminants to migrate (i.e., their leachability) to groundwater was not evaluated.

Human Health Preliminary Risk Evaluation

- Lead was identified as an HHCOPC in surface water.

Ecological Preliminary Risk Evaluation

- Lead in surface water was indicated as an ECOPC for aquatic biota.

9.15.8.2 Risk management and site recommendations

- Lead was identified as an HHCOPC in surface water. The screening value used is based on drinking water standards. This value is conservative given that chronic exposure to anyone at this site is impossible because water is present only during rain events. In addition, it is not reasonable to assume that anyone would consume 2 liters of water from the ditch at any point in time, much less on a daily basis. Exposure is likely to be limited to sporadic exposure via inadvertent exposure. The maximum concentration was within an order of magnitude of the drinking water standard. The potential for adverse effects resulting from exposure to lead in surface water is expected to be minimal; therefore, lead in surface water is eliminated as an HHCOPC for SWMU 27I.

- Lead was indicated as an ECOPC for aquatic biota in surface water. Surface water is present in the drainage ditch only after rainfall events (i.e., as surface drainage/storm runoff), and the surface water in the ditch is not expected to support an aquatic community. Lead is not an ECOPC for terrestrial receptors ingesting surface water in the ditch; therefore, lead in surface water is eliminated as an ECOPC and does not require further investigation and/or evaluation (SAIC 1999a).

- Based on the information presented in this section, SWMU 27I is recommended for NFA status. If approved by GEPD, Fort Stewart respectfully requests that the Installation's Subpart B permit be modified to reflect the revised status for this SWMU.

Table 9.15-1. Summary of Analytes Detected in Subsurface Soil, SWMU 271 (Block 10300)

Station	Reference Background Criteria	7SGP1	7SGP2	7SGP3	7SGP4
Sample ID		7S1111	7S1211	7S1311	7S1411
Date		01/19/98	01/19/98	01/20/98	01/20/98
Depth (feet)		6 to 8	2 to 4	6 to 8	6 to 8
Sample Type		Grab	Grab	Grab	Grab
Metals (mg/kg)					
Lead	11.10	5.5	3.1	5.7	6

Table 9.15-2. Summary of Analytes Detected in Groundwater, SWMU 271 (Block 10300)

Station	Reference Background Criteria	MCL	7SGP1	7SGP2	7SGP2	7SGP3	7SGP3	7SGP4
Sample ID			7S4111	7S4211	7S4212	7S4311	7S4312	7S4411
Date			01/19/98	01/19/98	08/26/99	01/20/98	08/26/99	01/20/98
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (µg/L)								
Bis(2-ethylhexyl)phthalate	0.00	6		***14.7***		***9.5***		
Metals (µg/L)								
Lead	4.69	15		0.89	NA		NA	

NA = Not analyzed.
Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.

Table 9.15-3. Summary of Analytes Detected in Surface Water and Sediment, SWMU 27I (Block 10300)

SURFACE WATER		
Station	**Reference Background Criteria[a]**	**7S-SWS1**
Sample ID		**7S3111**
Date		**2/1/98**
Sample Type		**Grab**
Metals(µg/L)		
Lead	5.2	**48.8**

SEDIMENT		
Station	**Reference Background Criteria[b]**	**7SSWS1**
Sample ID		**7S2111**
Date		**2/1/98**
Sample Type		**Grab**
Metals(mg/kg)		
Lead	8.81	6.4

[a]Reference background collected at SWSI, Former 724th Tanker Purging Station (SWMU 26).
[b]Reference background for sediment is reference surface soil background.
Bold indicates concentrations above reference background criteria.

Table 9.15-4. Summary of Site-related Contaminants, SWMU 27I (Block 10300)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Metals (µg/L)					
Lead	NC	BRBC	BRBC	BRBC	48.8

BRBC = Below reference background criteria.
NC = Not collected based on field headspace readings.

Table 9.15-5. Human Health Risk Screening for Surface Water, SWMU 27I (Block 10300)

SURFACE WATER						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Metals (µg/L)						
Lead	1/1	48.8	48.8	15	Yes	Max Detect > Risk Criteria

Table 9.15-6. Ecological Screening Value Comparison for Analytes Detected in Surface Water, SWMU 27I (Block 10300)

Analyte	SWMU 27I (Block 10300) Maximum	ESV	ECOPC Aquatic Biota?	Justification
Metals (µg/L)				
Lead	48.8	1.32	Yes	Max Detect > ESV

ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.

Table 9.15-7. Preliminary Risk Calculations for ECOPCs in Surface Water, SWMU 27I (Block 10300)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = $C_{Max} \times 0.001 \times IR_W$	TRV (mg/kg/d)	HQ = ADD/ TRV
Metals				
Lead	48.8	3.91E-03	4.87E+00	8.02E-04

0.001 (mg/µg) = Conversion from µg/L to mg/L.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).

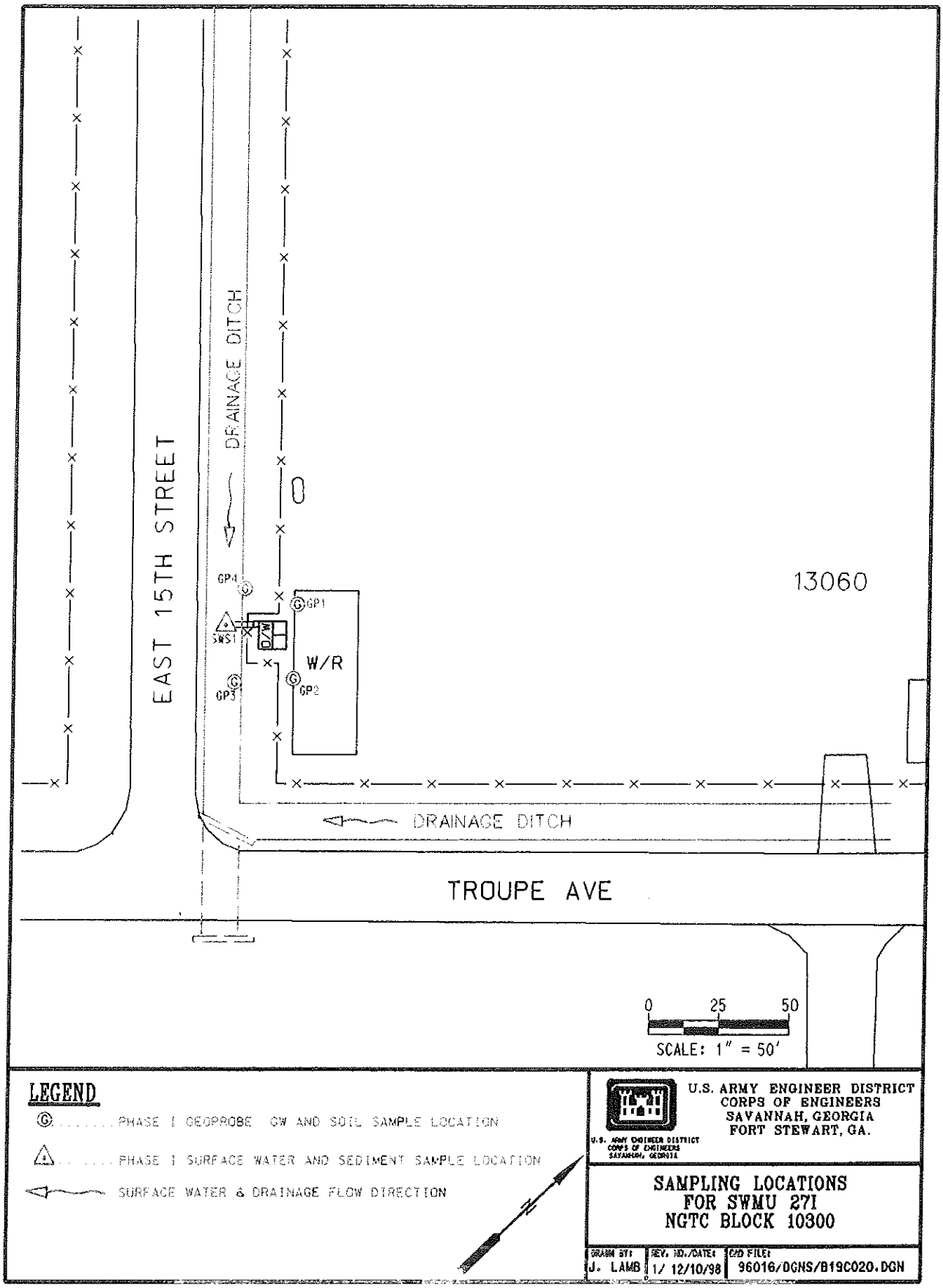

Figure 9.15-1. Sampling Locations, SWMU 27I (Block 10300)

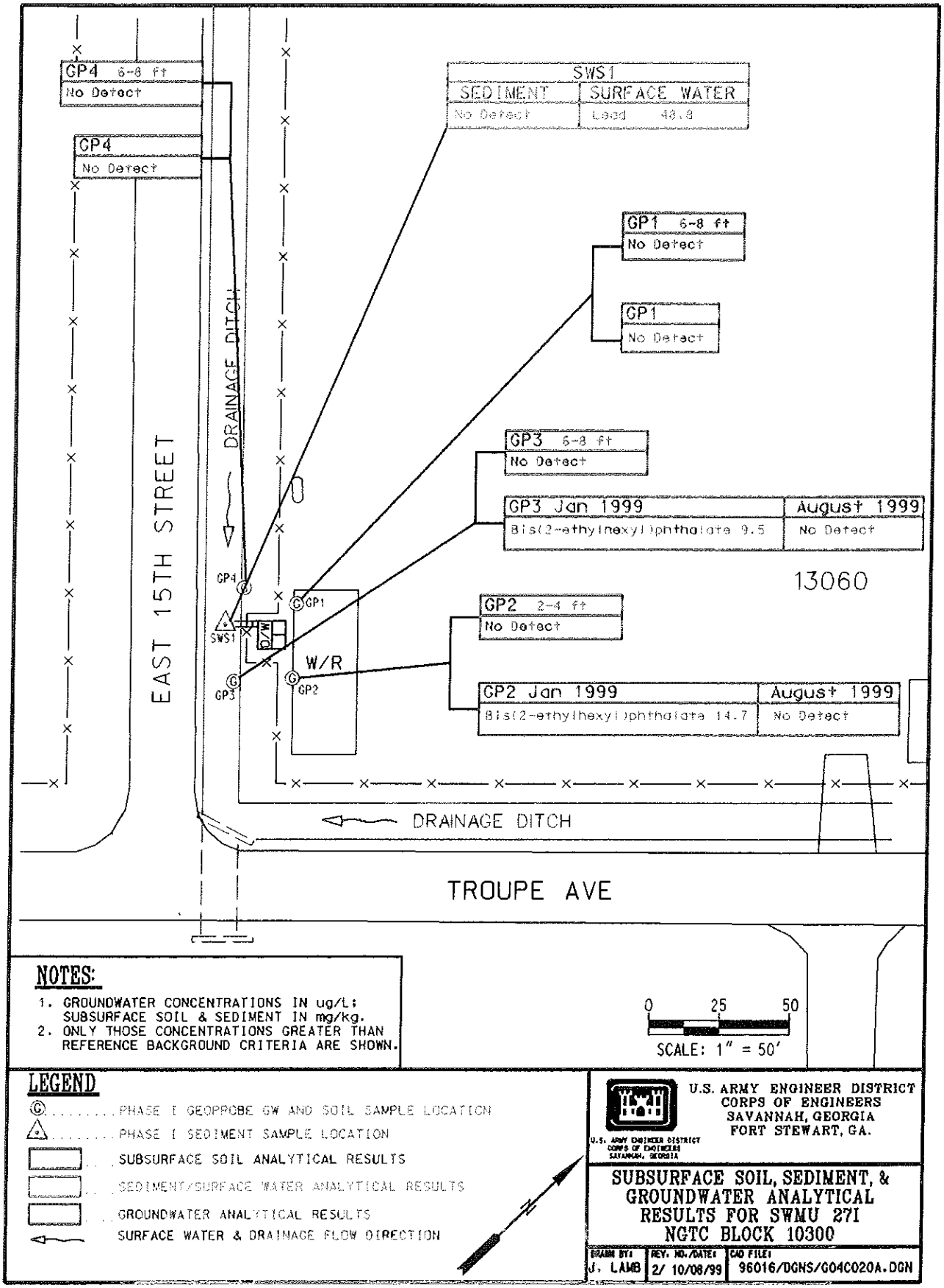

Figure 9.15-2. Summary of Analytical Results in Subsurface Soil, Groundwater, Surface Water, and Sediment, SWMU 271 (Block 10300)

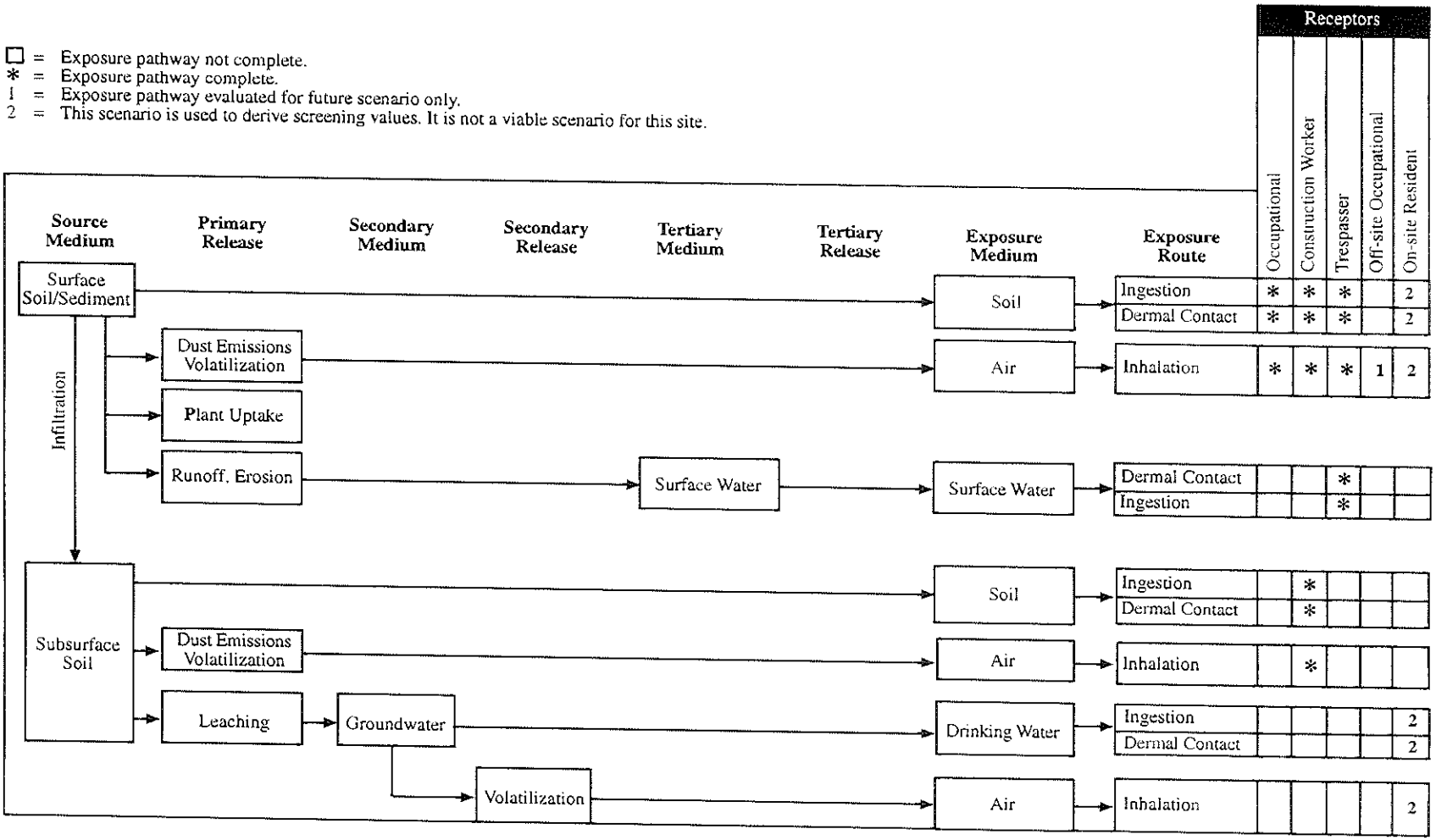

Figure 9.15-3. Potential Migration and Exposure Pathways, SWMU 27I (Block 10300)

9.16 SWMU 27J: GANG MATES, BUILDING 10535

9.16.1 History and Description of SWMU 27J, GANG MATES, Building 10535

SWMU 27J, Building 10535 is one of two OWSs that support vehicle maintenance activities within GANG MATES. The OWS is located adjacent to a covered maintenance pad identified as Building 10535 (Figure 9.16-1). Floor drains from the maintenance pad are piped to the OWS. No previous investigations have been performed at the site. The OWS discharges into the sanitary sewer system.

9.16.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. In addition, with the concurrence of GEPD, DPT techniques were used to install a 3/4-ineh-inside-diameter PVC monitoring point with a 10-foot sereened interval with a filter pack that was installed to intersect the water table at the GP2 location (SAIC 1999a). The resampling monitoring point (GP2) was installed approximately 1 foot away from the previous sampling locations. In addition, with the concurrence of GEPD, a 2-inch-diameter monitoring well was installed at the GP2 location, and the groundwater was resampled using low-flow techniques. The well construction, well development, and field parameter measurements for MW1 are presented in Table 9.16-1. A geotechnical sample was inadvertently not collected during the installation of the well. The soil and groundwater from the DPT–collected samples were analyzed for VOCs, SVOCs, and lead. The groundwater from the two monitoring points and one monitoring well were analyzed for only bis(2-ethylhexyl)phthalate. The soil sampling, DPT groundwater sampling, and monitoring well locations are presented in Figure 9.16-1.

9.16.3 Physical Characteristics of the Site

9.16.3.1 Topography

The topography of the OWS site is essentially level. The OWS area is located in the grass border between the maintenance pad and the boundary fence (Figure 9.16-1). The area to the west is an asphalt and concrete vehicle parking area and roadway. The surface elevation is approximately 57.5 feet amsl.

9.16.3.2 Surface drainage

There are no surface water/sediment pathways at this site. Potential surface water drainage from this site is allowed to percolate into the soil. In addition, the OWS discharges to the sanitary sewer system.

9.16.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.16.3.4 Hydrogeology

Groundwater was encountered at approximately 4.2 feet to 7.4 feet bgs.

9.16.3.5 Ecology

As stated in Section 8.2, SWMU 27J, Building 10535 is classified as an "industrialized area with managed grasslands." The area is comprised mainly of concrete surface, fence, and man-made structures. This SWMU

contains a small section of managed grasses, and a wooded area borders the SWMU toward the east. The site is comprised of approximately 0.02 acre and is located in the southeastern corner of the garrison area.

9.16.4 Nature and Extent of Contamination

9.16.4.1 Surface soil

Two surface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.16-2 and Figure 9.16-2.

VOCs. No VOCs were detected in surface soil.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected in the samples from both GP2 and GP4 at concentrations of 4.3 mg/kg and 3.6 mg/kg, respectively. Neither of these concentrations was above the reference background criterion; therefore, lead is not considered to be an SRC in surface soil.

9.16.4.2 Subsurface soil

Two subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.16-3 and Figure 9.16-2.

VOCs. No VOCs were detected in subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in both GP1 and GP3 at concentrations of 2.5 mg/kg and 2.9 mg/kg, respectively. Neither of these concentrations is above the reference background criterion; therefore, lead is not considered to be an SRC in subsurface soil.

9.16.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 9.16-4 and Figure 9.16-2.

VOCs. The sample collected from GP2 indicated the presence of total xylenes at a concentration of 7 µg/L. Total xylenes are considered to be SRCs for groundwater.

SVOCs. Bis(2-ethylhexyl)phthalate and di-*N*-octyl phthalate were detected in the groundwater collected from GP2 at concentrations of 14.8 µg/L and 5.6 µg/L, respectively. The bis(2-ethylhexyl)phthalate at GP2 was believed to be the result of field or laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), the groundwater at the GP2 location was resampled for only bis(2-ethylhexyl)phthalate on August 26, 1999. The groundwater was collected from a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack that was installed to intersect the water table. The resampling monitoring point was installed approximately 1 foot away from the previous sampling location. Bis(2-ethylhexyl)phthalate was detected at a concentration of 17.2 µg/L. Therefore, with the concurrence of GEPD, a 2-inch-diameter monitoring well was installed at the GP2 location, and the groundwater was sampled using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected in the groundwater from the monitoring well. The elevated concentration of bis(2-ethylhexyl)phthalate initially detected at GP2 is considered to be the result of

field or laboratory contamination. Bis(2-ethylhexyl)phthalate is not considered to be an SRC; however, di-*N*-octyl phthalate is still considered to be an SRC at SWMU 27J.

Lead. Lead was considered to be a nondetect at GP1 and was below the reference background criterion at GP2, GP3, and GP4; therefore, lead is not considered to be an SRC.

9.16.4.4 Surface water

No surface water samples were collected during the field investigation because a surface water pathway does not exist at this site.

9.16.4.5 Sediment

No sediment samples were collected during the field investigation because a sediment pathway does not exist at this site.

9.16.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.16-5.

9.16.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface soil and subsurface soil SRCs to their respective GSSLs.

Because no SRCs were identified in surface or subsurface soils, no comparison to GSSLs was performed.

9.16.6 Human Health Preliminary Risk Evaluation of SWMU 27J, Building 10535

SRCs were identified for the following media: surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.16.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds in the air. The site is comprised mainly of a concrete surface, a fence, and man-made structures. This SWMU contains a small section of managed grasses, and a wooded area borders the site to the east. Therefore, soil erosion via fugitive dust or surface water runoff is not a viable migration pathway.

Groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.16-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.16.6.2 Risk Evaluation

The results of the human health risk screening are given below.

No SRCs were identified in surface soil or subsurface soil.

The SRCs for groundwater consisted of one VOC (total xylenes) and one SVOC (di-*N*-octyl phthalate). The maximum concentrations of total xylenes and di-*N*-octyl phthalate did not exceed their respective risk-based screening values (Table 9.16-6); therefore, there are no HHCOPCs in groundwater.

9.16.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.16.7 Ecological Preliminary Risk Evaluation of SWMU 27J, Building 10535

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites were surface soil was collected, substances detected in surface soil and drinking water were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil and drinking water. The results of the five steps of the EPRE are presented below.

9.16.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

One VOC and one SVOC were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.16-7. The ECOPCs identified by the ESV comparison for groundwater were total xylenes and di-*N*-octyl phthalate. There is no ESV for di-*N*-octyl phthalate, so it is an ECOPC by default (GEPD 1997a).

Because there are no SRCs for soil, this medium was not evaluated further in EPRE Steps ii through v.

9.16.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 9.16.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.16.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

9.16.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of drinking water. The exposure parameters for the surrogate species—raccoons—are presented in Table 8-7.

9.16.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 9.16-8. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptor. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for SVOCs does not exceed one.

9.16.8 Conclusions and Risk Management and Site Recommendations for SWMU 27J, Building 10535

9.16.8.1 Conclusions

Nature and Extent of Contamination

- No VOCs or SVOCs were detected in surface or subsurface soil. Lead was not detected in surface or subsurface soil above the reference background criterion.

- Total xylenes were detected in the groundwater samples and are considered to be SRCs.

- Bis(2-ethylhexyl)phthalate and di-*N*-octyl phthalate were detected in groundwater. Bis(2-ethylhexyl)phthalate was detected above its MCL at one Geoprobe groundwater location (GP2). A monitoring well was installed at the location, and the groundwater was resampled using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected when the groundwater sample was collected using low-flow sampling techniques, indicating that the previous bis(2-ethylhexyl)phthalate concentrations were due to

field or laboratory contamination. Bis(2-ethylhexyl)phthalate is not considered to be an SRC in groundwater; however, di-*N*-octyl phthalate is still considered to be an SRC at SWMU 27J.

- Lead was not detected in the groundwater samples collected from the four Geoprobe locations at concentrations above the reference background criterion and is not considered to be an SRC in groundwater.

Fate and Transport

- There are no SRCs in soil.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs in groundwater.

Ecological Preliminary Risk Evaluation

- The ECOPCs in groundwater are total xylenes and di-*N*-octyl phthalate. These ECOPCs are a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.

- There are no ECOPCs in groundwater for terrestrial receptors.

9.16.8.2 Risk management and site recommendations

- Total xylenes and di-*N*-octyl phthalate were indicated as ECOPCs in groundwater because of their potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies. As stated in Section 9.16.6.1, "Migration and Exposure Pathway Analysis," groundwater at this site does not discharge to any nearby surface water bodies. In addition, total xylenes and di-*N*-octyl phthalate are probably being reduced through the natural attenuation process of biodegradation, volatilization, hydrolysis, and Redox. Therefore, given the lack of a groundwater-to-surface-water pathway (receptor), total xylenes and di-*N*-octyl phthalate are not considered to be ECOPCs for this site and do not require further investigation and/or evaluation.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27J, Building 10535 regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU. MW1 and permanent monitoring point GP2 located at the site will be properly abandoned within 90 days of approval of this report.

Table 9.16-1. Monitoring Well Construction, Well Development Summary, and Field Parameter Measurements during Groundwater Sampling for Monitoring Well MW1, SWMU 27J (Building 10535)

MONITORING WELL CONSTRUCTION							
Well No.	Date Installed	Size/Type	Coordinates	Total Depth (feet)	Screen Interval (feet bgs)	Top of Filter Pack Elevation (feet bgs)	Top of Casing Elevation (feet)
27J-MW1	10/06/99	2-inch PVC	N 681817.19 E 837125.60	12.0	1.5 to 11.5	1.0	57.71

Note: All elevations are NGVD 1929.

WELL DEVELOPMENT SUMMARY					
Well No.	Date	Total Development Time (hours)	Total Volume Removed (gallons)	Final Turbidity Reading (NTUs)	Total Well Depth (feet)
27J-MW1	10/10/99	11 hours 50 minutes	102.5	43.6	11.25

FIELD PARAMETER MEASUREMENTS DURING GROUNDWATER SAMPLING							
Parameter	Date	pH (su)	Conductivity (mS/cm)	Temperature (°C)	Turbidity (NTUs)	DO (mg/L)	Redox (mV)
27J-MW1	10/28/99	6.07	99.0	24.01	9.9	2.59	12.4

Table 9.16-2. Summary of Analytes Detected in Surface Soil, SWMU 27J (Building 10535)

Station	Reference Background Criteria	7TGP2	7TGP4
Sample ID		7T1211	7T1411
Date		01/28/98	01/29/98
Depth (feet)		0 to 2	0 to 2
Sample Type		Grab	Grab
Metals (mg/kg)			
Lead	8.81	4.3	3.6

Bold indicates concentrations above reference background criteria.

Table 9.16-3. Summary of Analytes Detected in Subsurface Soil, SWMU 27J (Building 10535)

Station	Reference Background Criteria	7TGP1	7TGP3
Sample ID		7T1111	7T1311
Date		01/29/98	01/29/98
Depth (feet)		2 to 3	2 to 4
Sample Type		Grab	Grab
Metals (mg/kg)			
Lead	11.10	2.5	2.9

Bold indicates concentrations above reference background criteria.

Table 9.16-4. Summary of Analytes Detected in Groundwater, SWMU 27J (Building 10535)

Station	Reference Background Criteria	MCL	7TGP1	7TGP2	7TGP2	7TGP3	7TGP4	7TMW1
Sample ID			7T4111	7T4211	7T4212	7T4311	7T4411	7T4171
Date			01/29/98	01/28/98	08/26/99	01/29/98	01/29/98	10/28/99
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)								
Xylenes, total	0.00	10,000		7	NA			NA
Semivolatile Organic Compounds (µg/L)								
Bis(2-ethylhexyl)phthalate	0.00	6		***14.8***[a]	***17.2***[a]			
Di-*N*-octyl phthalate	0.00			**5.6**	NA			NA
Metals (µg/L)								
Lead	4.69	15		1.3	NA	1.4	1	NA

[a] A monitoring well (MW1) was installed at the GP2 sample location, and the groundwater was resampled using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected in the groundwater from the monitoring well, indicating that the previous detections were the result of field or laboratory contamination.

NA = Not analyzed.

Bold indicates concentrations above reference background criteria.

Boxed *italic* indicates concentrations above MCLs.

Table 9.16-5. Summary of Site-related Contaminants, SWMU 27J (Building 10535)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (mg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Xylenes, total	ND	ND	NP	7	NP
Semivolatile Organic Compounds					
Di-*N*-octyl phthalate	ND	ND	NP	5.6	NP

ND = Not detected.
NP = No pathway exists.

Table 9.16-6. Human Health Risk Screening for Groundwater, SWMU 27J (Building 10535)

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Volatile Organic Compounds (µg/L)						
Xylenes, total	1/4	7	7	1,200	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (µg/L)						
Di-*N*-octyl phthalate	1/4	5.6	5.6	73	No	Max Detect < Risk Criteria

Table 9.16-7. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27J (Building 10535)

Analyte	SWMU 27J (Building 10535) Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Xylenes, total	7	1.8[a]	Yes	Max Detect > ESV
Semivolatile Organic Compounds (µg/L)				
Di-*N*-octyl phthalate	5.6	No ESV	Yes	Max Detect > ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 9.16-8. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27J (Building 10535)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds				
Xylenes, total	7	5.60E-04	5.48E-01	1.02E-03
Semivolatile Organic Compounds				
Di-*N*-octyl phthalate	5.6	4.48E-04	No TRV	--
			HI=	1.02E-03

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
BCF = Water-to-fish bioconcentration factor (HAZWRAP 1994).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).
-- = Cannot be calculated due to the lack of data.

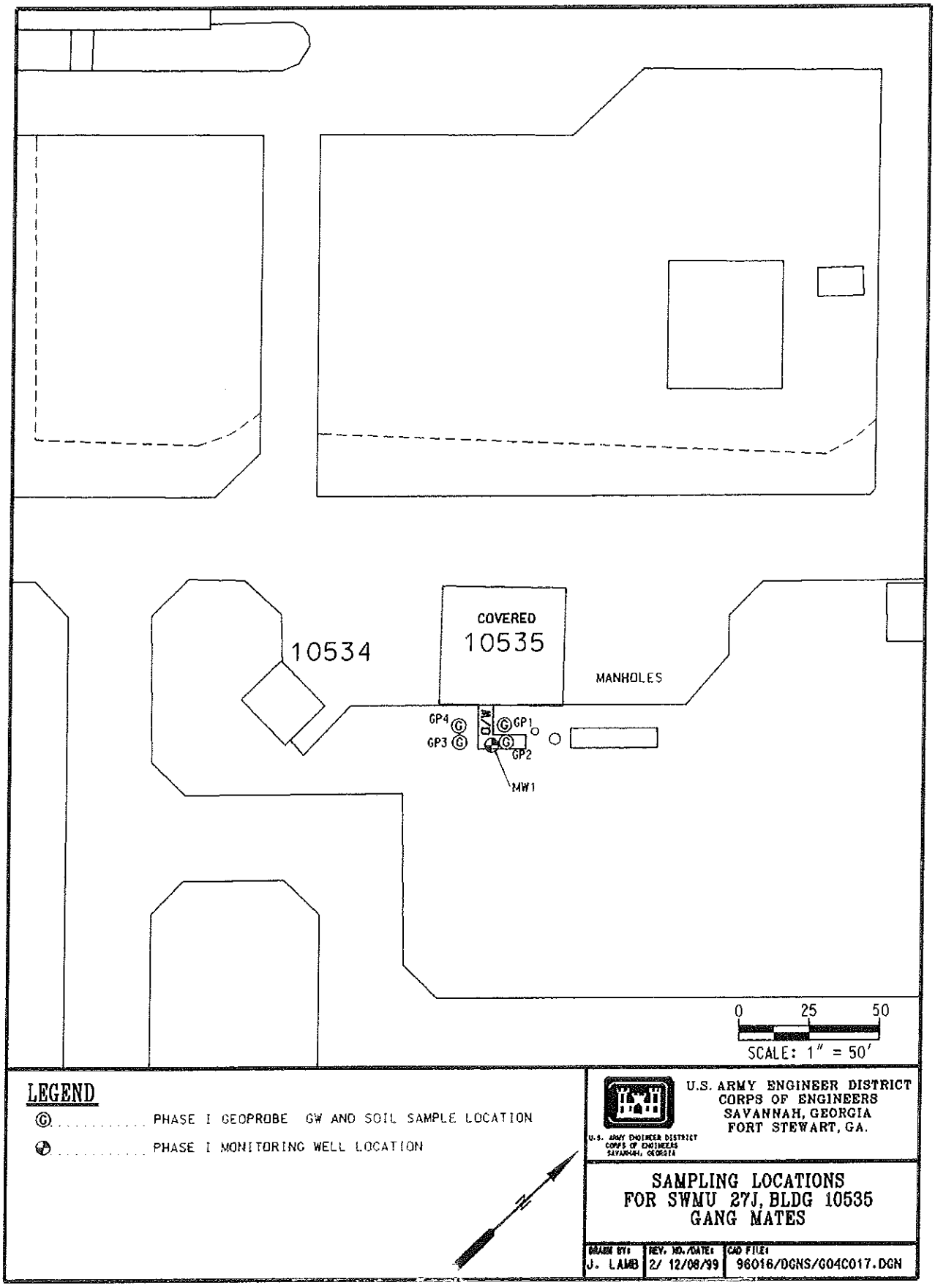

Figure 9.16-1. Sampling Locations, SWMU 27J (Building 10535)

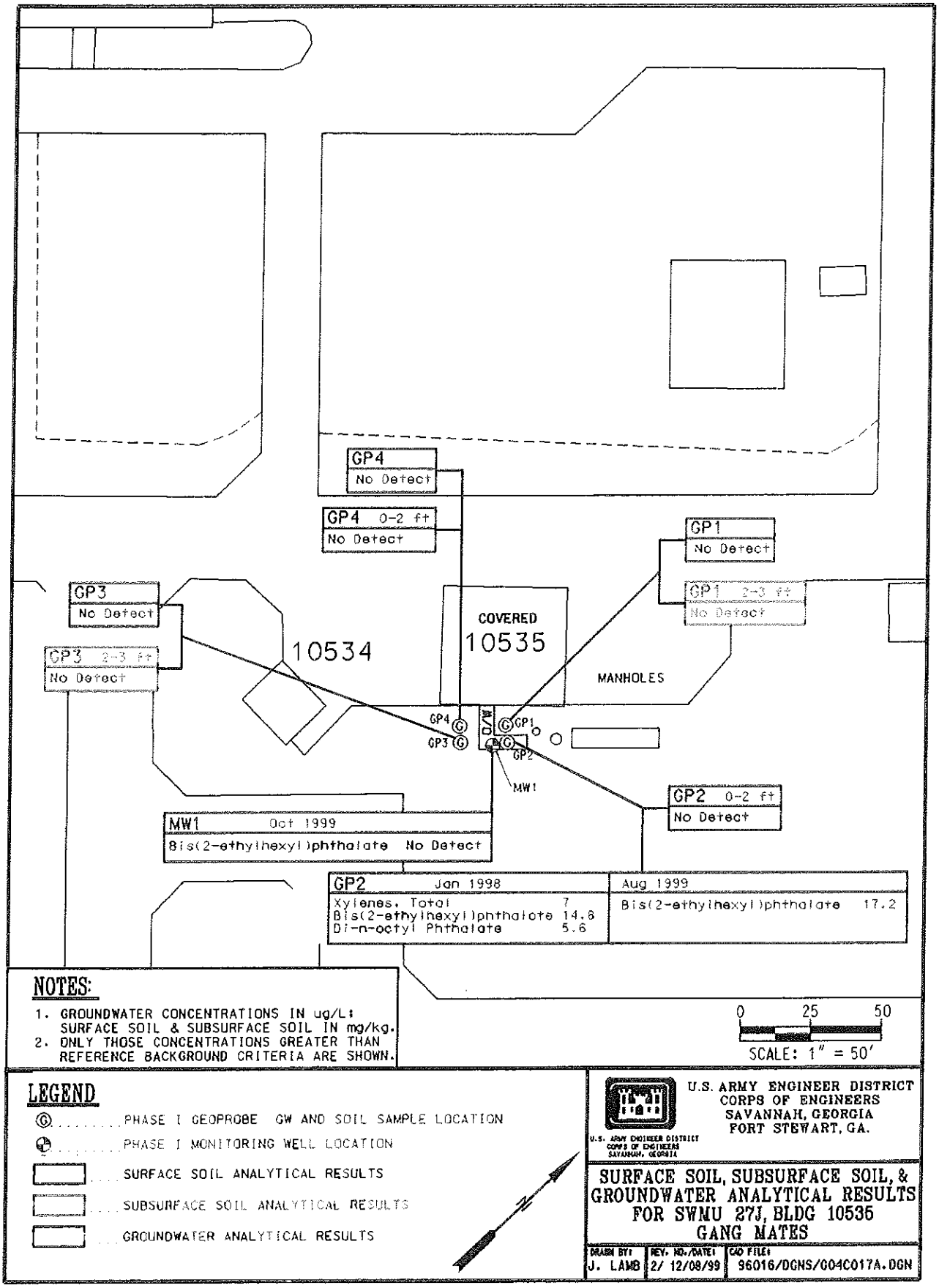

Figure 9.16-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27J (Building 10535)

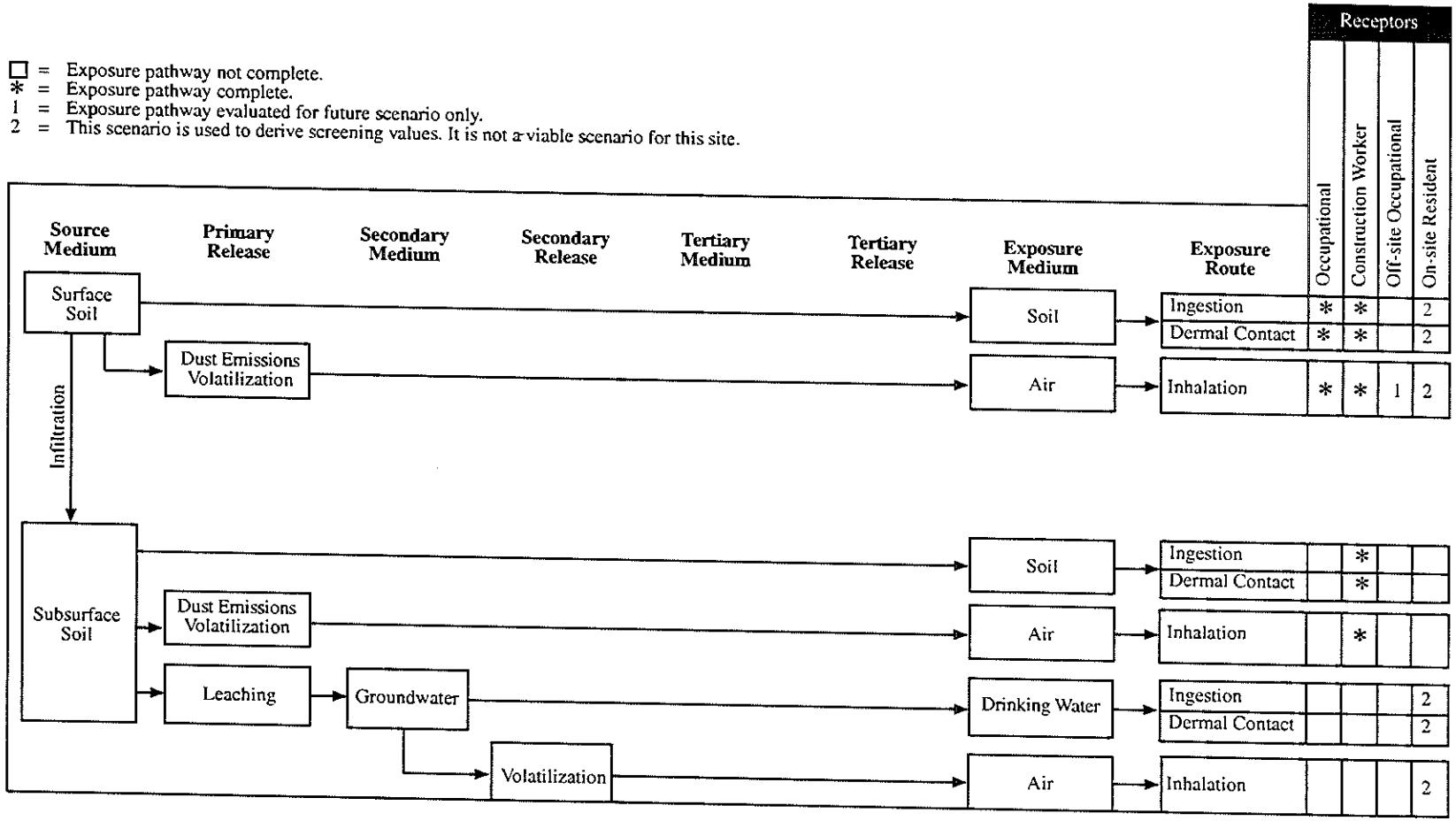

Figure 9.16-3. Potential Migration and Exposure Pathways, SWMU 27J (Building 10535)

9.17 SWMU 27K: 3D BN 69TH ARMOR

9.17.1 History and Description of SWMU 27K, 3d BN 69th Armor

SWMU 27K is an OWS that supports vehicle maintenance activities within the 3d BN 69th Armor Motorpool. The OWS is located adjacent to a wash rack identified as Building 1630 (Figure 9.17-1). The OWS also receives wastewater from a wash rack located to the northeast within the 1st BN 64th Armor Motorpool. A gravel tank road separates the two motorpools. Grated troughs direct the wastewater from the wash racks where it is piped to the OWS. Steel plates cover the grated troughs where they cross the road. No previous investigations have been performed at the site. The OWS discharges into the IWTP.

9.17.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater samples are presented in Figure 9.17-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

9.17.3 Physical Characteristics of the Site

9.17.3.1 Topography

The topography of the OWS site is essentially level. The OWS area is surrounded by grass that merges into gravel roads and parking areas toward the adjacent buildings. The surface elevation is approximately 67.5 feet amsl.

9.17.3.2 Surface drainage

There is a drainage ditch approximately 125 feet southwest of the OWS outside the boundary fence. The OWS discharges all effluent via piping directly to the IWTP; therefore, there are no surface water/sediment pathways at this site. This drainage ditch receives runoff from the vehicle parking area of the 3d BN 69th Armor Motorpool and the adjacent gravel/dirt roads. Surface water is present in the drainage ditch only after rainfall events. The surface water is allowed to percolate into the soil (see Section 3.3). During periods of heavy rainfall events, the surface water may potentially make it to Mill or Taylors Creek.

9.17.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.17.3.4 Hydrogeology

Groundwater was encountered at approximately 2.6 feet to 3 feet bgs.

9.17.3.5 Ecology

As stated in Section 8.2, SWMU 27K (3d BN 69th Armor) is classified as an "industrialized area with managed grasslands." The site is comprised of approximately 0.02 acre and is located in the western edge of the industrialized garrison area (Figure 9.17-1). Much of the fenced area of the motorpool consists of concrete surfaces and buildings; however, there is an area of managed grasses on the southwest side. This

grassy area contained puddles of standing water throughout much of the field investigation. A wooded area exists to the west beyond the boundary fence.

9.17.4 Nature and Extent of Contamination

9.17.4.1 Surface soil

Because the surface soil interval did not indicate elevated volatile organic readings based on field headspace readings, no surface soil samples were collected at this site during the field investigation.

9.17.4.2 Snbsurface soil

The analytical laboratory missed the holding times for VOCs and SVOCs for soils during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. Four subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.17-1 and Figure 9.17-2.

VOCs. Samples from GP2, GP3, and GP4 indicated 2-butanone at concentrations ranging from 0.0094 mg/kg at GP4 to 0.014 mg/kg at GP2. The sample taken from GP2 indicated 2-hexanone at a concentration of 0.0028 mg/kg. Acetone was detected in three of four samples at concentrations ranging from 0.0462 mg/kg at GP2 to 0.0577 mg/kg at GP4. Toluene was detected at a concentration of 0.0577 mg/kg at GP4. 2-Butanone, 2-hexanone, acetone, and toluene are considered to be SRCs.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in the samples taken from all four locations at concentrations ranging from 5 mg/kg at GP2 to 8.7 mg/kg at GP3. None of the concentrations exceeded the reference background criterion; therefore, lead is not considered to be an SRC in subsurface soil.

9.17.4.3 Groundwater

Five groundwater samples were collected from the four Geoprobe locations at the site. Due to a field oversight, GP4 was inadvertently resampled for groundwater during the soil resampling in May 1998 discussed in Section 9.17.4.2. The results of the groundwater analysis are presented in Table 9.17-2 and Figure 9.17-3.

VOCs. The sample collected from GP2 indicated the presence of 1,1,2,2-tetrachloroethane at a concentration of 7.9 µg/L. With the concurrence of GEPD, the quality of the data was reevaluated (see Comment No. 94 in Appendix L). The 1,1,2,2-tetrachloroethane value for sample GP2 (7V4211) was originally qualified as estimated, as indicated by the qualifier "J" with the qualifier reason codes C05 and G01 attached (see Appendix H). The associated validation code indicates that the value was estimated due to a high percentage difference between initial and continuing calibration checks and a surrogate recovery above the upper control limit. This combination indicates that the 7.9 µg/L value is biased high by an indeterminate amount. Given that the reporting level for the compound is 5 µg/L, the value reported was requalified as undetected, as indicated by the "U" in the qualifier "UJ." Therefore, 1,1,2,2-tetrachloroethane is not an SRC in groundwater. The sample collected from GP4 (May 1998) indicated the presence of 2-butanone at a concentration of 9 µg/L. Therefore, 2-butanone is considered to be an SRC in groundwater.

SVOCs. Bis(2-ethylhexyl)phthalate was detected at a concentration of 21.3 µg/L at GP4 (May 1998), which is above its respective MCL of 6 µg/L. However, it should be noted that the January 1998 groundwater sample from the same Geoprobe boring location did not indicate bis(2-ethylhexyl)phthalate above detection limits. The elevated concentration of bis(2-ethylhexyl)phthalate detected in the second sample was considered to be the result of field or laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), bis(2-ethylhexyl)phthalate is not considered to be an SRC in groundwater.

Lead. Lead was not detected in any of the four samples; therefore, lead is not considered to be an SRC.

9.17.4.4 Surface water

No surface water samples were collected during the field investigation because a surface water pathway does not exist at this site.

9.17.4.5 Sediment

No sediment samples were collected during the field investigation because a sediment pathway does not exist at this site.

9.17.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.17-3.

9.17.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil SRCs to the respective GSSLs.

Of the SRCs identified in subsurface soil, none of the analytes exceeded their respective GSSLs (Table 9.17-4); therefore, there are no CMCOPCs in soil at SWMU 27K based on leaching to groundwater.

9.17.6 Human Health Preliminary Risk Evaluation of SWMU 27K

SRCs for the site were identified for subsurface soil and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.17.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. Soil contamination at this site is limited to subsurface soil; therefore, only a construction worker or other individuals working within an excavation are likely to be exposed to contaminants.

Given that contamination in soils is limited to subsurface soils and that land use at the site is not likely to change, the future potential receptor populations are likely to be the same as current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater. Much of the fenced area of the motorpool consists of concrete surfaces and buildings; however, there is an area of managed grasses on the southwest side. Soil contamination at the site is limited to subsurface soils; therefore, air migration pathways (volatilization, fugitive dust, etc.) and surface water runoff are not viable migration pathways.

Because the elevation of groundwater at the site is lower than that of the adjacent drainage ditch and there are no other surface water bodies nearby, groundwater at the site does not discharge into any nearby surface waters. Therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.17-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site exposure scenario.

9.17.6.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for subsurface soils included four volatile organics: acetone, toluene, 2-butanone, and 2-hexanone. The concentrations of these contaminants were below their respective screening values (Table 9.17-4). Therefore, there are no identified HHCOPCs in subsurface soil.

The SRCs for groundwater consisted of one volatile organic: 2-butanone. The maximum concentration of 2-butanone was below its screening value (Table 9.17-5); therefore, there are no HHCOPCs in groundwater.

9.17.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.17.7 Ecological Preliminary Risk Evaluation of SWMU 27K

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in the surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the EPRE are presented below.

9.17.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

One VOC was detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.17-6. The constituent detected in groundwater did not exceed its ESV.

Surface soils were not analyzed based on field headspace readings. There was no further evaluation of the surficial soil in the EPRE for SWMU 27K.

9.17.8 Conclusions and Risk Management and Site Recommendations for SWMU 27K

9.17.8.1 Conclusions

Nature and Extent of Contamination

- Field headspace readings did not indicate contaminants in surface soil.
- 2-Butanone, 2-hexanone, acetone, and toluene were detected in subsurface soil and are SRCs.
- 2-Butanone was detected in groundwater and is considered to be an SRC. In addition, 1,1,2,2-tetrachloroethane was estimated as undetected at a concentration of 7.9 µg/L in groundwater from GP2. 1,1,2,2-Tetrachloroethane is not considered to be an SRC in groundwater.
- Bis(2-ethylhexyl)phthalate was detected above its MCL in one of five groundwater samples. The elevated concentration of bis(2-ethylhexyl)phthalate was indicated in a location (GP4) that was inadvertently sampled for groundwater during the soil resampling event in May 1998. The bis(2-ethylhexyl)phthalate concentration detected in the second sample was considered to be the result of laboratory or field contamination; therefore, with the concurrence of GEPD, bis(2-ethylhexyl)phthalate is not considered to be an SRC in groundwater (SAIC 1999a).
- Lead was not detected in the four groundwater samples that were analyzed for lead; therefore, lead is not considered to be an SRC.

Fate and Transport

- SRCs identified in subsurface soil did not exceed the respective GSSLs; therefore, there are no CMCOPCs in soil.

Human Health Preliminary Risk Evaluation

- There are no identified HHCOPCs for subsurface soils or groundwater.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in groundwater at SWMU 27K.

9.17.8.2 Risk management and site recommendations

- Based on the information presented in this section, an NFA status is recommended for SWMU 27K regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.17-1. Summary of Analytes Detected in Subsurface Soil, SWMU 27K

Station	Reference Background Criteria	7VGP1	7VGP2	7VGP3	7VGP4
Sample ID		7V1112	7V1212	7V1312	7V1412
Date		05/06/98	05/06/98	05/06/98	05/06/98
Depth (feet)		8 to 10	4 to 6	2 to 4	4 to 6
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
2-Butanone	0.00		**0.014**	**0.0128**	**0.0094**
2-Hexanone	0.00		**0.0028**		
Acetone	0.00		**0.0462**	**0.057**	**0.0577**
Toluene	0.00				**0.0577**
Metals (mg/kg)					
Lead	11.10	5.2	5	8.7	5.5

Bold indicates concentrations above reference background criteria.

Table 9.17-2. Summary of Analytes Detected in Groundwater, SWMU 27K

Station	Reference Background Criteria	MCL	7VGP1	7VGP2	7VGP3	7VGP4	7V-GP4
Sample ID			7V4111	7V4211	7V4311	7V4411	7V4412
Date			01/19/98	01/19/98	01/19/98	01/19/98	05/06/98
Sample Type			Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)							
1,1,2,2-Tetrachloroethane	0.00			**7.9 UJ**[a]			
2-Butanone	0.00						**9**
Semivolatile Organic Compounds (µg/L)							
Bis(2-ethylhexyl)phthalate	0.00	6					*21.3*[b]

[a]The 1,1,2,2-tetrachloroethane value for sample GP2 (7V4211) was originally qualified as estimated, "J," with qualifier reason codes of C05 and G01 attached. These reason codes indicate that the value was estimated due to a high percentage difference between initial and continuing calibration checks and a surrogate recovery above the upper control limit. This combination indicates that the 7.9 µg/L value is biased high by an indeterminate amount. Given that the reporting level for the compound is 5 µg/L, the value reported was requalified as undetected, "UJ."

[b]Bis(2-ethylhexyl)phthalate was detected at a concentration of 21.3 µg/L at GP4 in May 1998 (above MCL of 6 µg/L). However, the January 1998 groundwater sample from the same Geoprobe boring location did not indicate bis(2-ethylhexyl)phthalate above detection limits. The elevated concentration of bis(2-ethylhexyl)phthalate detected in the second sample was considered to be the result of field or laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), bis(2-ethylhexyl)phthalate is not considered to be an SRC in groundwater.

Bold indicates concentrations above reference background criteria.

Boxed *italic* indicates concentrations above MCLs.

Table 9.17-3. Summary of Site-related Contaminants, SWMU 27K

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
2-Butanone	NC	0.014	NP	9	NP
2-Hexanone	NC	0.0028	NP	ND	NP
Acetone	NC	0.0577	NP	ND	NP
Toluene	NC	0.0577	NP	ND	NP

NC = Soil samples not collected based on field headspace analysis.

ND = Not detected.

NP = No pathway exists.

Table 9.17-4. GSSL Screening of Site-related Contaminants in Soil, SWMU 27K

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
2-Butanone[b]	0.014	7.685	No
2-Hexanone[b]	0.0028	6.9	No
Acetone	0.0577	16	No
Toluene	0.0577	12	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA-suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

Table 9.17-5. Human Health Risk Screening for Subsurface Soil and Groundwater, SWMU 27K

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
2-Butanone	3/3	0.0094	0.014	4,700	No	Max Detect < Risk Criteria
2-Hexanone	1/4	0.0028	0.0028	313	No	Max Detect < Risk Criteria
Acetone	3/4	0.0462	0.0577	780	No	Max Detect < Risk Criteria
Toluene	1/4	0.0577	0.0577	1,600	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Volatile Organic Compounds (µg/L)						
2-Butanone	1/5	9	9	190	No	Max Detect < Risk Criteria

Table 9.17-6. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27K

Analyte	SWMU 27K Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
2-Butanone	9	14,000[a]	No	Max Detect < ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.

ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.

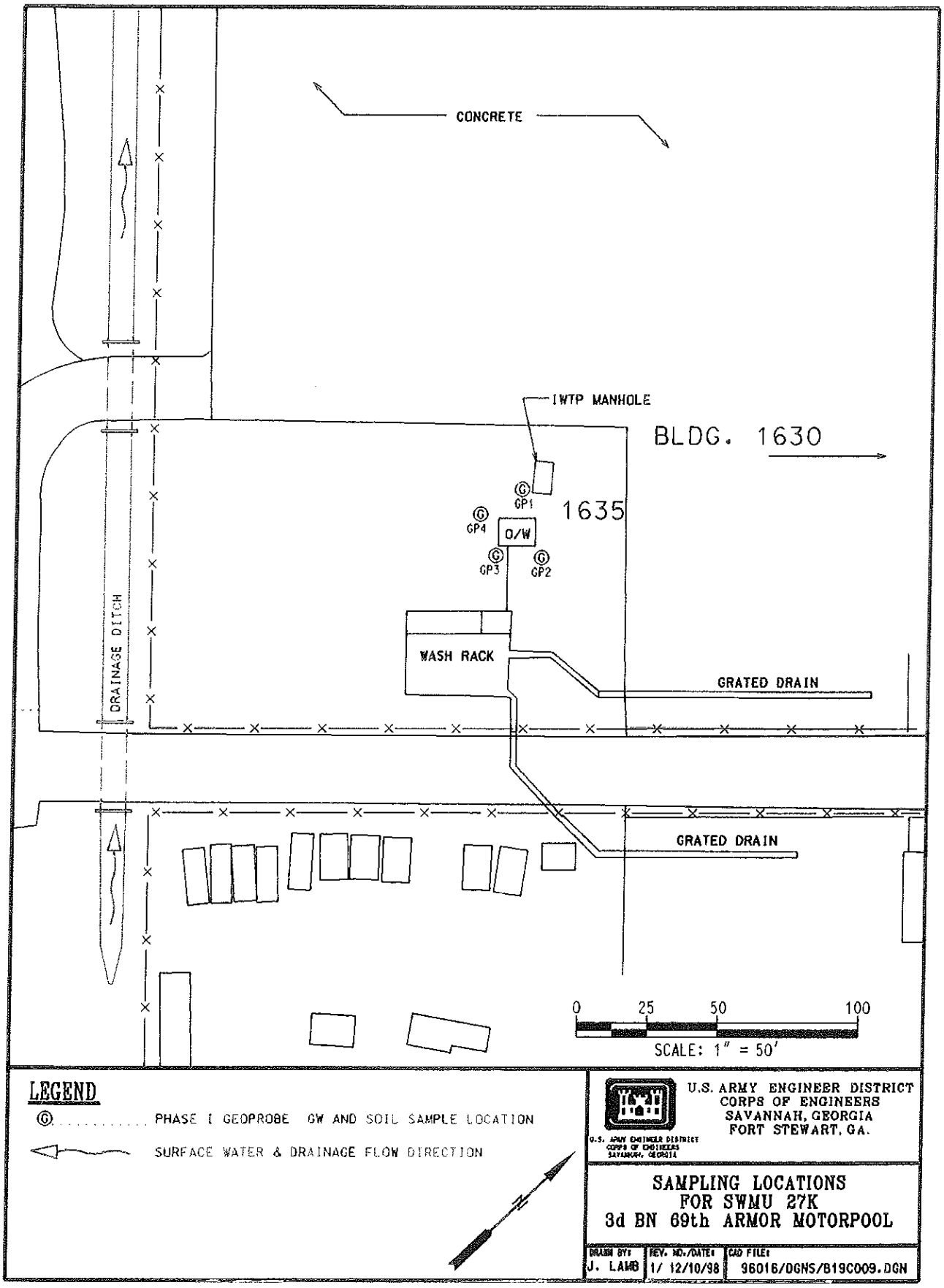

Figure 9.17-1. Sampling Locations, SWMU 27K

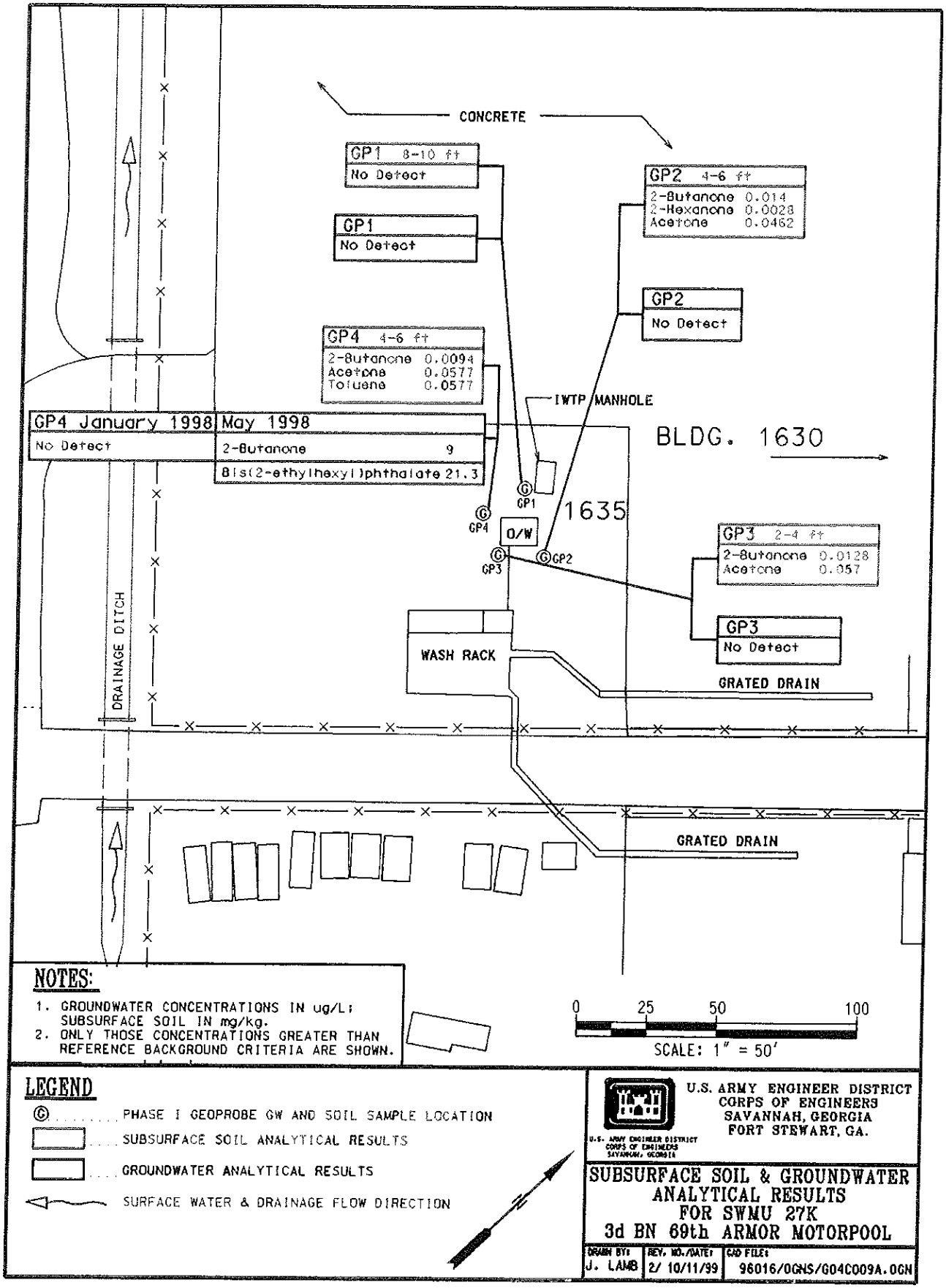

Figure 9.17-2. Summary of Analytical Results in Subsurface Soil and Groundwater, SWMU 27K

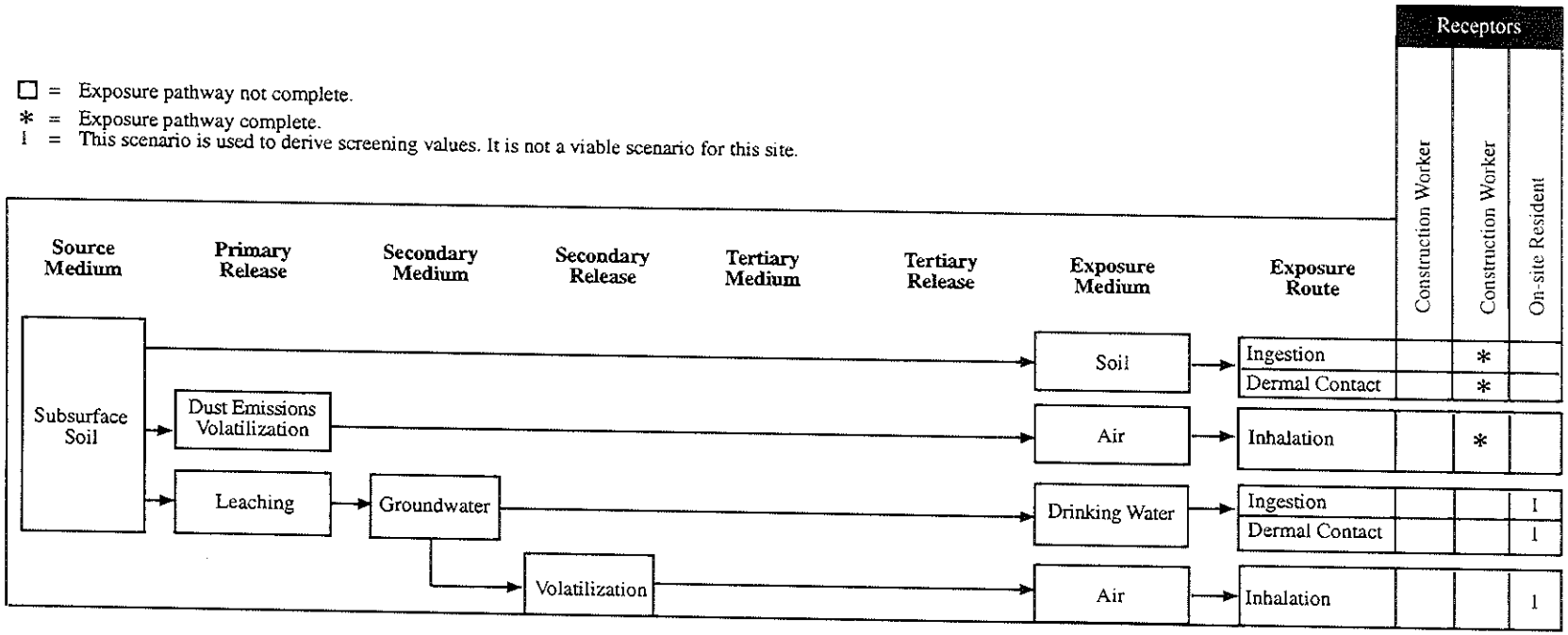

Figure 9.17-3. Potential Migration and Exposure Pathways, SWMU 27K

9.18 SWMU 27M: NGTC BLOCK 10100

9.18.1 History and Description of SWMU 27M, Block 10100

SWMU 27M, Block 10100 is one of eight OWSs located in the NGTC along Troupe Avenue. The OWS is located in the south/southwestern corner of Block 10100 at the corner of 13th Street and Troupe Avenue (Figure 9.18-1). The OWS receives wastewater from an adjacent vehicle wash rack. Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges into a drainage ditch located southwest of the OWS along Troupe Avenue. The wash rack is not presently in use and is scheduled for removal during 2000. Units rarely use the motorpool, and when assigned to the facility, they are strictly forbidden from using the wash rack. All equipment and vehicles are washed at a centralized location in the National Guard area. Thus, only rainwater currently collects in the OWS, which is an open unit. No previous investigations have been performed at the site.

9.18.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 9.18-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

One sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch. The sediment was analyzed for VOCs, SVOCs, and lead. No surface water was available during the Phase I RFI.

9.18.3 Physical Characteristics of the Site

9.18.3.1 Topography

The topography of the site is essentially flat, with a gravel vehicle parking area adjacent to the north and a grass border between the OWS and wash rack and the fence to the south/southwest and southeast. The surface elevation ranges from 73.22 feet to 73.77 feet amsl.

9.18.3.2 Surface drainage

Drainage ditches are located approximately 25 feet south/southwest and 65 feet south/southeast of the OWS. The effluent from the OWS discharges to the drainage ditch to the south/southwest (Figure 9.18-1). Surface water is present in the drainage ditches only during rainfall events. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where it is allowed to percolate into the soil (see Section 3.3).

9.18.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.18.3.4 Hydrogeology

Groundwater was encountered at approximately 4 feet to 4.5 feet bgs.

9.18.3.5 Ecology

As stated in Section 8.2, SWMU 27M is classified as an "industrialized area with managed grasslands." The site comprises approximately 0.01 acre (Figure 9.18-1). Habitat associated with the OWS consists of a large, managed grass area adjacent to a drainage ditch.

9.18.4 Nature and Extent of Contamination

9.18.4.1 Snrface soil

Three surface soil samples were collected based on field headspace screening for VOCs (i.e., hits). The results of the soil analysis are presented in Table 9.18-1 and Figure 9.18-2.

VOCs. Methylene chloride was detected in the sample taken from GP2 at a concentration of 0.0374 mg/kg; therefore, methylene chloride is considered to be an SRC in surface soil.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected in the samples taken from all three locations at concentrations ranging from 18 mg/kg at GP3 to 30.2 mg/kg at GP4. All concentration levels exceeded the reference background criterion; therefore, lead is considered to be an SRC for surface soil.

9.18.4.2 Subsurface soil

One subsurface soil sample was collected based on field headspace screening for VOCs (i.e., hits). The results of the soil analysis are presented in Table 9.18-2 and Figure 9.18-2.

VOCs. No VOCs were detected in subsurface soil.

SVOCs. Fluoranthene and pyrene were detected in the sample taken from GP1 at concentrations of 0.324 mg/kg and 0.294 mg/kg, respeetively. Both fluoranthene and pyrene are considered to be SRCs in subsurface soil.

Lead. Lead was detected in the samples taken from GP1 at a concentration of 19.1 mg/kg, which exceeds the reference background criterion; therefore, lead is considered to be an SRC for subsurface soil.

9.18.4.3 Groundwater

Four groundwater samples were collected from the four locations at the site. The results of the groundwater analysis are presented in Table 9.18-3 and Figure 9.18-2.

VOCs. Tetrachloroethene was detected in the sample taken from GP1 at a concentration of 2.6 µg/L. Tetrachloroethene is considered to be an SRC in groundwater.

SVOCs. No SVOCs were detected in groundwater.

Lead. Lead was detected below the reference background criterion at GP1 and GP4 and not detected at GP2 and GP3; therefore, lead is not considered to be an SRC in groundwater.

9.18.4.4 Surface water

No surface water was available during the Phase I RFI; therefore, no surface water samples were collected.

9.18.4.5 Sediment

One sediment sample was collected. The results of the sediment analysis are presented in Table 9.18-4 and Figure 9.18-2.

VOCs. No VOCs were detected in sediment.

SVOCs. No SVOCs were detected in sediment.

Lead. Lead was detected in the sample taken from SWS1 at a concentration of 24.3 mg/kg, which is above the reference background criterion; therefore, lead is considered to be an SRC in sediment.

9.18.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.18-5.

9.18.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface soil, subsurface soil, and sediment SRCs to their respective GSSLs.

Of the SRCs identified in surface soil and subsurface soil, only methlyene chloride exceeded its respective GSSL (Table 9.18-6) and is considered to be a CMCOPC in soil based on leaching to groundwater; however, methylene chloride was not detected in subsurface soil or groundwater.

9.18.6 Human Health Preliminary Risk Evaluation of SWMU 27M

SRCs for the site were identified for the following media: surface soil, subsurface soil, groundwater, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.18.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area; however, the wash rack is not currently in use. The OWS discharges to an open ditch outside the fence, but water is present only during rain events. The potential receptor populations include:

- occupational populations (individuals working on the site),

- construction workers,
- juvenile trespassers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is covered by managed grasses and gravel; therefore, soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway. The OWS is scheduled for removal. At that time, the groundcover within the immediate OWS area will be removed. Clean backfill will be placed in the excavation area, and the area will be seeded.

Because groundwater is lower than the adjacent drainage ditch and there are no other surface water bodies nearby, groundwater at the site does not discharge into any nearby surface waters. Therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.18-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

The OWS discharges to an open ditch. Water is present in the ditch only after heavy rains; therefore, for the purposes of this assessment, the sediments within the ditch were addressed as surface soils.

Given that water is present only during rain events, exposure, if any, to contaminants in surface water would be sporadic; therefore, potential exposure to contaminants in surface water is not considered to be a viable chronic exposure pathway.

9.18.6.2 Risk evaluation

The results of the human health risk sereening are given below.

Methylene chloride and lead were identified as SRCs for surface soil. The maximum concentration for methylene chloride and lead were below their respective screening values for direct exposure (Table 9.18-7); therefore, there are no HHCOPCs for surface soil.

The SVOCs (PAHs) fluoranthene and pyrene as well as lead were identified as SRCs for subsurface soils, but the concentrations of these contaminants were below their respective screening values (Table 9.18-7). Therefore, there are no HHCOPCs for subsurface soil.

Tetrachloroethane was the only SRC for groundwater. The maximum concentration of tetrachloroethane exceeded its respective screening value (Table 9.18-7).

The maximum concentration of tetrachloroethane was 2.6 µg/L as compared to its screening value of 1.1 µg/L. Tetrachloroethane is an HHCOPC in groundwater.

Lead was identified as an SRC for sediment, but the concentrations of this contaminant were below its screening value (Table 9.18-7). Therefore, there are no HHCOPCs in sediment.

9.18.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of HHPRE (Chapter 7.0).

9.18.7 Ecological Preliminary Risk Evaluation of SWMU 27M

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.18.7.I Ecological screening value comparison (Step i)

There was no surface water at the site during the Phase I RFI. The sediment was treated as surface soil (Section 9.18.7.5).

Only tetrachloroethane was detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.18-8. No ECOPCs were identified by the ESV comparison for groundwater.

Because there are no ESVs for soil, all analytes detected in soil and drainage ditch sediment were evaluated further in EPRE Steps ii through v.

9.18.7.2 Preliminary problem formulation (Step ii)

The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation for SWMU 27M are described in Section 8.2.

9.18.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil or drainage ditch sediment at the site. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

9.18.7.4 Preliminary exposure (Step iv)

Ecological receptors at the site are probably exposed by ingestion of contaminated soil or drainage ditch sediment or of biota exposed to contaminated soil or drainage ditch sediment. The exposure parameters for the surrogate species—shrews and robins—are presented in Table 8-7.

9.18.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects

endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil and drainage ditch sediment at the site are presented in Tables 9.18-9 and 9.18-10, respectively. These tables show the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. HQs exceeding one are shown bordered by a double line.

The only ECOPC present in surface soil at concentrations resulting in ADDs exceeding the TRVs for the surrogate species was lead (Table 9.18-9). Only the robin, with an HQ of 16.2, is potentially at risk from lead in surface soil.

Lead was the only ECOPC in sediment from the drainage ditch that had an HQ exceeding one (Table 9.18-10). The lead HQ for robins is 13.1.

9.18.8 Conclusions and Risk Management and Site Recommendations for SWMU 27M

9.18.8.1 Conclusions

Nature and Extent of Contamination

- Methylene chloride is considered to be an SRC in surface soil.
- Fluoranthene and pyrene were detected in the subsurface soil sample; therefore, both are considered to be SRCs for subsurface soil.
- Lead was detected in surface soil, subsurface soil, and sediment samples at concentrations that exceeded the reference background criterion; therefore, lead is considered to be an SRC for those media.
- Tetrachloroethane was detected in one groundwater sample and is considered to be an SRC.
- Lead was below the reference background criterion or not detected in all groundwater samples; therefore, lead is not considered to be an SRC in groundwater.

Fate and Transport

- Methylene chloride in soil exceeded its GSSL and is considered to be a CMCOPC in soil.
- There are no CMCOPCs for sediment.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for surface soil, subsurface soil, or sediment.
- Tetrachloroethane was identified as an HHCOPC in groundwater.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs for groundwater at the site.
- Lead is the only ECOPC in surface soil for terrestrial receptors.
- Lead is the only ECOPC in drainage ditch sediment for terrestrial receptors.

9.18.8.2 Risk management and site recommendations

- Methylene chloride was the only contaminant identified as a CMCOPC in surface soil. Methylene chloride was identified as a possible CMCOPC in surface soil based on its potential to leach into groundwater at concentrations that might have an impact upon human health if the groundwater was used as a source of drinking water. Methylene chloride was not detected in either subsurface soil or groundwater; therefore, the methylene chloride detected is probably the result of laboratory contamination. Methylene chloride is a common laboratory contaminant, and it was detected in only one sample. The maximum concentration was 0.0374 mg/kg as compared to a screening value of 0.02 mg/kg. Given the conservative assumptions used to derive the screening values, it is unlikely that this contaminant would leach to groundwater in significant concentrations. Based on the preceding evaluations, methylene chloride is not considered to be a CMCOPC for SWMU 27M.

- Lead was identified as an ECOPC in surface soil and drainage ditch sediment. Lead was detected at a maximum concentration of 30.2 mg/kg, which is approximately four times the reference background criterion. The lead concentration was within the observed range (less than 10 mg/kg to 300 mg/kg) established by the USGS for lead concentrations in the eastern United States (USGS 1984). This site is located in an industrialized and heavily trafficked area and has very little ecological habitat for potential exposure of ecological receptors; therefore, lead is not considered to be an ECOPC at this site and does not require further investigation and/or evaluation.

- Tetrachloroethane is considered to be an HHCOPC in groundwater. Human receptors are not at risk from exposure to these chemicals unless there is a potential exposure pathway (i.e., these receptors come into contact with groundwater). Humans would potentially be at risk if groundwater was used as a source of drinking water. The maximum concentration of tetrachloroethane (2.6 µg/L) was below its MCL (5 µg/L). Given the absence of potential exposure pathways at this site, tetrachloroethane in groundwater is unlikely to have an adverse effect upon human health and does not require further investigation and/or evaluation.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27M regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.18-1. Summary of Analytes Detected in Surface Soil, SWMU 27M

Station	Reference Background Criteria	7YGP2	7YGP3	7YGP4
Sample ID		7Y1211	7Y1311	7Y1411
Date		01/27/98	01/27/98	01/27/98
Depth (feet)		0 to 2	0 to 2	0 to 2
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
Methylene chloride	0.00	**0.0374**		
Metals (mg/kg)				
Lead	8.81	**23.9**	**18**	**30.2**

Bold indicates concentrations above reference background criteria.

Table 9.18-2. Summary of Analytes Detected iu Subsurface Soil, SWMU 27M

Station	Reference Background Criteria	7YGP1
Sample ID		7Y1111
Date		01/27/98
Depth (feet)		2 to 5
Sample Type		Grab
Volatile Organic Compounds (mg/kg)		
Fluoranthene	0.00	**0.324**
Pyrene	0.00	**0.294**
Metals (mg/kg)		
Lead	11.10	**19.1**

Bold indicates concentrations above reference background criteria.

Table 9.18-3. Summary of Analytes Detected in Groundwater, SWMU 27M

Station	Reference Background Criteria	MCL	7YGP1	7YGP2	7YGP3	7YGP4
Sample ID			7Y4111	7Y4211	7Y4311	7Y4411
Date			01/27/98	01/27/98	01/27/98	01/27/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
Tetrachloroethene	0.00	5	**2.6**			
Metals (µg/L)						
Lead	4.69	15	1.4			1.4

Bold indicates concentrations above reference background criteria.

Table 9.18-4. Summary of Analytes Detected in Sediment, SWMU 27M

Station	Reference Background Criteria	7YSWS1
Sample ID		7Y2111
Date		02/01/98
Sample Type		Grab
Metals (mg/kg)		
Lead	8.81	**24.3**

Bold indicates concentrations above reference background criteria.

Table 9.18-5. Summary of Site-related Contaminants, SWMU 27M

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Methylene chloride	0.0374	ND	ND	ND	NC
Tetrachloroethene	ND	ND	ND	2.6	NC
Semivolatile Organic Compounds					
Fluoranthene	ND	0.324	ND	ND	NC
Pyrene	ND	0.294	ND	ND	NC
Metals					
Lead	30.2	19.1	24.3	BRBC	NC

BRBC = Below reference background criteria.
NC = Not collected; surface water unavailable during Phase I RFI.
ND = Not detected.

Table 9.18-6. GSSL Screening of Site-related Contaminants in Soil and Sediment, SWMU 27M

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
SOIL			
Volatile Organic Compounds (mg/kg)			
Methylene chloride	0.0374	0.02	Yes
Semivolatile Organic Compounds (mg/kg)			
Fluoranthene	0.324	4,300	No
Pyrene	0.294	4,200	No
Metals (mg/kg)			
Lead[b]	30.2	400	No
SEDIMENT			
Metals (mg/kg)			
Lead[b]	24.3	400	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.18-7. Human Health Risk Screening for Surface Soil, Subsurface Soil, Groundwater, and Sediment, SWMU 27M

SURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Methylene chloride	1/3	0.0374	0.0374	85	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	3/3	18	30.2	400	No	Max Detect < Risk Criteria

SUBSURFACE SOIL						
Analyte	Resnlts > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Fluoranthene	1/1	0.324	0.324	310	No	Max Detect < Risk Criteria
Pyrene	1/1	0.294	0.294	230	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	1/1	19.1	19.1	400	No	Max Detect < Risk Criteria

Table 9.18-7. Human Health Risk Screening for Surface Soil, Subsurface Soil, Groundwater, and Sediment, SWMU 27M (continued)

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Volatile Organic Compounds (µg/L)						
Tetrachloroethene	1/4	2.6	2.6	1.1	Yes	Max Detect > Risk Criteria

SEDIMENT						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Metals (mg/kg)						
Lead	1/1	24.3	24.3	400	No	Max Detect < Risk Criteria

Table 9.18-8. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27M

Analyte	SWMU 27M Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Tetrachloroethene	2.6	84	No	Max Detect < ESV

ESV = EPA Region IV ESV (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.

Table 9.18-9. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27M

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = C_{Max} × BAF_i × IR_S	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = C_{Max} × BAF_i × IR_R	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
Methylene chloride	0.0374	5.00E-02	9.91E-04	1.29E+01	7.71E-05	2.84E-03	No TRV	No HQ
Metals								
Lead[a]	30.2	4.00E-01	6.40E+00	1.76E+01	3.64E-01	1.8E+01	1.13E+00	1.62E+01

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soil >500 mg/kg and lead concentration >1 mg/kg.
ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.
Cells with double borders indicate HQ > 1.

Table 9.18-10. Preliminary Risk Calculations for ECOPCs in Sediment, SWMU 27M

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = C_{Max} × BAF_i × IR_S	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = C_{Max} × BAF_i × IR_R	TRV (mg/kg/d)	HQ = ADD/TRV
Metals								
Lead[a]	24.3	4.00E-01	5.15E+00	1.76E+01	2.93E-01	1.48E+01	1.13E+00	1.31E+01

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration > 1 mg/kg.
ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.
Cells with double borders indicate HQ > 1.

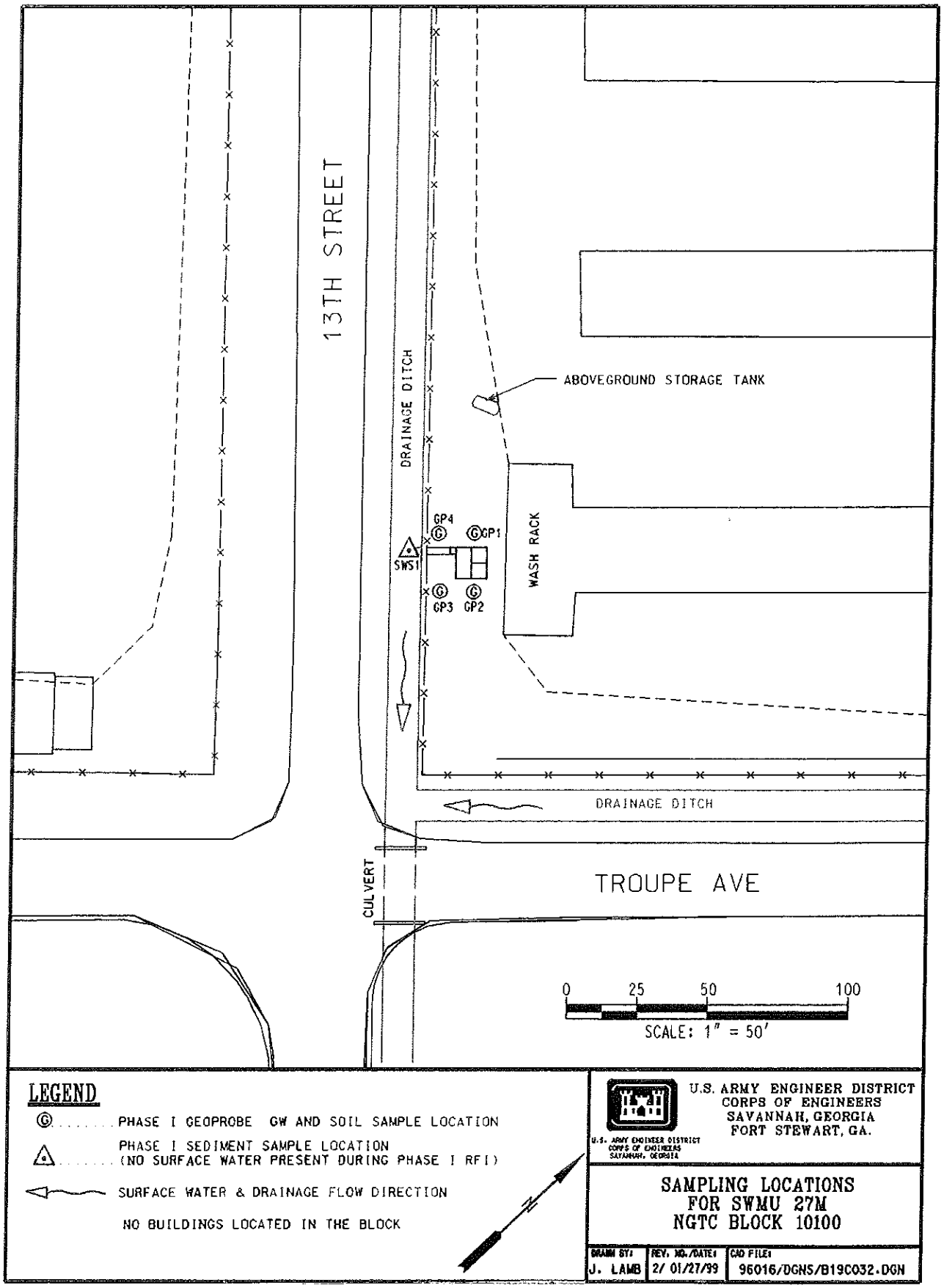

Figure 9.18-1. Sampling Locations, SWMU 27M

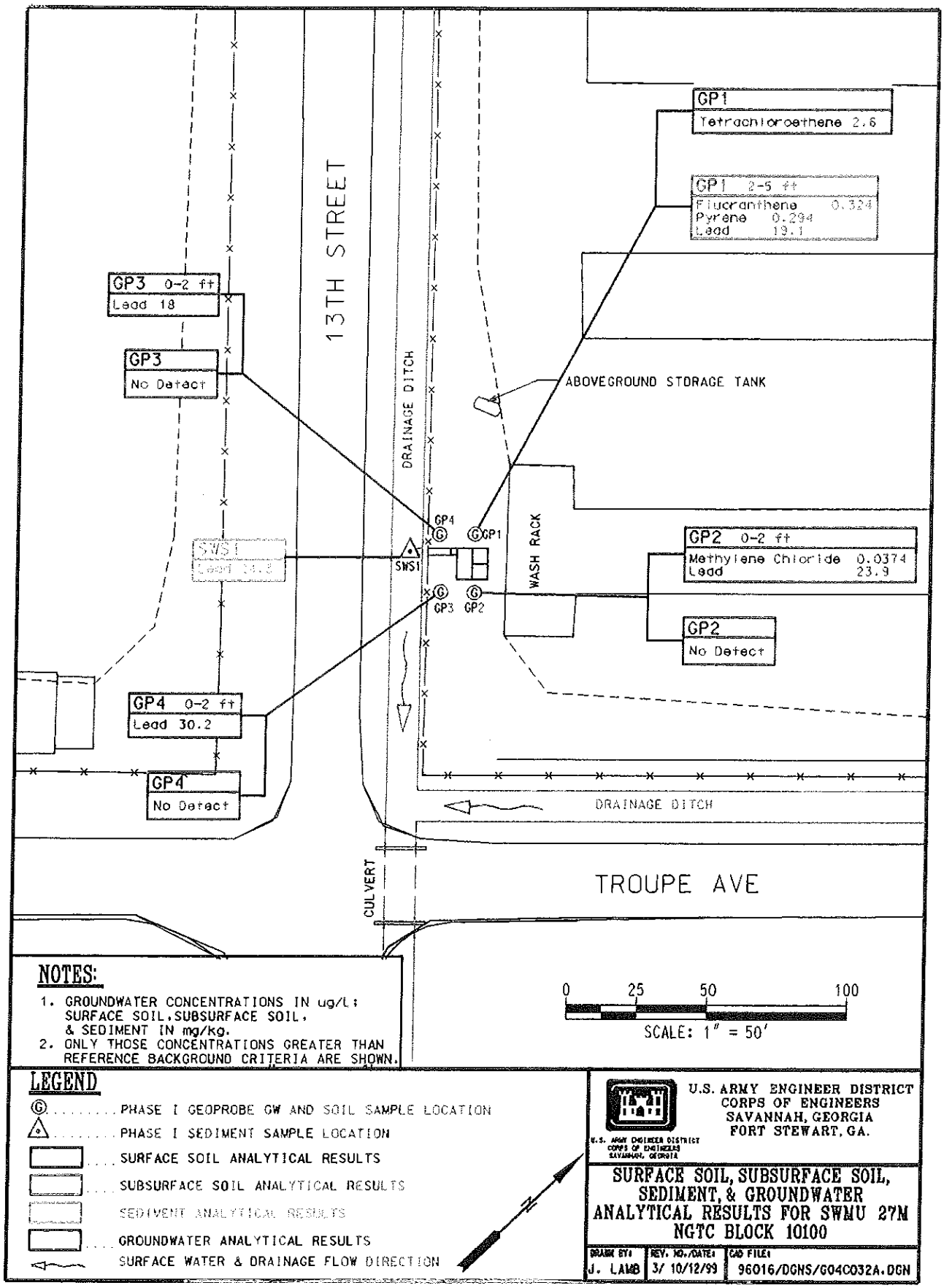

Figure 9.18-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, Groundwater, and Sediment, SWMU 27M

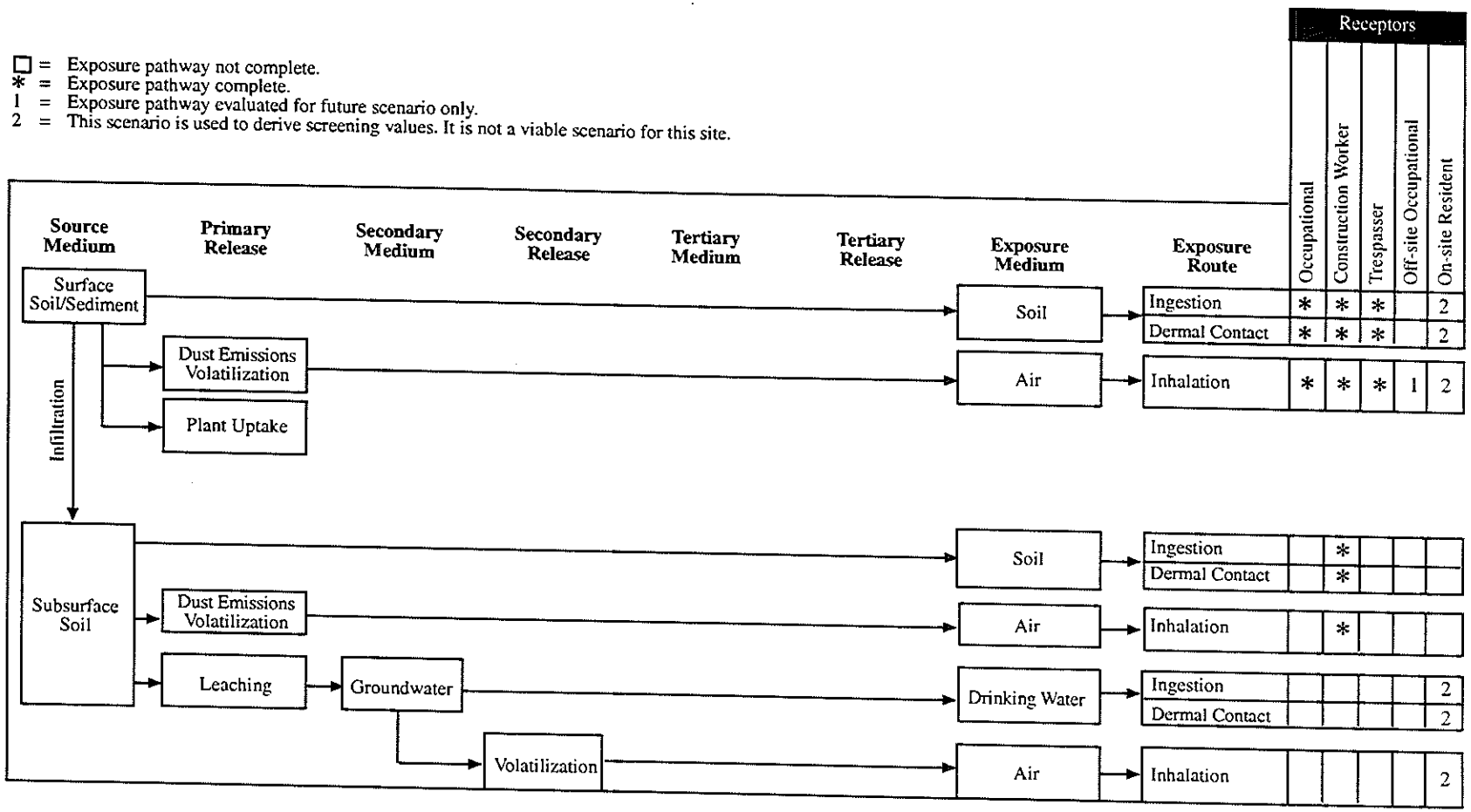

Figure 9.18-3. Potential Migration and Exposure Pathways, SWMU 27M

9.19 SWMU 27N: NGTC BLOCK 9800

9.19.1 History and Description of SWMU 27N, Block 9800

SWMU 27N, Block 9800 is one of eight OWSs located in the NGTC along Troupe Avenue. The OWS is located approximately in the middle of Block 9800, adjacent to a wash rack identified as Building 9893 (Figure 9.19-1). The facility was used until 1989, and during operation the OWS received wastewater from an adjacent vehicle wash rack. Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges into a drainage ditch located southeast of the OWS along Troupe Avenue. The wash rack is not presently in use and is scheduled for removal during 2000. Units rarely use the motorpool, and when assigned to the facility, they are strictly forbidden from using the wash rack facility. All equipment and vehicles are washed at a centralized location in the National Guard area. Thus, only rainwater currently collects in the OWS, which is an open unit. No previous investigations have been performed at the site.

9.19.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. In addition, with the concurrence of GEPD, DPT techniques were used to install a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack that was installed to intersect the water table at the GP3 location (SAIC 1999a). The resampling monitoring point (GP3) was installed approximately 1 foot away from the previous sampling location. In addition, with the concurrence of GEPD, a 2-inch-diameter monitoring well was installed at the GP3 location, and the groundwater was resampled using low-flow techniques. The well construction, geotechnical results, well development, and field parameter measurements for MW1 are presented in Table 9.19-1. The soil and groundwater from the DPT–collected samples were analyzed for VOCs, SVOCs, and lead. The groundwater from the monitoring point and one monitoring well were analyzed for only bis(2-ethylhexyl)phthalate. The soil sampling, DPT groundwater sampling, and monitoring well locations are presented in Figure 9.19-1.

One sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch. The sediment was analyzed for VOCs, SVOCs, and lead. No surface water was available during the Phase I RFI.

9.19.3 Physical Characteristics of the Site

9.19.3.1 Topography

The topography of the site is essentially flat, with a gravel vehicle parking area adjacent to the north and a grass border between the OWS and wash rack and the fence to the southeast. The surface elevation ranges from 75.78 feet to 76.84 feet amsl.

9.19.3.2 Surface drainage

Drainage ditches are located approximately 25 feet southwest and 65 feet southeast of the OWS. When the facility was in operation, the effluent from the OWS discharged to the drainage ditch to the southwest (Figure 9.19-1). Surface water is present in the drainage ditches only during rainfall events. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site where the water is allowed to percolate into the soil (Section 3.3).

9.19.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.19.3.4 Hydrogeology

Groundwater was encountered at approximately 3.6 feet to 4.3 feet bgs.

9.19.3.5 Ecology

As stated in Section 8.2, SWMU 27N is classified as an "industrialized area with managed grasslands." The site consists primarily of concrete and gravel, with a managed grassland habitat adjacent to the OWS. The site comprises approximately 0.01 acre (Figure 9.19-1). Additionally, a storm water ditch is adjacent to the SWMU. The storm water ditch typically contains water only after rainfall events.

9.19.4 Nature and Extent of Contamination

9.19.4.1 Surface soil

Because PID field headspace readings did not indicate elevated VOC readings, no surface soil samples were collected during the field investigation.

9.19.4.2 Subsurface soil

Four subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.19-2 and Figure 9.19-2.

VOCs. No VOCs were detected in subsurface soil.

SVOCs. Benzo(*b*)fluoranthene and fluoranthene were detected in the sample taken from GP1 at concentrations of 0.846 mg/kg and 0.746 mg/kg, respectively; therefore, benzo(*b*)fluoranthene and fluoranthene are considered to be SRCs in subsurface soil.

Lead. Lead was detected in all four samples at concentrations ranging from 2.3 mg/kg at GP3 to 39.9 mg/kg at GP1. The concentration levels of 39.9 mg/kg at GP1 and 32 mg/kg at GP4 exceeded the reference background criterion; therefore, lead is considered to be an SRC in subsurface soil.

9.19.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 9.19-3 and Figure 9.19-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. Bis(2-ethylhexyl)phthalate was detected at a concentration of 12.3 µg/L at GP3. The bis(2-ethylhexyl)phthalate at GP3 was believed to be the result of field or laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), the groundwater at the GP3 location was resampled for only bis(2-ethylhexyl)phthalate on August 26, 1999. The groundwater was collected from a 3/4-inch-inside-diameter PVC monitoring point with a 10-foot screened interval with a filter pack that was installed to intersect the water

table. The resampling monitoring point was installed approximately 1 foot away from the previous sampling location. Bis(2-ethylhexyl)phthalate was detected at a concentration of 174 µg/L. With the concurrence of GEPD, a 2-inch-diameter monitoring well was installed at the GP3 location, and the groundwater was resampled on October 29, 1999, using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected in the groundwater from the monitoring well when using low-flow sampling techniques. The elevated concentration of bis(2-ethylhexyl)phthalate previously detected at GP3 was considered to be the result of field or laboratory contamination. Bis(2-ethylhexyl)phthalate is not considered to be an SRC at SWMU 27N.

Lead. Lead was not detected in the groundwater samples collected at SWMU 27N.

9.19.4.4 Surface water

No surface water was available in the drainage ditch during the Phase I RFI; therefore, no surface water samples were collected.

9.19.4.5 Sediment

One sediment sample was collected. The results of the sediment analysis are presented in Figure 9.19-2 and Table 9.19-4.

VOCs. No VOCs were detected in the sediment sample.

SVOCs. Benzo(*a*)anthracenc, benzo(*a*)fluoranthene, benzo(*a*)pyrene, chrysene, and pyrene were detected at SWS1 at concentrations of 0.208 mg/kg, 0.349 mg/kg, 0.264 mg/kg, 0.292 mg/kg, and 0.353 mg/kg, respectively. These analytes are considered to be SRCs in sediment.

Lead. Lead was detected in the sample taken from SWS1 at a concentration of 7.2 mg/kg, which is below the reference background criterion; therefore, lead is not considered to be an SRC in sediment.

9.19.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.19-5.

9.19.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil and sediment SRCs to their respective GSSLs.

Of the SRCs identified in subsurface soil and sediment, none of the analytes exceeded their respective GSSLs (Table 9.19-6); therefore, there are no CMCOPCs in soil or sediment at SWMU 27N based on leaching to groundwater.

9.19.6 Human Health Preliminary Risk Evaluation of SWMU 27N

SRCs for SWMU 27N were identified for the following media: subsurface soil, groundwater, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of COPCs are addressed in this section.

9.19.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area; however, the wash rack is not currently in use. The OWS discharges to an open ditch outside the fence, but water is present only during rain events. On-site soil contamination at this site is limited to subsurface soil; therefore, only a construction worker or other individuals working within an excavation are likely to be exposed to contaminants. Juvenile trespassers playing in the drainage ditch may be exposed to contaminants present in sediment. It is unlikely that other receptors would come in contact with these contaminants.

Land use at this site is not likely to change; therefore, future receptor populations are likely to he the same as the current ones.

Migration and Exposure Pathway Analysis

The area is relatively flat and consists primarily of concrete; however, there is an area of managed grass in association with the OWS and a storm water ditch adjacent to the SWMU. Potential migration pathways for soils include leaching to groundwater. Soil contamination at the site is limited to subsurface soils; therefore, air migration pathways (volatilization, fugitive dust, etc.) and surface water runoff are not viable migration pathways. The OWS is scheduled for removal. At that time, the groundcover within the immediate OWS area will be removed, clean hackfill will be placed in the excavation area, and the area will be seeded.

Potential migration pathways for sediment include leaching into subsurface soils and volatilization into the air. The drainage ditch is vegetated, so releases via fugitive dust are not likely.

Because the elevation of groundwater is lower than that of the adjacent drainage ditch and no other surfaee water is nearby, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.19-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

The effluent (i.e., water) from the OWS discharges to an open ditch. Water is present in the ditch only after heavy rains; therefore, for the purposes of this assessment, the sediments within the ditch are addressed as surface soils.

Given that water is present only during rain events, exposure, if any, to contaminants in surface water would be sporadic; therefore, potential exposure to contaminants in surface water is not considered to be a viable chronic exposure pathway.

9.19.6.2 Risk evaluation

SRCs were identified in only subsurface soil and sediment. The results of the human health risk screening are given below.

Benzo(*b*)fluoranthene, fluoranthene, and lead were identified as SRCs for subsurface soil. The concentrations of these contaminants were below their respective screening values (Table 9.19-7).

Five SVOCs (PAHs) were identified as SRCs for sediment: benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, chrysene, and pyrene. The maximum concentration of benzo(*a*)pyrene (0.26 mg/kg) exceeded the soil ingestion screening value (0.088 mg/kg) (Table 9.19-7). The concentrations of the other PAHs in sediment were below their respective screening values. Benzo(*a*)pyrene is considered to be an HHCOPC in sediment.

9.19.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.19.7 Ecological Preliminary Risk Evaluation of SWMU 27N

The EPRE of SWMU 27N was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil/sediment were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil/sediment. The results of the five steps of the EPRE are presented below.

9.19.7.1 Ecological screening value comparison (Step i)

At the time of sampling, there was no surface water present on-site. The drainage ditch sediment is treated as surface soil (Section 9.19.7.5).

Because there are no ESVs for soil, all analytes detected in drainage ditch sediment were evaluated further in EPRE Steps ii through v.

9.19.7.2 Preliminary problem formulation (Step ii)

Ecological habitat is described in Section 9.19.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.19.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to drainage ditch sediment at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and the TRVs for robins are presented in Table 8-6.

9.19.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated drainage ditch sediment, of biota exposed to contaminated drainage ditch sediment, or of drinking water The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

9.19.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. There are no data for surface soil. There are no ECOPCs present in drainage ditch sediment at concentrations resulting in ADDs exceeding the TRV for the surrogate species (Table 9.19-8). The HI calculated for SVOCs does not exceed one.

9.19.8 Conclusions and Risk Management and Site Recommendations for SWMU 27N

9.19.8.1 Conclusions

Nature and Extent of Contamination

- No VOCs were detected in subsurface soil. The SVOCs, benzo(*b*)fluoranthene and fluoranthene, were detected in subsurface soil; therefore, both are considered to be SRCs.

- Bis(2-ethylhexyl)phthalate was detected above its MCL at one Geoprobe groundwater location (GP3). A monitoring well was installed at the location, and the groundwater was resampled using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected in the second set of samples, indicating that the previous bis(2-ethylhexyl)phthalate concentration was the result of field or laboratory contamination. Bis(2-ethylhexyl)phthalate is not considered to be an SRC in groundwater at SWMU 27N.

- Lead exceeded the reference background criterion in subsurface soil, and therefore, lead is considered to be an SRC.

- Benzo(*a*)anthracene, benzo(*a*)fluoranthene, benzo(*a*)pyrene, chrysene, and pyrene were detected in the sediment sample and are considered to be SRCs.

Fate and Transport

- SRCs identified in subsurface soil and sediment did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil or sediment based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for subsurface soil at this site.

- Benzo(*a*)pyrene was identified as an HHCOPC in sediment.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in drainage ditch sediment for terrestrial receptors.

9.19.8.2 Risk management and site recommendations

- Benzo(*a*)pyrene was identified as an HHCOPC in sediment. Benzo(*a*)pyrene was not indicated as a CMCOPC in sediment and was not detected in groundwater. A baseline human health risk assessment addressing the risk associated with exposure to benzo(*a*)pyrene in sediment was performed (see Attachment 9.19A). The risks associated with exposure of benzo(*a*) pyrene in sediment to the identified receptor populations are within the acceptable range, and no further investigation and/or evaluation is required.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27N regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU. MW1 and permanent monitoring point GP3 located at the site will be properly abandoned within 90 days of approval of this report.

Table 9.19-1. Monitoring Well Construction, Summary of Geotechnical Analyses, Well Development Summary, and Field Parameter Measurements during Groundwater Sampling for Monitoring Well MW1, SWMU 27N

MONITORING WELL CONSTRUCTION							
Well No.	Date Installed	Size/Type	Coordinates	Total Depth (feet)	Screen Interval (feet bgs)	Top of Filter Pack Elevation (feet bgs)	Top of Casing Elevation (feet)
27N-MW1	10/06/99	2-inch PVC	N 680842.26 E 835044.10	13.4	2.8 to 12.8	1.8	76.57

Note: All elevations are NGVD 1929.

SUMMARY OF GEOTECHNICAL ANALYSES						
Station	Sample ID	Depth (feet)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
27N-MW1	7Z1173	3 to 13	6.0	NP	NP	NP
Station	Sample ID	Depth (feet)	Class	Gravel (%)	Sand (%)	Fines (%)
27N-MW1	7Z1173	3 to 13	NP	0.0	91.65	8.35

NP = Non-plastic.

WELL DEVELOPMENT SUMMARY					
Well No.	Date	Total Development Time (hours)	Total Volume Removed (gallons)	Final Turbidity Reading (NTUs)	Total Well Depth (feet)
27N-MW1	10/08/99	2 hours 13 minutes	175	9.7	12.60

FIELD PARAMETER MEASUREMENTS DURING GROUNDWATER SAMPLING							
Parameter	Date	pH (su)	Conductivity (mS/cm)	Temperature (°C)	Turbidity (NTUs)	DO (mg/L)	Redox (mV)
27N-MW1	10/29/99	5.29	28.0	25.34	24.7	0.89	156.2

Table 9.19-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27N

Station	Reference Background Criteria	7ZGP1	7ZGP2	7ZGP3	7ZGP4
Sample ID		7Z1111	7Z1211	7Z1311	7Z1411
Date		01/30/98	01/21/98	01/21/98	01/30/98
Depth (feet)		2 to 5	4 to 6	4 to 6	4 to 5
Sample Type		Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (mg/kg)					
Benzo(*b*)fluoranthene	0.00	**0.846**			
Fluoranthene	0.00	**0.746**			
Metals (mg/kg)					
Lead	11.10	**39.9**	2.7	2.3	**32**

Bold indicates concentrations above reference background criteria.

Table 9.19-3. Summary of Analytes Detected in Groundwater, SWMU 27N

Station	Reference Background Criteria	MCL	7ZGP1	7ZGP2	7ZGP3	7ZGP3	7ZGP4	7ZMW1
Sample ID			7Z4111	7Z4211	7Z4311	7Z4312	7Z4411	7Z4171
Date			01/30/98	01/21/98	01/21/98	08/26/99	01/30/98	10/29/99
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab
Semivolatile Organic Compounds								
Bis(2-ethylhexyl)phthalate	0.00	6			*12.3*[a]	*174*[a,b]		

[a]A monitoring well (MW1) was installed at the GP3 sample location, and the groundwater was resampled using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected in the groundwater from the monitoring well, indicating the previous detections were the result of field or laboratory contamination.
[b]A 3/4-inch-diameter monitoring point was installed at the GP3 sample location, and the groundwater was resampled.
Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.

Table 9.19-4. Summary of Analytes Detected in Sediment, SWMU 27N

Station	Reference Background Criteria	7ZSWS1
Sample ID		7Z2111
Date		02/01/98
Sample Type		Grab
Semivolatile Organic Compounds (mg/kg)		
Benzo(*a*)anthracene	0.00	**0.208**
Benzo(*a*)pyrene	0.00	**0.264**
Benzo(*b*)fluoranthene	0.00	**0.349**
Chrysene	0.00	**0.292**
Pyrene	0.00	**0.353**
Metals (mg/kg)		
Lead	8.81	7.2

Bold indicates concentrations above reference background criteria.

Table 9.19-5. Summary of Site-related Contaminants, SWMU 27N

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Semivolatile Organic Compounds					
Benzo(*a*)anthracene	NC	ND	0.208	ND	NC
Benzo(*a*)pyrene	NC	ND	0.264	ND	NC
Benzo(*b*)fluoranthene	NC	0.846	0.349	ND	NC
Chrysene	NC	ND	0.292	ND	NC
Fluoranthene	NC	0.746	ND	ND	NC
Pyrene	NC	ND	0.353	ND	NC
Metals					
Lead	NC	39.9	BRBC	ND	NC

BRBC = Below reference background criteria.
NC = Sample not collected based on field screening results or unavailability of media.
ND = Not detected.

Table 9.19-6. GSSL Screening of Site-related Contaminants in Soil and Sediment, SWMU 27N

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
SOIL			
Semivolatile Organic Compounds (mg/kg)			
Benzo(*b*)fluoranthene	0.846	5	No
Fluoranthene	0.746	4,300	No
Metals (mg/kg)			
Lead[b]	39.9	400	No
SEDIMENT			
Semivolatile Organics Compounds (mg/kg)			
Benzo(*a*)anthracene	0.208	2	No
Benzo(*a*)pyrene	0.264	8	No
Benzo(*b*)fluoranthene	0.349	5	No
Chrysene	0.292	160	No
Pyrene	0.353	4,200	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).
[b]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.19-7. Human Health Risk Screening for Subsurface Soil and Sediment, SWMU 27N

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Semivolatile Organic Compounds (mg/kg)						
Benzo(*b*)fluoranthene	1/4	0.846	0.846	0.88	No	Max Detect < Risk Criteria
Fluoranthene	1/4	0.746	0.746	310	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	4/4	2.3	39.9	400	No	Max Detect < Risk Criteria

SEDIMENT						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Semivolatile Organic Compounds (mg/kg)						
Benzo(*a*)anthracene	1/1	0.208	0.208	0.88	No	Max Detect < Risk Criteria
Benzo(*a*)pyrene	1/1	0.264	0.264	0.09	Yes	Max Detect > Risk Criteria
Benzo(*b*)fluoranthene	1/1	0.349	0.349	0.88	No	Max Detect < Risk Criteria
Chrysene	1/1	0.292	0.292	88	No	Max Detect < Risk Criteria
Pyrene	1/1	0.353	0.353	230	No	Max Detect < Risk Criteria

Table 9.19-8. Preliminary Risk Calculations for ECOPCs in Sediment, SWMU 27N

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Semivolatile Organic Compounds								
Benzo(*a*)anthracene	0.208	5.00E-02	5.51E-03	1.58E+01	3.48E-04	1.58E-02	1.24E+01	1.27E-03
Benzo(*a*)pyrene	0.264	5.00E-02	7.00E-03	1.19E+00	5.88E-03	2.01E-02	9.97E+00	2.01E-03
Benzo(*b*)fluoranthene	0.349	5.00E-02	9.25E-03	1.58E+01	5.85E-04	2.65E-02	1.25E+01	2.14E-03
Chrysene	0.292	5.00E-02	7.74E-03	1.58E+01	4.889E-04	2.22E-02	1.24E+01	1.79E-03
Pyrene	0.353	5.00E-02	9.35E-03	1.19E+00	7.87E-03	2.78E-02	9.98E+00	2.69E-03
				HI =	1.52E-02		**HI =**	9.91E-03

ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
Cells with double borders indicate HQ > 1.
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

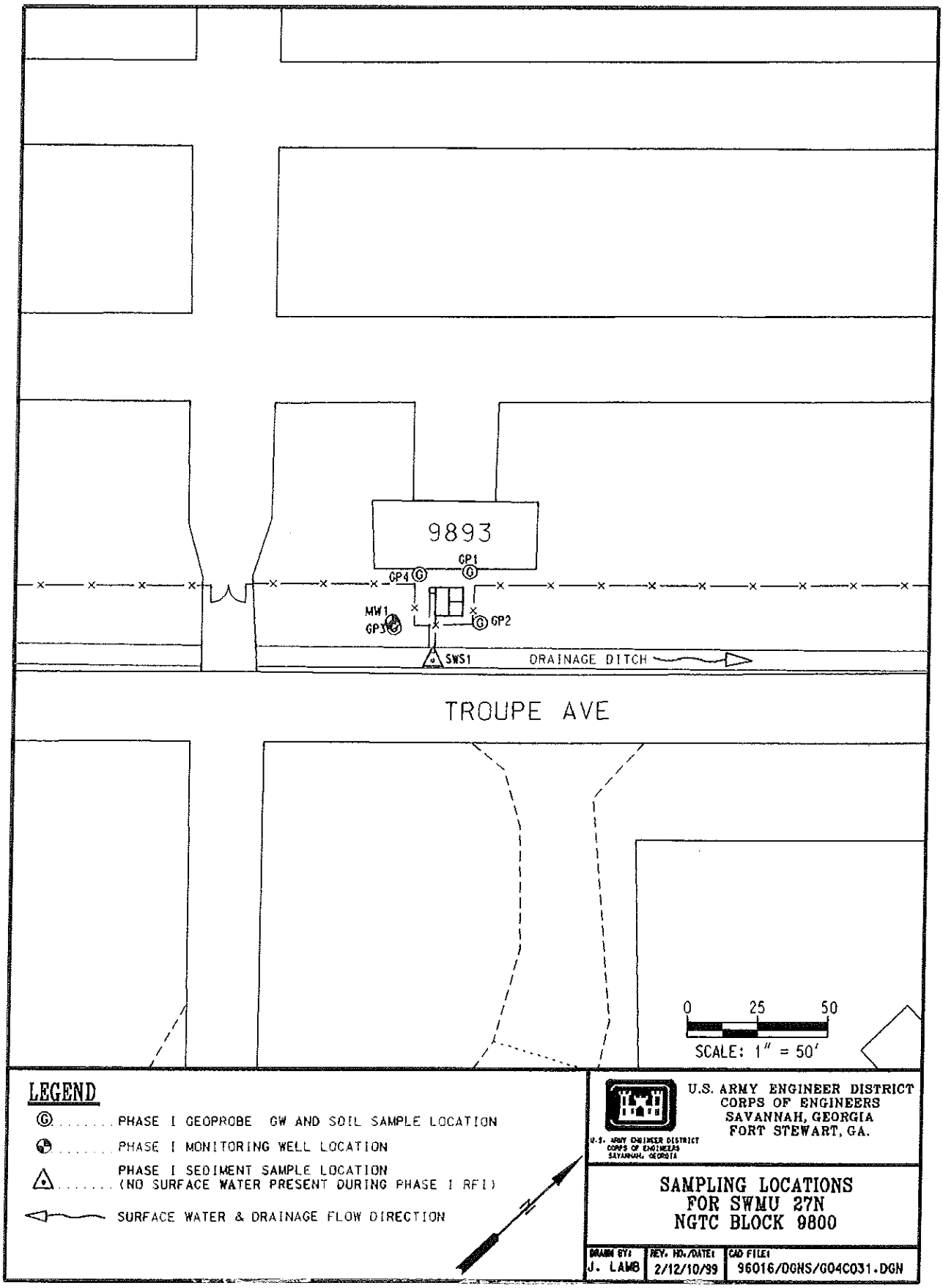

Figure 9.19-1. Sampling Locations, SWMU 27N

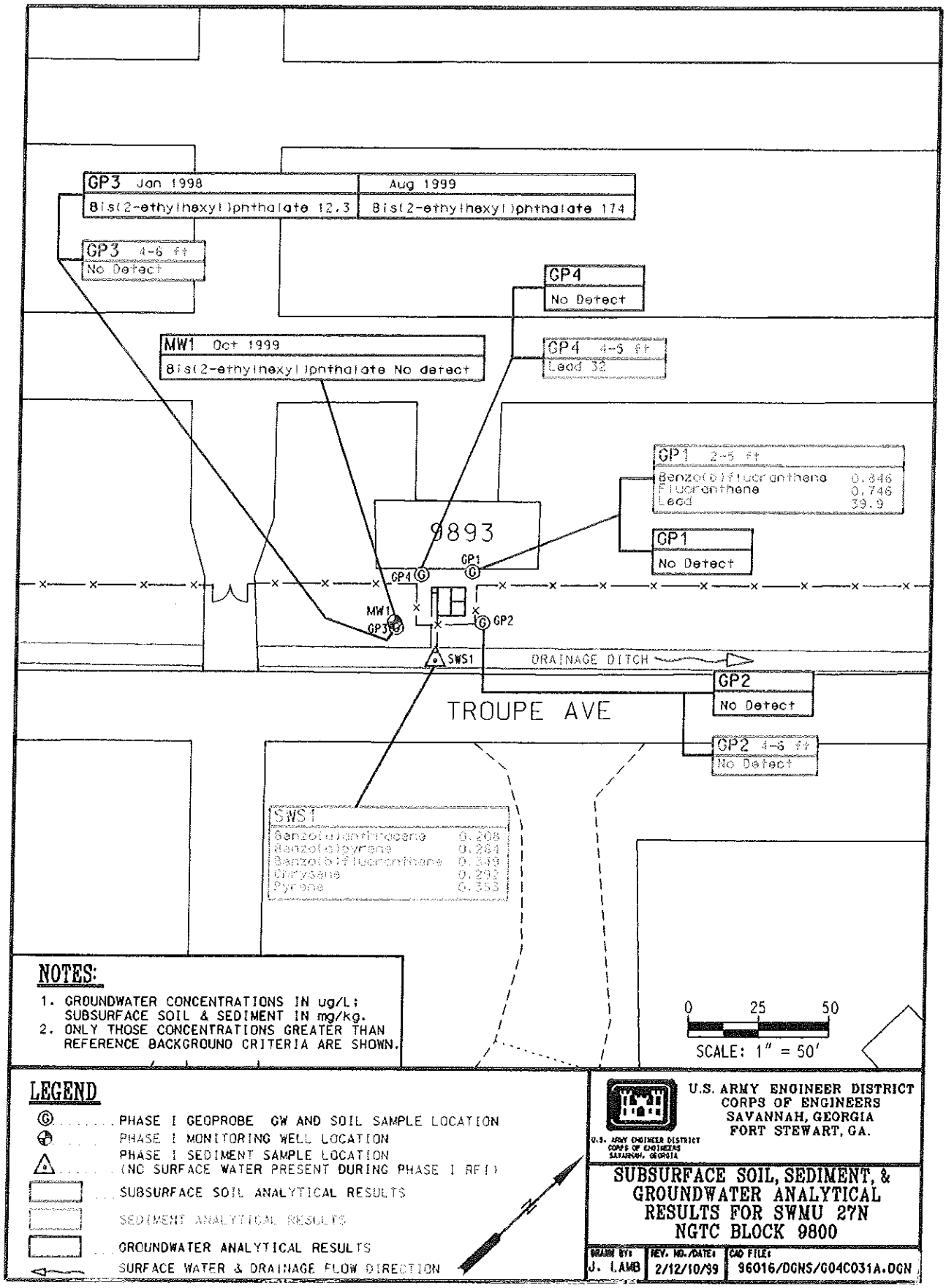

Figure 9.19-2. Summary of Analytical Results in Subsurface Soil, Groundwater, and Sediment, SWMU 27N

□ = Exposure pathway not complete.
* = Exposure pathway complete.
I = This scenario is used to derive screening values. It is not a viable scenario for this site.

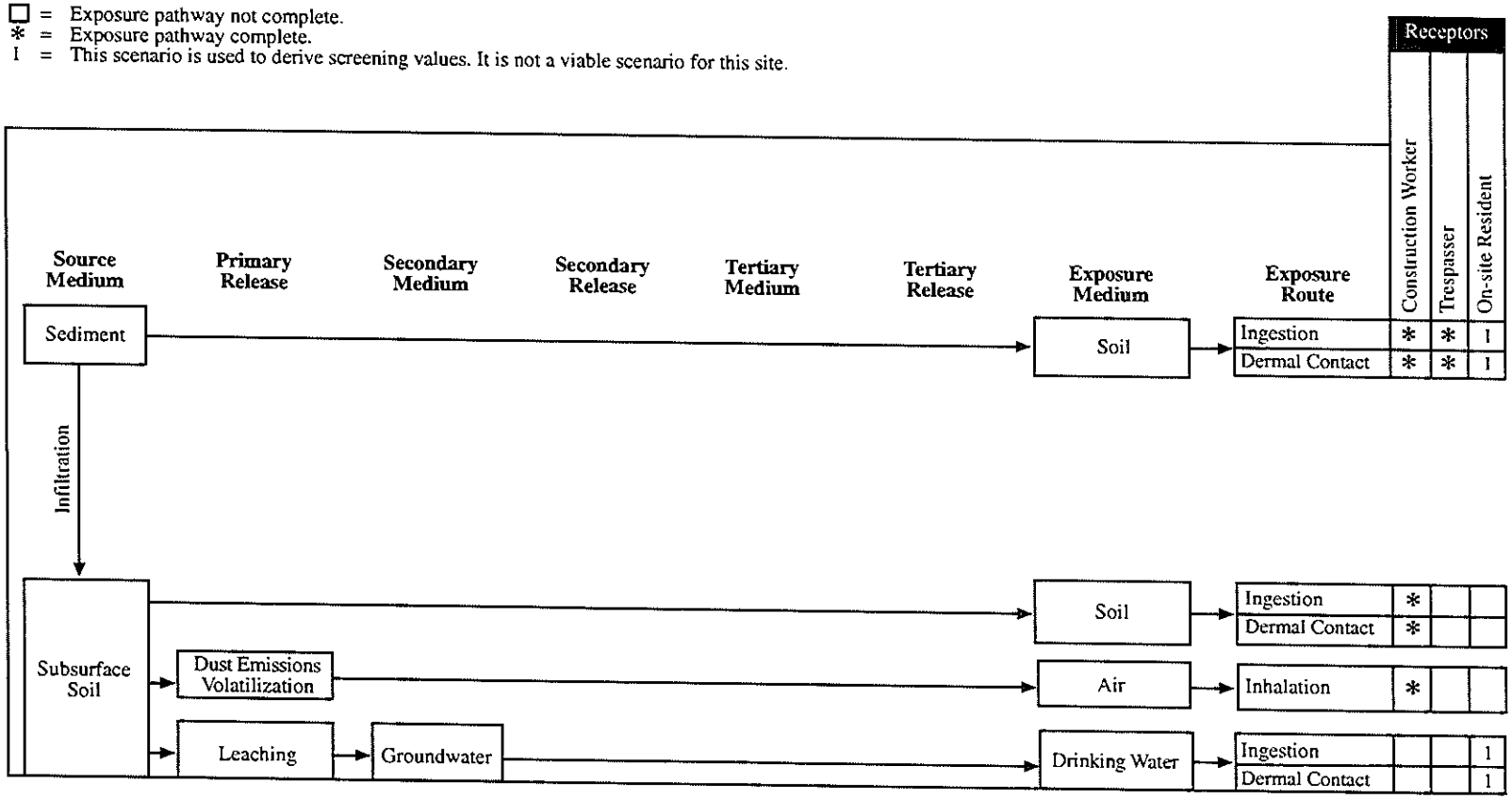

Figure 9.19-3. Potential Migration and Exposure Pathways, SWMU 27N

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ATTACHMENT 9.19A
SWMU 27N: NGTC BLOCK 9800

HUMAN HEALTH BASELINE RISK ASSESSMENT

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ATTACHMENT 9.19A
SWMU 27N: NGTC BLOCK 9800
HUMAN HEALTH BASELINE RISK ASSESSMENT

The human health baseline risk assessment consists of five elements: (1) identification of COPCs, (2) exposure assessment, (3) toxicity assessment, (4) risk characterization, and (5) assessment of uncertainty.

9.19A.1 IDENTIFICATION OF COPCS

The CMCOPCs and HHCOPCs have been discussed in the sections on contaminant fate and transport (Section 9.19.5) and the HHPRE (Section 9.19.6), respectively. There are no CMCOPCs or HHCOPCs in soil. Benzo(*a*)pyrene was identified as an HHCOPC in sediment.

9.19A.2 EXPOSURE ASSESSMENT

The exposure assessment quantifies the amount of a COPC an individual may come in contact with at each site. The exposure assessment considers all pathways of potential human exposure, the magnitude of the exposure, and the frequency and duration of exposure. The process for estimating exposure consists of the following elements: (1) characterization of the exposure setting in terms of the physical and demographic characteristics of the site, (2) identification of receptor populations, (3) identification of the exposure pathways by which an individual may come in contact with a COPC, (4) estimation of the exposure point concentration, and (5) quantification of the intake or dose to which an individual may be exposed.

9.19A.2.1 Exposure Setting

The exposure setting describes the physical features at the site that are important when identifying the human populations that may be exposed to COPCs, either currently or in the future.

SWMU 27N is one of eight OWSs located in the NGTC along Troupe Avenue. This OWS site consists of an area of approximately 0.01 acre, covered primarily by concrete and gravel. An open drainage ditch, which runs parallel to Troupe Avenue, is located approximately 25 feet southwest and 65 feet southeast of the site.

9.19A.2.2 Identification of Potential Receptor Populations and Exposure Pathways

A complete exposure pathway consists of four elements: (1) a source of contamination, (2) a transport or retention medium, (3) a point of contact with the chemical, and (4) a route of exposure (ingestion, dermal absorption, or inhalation) at the point of contact through which the chemical may be taken into the body. When all of these elements are present, the pathway is considered to be complete.

HHCOPCs at this site are limited to sediment in the ditch located adjacent to Troupe Avenue. The ditch is located along a major road and can be freely accessed; therefore, a juvenile may play in the ditch. The only change that might occur in the foreseeable future would be that the ditch might become part of a secured area and no longer be freely accessed by a juvenile trespasser. Therefore, the juvenile trespasser

is representative of both the current and future receptor populations. The potential exposure pathway for sediment is incidental ingestion.

9.19A.2.3 Estimation of Exposure Concentrations

The estimation of exposure concentrations for on-site receptors to HHCOPCs in groundwater is discussed in Appendix I, Section I.2.3. Only one sediment sample was collected at this site; therefore, the measured concentration of benzo(*a*)pyrene (0.264 mg/kg) from this sample is used as the exposure concentration.

9.19A.2.4 Quantification of Exposure

The equations and exposure factors used to estimate exposures to receptor populations are discussed in Appendix I, Section I.2.4. The exposure parameter values used to estimate potential exposures are given in Table 9.19A-1. The estimated intake is given in Table 9.19A-2.

9.19A.3 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to determine the increased likelihood and magnitude of adverse human health effects based on the extent of exposure to contamination. The toxicity assessment for SWMU 27N was carried out as described in Appendix I, Section I.3. An oral reference dose has not been derived for benzo(*a*)pyrene (EPA 1999a; EPA 1997c). Benzo(*a*)pyrene is a Group B2 carcinogen and has an oral cancer slope factor of 7.30 (EPA 1999a).

9.19A.4 RISK CHARACTERIZATION RESULTS

The risk characterization follows the procedures outlined in Appendix I, Section I.4. The carcinogenic risk for oral exposure of a juvenile trespasser to benzo(*a*)pyrene in sediment is 1.13×10^{-8} (Table 9.19A-2), which is more than an order of magnitude below the target risk value of 1×10^{-6}.

9.19A.5 UNCERTAINTY ASSESSMENT

A discussion of the general uncertainties associated with the analysis of risks at sites within the 16 SWMUs is provided in Appendix I, Section I.5.

The exposure concentration for this risk assessment is based on a single sample. The actual exposure concentration may be greater or less than the exposure concentration used in this assessment.

9.19A.6 RISK SUMMARY

The ILCR for the potential exposure of the juvenile trespasser to benzo(*a*)pyrene in sediment is 1.13×10^{-8}. This value is more than an order of magnitude below the target risk value of 1×10^{-6}; therefore, the risks associated with exposure of the identified receptor populations to benzo(*a*)pyrene in sediment are within the acceptable range.

Table 9.19A-1. Exposure Parameters for Juvenile Trespasser, SWMU 27N

Parameter	Units	Juvenile Trespasser
SEDIMENT		
Incidental Ingestion		
Sediment ingestion rate	kg/day	0.0001
Fraction ingested from area	unitless	0.13
Exposure frequency	days/year	52
Exposure duration	years	10
Body weight	kg	45
Carcinogen averaging time	days	25,550
Noncarcinogen averaging time	days	3,650

Table 9.19A-2. Estimated Intakes and Carcinogenic Risks for Juvenile Trespasser, SWMU 27N

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a] Average Daily Dose for Carcinogens (mg/kg/d)	Oral ILCR[b]	Total Cancer Risk[b]
Sediment	Benzo(*a*)pyrene	0.264	mg/kg	1.55E-09	1.13E-08	1.13E-08

[a]The equation used to calculate oral exposure in sediment is presented in Appendix I, Section I.2.4.5.
[b]The equation used to calculate carcinogenic risks is presented in Appendix I, Section I.4.1.

9.20 SWMU 27O: NGTC BLOCK 9700

9.20.1 History and Description of SWMU 27O, Block 9700

SWMU 27O, Block 9700 is one of eight OWSs located in the NGTC along Troupe Avenue. The OWS is located at the corner of Block 9700, adjacent to a wash rack identified as Building 9793 (Figure 9.20-1). The OWS receives wastewater from an adjacent vehicle wash rack. Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges into a drainage ditch located southeast of the OWS along Troupe Avenue. The wash rack is not presently in use and is scheduled for removal during 2000. Units rarely use the motorpool, and when assigned to the facility, they are strictly forbidden from using the wash rack. All equipment and vehicles are washed at a centralized location in the National Guard area. Thus, only rainwater currently collects in the OWS, which is an open unit. No previous investigations have been performed at the site.

9.20.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 9.20-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

One surface water/sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch. The sediment and surface water samples were analyzed for VOCs, SVOCs, and lead.

9.20.3 Physical Characteristics of the Site

9.20.3.1 Topography

The topography of the site is essentially flat, with a gravel vehicle parking area adjacent to the north and a grass border between the OWS and wash rack and the fence to the southeast. The surface elevation ranges from 76.95 feet to 77.17 feet amsl.

9.20.3.2 Surface drainage

Drainage ditches are located approximately 35 feet southwest and 25 feet southeast of the OWS. The effluent from the OWS discharges to the drainage ditch to the southeast (Figure 9.20-1). Surface water is present in the drainage ditches only during rainfall events. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where it is allowed to percolate into the soil (see Section 3.3).

9.20.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.20.3.4 Hydrogeology

Groundwater was encountered at approximately 2.5 feet bgs.

9.20.3.5 Ecology

As stated in Section 8.2, SWMU 27O is classified as an "industrialized area with managed grasslands." The site comprises approximately 0.01 acre (Figure 9.20-1). Habitat surrounding the OWS consists mainly of managed grasses. A storm water ditch is adjacent to the SWMU, paralleling the road (Troupe Avenue).

9.20.4 Nature and Extent of Contamination

9.20.4.1 Surface soil

Three surface soil samples were collected based on field headspace screening for VOCs (i.e., hits). The results of the surface soil analysis are presented in Table 9.20-1 and Figure 9.20-2.

VOCs. No VOCs were detected in surface soil.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected in the samples taken from all three locations at concentrations ranging from 9.9 mg/kg at GP4 to 26.8 mg/kg at GP3. All of the concentrations exceeded the reference background criterion; therefore, lead is considered to be an SRC for surface soil.

9.20.4.2 Subsurface soil

One subsurface soil sample was collected based on field headspace screening for VOCs (i.e., hits). The results of the subsurface soil analysis are presented in Table 9.20-2 and Figure 9.20-2.

VOCs. No VOCs were detected in subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in the sample taken from GP1 at a concentration of 6.9 mg/kg, which does not exceed the reference background criterion; therefore, lead is not considered to be an SRC for subsurface soil.

9.20.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 9.20-3 and Figure 9.20-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. Di-*N*-octyl phthalate was detected in the sample collected from GP2 at a concentration of 7.5 µg/L; therefore, di-*N*-octyl phthalate is considered to be an SRC for groundwater.

Lead. Lead was not detected at any of the four sampling locations; therefore, lead is not considered to be an SRC for groundwater.

9.20.4.4 Surface water

One surface water sample was collected. The results of the surface water analysis are presented in Table 9.20-4 and Figure 9.20-2.

VOCs. No VOCs were detected in surface water.

SVOCs. No SVOCs were detected in surface water.

Lead. Lead was detected in the sample collected from SWS1 at a concentration of 4.3 µg/L, which does not exceed the reference background criterion; therefore, lead is not considered to be an SRC for surface water.

9.20.4.5 Sediment

One sediment sample was collected. The results of the sediment analysis are presented in Figure 9.20-2 and Table 9.20-4.

VOCs. No VOCs were detected in sediment.

SVOCs. No SVOCs were detected in sediment.

Lead. Lead was detected in the sample taken from SWS1 at a concentration of 66 mg/kg, which is above the reference background criterion; therefore, lead is considered to be an SRC in sediment.

9.20.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.20-5.

9.20.5 Fate and Transport Considerations

The potential for soil and sediment contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface soil, subsurface soil, and sediment SRCs to their respective GSSLs.

Of the SRCs identified in soil and sediment, none of the analytes exceeded their respective GSSLs (Table 9.20-6); therefore, there are no CMCOPCs in soil or sediment at SWMU 27O based on leaching to groundwater.

9.20.6 Human Health Preliminary Risk Evaluation of SWMU 27O

SRCs were identified for the following media: surface soil, surface water, groundwater, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.20.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area; however, the wash rack is not currently used. The OWS discharges to an open ditch outside the fence, but water is present only during rain events. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers,
- juvenile trespassers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and consists primarily of concrete structures; however, areas of managed grasses surround the OWS, and a storm water ditch is adjacent to the SWMU and parallels the road; therefore, soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway. The OWS is scheduled for removal. At that time, the groundcover within the immediate OWS area will be removed. Clean backfill will be placed in the excavation area, and the area will be seeded.

As previously discussed, the OWS discharges to a ditch adjacent to the site. Contaminants in the effluent (i.e., water) might become adsorbed to soil particles within the ditch.

Because the elevation of the groundwater is lower than the adjacent drainage ditch and no other surface water bodies are nearby, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.20-3. Water is present only during rain events; therefore, for the purposes of this assessment, the sediment within the ditch was addressed as surface soil.

The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.20.6.2 Risk evaluation

The results of the human health risk screening are given below.

Lead was identified as an SRC for surface soil at this site. All of the concentrations of this compound were below its screening value (Table 9.20-7); therefore, there are no HHCOPCs in surface soil.

Di-*N*-octyl phthalate was identified as an SRC for groundwater. The maximum concentration of di-*N*-octyl phthalate did not exceed its screening value; therefore, there are no HHCOPCs in groundwater.

Lead was identified as an SRC for sediment. The concentration of lead was below the screening value (Table 9.20-7); therefore, there are no HHCOPCs in sediment.

9.20.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.20.7 Ecological Preliminary Risk Evaluation of SWMU 27O

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.20.7.1 Ecological screening value comparison (Step i)

No SRCs were identified in surface water.

The drainage ditch sediment sample was treated as surface soil (Section 9.20.7.5).

One SVOC (di-*N*-octyl phthalate) was detected in groundwater at the site. The results of the ESV comparison for groundwater are presented in Table 9.20-8. The ECOPC identified by the ESV comparison for groundwater was di-*N*-octyl phthalate. There is no ESV for di-*N*-octyl phthalate, so it is an ECOPC by default (GEPD 1997a).

Because there are no ESVs for soil, all analytes detected in soil and drainage ditch sediment were evaluated further in EPRE Steps ii through v.

9.20.7.2 Preliminary problem formulation (Step ii)

The ecological habitat for the site is described in Section 9.20.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation for the site are described in Section 8.2.

9.20.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs are required for shrews and robins ingesting contaminated biota exposed to drainage ditch sediment at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

9.20.7.4 Preliminary exposure (Step iv)

Ecological receptors at the site are probably exposed by ingestion of contaminated drainage ditch sediment or of biota exposed to contaminated drainage ditch sediment or by ingestion of drinking water. The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

9.20.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil and drainage ditch sediment are presented in Tables 9.20-9 and 9.20-10, respectively. These tables show the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. HQs exceeding one are shown bordered by a double line.

The only ECOPC present in surface soil at concentrations resulting in ADDs exceeding the TRVs for the surrogate species was lead (Table 9.20-9). Robins, with an HQ of 14.4, are potentially at risk from lead in surface soil.

Lead was the only ECOPC in sediment from the drainage ditch that had an HQ exceeding one (Table 9.20-10). The lead HQ was 35.5 for shrews and robins. The HI calculated for organics did not exceed one.

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 9.20-11. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. No ECOPCs were present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The one ECOPC did not have a TRV; therefore, an HQ could not be calculated.

9.20.8 Conclusions and Risk Management and Site Recommendations for SWMU 27O

9.20.8.1 Conclusions

Nature and Extent of Contamination

- Lead was detected in the surface soil samples taken from all three locations at concentrations that exceeded the reference background criterion; therefore, lead is considered to be an SRC for surface soil.

- No VOCs were detected in groundwater. One SVOC, di-*N*-octyl phthalate, was detected in one groundwater sample; therefore, di-*N*-octyl phthalate is considered to be an SRC for groundwater.

- Lead in groundwater was not detected at any of the four sampling locations; therefore, lead is not considered to be an SRC for groundwater.

- Lead was detected in the sediment sample at a concentration that exceeded the reference background criterion; therefore, lead is considered to be an SRC for sediment.

Fate and Transport

- SRCs identified in soil or sediment did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil or sediment based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- Based on a comparison to human health criteria, no HHCOPCs were identified for surface soil, groundwater, or sediment.

Ecological Preliminary Risk Evaluation

- Di-*N*-octyl phthalate is an ECOPC in groundwater. Di-*N*-octyl phthalate is a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.

- Di-*N*-octyl phthalate is an ECOPC in groundwater for terrestrial receptors.

- Lead is the only ECOPC in surface soil for terrestrial receptors.

- The only ECOPC in drainage ditch sediment for terrestrial receptors is lead.

9.20.8.2 Risk management and site recommendations

- Lead was identified as an ECOPC in surface soil and sediment for terrestrial receptors. Lead was detected in surface soil and sediment above the reference background criterion (8.81 mg/kg) at a maximum concentration of 66 mg/kg (sediment). The lead concentration was within the observed range (less than 10 mg/kg to 300 mg/kg) established by the USGS for lead concentrations in soils of the eastern United States (USGS 1984). Because the site is located in an industrialized and heavily trafficked area, the lead in surface soil and sediment might not be associated with the OWS. In addition, the site has very little ecological habitat for potential exposure; therefore, lead is not considered to be an ECOPC and does not require further investigation and/or evaluation.

- Di-*N*-octyl phthalate was identified as an ECOPC in groundwater (i.e., aquatic biota). Ecological receptors are not at risk from exposure to di-*N*-octyl phthalate unless there is a potential exposure pathway (i.e., these receptors come into contact with groundwater). Ecological receptors may be exposed if groundwater discharges to the surface water. As stated in Section 9.20.6.1, there are no surface water bodies located within the area of the site. Given the groundwater flow rate in the garrison area, it is unlikely that di-*N*-octyl phthalate will migrate to surface water. In addition, di-*N*-octyl phthalate is probably being reduced by the natural attenuation processes of hydrolysis, Redox, biodegradation, and volatilization. Given the absence of potential exposure pathways at this site, di-*N*-octyl phthalate in groundwater is unlikely to have an adverse effect upon the environment (i.e., aquatic biota), and additional investigation and/or evaluation of this constituent is not required.

- Based on the information presented in this section, an NFA status is recommended for SWMU 270 regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.20-1. Summary of Analytes Detected in Surface Soil, SWMU 27O

Station	Reference Background Criteria	8AGP2	8AGP3	8AGP4
Sample ID		8A1211	8A1311	811411
Date		01/28/98	01/29/98	01/28/98
Depth (feet)		0 to 2	0 to 2	0 to 2
Sample Type		Grab	Grab	Grab
Metals (mg/kg)				
Lead	8.81	**11.7**	**26.8**	**9.9**

Bold indicates concentrations above reference background criteria.

Table 9.20-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27O

Station	Reference Background Criteria	8AGP1
Sample ID		8A1111
Date		01/28/98
Depth (feet)		2 to 4
Sample Type		Grab
Metals (mg/kg)		
Lead	11.10	6.9

Table 9.20-3. Summary of Analytes Deteeted in Groundwater, SWMU 27O

Station	Reference Background Criteria	MCL	8AGP1	8AGP2	8AGP3	8AGP4
Sample ID			8A4111	8A4211	8A4311	8A4411
Date			01/28/98	01/28/98	01/28/98	01/28/98
Sample Type			Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (µg/L)						
Di-*N*-octyl phthalate	0.00			**7.5**		
Metals (µg/L)						
Lead	4.69	15				

Bold indicates concentrations above reference background criteria.

Table 9.20-4. Summary of Analytes Detected in Surface Water and Sediment, SWMU 27O

SURFACE WATER		
Station	**Reference Background Criteria**	**8ASWS1**
Sample ID		**8A3111**
Date		**02/01/98**
Sample Type		**Grab**
Metals (µg/L)		
Lead	5.2	4.3

SEDIMENT		
Station	**Reference Background Criteria**	**8ASWS1**
Sample ID		**8A2111**
Date		**02/01/98**
Sample Type		**Grab**
Metals (mg/kg)		
Lead	8.81	**66**

Bold indicates concentrations above reference background criteria.

Table 9.20-5. Summary of Site-related Contaminants, SWMU 27O

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Semivolatile Organic Compounds					
Di-*N*-octyl phthalate	ND	ND	ND	7.5	ND
Metals					
Lead	26.8	BRBC	66	ND	BRBC

BRBC = Below reference background criteria.
ND = Not detected

Table 9.20-6. GSSL Screening of Site-related Contaminants in Soil and Sediment, SWMU 27O

Site-related Contaminant	Maximum Concentration	GSSL	CMCOPC?
SOIL			
Metals (mg/kg)			
Lead[a]	26.8	400	No
SEDIMENT			
Metals (mg/kg)			
Lead[a]	66	400	No

[a]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.20-7. Human Health Risk Screening for Surface Soil, Groundwater, and Sediment, SWMU 27O

SURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Metals (mg/kg)						
Lead	3/3	9.9	26.8	400	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Semivolatile Organic Compounds (µg/L)						
Di-*N*-octyl phthalate	1/4	7.5	7.5	73	No	Max Detect < Risk Criteria

SEDIMENT						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Metals (mg/kg)						
Lead	1/1	66	66	400	No	Max Detect < Risk Criteria

Table 9.20-8. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27O

Analyte	SWMU 27O Maximum	ESV	ECOPC Aquatic Biota?	Justification
Semivolatile Organic Compounds (µg/L)				
Di-*N*-octyl phthalate	7.5	No ESV	Yes	ECOPC by Default

ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESVs or, when there is no ESV, concentrations then become ECOPCs by default.

Table 9.20-9. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27O

			Short-tailed Shrew			American Robin		
ECOPC	C_{Max} (mg/kg)	BAF_i	ADD (mg/kg/d) = C_{Max} × BAF_i × IR_S	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = C_{Max} × BAF_i × IR_R	TRV (mg/kg/d)	HQ = ADD/TRV
Metals								
Lead[a]	26.8	4.0E-01	5.68E+00	1.76E+01	3.23E-01	1.63E+01	1.13E+00	1.44E+01

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soils >500 mg/kg and lead concentration >1 mg/kg.
ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.
Cells with double borders indicate HQ > 1.

Table 9.20-10. Preliminary Risk Calculations for ECOPCs in Sediment, SWMU 27O

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew: ADD (mg/kg/d) = C_{Max} × BAF_i × IR_S	Short-tailed Shrew: TRV (mg/kg/d)	Short-tailed Shrew: HQ = ADD/TRV	American Robin: ADD (mg/kg/d) = C_{Max} × BAF_i × IR_R	American Robin: TRV (mg/kg/d)	American Robin: HQ = ADD/TRV
Metals								
Lead[a]	66	4.0E-01	1.40E+01	1.76E+01	7.95E-01	4.01E+01	1.13E+00	3.55E+01

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soils >500 mg/kg and lead concentration >1 mg/kg.

ADD = Average daily dose (mg/kg/d).

BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).

C_{Max} = Maximum detected surface soil concentration (mg/kg).

HQ = Hazard quotient; HI = hazard index = sum of HQs.

IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.

IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.

TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

Cells with double borders indicate HQ > 1.

Table 9.20-11. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27O

ECOPC	C_{Max} (µg/L)	Raccoon: ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	Raccoon: TRV (mg/kg/d)	Raccoon: HQ = ADD/TRV
Semivolatile Organic Compounds				
Di-*N*-octyl phthalate	7.5	6.00E-04	No TRV	--

0.001 (mg/µg) = Conversion from µg to mg.

ADD = Average daily dose (mg/kg/d).

C_{Max} = Maximum detected concentration (µg/L).

HQ = Hazard quotient; HI = hazard index = sum of HQs.

IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.

TRV = NOAEL (mg/kg/d).

-- = Cannot be calculated due to the lack of data.

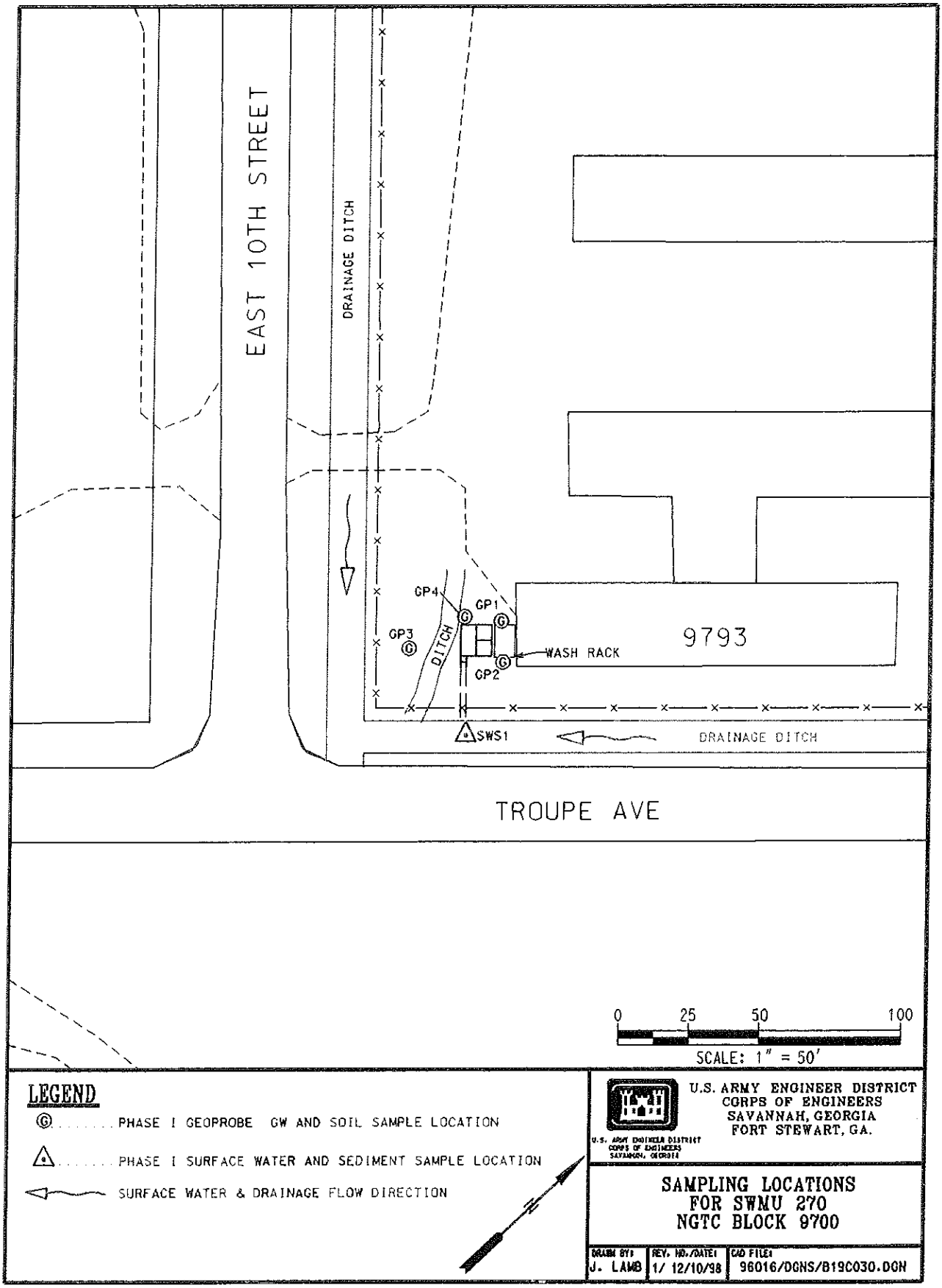

Figure 9.20-1. Sampling Locations, SWMU 27O

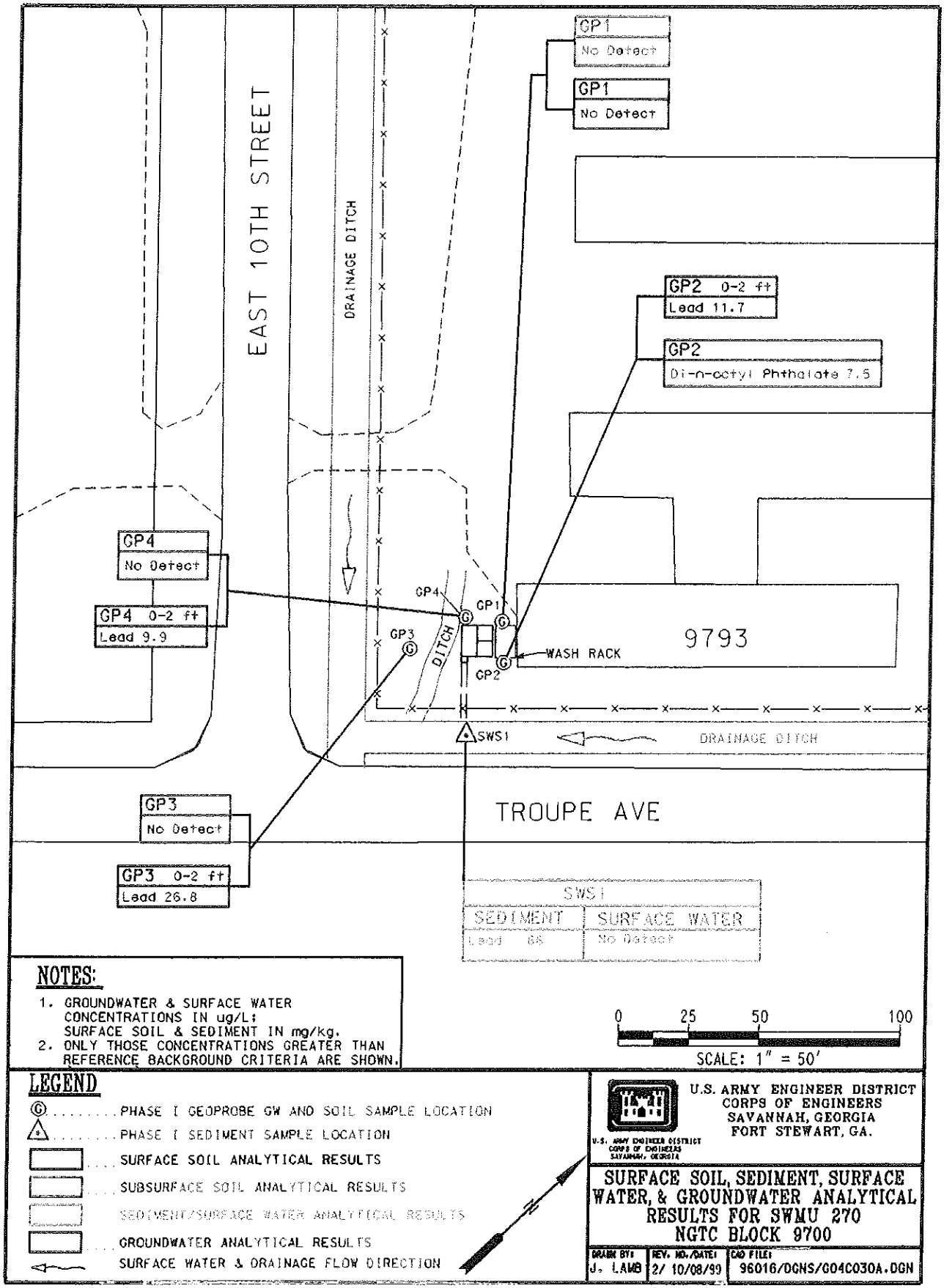

Figure 9.20-2. Summary of Analytical Results in Surface Soil, Groundwater, Surface Water, and Sediment, SWMU 27O

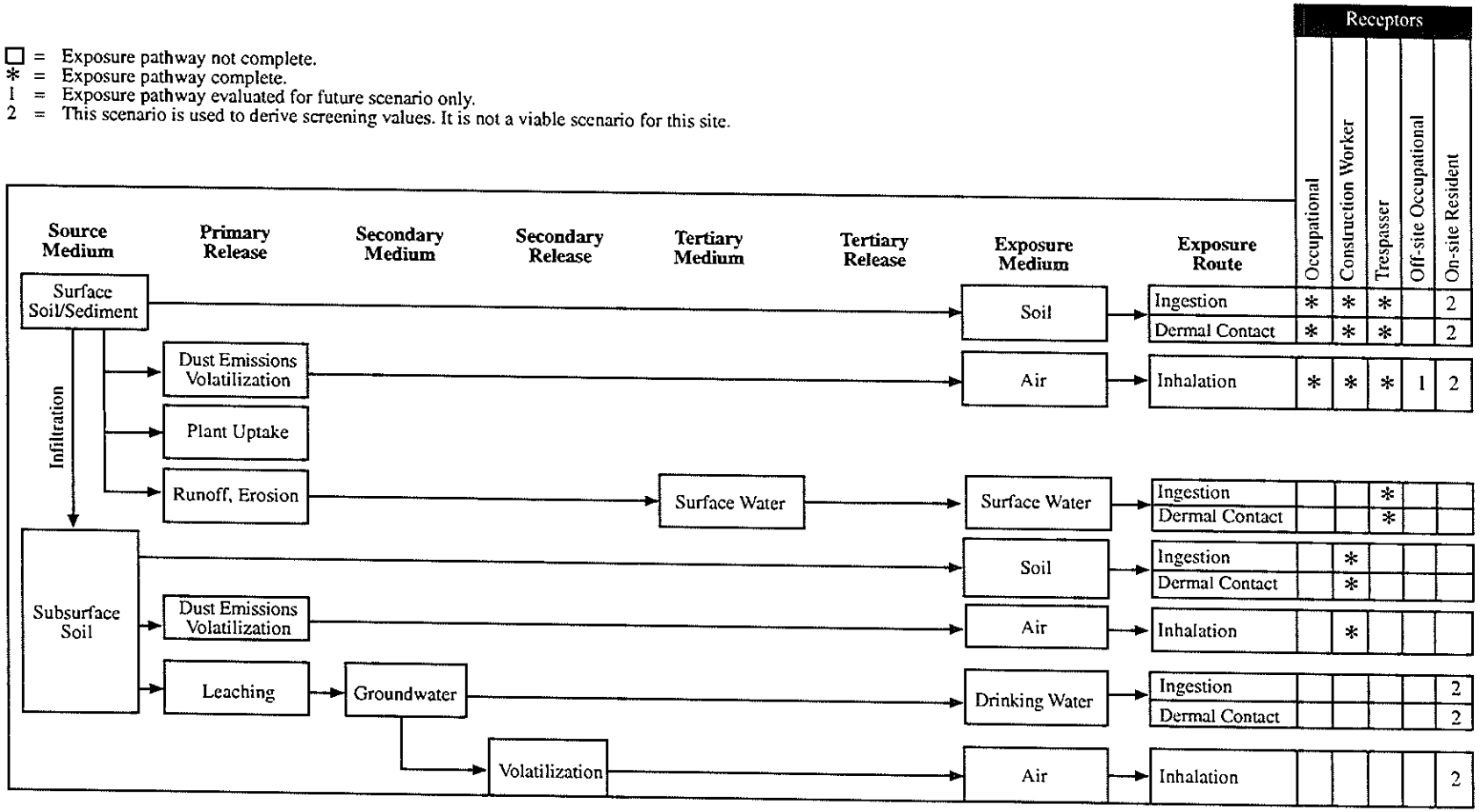

Figure 9.20-3. Potential Migration and Exposure Pathways, SWMU 27O

9.21 SWMU 27P: NGTC BLOCK 9500

9.21.1 History and Description of SWMU 27P, Block 9500

SWMU 27P, Block 9500 is one of eight OWSs located in the NGTC along Troupe Avenue. The OWS is located at the corner of East 9th Street and Troupe Avenue, the southwestern corner of Block 9500, and adjacent to a wash rack from which it receives wastewater. Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges into a drainage ditch located southeast of the OWS along Troupe Avenue. The wash rack is not presently in use and is scheduled for removal. The site has visually stained soil and stressed vegetation, potentially due to numerous overflows of the OWS. No previous investigations have been performed at the site.

9.21.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 9.21-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

One sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the diteh. The sediment sample was analyzed for VOCs, SVOCs, and lead. No surface water was available during the Phase I RFI.

9.21.3 Physical Characteristics of the Site

9.21.3.1 Topography

The topography of the site is essentially flat, with a gravel vehicle parking area adjacent to the north and a grass border between the OWS and wash rack and the fence to the southeast. The surface elevation ranges from 78.11 feet to 79.64 feet amsl.

9.21.3.2 Surface drainage

Drainage ditches are located approximately 75 feet southwest and 25 feet southeast of the OWS. The effluent from the OWS discharges to the drainage ditch to the southeast (Figure 9.21-1). Surface water is present in the drainage ditches only during rainfall events. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where it is allowed to percolate into the soil (see Section 3.3).

9.21.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.21.3.4 Hydrogeology

Groundwater was encountered from approximately 3.6 feet to 5 feet bgs.

9.21.3.5 Ecology

As stated in Section 8.2, SWMU 27P is classified as an "industrialized area with managed grasslands." The site comprises approximately 0.01 acre (Figure 9.21-1). The habitat associated with the OWS consists of managed grasses and a storm water ditch, approximately 2 feet deep, that parallels the adjacent road.

9.21.4 Nature and Extent of Contamination

9.21.4.1 Surface soil

Two surface soil samples were collected based on field headspace screening for VOCs. The results of the surface soil analysis are presented in Table 9.21-1 and Figure 9.21-2.

VOCs. The surface soil sample collected from GP2 indicated the presence of toluene at a concentration of 0.0204 mg/kg. Toluene is considered to be an SRC in surface soil.

SVOCs. Chrysene was detected in the sample collected from GP2 at a concentration of 0.155 mg/kg; therefore, chrysene is considered to be an SRC for surface soil.

Lead. Lead was detected in the samples taken from both GP1 and GP2 at concentrations of 8.5 mg/kg and 5.2 mg/kg, respectively. Neither concentration exceeded the reference background criterion; therefore, lead is not considered to be an SRC for surface soil.

9.21.4.2 Subsurface soil

Two subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.21-2 and Figure 9.21-2.

VOCs. Toluene was detected in the sample collected from GP2 at a concentration of 0.017 mg/kg; therefore, toluene is considered to be an SRC for subsurface soil.

SVOCs. Benzo(*b*)fluoranthene and benzo(*k*)fluoranthene were detected in the sample taken from GP2 at concentrations of 0.24 mg/kg and 0.245 mg/kg, respectively. The sample collected from GP2 also indicated the presence of chrysene, fluoranthene, phenanthrene, and pyrene at concentrations of 0.549 mg/kg, 1.8 mg/kg, 0.48 mg/kg, and 1.5 mg/kg, respectively. Benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene are considered to be SRCs in subsurface soil.

Lead. Lead was detected in samples at concentrations of 11.7 mg/kg at GP2 and 4.8 mg/kg at GP4. The concentration at GP2 slightly exceeded the reference background criterion; therefore, lead is considered to be an SRC for subsurface soil.

9.21.4.3 Groundwater

Four groundwater samples were collected from the four locations. The results of the groundwater analysis are presented in Table 9.21-3 and Figure 9.21-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. No SVOCs were detected in groundwater.

Lead. Lead was not detected at either GP1and GP4 and was below the reference background criterion at GP2 and GP3; therefore, lead is not an SRC in groundwater.

9.21.4.4 Surface water

No surface water was available in the ditch during the field investigation; therefore, no surface water samples were collected.

9.21.4.5 Sediment

One sediment sample was collected due to the proximity of a storm water ditch to the site. The results of the sediment analysis are presented in Table 9.21-4 and Figure 9.21-2.

VOCs. The sample collected at SWS1 indicated the presence of 1,2-dichloroethane at a concentration of 0.0034 mg/kg. 1,2-Dichloroethane is considered to be an SRC in sediment.

SVOCs. No SVOCs were detected in sediment.

Lead. Lead was detected in the sample taken from SWS1 at a concentration of 72.7 mg/kg, which was above the reference background criterion; therefore, lead is considered to be an SRC in sediment.

9.21.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum eoncentrations are presented in Table 9.21-5.

9.21.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface soil, subsurface soil, and sediment SRCs to their respective GSSLs.

Of the SRCs identified in surface soil, subsurface soil, and sediment, none of the analytes exceeded their respective GSSLs (Table 9.21-6); therefore, there are no CMCOPCs in sediment at SWMU 27P.

9.21.6 Human Health Preliminary Risk Evaluation of SWMU 27P

SRCs for the site were identified for the following media: surface soil, subsurface soil, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.21.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area; however, the wash rack is not currently used. The OWS discharges to an open ditch outside the fence, but water is present only during rain events. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers,
- juvenile trespassers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and consists primarily of managed grasses, with a storm water ditch that parallels the adjacent road; therefore, soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway. The OWS is scheduled for removal. At that time, the groundcover within the immediate OWS area will be removed. Clean backfill will be placed in the excavation area, and the area will be seeded.

Because the elevation of the groundwater is lower than the adjacent drainage ditch and no other surface water is nearby, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway. The depth to groundwater is approximately 3.5 feet to 5.0 feet bgs, which is deeper than the bottom of the storm water ditch.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.21-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

The OWS discharges to an open ditch. Water is present in the ditch only after heavy rains; therefore, for the purposes of this assessment, the sediments within the ditch were addressed as surface soils.

Given that water is present only during rain events, exposure, if any, to contaminants in surface water would be sporadic; therefore, potential exposure to contaminants in surface water is not considered to be a viable chronic exposure pathway.

9.21.6.2 Risk evaluation

The results of the human health risk screening are given below.

Toluene and chrysene were identified as SRCs in surface soil at this site. All of the concentrations of these compounds were below their respective screening values (Table 9.21-7); therefore, there are no HHCOPCs in surface soils.

Seven organic compounds (six PAHs [benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene] and toluene) and lead were identified as SRCs in subsurface soils. The concentrations of these contaminants were below their respective screening values (Table 9.21-7); therefore, there are no HHCOPCs in subsurface soils.

One volatile organic and lead were identified as SRCs in sediments. The concentrations of these contaminants were below their respective screening values (Table 9.21-7); therefore, there are no HHCOPCs in sediment.

9.21.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.21.7 Ecological Preliminary Risk Evaluation of SWMU 27P

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.21.7.1 Ecological screening value comparison (Step i)

There is no surface water at the site. The sediment was treated as surface soil (Section 9.21.7.5).

No SRCs were indicated in groundwater.

Because there are no ESVs for soil, all analytes detected in soil and drainage ditch sediment were evaluated further in EPRE Steps ii through v.

9.21.7.2 Preliminary problem formulation (Step ii)

The ecological habitat for the site is presented in Section 9.21.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation for the site are described in Section 8.2.

9.21.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil or drainage ditch sediment. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

9.21.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated soil or drainage ditch sediment or of biota exposed to contaminated soil or drainage ditch sediment. The exposure parameters for the surrogate species—shrews and robins—are presented in Table 8-7.

9.21.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil and drainage ditch sediment are presented in Tables 9.21-8 and 9.21-9, respectively. These tables show the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. HQs exceeding one are shown bordered by a double line.

There are no ECOPCs in surface soil at the site. The HIs calculated for VOCs did not exceed one.

Lead was the only ECOPC in sediment from the drainage ditch that had an HQ exceeding one (Table 9.21-9). The lead HQ is 39 for robins. The HIs calculated for VOCs did not exceed one.

9.21.8 Conclusions and Risk Management and Site Recommendations for SWMU 27P

Nature and Extent of Contamination

- Chrysene and toluene were detected in surface soil and are considered to be SRCs for surface soil.
- Toluene was detected in subsurface soil; therefore, toluene is considered to be an SRC for subsurface soil.
- Benzo(*b*)fluoranthene, benzo(*k*)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene were detected in subsurface soil; therefore, these constituents are considered to be SRCs for subsurface soil.
- Lead was detected in subsurface soil and sediment at concentrations that exceeded the reference background criterion; therefore, lead is considered to be an SRC for both of these media.
- No SRCs were identified in groundwater.
- The sediment sample indicated the presence of 1,2-dichloroethane and lead; therefore, they are considered to be SRCs for sediment.

Fate and Transport

- SRCs identified in surface soil, subsurface soil, and sediment did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil or sediment based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- Concentrations of SRCs in surface soil, subsurface soil, and sediment were below human health screening criteria; therefore, there are no HHCOPCs for surface soil, subsurface soil, or sediment.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in surface soil.

- Lead is the only ECOPC in the drainage ditch sediment for terrestrial receptors.

9.21.8.2 Risk management and site recommendations

- Lead was identified as an ECOPC in drainage ditch sediment. Lead was detected at a concentration of 72.7 mg/kg. This lead concentration was within the observed range (less than 10 mg/kg to 300 mg/kg) established by the USGS for lead concentrations in soil of the eastern United States (USGS 1984). Because the drainage ditch is located adjacent to a heavily trafficked road, the elevated lead concentrations are most likely attributable to runoff from the road. In addition, the site has very little ecological habitat for potential exposure (and it is highly improbable that a terrestrial receptor would get the majority of its food from this area). Therefore, lead is not an ECOPC requiring further investigation at SWMU 27P.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27P regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.21-1. Summary of Analytes Detected in Surface Soil, SWMU 27P

Station	Reference Background Criteria	8BGP1	8BGP3
Sample ID		8B1111	8B1311
Date		01/28/98	01/28/98
Depth (feet)		0 to 2	0 to 2
Sample Type		Grab	Grab
Volatile Organic Compounds (mg/kg)			
Toluene	0.00		**0.0204**
Semivolatile Organic Compounds			
Chrysene	0.00	**0.155**	
Metals (mg/kg)			
Lead	8.81	8.5	5.2

Bold indicates concentrations above reference background criteria.

Table 9.21-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27P

Station	Reference Background Criteria	8BGP2	8BGP4
Sample ID		8B1211	8B1411
Date		01/28/98	01/28/98
Depth (feet)		2 to 4	2 to 5
Sample Type		Grab	Grab
Volatile Organic Compounds (mg/kg)			
Toluene	0.00	**0.017**	
Semivolatile Organic Compounds			
Benzo(*b*)fluoranthene	0.00	**0.24**	
Benzo(*k*)fluoranthene	0.00	**0.245**	
Chrysene	0.00	**0.549**	
Fluoranthene	0.00	**1.8**	
Phenanthrene	0.00	**0.48**	
Pyrene	0.00	**1.5**	
Metals (mg/kg)			
Lead	11.10	**11.7**	4.8

Bold indicates concentrations above reference background criteria.

Table 9.21-3. Summary of Analytes Detected in Groundwater, SWMU 27P

Station	Reference Background Criteria	MCL	8BGP1	8BGP2	8BGP3	8BGP4
Sample ID			8B4111	8B4211	8B4311	8B4411
Date			01/28/98	01/28/98	01/28/98	01/28/98
Sample Type			Grab	Grab	Grab	Grab
Metals (µg/L)						
Lead	4.69	15		1.2	1.2	

Table 9.21-4. Summary of Analytes Detected in Sediment, SWMU 27P

Station	Reference Background Criteria	8BSWS1
Sample ID		8B2111
Date		02/01/98
Sample Type		Grab
Volatile Organic Compounds (mg/kg)		
1,2-Dichloroethane	0.00	**0.0034**
Metals (mg/kg)		
Lead	8.81	**72.7**

Bold indicates concentrations above reference background criteria.

Table 9.21-5. Summary of Site-related Contaminants, SWMU 27P

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
1,2-Dichloroethane	ND	NA	0.0034	ND	NC
Toluene	0.0204	0.017	ND	ND	NC
Semivolatile Organic Compounds					
Benzo(*b*)fluoranthene	ND	0.24	ND	ND	NC
Benzo(*k*)fluoranthene	ND	0.245	ND	ND	NC
Chrysene	0.155	0.549	ND	ND	NC
Fluoranthene	ND	1.8	ND	ND	NC
Phenanthrene	ND	0.48	ND	ND	NC
Pyrene	ND	1.5	ND	ND	NC
Metals					
Lead	BRBC	11.7	72.7	BRBC	NC

BRBC = Below reference background criteria.
NA = Not analyzed.
NC = Not collected; no surface water available during Phase I RFI.
ND = Not detected.

Table 9.21-6. GSSL Screening of Site-related Contaminants in Soil and Sediment, SWMU 27P

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
SOIL			
Volatile Organic Compounds (mg/kg)			
Toluene	0.0204	12	No
Semivolatile Organic Compounds (mg/kg)			
Benzo(*b*)fluoranthene	0.24	5	No
Benzo(*k*)fluoranthene	0.245	49	No
Chrysene	0.549	160	No
Fluoranthene	1.8	4,300	No
Phenanthrene[b, c]	0.48	80.4	No
Pyrene	1.5	4,200	No
Metals (mg/kg)			
Lead[d]	11.7	400	No
SEDIMENT			
Volatile Organics Compounds (mg/kg)			
1,2-Dichloroethane	0.0034	0.02	No
Metals (mg/kg)			
Lead[d]	72.7	400	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

[c]Risk-based concentration of pyrene used to develop GSSL for phenanthrene.

[d]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.21-7. Human Health Risk Screening for Surface Soil, Subsurface Soil, and Sediment, SWMU 27P

SURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Toluene	1/2	0.0204	0.0204	1,600	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Chrysene	1/2	0.155	0.155	88	No	Max Detect < Risk Criteria

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Toluene	1/2	0.017	0.017	1,600	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Benzo(*b*)fluoranthene	1/2	0.24	0.24	0.88	No	Max Detect < Risk Criteria
Benzo(*k*)fluoranthene	1/2	0.245	0.245	8.8	No	Max Detect < Risk Criteria
Chrysene	1/2	0.549	0.549	88	No	Max Detect < Risk Criteria
Fluoranthene	1/2	1.8	1.8	310	No	Max Detect < Risk Criteria
Phenanthrene	1/2	0.48	0.48	235[a]	No	Max Detect < Risk Criteria
Pyrene	1/2	1.5	1.5	230	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	2/2	4.8	11.7	400	No	Max Detect < Risk Criteria

SEDIMENT						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
1,2-Dichloroethane	1/1	0.0034	0.0034	7	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	1/1	72.7	72.7	400	No	Max Detect < Risk Criteria

[a]Risk-based concentration of pyrene used to develop GSSL for phenanthrene [comment 110 (SAIC 1999a)].

Table 9.21-8. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27P

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = C_{Max} × BAF_i × IR_S	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = C_{Max} × BAF_i × IR_R	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
Toluene	0.0204	5.00E-02	5.41E-04	3.09E+01	1.75E-05	1.55E-03	No TRV	No HQ
					HI= 1.75E-05			HI= 0.00E+00
Semivolatile Organic Compounds								
Chrysene	0.155	5.00E-02	4.11E-03	1.58E+01	2.60E-04	1.18E-02	1.24E+01	9.50E-04

ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

Table 9.21-9. Preliminary Risk Calculations for ECOPCs in Sediment, SWMU 27P

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = C_{Max} × BAF_i × IR_S	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = C_{Max} × BAF_i × IR_R	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
1,2-Dichloroethane	0.0034	5.00E-02	9.01E-05	6.18E+01	1.46E-06	2.58E-04	1.72E+01	1.50E-05
					HI= 1.46E-06			HI= 1.50E-05
Metals								
Lead[a]	72.7	4.0E-01	1.54E+01	1.76E+01	8.75E-01	4.42E+01	1.13E+00	3.91E+01

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration > 1 mg/kg.
ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.
Cells with double borders indicate HQ > 1.

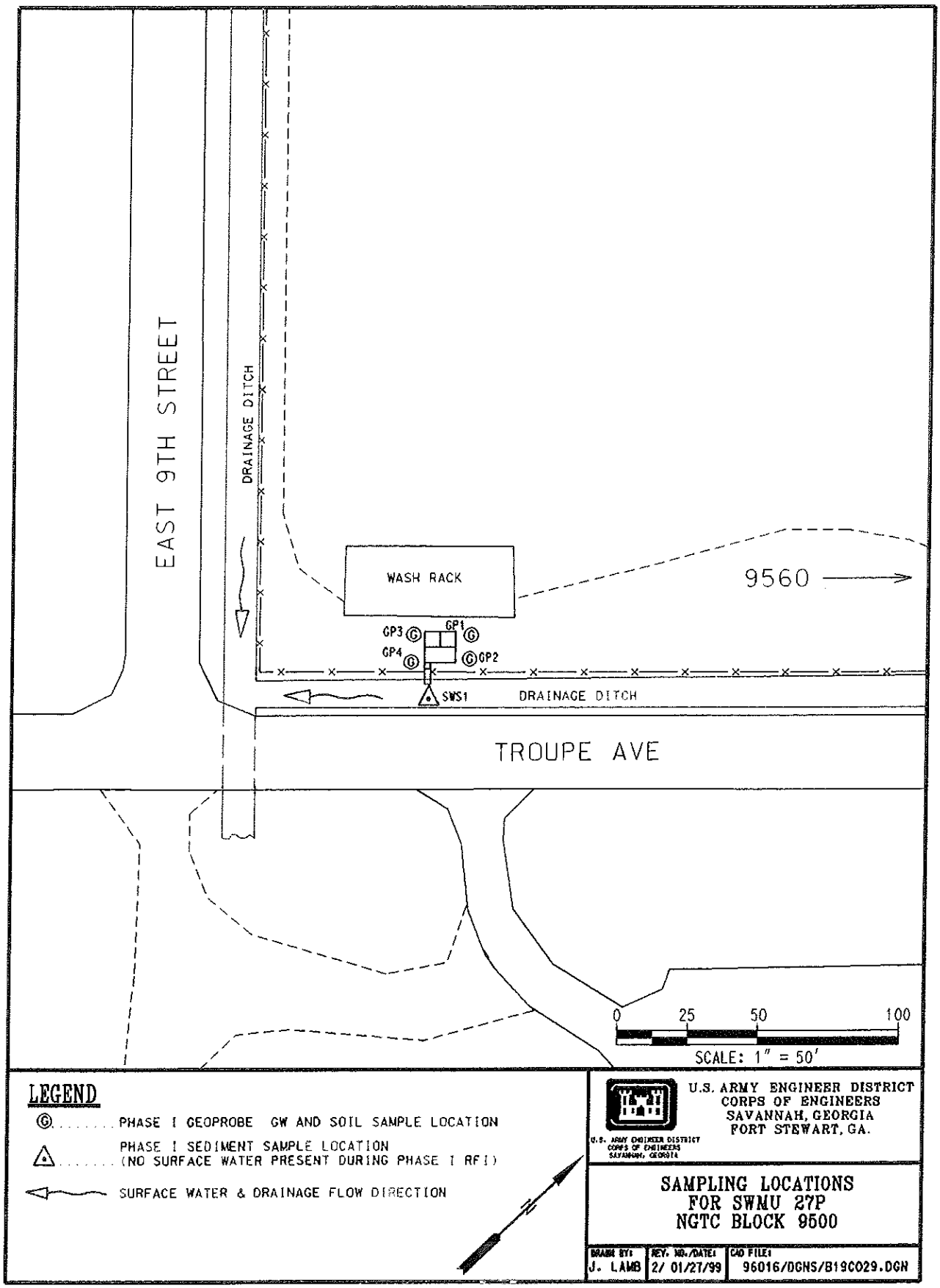

Figure 9.21-1. Sampling Locations, SWMU 27P

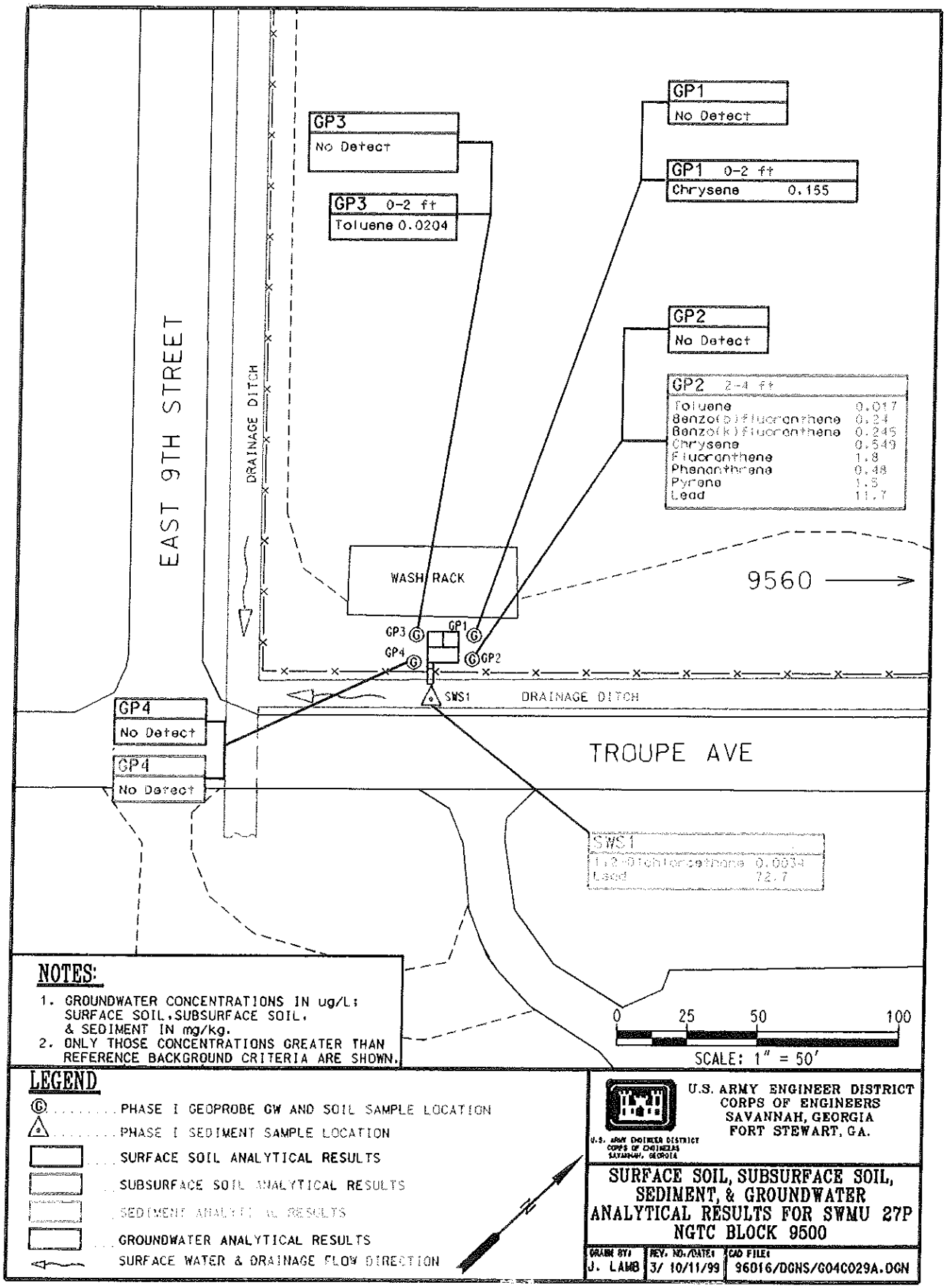

Figure 9.21-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, Groundwater, and Sediment, SWMU 27P

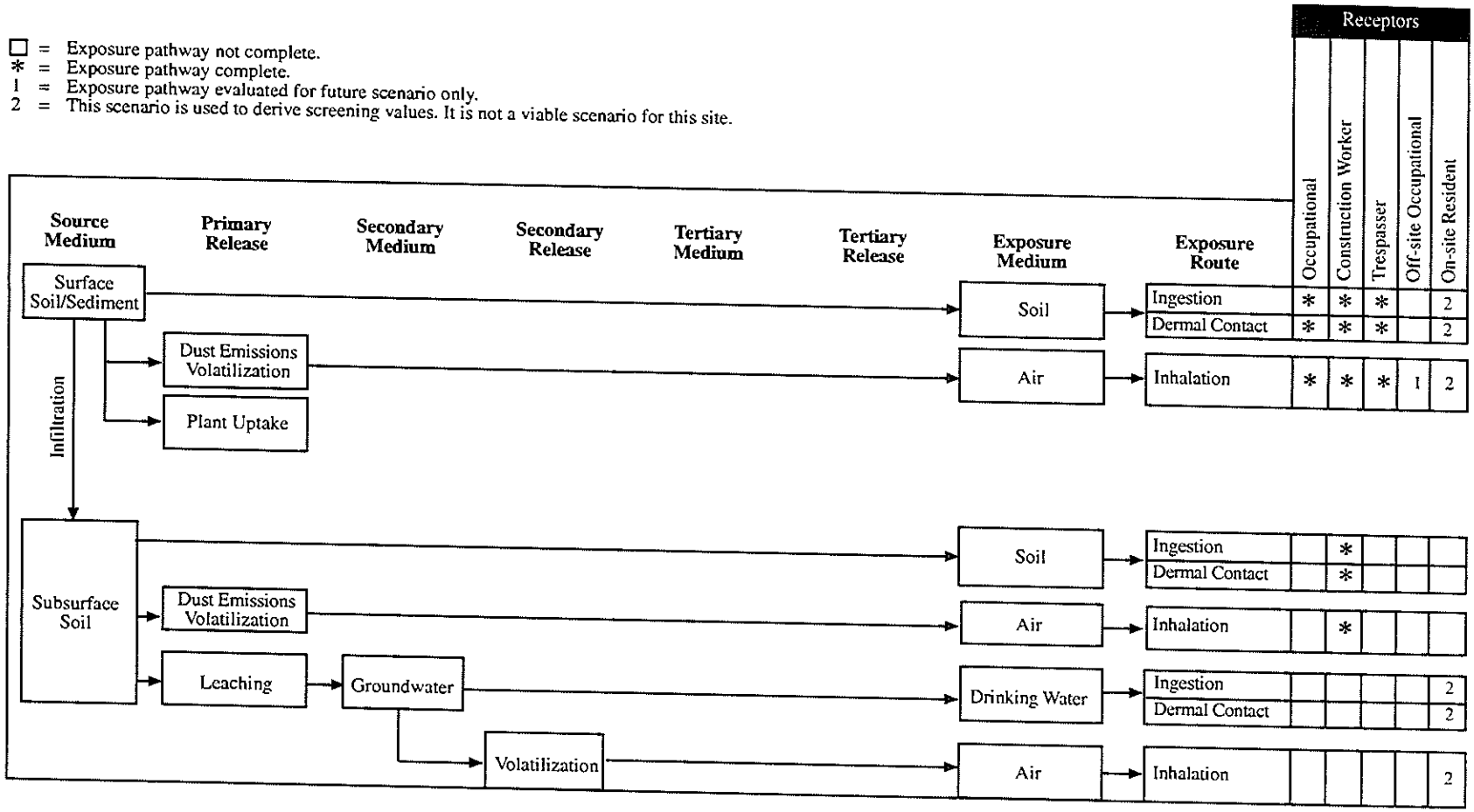

Figure 9.21-3. Potential Migration and Exposure Pathways, SWMU 27P

9.22 SWMU 27Q: NGTC BLOCK 9400

9.22.1 History and Description of SWMU 27Q, Block 9400

SWMU 27Q, Block 9400 is one of eight OWSs located in the NGTC along Troupe Avenue. The OWS is located approximately in the middle of Block 9400 adjacent to a wash rack (Figure 9.22-1). The OWS receives wastewater from an adjacent vehicle wash rack. Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges into a drainage ditch located southeast of the OWS along Troupe Avenue. The wash rack is not presently in use and is scheduled for removal during 2000. Units rarely use the motorpool, and when assigned to the facility, they are strictly forbidden from using the wash rack. All equipment and vehicles are washed at a centralized location in the National Guard area. Thus, only rainwater currently collects in the OWS, which is an open unit. No previous investigations have been performed at the site.

9.22.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 9.22-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

One sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch. The sediment was analyzed for VOCs, SVOCs, and lead. No surface water was available during the Phase I RFI.

9.22.3 Physical Characteristics of the Site

9.22.3.1 Topography

The topography of the site is essentially flat, with a gravel vehicle parking area adjacent to the north and a grass border between the OWS and wash rack and the fence to the southeast. The surface elevation is approximately 79.5 feet amsl.

9.22.3.2 Surface drainage

A drainage ditch is located approximately 10 feet from the OWS. The effluent from the OWS discharges to the drainage ditch to the southeast of the site (Figure 9.22-1). Surface water is present in the drainage ditch only during rainfall events. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where it is allowed to percolate into the soil (see Section 3.3).

9.22.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.22.3.4 Hydrogeology

Groundwater was encountered from approximately 3.5 feet to 5 feet bgs. Groundwater is unlikely to intercept the adjacent shallow ditch/swale.

9.22.3.5 Ecology

As stated in Section 8.2, SWMU 27Q is classified as an "industrialized area with managed grasslands." The site comprises approximately 0.01 acre (Figure 9.22-1). The OWS is surrounded by a large area of managed grass. Adjacent to the site lies a storm water ditch that parallels the road (Troupe Avenue).

9.22.4 Nature and Extent of Contamination

9.22.4.1 Surface soil

Three surface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.22-1 and Figure 9.22-2.

VOCs. No VOCs were detected in surface soil.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected in all three samples taken from GP1, GP3, and GP4 at concentrations of 51.1 mg/kg, 2.1 mg/kg, and 26.8 mg/kg, respectively. The concentrations found at GP1 and GP4 exceeded the reference background criterion; therefore, lead is considered to be an SRC for surface soil.

9.22.4.2 Subsurface soil

One subsurface soil sample was collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.22-2 and Figure 9.22-2.

VOCs. No VOCs were detected in subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in the sample taken from GP2 at a concentration of 1.8 mg/kg, which did not exceed the reference background criterion; therefore, lead is not considered to be an SRC for subsurface soil.

9.22.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 9.22-3 and Figure 9.22-2.

VOCs. Chloromethane was detected in the groundwater sample taken from GP2 at a concentration of 3.8 µg/L. With the concurrence of GEPD, the quality of the data was reevaluated (see Comment No. 111 in Appendix L). The chloromethane value for sample 8C4211 collected at GP2 was originally qualified as estimated, "J," with a qualifier reason code of G02 attached. The associated validation code indicated that the value was estimated because the concentration was below the reporting level for the analyte. In addition, the analysis had a low surrogate recovery. Given that the reporting level for chloromethane is 10 µg/L, while the value determined was 3.8 µg/L and given that there was additional qualification of the data, the value reported was requalified as estimated nondetect, "UJ." Therefore, chloromethane is not an SRC in groundwater.

SVOCs. No SVOCs were detected in groundwater.

Lead. Lead was not detected in the groundwater samples collected at the site.

9.22.4.4 Surface water

No surface water samples were collected at this site during the RFI because no surface water was present.

9.22.4.5 Sediment

One sediment sample was collected. The results of the sediment sample analysis are presented in Table 9.22-4 and Figure 9.22-2.

VOCs. No VOCs were detected in sediment.

SVOCs. No SVOCs were detected in sediment.

Lead. Lead was detected in the sample taken from SWS1 at a concentration of 20.5 mg/kg, which was above the reference background criterion; therefore, lead is considered to be an SRC in sediment.

9.22.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.22-5.

9.22.5 Fate and Transport Considerations

The potential for soil and sediment contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface and subsurface soil and sediment SRCs to their respective GSSLs.

Of the SRCs identified in soil and sediment, none of the analytes exceeded their respective GSSLs (Table 9.22-6); therefore, there are no CMCOPCs in soil or sediment at SWMU 27Q based on leaching to groundwater.

9.22.6 Human Health Preliminary Risk Evaluation of SWMU 27Q

SRCs were identified for the following media: surface soil, groundwater, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.22.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area: however, the wash rack is not currently used. The OWS discharges to an open ditch outside the fence, but water is present only during rain events. The potential receptor populations include:

- occupational populations (individuals working on the site),

- construction workers,
- juvenile trespassers, and
- off-site occupational workers.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The OWS site is relatively flat and is surrounded by a large area of managed grass, with an adjacent storm water ditch that parallels the road; therefore, soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway. The OWS is scheduled for removal. At that time, the groundcover within the immediate OWS area will be removed. Clean backfill will be placed in the excavation area, and the area will be seeded.

Because the groundwater is deeper than the adjacent shallow drainage ditch and there are no other nearby surface waters, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.22-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

The OWS discharges to an open ditch. Water is present in the ditch only after heavy rains; therefore, for the purposes of this assessment, the sediments within the ditch were addressed as surface soils.

Given that water is present only during rain events, exposure, if any, to contaminants in surface water would be sporadic; therefore, potential exposure to contaminants in surface water is not considered to be a viable chronic exposure pathway.

9.22.6.2 Risk evaluation

The results of the human health risk screening are given below. No SRCs were identified in groundwater.

Lead was identified as an SRC in surface soil. The concentration of lead was below its screening value (Table 9.22-7); therefore, there are no HHCOPCs present in surface soil.

Lead was identified as an SRC in sediment. The concentration of lead was below its screening value (Table 9.22-7); therefore, there are no HHCOPCs present in sediment.

9.22.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.22.7 Ecological Preliminary Risk Evaluation of SWMU 27Q

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was collected. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.22.7.1 Ecological screening value comparison (Step i)

There is no surface water at the site, and the sediment was treated as surface soil (see Section 9.22.7.5). No SRCs were identified in groundwater.

Because there are no ESVs for soil, all analytes detected in soil and drainage ditch sediment were evaluated further in EPRE Steps ii through v.

9.22.7.2 Preliminary problem formulation (Step ii)

The ecological habitat for the site is described in Section 9.22.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.22.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil or drainage ditch sediment at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

9.22.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated soil or drainage ditch sediment or of biota exposed to contaminated soil or drainage ditch sediment or by ingestion of drinking water. The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

9.22.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil and drainage ditch sediment at the site are presented in Tables 9.22-8 and 9.22-9, respectively. These

tables show the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. HQs exceeding one are shown bordered by a double line.

The only ECOPC present in surface soil at concentrations resulting in ADDs exceeding the TRVs for the surrogate species was lead (Table 9.22-8). The robin, with an HQ of 27.5, is potentially at risk from lead in surface soil. The HI calculated for shrews exposed to VOCs in surface soil did not exceed one.

Lead was the only ECOPC in sediment from the drainage ditch that had an HQ exceeding one (Table 9.22-9). The lead HQ for robins was 11.1.

9.22.8 Conclusions and Risk Management and Site Recommendations for SWMU 27Q

9.22.8.1 Conclusions

Nature and Extent of Contamination

- No organics (VOCs and SVOCs) were detected in surface soil. Lead was detected in all three surface soil samples at concentrations that exceeded the reference background criterion; therefore, lead is considered to be an SRC for surface soil.

- Chloromethane was detected in the groundwater sample taken from GP2 at a concentration of 3.8 µg/L. The chloromethane value was estimated as undetected; therefore, chloromethane is not an SRC in groundwater.

- Lead was detected in the sediment sample at a concentration above the reference background criterion; therefore, lead is considered to be an SRC for sediment.

Fate and Transport

- SRCs identified in subsurface soil or sediment did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil or sediment based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There were no HHCOPCs for surface soil, groundwater, or sediment.

Ecological Preliminary Risk Evaluation

- There were no ECOPCs in groundwater for aquatic biota and/or terrestrial receptors.

- Lead was the only ECOPC in surface soil and drainage ditch sediment for terrestrial receptors.

9.22.8.2 Risk management and site recommendations

- Lead was indicated as a potential ECOPC in surface soil and drainage ditch sediment if a terrestrial receptor obtains a large percentage of food from the site. Lead was detected in surface soil and drainage ditch sediment above the reference background criterion (8.81 mg/kg) at a maximum concentration of 51.1 mg/kg. The lead concentration was within the observed range (less than 10 mg/kg to 300 mg/kg) established by the USGS for lead concentrations in soils of the eastern United States (USGS 1984). The

OWS is located in an industrialized and heavily trafficked area with limited ecological habitat to support ecological receptors, thereby limiting any potential exposure. Therefore, lead is eliminated as an ECOPC for SWMU 27Q and does not require further investigation and/or evaluation.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27Q regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.22-1. Summary of Analytes Detected in Surface Soil, SWMU 27Q

Station	Reference Background Criteria	8CGP1	8CGP3	8CGP4
Sample ID		8C1111	8C1311	8C1411
Date		01/28/98	01/21/98	01/28/98
Depth (feet)		0 to 2	0 to 2	0 to 2
Sample Type		Grab	Grab	Grab
Metals (mg/kg)				
Lead	8.81	**51.1**	2.1	**26.8**

Bold indicates concentrations above reference background criteria.

Table 9.22-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27Q

Station	Reference Background Criteria	8CGP2
Sample ID		8C1211
Date		01/21/98
Depth (feet)		2 to 4
Sample Type		Grab
Metals (mg/kg)		
Lead	11.1	1.8

Table 9.22-3. Summary of Analytes Detected in Groundwater, SWMU 27Q

Station	Reference Background Criteria	MCL	8CGP1	8CGP2	8CGP3	8CGP4
Sample ID			8C4111	8C4211	8C4311	8C4411
Date			01/28/98	01/21/98	01/21/98	01/28/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
Chloromethane	0.00			3.8 UJ[a]		

[a]The chloromethane value for sample 8C4211 collected at GP2 was qualified as estimated, "J," with a qualifier reason code of GO2, indicating that the value was estimated because it was below the reporting level for the analyte. In addition, the analysis had a low surrogate recovery. Given that the reporting level for chloromethane is 10 µg/L, while the value determined was 3.8 µg/L and given that there was additional qualification of the data, the value reported was qualified as estimated, nondetect, "UJ."

Bold indicates concentrations above reference background criteria.

Table 9.22-4. Summary of Analytes Detected in Sediment, SWMU 27Q

Station	Reference Background Criteria	8CSWS1
Sample ID		8C2111
Date		2/1/98
Sample Type		Grab
Metals (mg/kg)		
Lead	8.81	**20.5**

Bold indicates concentrations above reference background criteria.

Table 9.22-5. Summary of Site-related Contaminants, SWMU 27Q

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Metals					
Lead	51.1	BRBC	20.5	ND	NC

BRBC = Below reference background criteria.
NC = Not collected; surface water unavailable during Phase I RFI.
ND = Not detected above reference background criteria.

Table 9.22-6. GSSL Screening of Site-related Contaminants in Soil and Sediment, SWMU 27Q

Site-related Contaminant	Maximum Concentration	GSSL	CMCOPC?
SOIL			
Metals (mg/kg)			
Lead[a]	51.1	400	No
SEDIMENT			
Metals (mg/kg)			
Lead[a]	20.5	400	No

[a]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.22-7. Human Health Risk Screening for Surface Soil and Sediment, SWMU 27Q

SURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Metals (mg/kg)						
Lead	3/3	2.1	51.1	400	No	Max Detect < Risk Criteria

SEDIMENT						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Metals (mg/kg)						
Lead	1/1	20.5	20.5	400	No	Max Detect < Risk Criteria

Table 9.22-8. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27Q

			Short-tailed Shrew			American Robin		
ECOPC	CMax (mg/kg)	BAF_i	ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Metals								
Lead[a]	51.1	4.00E-01	1.08E+01	1.76E+01	6.16E-01	3.11E+01	1.13E+00	2.75E+01

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration > 1 mg/kg.

ADD = Average daily dose (mg/kg/d).

BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).

C_{Max} = Maximum detected surface soil concentration (mg/kg).

HQ = Hazard quotient; HI = hazard index = sum of HQs.

IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.

IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.

TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

Cells with double borders indicate HQ > 1.

Table 9.22-9. Preliminary Risk Calculations for ECOPCs in Sediment, SWMU 27Q

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew: ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_S$	Short-tailed Shrew: TRV (mg/kg/d)	Short-tailed Shrew: HQ = ADD/TRV	American Robin: ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_R$	American Robin: TRV (mg/kg/d)	American Robin: HQ = ADD/TRV
Metals								
Lead[a]	20.5	4.0E-01	4.35E+00	1.76E+01	2.47E-01	1.25E+01	1.13E+00	1.10E+01

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration > 1 mg/kg.

ADD = Average daily dose (mg/kg/d).

BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).

C_{Max} = Maximum detected surface soil concentration (mg/kg).

HQ = Hazard quotient; HI = hazard index = sum of HQs.

IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.

IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.

TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

Cells with double borders indicate HQ > 1.

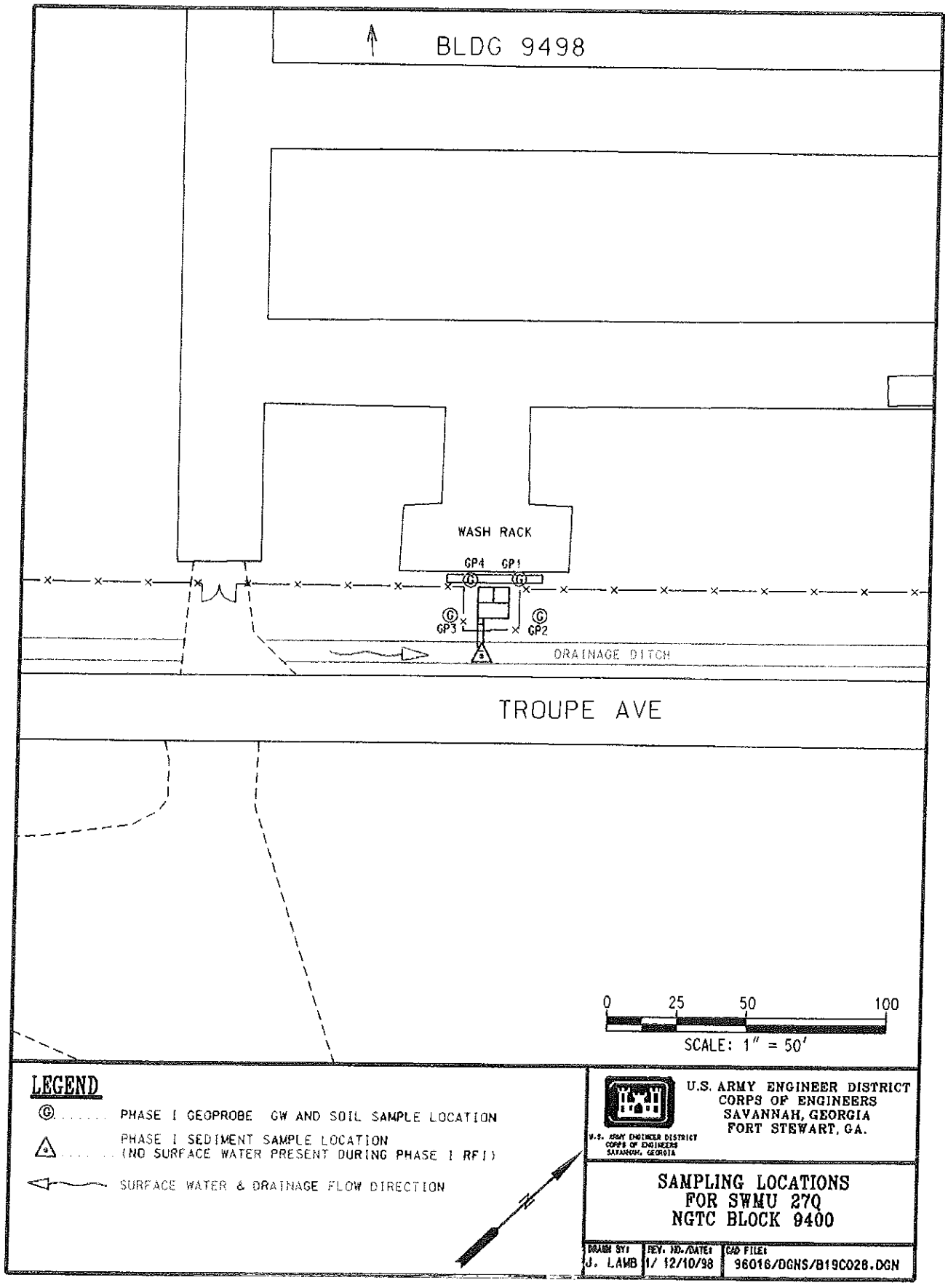

Figure 9.22-1. Sampling Locations, SWMU 27Q

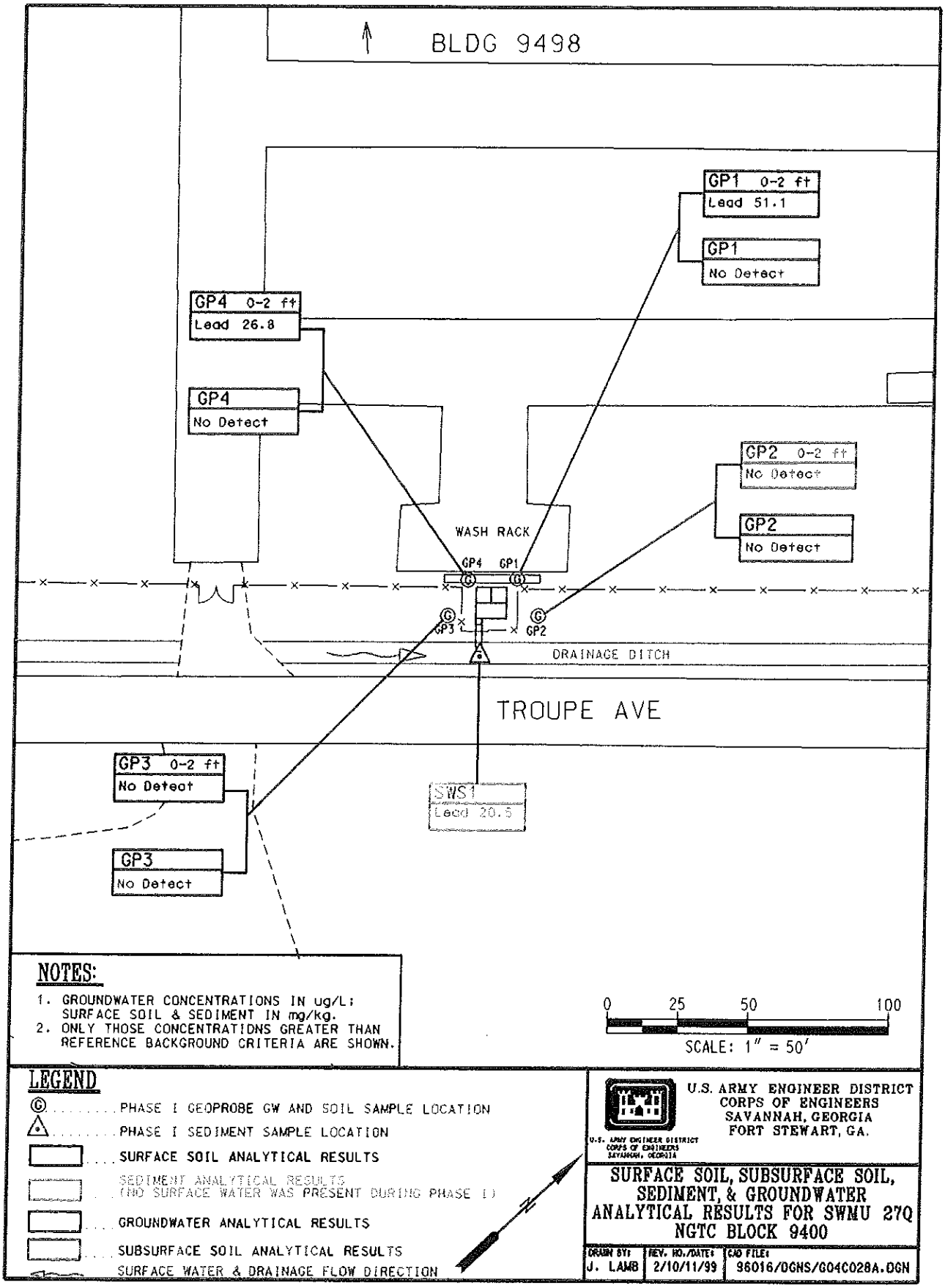

Figure 9.22-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, Groundwater, and Sediment, SWMU 27Q

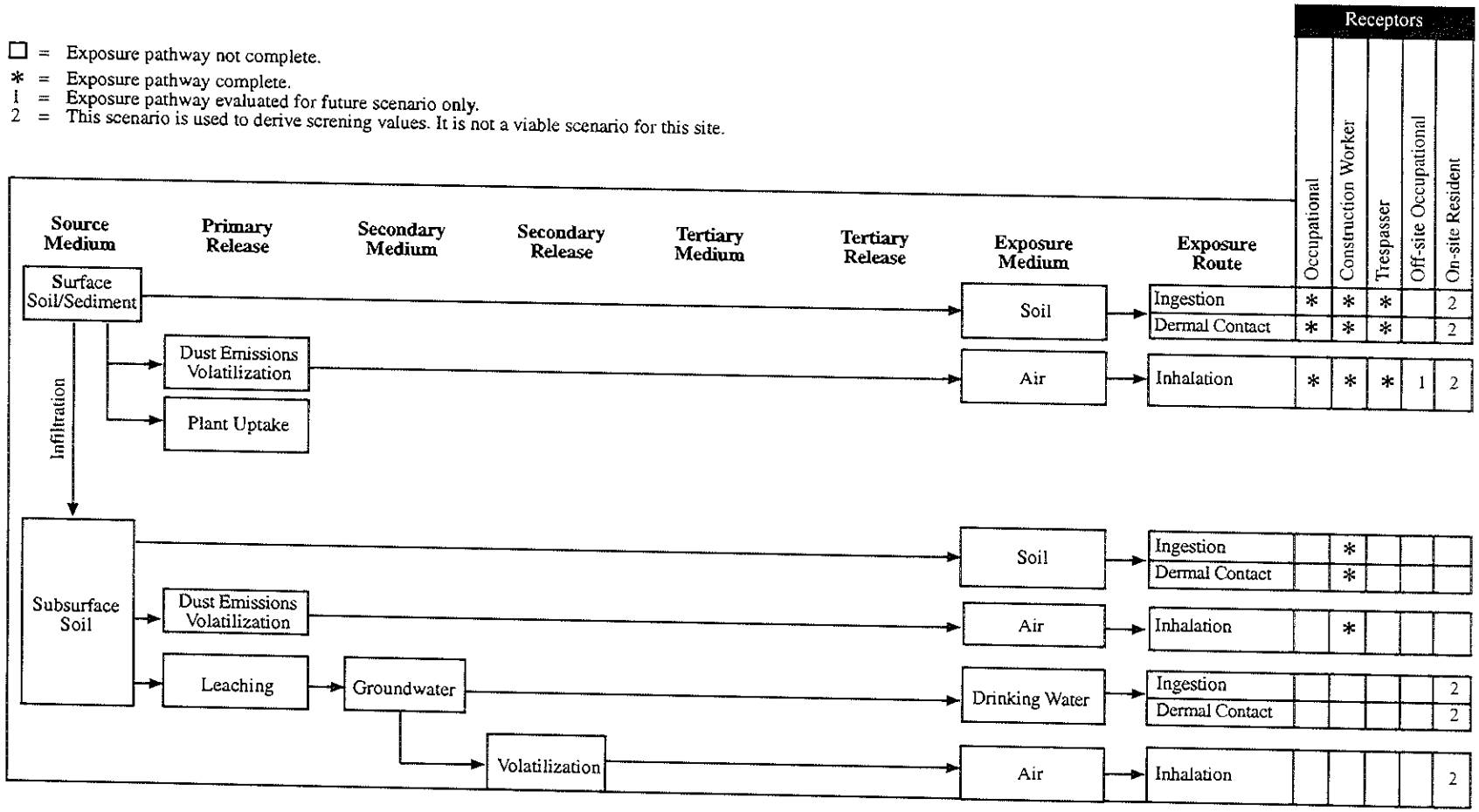

Figure 9.22-3. Potential Migration and Exposure Pathways, SWMU 27Q

9.23 SWMU 27R: 396 TRANSPORTATION COMPANY

9.23.1 History and Description of SWMU 27R, 396 Transportation Company

SWMU 27R is an OWS that supports the vehicle maintenance activities of the 396 Transportation Company. The OWS is located adjacent to the southeastern boundary of the motorpool area along Troupe Avenue. The OWS receives wastewater from an adjacent vehicle wash rack. Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges to the NGTC Equalization Basin (SWMU 37), and the waste oil is pumped out of the holding unit and burned at the Central Energy Plant. No previous investigations have been performed at the site.

9.23.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 9.23-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead. The analytical laboratory missed the holding times for VOCs and SVOCs for all four soil sampling locations during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998.

9.23.3 Physical Characteristics of the Site

9.23.3.1 Topography

The topography of the site is essentially flat. The surface elevation is approximately 84.8 feet amsl. The OWS is located in a grassy area that extends to the southeast to the motorpool's fence line. The area to the north/northeast is paved with concrete for vehicle parking.

9.23.3.2 Surface drainage

A drainage ditch is located approximately 25 feet from the OWS (Figure 9.23-1). The effluent from the OWS discharges directly to SWMU 37. Surface water is present in the drainage ditch only during rainfall events. Because the drainage ditch/swale is shallow and groundwater at the site was encountered at approximately 6 feet bgs, it is unlikely that the groundwater will intercept surface waters in the drainage ditch. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where it is allowed to percolate into the soil (see Section 3.3).

9.23.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.23.3.4 Hydrogeology

Groundwater was encountered at approximately 6 feet bgs. Groundwater is unlikely to intercept the adjacent shallow drainage ditch/swale.

9.23.3.5 Ecology

As stated in Section 8.2, SWMU 27R is classified as an "industrialized area with managed grasslands." The site is located to the immediate west of the NGTC and comprises approximately 0.02 acre (Figure 9.23-1). The site contains habitats similar to those within the NGTC. The majority of the motorpool is covered by concrete; however, a small area of managed grass does exist within the SWMU's boundaries. A small, forested area lies to the south of the SWMU. A storm water ditch is present and separates the site from the road.

9.23.4 Nature and Extent of Contamination

9.23.4.1 Surface soil

One surface soil sample was collected based on field headspace screening for VOCs. The analytical laboratory missed the holding times for VOCs and SVOCs for soil during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. The results of the soil analysis are presented in Table 9.23-1 and Figure 9.23-2.

VOCs. No VOCs were detected in surface soil.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected in the sample taken from GP4 at a concentration of 6.2 mg/kg, which did not exceed the reference background criterion; therefore, lead is not considered to be an SRC for surface soil.

9.23.4.2 Subsurface soil

Three subsurface soil samples were collected based on field headspace screening for VOCs. The analytical laboratory missed the holding times for VOCs and SVOCs for all three subsurface soil sampling locations during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. The soil samples were analyzed for VOCs, SVOCs, and lead. The results of the soil analysis are presented in Table 9.23-2 and Figure 9.23-2.

VOCs. Toluene was detected at two sampling locations at concentrations of 0.108 mg/kg at GP2 and 0.125 mg/kg at GP1; therefore, toluene is considered to be an SRC for subsurface soil.

SVOCs. Benzo(*b*)fluoranthene was detected in the sample collected from GP2 at a concentration of 0.194 mg/kg, and bis(2-ethylhexyl)phthalate was detected in the sample collected from GP3 at a concentration of 0.277 mg/kg. Benzo(*b*)fluoranthene and bis(2-ethylhexyl)phthalate are considered to be SRCs for subsurface soil.

Lead. Lead was detected in the samples taken from all three locations at concentrations ranging from 4.9 mg/kg at GP2 and GP3 to 10.4 mg/kg at GP1. The highest concentration, at GP1, did not exceed the reference background criterion; therefore, lead is not an SRC for subsurface soil.

9.23.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Figure 9.23-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. No SVOCs were detected in groundwater.

Lead. Lead was not detected in groundwater samples collected from the site.

9.23.4.4 Surface water

No surface water samples were collected at this site during the RFI because no surface water pathway exists.

9.23.4.5 Sediment

No sediment samples were collected at this site during the RFI because no sediment pathway exists.

9.23.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.23-3.

9.23.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in subsurface soil, none of the analytes exceeded their respective GSSLs (Table 9.23-4); therefore, there are no CMCOPCs in soil at SWMU 27R.

9.23.6 Human Health Preliminary Risk Evaluation of SWMU 27R

SRCs were identified for the following media: surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.23.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is covered primarily by concrete; however, an area of managed grass does exist within the SWMU's boundaries. A small, forested area lies to the south of the SWMU, and a storm water ditch separates the site from the road; therefore, soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.23-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.23.6.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for subsurface soils consisted of the following organics: toluene, benzo(*b*)fluoranthene, and bis(2-ethylhexyl)phthalate. The concentrations of these contaminants were below their respective screening values (Table 9.23-5); therefore, there are no HHCOPCs in subsurface soil.

9.23.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.23.7 Ecological Preliminary Risk Evaluation of SWMU 27R

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the EPRE are presented below.

9.23.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site. No SRCs were identified in surface soil or groundwater; therefore, an EPRE was not conducted.

9.23.8 Conclusions and Risk Management and Site Recommendations for SWMU 27R

9.23.8.1 Conclusions

Nature and Extent of Contamination

- No SRCs were identified in surface soil.
- Toluene was detected at two subsurface soil sampling locations; therefore, toluene is considered to be an SRC for subsurface soil.

- Benzo(*b*)fluoranthene and bis(2-ethylhexyl)phthalate were detected in the subsurface soil samples; therefore, benzo(*b*)fluoranthene and bis(2-ethylhexyl)phthalate are considered to be SRCs for subsurface soil.

- No SRCs were identified in groundwater.

Fate and Transport

- SRCs identified in subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for subsurface soils.

Ecological Preliminary Risk Evaluation

- No SRCs were identified in surface soil or groundwater. There was no surface water or sediment present at this site; therefore, an EPRE was not conducted.

9.23.8.2 Risk management and site recommendations

- Based on information presented in this section, an NFA status is recommended for SWMU 27R regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU.

Table 9.23-1. Summary of Analytes Detected in Surface Soil, SWMU 27R

Station	Reference Background Criteria	8DGP4[a]
Sample ID		8D1412
Date		05/06/98
Depth (feet)		0 to 2
Sample Type		Grab
Metals (mg/kg)		
Lead	8.81	6.2

[a]The analytical laboratory inadvertently missed the holding times for VOCs and SVOCs for soil during the January 1998 sampling endeavor. Soil was resampled May 6, 1998.

Table 9.23-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27R

Station	Reference Background Criteria	8DGP1[a]	8DGP2[a]	8DGP3[a]
Sample ID		8D1112	8D1212	8D1312
Date		05/06/98	05/06/98	05/06/98
Depth (feet)		4 to 6	4 to 6	4 to 6
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
Toluene	0.00	**0.125**	**0.108**	
Semivolatile Organic Compounds (mg/kg)				
Benzo(*b*)fluoranthene	0.00		**0.194**	
Bis(2-ethylhexyl)phthalate	0.00			**0.277**
Metals (mg/kg)				
Lead	11.10	10.4	4.9	4.9

[a]The analytical laboratory inadvertently missed the holding times for VOCs and SVOCs for soil during the January 1998 sampling endeavor. Soil was resampled May 6, 1998.
Bold indicates concentrations above reference background criteria.

Table 9.23-3. Summary of Site-related Contaminants, SWMU 27R

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Toluene	ND	0.125	NP	ND	NP
Semivolatile Organic Compounds					
Benzo(*b*)fluoranthene	ND	0.194	NP	ND	NP
Bis(2-ethylhexyl)phthalate	ND	0.277	NP	ND	NP

ND = Not detected above reference background criteria.
NP = No pathway.

Table 9.23-4. GSSL Screening of Site-related Contaminants in Soil, SWMU 27R

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Toluene	0.125	12	No
Semivolatile Organic Compounds (mg/kg)			
Benzo(*b*)fluoranthene	0.194	5	No
Bis(2-ethylhexyl)phthalate	0.277	3,600	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

Table 9.23-5. Human Health Risk Screening for Subsurface Soil, SWMU 27R

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Toluene	2/3	0.108	0.125	1,600	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Benzo(*b*)fluoranthene	1/3	0.194	0.194	0.88	No	Max Detect < Risk Criteria
Bis(2-ethylhexyl)phthalate	1/3	0.277	0.277	46	No	Max Detect < Risk Criteria

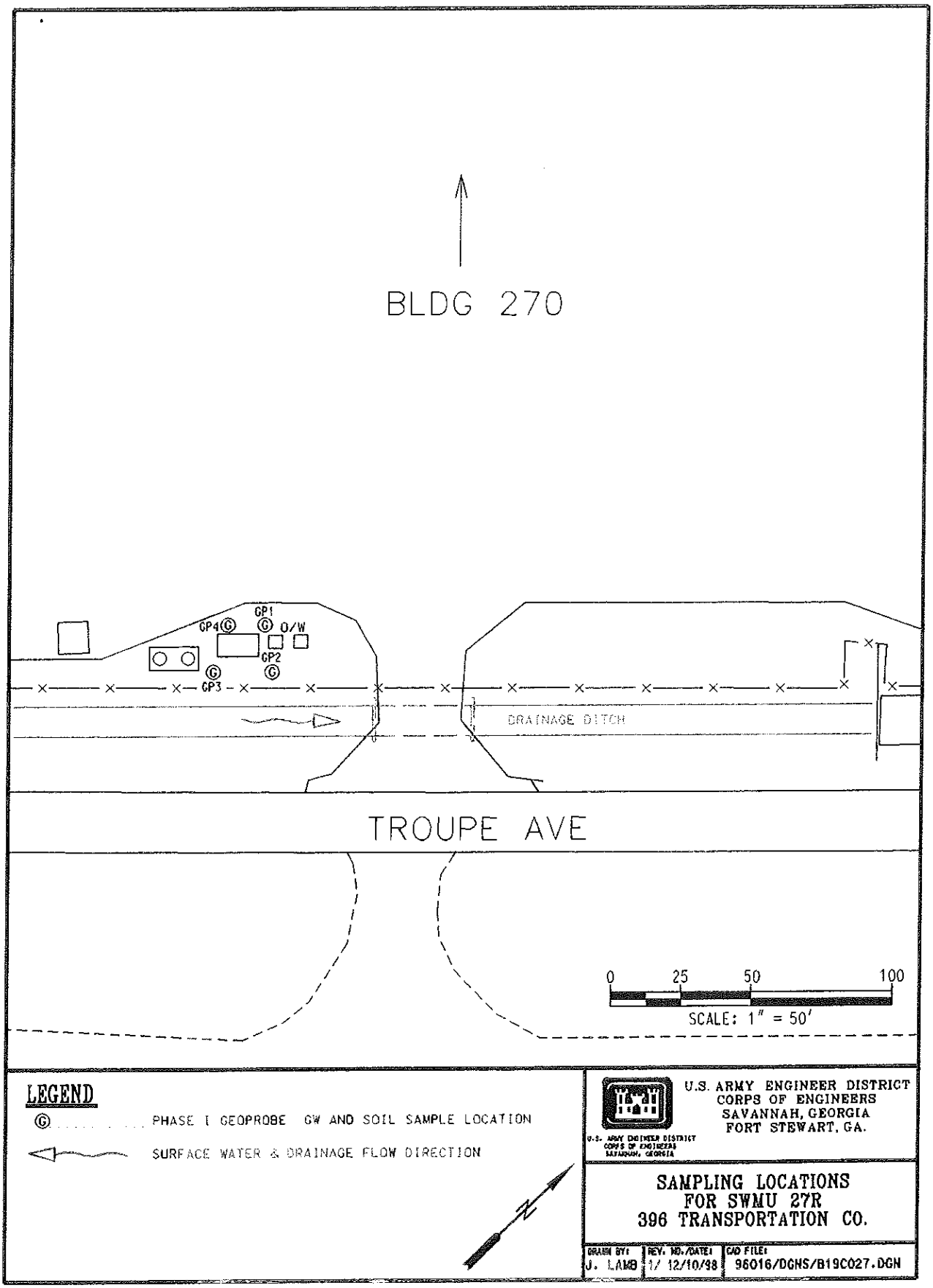

Figure 9.23-1. Sampling Locations, SWMU 27R

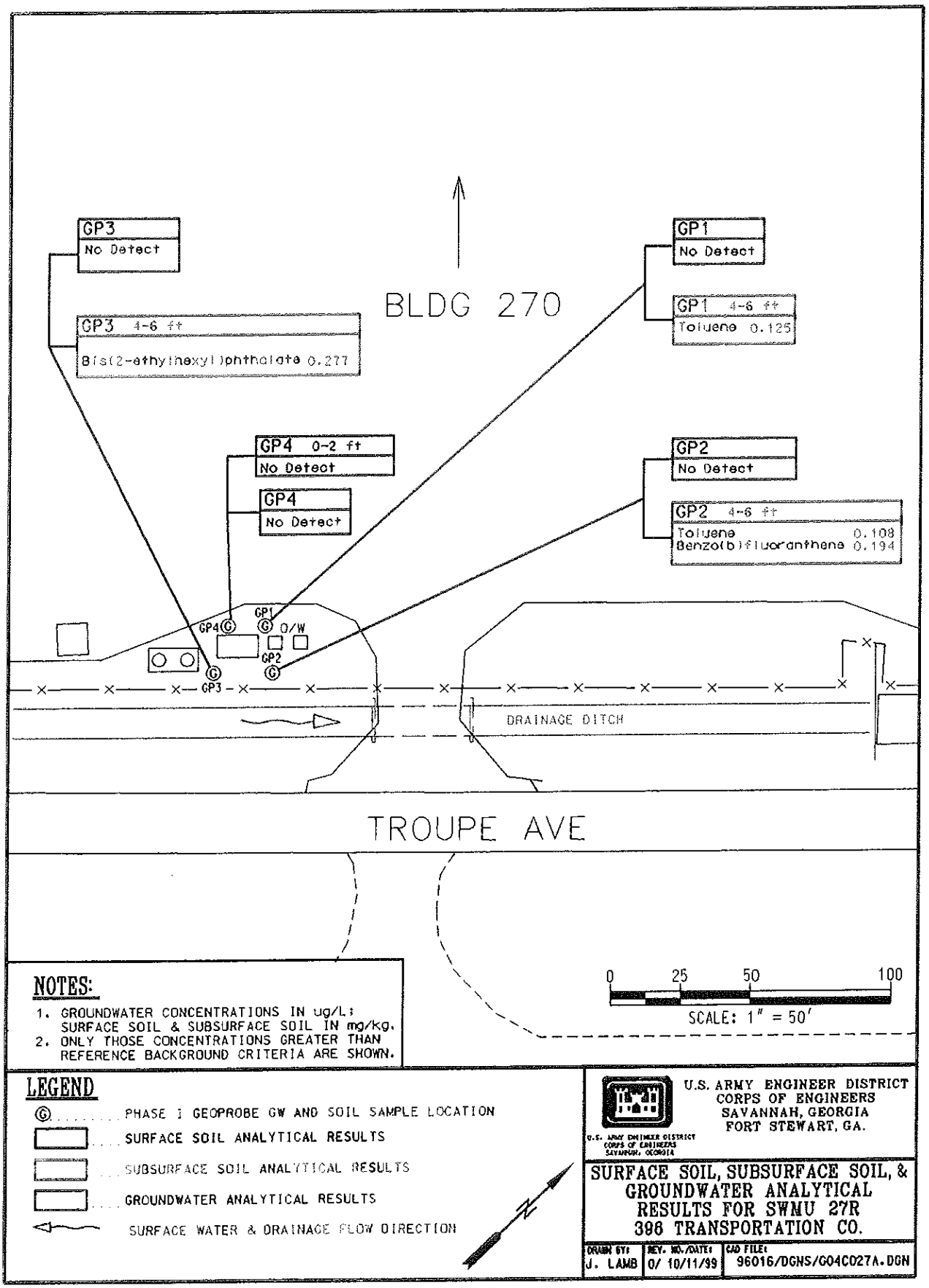

Figure 9.23-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27R

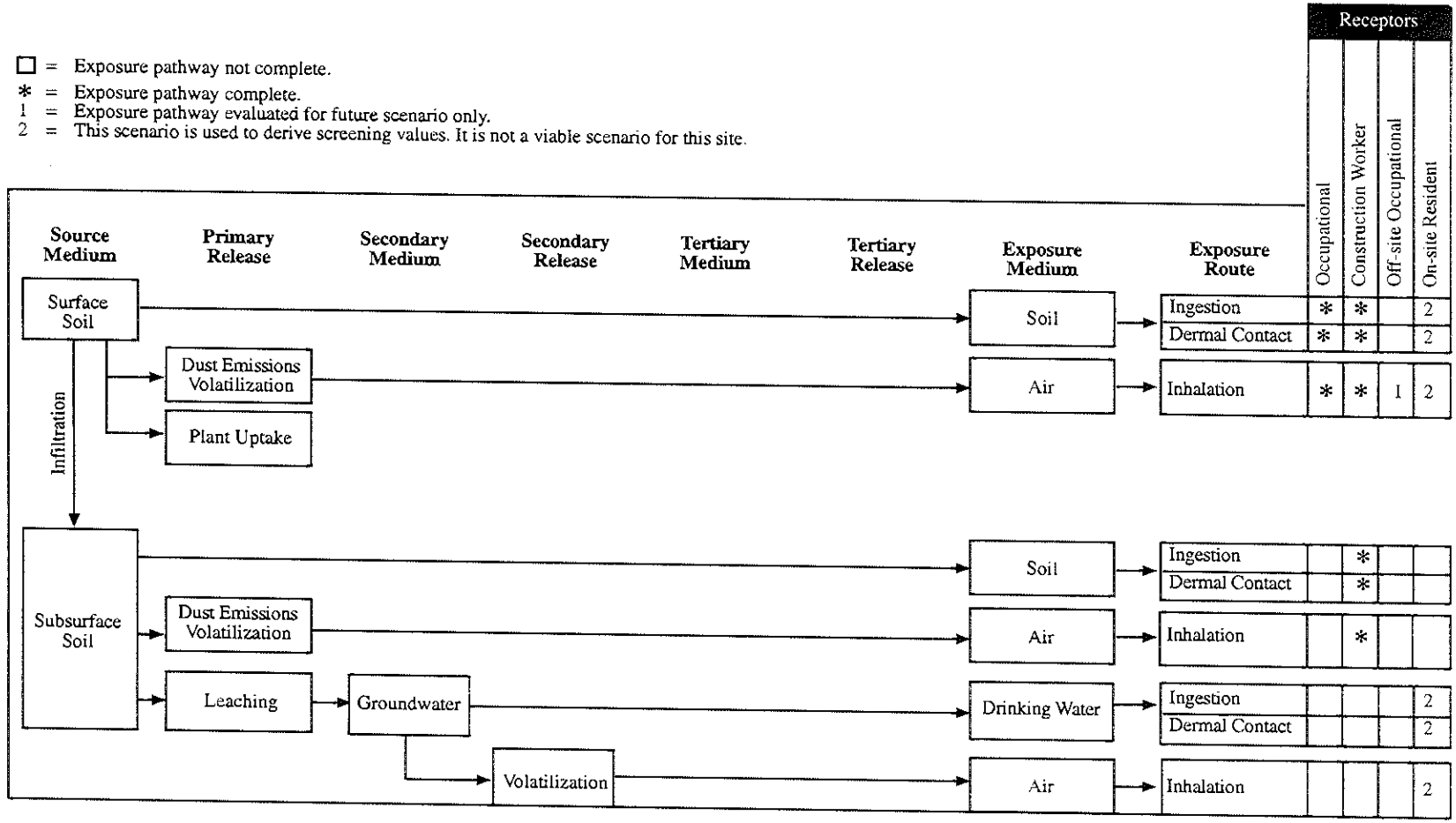

Figure 9.23-3. Potential Migration and Exposure Pathways, SWMU 27R

9.24 SWMU 27S: 103D MI BN

9.24.1 History and Description of SWMU 27S, 103d MI BN

SWMU 27S consists of two OWSs that support the vehicle maintenance activities of the 103d MI BN. The OWSs are located in the southwestern corner of the motorpool along Troupe Avenue. The OWSs receive wastewater from vehicle maintenance activities performed in Building 241, located to the northeast (Figure 9.24-1). The effluent from the OWSs discharges to the NGTC Equalization Basin (SWMU 37). No previous investigations have been performed at the site.

9.24.2 Summary of Investigative Activities

DPT techniques were used to collect six soil and groundwater samples at the site. In addition, with the concurrence of GEPD, DPT techniques were used to install two separate 3/4-inch-inside-diameter PVC monitoring points with 10-foot screened intervals with filter packs that were installed to intersect the water table at the GP2 and GP3 locations (SAIC 1999a). The resampling monitoring points (GP2 and GP3) were installed approximately 1 foot away from the previous sampling locations. In addition, with the concurrence of GEPD, a 2-inch-diameter monitoring well was installed at the GP3 location, and the groundwater was sampled using low-flow techniques. The well construction, geotechnical results, well development, and field parameter measurements for MW1 are presented in Table 9.24-1. The soil and groundwater from the DPT–collected samples were analyzed for VOCs, SVOCs, and lead. The groundwater from the two monitoring points and one monitoring well were analyzed for only bis(2-ethylhexyl)phthalate. The soil sampling, DPT groundwater sampling, and monitoring well locations are presented in Figure 9.24-1.

9.24.3 Physical Characteristics of the Site

9.24.3.1 Topography

The site is essentially flat. The surface elevation is approximately 87.5 feet amsl. The OWSs are surrounded by gravel that extends to the southeast beyond the motorpool's fence line. The area surrounding the gravel island is concreted road or parking area.

9.24.3.2 Surface drainage

A drainage ditch is located approximately 25 feet from the OWSs (Figure 9.24-1). The effluent from the OWSs discharges to SWMU 37. Because the drainage ditch/swale is shallow (less than 4 feet) and groundwater at the site was encountered at approximately 4 feet bgs, it is unlikely that the groundwater will intercept surface waters in the drainage ditch. Surface water is present in the drainage ditch only during rainfall events. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where the water is allowed to percolate into the soil (Section 3.3).

9.24.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.24.3.4 Hydrogeology

Groundwater was encountered at approximately 4 feet to 4.4 feet bgs. Groundwater is unlikely to intercept the adjacent shallow drainage ditch/swale.

9.24.3.5 Ecology

As stated in Section 8.2, SWMU 27S is classified as an "industrialized area with managed grasslands." The site is located to the immediate west of the NGTC and comprises approximately 0.02 acre (Figure 9.24-1). The surface of the motorpool and the SWMU is gravel and concrete. There is a drainage ditch located to the south just beyond the fence line and also a small, forested area approximately 50 feet south of the SWMU.

9.24.4 Nature and Extent of Contamination

9.24.4.1 Surface soil

The surface soil sampling intervals did not indicate elevated VOC headspace readings (PID readings); therefore, no surface soil samples were collected at this site during the Phase I RFI.

9.24.4.2 Subsurface soil

Six subsurface soil samples were collected based on field headspace screening for VOCs. The results of the subsurface soil analysis are presented in Table 9.24-2 and Figure 9.24-2.

VOCs. The sample collected from GP6 indicated the presence of 1,2-dichloroethene; ethylbenzene; tetrachloroethene; trichloroethene; and total xylenes at concentrations of 0.0024 mg/kg, 0.0027 mg/kg, 0.0023 mg/kg, 0.0022 mg/kg, and 0.007 mg/kg, respectively. Acetone was detected in the samples collected from GP2, GP3, GP4, and GP6 at concentrations ranging from 0.0324 mg/kg at GP4 to 0.396 mg/kg at GP6. Acetone; 1,2-dichoroethene; ethylbenzene; tetrachloroethene; trichloroethene; and total xylenes are considered to be SRCs for subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in the samples taken from all six Geoprobe sampling locations at concentrations ranging from 2.3 mg/kg at GP2 to 5.9 mg/kg at GP6, which do not exceed the reference background criterion; therefore, lead is not considered to be an SRC for subsurface soil.

9.24.4.3 Groundwater

Six groundwater samples were collected from the six Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 9.24-3 and Figure 9.24-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. Bis(2-ethylhexyl)phthalate was initially detected above its MCL in the groundwater samples from GP2 and GP3 at concentrations of 12 µg/L and 22.8 µg/L, respectively. The bis(2-ethylhexyl)phthalate concentrations at GP2 and GP3 were believed to be the result of field or laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), the groundwater at the GP2 and GP3 locations was resampled for only bis(2-ethylhexyl)phthalate on August 26–27, 1999. The groundwater was collected

from two separate 3/4-inch-inside-diameter PVC monitoring points with 10-foot screened intervals with filter packs that were installed to intersect the water table. The resampling monitoring points were installed approximately 1 foot away from their respective previous sampling locations. Bis(2-ethylhexyl)phthalate was not detected at either location; however, an elevated detection level (less than 40 µg/L) was indicated at GP3. Therefore, a 2-inch-diameter monitoring well was installed at the GP3 location, and the groundwater was resampled on October 31, 1999, using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected in the groundwater from the monitoring well. The elevated concentration of bis(2-ethylhexyl)phthalate previously detected at GP2 and GP3 is considered to be the result of field or laboratory contamination. Bis(2-ethylhexyl)phthalate is not considered to be an SRC at SWMU 27S.

Lead. Lead was not detected at any of the six groundwater sampling locations.

9.24.4.4 Surface water

No surface water samples were collected at this site during the RFI because no pathway exists.

9.24.4.5 Sediment

No sediment samples were collected at this site during the RFI because no pathway exists.

9.24.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.24-4.

9.24.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in subsurface soil, none of the analytes exceeded its respective GSSL (Table 9.24-5); therefore, there are no CMCOPCs in soil based on leaching to groundwater.

9.24.6 Human Health Preliminary Risk Evaluation of SWMU 27S

SRCs were identified for subsurface soil. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.24.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and

- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is covered by concrete; however, there is a drainage ditch located to the south just beyond the fence line and also a small, forested area approximately 50 feet south of the SWMU. Soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway.

Groundwater at the site does not discharge into any nearby surface waters because the depth to groundwater is greater than the depth of the drainage ditch; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.24-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in aecordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.24.6.2 Risk evaluation

SRCs were identified in only subsurface soil. The results of the human health risk screening are given below.

Six VOCs were identified as SRCs for subsurface soil. The concentrations of these contaminants were below their respective screening values for soil ingestion (Table 9.24-5); therefore, there are no HHCOPCs in subsurface soil.

9.24.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.24.7 Ecological Preliminary Risk Evaluation of SWMU 27S

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the EPRE are presented below.

9.24.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site. Surface soils were not evaluated because no surface soil samples were collected based on field headspace VOC analyses (i.e., field readings were nondetect).

9.24.8 Conclusions and Risk Management and Site Recommendations for SWMU 27S

9.24.8.1 Conclusions

Nature and Extent of Contamination

- The site is covered with concrete and thick gravel, and the initial soil interval (6 inches to 2 feet bgs) did not indicate surface soil contamination based on field VOC screening.

- Subsurface soil samples indicated the following to be SRCs in that medium: 1,2-dichloroethene; acetone; ethylbenzene; tetrachloroethene; trichloroethene; and total xylenes.

- Bis(2-ethylhexyl)phthalate was initially detected above its MCL at two Geoprobe groundwater locations (GP2 and GP3). Groundwater was resampled with two separate 3/4-inch-diameter monitoring points at GP2 and GP3 and a 2-inch-diameter monitoring well at GP3. Bis(2-ethylhexyl)phthalate was not detected in the monitoring point at GP2 or in MW1 at the GP3 location, indicating that the initial bis(2-ethylhexyl)phthalate concentrations at GP2 and GP3 were due to field or laboratory contamination. Bis(2-ethylhexyl)phthalate is not an SRC in groundwater at SWMU 27S.

Fate and Transport

- SRCs identified in subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- No HHCOPCs were identified in subsurface soil.

Ecological Preliminary Risk Evaluation

- There are no SRCs in groundwater. The surface of the SWMU is covered with either concrete or gravel; therefore, there is no surface soil pathway for ecological receptors.

9.24.8.2 Risk management and site recommendations

- Based on the information presented in this section, an NFA status is recommended for SWMU 27S regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU. MW1 and permanent monitoring points GP2 and GP3 located at the site will be properly abandoned within 90 days of approval of this report.

Table 9.24-1. Monitoring Well Construction, Summary of Geotechnical Analyses, Well Development Summary, and Field Parameter Measurements during Groundwater Sampling for Monitoring Well MW1, SWMU 27S

MONITORING WELL CONSTRUCTION							
Well No.	Date Installed	Size/Type	Coordinates	Total Depth (feet)	Screen Interval (feet bgs)	Top of Filter Pack Elevation (feet bgs)	Top of Casing Elevation (feet)
27S-MW1	10/06/99	2-inch PVC	N 677910.51 E 831823.91	13.3	2.7 to 12.7	1.5	76.57

Note: All elevations are NGVD 1929.

SUMMARY OF GEOTECHNICAL ANALYSES						
Station	Sample ID	Depth (feet)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
27S-MW1	8E1173	3 to 13	13.74	NP	NP	NP
Station	Sample ID	Depth (feet)	Class	Gravel (%)	Sand (%)	Fines (%)
27S-MW1	8E1173	3 to 13	NP	0.24	89.24	10.52

NP = Non-plastic.

WELL DEVELOPMENT SUMMARY					
Well No.	Date	Total Development Time (hours)	Total Volume Removed (gallons)	Final Turbidity Reading (NTUs)	Total Well Depth (feet)
27S-MW1	10/09/99	5 hours, 23 minutes	150	9.2	12.65

FIELD PARAMETER MEASUREMENTS DURING GROUNDWATER SAMPLING							
Parameter	Date	pH (su)	Conductivity (mS/cm)	Temperature (°C)	Turbidity (NTUs)	DO (mg/L)	Redox (mV)
27S-MW1	10/31/99	6.06	124.0	26.08	3.5	2.15	61.6

Table 9.24-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27S

Station	Reference Background Criteria	8EGP1	8EGP2	8EGP3	8EGP4	8EGP5	8EGP6
Sample ID		8E1111	8E1211	8E1311	8E1411	8E1511	8E1611
Date		01/20/98	01/20/98	01/20/98	01/21/98	01/20/98	01/21/98
Depth (feet)		10 to 12	4 to 6	4 to 6	6 to 8	10 to 12	6 to 8
Sample Type		Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)							
1,2-Dichloroethene	0.00						**0.0024**
Acetone	0.00		**0.0515**	**0.11**	**0.0324**		**0.396**
Ethylbenzene	0.00						**0.0027**
Tetrachloroethene	0.00						**0.0023**
Trichloroethene	0.00						**0.0022**
Xylenes, total	0.00						**0.007**
Metals (mg/kg)							
Lead	11.10	3.5	2.3	4.5	4.6	2.7	5.9

Bold indicates concentrations above reference background criteria.

Table 9.24-3. Summary of Analytes Detected in Groundwater, SWMU 27S

Station	Reference Background Criteria	MCL	8EGP1	8EGP2	8EGP2	8EGP3	8EGP3	8EGP4	8EGP5	8EGP6	8EMW1
Sample ID			8E4111	8E4211	8E4212	8E4311	8E4312	8E4411	8E4511	8E4611	8E4171
Date			01/20/98	01/20/98	08/27/99	01/20/98	08/26/99	01/21/98	01/20/98	01/21/98	10/31/99
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Semivolatile Organic Compounds											
Bis(2-ethylhexyl)phthalate	0.00	6		*12*[a]		*22.8*[a]	*<40*[a,b]				

[a]Two separate 3/4-inch-diameter monitoring points were installed at the GP2 and GP3 sample locations, and the groundwater was resampled. Bis(2-ethylhexyl)phthalate was not detected in the groundwater from the monitoring point at GP2, indicating that the initial detection was the result of field or laboratory contamination. Bis(2-ethylhexyl)phthalate had an elevated detection level at GP3; therefore, a monitoring well (MW1) was installed at the GP3 sample location.

[b]A monitoring well (MW1) was installed at the GP3 sample location, and the groundwater was resampled using low-flow techniques. Bis(2-ethylhexyl)phthalate was not detected in the groundwater from the monitoring well, indicating that the initial detection was the result of field or laboratory contamination.

Bold indicates concentrations above reference background criteria.

Boxed *italic* indicates concentrations above MCLs.

Table 9.24-4. Summary of Site-related Contaminants, SWMU 27S

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
1,2-Dichloroethene	NC	0.0024	NP	ND	NP
Acetone	NC	0.396	NP	ND	NP
Ethylbenzene	NC	0.0027	NP	ND	NP
Tetrachloroethene	NC	0.0023	NP	ND	NP
Trichloroethene	NC	0.0022	NP	ND	NP
Xylenes, total	NC	0.007	NP	ND	NP
Metals					
Lead	NC	BRBC	NP	BRBC	NP

BRBC = Below reference background criteria.
NC = Not collected.
ND = Not detected.
NP = No pathway exists.

Table 9.24-5. GSSL Screening of Site-related Contaminants in Soil, SWMU 27S

SUBSURFACE SOIL			
Site-related Contaminant	Maximum Concentration	GSSL[a]	HHCOPC?
Volatile Organic Compounds (mg/kg)			
1,2-Dichloroethene[b]	0.0024	0.416	No
Acetone	0.396	16	No
Ethylbenzene	0.0027	13	No
Tetrachloroethene	0.0023	0.06	No
Trichloroethene	0.0022	0.06	No
Xylenes, total	0.007	190	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

Table 9.24-6. Human Health Risk Screening for Subsurface Soil, SWMU 27S

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Acetone	4/5	0.0324	0.396	780	No	Max Detect < Risk Criteria
Ethylbenzene	1/6	0.0027	0.0027	780	No	Max Detect < Risk Criteria
Tetrachloroethene	1/6	0.0023	0.0023	12	No	Max Detect < Risk Criteria
Trichloroethene	1/6	0.0022	0.0022	58	No	Max Detect < Risk Criteria
Xylenes, total	1/6	0.007	0.007	16,000	No	Max Detect < Risk Criteria

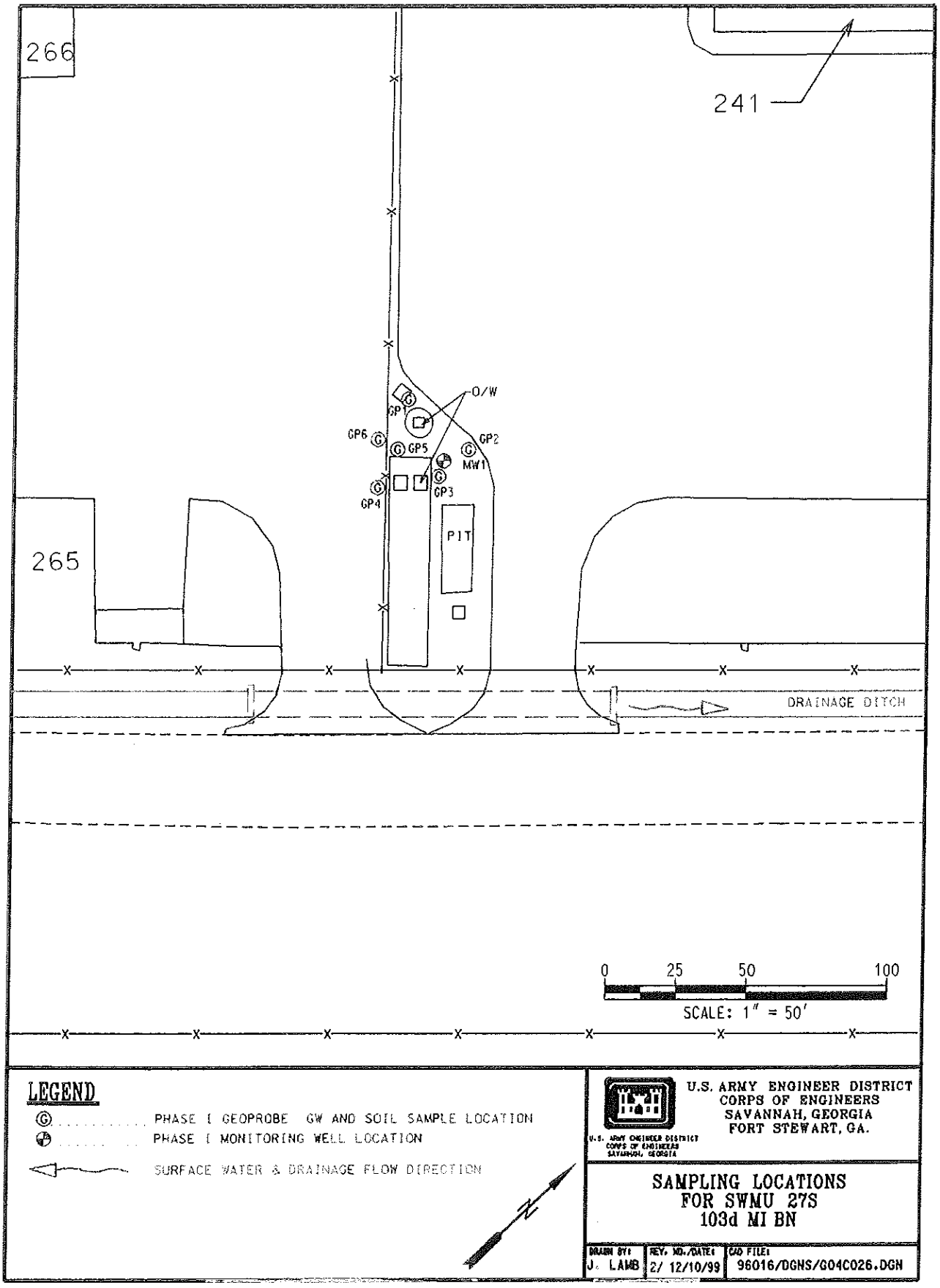

Figure 9.24-1. Sampling Locations, SWMU 27S

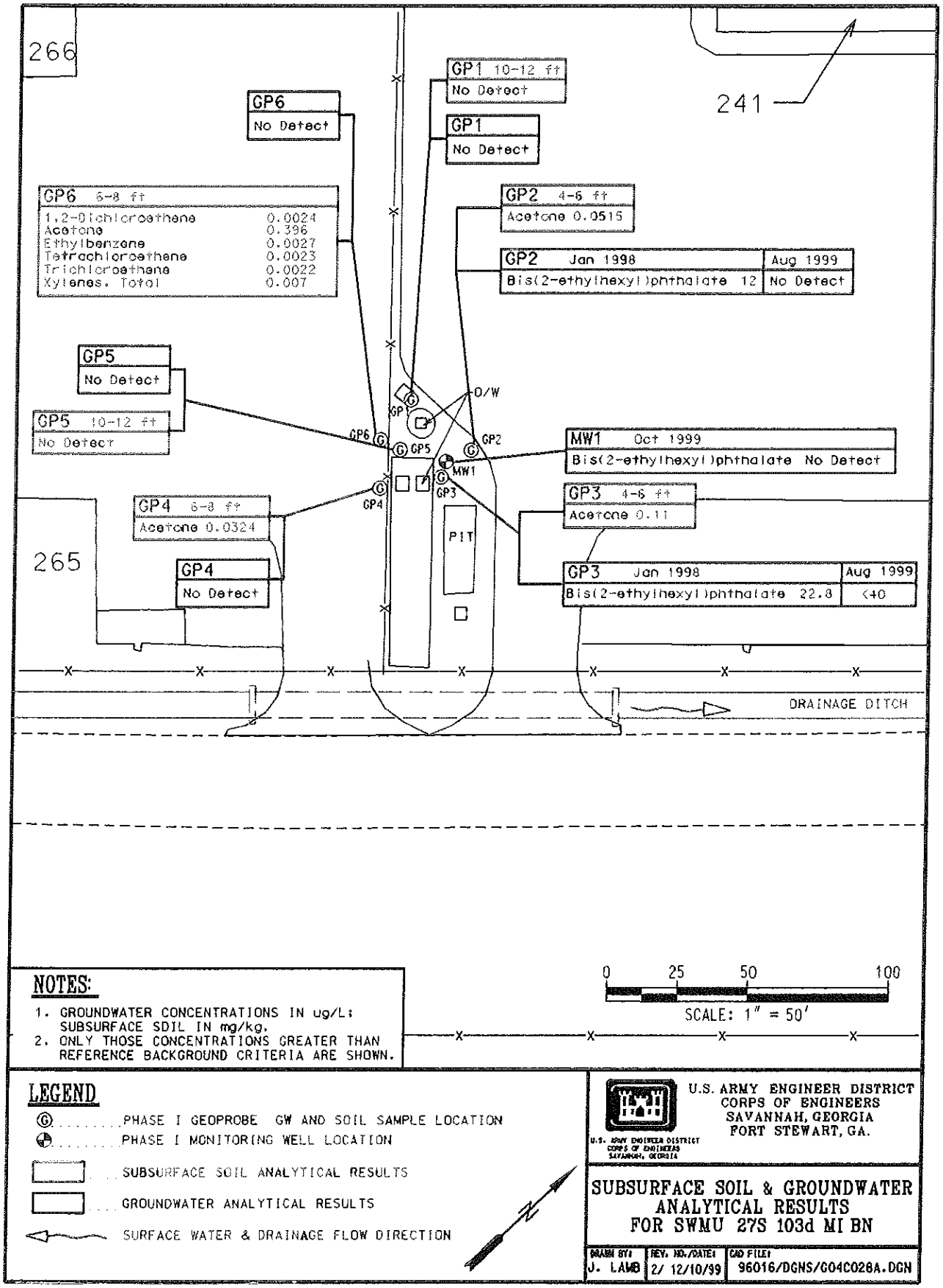

Figure 9.24-2. Summary of Analytical Results in Subsurface Soil and Groundwater, SWMU 27S

☐ = Exposure pathway not complete.
* = Exposure pathway complete.
1 = This scenario is used to derive screening values. It is not a viable scenario for this site.

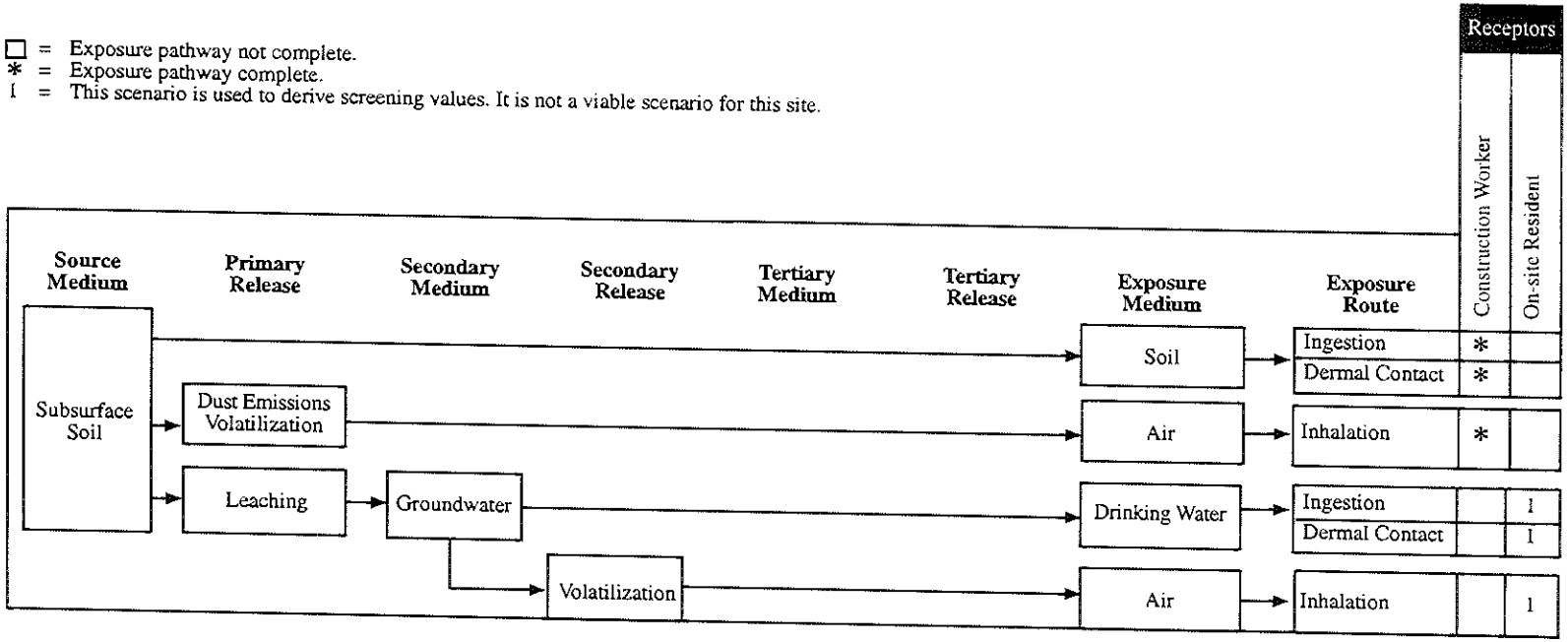

Figure 9.24-3. Potential Migration and Exposure Pathways, SWMU 27S

9.25 SWMU 27U: WRIGHT ARMY AIRFIELD

9.25.1 History and Description of SWMU 27U, Wright Army Airfield

SWMU 27U consists of one OWS that supports the vehicle maintenance activities of Wright Army Airfield. The OWS is located east of Building 7738 (Figure 9.25-1). The OWS receives wastewater from two vehicle wash racks located to the northeast and northwest. The effluent from the OWS discharges to the Wright Army Airfield Land Application System (LAS), and the waste oil is pumped out of the holding unit and burned at the Central Energy Plant. No previous investigations have been performed at the site.

9.25.2 Summary of Investigative Activities

DPT techniques were used to collect six soil and groundwater samples at the site. The six soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples from the DPT locations were analyzed for VOCs, SVOCs, and lead. In addition, with the concurrence of GEPD, a 2-inch-diameter monitoring well (MW1) was installed at the GP3 location, and the groundwater was resampled using low-flow techniques to confirm the analytical results of samples collected at that location (Figure 9.25-1). Two soil samples (surface and subsurface) were collected during the installation of the monitoring well. The soil and groundwater from the monitoring well was analyzed for VOCs, SVOCs, and RCRA metals. The well construction, geotechnical results, well development, and field parameter measurements for MW1 are presented in Table 9.25-1. The locations of the soil and groundwater sampling are presented in Figure 9.25-1.

9.25.3 Physical Characteristics of the Site

9.25.3.1 Topography

The site is essentially flat. The surface elevation is approximately 41.5 feet amsl. The OWS is surrounded by grass that extends to beyond the fenced boundary to the south. The concrete tarmac of the Wright Army Airfield is located to the north of the site.

9.25.3.2 Surface drainage

A drainage swale is located approximately 150 feet south (outside the fenced boundary) of the OWS and the wash racks (Figure 9.25-1). The effluent from the OWS discharges to the Wright Army Airfield LAS, and the waste oil is pumped out of the holding unit and burned at the Central Energy Plant. Surface water is present in the drainage ditch only during rainfall events.

9.25.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.25.3.4 Hydrogeology

Groundwater was encountered at approximately 4.7 feet to 7.6 feet bgs in the DPT borings installed in January 1998. Groundwater was encountered at approximately 13 feet bgs in the monitoring well (MW1) installed in October 1999.

9.25.3.5 Ecology

As stated in Section 8.2, SWMU 27U is classified as an "industrialized area with managed grasslands." Wright Army Airfield is located in the southern portion of the FSMR, outside of the garrison area. The airfield consists of a concrete/asphalt runway contained within a large, grassy meadow surrounded by wooded areas. The SWMU comprises approximately 0.01 acre (Figure 9.25-1). Habitat within the SWMU's boundaries consists of managed grasses and man-made structures and surfaces.

9.25.4 Nature and Extent of Contamination

9.25.4.1 Surface soil

Three surface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.25-2 and Figure 9.25-2.

VOCs. Toluene was detected at a concentration of 0.0216 mg/kg at GP5. 2-Butanone, acetone, and carbon disulfide were detected at concentrations of 0.0046 mg/kg, 0.0388 mg/kg, and 0.107 mg/kg at MW1, respectively. Toluene, 2-butanone, acetone, and carbon disulfide are considered to be SRCs in surface soil.

SVOCs. Benzo(*a*)anthracene, chrysene, fluoranthene, phenanthrene, and pyrene were detected in the surface soil from MW1 at concentrations of 0.0245 mg/kg, 0.0376 mg/kg, 0.0555, mg/kg, 0.0296 mg/kg, and 0.0499 mg/kg, respectively. No SVOCs were detected in surface soil from GP1 or GP5. Benzo(*a*)anthracene, chrysene, fluoranthene, phenantbrene, and pyrene are considered to be SRCs in subsurface soil.

RCRA Metals. Lead was detected in the samples taken from GP1 and GP5 at concentrations of 25 mg/kg and 3.7 mg/kg, respectively. The concentration at GP1 exceeded the reference background criterion. Lead was also detected in surface soil from MW1 at a concentration (11 mg/kg) above the reference background criterion. No other RCRA metals were detected in surface soil. Lead is considered to be an SRC in surface soil.

9.25.4.2 Subsurface soil

Five subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.25-3 and Figure 9.25-2.

VOCs. Methylene chloride was detected in the sample taken from GP3 at a concentration of 0.0164 mg/kg. The sample from GP4 indicated the presence of toluene at a concentration of 0.0264 mg/kg. No VOCs were detected in subsurface soil collected from MW1. Metbylene chloride and toluene are considered to be SRCs for subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

RCRA Metals. Lead was detected in the sample taken from all five locations at concentrations ranging from 6.1 mg/kg at MW1 to 13.3 mg/kg at GP3. Arsenic, barium, chromium, and selenium were detected in surface soil from MW1 but at concentrations below the reference background criteria. The concentration of lead at GP3 exceeded the reference background criterion; therefore, lead is considered to be an SRC for subsurface soil.

9.25.4.3 Groundwater

Six groundwater samples were collected from the six Geoprobe locations at the site. As discussed in Section 9.25.2, a 2-inch-diameter monitoring well (MW1) was installed at the GP3 location to confirm the analytical results of samples collected at that location (Figure 9.25-1). The groundwater from the monitoring well was analyzed for VOCs, SVOCs, and RCRA metals. The results of the groundwater analyses from the Geoprobe locations and monitoring well are presented in Table 9.25-4 and Figure 9.25-2.

VOCs. The sample collected at GP4 indicated the presence of benzene at a concentration of 2.2 µg/L. Ethylbenzene was detected in the samples taken from GP3, GP4, and GP6 at concentrations of 72.7 µg/L, 100 µg/L, and 5.2 µg/L, respectively. The sample from GP3 indicated the presence of styrene at a concentration of 5.3 µg/L. Total xylenes were detected in the samples from GP3 and GP4 at concentrations of 449 µg/L and 670 µg/L, respectively. Benzene, ethylbenzene, styrene, and total xylenes are considered to be SRCs in groundwater.

SVOCs. Naphthalene was detected at a concentration of 114 µg/L at GP3. The elevated naphthalene concentration at GP3 was believed to be the result of field or laboratory contamination; therefore, with the concurrence of GEPD (SAIC 1999a), a 2-inch-diameter monitoring well was installed at the GP3 location, and the groundwater was sampled for VOCs, SVOCs, and RCRA metals using low-flow techniques. Naphthalene was not detected in the groundwater from the monitoring well. The elevated concentration of naphthalene initially detected at GP3 is considered to be the result of field or laboratory contamination. Naphthalene is not considered to be an SRC at SWMU 27U.

Lead. Lead was a not detected at any of the sampling locations; therefore, lead is not considered to be an SRC in groundwater.

As discussed, RCRA metals analyses were performed on the groundwater sample collected using low-flow techniques from MW1. Barium and chromium were detected in the groundwater. Barium and chromium were not detected above the reference background criteria; therefore, there are no SRCs in groundwater.

9.25.4.4 Surface water

No surface water samples were collected at this site during the RFI because no surface water pathway exists.

9.25.4.5 Sediment

No sediment samples were collected at this site during the RFI because no sediment pathway exists.

9.25.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.25-5.

9.25.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of soil SRCs to their respective GSSLs.

None of the SRCs exceeded their respective GSSLs (Table 9.25-6); therefore, there are no CMCOPCs at SWMU 27U based on leaching to groundwater.

9.25.6 Human Health Preliminary Risk Evaluation of SWMU 27U

SRCs were identified for surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

9.25.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The airfield is relatively flat and consists of a concrete/asphalt runway contained within a large, grassy meadow surrounded by wooded areas. Therefore, soil erosion via fugitive dust or surface water runoff is not currently a viable migration pathway.

Groundwater at the site does not discharge into any nearby surface waters because the depth to groundwater is greater than the depth of the drainage ditch; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.25-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.25.6.2 Risk evaluation

The results of the human health risk screening are given below.

Four VOCs, five SVOCs, and lead were identified as SRCs in surface soil. The concentrations of all the SRCs were below their respective screening values for ingestion (Table 9.25-7); therefore, there are no HHCOPCs in surface soil.

Methylene chloride, toluene, and lead were identified as SRCs for subsurface soil. The concentrations of these contaminants were below their respective screening values for ingestion (Table 9.25-7); therefore, there are no HHCOPCs in subsurface soil.

The SRCs for groundwater consisted of four volatile organics (benzene, ethylbenzene, styrene, and total xylenes). The maximum concentration of benzene (2.2 µg/L) was greater than its respective screening value (0.36 µg/L) (Table 9.25-7). The concentrations of the remaining compounds were below their respective screening values. Benzene is an HHCOPC in groundwater.

9.25.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.25.7 Ecological Preliminary Risk Evaluation of SWMU 27U

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

9.25.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

Four VOCs were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 9.25-8. The ECOPCs identified by the ESV comparison for groundwater are total xylenes because they were detected at concentrations exceeding the ESV.

Because there are no ESVs for soil, all analytes detected in soil were evaluated further in EPRE Steps ii through v.

9.25.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 9.25.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

9.25.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

9.25.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated soil or of biota exposed to contaminated soil and by ingestion of drinking water. The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

9.25.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil are presented in Table 9.25-9. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. HQs exceeding one are shown bordered by a double line.

Lead is the only ECOPC present in surface soil at a concentration resulting in an ADD exceeding the TRV of a surrogate species. The robin has a preliminary HQ for lead in surface soil that exceeds one. The lead HQ is 13.5. HIs calculated for VOCs and SVOCs do not exceed one.

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 9.25-10. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for this receptor. No ECOPCs are present in groundwater at concentrations resulting in ADDs exceeding the TRV for the surrogate species.

9.25.8 Conclusions and Risk Management and Site Recommendations for SWMU 27U

9.25.8.1 Conclusions

Nature and Extent of Contamination

- Toluene, 2-butanone, acetone, and carbon disulfide were detected in surface soil and are considered to be SRCs in surface soil.

- Benzo(*a*)anthracene, chrysene, fluoranthene, phenanthrene, and pyrene were detected in subsurface soil and are considered to be SRCs in subsurface soil.

- Methylene chloride and toluene were detected in the subsurface soil samples (GP3 and GP4, respectively) and are considered to be SRCs for subsurface soil.

- Benzene, ethylbenzene, styrene, and total xylenes were detected in groundwater and are considered to be SRCs for groundwater. None of the constituents were detected above their respective MCLs.

- Naphthalene was detected at one Geoprobe groundwater location (GP3). A monitoring well was installed at the location, and the groundwater was resampled using low-flow techniques. Naphthalene

was not detected, indicating that the initial naphthalene concentration was due to field or laboratory contamination. Naphthalene is not an SRC in groundwater at SWMU 27U.

- Lead was not detected at any of the groundwater sampling locations; therefore, lead is not considered to be an SRC.

Fate and Transport

- No CMCOPCs were identified in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs in surface or subsurface soils.

- Benzene was identified as an HHCOPC in groundwater.

Ecological Preliminary Risk Evaluation

- Total xylenes in groundwater are the only ECOPCs for aquatic biota. Total xylenes are a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.

- There are no ECOPCs in groundwater for terrestrial receptors.

- Lead is the only ECOPC in surface soil for terrestrial receptors.

9.25.8.2 Risk management and site recommendations

- Benzene was identified as an HHCOPC in groundwater. Benzene was detected in two groundwater samples at concentrations of 0.92 µg/L and 2.2 µg/L, both of which are well below the MCL of 5 µg/L. Therefore, benzene does not require further investigation and/or evaluation at SWMU 27U.

- RCRA metals analyses were performed on the low-flow groundwater sample collected from MW1. Only barium and chromium were detected in the groundwater, but they were not detected above the reference background criteria; therefore, barium and chromium are not considered to be SRCs in groundwater.

- Total xylenes were identified as possible ECOPCs to aquatic biota if groundwater discharges to nearby surface waters. No surface water bodies exist in the immediate area. Total xylenes were detected at a relatively low concentration (670 µg/L). This low concentration and the natural attenuation processes in the subsurface make it unlikely that the constituents identified in groundwater would discharge to any nearby surface waters at concentrations that would pose a risk to aquatic biota. Therefore, total xylenes are eliminated as ECOPCs for SWMU 27U and do not require further investigation and/or evaluation.

- Lead was identified as a possible ECOPC in surface soil. Lead was detected in surface soil above the reference background criterion (8.81 mg/kg) at a maximum concentration of 25 mg/kg. The maximum lead concentration was within the observed range (less than 10 mg/kg to 300 mg/kg) established by the USGS for lead concentrations in soils of the eastern United States (USGS 1984). This site is a heavily industrialized and trafficked area, and the lead might not be associated with any potential releases from

the OWS. In addition, very little habitat is available to support ecological receptors. Therefore, lead is eliminated as an ECOPC for SWMU 27U and does not require further investigation and/or evaluation.

- Based on the information presented in this section, an NFA status is recommended for SWMU 27U regarding further investigation of the site. If approved by GEPD, Fort Stewart respeetfully requests that the Installation's RCRA Subpart B permit be amended to annotate the revised status of this SWMU. MW1 will remain in place to potentially support any investigation or remediation efforts at the adjacent SWMU 35, Wright Army Airfield Bulk Fuel Storage.

Table 9.25-1. Monitoring Well Construction, Summary of Geotechnical Analyses, Well Development Summary, and Field Parameter Measurements during Groundwater Sampling for Monitoring Well MW1, SWMU 27U

MONITORING WELL CONSTRUCTION							
Well No.	Date Installed	Size/Type	Coordinates	Total Depth (feet)	Screen Interval (feet bgs)	Top of Filter Pack Elevation (feet bgs)	Top of Casing Elevation (feet)
27U-MW1	10/08/99	2-inch PVC	N 685812.84 E 844125.26	22.0	11.01 to 21.01	9.2	42.36

Note: All elevations are NGVD 1929.

SUMMARY OF GEOTECHNICAL ANALYSES							
Station	Sample ID	Depth (feet)	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	
27U-MW1	8G1173	19 to 20	29.96	43.0	25.7	17.3	
Station	Sample ID	Depth (feet)	Class	Gravel (%)	Sand (%)	Fines (%)	Total Organic Carbon (mg/kg)
27U-MW1	8G1173	19 to 20	CL	0.23	82.38	17.39	140[a]

[a]Sample ID is 8G1172, collected at 13 feet to 14 feet bgs.
NA =Not analyzed.
NP = Non-plastic.

WELL DEVELOPMENT SUMMARY					
Well No.	Date	Total Development Time (hours)	Total Volume Removed (gallons)	Final Turbidity Reading (NTUs)	Total Well Depth (feet)
27U-MW1	10/14/99	45 minutes	40	5.4	21.0

FIELD PARAMETER MEASUREMENTS DURING GROUNDWATER SAMPLING							
Parameter	Date	pH (su)	Conductivity (mS/cm)	Temperature (°C)	Turbidity (NTUs)	DO (mg/L)	Redox (mV)
27U-MW1	11/01/99	4.82	17.0	24.74	4.97	0.73	190.4

Table 9.25-2. Summary of Analytes Detected in Surface Soil, SWMU 27U

Station	Reference Background Criteria	8GGP1	8GGP5	8GMW1
Sample ID		8G1111	8G1511	8G1171
Date		01/29/98	01/29/98	10/08/99
Depth (feet)		0 to 2	0 to 2	0 to 1
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
2-Butanone	0.00			0.0046
Acetone	0.00			0.0388
Carbon disulfide	0.00			0.107
Toluene	0.00		**0.0216**	
Semivolatile Organic Compounds (mg/kg)				
Benzo(*a*)anthracene	0.00			0.0245
Chrysene	0.00			0.0376
Fluoranthene	0.00			0.0555
Phenanthrene	0.00			0.0296
Pyrene	0.00			0.0499
Metals (mg/kg)				
Lead	8.81	**25**	3.7	11

Bold indicates concentrations above reference background criteria.

Table 9.25-3. Summary of Analytes Detected in Subsurface Soil, SWMU 27U

Station	Reference Background Criteria	8GGP2	8GGP3	8GGP4	8GGP6	8GMW1
Sample ID		8G1211	8G1311	8G1411	8G1611	8G1172
Date		01/29/98	01/29/98	01/29/98	01/29/98	10/08/99
Depth (feet)		8 to 10	8 to 10	2 to 3	4 to 6	13 to 14
Sample Type		Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)						
Methylene chloride	0.00		**0.0164**			
Toluene	0.00			**0.0264**		
Metals (mg/kg)						
Arsenic	8.04	NA	NA	NA	NA	0.99
Barium	17	NA	NA	NA	NA	6.5
Chromium	11.6	NA	NA	NA	NA	10.5
Lead	11.1	6.2	**13.3**	9	6.4	6.1
Selenium	1.12	NA	NA	NA	NA	0.36

Bold indicates concentrations above reference background criteria.

Table 9.25-4. Summary of Analytes Detected in Groundwater, SWMU 27U

Station	Reference Background Criteria	MCL	8GGP1	8GGP2	8GGP3	8GGP4	8GGP6	8GMW1
Sample ID			8G4111	8G4211	8G4311	8G4411	8G4611	8G4171
Date			01/28/98	01/29/98	01/29/98	01/29/98	01/29/98	11/01/99
Sample Type			Grab	Grab	Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)								
Benzene	0.00	5				**2.2**		
Ethylbenzene	0.00	700			**72.7**	**100**	**5.2**	
Styrene	0.00	100			**5.3**			
Xylenes, total	0.00	10,000			**449**	**670**		
Semivolatile Organic Compounds (µg/L)								
Naphthalene	0.00				**114**[a]			
Metals (µg/L)								
Barium	71.72	2,000	NA	NA	NA	NA	NA	19.9
Chromium	3.56	100	NA	NA	NA	NA	NA	0.96

[a]A monitoring well (MW1) was installed at the GP3 location, and the groundwater was resampled in November 1999 using low-flow techniques. Naphthalene was not detected in the groundwater from the monitoring well, indicating that the previous detection was the result of field contamination.

NA = Not analyzed.

Bold indicates concentrations above the reference background criteria.

Table 9.25-5. Summary of Site-related Contaminants, SWMU 27U

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
2-Butanone	0.0046	ND	NP	ND	NP
Acetone	0.0388	ND	NP	ND	NP
Benzene	ND	ND	NP	2.2	NP
Carbon disulfide	0.107	ND	NP	ND	NP
Ethylbenzene	ND	ND	NP	100	NP
Methylene chloride	ND	0.0164	NP	ND	NP
Toluene	0.0216	0.0264	NP	ND	NP
Styrene	ND	ND	NP	5.3	NP
Xylenes, total	ND	ND	NP	670	NP
Semivolatile Organic Compounds					
Benzo(*a*)anthracene	0.0245	ND	NP	ND	NP
Chrysene	0.0376	ND	NP	ND	NP
Fluoranthene	0.0555	ND	NP	ND	NP
Phenanthrene	0.0296	ND	NP	ND	NP
Pyrene	0.0499	ND	NP	ND	NP
Metals					
Lead	25	13.3	NP	BRBC	NP

BRBC = Below reference background criteria.

ND = Not detected.

NP = No pathway exists.

Table 9.25-6. GSSL Screening of Site-related Contaminants in Soil, SWMU 27U

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
2-Butanone	0.0046	7.685	No
Acetone	0.0388	16	No
Carbon disulfide	0.107	32	No
Methylene chloride	0.0164	0.02	No
Toluene	0.0264	12	No
Semivolatile Organic Compounds (mg/kg)			
Benzo(a)anthracene	0.0245	2	No
Chrysene	0.0375	160	No
Fluoranthene	0.0555	4,300	No
Phenanthrene[b]	0.0296	80.4[b]	No
Pyrene	0.0499	4,200	No
Metals (mg/kg)			
Lead[c]	25	400	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]The RBC of pyrene was used to calculate the GSSL for phenanthrene.

[c]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.25-7. Human Health Risk Screening for Surface Soil, Subsurface Soil, and Groundwater, SWMU 27U

SURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
2-Butanone	1/1	0.0046	0.0046	4,700	No	Max Detect < Risk Criteria
Acetone	1/1	0.0388	0.0388	780	No	Max Detect < Risk Criteria
Carbon disulfide	1/3	0.0107	0.0107	780	No	Max Detect < Risk Criteria
Toluene	1/3	0.0216	0.0216	1,600	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Benzo(*a*)anthracene	1/3	0.0245	0.0245	0.88	No	Max Detect < Risk Criteria
Chrysene	1/3	0.0376	0.0376	88	No	Max Detect < Risk Criteria
Fluoranthene	1/3	0.0555	0.0555	310	No	Max Detect < Risk Criteria
Phenanthrene[a]	1/3	0.0296	0.0296	2,300	No	Max Detect < Risk Criteria
Pyrene	1/3	0.0499	0.0499	230	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	3/3	3.7	25	400	No	Max Detect < Risk Criteria

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Methylene chloride	1/4	0.0164	0.0164	85	No	Max Detect < Risk Criteria
Toluene	1/4	0.0264	0.0264	1,600	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	4/4	6.2	13.3	400	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Freq. of Detection**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
Benzene	1/6	2.2	2.2	0.36	Yes	Max Detect > Risk Criteria
Ethylbenzene	2/5	5.2	100	130	No	Max Detect < Risk Criteria
Styrene	1/6	5.3	5.3	160	No	Max Detect < Risk Criteria
Xylenes, total	2/6	449	670	1,200	No	Max Detect < Risk Criteria

[a]The RBC for pyrene was used for phenanthrene.

Table 9.25-8. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27U

Analyte	SWMU 27U Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Benzene	2.2	53	No	Max Detect < ESV
Ethylbenzene	100	453	No	Max Detect < ESV
Styrene	5.3	10,000[a]	No	Max Detect < ESV
Xylenes, total	670	1.8	Yes	Max Detect > ESV

[a]Fish LC_{50} (Clayton and Clayton 1981).
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.
Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 9.25-9. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27U

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
Acetone	0.0388	5.00E-02	1.03E-03	2.20E+01	4.68E-05	2.95E-03	No TRV	No HQ
Methyl ethyl ketone	0.0046	5.00E-02	1.22E-04	3.89E+03	3.13E-08	3.50E-04	No TRV	No HQ
Carbon disulfide	0.107	1.00E+00	5.67E-02	2.42E+01	2.35E-03	1.63E-01	No TRV	No HQ
Toluene	0.0216	5.00E-02	5.72E-04	3.09E+01	1.85E-05	1.64E-03	No TRV	No HQ
				HI =	**2.53E-05**		**HI =**	**0.00E+00**
Semivolatile Organic Compounds								
Benzo(*a*)anthracene	0.0245	5.00E-02	6.49E-04	1.58E+01	4.10E-05	1.86E-03	1.24E+01	No HQ
Chrysene	0.0376	5.00E-02	9.96E-04	1.58E+01	6.30E-05	2.86E-03	1.24E+01	No HQ
Fluoranthene	0.0555	5.00E-02	1.47E-03	5.95E+01	2.47E-05	4.22E-03	1.95E+02	No HQ
Phenanthrene	0.0296	5.00E-02	7.84E-04	1.19E+00	6.60E-04	2.25E-03	9.97E+00	No HQ
Pyrene	0.0499	5.00E-02	1.32E-03	1.19E+00	1.11E-03	3.79E-03	9.97E+00	No HQ
				HI =	**1.90E-03**		**HI =**	**0.00E+00**
Metals								
Lead[a]	25	4.00E-01	5.30E+00	1.76E+01	3.01E-01	1.52E+01	1.13E+00	1.35E+01

[a]Calcium-dependent BAF for lead (Corp and Morgan 1991, as cited in HAZWRAP 1994); default value = 0.4, assumes calcium concentration in soil > 500 mg/kg and lead concentration > 1 mg/kg.

ADD = Average daily dose (mg/kg/d).

BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).

C_{Max} = Maximum detected surface soil concentration (mg/kg).

HQ = Hazard quotient; HI = hazard index = sum of HQs.

IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.

IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.

TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

Cells with double borders indicate HQ > 1.

Table 9.25-10. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27U

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = $C_{Max} \times 0.001 \times IR_W$	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds				
Xylenes, total	670	5.36E-02	5.48E-01	9.78E-02

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).

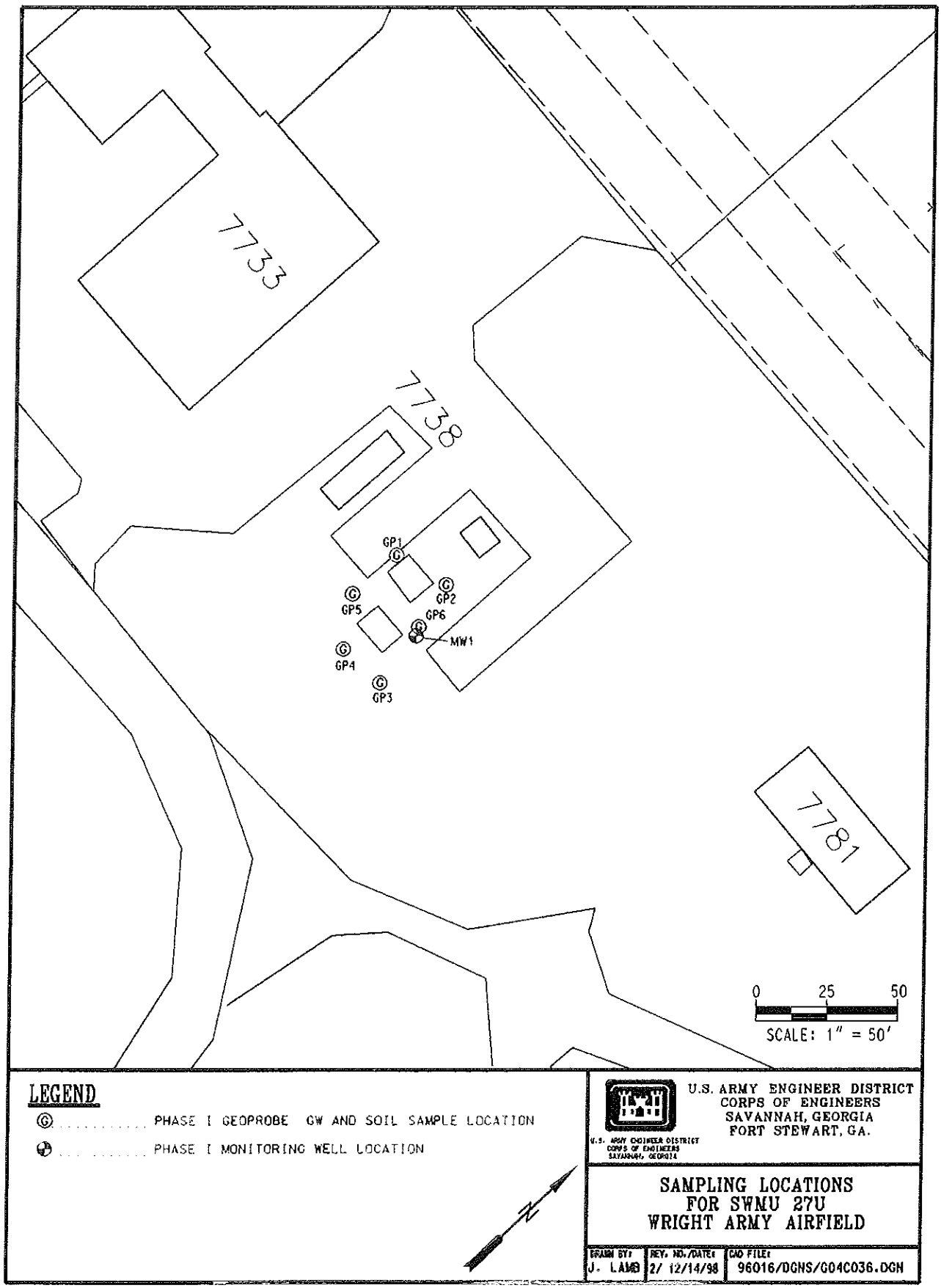

Figure 9.25-1. Sampling Locations, SWMU 27U

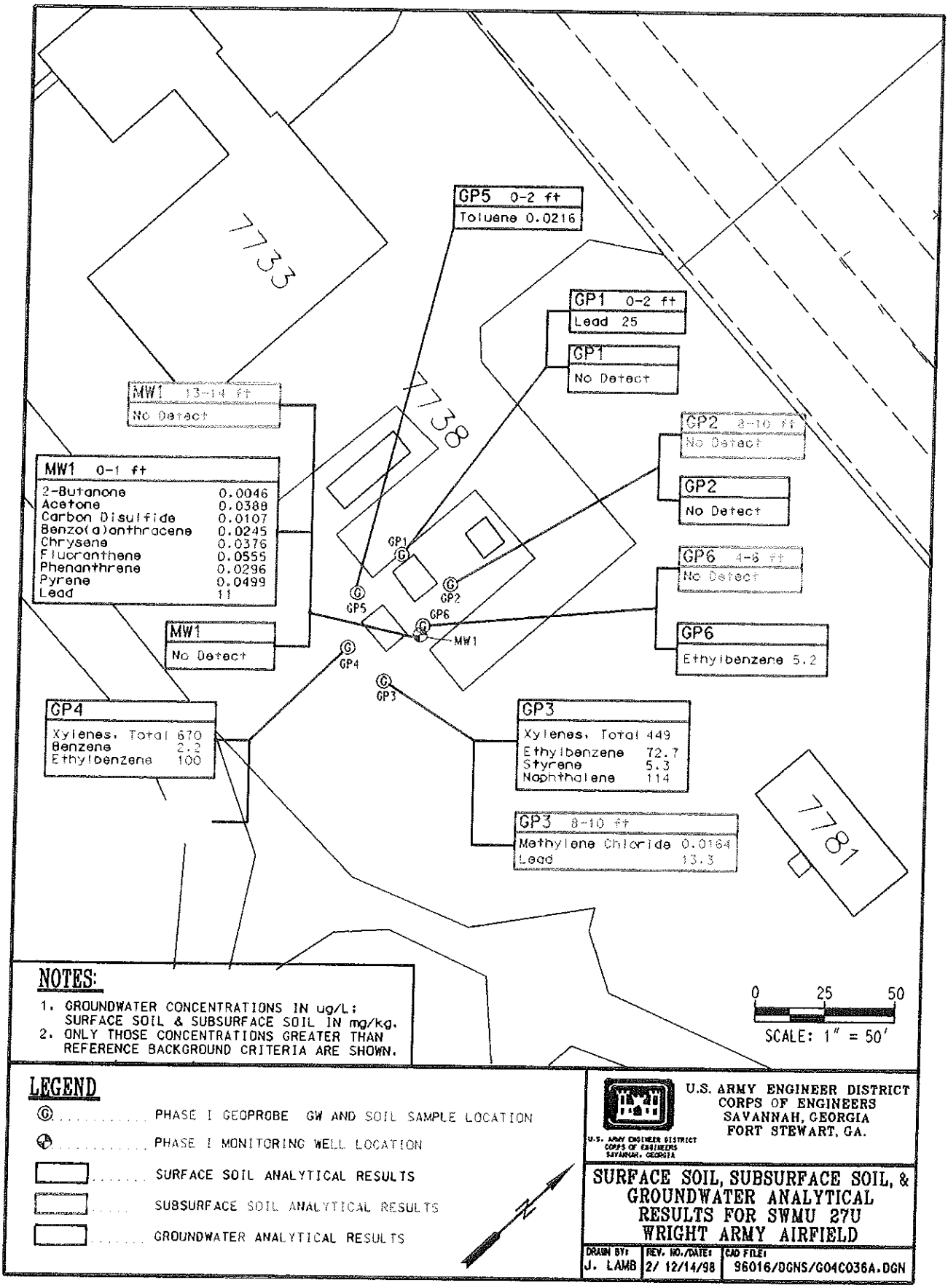

Figure 9.25-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27U

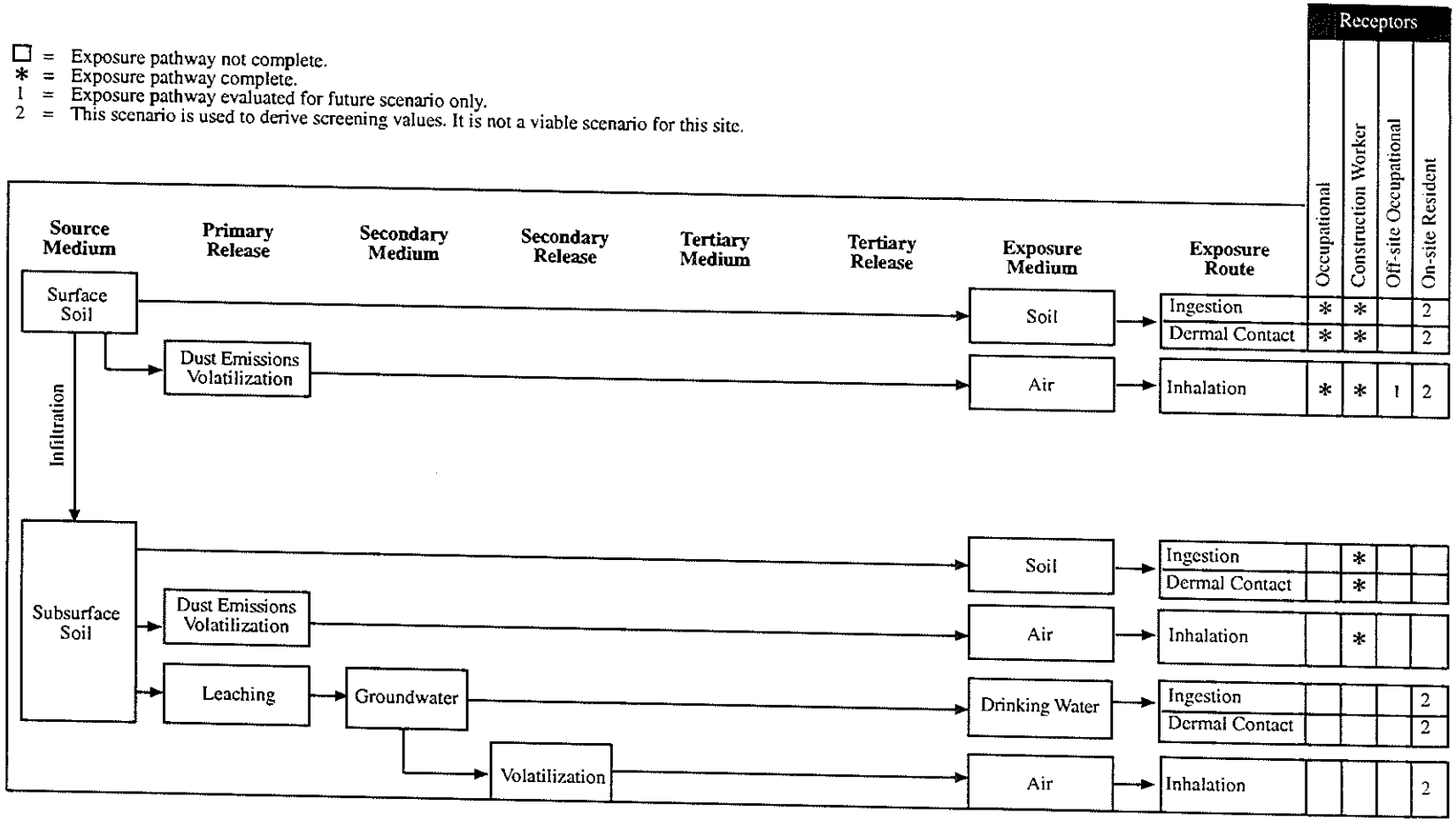

Figure 9.25-3. Potential Migration and Exposure Pathways, SWMU 27U

9.26 SWMU 27V: AUTO CRAFT CENTER

9.26.1 History and Description of SWMU 27V, Auto Craft Center

SWMU 27V consists of one OWS that supports personal vehicle maintenance activities of Fort Stewart personnel. The OWS is located in the southwestern corner of Building 1503 (Figure 9.26-1). The OWS receives waste products from vehicle maintenance activities performed in Building 1503. The effluent from the OWS discharges to the IWTP, and the waste oil is pumped out and burned at the Central Energy Plant. No previous investigations have been performed at the site.

9.26.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at SWMU 27V. The locations of the soil and groundwater sampling are presented in Figure 9.26-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

9.26. 3 Physical Characteristics of the Site

9.26.3.1 Topography

The topography of the site is essentially flat. The surface elevation is approximately 75.5 feet amsl. The OWS is located on a curbed grass island. An asphalt parking area and a road surround the curbed island. The asphalt parking area is sloped to drain to the southwestern corner of the site.

9.26.3.2 Surface drainage

A drainage ditch is located approximately 75 feet from the OWS (Figure 9.26-1). Drainage from the parking area is directed to the drainage ditch. The effluent (i.e., separated water) from the OWS discharges to the IWTP.

9.26.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

9.26.3.4 Hydrogeology

Groundwater was encountered at approximately 7 feet to 7.5 feet bgs.

9.26.3.5 Ecology

As stated in Section 8.2, SWMU 27V is classified as an "industrialized area with managed grasslands." The Auto Craft Center is located within the garrison area of the FSMR and comprises approximately 0.01 acre (Figure 9.26-1). Existing habitat consists of a small area of managed grass surrounded by concrete and asphalt.

9.26.4 Nature and Extent of Contamination

9.26.4.1 Surface soil

Two surface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.26-1 and Figure 9.26-2.

VOCs. Toluene was detected in the sample collected from GP4 at a concentration of 0.0192 mg/kg; therefore, toluene is considered to be an SRC.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected in the samples taken from GP2 and GP4 at concentrations of 23 mg/kg and 35 mg/kg, respectively, which exceeded the reference background criterion; therefore, lead is considered to be an SRC for surface soil.

9.26.4.2 Subsurface soil

Two subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Table 9.26-2 and Figure 9.26-2.

VOCs. Toluene was detected at concentrations of 0.0393 mg/kg at GP3 and 0.0521 mg/kg at GP1; therefore, toluene is considered to be an SRC for subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in the samples taken from GP1 and GP3 at concentrations of 18.5 mg/kg and 33.1 mg/kg, respectively. Both concentrations exceeded the reference background criterion; therefore, lead is considered to be an SRC for subsurface soil.

9.26.4.3 Groundwater

Four groundwater samples were collected from the Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 9.26-3 and Figure 9.26-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. No SVOCs were detected in groundwater.

Lead. Lead was not detected at GP1 and GP4 and was below the reference background criterion at GP2 and GP3; therefore, lead is not considered to be an SRC in groundwater.

9.26.4.4 Surface water

No surface water samples were collected at this site during the field investigation because no surface water pathway exists.

9.26.4.5 Sediment

No sediment samples were collected at this site during the field investigation because no sediment pathway exists.

9.26.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 9.26-4.

9.26.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of surface and subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in soil, none of the analytes exceeded their respective GSSLs (Table 9.26-5); therefore, there are no CMCOPCs in soil at SWMU 27V.

9.26.6 Human Health Preliminary Risk Evaluation of SWMU 27V

SRCs for SWMU 27V were identified for the following media: surface soil, subsurface soil, and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of COPCs are addressed in this section.

9.26.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The OWS site is relatively flat and is located in a small area of managed grass surrounded by concrete and asphalt. Therefore, soil erosion via fugitive dust or surface water runoff is currently not a viable migration pathway.

Groundwater at the site does not discharge into any nearby surface waters because the depth to groundwater is greater than the depth of the drainage ditch; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 9.26-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

9.26.6.2 Risk evaluation

The results of the human health risk screening are given below.

Toluene and lead were identified as SRCs for surface soils. The concentrations of these contaminants were below their respective screening values (Table 9.26-6); therefore, there are no HHCOPCs in surface soils.

Toluene and lead were identified as SRCs for subsurface soils. The concentrations of these contaminants were below their respective screening values (Table 9.26-6); therefore, there are no HHCOPCs in subsurface soils.

9.26.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

9.26.7 Ecological Preliminary Risk Evaluation of SWMU 27V

The EPRE of SWMU 27V was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the EPRE are presented below.

9.26.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site. No SRCs were identified in groundwater.

There is no habitat for ecological receptors; therefore, analytes detected in surface soil were not evaluated.

9.26.8 Conclusions and Risk Management and Site Recommendations for SWMU 27V

9.26.8.1 Conclusions

Nature and Extent of Contamination

- Toluene was detected in surface and subsurface soil samples and is considered to be an SRC for both surface and subsurface soil.

- Lead was detected in both the surface and subsurface soil samples at concentrations that exceeded the reference background criterion and is considered to be an SRC for surface and subsurface soil.

- No VOCs or SVOCs were detected in groundwater. Lead was not detected in two groundwater locations and was below the reference background criterion at the remaining two locations; therefore, there are no SRCs in groundwater.

Fate and Transport

- SRCs identified in surface and subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs in surface or subsurface soils.

Ecological Preliminary Risk Evaluation

- There is no habitat for ecological receptors at this site.

9.26.8.2 Risk management and site recommendations

- There are no SRCs identified in groundwater. There are no CMCOPCs or HHCOPCs in surface or subsurface soil. Based on the information presented in this section, an NFA status is recommended for SWMU 27V regarding further investigation of the site. If approved by GEPD, Fort Stewart respectfully requests that the Installation's RCRA Subpart B permit be amended to reflect the revised status of this SWMU.

Table 9.26-1. Summary of Analytes Detected in Surface Soil, SWMU 27V

Station	Reference Background Criteria	8HGP2	8HGP4
Sample ID		8H1211	8H1411
Date		01/30/98	01/31/98
Depth (feet)		0 to 2	0 to 2
Sample Type		Grab	Grab
Volatile Organic Compounds (mg/kg)			
Toluene	0.00		**0.0192**
Metals (mg/kg)			
Lead	8.81	**23**	**35**

Bold indicates concentrations above reference background criteria.

Table 9.26-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27V

Station	Reference Background Criteria	8HGP1	8HGP3
Sample ID		8H111	8H1311
Date		01/31/98	01/30/98
Depth (feet)		6 to 7	4 to 5
Sample Type		Grab	Grab
Volatile Organic Compounds (mg/kg)			
Toluene	0.00	**0.0521**	**0.0393**
Metals (mg/kg)			
Lead	11.10	**18.5**	**33.1**

Bold indicates concentrations above reference background criteria.

Table 9.26-3. Summary of Analytes Detected in Groundwater, SWMU 27V

Station	Reference Background Criteria	MCL	8HGP1	8HGP2	8HGP3	8HGP4
Sample ID			8H4111	8H4211	8H4311	8H4411
Date			01/31/98	01/30/98	01/30/98	01/31/98
Sample Type			Grab	Grab	Grab	Grab
Metals (µg/L)						
Lead	4.69	15		1.8	1.5	

Table 9.26-4. Summary of Site-related Contaminants, SWMU 27V

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Toluene	0.0192	0.0521	NP	ND	NP
Metals					
Lead	35	33.1	NP	ND	NP

ND = Not detected above reference background criteria.
NP = No pathway exists.

Table 9.26-5. GSSL Sereening of Site-related Contaminants in Soil, SWMU 27V

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Toluene	0.0521	12	No
Metals (mg/kg)			
Lead[b]	35	400	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).
[b]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 9.26-6. Human Health Risk Screening for Surface Soil and Subsurface Soil, SWMU 27V

SURFACE SOIL						
Analyte	Results > Detection Limit	Miuimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Toluene	1/2	0.0192	0.0192	1,600	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	2/2	23	35	400	No	Max Detect < Risk Criteria

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Toluene	2/2	0.0393	0.0521	1,600	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	2/2	18.5	33.1	400	No	Max Detect < Risk Criteria

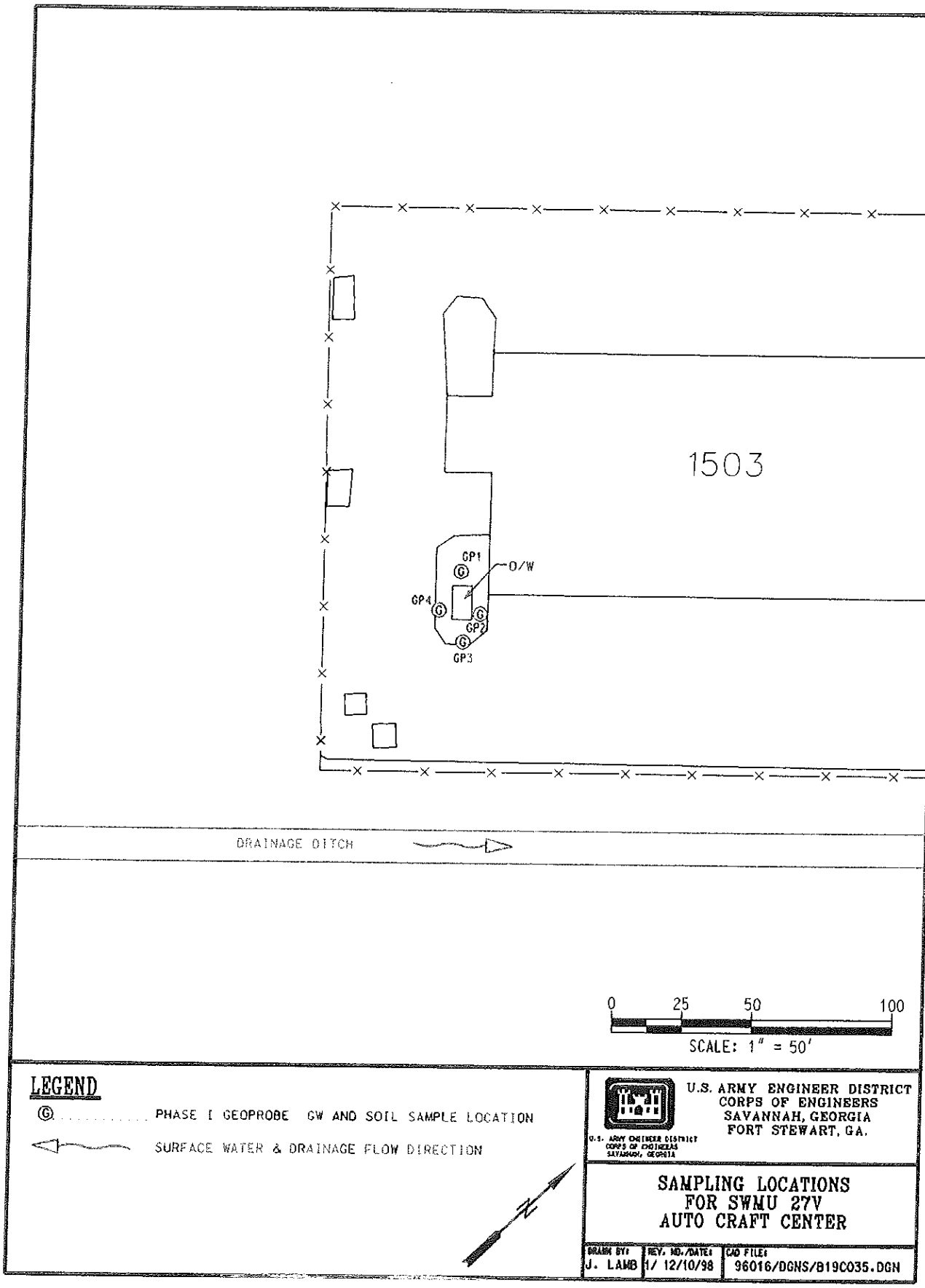

Figure 9.26-1. Sampling Locations, SWMU 27V

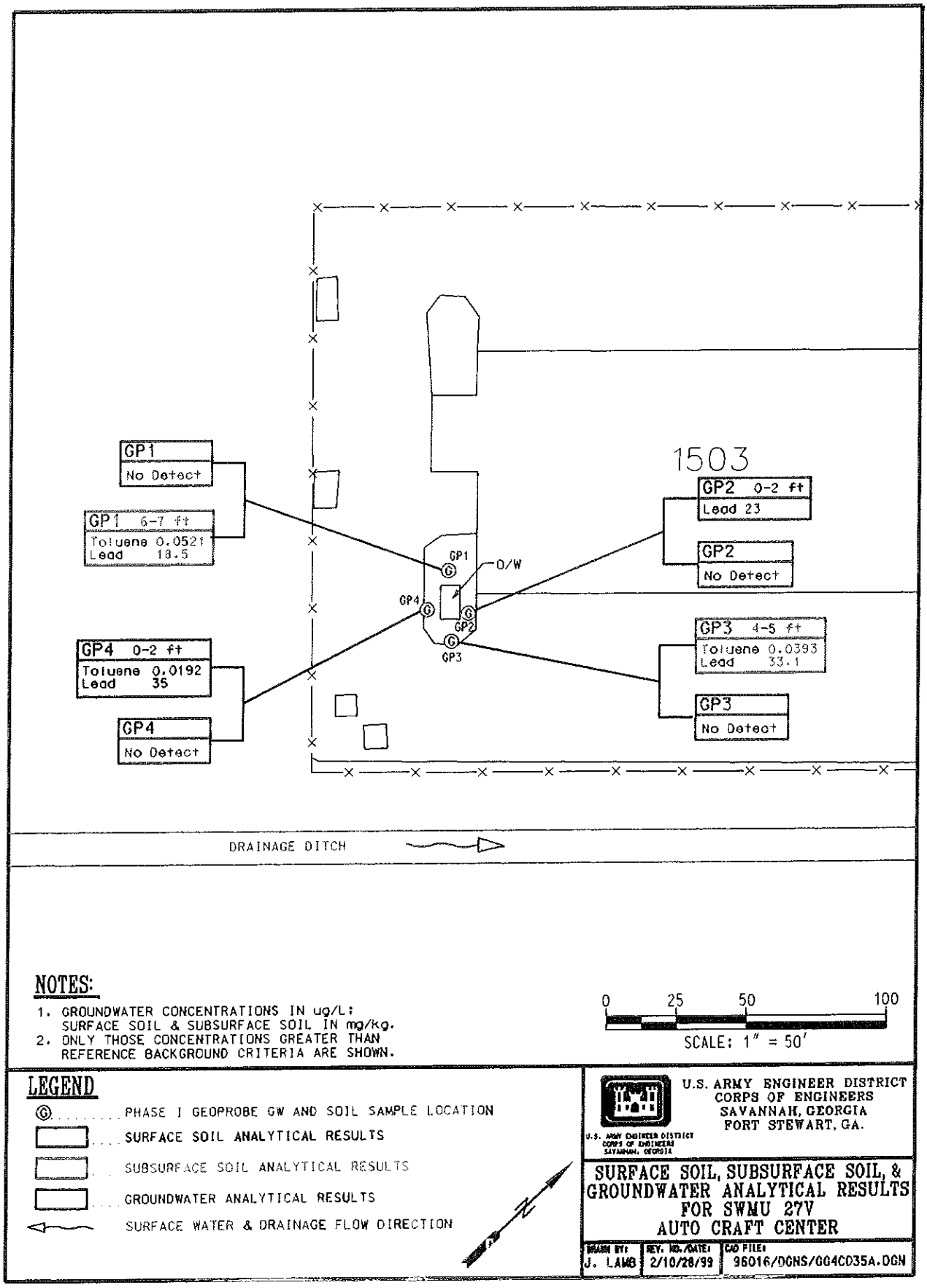

Figure 9.26-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, and Groundwater, SWMU 27V

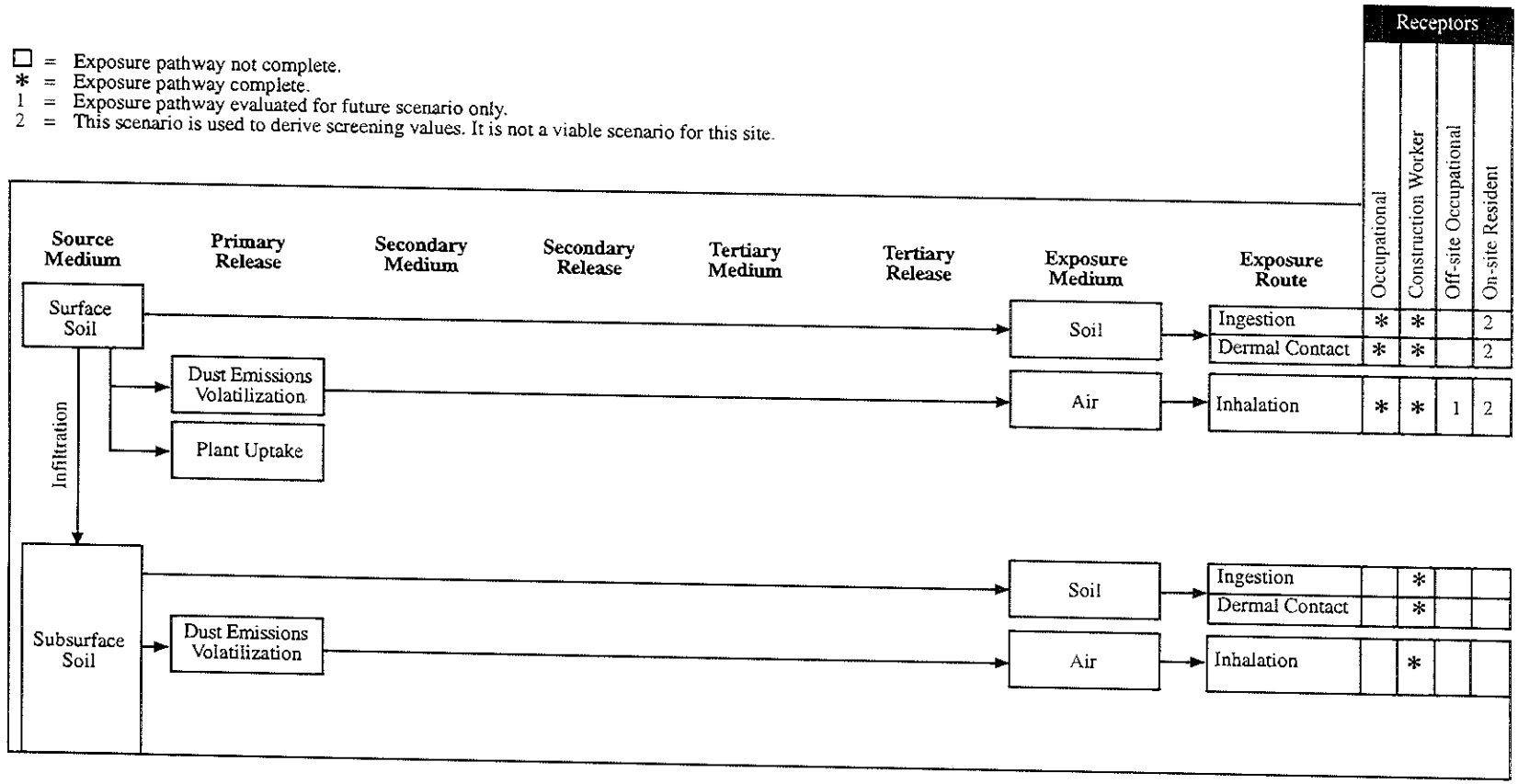

Figure 9.26-3. Potential Migration and Exposure Pathways, SWMU 27V

10.9 SWMU 27F: 3D ENGINEER BRIGADE, NORTHWEST OF BUILDING 1340

10.9.1 History and Description of SWMU 27F, 3d Engineer Brigade, Northwest of Building 1340

SWMU 27F, northwest of Building 1340, is one of two OWSs that support vehicle maintenance activities of the 3d Engineer Brigade. The OWS is located along the northwestern boundary of the motorpool area, approximately 200 feet northwest of Building 1340 (Figure 10.9-1). The OWS receives wastewater from an adjacent, covered maintenance pad. Maintenance activities for military vehicles are performed at the maintenance pad. Floor drains from the maintenance pad are piped to the OWS. The effluent from the OWS discharges to the IWTP, and the oil is pumped out of the holding unit and burned at the Central Energy Plant. No previous investigations have been performed at the site.

10.9.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 10.9-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

10.9.3 Physical Characteristics of the Site

10.9.3.1 Topography

The topography of the site is essentially flat. The surface elevation is approximately 68 feet amsl. The OWS is located in a small, grassy area that extends to the northwestern boundary of the motorpool's fence line where a fenced storage area is located. The other three sides are comprised of concrete vehicle parking area/road or the maintenance pad.

10.9.3.2 Surface drainage

There are no surface drainage features around the OWS (Figure 10.9-1). In addition, the effluent from the OWS discharges to the IWTP; therefore, there are no surface water/sediment migration pathways at this site.

10.9.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

10.9.3.4 Hydrogeology

Groundwater was encountered at approximately 7 feet to 9 feet bgs.

10.9.3.5 Ecology

As stated in Section 8.2, SWMU 27F is classified as an "industrialized area with managed grassland." The site is located within the industrialized area and comprises approximately 0.01 acre (Figure 10.9-1). The surface of this SWMU is primarily concrete and contains man-made structures; however, a small area of managed grass does exist between the concrete and the fence line.

10.9.4 Nature and Extent of Contamination

10.9.4.1 Surface soil

Based on field headspace screening for VOCs (i.e., no PID detections in the 0-foot to 2-foot interval), no surface soil samples were collected for analysis.

10.9.4.2 Subsurface soil

Four subsurface soil samples were collected (see Figure 10.9-1). These samples were selected for analysis based on field headspace screening for VOCs. Analytical results are summarized in Table 10.9-1 and Figure 10.9-2.

VOCs. VOCs were detected at levels above the analytical detection limit in subsurface soil samples. Acetone was detected at more than one sample location. Acetone was detected at concentrations ranging from 0.0382 mg/kg at GP4 to 0.111 mg/kg at GP1. Ethylbenzene and total xylenes were each detected in only one subsurface sample (GP3) at concentrations of 0.0137 mg/kg and 0.0784 mg/kg, respectively. The SRCs in subsurface soil include the following VOCs: acetone, ethylbenzene, and total xylenes.

SVOCs. SVOCs were not detected in subsurface soil samples at concentrations above the analytical detection limits.

Lead. Lead was detected at a concentration of 11.4 mg/kg in one subsurface soil sample collected from GP1, which minimally exceeds the reference background criterion of 11.1 mg/kg. Lead is considered to be an SRC for subsurface soil.

10.9.4.3 Groundwater

With the use of DPT techniques, groundwater samples were collected from the four locations at the site. Groundwater samples were analyzed for VOCs, SVOCs, and lead. The results of the groundwater analyses are presented in Table 10.9-2 and Figure 10.9-2.

VOCs. A wide range of VOCs was detected in the groundwater samples. Groundwater from GP3, east of the OWS, accounted for the majority of the VOCs. Benzene was detected at two of the four locations, with concentrations of 3.6 µg/L at GP4 and 67.2 µg/L at GP3. At GP3, benzene exceeded its MCL. Total xylenes were detected at two of the four locations, with concentrations of 5.3 µg/L at GP4 and 255 µg/L at GP3. Ethylbenzene was detected at two of the four locations, with concentrations of 2.4 µg/L at GP4 and 69.5 µg/L at GP3. Several VOCs, including 1,1,1-trichloroethane; 1,1,2-trichloroethane; 1,1-dichloroethane; acetone; methylene chloride; styrene; and toluene were detected at only GP3 at concentrations of 3.6 µg/L, 2.7 µg/L, 3 µg/L, 62.6 µg/L, 42 µg/L, 3 µg/L, and 39 µg/L, respectively. Methylene chloride exceeded its MCL at GP3. Organic SRCs in groundwater include the following VOCs: toluene; total xylenes; 1,1,1-trichloroethane; 1,1,2-trichloroethane; 1,1-dichloroethane; acetone; benzene; ethylbenzene; methylene chloride; and styrene.

SVOCs. SVOCs that were detected above analytical detection limits in groundwater samples include 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, naphthalene, and phenanthrene (see Figure 10.9-2). Naphthalene, phenanthrene, and 2-methylnaphthalene were detected at only GP3 at concentrations of 569 µg/L; 379 µg/L; and 1,440 µg/L, respectively. Bis(2-ethylhexyl)phthalate was detected at GP1 at a concentration of 6.7 µg/L, which slightly exceeds its MCL of 6.0 µg/L. SVOCs that are SRCs for groundwater include 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, naphthalene, and phenanthrene.

Lead. Lead concentrations were below reference background levels (see Figure 10.9-2).

10.9.4.4 Surface water

No surface water samples were collected at this SWMU because no surface water pathway exists.

10.9.4.5 Sediment

No sediment samples were collected at this SWMU because no sediment pathway exists.

10.9.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations detected are presented in Table 10.9-3.

10.9.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of soil SRCs to the respective GSSLs.

The maximum concentrations of SRCs in soil did not exceed the respective GSSLs (Table 10.9-4); therefore, there are no CMCOPCs in soil at SWMU 27F.

10.9.6 Human Health Preliminary Risk Evaluation of SWMU 27F, Northwest of Building 1340

SRCs were identified for subsurface soil and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

10.9.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. Contamination at the site is limited to subsurface soils and groundwater. A construction worker is the only likely receptor population for this site.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat, is primarily covered by concrete, and contains man-made structures; however, a small area of managed grass does exist between the concrete and the area northwest beyond the fence line. Consequently, soil erosion via fugitive dust or surface water runoff is not a viable migration pathway.

Groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 10.9-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways are taken into consideration when deriving the screening values.

10.9.6.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for subsurface soils included three volatile organics and lead. The concentrations of these contaminants were below their respective screening values (Table 10.9-5). There are no HHCOPCs in subsurface soil.

The SRCs for groundwater consisted of 10 volatile organics, and four SVOCs [three PAHs (2-methylnaphthalene, naphthalene, and phenanthrene) and bis(2-ethylhexyl)phthalate]. The maximum concentrations of 1,1,2-trichloroethane; acetone; benzene; methylene chloride; bis(2-ethylhexyl)phthalate; naphthalene; 2-methylnaphthalene; and phenanthrene exceeded their respective screening values (Table 10.9-5); therefore, they are HHCOPCs. The remaining compounds had maximum concentrations that were below their respective screening values.

The maximum values for benzene and phenanthrene were more than three orders of magnitude above their respective screening values. The maximum concentration of 2-methylnaphthalene was more than two orders of magnitude above its screening value. The maximum concentrations of methylene chloride and 1,1,2-trichloroethane were more than an order of magnitude above their respective screening values. Acetone, bis(2-ethylhexyl)phthalate, and naphthalene had maximum concentrations less than an order of magnitude above their respective screening concentrations.

10.9.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

10.9.7 Ecological Preliminary Risk Evaluation of SWMU 27F, Northwest of Building 1340

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

10.9.7.1 Ecological screening value comparison (Step i)

There is no surface water or sediment at the site.

Surface soil was not evaluated because no surface soil samples were collected.

Ten VOCs and four SVOCs were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 10.9-6. The ECOPCs identified by the ESV comparison for groundwater are benzene, xylenes, and all four SVOCs. Bis(2-ethylhexyl)phthalate, naphthalene,

phenanthrene, benzene, and xylenes were detected at concentrations exceeding ESVs. There is no ESV for 2-methylnaphthalene, so it is an ECOPC by default (GEPD 1997a).

10.9.7.2 Preliminary problem formulation (Step ii)

The ecological habitat of the site is described in Section 10.9.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

10.9.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

10.9.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of drinking water. The exposure parameters for the surrogate species—raccoons—are presented in Table 8-7.

10.9.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater at the site are presented in Table 10.9-7. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HIs calculated for VOCs and SVOCs do not exceed one.

10.9.8 Conclusions and Risk Management and Site Recommendations for SWMU 27F, Northwest of Building 1340

10.9.8.1 Conclusions

Nature and Extent of Contamination

- The SRCs in subsurface soil include the following VOCs: acetone, ethylbenzene, and total xylenes. Lead was detected at a level exceeding the site reference background criterion in subsurface soil samples. SVOCs were not detected in this medium.

- Volatile organic SRCs in groundwater include the following: toluene; total xylenes; 1,1,1-trichloroethane; 1,1,2-trichloroethane; 1,1-dichloroethane; acetone; benzene; ethylbenzene; methylene chloride; and styrene. Groundwater from location GP3, east of the OWS, had detectable

levels of all of the VOCs indicated at the site. Benzene and methylene chloride were detected above their respective MCLs.

- SVOCs that are SRCs for groundwater at the site include: 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, naphthalene, and phenanthrene. The MCL for bis(2-ethylhexyl)phthalate was exceeded at GP1.

Fate and Transport

- The maximum concentrations of SRCs in soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for subsurface soils.

- The HHCOPCs for groundwater are 1,1,2-trichloroethane; acetone; benzene; methylene chloride; bis(2-ethylhexyl)phthalate; naphthalene; 2-methylnaphthalene; and phenanthracene.

Ecological Preliminary Risk Evaluation

- ECOPCs in groundwater at the site are benzene, total xylenes, 2-methylnaphthalene, bis(2-ethylhexyl)phthalate, naphthalene, and phenanthrene. ECOPCs are potential hazards to aquatic biota if groundwater discharges to nearby surface water bodies.

- There are no ECOPCs in groundwater at the site for terrestrial receptors.

10.9.8.2 Risk management and site recommendations

- Although two VOCs and four SVOCs were identified as potential ECOPCs in groundwater, it is highly unlikely that the groundwater in this area will migrate to a surface water body to be ingested by aquatic biota. The nearest surface water body (main drainage ditch) is located approximately 1,000 feet from the site, and given the typical groundwater flow rate for the garrison area, these organic compounds are probably being reduced by such natural attenuation processes as volatilization, biodegradation, and hydrolysis prior to reaching the potential receptor. Therefore, these organic compounds are not considered to be ECOPCs for this site, and an ERA is not required.

- The maximum concentrations of benzene, methylene chloride, and bis(2-ethylhexyl)phthalate exceeded their respective MCLs; therefore, the vertical and horizontal extent of groundwater contamination at this site must be determined. At a minimum, four groundwater screening samples using DPT will be collected and analyzed for VOCs and to determine the groundwater gradient. At a minimum, one vertical-profile boring will be installed adjacent to the DPT location having the most elevated concentration of VOCs. At a minimum, three permanent monitoring wells will be installed on-site (one upgradient and two downgradient) for delineation of the horizontal extent of contamination. At each well, two soil samples will be collected following the same procedures outlined in the revised final version of the SAP for Phase II RFIs of the 16 SWMUs (SAIC 1997). Surface soil samples (0 foot to 2 feet bgs) will be collected at each monitoring well location to evaluate the potential risk to ecological receptors. All wells will be sampled using low-flow techniques. The soil and groundwater samples obtained during well installation will be analyzed for VOCs, SVOCs, and RCRA metals. The proposed sampling locations are presented in Figure 10.9-4.

- The information obtained from the additional sampling proposed above will be submitted to GEPD as an addendum to this report to be submitted to GEPD before July 21, 2000. The addendum to the Phase II RFI Report will address any additional human health and/or ecological risk assessments required.

Table 10.9-1. Summary of Analytes Detected in Subsurface Soil, SWMU 27F (Northwest of Building 1340)

Station	Reference Background Criteria	7JGP1	7JGP2	7JGP3	7JGP4
Sample ID		7J1111	7J1211	7J1312	7J1411
Date		01/03/98	02/03/98	05/06/98	02/03/98
Depth (feet)		8 to 10	5 to 6	10 to 12	8 to 10
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Acetone	0.00	**0.111**	**0.095**		**0.0382**
Ethylbenzene	0.00			**0.0137**	
Xylenes, total	0.00			**0.0784**	
Metals (mg/kg)					
Lead	11.10	**11.4**	7.7	9.7	4.5

Bold indicates concentrations above reference background criteria.

Table 10.9-2. Summary of Analytes Detected in Groundwater, SWMU 27F (Northwest of Building 1340)

Station	Reference Background Criteria	MCL	7JGP1	7JGP2	7JGP3	7JGP4
Sample ID			7J4111	7J4211	7J4311	7J4411
Date			01/18/98	02/03/98	01/17/98	02/03/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
1,1,1-Trichloroethane	0.00	200			**3.6**	
1,1,2-Trichloroethane	0.00	5			**2.7**	
1,1-Dichloroethane	0.00				**3**	
Acetone	0.00				**62.6**	
Benzene	0.00	5			***67.2***	**3.6**
Ethylbenzene	0.00	700			**69.5**	**2.4**
Methylene chloride	0.00	5			***42***	
Styrene	0.00	100			**3**	
Toluene	0.00	1,000			**39**	
Xylenes, total	0.00	10,000			**255**	**5.3**
Semivolatile Organic Compounds (µg/L)						
2-Methylnaphthalene	0.00				**1,440**	
Bis(2-ethylhexyl)phthalate	0.00	6	***6.7***			
Naphthalene	0.00				**569**	
Phenanthrene	0.00				**379**	
Metals (µg/L)						
Lead	4.69	15			3.8	

Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.

Table 10.9-3. Summary of Site-related Contaminants, SWMU 27F (Northwest of Building 1340)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (mg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
1,1,1-Trichloroethane	NC	ND	NP	3.6	NP
1,1,2-Trichloroethane	NC	ND	NP	2.7	NP
1,1-Dichloroethane	NC	ND	NP	3	NP
Acetone	NC	0.111	NP	62.6	NP
Benzene	NC	ND	NP	67.2	NP
Ethylbenzene	NC	0.0137	NP	69.5	NP
Methylene chloride	NC	ND	NP	42	NP
Styrene	NC	ND	NP	3	NP
Toluene	NC	ND	NP	39	NP
Xylenes, total	NC	0.0784	NP	255	NP
Semivolatile Organic Compounds					
2-Methylnaphthalene	NC	ND	NP	1,440	NP
Bis(2-ethylhexyl)phthalate	NC	ND	NP	6.7	NP
Naphthalene	NC	ND	NP	569	NP
Phenanthrene	NC	ND	NP	379	NP
Metals					
Lead	NC	11.4	NP	BRBC	NP

BRBC = Below reference background criteria.
NC = Not collected based on field screening results.
ND = Not detected above reference background criteria.
NP = No pathway exists.

Table 10.9-4. GSSL Screening of Site-related Contaminants in Soil, SWMU 27F (Northwest of Building 1340)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Acetone	0.111	16	No
Ethylbenzene	0.0137	13	No
Xylenes, total	0.0784	190	No
Metals (mg/kg)			
Lead[b]	11.4	400	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).
[b]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 10.9-5. Human Health Risk Screening for Subsurface Soil and Groundwater, SWMU 27F (Northwest of Building 1340)

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds(mg/kg)						
Acetone	3/3	0.0382	0.111	780	No	Max Detect < Risk Criteria
Ethylbenzene	1/4	0.0137	0.0137	780	No	Max Detect < Risk Criteria
Xylenes, total	1/4	0.0784	0.0784	16,000	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Lead	4/4	4.5	11.4	400	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Volatile Organic Compounds (µg/L)						
1,1,1-Trichloroethane	1/4	3.6	3.6	79	No	Max Detect < Risk Criteria
1,1,2-Trichloroethane	1/4	2.7	2.7	0.19	Yes	Max Detect > Risk Criteria
1,1-Dichloroethane	1/4	3	3	81	No	Max Detect < Risk Criteria
Acetone	1/2	62.6	62.6	61	Yes	Max Detect > Risk Criteria
Benzene	2/4	3.6	67.2	0.36	Yes	Max Detect > Risk Criteria
Ethylbenzene	2/4	2.4	69.5	130	No	Max Detect < Risk Criteria
Methylene chloride	1/4	42	42	4.1	Yes	Max Detect > Risk Criteria
Styrene	1/4	3	3	160	No	Max Detect < Risk Criteria
Toluene	1/4	39	39	75	No	Max Detect < Risk Criteria
Xylenes, total	2/4	5.3	255	1,200	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (µg/L)						
2-Methylnaphthalene	1/4	1,440	1,440	12	Yes	Max Detect > Risk Criteria
Bis(2-ethylhexyl)phthalate	1/4	6.7	6.7	4.8	Yes	Max Detect > Risk Criteria
Naphthalene	1/4	569	569	0.65	Yes	Max Detect > Risk Criteria
Phenanthrene[a]	1/4	379	379	18[a]	Yes	Max Detect > Risk Criteria

[a]The RBC for pyrene was used for phenanthrene.

Table 10.9-6. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27F (Northwest of Building 1340)

Analyte	SWMU 27F (Northwest of Building 1340) Maximum	ESV	ECOPC Aqnatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
1,1,1-Trichloroethane	3.6	528	No	Max Detect < ESV
1,1,2-Trichloroethane	2.7	940	No	Max Detect < ESV
1,1-Dichloroethane	3	47[a]	No	Max Detect < ESV
Acetone	62.6	1,500[a]	No	Max Detect < ESV
Benzene	67.2	53	Yes	Max Detect > ESV
Ethylbenzene	69.5	453	No	Max Detect < ESV
Methylene chloride	42	1,930	No	Max Detect < ESV
Styrene	3	10,000[b]	No	Max Detect < ESV
Toluene	39	175	No	Max Detect < ESV
Xylenes, total	255	1.8[a]	Yes	Max Detect > ESV
Semivolatile Organic Compounds (µg/L)				
2-Methylnaphthalene	1,440	No ESV	Yes	Max Detect > ESV
Bis(2-ethylhexyl)phthalate	6.7	0.300	Yes	Max Detect > ESV
Naphthalene	569	62	Yes	Max Detect > ESV
Phenanthrene	379	6.3[a]	Yes	Max Detect > ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
[b]Fish LC_{50} (Clayton and Clayton 1981).
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.
Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 10.9-7. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27F (Northwest of Building 1340)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds				
Benzene	67.2	5.38E-03	7.02E+00	7.67E-04
Xylenes, total	255	2.04E-02	5.48E-01	3.72E-02
			HI =	3.80E-02
Semivolatile Organic Compounds				
2-Methylnaphthalene	1,440	1.15E-01	2.46E+00	4.69E-02
Bis(2-ethylhexyl)phthalate	6.7	5.36E-04	4.87E+00	1.10E-04
Naphthalene	569	4.55E-02	2.46E+00	1.85E-02
Phenanthrene	379	3.03E-02	2.66E-01	1.14E-01
			HI =	1.80E-01

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).

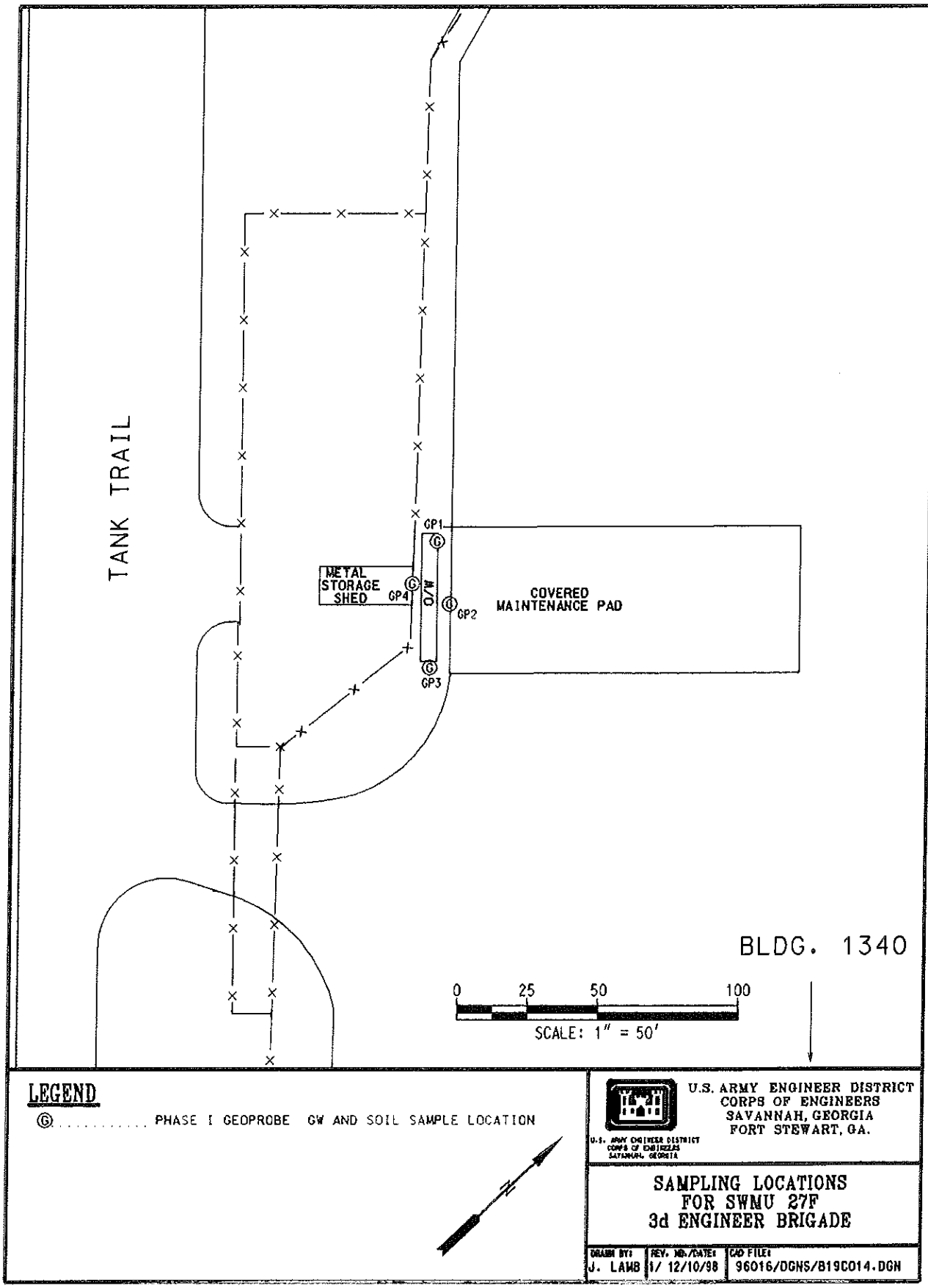

Figure 10.9-1. Sampling Locations, SWMU 27F (Northwest of Building 1340)

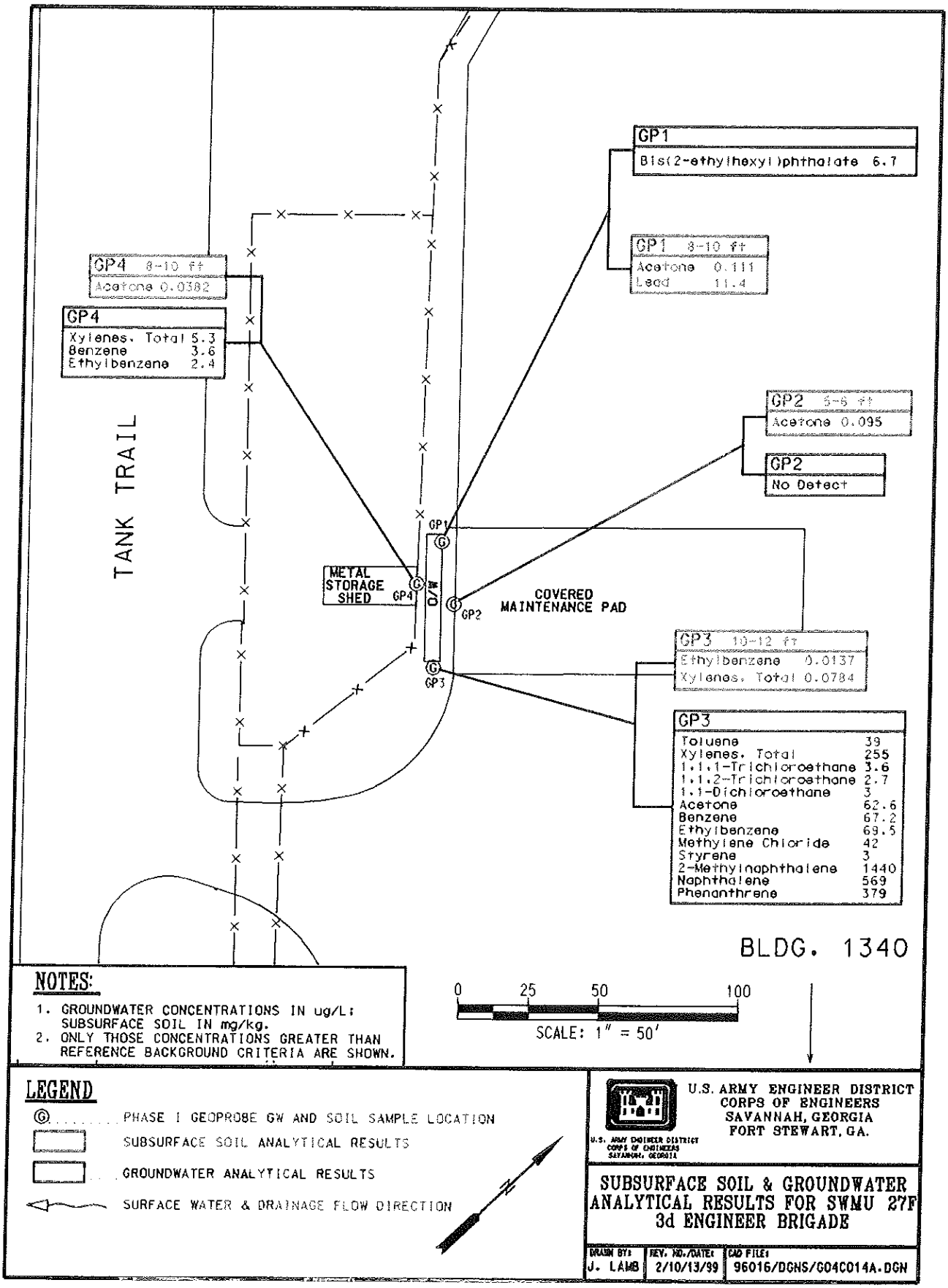

Figure 10.9-2. Summary of Analytical Results in Subsurface Soil and Groundwater, SWMU 27F (Northwest of Building 1340)

❑ = Exposure pathway not complete.
* = Exposure pathway complete.
1 = This scenario is used to derive screening values. It is not a viable scenario for this site.

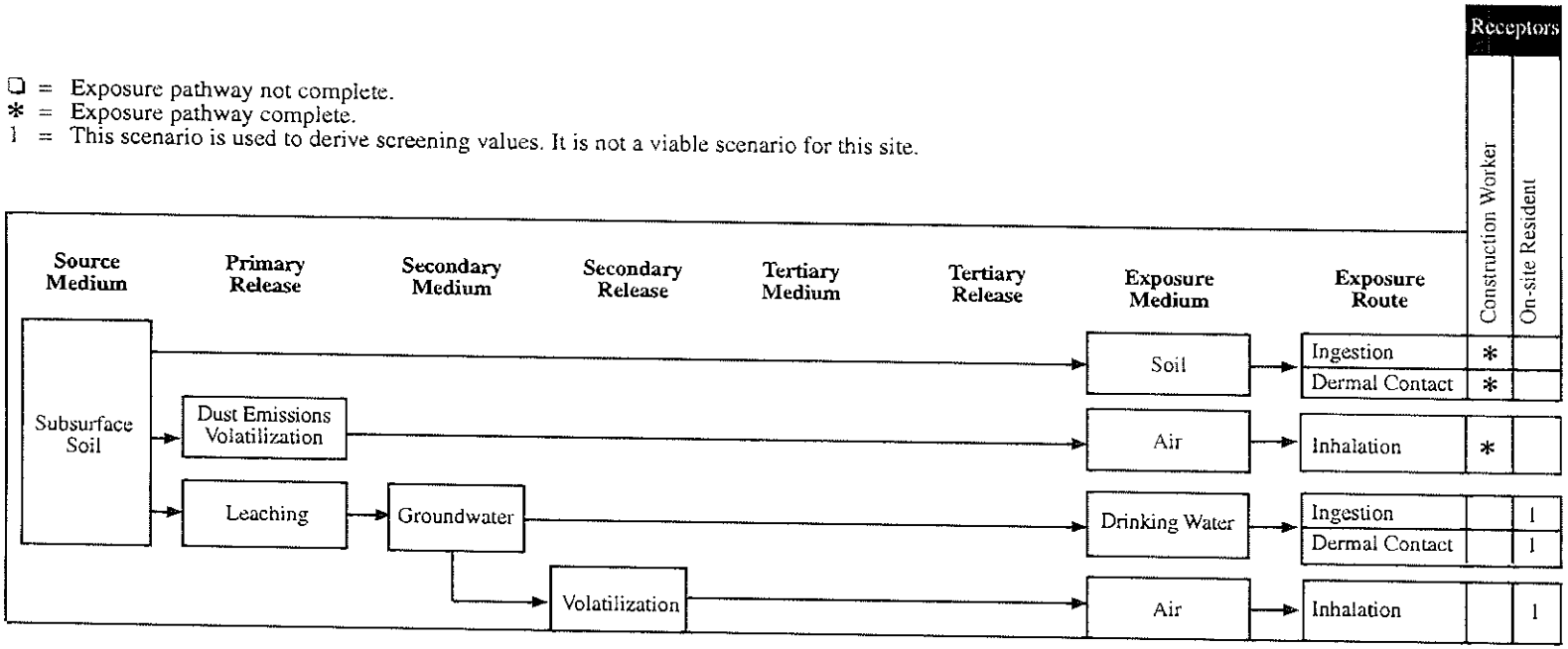

Figure 10.9-3. Potential Migration and Exposure Pathways, SWMU 27F (Northwest of Building 1340)

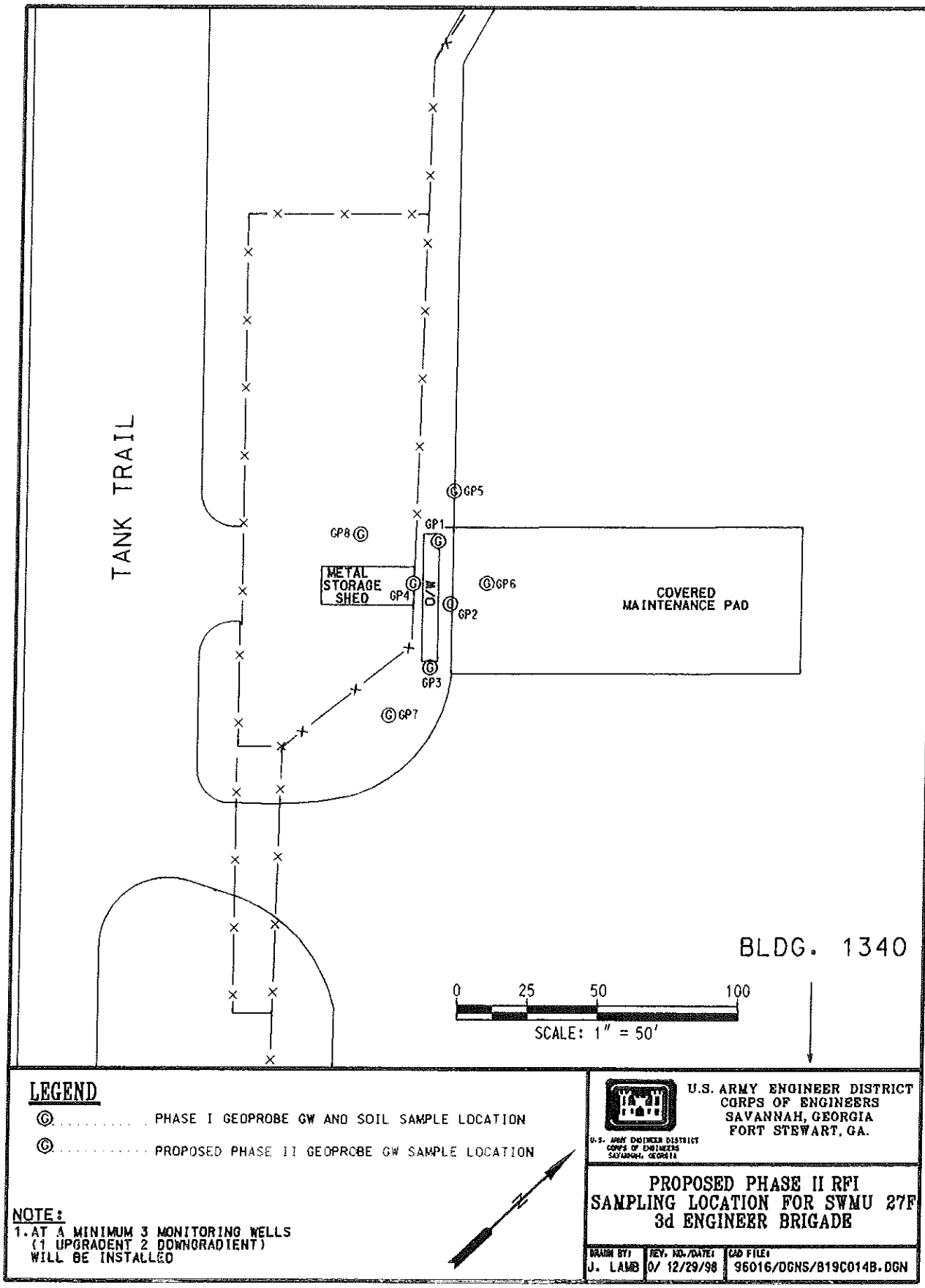

Figure 10.9-4. Proposed Phase II RFI Sampling Locations, SWMU 27F (Northwest of Building 1340)

10.10 SWMU 27H: DOL MAINTENANCE, BUILDING 1056

10.10.1 History and Description of SWMU 27H, DOL Maintenance, Building 1056

SWMU 27H, Building 1056 is one of two OWSs that support vehicle maintenance activities at the Directorate of Logistics (DOL) Maintenance facilities. The OWS is located adjacent to a wash rack northeast of Building 1056 (Figure 10.10-1). Floor drains from the wash rack are piped to the OWS. The effluent from the OWS discharges to the IWTP, and the oil is pumped out of the holding unit and burned at the Central Energy Plant.

10.10.2 Compliance Evaluation Inspection

During a compliance evaluation inspection by GEPD on September 28, 1993, the wash rack that discharges to the OWS was identified as an area of concern. In response to the notice of violation, FSMR collected 10 surface soil samples around the perimeter of the wash rack. The soil samples were analyzed for TCLP VOCs and metals. The results of the surface soil sampling are presented in Table 10.10-1.

TCLP VOCs. No VOCs were detected in the TCLP extract.

TCLP Metals. Barium, cadmium, and lead were detected in the TCLP extract. None of the concentrations in the samples were above the TCLP regulatory limits.

10.10.3 Summary of Phase I Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater samples are presented in Figure 10.10-1. The four soil samples were collected based on field headspace screening for VOCs. A sediment sample was collected at the culvert north of the OWS. Upon closer evaluation of the site and after interviews with the site personnel, it was discovered that the effluent from the OWS discharges to the IWTP drainage lines. The soil, groundwater, and sediment samples were analyzed for VOCs, SVOCs, and RCRA metals.

10.10.4 Physical Characteristics of the Site

10.10.4.1 Topography

The topography of the OWS site is essentially level. The OWS area is surrounded by grass that merges into gravel roads and parking areas toward the adjacent buildings. The surface elevation is approximately 86.5 feet amsl.

10.10.4.2 Surface drainage

There is a drainage ditch north of the OWS and the adjacent boundary fence. The drainage ditch receives runoff from the adjacent wash rack and outside storage area northwest of the OWS and from the adjacent gravel/dirt roads northeast of the OWS. Surface water is present in the drainage ditch only after rainfall events. During periods of heavy rainfall, the surface water may potentially make it to Mill or Taylors Creek. The OWS discharges to the IWTP; therefore, because all waste streams are contained at this SWMU, neither a direct nor an indirect surface water/sediment pathway exists for SWMU 27H (Building 1056). However, a sediment sample was inadvertently collected from the adjacent drainage ditch, located approximately 10 feet from the OWS.

10.10.4.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

10.10.4.4 Hydrogeology

Groundwater was encountered at approximately 3.8 feet to 6 feet bgs.

10.10.4.5 Ecology

As stated in Section 8.2, SWMU 27H (Building 1056) is classified as an "industrialized area." The site is comprised of approximately 0.01 acre, with man-made structures and surfaces covering the majority of the SWMU. However, a small grass area does exist adjacent to the drainage ditch, which is located beyond the boundaries of the site.

10.10.5 Nature and Extent of Contamination

10.10.5.1 Surface soil

No surface soil samples were collected because the selected sample at each boring, based on PID readings, was a subsurface sample.

10.10.5.2 Subsurface soil

Four subsurface soil samples were collected based on field headspace screening for VOCs. Analytical results are presented in Table 10.10-2 and Figure 10.10-2.

VOCs. Toluene was detected above its analytical detection limit at a concentration of 0.0151 mg/kg at GP1. Toluene is an SRC in subsurface soil.

SVOCs. Pyrene, detected at a concentration of 0.257 mg/kg at GP1, was the only SVOC detected above the analytical detection limit for subsurface soil. Pyrene is an SRC in subsurface soil.

Metals. Arsenic, barium, cadmium, chromium, and lead were detected in the subsurface soil. Cadmium and lead were detected at concentrations exceeding reference background levels for subsurface soil samples. Cadmium was detected in all subsurface soil samples at concentrations ranging from 0.51 mg/kg at GP2 to 1.3 mg/kg at GP4. Lead was detected above the reference background criterion in three of the four subsurface soil samples at concentrations ranging from 34.8 mg/kg at GP2 to 46.8 mg/kg at GP3. Cadmium and lead are SRCs in subsurface soil.

10.10.5.3 Groundwater

With the use of DPT technologies, groundwater samples were collected from the four Geoprobe locations (Figure 10.10-1). The results of the groundwater analyses are presented in Table 10.10-3 and Figure 10.10-2.

VOCs. 1,1-Dichloroethane and acetone were detected above analytical detection limits in groundwater samples. 1,1-Dichloroethane was detected at a concentration of 2.9 µg/L in GP1. Acetone was detected at a concentration of 39.2 µg/L in GP3. SRCs in groundwater are 1,1-dichloroethane and acetone.

SVOCs. SVOCs detected above analytical detection limits in groundwater samples include 2-methylnaphthalene, dibenzofuran, naphthalene, and phenanthrene. Dibenzofuran, 2-methylnaphthalene, and phenanthrene were detected only at GP4 at concentrations of 8.9 µg/ L, 43.8 µg/L, and 5.6 µg/L, respectively. Naphthalene was detected at GP2 and GP4 at concentrations of 5.6 µg/L and 16.4 µg/L, respectively. Phenanthrene, 2-methylnaphthalene, dibenzofuran, and naphthalene are SRCs in groundwater at the site.

RCRA Metals. Barium, chromium, selenium, and silver were detected in groundwater. None of the metals were detected above their respective reference background criteria; therefore, there are no RCRA metal SRCs in groundwater.

10.10.5.4 Surface water

No surface water samples were collected at this SWMU because no surface water pathway exists.

10.10.5.5 Sediment

SWMU 27H, Building 1056 discharges to the IWTP; however, one sediment sample was inadvertently collected. Surface water/sediment is not considered a pathway at the site and was not evaluated further (i.e., through fate and transport or risk evaluation). Analytical results for sediment are presented in Table 10.10-4.

RCRA Metals. Six metals exceeded reference background levels in sediment. Arsenic was detected at 3.6 mg/kg, barium at 32.6 mg/kg, cadmium at 1.9 mg/kg, chromium at 18 mg/kg, lead at 164 mg/kg, and mercury at 0.05 mg/kg. Arsenic, barium, cadmium, chromium, lead, and mercury are not SRCs in sediment because the OWS discharges directly to the IWTP; therefore, it is unlikely that the activities associated with the site contributed to the metal contamination identified in the drainage ditch. Other ongoing activities/operations in this heavily industrialized and trafficked area are more likely to have resulted in a release to the drainage ditch.

10.10.5.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are summarized in Table 10.10-5.

10.10.6 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of soil SRCs to their respective GSSLs (Table 10.10-6).

Of the SRCs identified in subsurface soil, none of the analytes exceeded their respective GSSLs (Table 10.10-6); therefore, there are no CMCOPCs in soil at the site based on leaching to groundwater.

10.10.7 Human Health Preliminary Risk Evaluation of SWMU 27H, Building 1056

SRCs were identified for subsurface soil and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

10.10.7.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. Soil contamination at this site is limited to subsurface soil; therefore, only a construction worker or other individual working within an excavation is likely to be exposed to contaminants. Given that contamination in soils is limited to subsurface soils and that land use at the site is unlikely to change, the future potential receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

The site is comprised of approximately 0.01 acre, with man-made structures and surfaces covering the majority of the SWMU. However, a small grass area does exist adjacent to the drainage ditch, which is located beyond the boundaries of the site. Potential migration pathways for soils include leaching into groundwater. Soil contamination at the site is limited to subsurface soils; therefore, air migration pathways (volatilization, fugitive dust, etc.) and surface water runoff are not viable migration pathways.

Because groundwater is lower than the adjacent drainage ditch and there are no surface water bodies nearby, groundwater at the site does not discharge into nearby surface waters. Therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 10.10-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

10.10.7.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for subsurface soils included one volatile organic (toluene), one SVOC (the PAH pyrene), and two metals (cadmium and lead). The concentrations of these contaminants were below their respective screening values (Table 10.10-7); therefore, there are no HHCOPCs in subsurface soil.

The SRCs for groundwater consisted of two volatile organics (1,1-dichlorothane and acetone) and four SVOCs (the PAHs 2-methylnaphthalene, naphthalene, phenanthrene, and dibenzofuran). The maximum concentrations of 2-methylnaphthalene, dibenzofuran, and naphthalene exceeded their respective screening values (Table 10.10-7). The concentration of the remaining constituents—1,1-dichloroethane; acetone; and phenanthrene—were below their respective screening values.

The maximum concentrations of 2-methylnaphthalene (43.8 µg/L) and dibenzofuran (8.9 µg/L) were within an order of magnitude of their respective screening values (12 µg/L and 2.4 µg/L, respectively). Naphthalene had a maximum concentration more than an order of magnitude higher than its screening value. 2-Methylnaphthalene, dibenzofuran, and naphthalene are HHCOPCs in groundwater.

10.10.7.3 Uncertainties

A surrogate value was used for pyrene. There is uncertainty associated with the inclusion of pyrene as an HHCOPC. The actual toxicity value and, therefore, the screening value for pyrene may be much higher than the value used in this HHPRE. Therefore, inclusion of this chemical as an HHCOPC may reflect overly

conservative assumptions concerning its toxicity. Other human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

10.10.8 Ecological Preliminary Risk Evaluation of SWMU 27H, Building 1056

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

10.10.8.1 Ecological screening value comparison (Step i)

No surface soil was collected at the site because field screening results did not indicate elevated VOC concentrations. There is no surface water at the site. Although a sediment sample was inadvertently collected, sediment was not evaluated because there are no complete exposure pathways at the site.

Two VOCs and four SVOCs were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 10.10-8. The ECOPCs identified by the ESV comparison for groundwater are 2-methylnaphthalene and dibenzofuran. Dibenzofuran was detected at a concentration exceeding the ESV. There is no ESV for 2-methylnaphthalene, so it is an ECOPC by default (GEPD 1997a).

10.10.8.2 Preliminary problem formulation (Step ii)

The ecological habitat at the site is described in Section 10.10.4.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

10.10.8.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

10.10.8.4 Preliminary exposure (Step iv)

Ecological receptors are potentially exposed by ingestion of drinking water to ECOPCs in groundwater if it discharges to surface water. The exposure parameters for the surrogate species—raccoons—are presented in Table 8-7.

10.10.8.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 10.10-9. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for SVOCs does not exceed one.

10.10.9 Conclusions and Risk Management and Site Recommendations for SWMU 27H, Building 1056

10.10.9.1 Conclusions

Nature and Extent of Contamination

- Field VOC screening did not indicate surface soil contamination.
- The organic SRCs in subsurface soil include one VOC, toluene, and one SVOC, pyrene.
- Cadmium and lead are SRCs in subsurface soil.
- Organic SRCs in groundwater include VOCs (1,1-dichloroethane and acetone) and SVOCs (phenanthrene, 2-methylnaphthalene, dibenzofuran, and naphthalene). No RCRA metals were detected above site reference background criteria.

Fate and Transport

- SRCs identified in subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for subsurface soils.
- 2-Methylnaphthalene, dibenzofuran, and naphthalene are HHCOPCs for groundwater.

Ecological Preliminary Risk Evaluation

- The ECOPCs in groundwater are 2-methylnaphthalene and dibenzofuran; however, these ECOPCs are potential hazards to aquatic biota only if groundwater discharges to nearby surface water bodies, which is not likely at this site.
- There are no ECOPCs in groundwater that are potential hazards to terrestrial receptors.

10.10.9.2 Risk management and site recommendations

- 2-Methylnaphthalene and dibenzofuran are considered to be potential hazards to aquatic biota only if groundwater discharges to a nearby surface body. As stated in Section 10.10.7.1, groundwater does not discharge into any nearby surface water bodies. The adjacent drainage ditch is too shallow to intercept groundwater, and the effluent from the OWS discharges to the IWTP. Therefore, 2-methylnaphthalene and dibenzofuran are not ECOPCs at SWMU 27H (Building 1056) and do not require further investigation and/or evaluation.

- 2-Methylnaphtalene, dibenzofuran, and naphthalene are HHCOPCs in groundwater. The extent of potential groundwater contamination was not determined during the Phase I investigation. Therefore, the vertical and horizontal extent of groundwater contamination at this site must be determined. At a minimum, three shallow groundwater monitoring wells will be installed (one upgradient and two downgradient). Soil samples will be not be required during the installation of the monitoring wells because the soil was characterized during the Phase I RFI. The proposed sampling locations are presented in Figure 10.10-4. Proposed monitoring wells MW1 and MW2 are to be located in the areas identified in the Phase I RFI as having elevated concentrations of contaminants. MW3 (upgradient) will be used only to determine groundwater gradient and direction and will not be sampled. MW1 and MW2 will be sampled using low-flow techniques following the procedures outlined in the revised final version of the SAP for Phase II RFIs of the 16 SWMUs (SAIC 1997). The groundwater samples will be analyzed for VOCs, SVOCs, and RCRA metals. Geotechnical samples will be collected to support the fate and transport analysis, if it is required.

- The information obtained from the additional sampling proposed above will be submitted to GEPD as an addendum to this report to be submitted to GEPD before July 21, 2000. The addendum to the Phase II RFI Report will address any additional human health and/or ecological risk assessments required.

Table 10.10-1. Summary of Results from TCLP Metals and VOCs Analyses of Compliance Evaluation Inspection, SWMU 27H (Building 1056)

SURFACE SOIL											
Analyte	TCLP Regulatory Level	Sample Location									
		SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10
Volatile Organic Compounds (mg/L)											
All VOCs		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCLP Metals (mg/L)											
Barium	100	ND	ND	ND	1.1	ND	1.1	1.7	ND	ND	1.3
Cadmium	1	0.099	0.44	0.35	0.05	0.11	ND	ND	0.062	0.042	0.018
Lead	5	ND	ND	ND	0.2	ND	ND	ND	0.21	ND	ND

ND = Not detected.

Table 10.10-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27H (Building 1056)

Station	Reference Background Criteria	7PGP1	7PGP2	7PGP3	7PGP4
Sample ID		7P1111	7P1211	7P1311	7P1411
Date		01/21/98	01/21/98	01/21/98	01/21/98
Depth (feet)		3 to 5	3 to 5	3 to 5	2 to 4
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Toluene	0.00	**0.0151**			
Semivolatile Organic Compounds (mg/kg)					
Pyrene	0.00	**0.257**			
Metals (mg/kg)					
Arsenic	8.04	0.43			
Barium	17.00	9	6.5	12	2.3
Cadmium	0.24	**0.88**	**0.51**	**0.98**	**1.3**
Chromium	11.60	6.8	6.5	6.7	2.4
Lead	11.10	**41.1**	**34.8**	**46.8**	5

Bold indicates concentrations above reference background criteria.

Table 10.10-3. Summary of Analytes Detected in Groundwater, SWMU 27H (Building 1056)

Station	Reference Background	MCL	7PGP1	7PGP2	7PGP3	7PGP4
Sample ID			7P4111	7P4211	7P4311	7P4411
Date			01/21/98	01/21/98	01/21/98	01/21/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
1,1-Dichloroethane	0.00		**2.9**			
Acetone	0.00				**39.2**	
Semivolatile Organic Compounds (µg/L)						
2-Methylnaphthalene	0.00					**43.8**
Dibenzofuran	0.00					**8.9**
Naphthalene	0.00			**5.6**		**16.4**
Phenanthrene	0.00					**5.6**
Metals (µg/L)						
Barium	71.72	2,000	5.7	3.4	3.4	
Chromium	3.56	100	0.64	1.1		
Selenium	1.90	50		1.9		
Silver	1.12		0.84			

Bold indicates concentrations above reference background criteria.

Table 10.10-4. Summary of Analytes Detected in Sediment, SWMU 27H (Building 1056)

Station	Reference Background Criteria	7PSWS1
Sample ID		7P2111
Date		02/01/98
Sample Type		Grab
Metals (mg/kg)		
Arsenic	2.10	**3.6**
Barium	14.70	**32.6**
Cadmium	0.18	**1.9**
Chromium	6.21	**18**
Lead	8.81	**164**
Mercury	0.03	**0.05**

Bold indicates concentrations above reference background criteria.

Table 10.10-5. Summary of Site-related Contaminants, SWMU 27H (Building 1056)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment[a]	Groundwater	Surface Water
Volatile Organic Compounds					
1,1-Dichloroethane	NC	ND	ND	2.9	NP
Acetone	NC	ND	ND	39.2	NP
Toluene	NC	0.0151	ND	ND	NP
Semivolatile Organic Compounds					
2-Methylnaphthalene	NC	ND	ND	43.8	NP
Dibenzofuran	NC	ND	ND	8.9	NP
Naphthalene	NC	ND	ND	16.4	NP
Phenanthrene	NC	ND	ND	5.6	NP
Pyrene	NC	0.257	ND	ND	NP
Metals					
Arsenic	NC	BRBC	3.6	ND	NP
Barium	NC	BRBC	32.6	BRBC	NP
Cadmium	NC	1.3	1.9	ND	NP
Chromium	NC	BRBC	18	BRBC	NP
Lead	NC	46.8	164	ND	NP
Mercury	NC	ND	0.05	ND	NP

[a]Sediment sample inadvertently collected. SWMU 27H discharges to the IWTP.
BRBC = Below reference background criteria.
NC = Samples not collected based on field screening or unavailability of medium.
ND = Not detected.
NP = No pathway exists.

Table 10.10-6. GSSL Screening of Site-related Contaminants in Soil, SWMU 27H (Building 1056)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Toluene	0.0151	12	No
Semivolatile Organic Compounds (mg/kg)			
Pyrene	0.257	4,200	No
Metals (mg/kg)			
Cadmium	1.3	8	No
Lead[b]	46.8	400	No

[a]GSSL = EPA GSSL with a DAF of 20 for inorganics and volatile and semivolatile organics. A DAF of 20 for inorganics was used because the area of potential contamination is less than 0.5 acre; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).
[b]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 10.10-7. Human Health Risk Screening for Subsurface Soil and Groundwater, SWMU 27H (Building 1056)

SUBSURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Toluene	1/4	0.0151	0.0151	1,600	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Pyrene	1/4	0.257	0.257	230	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Cadmium	4/4	0.51	1.3	3.9	No	Max Detect < Risk Criteria
Lead	4/4	5	46.8	400	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Volatile Organic Compounds (µg/L)						
1,1-Dichloroethane	1/4	2.9	2.9	81	No	Max Detect < Risk Criteria
Acetone	1/4	39.2	39.2	61	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (µg/L)						
2-Methylnaphthalene	1/4	43.8	43.8	12	Yes	Max Detect > Risk Criteria
Dibenzofuran	1/4	8.9	8.9	2.4	Yes	Max Detect > Risk Criteria
Naphthalene	2/4	5.6	16.4	0.65	Yes	Max Detect > Risk Criteria
Phenanthrene	1/4	5.6	5.6	18[a]	No	Max Detect < Risk Criteria

[a]The screening value for pyrene was used as a surrogate value.

Table 10.10-8. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27H (Building 1056)

Analyte	SWMU 27H (Building 1056) Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
1,1-Dichloroethane	2.9	47[a]	No	Max Detect < ESV
Acetone	39.2	1,500[a]	No	Max Detect < ESV
Semivolatile Organic Compounds (µg/L)				
2-Methylnaphthalene	43.8	No ESV	Yes	ECOPC by Default
Dibenzofuran	8.9	3.7[a]	Yes	Max Detect > ESV
Naphthalene	16.4	62	No	Max Detect < ESV
Phenanthrene	5.6	6.3[a]	No	Max Detect < ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 10.10-9. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27H (Building 1056)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/ TRV
Semivolatile Organic Compounds				
2-Methylnaphthalene	43.8	3.51E-03	2.46E+00	1.43E-03
Dibenzofuran	8.9	7.12E-04	No TRV	--

0.001 = (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d)
-- = Cannot be calculated due to lack of data.

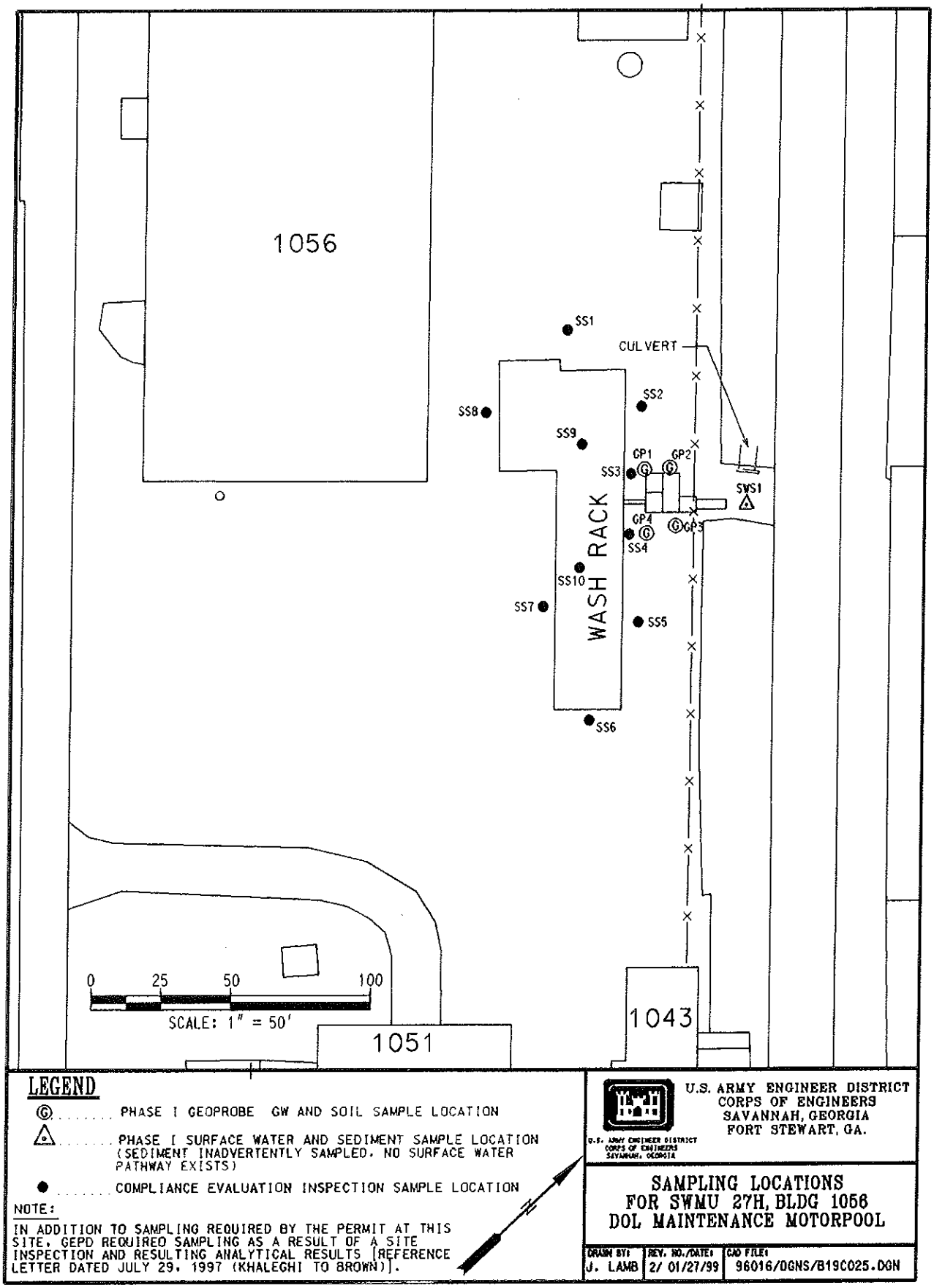

Figure 10.10-1. Sampling Locations, SWMU 27H (Building 1056)

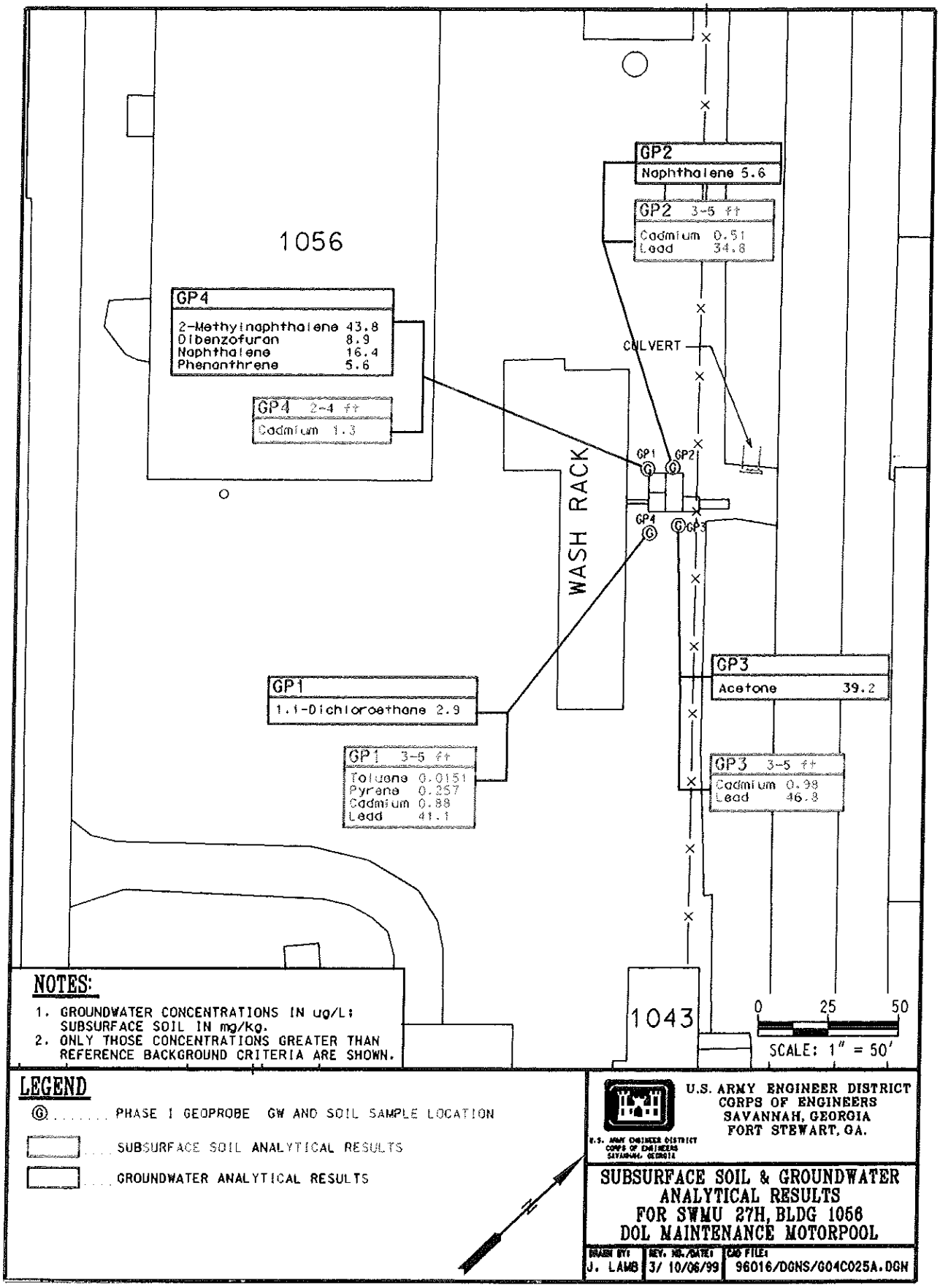

Figure 10.10-2. Summary of Analytical Results in Subsurface Soil and Groundwater, SWMU 27H (Building 1056)

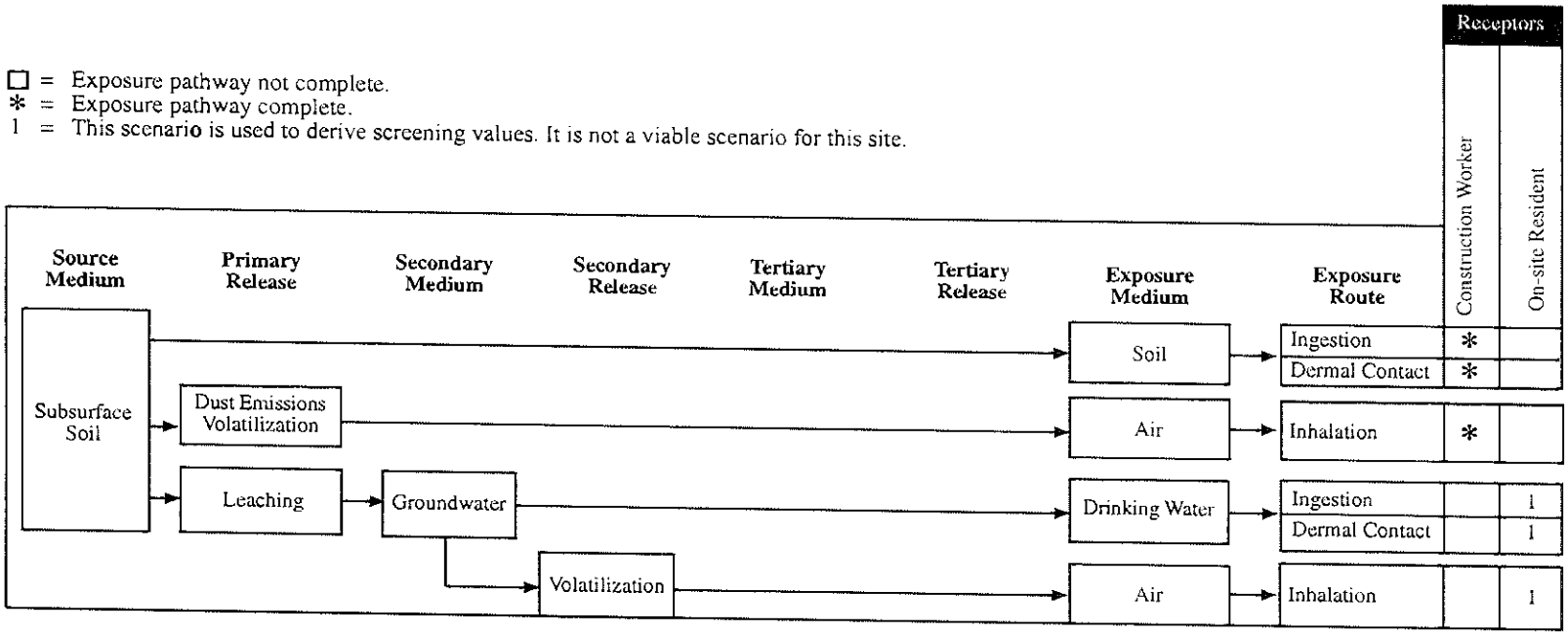

Figure 10.10-3. Potential Migration and Exposure Pathways, SWMU 27H (Building 1056)

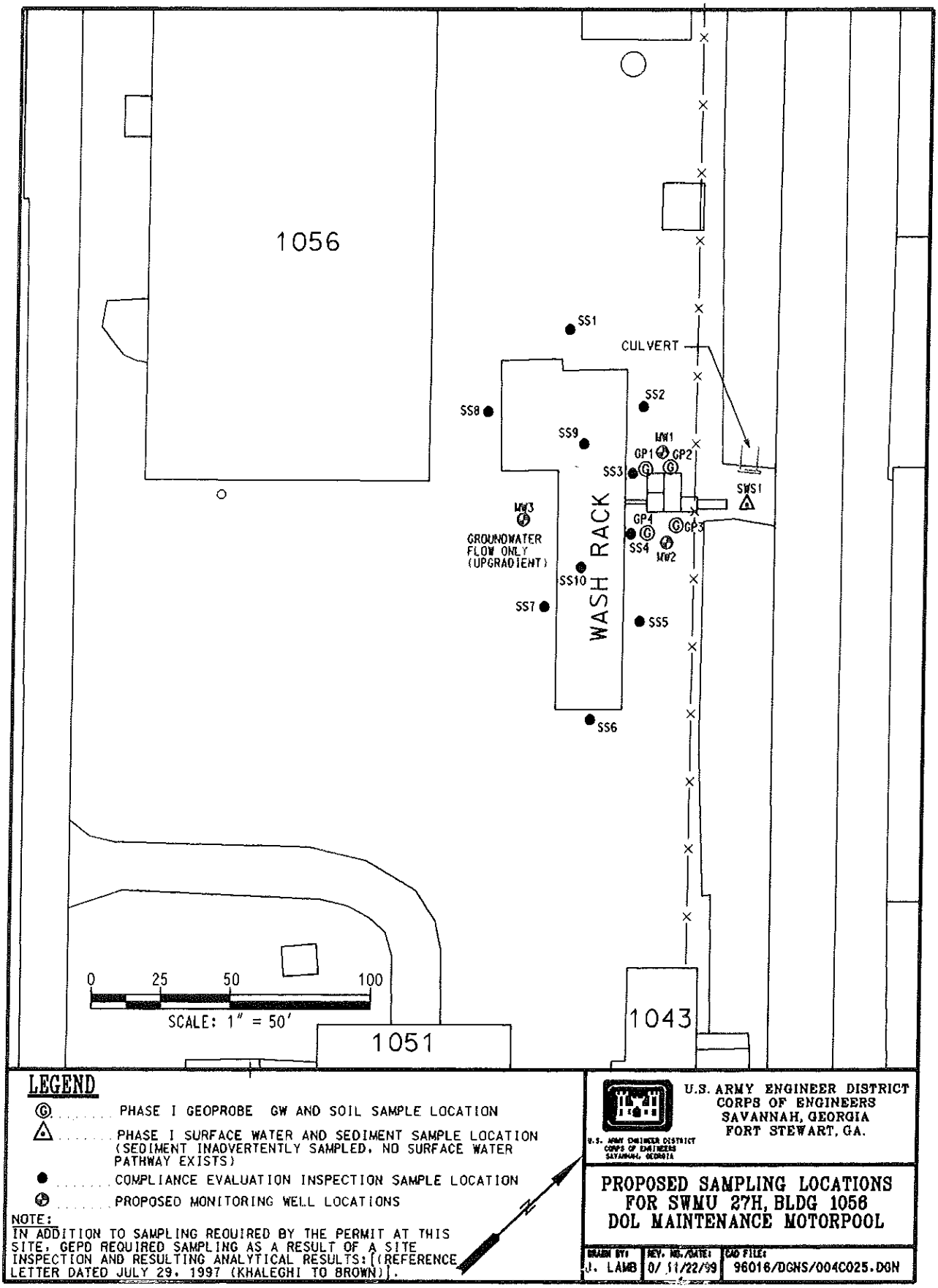

Figure 10.10-4. Proposed Sampling Locations, SWMU 27H (Building 1056)

10.11 SWMU 27H: DOL MAINTENANCE, BUILDING 1071

10.11.1 History and Description of SWMU 27H, DOL Maintenance, Building 1071

SWMU 27H, Building 1071 is one of two OWSs that support vehicle maintenance activities at the DOL Maintenance facilities. The OWS is located adjacent to an open maintenance pad identified as Building 1071 (Figure 10.11-1). Maintenance activities for military vehicles are performed at the maintenance pad. Floor drains from the maintenance pad are piped to the OWS. In addition, residual oil from collection and storage containers, filters, and such is allowed to drain onto the grating that covers the OWS. No previous investigations have been performed at this OWS in the DOL Maintenance area. The effluent from the OWS discharges to the IWTP, and the oil is pumped out of the holding unit and burned at the Central Energy Plant.

10.11.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at SWMU 27H, Building 1071. The locations of the soil and groundwater samples are presented in Figure 10.11-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and RCRA metals. Full RCRA metals were analyzed at this site because of the varied operations that are associated with DOL areas.

10.11.3 Physical Characteristics of the Site

10.11.3.1 Topography

The topography of the OWS site is essentially level. The OWS area is concrete, and all the surrounding sides are concrete vehicle parking areas. The surface elevation is approximately 83 feet amsl.

10.11.3.2 Surface drainage

There is a drainage ditch southwest of the OWS and a boundary fence located approximately 50 feet from the OWS. The drainage ditch receives runoff from the vehicle parking area and outside storage area northeast of the OWS, from the adjacent gravel/dirt road southwest of the OWS, and from other upstream industrial sources. During periods of heavy rainfall events, the surface water may potentially make it to Mill or Taylors Creek. The OWS discharges directly to the IWTP; however, the adjacent drainage ditch is rather deep and may potentially intercept the relatively shallow groundwater.

10.11.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

10.11.3.4 Hydrogeology

Groundwater was encountered at approximately 8 feet bgs.

10.11.3.5 Ecology

As stated in Section 8.2, SWMU 27H, Building 1071 is classified as an "industrialized area." The site is comprised of approximately 0.11 acre, with concrete surfaces and man-made structures existing throughout. No natural habitat is present within or adjacent to the SWMU's boundaries.

10.11.4 Nature aud Extent of Contamination

10.11.4.1 Surface soil

No surface soil samples were collected at the site.

10.11.4.2 Subsurface soil

Subsurface soil samples were collected at all locations. These samples were selected for analysis based on field headspace screening for VOCs. Analytical results are summarized in Table 10.11-1 and Figure 10.11-2.

VOCs. Acetone and toluene were detected in subsurface soils at concentrations above the analytical detection limits. Acetone and toluene were found at GP4 at concentrations of 0.0512 mg/kg and 0.0163 mg/kg, respectively. Acetone and toluene are SRCs in subsurface soils at the site.

SVOCs. A wide range of SVOCs was detected in subsurface soils at sampling locations GP2, GP3, and GP4 (see Figure 10.11-2). SVOCs detected at concentrations above the analytical detection limits include the following: acenaphthylene (0.796 mg/kg at GP4 and 1.37 mg/kg at GP1), benzo(*a*)anthracene (1.86 mg/kg at GP3 to 5.24 mg/kg at GP1), benzo(*a*)pyrene (1.79 mg/kg at GP3 to 5.04 mg/kg at GP2), benzo(*b*)fluoranthene (1.76 mg/kg at GP3 to 5.15 mg/kg at GP2), benzo(*g,h,i*)perylene (0.948 mg/kg at GP3 to 3.56 mg/kg at GP2), benzo(*k*)fluoranthene (1.42 mg/kg at GP3 to 4.72 mg/kg at GP2), chrysene (1.94 mg/kg at GP3 to 6.21 mg/kg at GP2), fluoranthene (2.18 mg/kg at GP3 to 4.93 mg/kg at GP2), indeno(*1,2,3-cd*)pyrene (0.986 mg/kg at GP3 to 3.31 mg/kg at GP2), phenanthrene (1.86 mg/kg at GP2), and pyrene (3.35 mg/kg at GP3 to 10.6 mg/kg at GP2). SRCs in subsurface soils include the following SVOCs: acenaphthylene, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, fluoranthene, indeno(*1,2,3-cd*)pyrene, phenanthrene, and pyrene.

RCRA Metals. Lead and mercury were detected in subsurface soils at concentrations exceeding the site reference background levels. Lead was detected at GP4 at 47.3 mg/kg, and mercury was detected at GP3 at 0.09 mg/kg. Both lead and mercury are SRCs in subsurface soils at the site.

10.11.4.3 Groundwater

With the use of DPT techniques, groundwater samples were collected from the four Geoprobe locations at SWMU 27H, Building 1071. The results of the groundwater analyses are presented in Table 10.11-2 and Figure 10.11-2.

VOCs. Acetone was detected in groundwater at a concentration of 141 µg/L at GP2. Acetone is an SRC in groundwater at the site.

SVOCs. SVOCs were detected in groundwater at only sampling location GP4. SVOCs detected include: benzo(*a*)anthracene at 13.3 µg/L, benzo(*a*)pyrene at 11.5 µg/L, benzo(*b*)fluoranthene at 18.4 µg/L, benzo(*g,h,i*)perylene at 6 µg/L, chrysene at 18.6 µg/L, fluoranthene at 18.8 µg/L, indeno(*1,2,3-cd*)pyrene at 5.8 µg/L, phenanthrene at 11.7 µg/L, and pyrene at 30.4 µg/L. The SRCs in groundwater include the following SVOCs: benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, chrysene, fluoranthene, indeno(*1,2,3-cd*)pyrene, phenanthrene, and pyrene. The detected concentration of benzo(*a*)pyrene exceeded its MCL.

RCRA Metals. RCRA metals were not detected above the reference background criteria in any of the four groundwater samples.

10.11.4.4 Surface water

No surface water samples were collected because no definitive surface water pathway had been identified prior to the Phase I RFI.

10.11.4.5 Sediment

No sediment samples were collected because no definitive sediment pathway had been identified prior to the Phase I RFI.

10.11.4.6 Site-related contaminant summary

The SRCs and their maximum concentrations by medium are summarized in Table 10.11-3.

10.11.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in subsurface soil, benzo(*a*)anthracene and benzo(*b*)fluoranthene exceeded their respective GSSLs (Table 10.11-4) and are considered to be CMCOPCs in soil at SWMU 27H.

10.11.6 Human Health Preliminary Risk Evaluation of SWMU 27H, Building 1071

SRCs were identified for subsurface soil and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

10.11.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. On-site soil contamination at this site is limited to subsurface soil; therefore, only a construction worker or other individuals working within an excavation are likely to be exposed to contaminants. However, groundwater at the site may discharge to a nearby ditch, and, therefore, a juvenile trespasser may come in contact with surface water in the ditch.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

The site is relatively flat and is comprised entirely of concrete surfaces and man-made structures. No natural habitat is present within or adjacent to the SWMU's boundaries. Potential migration pathways for soils include leaching into groundwater. Soil contamination at the site is limited to subsurface soils; therefore, air migration pathways (volatilization, fugitive dust, etc.) and surface water runoff are not viable migration pathways.

There is a deep drainage ditch located approximately 50 feet southeast of the site. Groundwater, which is located approximately 8 feet bgs, may intercept this drainage ditch; therefore, migration via discharge of groundwater is a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 10.11-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

10.11.6.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for subsurface soils included two volatile organics (acetone and toluene), 11 SVOCs (all PAHs), and two metals (lead and mercury). Only benzo(*a*)pyrene exceeded its screening value and is considered to be an HHCOPC in subsurface soil. The maximum concentration of benzo(*a*)pyrene (5.04 mg/kg) was within an order of magnitude of its industrial screening value (0.78 mg/kg).

The SRCs for groundwater consisted of a volatile organic (acetone) and nine SVOCs (all PAHs). With the exception of fluoranthene and phenanthrene, all of the SRCs in groundwater exceeded their respective screening values. The maximum concentration for benzo(*a*)pyrene was more than three orders of magnitude higher than its screening value (13.3 µg/L as compared to a screening value of 0.0092 µg/L) (Table 10.11-5). The maximum concentrations of benzo(*a*)anthracene and benzo(*b*)fluoranthene were more than two orders of magnitude above their respective screening values. Indeno(*1,2,3-cd*)pyrene was more than an order of magnitude higher than its screening value. Acetone, chrysene, benzo(*g,h,i*)perylene, and pyrene were within an order of magnitude of their respective screening values.

Acetone, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, chrysene, indeno(*1,2,3-cd*)pyrene, and pyrene are HHCOPCs in groundwater.

10.11.6.3 Uncertainties

Surrogate values were used to screen acenaphthylene and phenanthrene in subsurface soils and phenanthrene in groundwater. Acenaphthylene was identified as an HHCOPC in subsurface soil. The actual toxicity of acenaphthylene may be lower than that of the surrogate chemical used, and this chemical may not present a potential tbreat to human health. In comparison, phenanthrene was eliminated as an HHCOPC in subsurface soils. However, if the toxicity of this compound is higher than that of the surrogate, this chemical may have been prematurely eliminated from the risk assessment process. Other human health uncertainties have been addressed in Section 7.5 of tbe HHPRE (Chapter 7.0).

10.11.7 Ecological Preliminary Risk Evaluation of SWMU 27H, Building 1071

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was colleeted, an ESV comparison was condueted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

10.11.7.1 Ecological screening value comparison (Step i)

There are no surface water or sediment data for the site. Surface soils were not evaluated because no surface soil samples were collected based on field headspace VOC analysis (i.e., field readings were nondetect).

No RCRA metals were detected in groundwater at concentrations exceeding the reference background criteria. One VOC and nine SVOCs were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 10.11-6. The ECOPCs identified by the ESV comparison for groundwater consisted of eight SVOCs. There are no ESVs for benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, chrysene, indeno(*1,2,3-cd*)pyrene, and pyrene, so these are ECOPCs by default (GEPD 1997a). Benzo(*a*)anthracene, benzo(*a*)pyrene, and phenanthrene were detected at concentrations exceeding ESVs.

10.11.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 10.11.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

10.11.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water in drainage ditches. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

10.11.7.4 Preliminary exposure (Step iv)

SWMU 27H has been classified as an "industrialized area," and the terrestrial part of the SWMU is not capable of supporting an ecological habitat; therefore, surface soil samples were not collected at this site. However, ecological receptors are potentially exposed to ECOPCs in groundwater by ingestion of drinking water if groundwater discharges to nearby surface water. The exposure parameters for the surrogate species—raccoons—are presented in Table 8-7.

10.11.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Groundwater. The preliminary risk calculations for raccoons potentially exposed to ECOPCs detected in groundwater are presented in Table 10.11-7. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HIs calculated for VOCs and SVOCs do not exceed one.

10.11.8 Conclusions and Risk Management and Site Recommendations for SWMU 27H, Building 1071

10.11.8.1 Conclusions

Nature and Extent of Contamination

- Acetone and toluene are SRCs in subsurface soils at the site.
- Other organic SRCs in subsurface soils include the following SVOCs: acenaphthylene, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, fluoranthene, indeno(*1,2,3-cd*)pyrene, phenanthrene, and pyrene.
- Lead and mercury were detected in subsurface soils at concentrations exceeding the site reference background levels.
- Acetone is an SRC in groundwater at the site.
- SRCs in groundwater also include the following SVOCs: benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, indeno(*1,2,3-cd*)pyrene, chrysene, fluoranthene, phenanthrene, and pyrene. The detected concentration of benzo(*a*)pyrene exceeded its MCL.
- RCRA metals were not detected above the reference background criteria in any groundwater sample.

Fate and Transport

- Benzo(*a*)anthracene and benzo(*b*)fluoranthene were identified as CMCOPCs in subsurface soil.

Human Health Preliminary Risk Evaluation

- Benzo(*a*)pyrene was identified as an HHCOPC in subsurface soil.
- The following chemicals were identified as HHCOPCs in groundwater: acetone, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, chrysene, indeno(*1,2,3-cd*)pyrene, and pyrene.

Ecological Preliminary Risk Evaluation

- The ECOPCs in groundwater are eight SVOCs, all of which are PAHs. These ECOPCs are potential hazards to aquatic biota if groundwater discharges to nearby surface water bodies.
- Surface soil was not collected at this site because this SWMU is covered with concrete, and no vegetation or surface soil is present in the immediate area; therefore, there is no pathway to ecological receptors from surface soil.
- No ECOPCs were identified for terrestrial receptors exposed to groundwater.

10.11.8.2 Risk management and site recommendations

- One SRC [benzo(*a*)pyrene] was indicated as an HHCOPC in subsurface soil, and two SRCs were indicated as CMCOPCs. Acetone was identified as an HHCOPC in groundwater. Numerous SVOCs were indicated as HHCOPCs and ECOPCs in groundwater. Benzo(*a*)pyrene was indicated at concentrations approximately 60 times greater than its MCL. The extent of potential soil and groundwater contamination was not determined during the Phase I investigation; therefore, the vertical and horizontal extent of groundwater contamination at this site must be determined. At a minimum, four groundwater screening samples will be collected using DPT techniques and analyzed for VOCs to evaluate the horizontal extent of potential contamination and to estimate the groundwater flow direction. At a minimum, one vertical-profile boring will be installed adjacent to the DPT location having the most elevated concentration of VOCs. The field screening results for VOCs from the four DPT and vertical-profile samples will be used to locate at least three shallow monitoring wells (one upgradient and two downgradient) and potentially three deep monitoring wells (one upgradient and two downgradient). The deep monitoring wells will be installed only if vertical contamination is indicated. The field screening results and recommended locations of monitoring wells will be presented to GEPD for its concurrence prior to installation. At each well, two soil samples will be collected following the procedures outlined in the revised final version of the SAP for Phase II RFIs of the 16 SWMUs (SAIC 1997). Surface soil samples (0 foot to 2 feet bgs) will be collected at each monitoring well location to evaluate the potential risk to ecological receptors. All wells will be sampled using low-flow techniques. Because groundwater from the OWS site may reach the adjacent drainage ditch approximately 50 feet to the west/southwest, two surface water and sediment samples (one upstream and one downstream of the OWS) will be collected in the drainage ditch. The proposed sampling locations are presented in Figure 10.11-4. The soil, surface water, sediment, and groundwater samples will be analyzed for VOCs, SVOCs, and RCRA metals. Geotechnical samples will be collected to support the fate and transport analysis, if it is required.

- The information obtained from the additional sampling proposed above will be submitted to GEPD as an addendum to this report to be submitted to GEPD before July 21, 2000. The addendum to the Phase II RFI Report will address any additional human health and/or ecological risk assessments required.

Table 10.11-1. Summary of Analytes Detected in Subsurface Soil, SWMU 27H (Building 1071)

Station	Reference Background Criteria	7NGP1	7NGP2	7NGP3	7NGP4
Sample ID		7N1111	7N1211	7N1311	7N1411
Date		01/21/98	01/21/98	02/04/98	01/21/98
Depth (feet)		6 to 8	6 to 8	6 to 8	5 to 8
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Acetone	0.00				**0.0512**
Toluene	0.00				**0.0163**
Semivolatile Organic Compounds (mg/kg)					
Acenaphthylene	0.00		**1.37**		**0.796**
Benzo(*a*)anthracene	0.00		**5.24**	**1.86**	**3.72**
Benzo(*a*)pyrene	0.00		**5.04**	**1.79**	**3.44**
Benzo(*b*)fluoranthene	0.00		**5.15**	**1.76**	**3.49**
Benzo(*g,h,i*)perylene	0.00		**3.56**	**0.948**	**2.18**
Benzo(*k*)fluoranthene	0.00		**4.72**	**1.42**	**3.4**
Chrysene	0.00		**6.21**	**1.94**	**4.48**
Fluoranthene	0.00		**4.93**	**2.18**	**3.03**
Indeno(*1,2,3-cd*)pyrene	0.00		**3.31**	**0.986**	**2**
Phenanthrene	0.00		**1.86**		
Pyrene	0.00		**10.6**	**3.35**	**7.06**
Metals (mg/kg)					
Arsenic	8.04	0.42			0.45
Barium	17.00	1.9	4.2	3.2	13.4
Cadmium	0.24				0.22
Chromium	11.60	6.8	3.2	7.3	4.9
Lead	11.10	2.9	4.2	5.4	**47.3**
Mercury	0.06			**0.09**	
Selenium	1.12			0.21	

Bold indicates concentrations above reference background criteria.

Table 10.11-2. Summary of Analytes Detected in Groundwater, SWMU 27H (Building 1071)

Station	Reference Background Criteria	MCL	7NGP1	7NGP2	7NGP3	7NGP4
Sample ID			7N4111	7N4211	7N4311	7N4411
Date			01/21/98	01/21/98	02/04/98	01/21/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
Acetone	0.00			**141**		
Semivolatile Organic Compounds (µg/L)						
Benzo(*a*)anthracene	0.00					**13.3**
Benzo(*a*)pyrene	0.00	0.2				***11.5***
Benzo(*b*)fluoranthene	0.00					**18.4**
Benzo(*g,h,i*)perylene	0.00					**6**
Chrysene	0.00					**18.6**
Fluoranthene	0.00					**18.8**
Indeno(*1,2,3-cd*)pyrene	0.00					**5.8**
Phenanthrene	0.00					**11.7**
Pyrene	0.00					**30.4**
Metals (µg/L)						
Barium	71.72	2,000	17.9	11.9	27	7.4
Chromium	3.56	100	0.68	0.72	0.96	1.9

Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.

Table 10.11-3. Summary of Site-related Contaminants, SWMU 27H (Building 1071)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Acetone	NC	0.0512	NP	141	NP
Toluene	NC	0.0163	NP	ND	NP
Semivolatile Organic Compounds					
Acenaphthylene	NC	1.37	NP	ND	NP
Benzo(*a*)anthracene	NC	5.24	NP	13.3	NP
Benzo(*a*)pyrene	NC	5.04	NP	11.5	NP
Benzo(*b*)fluoranthene	NC	5.15	NP	18.4	NP
Benzo(*g,h,i*)perylene	NC	3.56	NP	6	NP
Benzo(*k*)fluoranthene	NC	4.72	NP	ND	NP
Chrysene	NC	6.21	NP	18.6	NP
Fluoranthene	NC	4.93	NP	18.8	NP
Indeno(*1,2,3-cd*)pyrene	NC	3.31	NP	5.8	NP
Phenanthrene	NC	1.86	NP	11.7	NP
Pyrene	NC	10.6	NP	30.4	NP
Metals					
Lead	NC	47.3	NP	ND	NP
Mercury	NC	0.09	NP	ND	NP

NC = Not analyzed based on field headspace analysis.
ND = Not detected above reference background criteria.
NP = No pathway exists.

Table 10.11-4. GSSL Screening of Site-related Contaminants in Soil, SWMU 27H (Building 1071)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Acetone	0.0512	16	No
Toluene	0.0163	12	No
Semivolatile Organic Compounds (mg/kg)			
Acenaphthylene[b,c]	1.37	111[c]	No
Benzo(*a*)anthracene	5.24	2	Yes
Benzo(*a*)pyrene	5.04	8	No
Benzo(*b*)fluoranthene	5.15	5	Yes
Benzo(*g,h,i*)perylene[b,d]	3.56	394[d]	No
Benzo(*k*)fluoranthene	4.72	49	No
Chrysene	6.21	160	No
Fluoranthene	4.93	4,300	No
Indeno(*1,2,3-cd*)pyrene	3.31	14	No
Phenanthrene[b,e]	1.86	80.4[e]	No
Pyrene	10.6	4,200	No
Metals (mg/kg)			
Lead[f]	47.3	400	No
Mercury	0.09	2	No

[a]GSSL = EPA GSSL with a DAF of 20 for inorganics and volatile and semivolatile organics. A DAF of 20 for inorganics was used because the area of potential contamination is less than 0.5 acre; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

[c]The RBC for acenaphthene was used to develop the GSSL for acenaphthylene.

[d]An RBC was not available for benzo(*g,h,i*)perylene; therefore, an RBC was calculated based on a TEF of 0.01 (see Section 7.3) and was used to develop the GSSL.

[e]The RBC for pyrene was used to develop the GSSL for phenanthrene.

[f]A screening level of 400 mg/kg is used for lead based on Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (EPA 1994e).

Table 10.11-5. Human Health Risk Screening for Subsurface Soil and Groundwater, SWMU 27H (Building 1071)

SUBSURFACE SOIL							
Analyte	**Results> Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**EPA Region III Industrial**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)							
Acetone	1/4	0.0512	0.0512	780	NA	No	Max Detect < Risk Criteria
Toluene	1/4	0.0163	0.0163	1,600	NA	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)							
Acenaphthylene[a]	2/4	0.796	1.37[a]	470	NA	No	Max Detect < Background
Benzo(*a*)anthracene	3/4	1.86	5.24	0.88	7.84	No	Max Detect < Risk Criteria
Benzo(*a*)pyrene	3/4	1.79	5.04	0.09	0.78	Yes	Max Detect > Risk Criteria
Benzo(*b*)fluoranthene	3/4	1.76	5.15	0.88	7.84	No	Max Detect <Risk Criteria
Benzo(*g,h,i*)perylene[b]	3/4	0.948	3.56	8.8[b]	NA	No	Max Detect < Risk Criteria
Benzo(*k*)fluoranthene	3/4	1.42	4.72	8.8	NA	No	Max Detect < Risk Criteria
Chrysene	3/4	1.94	6.21	88	NA	No	Max Detect < Risk Criteria
Fluoranthene	3/4	2.18	4.93	310	NA	No	Max Detect < Risk Criteria
Indeno(*1,2,3-cd*)pyrene	3/4	0.986	3.31	0.88	7.84	No	Max Detect < Risk Criteria
Phenanthrene[c]	1/4	1.86	1.86	2,300[c]	NA	No	Max Detect < Risk Criteria
Pyrene	3/4	3.35	10.6	230	NA	No	Max Detect < Risk Criteria
Metals (mg/kg)							
Lead	4/4	2.9	47.3	400	NA	No	Max Detect < Risk Criteria
Mercury	1/4	0.09	0.09	2.3	NA	No	Max Detect < Risk Criteria

Note: Footnotes appear on page 10.11-13.

Table 10.11-5. Human Health Risk Screening for Subsurface Soil and Groundwater, SWMU 27H (Building 1071) (continued)

GROUNDWATER						
Chemicals	**Freq. of Detection**	**Minimum Detected**	**Maximum Detected**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
Acetone	1/3	141	141	61	Yes	Max Detect > Risk Criteria
Semivolatile Organic Compounds (µg/L)						
Benzo(*a*)anthracene	1/4	13.3	13.3	0.092	Yes	Max Detect > Risk Criteria
Benzo(*a*)pyrene	1/4	11.5	11.5	0.0092	Yes	Max Detect > Risk Criteria
Benzo(*b*)fluoranthene	2/4	18.4	18.4	0.092	Yes	Max Detect > Risk Criteria
Benzo(*g,h,i*)perylene[b]	1/4	6	6	0.92[b]	Yes	Max Detect > Risk Criteria
Chrysene	1/4	18.6	18.6	9.2	Yes	Max Detect > Risk Criteria
Fluoranthene	1/4	18.8	18.8	150	No	Max Detect < Risk Criteria
Indeno(*1,2,3-cd*)pyrene	1/4	5.8	5.8	0.092	Yes	Max Detect > Risk Criteria
Phenanthrene[c]	1/4	11.7	11.7	18.3[c]	No	Max Detect < Risk Criteria
Pyrene	2/4	30.4	30.4	18.3	Yes	Max Detect > Risk Criteria

[a]The RBC for acenaphthene was used for acenaphthylene.
[b]An RBC was not available for benzo(*g,h,i*)perylene; therefore, an RBC was calculated based on a TEF of 0.01 (see Section 7.3).
[c]The RBC for pyrene was used for phenanthrene.
NA = Not applicable.

Table 10.11-6. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27H (Building 1071)

Analyte	SWMU 27H (Building 1071) Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Acetone	141	1,500[a]	No	Max Detect < ESV
Semivolatile Organic Compounds (µg/L)				
Benzo(*a*)anthracene	13.3	0.027[a]	Yes	Max Detect > ESV
Benzo(*a*)pyrene	11.5	0.014[a]	Yes	Max Detect > ESV
Benzo(*b*)fluoranthene	18.4	No ESV	Yes	Max Detect > ESV
Benzo(*g,h,i*)perylene	6	No ESV	Yes	Max Detect > ESV
Chrysene	18.6	No ESV	Yes	Max Detect > ESV
Fluoranthene	18.8	40	No	Max Detect < ESV
Indeno(*1,2,3-cd*)pyrene	5.8	No ESV	Yes	Max Detect > ESV
Phenanthrene	11.7	6.3[a]	Yes	Max Detect > ESV
Pyrene	30.4	No ESV	Yes	Max Detect > ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.

ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 10.11-7. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27H (Building 1071)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/ TRV
Semivolatile Organic Compounds (µg/L)				
Benzo(*a*)anthracene	13.3	1.06E-03	3.54E+00	3.01E-04
Benzo(*a*)pyrene	11.5	9.21E-04	2.66E-01	3.46E-03
Benzo(*b*)fluoranthene	18.4	1.47E-03	3.54E+00	4.16E-04
Benzo(*g,h,i*)perylene	6	4.80E-04	3.54E+00	1.36E-04
Chrysene	18.6	1.49E-03	3.54E+00	4.21E-04
Fluoranthene	18.8	1.50E-03	1.33E+01	1.13E-04
Indeno(*1,2,3-cd*)pyrene	5.8	4.64E-04	3.54E+00	1.31E-04
Phenanthrene	11.7	9.37E-04	2.66E-01	3.52E-03
Pyrene	30.4	2.43E-03	2.66E-01	9.14E-03
			HI=	1.76E-02

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).

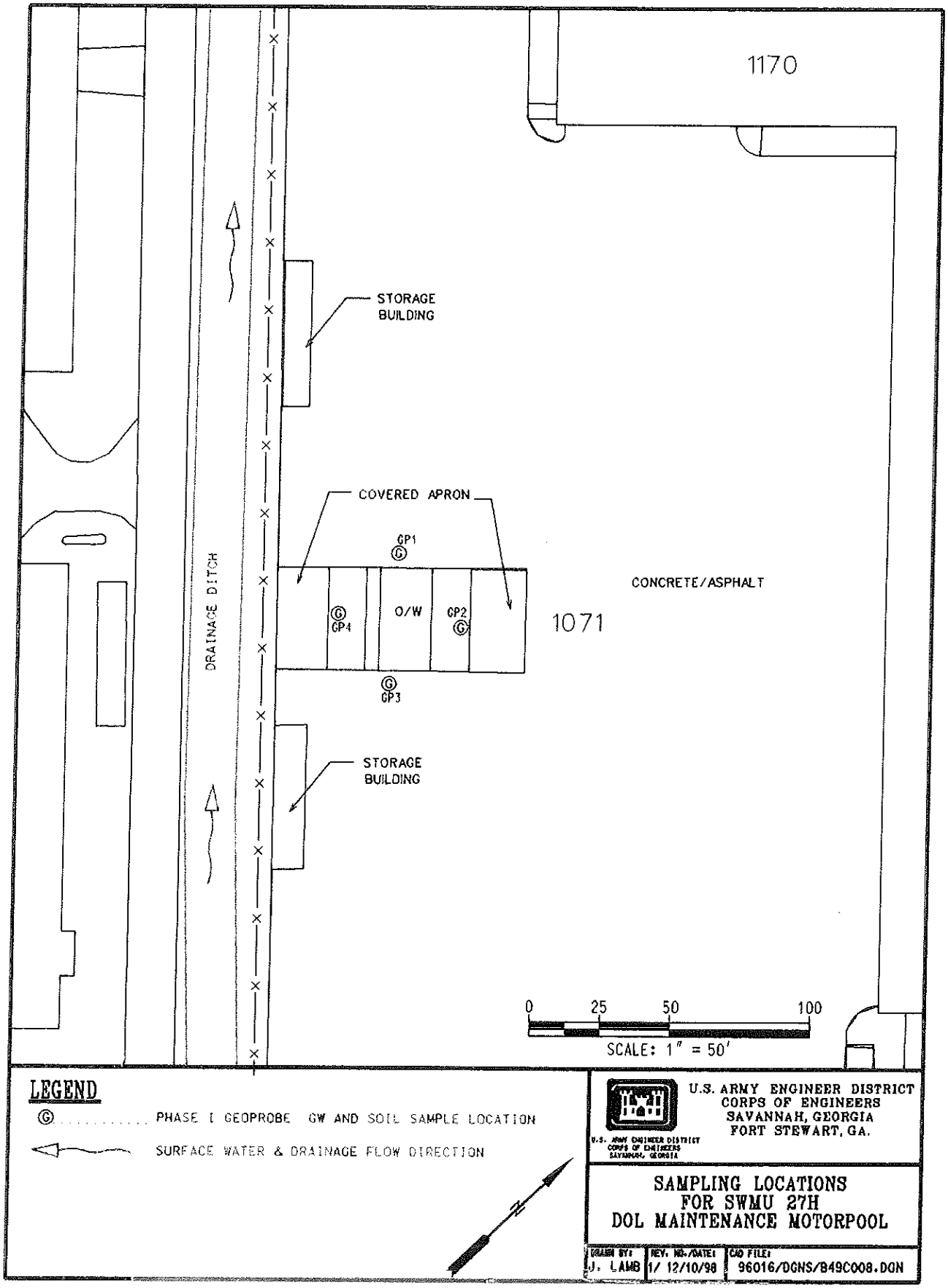

Figure 10.11-1. Sampling Locations, SWMU 27H (Building 1071)

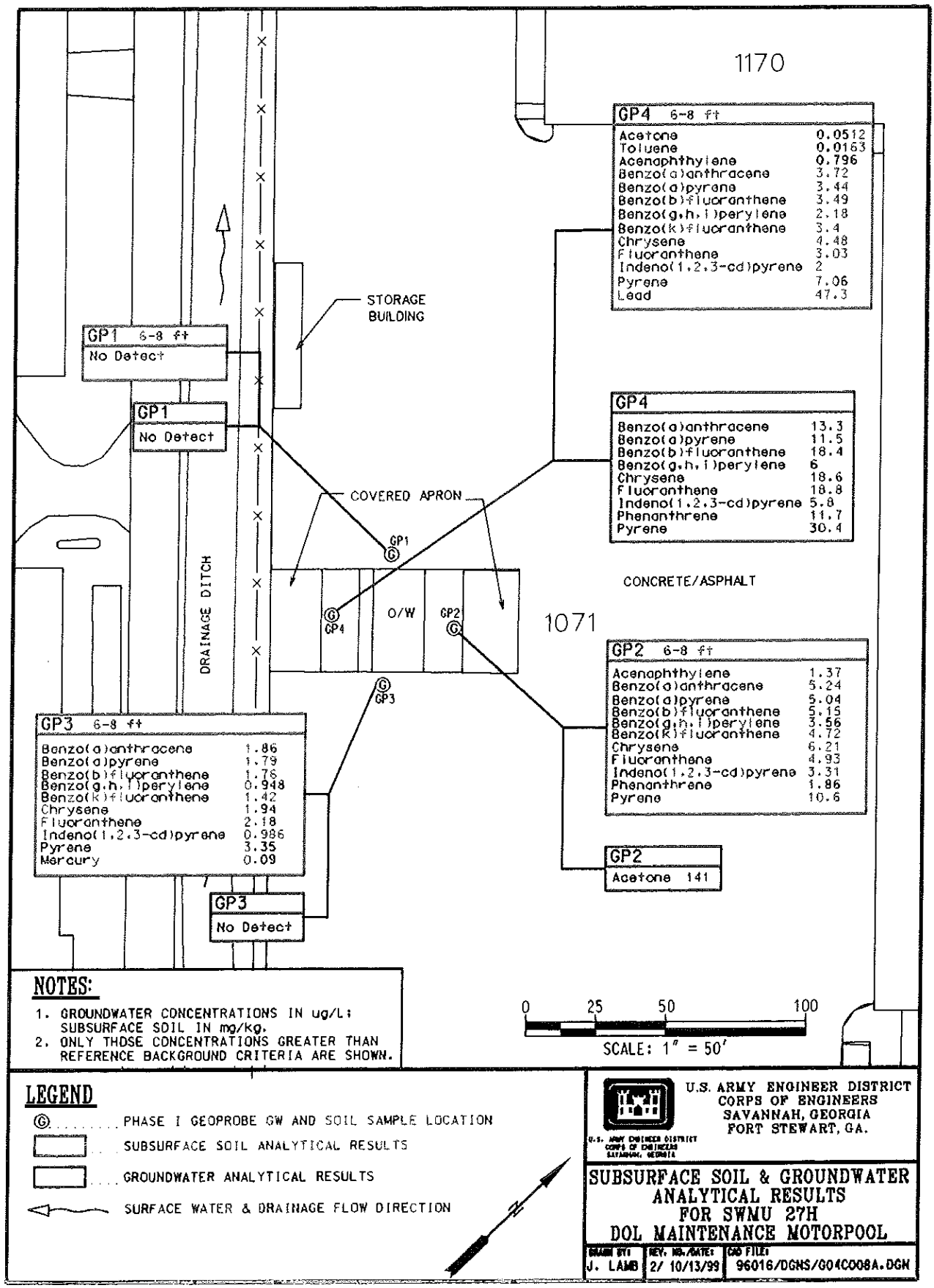

Figure 10.11-2. Summary of Analytical Results in Subsurface Soil and Groundwater, SWMU 27H (Building 1071)

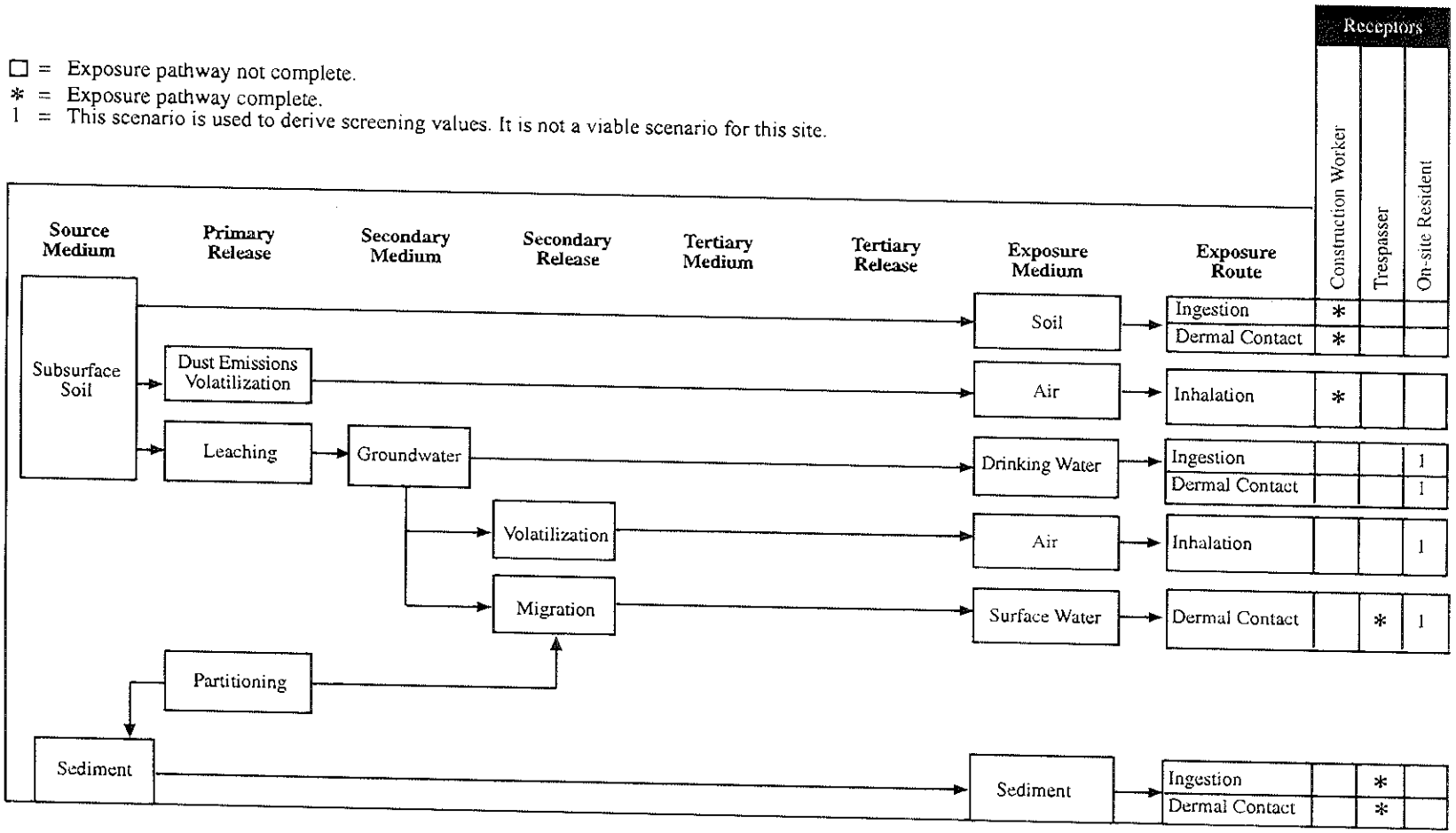

Figure 10.11-3. Potential Migration and Exposure Pathways, SWMU 27H (Building 1071)

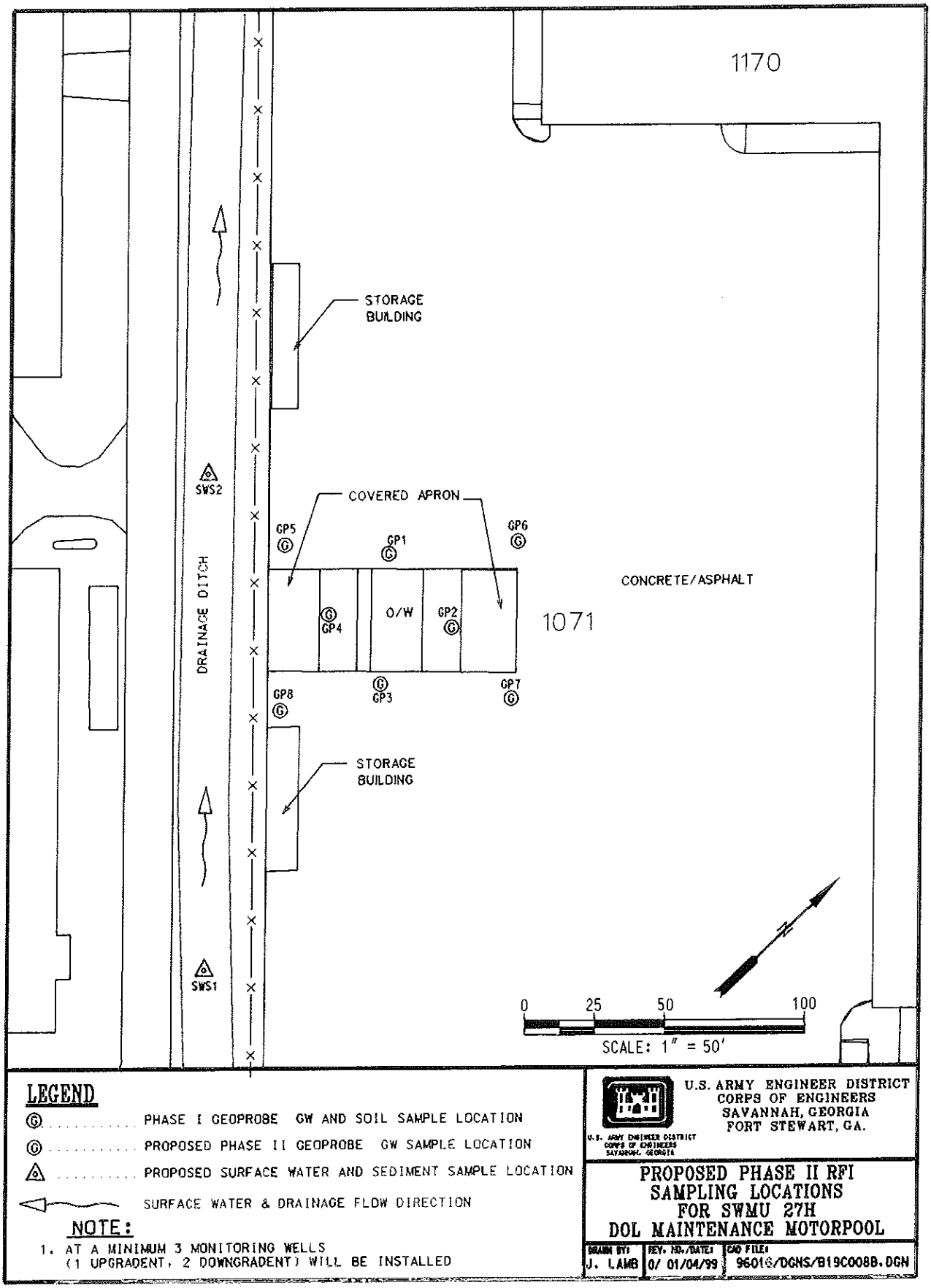

Figure 10.11-4. Proposed Phase II RFI Sampling Locations, SWMU 27H (Building 1071)

10.12 SWMU 27J: GANG MATES, Building 10531

10.12.1 History and Description of SWMU 27J, GANG MATES, Building 10531

SWMU 27J is one of two OWSs that support vehicle maintenance activities under GANG MATES. The OWS is located in the southeastern corner of the armor vehicle parking area, southeast of Building 10531 (Figure 10.12-1). The OWS receives wastewater from floor drains located in Building 10531. The site has visually stained soil and stressed vegetation, potentially due to numerous overflows of the OWS. No previous investigations have been performed at the site. The OWS discharges into the sanitary sewer system.

10.12.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 10.12-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

10.12.3 Physical Characteristics of the Site

10.12.3.1 Topography

The topography of the OWS site is essentially level. The OWS area is located in the grass border between the vehicle parking area and the boundary fence (Figure 10.12-1). The area to the west is a concrete vehicle parking area and a road. The surface elevation is approximately 57.5 feet amsl.

10.12.3.2 Surface drainage

A concrete drainage channel that receives runoff from the vehicle parking area is located approximately 50 feet to the east of the OWS. The runoff from the parking area discharges through the drainage channel to a low area northeast of the site, where the runoff percolates into the soil (Figure 10.12-1). Surface water that contacts potentially contaminated surface soil at the OWS could migrate by overland flow to this low area also. In addition, because groundwater was encountered at approximately 1.5 feet bgs, groundwater may intercept the surface water discharging to the low area to the east. The OWS discharges to the sanitary sewer system.

10.12.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

10.12.3.4 Hydrogeology

Groundwater was encountered at approximately 1.3 feet to 1.57 feet bgs.

10.12.3.5 Ecology

As stated in Section 8.2, SWMU 27J (Building 10531) is classified as an "industrialized area with managed grasslands" (Figure 10.12-1). The site encompasses approximately 0.02 acre and is located in the southeastern corner of the garrison area. The area is comprised mainly of concrete surface, fence, and man-made structures. This SWMU contains a small section of managed grasses, and a forest borders the SWMU toward the east.

10.12.4 Nature and Extent of Contamination

10.12.4.1 Surface soil

Four surface soil samples were collected based on field screening for VOCs. The results of the soil analysis are presented in Table 10.12-1 and Figure 10.12-2.

VOCs. Total xylenes were detected in the samples from GP1 and GP2 at concentrations of 0.0034 mg/kg and 0.0027 mg/kg, respectively; therefore, total xylenes are considered to be SRCs in surface soil.

SVOCs. Di-*N*-octyl phthalate was detected in the sample taken from GP2 at a concentration of 0.433 mg/kg. Di-*N*-octyl phthalate is considered to be an SRC.

Lead. Lead was detected in the surface soil samples taken from all four sampling locations at concentrations ranging from 0.95 mg/kg at GP3 to 7.9 mg/kg at GP1. None of these concentrations exceeded the reference background criterion; therefore, lead is not considered to be an SRC.

10.12.4.2 Subsurface soil

No subsurface soil samples were collected at this site during the field investigation.

10.12.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 10.12-2 and Figure 10.12-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. Benzo(*a*)pyrene was detected in the samples taken from GP2, GP3, and GP4 at concentrations of 6.1 µg/L, 5.7 µg/L, and 9.4 µg/L, respectively. In addition, the concentration levels for benzo(*a*)pyrene exceeded its MCL (0.2 µg/L). The sample taken from GP4 indicated di-*N*-octyl phthalate at a concentration of 13.2 µg/L. Both benzo(*a*)pyrene and di-*N*-octyl phthalate are considered to be SRCs in groundwater.

Lead. Lead was not detected at any of the four sampling locations; therefore, lead is not considered to be an SRC in groundwater.

10.12.4.4 Surface water

No surface water was collected at this site during the field investigation.

10.12.4.5 Sediment

No sediment samples were collected at this site during the field investigation.

10.12.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 10.12-3.

10.12.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of soil SRCs to the respective GSSLs.

Of the SRCs identified in soil, none of the analytes exceeded their respective GSSLs (Table 10.12-4); therefore, there are no CMCOPCs in surface soil at SWMU 27J based on leaching to groundwater.

10.12.6 Human Health Preliminary Risk Evaluation of SWMU 27J, Building 10531

SRCs were identified for surface soil and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

10.12.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. However, surface soil contaminants may migrate off-site to a nearby ditch via runoff and/or discharge of groundwater. Therefore, off-site receptors (i.e., juveniles) may be exposed as a result of playing in the ditch. The potential receptor populations include:

- occupational populations (individuals working on the site),
- juvenile trespassers,
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater, surface soil runoff, release of volatile compounds into the air, and groundwater discharge. The site is comprised mainly of concrete surface, fence, and man-made structures. This SWMU contains a small section of managed grasses, and a forest borders the site toward the east. However, there is a drainage ditch located adjacent to the site. This ditch may receive some runoff from the site. The groundwater at the site is close to the surface and may discharge into the ditch during periods of elevated groundwater levels, such as rain events.

The potential migration and exposure pathways for the various receptors are presented in Figure 10.12-3. The on-site resident scenario is not considered to be a viable scenario for the site. However, in accordance with RBCA guidance, it is used to derive screening valves. The exposure pathways associated with this scenario are presented to show what pathways are taken into consideration when deriving the screening values.

10.12.6.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for surface soils included total xylenes and di-*N*-octyl phthalate. The concentrations of these contaminants were below their respective screening values (Table 10.12-5); therefore, there are no HHCOPCs in surface soils.

The SRCs for groundwater consisted of two SVOCs [benzo(*a*)pyrene (a PAH) and di-*N*-octyl phthalate]. The maximum concentration of benzo(*a*)pyrene (9.4 µg/L) exceeded its screening value [0.0092 µg/L (Table 10.12-5)]. Benzo(*a*)pyrene was above its MCL (0.2 µg/L) in three of four groundwater samples. Di-*N*-octyl phthalate had a maximum concentration that was below its screening value. Benzo(*a*)pyrene is an HHCOPC in groundwater.

10.12.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

10.12.7 Ecological Preliminary Risk Evaluation of SWMU 27J, Building 10531

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

10.12.7.1 Ecological screening value comparison (Step i)

No surface water or sediment samples were collected at the site.

Two SVOCs were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 10.12-6. The ECOPCs identified by the ESV comparison for groundwater are benzo(*a*)pyrene and di-*N*-octyl phthalate. There is no ESV for di-*N*-octyl phthalate, so it is an ECOPC by default (GEPD 1997a). Benzo(*a*)pyrene was detected at concentrations exceeding the ESVs.

Because there are no ESVs for soil, all analytes detected in soil were evaluated further in EPRE Steps ii through v.

10.12.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 10.12.3.5. The preliminary assessment endpoints, ecological receptors, and species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

10.12.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

10.12.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated soil or biota exposed to contaminated soil and by ingestion of drinking water. The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

10.12.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil are presented in Table 10.12-7. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. There are no ECOPCs present in surface soil at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for shrews exposed to VOCs in surface soil does not exceed one.

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 10.12-8. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for the raccoon exposed to SVOCs does not exceed one.

10.12.8 Conclusions and Risk Management and Site Recommendations for SWMU 27J, Building 10531

10.12.8.1 Conclusions

Nature and Extent of Contamination

- Total xylenes were detected in the surface soil samples; therefore, they are considered to be SRCs.
- Di-*N*-octyl phthalate was detected in one of the surface soil samples; therefore, it is an SRC.
- No VOCs were detected in groundwater.
- Benzo(*a*)pyrene and di-*N*-octyl phthalate were detected in groundwater. In addition, the concentration levels for benzo(*a*)pyrene exceeded its MCL.

- Lead was nondetect at all four sampling locations; therefore, lead is not considered to be an SRC for groundwater.

Fate and Transport

- SRCs identified in soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for surface soils.

- Benzo(*a*)pyrene is an HHCOPC for groundwater.

Ecological Preliminary Risk Evaluation

- The ECOPCs in groundwater are benzo(*a*)pyrene and di-*N*-octyl phthalate. These ECOPCs are a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.

- There are no ECOPCs in groundwater for terrestrial receptors.

- There are no ECOPCs in surface soil for terrestrial receptors.

10.12.8.2 Risk management and site recommendations

- Staining of the surface soil is visible at this site, and only surface soil samples were collected based on elevated field headspace readings during the Phase I investigation. Benzo(*a*)pyrene exceeded its MCL in three of four groundwater samples; therefore, the vertical and horizontal extent of groundwater contamination at this site must be determined. At a minimum, four groundwater screening samples will be collected using DPT and analyzed for VOCs and to determine the groundwater gradient. At a minimum, one vertical-profile boring will be installed adjacent to the DPT location having the most elevated concentration of VOCs. At a minimum, three permanent monitoring wells will be installed on-site (one upgradient and two downgradient) for delineation of the horizontal extent of groundwater contamination. Because potential contamination at the site is confined to groundwater and with the concurrence of GEPD, no soil samples will be collected during the installation of the monitoring wells (GEPD 1999b). All wells will be sampled using low-flow techniques. Because overland surface flow and groundwater from the OWS may reach the adjacent drainage ditch, two surface water and sediment samples (downstream of the OWS) will be collected downgradient of the concrete drainage channel. No surface water/sediment location exists upgradient of the OWS. The proposed sampling locations are presented in Figure 10.12-4. The groundwater, surface water, and sediment samples will be analyzed for VOCs, SVOCs, and RCRA metals.

- The information obtained from the additional sampling proposed above will be submitted to GEPD as an addendum to this report to be submitted to GEPD before July 21, 2000. The addendum to the Phase II RFI Report will address any additional human health and/or ecological risk assessments required.

Table 10.12-1. Summary of Analytes Detected in Surface Soil, SWMU 27J (Building 10531)

Station	Reference Background Criteria	7UGP1	7UGP2	7UGP3	7UGP4
Sample ID		7U1111	7U1211	7U1311	7U1411
Date		01/29/98	01/29/98	01/29/98	01/30/98
Depth (feet)		0 to 2	0 to 2	1 to 2	1 to 2
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Xylenes, total	0.00	**0.0034**	**0.0027**		
Semivolatile Organic Compounds (mg/kg)					
Di-*N*-octyl phthalate	0.00		**0.433**		
Metals (mg/kg)					
Lead	8.81	7.9	3.7	0.95	2

Bold indicates concentrations above reference background criteria.

Table 10.12-2. Summary of Analytes Detected in Groundwater, SWMU 27J (Building 10531)

Station	Reference Background Criteria	MCL	7UGP1	7UGP2	7UGP3	7UGP4
Sample ID			7U4111	7U4211	7U4311	7U4411
Date			01/29/98	01/28/98	01/29/98	01/30/98
Sample Type			Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (µg/L)						
Benzo(*a*)pyrene	0.00	0.2		***6.1***	***5.7***	***9.4***
Di-*N*-octyl phthalate	0.00					**13.2**

Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.

Table 10.12-3. Summary of Site-related Contaminants, SWMU 27J (Building 10531)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Xylenes, total	0.0034	NC	NP	ND	NP
Semivolatile Organic Compounds					
Benzo(*a*)pyrene	ND	NC	NP	9.4	NP
Di-*N*-octyl phthalate	0.433	NC	NP	13.2	NP

NC = Soil samples not collected based on field headspace analysis.
ND = Not detected.
NP = No pathway exists.

Table 10.12-4. GSSL Screening of Site-related Contaminants in Soil, SWMU 27J (Building 10531)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Xylenes, total	0.0034	190	No
Semivolatile Organic Compounds (mg/kg)			
Di-*N*-octyl phthalate	0.433	10,000	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

Table 10.12-5. Human Health Risk Screening for Surface Soil and Groundwater, SWMU 27J (Building 10531)

SURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Xylenes, total	2/4	0.0027	0.0034	16,000	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Di-*N*-octyl phthalate	1/4	0.433	0.433	160	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Semivolatile Organic Compounds (µg/L)						
Benzo(*a*)pyrene	3/4	5.7	9.4	0.0092	Yes	Max Detect > Risk Criteria
Di-*N*-octyl phthalate	1/4	13.2	13.2	73	No	Max Detect < Risk Criteria

Table 10.12-6. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27J (Building 10531)

Analyte	SWMU 27J (Building 10531) Maximum	ESV	ECOPC Aquatic Biota?	Justification
Semivolatile Organic Compounds (µg/L)				
Benzo(*a*)pyrene	9.4	0.014[a]	Yes	Max Detect > ESV
Di-*N*-octyl phthalate	13.2	No ESV	Yes	Max Detect > ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 10.12-7. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27J (Building 10531)

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = C_{Max} × $BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = C_{Max} × $BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
Xylenes, total	0.0034	5.00E-02	9.01E-05	2.45E+00	4.10E-06	2.58E-04	No TRV	No HQ
					HI= 4.10E-06			
Semivolatile Organic Compounds								
Di-*N*-octyl phthalate	0.433	5.00E-02	1.15E-02	No TRV	No HQ	3.29E-02	No TRV	No HQ

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

Table 10.12-8. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27J (Building 10531)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/TRV
Semivolatile Organic Compounds				
Benzo(*a*)pyrene	9.4	7.52E-04	2.66E-01	2.83E-03
Di-*N*-octyl phthalate	13.2	1.06E-03	No TRV	--
			HI=	2.83E-03

0.001 (mg/µg) = conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.
-- = Cannot be calculated due to the lack of data.

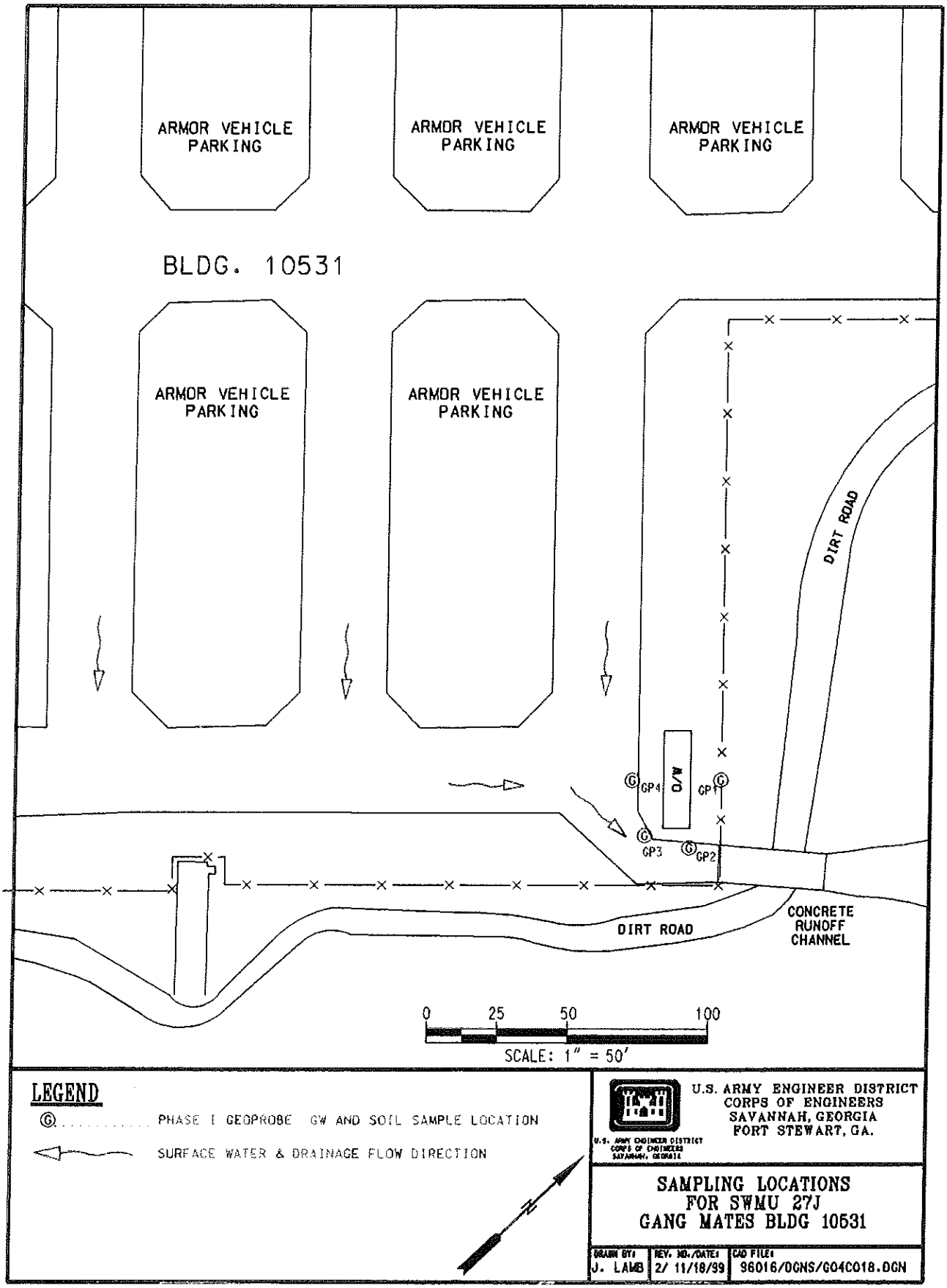

Figure 10.12-1. Sampling Locations, SWMU 27J (Building 10531)

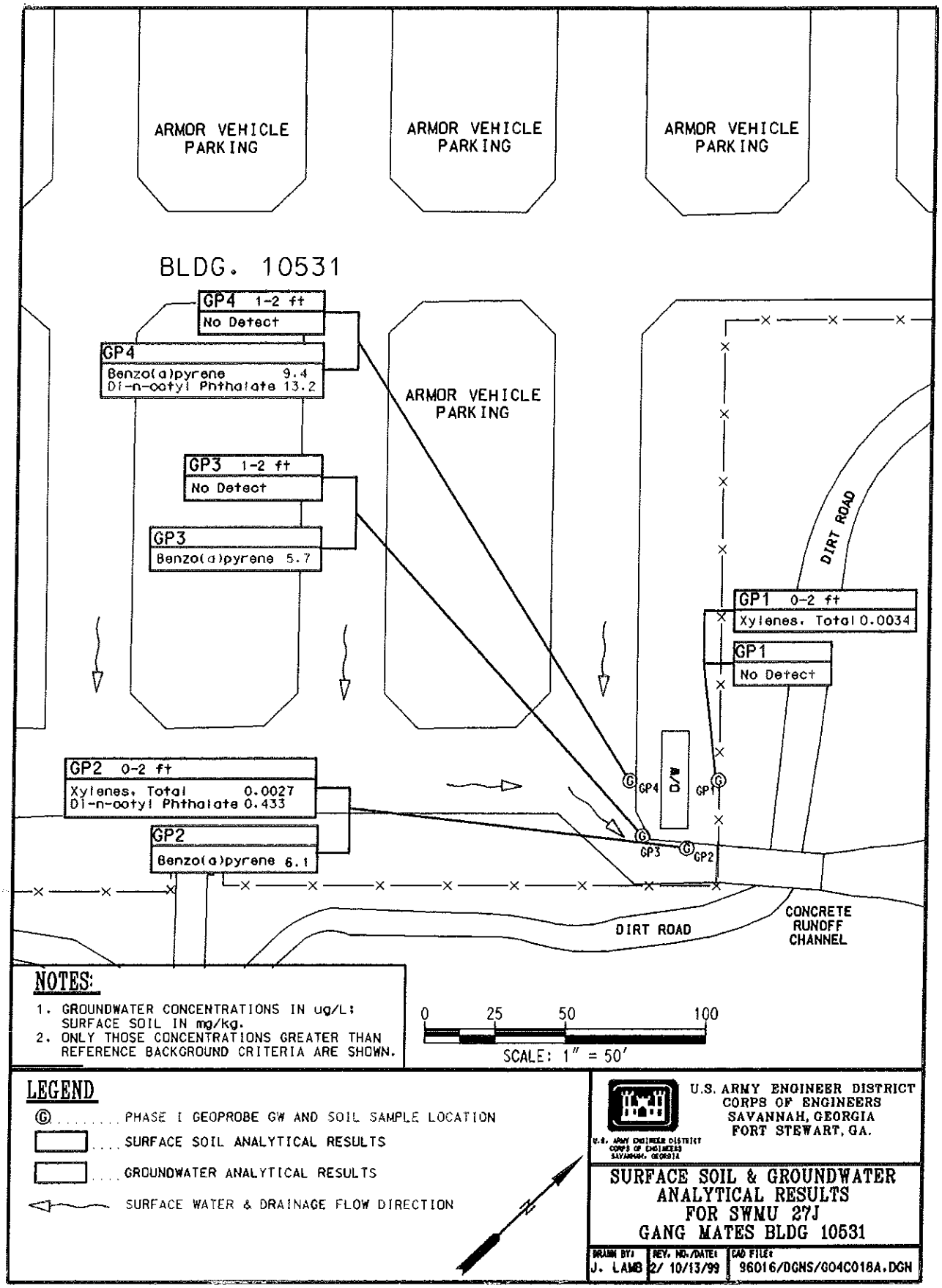

Figure 10.12-2. Summary of Analytical Results in Surface Soil and Groundwater, SWMU 27J (Building 10531)

❑ = Exposure pathway not complete.
* = Exposure pathway complete.
1 = Exposure pathway evaluated for future scenario only.
2 = This scenario is used to derive screening values. It is not a viable scenario for this site.

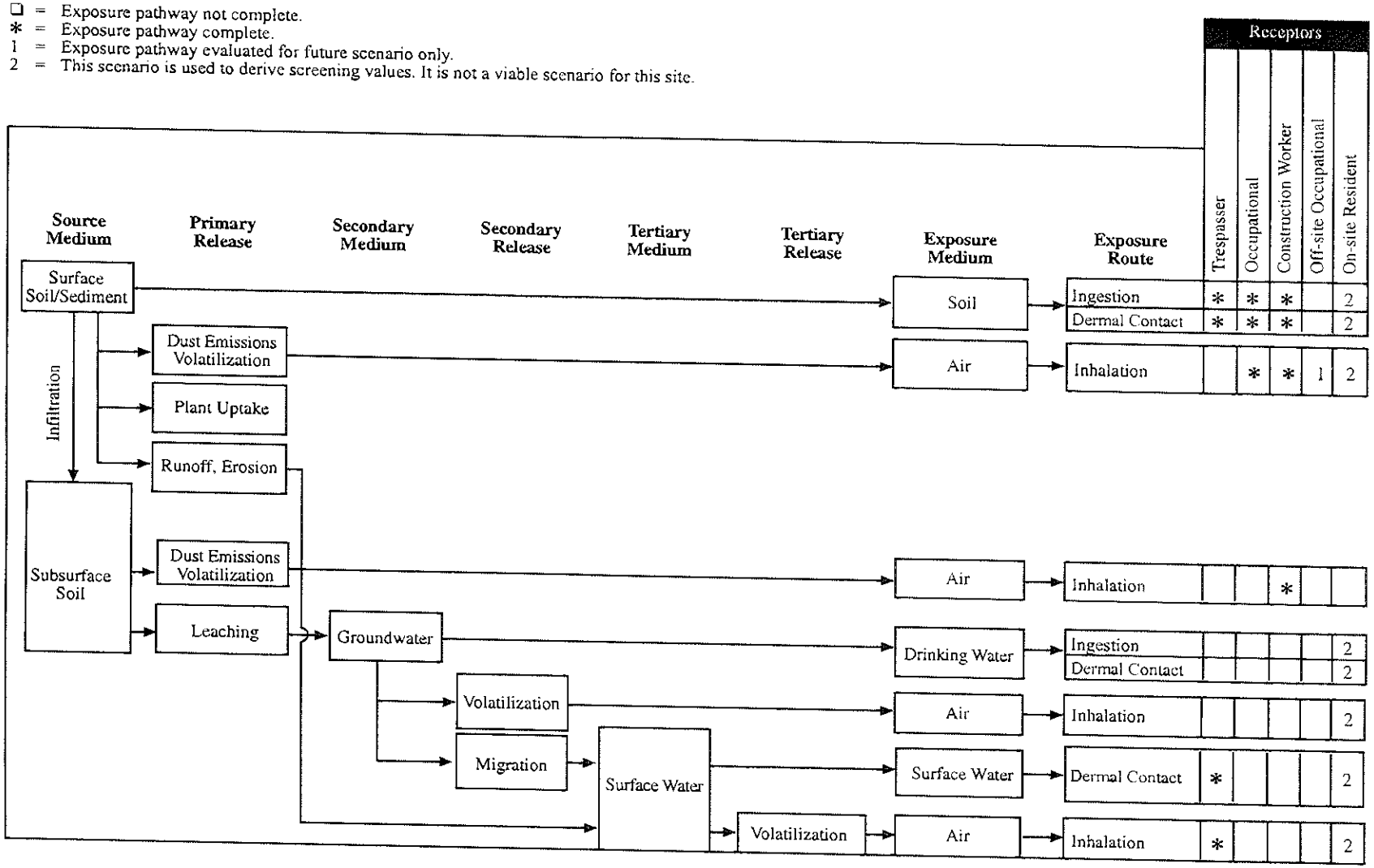

Figure 10.12-3. Potential Migration and Exposure Pathways, SWMU 27J (Building 10531)

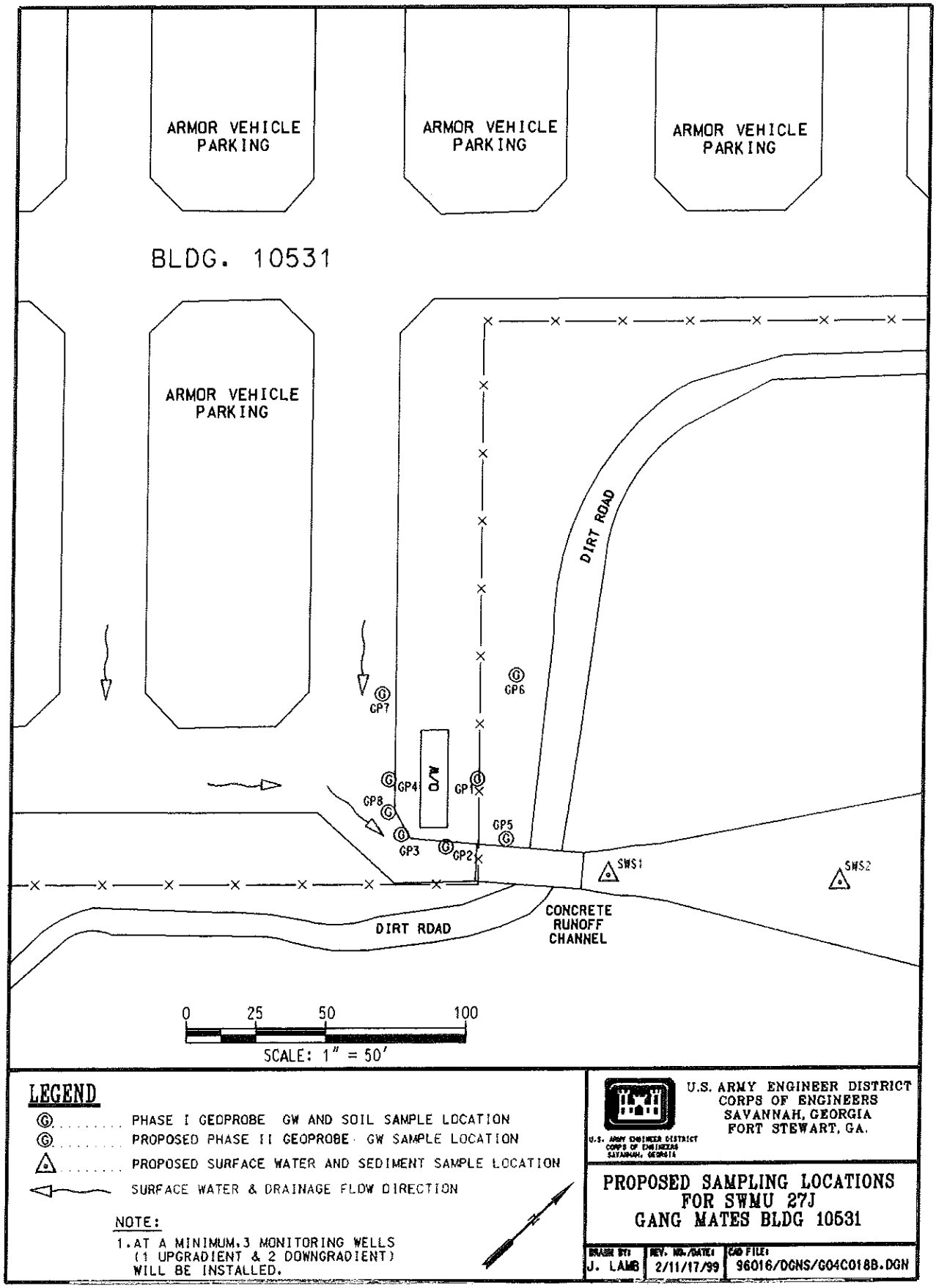

Figure 10.12-4. Proposed Phase II RFI Sampling Locations, SWMU 27J (Building 10531)

10.13 SWMU 27L: NGTC BLOCK 10200

10.13.1 History and Description of SWMU 27L, Block 10200

This OWS is one of eight located in the NGTC along Troupe Avenue. The OWS is located in the southwestern corner of Block 10200. The OWS receives wastewater from an adjacent vehicle wash rack (Figure 10.13-1). Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges into a drainage ditch located southeast of the OWS along Troupe Avenue. The wash rack is not presently in use and is scheduled for removal during 2000. Units rarely use the motorpool, and when assigned to the facility, they are strictly forbidden from using the wash rack. All equipment and vehicles are washed at a centralized location in the National Guard area. Thus, only rainwater currently collects in the OWS, which is an open unit. No previous investigations have been performed at the site.

10.13.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 10.13-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

One surface water/sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch. The surface water and sediment samples were analyzed for VOCs, SVOCs, and lead.

10.13.3 Physical Characteristics of the Site

10.13.3.1 Topography

The topography of the site is essentially flat, with a gravel vehicle parking area adjacent to the north and a grass border between the OWS and wash rack and the fence to the southeast. The surface elevation ranges from 72.02 feet to 72.92 feet amsl.

10.13.3.2 Surface drainage

A drainage ditch is located approximately 25 feet southeast of the OWS. The effluent from the OWS discharges to the drainage ditch. Surface water is present in the drainage ditch only during rainfall events or when the OWS discharges to it. Water flow in the drainage ditch is toward the southwest. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where it is allowed to percolate into the soil (see Section 3.3).

10.13.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

10.13.3.4 Hydrogeology

Groundwater was encountered at approximately 3.5 feet to 4.7 feet bgs.

10.13.3.5 Ecology

As stated in Section 8.2, SWMU 27L is classified as an "industrialized area with managed grasslands." The site lies along the southeastern portion of the garrison area and comprises approximately 0.01 acre (Figure 10.13-1). The only ecological habitat at this SWMU consists of a small grassy area and a storm water ditch that parallels the road. The drainage ditch contains water only after rainfall events. Water flow in the drainage ditch is toward the southwest. Industrial facilities exist across the road from the SWMU.

10.13.4 Nature and Extent of Contamination

10.13.4.1 Surface soil

Two surface soil samples were collected because the field headspace screening for VOCs indicated that interval as having the most elevated level. The results of the surface soil analysis are presented in Figure 10.13-2 and Table 10.13-1.

VOCs. No VOCs were detected in surface soil.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected in the samples taken from GP2 and GP3 at concentrations of 5.2 mg/kg and 5.4 mg/kg, respectively, which are below the reference background criterion; therefore, lead is not considered to be an SRC for surface soil.

10.13.4.2 Subsurface soil

Two subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Figure 10.13-2 and Table 10.13-2.

VOCs. Toluene was detected in the sample collected at GP4 at a concentration of 0.0253 mg/kg; therefore, toluene is considered to be an SRC for subsurface soil.

SVOCs. The sample collected at GP4 indicated the presence of bis(2-ethylhexyl)phthalate at a concentration of 0.23 mg/kg; therefore, bis(2-ethylhexyl)phthalate is considered to be an SRC for subsurface soil.

Lead. Lead was detected in the samples taken from GP1 and GP4 at concentrations of 9.1 mg/kg and 4.9 mg/kg, respectively, which are below the reference background criterion; therefore, lead is not considered to be an SRC.

10.13.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 10.13-3 and Figure 10.13-2.

VOCs. The samples taken at GP1, GP2, and GP4 indicated the presence of 1,1,2-trichloroethane at concentrations of 16.2 µg/L, 5.5 µg/L, and 6.2 µg/L, respectively. In addition, these concentration levels exceeded the MCL for this constituent. Also, the samples collected from GP1, GP2, and GP4 indicated the presence of 4-methyl-2-pentanone at concentrations of 17.7 µg/L, 11.3 µg/L, and 7.4 µg/L, respectively. Bromodichloromethane and toluene were detected in the samples collected from GP1 at concentrations of 53.6 µg/L and 24.6 µg/L, respectively. 2-Butanone was detected at GP1 and GP4 at concentrations of

89.2 µg/L and 14.8 µg/L, respectively. The samples collected from GP2 and GP4 indicated the presence of 2-hexanone at concentrations of 8.6 µg/L and 7 µg/L, respectively. Ethylbenzene was detected in the samples collected from GP1 and GP4 at concentrations of 198 µg/L and 2.2 µg/L, respectively. Total xylenes were detected at a concentration of 810 µg/L at GP1.

All of these analytes—1,1,2-trichloroethane; 2-butanone; 2-hexanone; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; toluene; and total xylenes—are considered to be SRCs for groundwater.

SVOCs. The sample collected from GP1 indicated the presence of 2-methylnaphthalene and naphthalene at concentrations of 22.6 µg/L and 54.1 µg/L, respectively. Both chemicals are considered to be SRCs for groundwater.

Lead. Lead was considered nondetect at all four sampling locations; therefore, lead is not considered to be an SRC for groundwater.

10.13.4.4 Surface water

One surface water sample was collected. The results of the surface water analysis are presented in Table 10.13-4 and Figure 10.13-2.

VOCs. Acetone was detected in the sample collected at SWS1 at a concentration of 73.8 µg/L; therefore, acetone is considered to be an SRC for surface water.

SVOCs. No SVOCs were detected in surface water.

Lead. Lead was not detected in surface water.

10.13.4.5 Sediment

One sediment sample was collected. The results of the sediment analysis are presented in Table 10.13-4 and Figure 10.13-2.

VOCs. No VOCs were detected in sediment.

SVOCs. No SVOCs were detected in sediment.

Lead. Lead was detected in the sediment sample taken from SWS1 at a concentration of 2.2 mg/kg, which does not exceed the reference background criterion; therefore, lead is not considered to be an SRC in sediment.

10.13.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 10.13-5.

10.13.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in subsurface soil, none of the analytes exceeded their respective GSSLs (Table 10.13-6); therefore, there are no CMCOPCs in soil at SWMU 27L based on leaching to groundwater.

10.13.6 Human Health Preliminary Risk Evaluation of SWMU 27L

SRCs were identified for the following media: subsurface soil, groundwater, surface water, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

10.13.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area; however, the OWS discharges to an open ditch outside the fence, but water is present only during rain events. The potential receptor populations include:

- construction workers,
- juvenile trespassers, and
- off-site occupational receptors.

On-site soil contamination at this site is limited to subsurface soil; therefore, only a construction worker or other individuals working within an excavation are likely to be exposed to contaminants. Juvenile trespassers playing in the drainage ditch may be exposed to contaminants present in sediment. It is unlikely that other receptors would come in contact with these contaminants. However, release of volatiles from the sediment may result in exposure of off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

The site is relatively flat and consists primarily of concrete structures; however, a small grassy area and storm water ditch parallel the road. Potential migration pathways for soils include leaching into groundwater. Soil contamination at the site is limited to subsurface soils; therefore, air migration pathways (volatilization, fugitive dust, etc.) and surface water runoff are not viable migration pathways.

As previously discussed, the OWS discharges to a ditch adjacent to the site. Contaminants in the water may become adsorbed to soil particles within the ditch. Potential migration pathways for sediment include leaching into subsurface soils and volatilization into the air. The drainage ditch is vegetated, so releases via fugitive dust are not likely.

Because groundwater is lower than the adjacent drainage ditch and no other surface bodies are nearby, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 10.13-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

Given that water is present only during rain events, exposure, if any, to contaminants in surface water would be sporadic; therefore, potential exposure to contaminants in surface water is not considered to be a chronic exposure and is generally not addressed. However, surface water samples were taken at this site during a storm event. For the purposes of completeness, the risk characterization addressed potential risks associated with contaminants in the surface water.

10.13.6.2 Risk evaluation

The results of the human health risk screening are given below.

Toluene and bis(2-ethylhexyl)phthalate were identified as SRCs for subsurface soil. The concentrations of these contaminants were below their respective screening values (Table 10.13-7); therefore, there are no HHCOPCs in subsurface soil.

SRCs for groundwater included eight volatile organics and two SVOCs (PAHs 2-methylnaphthalene and naphthalene). The maximum concentrations of 1,1,2-trichloroethane; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; 2-methylnaphthalene; and naphthalene exceeded their respective screening values (Table 10.13-7). The maximum concentrations for the remaining volatile organics were below their respective screening values. Therefore, 1,1,2-trichloroethane; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; 2-methylnaphthalene; and naphthalene are HHCOPCs for groundwater.

Acetone was identified as an SRC in surface water. There is no AWQC for acetone. However, the maximum concentration of acetone (73.8 µg/L) was above the risk-based screening level for tap water (61 µg/L). Given that incidental ingestion is the only potential pathway, the RBC for tap water is a more representative screening value; therefore, acetone is an HHCOPC in surface water.

10.13.6.3 Uncertainties

The potential risks associated with 2-hexanone could not be evaluated. A surrogate screening value was used for 2-methylnaphthalene; therefore, this contaminant might or might not be a true HHCOPC. The removal of 2-hexanone and 2-methylnaphthalene might result in an underestimation of risk. Additional human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

10.13.7 Ecological Preliminary Risk Evaluation of SWMU 27L

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

10.13.7.1 Ecological screening value comparison (Step i)

Lead was not detected in surface water. Only acetone was detected in surface water. The results of the ESV comparison for surface water are presented in Table 10.13-8. No ECOPCs were identified by the ESV comparison for surface water. Surface water was not evaluated further in the EPRE.

Eight VOCs and two SVOCs were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 10.13-9. The ECOPCs identified by the ESV comparison for groundwater were bromodichloromethane, total xylenes, and 2-methylnaphthalene. Only total xylenes were detected at a concentration exceeding the ESV. There are no ESVs for the other two organics, so they are ECOPCs by default (GEPD 1997a).

No SRCs were detected in surface soil or the drainage ditch sediment.

10.13.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 10.13.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

10.13.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

10.13.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of drinking water. The exposure parameters for the surrogate species—raccoons—are presented in Table 8-6.

10.13.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 10.13-10. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for VOCs does not exceed one.

10.13.8 Conclusions and Risk Management and Site Recommendations for SWMU 27L

10.13.8.1 Conclusions

Nature and Extent of Contamination

- No contaminants were indicated in surface soil.
- Toluene and bis(2-ethylhexyl)phthalate were detected in subsurface soil and are considered to be SRCs for subsurface soil.
- Groundwater samples indicated the presence of 1,1,2-trichloroethane; 2-butanone; 2-hexanone; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; toluene; total xylenes; 2-methylnaphthalene; and naphthalene. 1,1,2-Trichloroethane was detected above its MCL in three of the four groundwater samples. These analytes are considered to be SRCs.
- Lead was not detected in groundwater at concentrations exceeding the reference background criterion; therefore, lead is not considered to be an SRC.
- Acetone was detected in the surface water sample and is considered to be an SRC for surface water.
- No VOCs or SVOCs were detected in the sediment.
- Lead was detected in sediment below the reference background criterion; therefore, lead is not considered to be an SRC in sediment.

Fate and Transport

- SRCs identified in subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for subsurface soil or surface water.
- The following contaminants were identified as HHCOPCs for groundwater: 1,1,2-trichloroethane; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; 2-methylnaphthalene; and naphthalene.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in surface water at the site.
- The ECOPCs in groundwater are bromodichloromethane, total xylenes, and 2-methylnaphthalene. These ECOPCs are a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.
- There are no ECOPCs in groundwater for terrestrial receptors.

10.13.8.2 Risk management and site recommendations

- 1,1,2,2-Tetrachloroethane was detected above the MCL in three of four groundwater samples. The extent of potential groundwater contamination was not determined during the Phase I investigation; therefore, the vertical and horizontal extent of groundwater contamination at this site must be determined. At a minimum, four groundwater screening samples will be collected using DPT techniques and analyzed for VOCs to evaluate the horizontal extent of potential contamination and to estimate the groundwater direction. At a minimum, one vertical-profile boring will be installed adjacent to the DPT location having the most elevated concentration of VOCs. The field screening results for VOCs from the four DPT and vertical-profile samples will be used to locate at least three shallow monitoring wells (one upgradient and two downgradient) and potentially three deep monitoring wells (one upgradient and two downgradient). The deep monitoring wells will be installed only if vertical contamination is indicated. The field screening results and recommended locations of monitoring wells will be presented to GEPD for its concurrence prior to installation. At each well, two soil samples will be collected following the procedures outlined in the revised final version of the SAP for Phase II RFIs of the 16 SWMUs (SAIC 1997). Surface soil samples (0 foot to 2 feet bgs) will be collected at each monitoring well location to evaluate the potential risk to ecological receptors. All wells will be sampled using low-flow techniques. Because overland surface flow from the OWS may reach the adjacent drainage ditch, two surface water and two sediment samples (one upstream and one downstream of the OWS) will be collected in the drainage ditch. The proposed sampling locations are presented in Figure 10.13-4. The soil, surface water, sediment, and groundwater samples will be analyzed for VOCs, SVOCs, and RCRA metals. Geotechnical samples will be collected to support the fate and transport analysis, if it is required.

- The information obtained from the additional sampling proposed above will be submitted to GEPD as an addendum to this report to be submitted to GEPD before July 21, 2000. The addendum to the Phase II RFI Report will any address additional human health and/or ecological risk assessments required.

Table 10.13-1. Summary of Analytes Detected in Surface Soil, SWMU 27L

Station	Reference Background Criteria	7XGP2	7XGP3
Sample ID		7X1211	7X1311
Date		01/27/98	01/27/98
Depth (feet)		0 to 2	0 to 2
Sample Type		Grab	Grab
Metals (mg/kg)			
Lead	8.81	5.2	5.4

Table 10.13-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27L

Station	Reference Background Criteria	7XGP1	7XGP4
Sample ID		7X1111	7X1411
Date		01/27/98	01/27/98
Depth (feet)		2 to 5	2 to 5
Sample Type		Grab	Grab
Volatile Organic Compounds (mg/kg)			
Toluene	0.00		**0.0253**
Semivolatile Organic Compounds (mg/kg)			
Bis(2-ethylhexyl)phthalate	0.00		**0.23**
Metals (mg/kg)			
Lead	11.10	9.1	4.9

Bold indicates concentrations above reference background criteria.

Table 10.13-3. Summary of Analytes Detected in Groundwater, SWMU 27L

Station	Reference Background Criteria	MCL	7XGP1	7XGP2	7XGP3	7XGP4
Sample ID			7X4111	7X4211	7X4311	7X4411
Date			01/27/98	01/27/98	01/27/98	01/27/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
1,1,2-Trichloroethane	0.00	5	***16.2***	***5.5***		***6.2***
2-Butanone	0.00		**89.2**			**14.8**
2-Hexanone	0.00			**8.6**		**7**
4-Methyl-2-pentanone	0.00		**17.7**	**11.3**		**7.4**
Bromodichloromethane	0.00	100	**53.6**			
Ethylbenzene	0.00	700	**198**			**2.2**
Toluene	0.00	1,000	**24.6**			
Xylenes, total	0.00	10,000	**810**			
Semivolatile Organic Compounds (µg/L)						
2-Methylnaphthalene	0.00		**22.6**			
Naphthalene	0.00		**54.1**			

Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.

Table 10.13-4. Summary of Analytes Detected in Surface Water and Sediment, SWMU 27L

SURFACE WATER		
Station	**Reference Background Criteria**	**7XSWS1**
Sample ID		**7X3111**
Date		**02/01/98**
Sample Type		**Grab**
Volatile Organic Compounds (µg/L)		
Acetone	0.00	**73.8**

SEDIMENT		
Station	**Reference Background Criteria**	**7XSWS1**
Sample ID		**7X2111**
Date		**02/01/98**
Sample Type		**Grab**
Metals (mg/kg)		
Lead	8.81	2.2

Bold indicates concentrations above reference background criteria.

Table 10.13-5. Summary of Site-related Contaminants, SWMU 27L

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
1,1,2-Trichloroethane	ND	ND	ND	16.2	ND
2-Butanone	ND	ND	ND	89.2	ND
2-Hexanone	ND	ND	ND	8.6	ND
4-Methyl-2-pentanone	ND	ND	ND	17.7	ND
Acetone	ND	ND	ND	ND	73.8
Bromodichloromethane	ND	ND	ND	53.6	ND
Ethylbenzene	ND	ND	ND	198	ND
Toluene	ND	0.0253	ND	24.6	ND
Trichloroethene	ND	ND	ND	ND	ND
Xylenes, total	ND	ND	ND	810	ND
Semivolatile Organic Compounds					
2-Methylnaphthalene	ND	ND	ND	22.6	ND
Bis(2-ethylhexyl)phthalate	ND	0.23	ND	ND	ND
Naphthalene	ND	ND	ND	54.1	ND

ND = Not detected above reference background criteria.

Table 10.13-6. GSSL Screening of Site-related Contaminants in Soil, SWMU 27L

SOIL			
Site-related Contaminant	**Maximum Concentration**	**GSSL[a]**	**CMCOPC?**
Volatile Organic Compounds (mg/kg)			
Toluene	0.0253	12	No
Semivolatile Organic Compounds (mg/kg)			
Bis(2-ethylhexyl)phthalate	0.23	3,600	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

Table 10.13-7. Human Health Risk Screening for Subsurface Soil, Groundwater, and Surface Water, SWMU 27L

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Toluene	1/2	0.0253	0.0253	1,600	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Bis(2-ethylhexyl)phthalate	1/2	0.23	0.23	46	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Freq. of Detection**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
1,1,2-Trichloroethane	3/4	5.5	16.2	0.19	Yes	Max Detect > Risk Criteria
2-Butanone	2/4	14.8	89.2	190	No	Max Detect < Risk Criteria
2-Hexanone	2/4	7	8.6	146	No	Max Detect < Risk Criteria
4-Methyl-2-pentanone	3/4	7.4	17.7	14	Yes	Max Detect > Risk Criteria
Bromodichloromethane	1/4	53.6	53.6	0.17	Yes	Max Detect > Risk Criteria
Ethylbenzene	2/3	2.2	198	130	Yes	Max Detect > Risk Criteria
Toluene	1/4	24.6	24.6	75	No	Max Detect < Risk Criteria
Xylenes, total	1/3	810	810	1,200	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (µg/L)						
2-Methylnaphthalene	1/4	22.6	22.6	12	Yes	Max Detect > Risk Criteria
Naphthalene	1/4	54.1	54.1	0.65	Yes	Max Detect > Risk Criteria

SURFACE WATER						
Analyte	**Freq. of Detection**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
Acetone	1/1	73.8	73.8	61	Yes	Max Detect > Risk Criteria

Table 10.13-8. Ecological Screening Value Comparison for Analytes Detected in Surface Water, SWMU 27L

Analyte	SWMU 27L Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Acetone	73.8	1,500[a]	No	Max Detect < ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.

Table 10.13-9. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27L

Analyte	SWMU 27L Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
1,1,2-Trichloroethane	16.2	940	No	Max Detect < ESV
2-Butanone	89.2	14,000[a]	No	Max Detect < ESV
2-Hexanone	8.6	99[a]	No	Max Detect < ESV
4-Methyl-2-pentanone	17.7	170[a]	No	Max Detect < ESV
Bromodichloromethane	53.6	No ESV	Yes	ECOPC by default
Ethylbenzene	198	453	No	Max Detect < ESV
Toluene	24.6	175	No	Max Detect < ESV
Xylenes, total	810	1.8[a]	Yes	Max Detect > ESV
Semivolatile Organic Compounds (µg/L)				
2-Methylnaphthalene	22.6	No ESV	Yes	ECOPC by default
Naphthalene	54.1	62	No	Max Detect < ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.
Cells with double borders indicate concentrations exceeding ESVs or, when there is no ESV, concentrations that become ECOPCs by default.

Table 10.13-10. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27L

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds				
Bromodichloromethane	53.6	4.29E-03	4.76E-01	9.01E-03
Xylenes, total	810	6.48E-02	5.48E-01	1.18E-02
			HI=	2.08E-02
Semivolatile Organic Compounds				
2-Methylnaphthalene	22.6	1.81E-03	2.46E+00	7.36E-04

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).

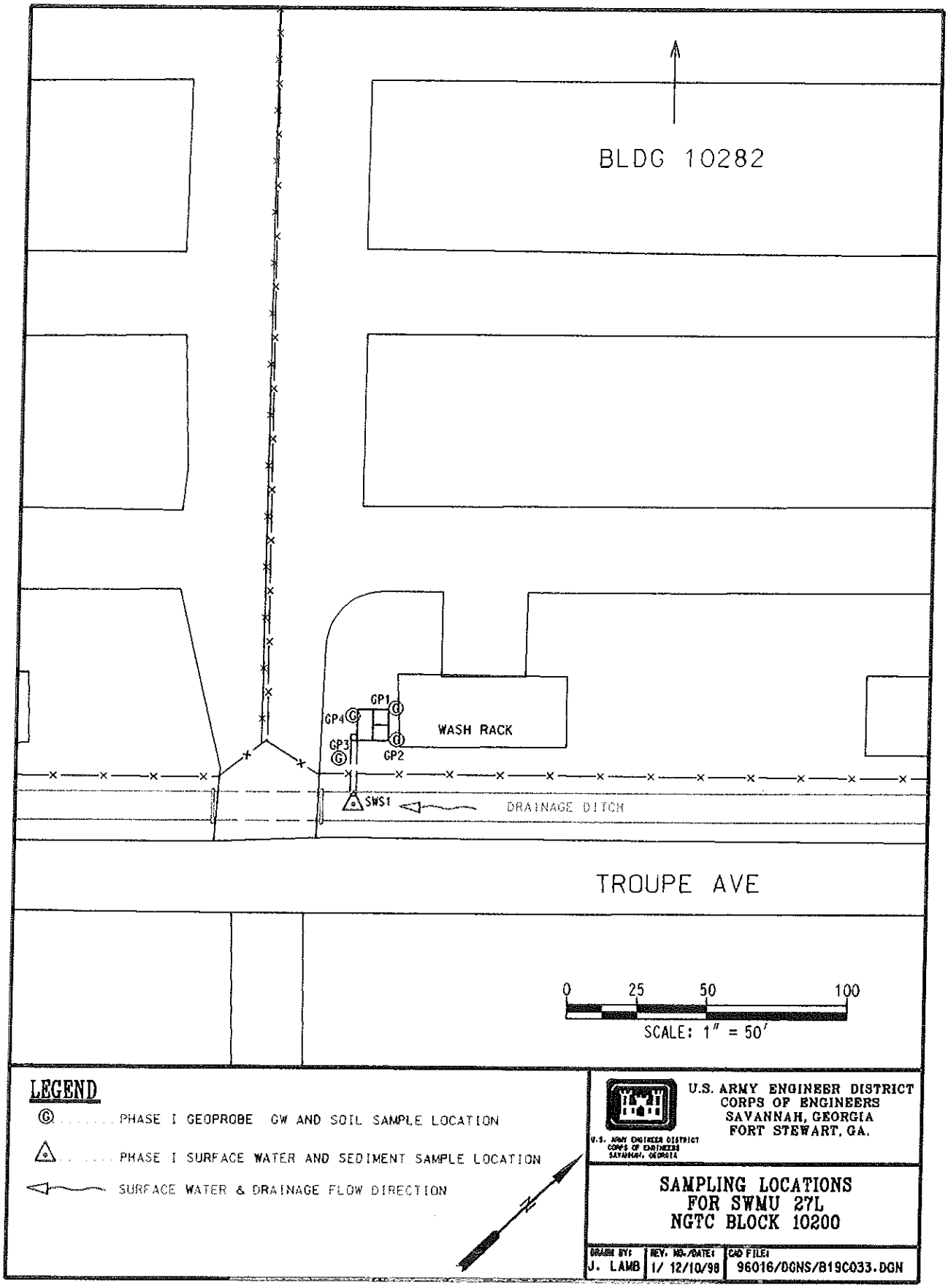

Figure 10.13-1. Sampling Locations, SWMU 27L

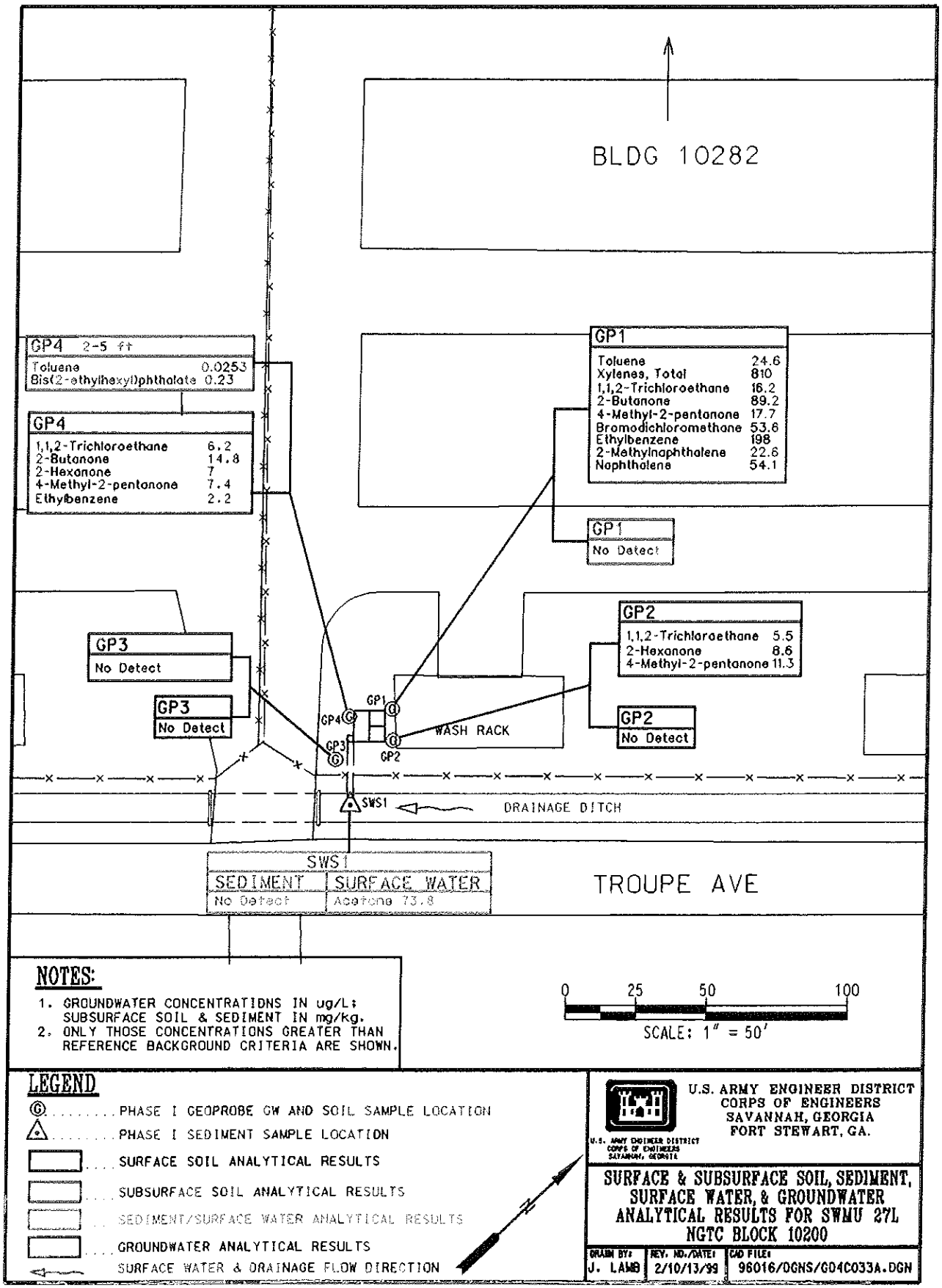

Figure 10.13-2. Summary of Analytical Results in Subsurface Soil, Groundwater, Surface Water, and Sediment, SWMU 27L

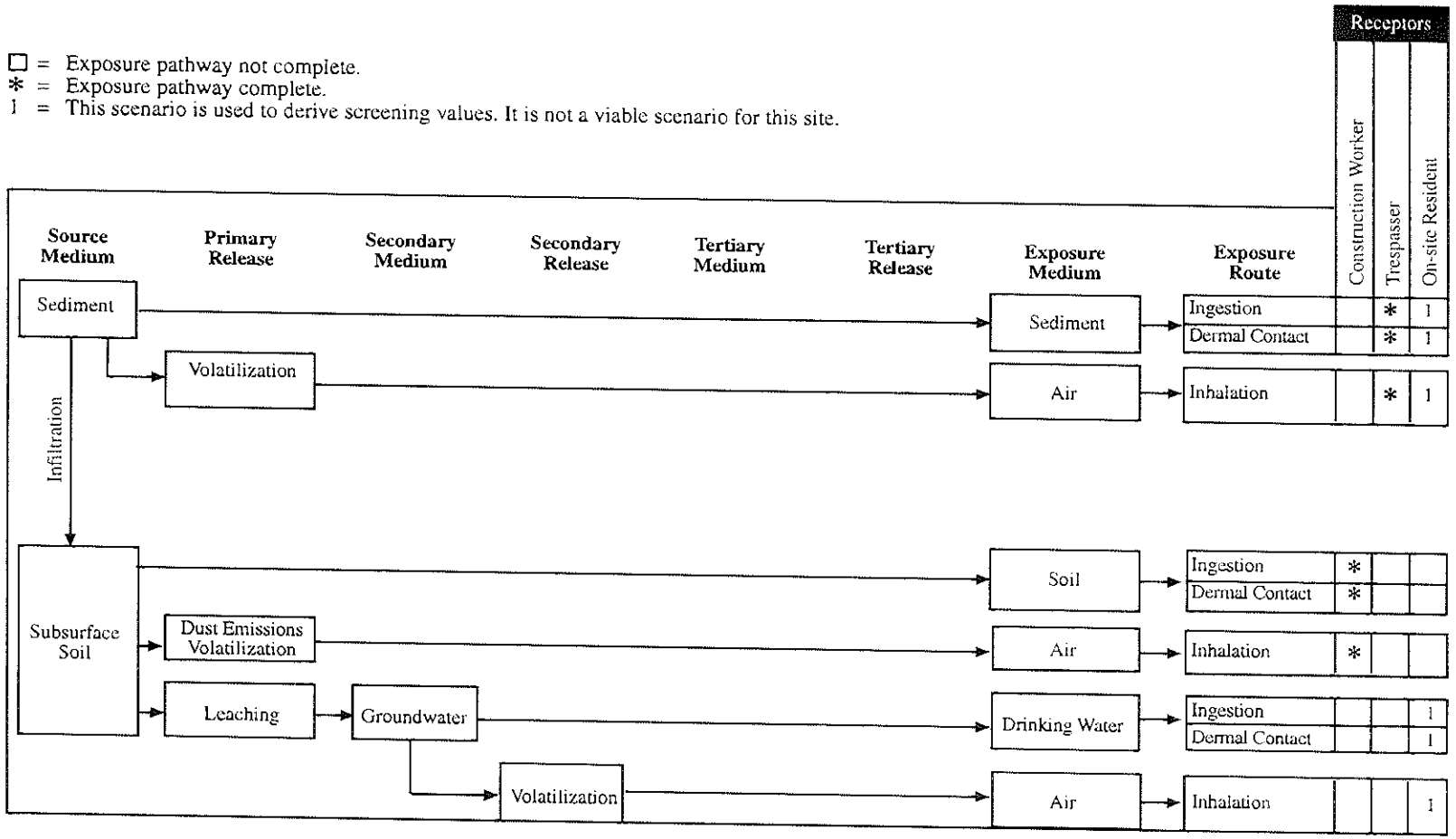

Figure 10.13-3. Potential Migration and Exposure Pathways, SWMU 27L

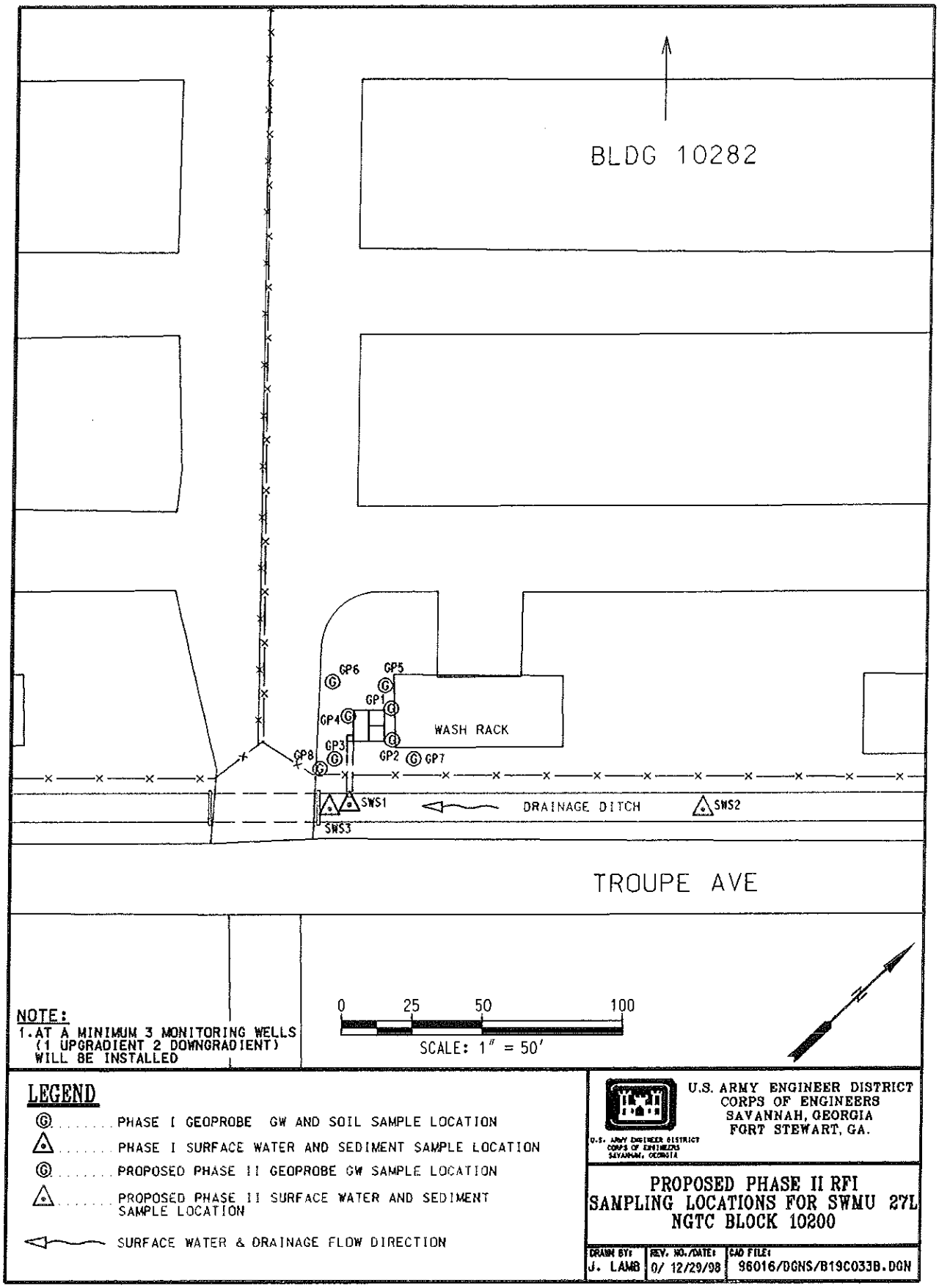

Figure 10.13-4. Proposed Phase II RFI Sampling Locations, SWMU 27L

10.14 SWMU 27T: 293 MP COMPANY

10.14.1 History and Description of SWMU 27T, 293 MP Company

SWMU 27T consists of one OWS that supports the vehicle maintenance activities of the 293 MP Company. The OWS is located in the southeastern corner outside the fenced boundary of the motorpool at the corner of Troupe Avenue and West 4th Street (Figure 10.14-1). The OWS receives wastewater from a vehicle wash rack located to the northwest. The effluent from the OWS discharges to the NGTC Equalization Basin (SWMU 37), and the waste oil is pumped out of the holding unit and burned at the Central Energy Plant. No previous investigations have been performed at the site.

10.14.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at SWMU 27T. The locations of the soil and groundwater sampling are presented in Figure 10.14-1. The four soil samples were collected based on field headspace screening for VOCs. The analytical laboratory inadvertently missed the holding times for VOCs and SVOCs for soil at GP1, GP2, and GP3 during the initial sampling endeavor (January 1998). Soil was resampled on May 6, 1998. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

Three sediment samples were collected from the drainage ditch. Initially, only a sediment sample downstream of the OWS was collected in February 2, 1998. To confirm that upstream sources were impacting the sediment downstream of the OWS, an upstream and a downstream sediment sample were collected September 23, 1999. The first sediment sample was analyzed for VOCs, SVOCs, and lead. The second set of sediment samples was analyzed for VOCs, SVOCs, and RCRA metals. No surface water was available during the Phase I RFI.

10.14.3 Physical Characteristics of the Site

10.14.3.1 Topography

The topography of the site is essentially flat. The surface elevation is approximately 85 feet amsl. The OWS is surrounded by grass that extends to unpaved Troupe Avenue to the southeast.

10.14.3.2 Surface drainage

A drainage ditch is located between the OWS and the wash rack (Figure 10.14-1). The effluent (i.e., separated water) from the OWS discharges to the NGTC Equalization Basin (SWMU 37). Surface water is present in the drainage ditch only during rainfall events.

10.14.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

10.14.3.4 Hydrogeology

Groundwater was encountered at approximately 4.4 feet to 6.0 feet bgs.

10.14.3.5 Ecology

As stated in Section 8.2, SWMU 27T is classified as an "industrialized area with managed grasslands." SWMU 27T comprises approximately 0.01 acre (Figure 10.14-1), is covered largely by concrete, and includes an area of managed grass within the SWMU boundaries. Additionally, a storm water ditch separates the SWMU from the road.

10.14.4 Nature and Extent of Contamination

10.14.4.1 Surface soil

Three surface soil samples were collected based on field headspace screening for VOCs. The analytical laboratory missed the holding times for VOCs and SVOCs for soil at GP2 and GP3 during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. The results of the soil analysis are presented in Table 10.14-1 and Figure 10.14-2.

VOCs. No VOCs were detected in surface soil.

SVOCs. Benzo(*b*)fluoranthene and phenanthrene were detected in the sample collected from GP3 at concentrations of 1.14 mg/kg and 0.79 mg/kg, respectively. The sample collected from GP4 indicated the presence of chrysene at a concentration of 0.215 mg/kg. Pyrene was detected in the samples collected from GP3 and GP4 at concentrations of 1.33 mg/kg and 0.22 mg/kg, respectively. Benzo(*b*)fluoranthene, chrysene, phenanthrene, and pyrene are considered to be SRCs in surface soil.

Lead. Lead was detected in the samples taken from all three locations at concentrations ranging from 6.1 mg/kg at GP3 to 7.5 mg/kg at GP2. None of the concentrations exceeded the respective reference background criteria; therefore, lead is not considered to be an SRC for surface soil.

10.14.4.2 Subsurface soil

One subsurface soil sample was collected based on field headspace screening for VOCs. The analytical laboratory missed the holding times for VOCs and SVOCs for soil at GP1 during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. The results of the soil analysis are presented in Table 10.14-2 and Figure 10.14-2.

VOCs. No VOCs were detected in subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in the sample taken from GP1 at a concentration of 5.5 mg/kg, which does not exceed the reference background criterion; therefore, lead is not considered to be an SRC in subsurface soil.

10.14.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 10.14-3 and Figure 10.14-2.

VOCs. Acetone was detected in GP3 at a concentration of 50.2 µg/L. Acetone is considered to be an SRC in groundwater.

SVOCs. Pyrene was detected in the sample collected from GP4 at a concentration of 26.2 µg/L; therefore, pyrene is considered to be an SRC in groundwater.

Lead. Lead was below the reference background criterion at GP1 and GP2 and not detected at GP3 and GP4; therefore, lead is not considered to be an SRC in groundwater.

10.14.4.4 Surface water

There was no surface water present at the site during the Phase I field investigation.

10.14.4.5 Sediment

Three sediment samples were collected, initially (February 1, 1998) only one downstream of the OWS, followed by a resampling (September 23, 1999) of the sediment samples both upstream and downstream (see Section 10.14.2). The results of the sediment analyses are presented in Table 10.14-4 and Figure 10.14-2.

VOCs. No VOCs were detected in the initial downstream sediment sample. However, four VOCs were detected in the sediment samples collected September 23, 1999. 2-Butanone, 2-hexanone, 4-methyl-2-pentanone, and acetone were detected at concentrations of 0.0227 mg/kg, 0.0023 mg/kg, 0.0052 mg/kg, and 0.099 mg/kg, respectively. 2-Butanone and acetone were also detected in the upstream sediment sample at concentrations of 0.0206 mg/kg and 0.391 mg/kg, respectively. 2-Butanone, 2-hexanone, 4-methyl-2-pentanone, and acetone are considered to be SRCs in sediment; however, only two of the VOCs (2-hexanone and 4-methyl-2-pentanone) were detected above their site-specific background criteria, indicating that a source upstream of the OWS is impacting the sediment characteristics. The probable source is surface runoff from the parking area of the adjacent motorpool that drains into the drainage ditch upstream of the OWS.

SVOCs. Benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, fluoranthene, indeno(*1,2,3-cd*)pyrene, and pyrene were detected in the downstream sediment samples. Chrysene was also detected at a concentration of 2.54 mg/kg in the downstream sediment sample collected on February 1, 1998. All of these constituents were detected in the upstream sediment sample as well. The sediment sample initially collected (February 1998) had the higher concentrations of detected SVOCs. The concentrations of benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, fluoranthene, indeno(*1,2,3-cd*)pyrene, and pyrene from the February 1998 and September 1999 samples were 1.07 mg/kg and 0.405 mg/kg, 1.95 mg/kg and 0.677 mg/kg, 3.51 mg/kg and 1.06 mg/kg, 1.81 mg/kg and 0.633 mg/kg, 2.4 mg/kg and 0.851 mg/kg, 2.92 mg/kg and 1 mg/kg, 1.65 mg/kg and 0.582 mg/kg, and 3.25 mg/kg and 1.12 mg/kg, respectively. Except for benzo(*a*)anthracene, all of the constituents detected in the sediment samples collected February 1998 were at concentrations that were above the site-specific background criteria of September 1999. No site-specific background sample was collected during the February 1998 sampling endeavor. Benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, fluoranthene, indeno(*1,2,3-cd*)pyrene, and pyrene are considered to be SRCs in sediment; however, the presence of these constituents in the upstream sediment sample indicates that a source upstream of the OWS is impacting the sediment characteristics. The probable source is surface runoff from the parking area of the adjacent motorpool that drains into the drainage ditch upstream of the OWS.

RCRA Metals. Arsenic, barium, cadmium, chromium, lead, mercury, and selenium were detected in the upstream and downstream sediment samples. However, only cadmium was detected above the site-specific reference background criterion. Cadmium is an SRC in sediment; however, the presence of these constituents in the upstream sediment sample indicates that a source upstream of the OWS is impacting the sediment characteristics. The probable source is surface runoff from the parking area of the adjacent motorpool that drains into the drainage ditch upstream of the OWS.

10.14.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 10.14-5.

10.14.5 Fate and Transport Considerations

The potential for soil and sediment contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of soil and sediment SRCs to their respective GSSLs.

Of the SRCs identified in soil and sediment, only cadmium exceeded its GSSL (Table 10.14-6). Cadmium is a CMCOPC in sediment based on leaching to groundwater.

10.14.6 Human Health Preliminary Risk Evaluation of SWMU 27T

SRCs for SWMU 27T were identified for the following media: surface soil, groundwater, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

10.14.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; tberefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is covered largely by concrete. An area of managed grass occurs within the SWMU boundaries. Additionally, a storm water ditch separates the SWMU from the road. Therefore, soil erosion via fugitive dust is not a viable migration pathway. Given the proximity of the OWS to the storm water ditch, contaminants in surface soils may migrate to the drainage ditch. However, a road is located alongside the ditch, and this road may be contributing to the organic and lead concentrations detected in the drainage ditch sediment. In addition, the storm water drainage system for the entire 200-motorpool block discharges to this ditch.

Because the elevation of groundwater is lower than the adjacent drainage ditch and no other surface bodies are nearby, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 10.14-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

10.14.6.2 Risk evaluation

The results of the human health risk screening are given below.

Four SVOCs [PAHs benzo(*b*)fluoranthene, chrysene, phenanthrene, and pyrene] were identified as SRCs in surface soil. The maximum concentration for benzo(*b*)fluoranthene (1.14 mg/kg) exceeded its screening criterion for ingestion (0.88 mg/kg) (Table 10.14-7). All of the concentrations for the remaining compounds were below their respective screening values. Therefore, benzo(*b*)fluoranthene is an HHCOPC in surface soil.

Acetone and pyrene were identified as SRCs for groundwater. The maximum concentrations of these constituents were below their respective screening values (Table 10.14-7); therefore, there are no HHCOPCs for groundwater.

Four VOCs, nine SVOCs (PAHs), and cadmium were identified as SRCs in sediment. None of the maximum concentrations of VOCs exceeded their respective screening criteria for exposure via ingestion (Table 10.14-7). With the exception of benzo(*k*)fluoranthene, benzo(*g,h,i*)perylene, chrysene, fluoranthene, and pyrene, the maximum concentrations for the SVOCs [PAHs benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, and indeno(*1,2,3-c,d*)pyrene] were above the screening criteria for exposure via ingestion (Table 10.14-7). The maximum concentration of cadmium was also above its screening value. Benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, indeno(*1,2,3-cd*)pyrene, and cadmium are considered to be HHCOPCs for sediment.

The maximum value for benzo(*a*)pyrene in sediment was more than an order of magnitude greater than the screening value for ingestion. The maximum concentrations for the other SVOCs identified as HHCOPCs and for cadmium were within an order of magnitude of their respective screening values.

10.14.6.3 Uncertainties

A screening value for a surrogate compound was used for phenanthrene, possibly resulting in exclusion of this PAH when it should be an HHCOPC. Other human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

10.14.7 Ecological Preliminary Risk Evaluation of SWMU 27T

The EPRE of SWMU 27T was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

10.14.7.1 Ecological screening value comparison (Step i)

There is no surface water at SWMU 27T. The sediment is treated as surface soil (see Section 10.14.7.5).

One VOC and one SVOC were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 10.14-8. The only ECOPC identified by the ESV comparison for groundwater was pyrene. Pyrene is an ECOPC by default because it has no ESV (GEPD 1997a).

Because there are no ESVs for soil, all analytes detected in soil and drainage ditch sediment were evaluated further in EPRE Steps ii through v.

10.14.7.2 Preliminary problem formulation (Step ii)

Ecological habitat is described in Section 10.14.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

10.14.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil or drainage ditch sediment at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

10.14.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated soil or drainage ditch sediment, of biota exposed to contaminated soil or drainage ditch sediment, or of drinking water. The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

10.14.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil and drainage ditch sediment are presented in Tables 10.14-9 and 10.14-10, respectively. These tables show the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. HQs exceeding one are shown bordered by a double line.

There are no ECOPCs present in surface soil at concentrations resulting in ADDs exceeding the TRV for the surrogate species (Table 10.14-9). The HIs calculated for VOCs and SVOCs do not exceed one.

Cadmium was the only ECOPC in sediment from the drainage ditch that had an HQ exceeding one (Table 10.14-10). The cadmium HQs are 53.1 for shrews and 223 for robins. The HIs calculated for VOCs and SVOCs do not exceed one.

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 10.14-11. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species.

10.14.8 Conclusions and Risk Management and Site Recommendations for SWMU 27T

10.14.8.1 Conclusions

Nature and Extent of Contamination

- No VOCs were detected in surface soil. The SVOCs benzo(*b*)fluoranthene, chrysene, phenanthrene, and pyrene were detected in surface soil and are considered to be SRCs in surface soil.
- No SRCs were identified in subsurface soil.
- Acetone and pyrene were detected in groundwater and are considered to be SRCs in groundwater.
- Lead in groundwater was below the reference background criterion at GP1 and GP2 and not detected at GP3 and GP4; therefore, lead is not considered to be an SRC.
- 2-Butanone, 2-hexanone, 4-methyl-2-pentanone, acetone, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, fluoranthene, indeno(*1,2,3-cd*)pyrene, pyrene, and cadmium were detected in the sediment samples and are considered to be SRCs for sediment.
- Cadmium was detected in the sediment sample at a concentration that exceeded the reference background criterion; therefore, cadmium is considered to be an SRC in sediment.

Fate and Transport

- Cadmium is a CMCOPC in sediment based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- Benzo(*b*)fluoranthene was identified as an HHCOPC in surface soil.
- There are no HHCOPCs in groundwater.
- HHCOPCs in sediment included cadmium and the following SVOCs (all PAHs): benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-cd*)pyrene.

Ecological Preliminary Risk Evaluation

- The only ECOPC in groundwater (i.e., aquatic biota) is pyrene (by default). This ECOPC is a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.

- There are no ECOPCs in groundwater for terrestrial receptors.

- The only ECOPC in drainage ditch sediment for terrestrial receptors is cadmium.

- There are no ECOPCs in surface soil for terrestrial receptors.

10.14.8.2 Risk management and site recommendations

- Cadmium was identified as a CMCOPC in sediment. Insufficient groundwater data were available to model the leaching of cadmium into groundwater for its evaluation in a human health baseline risk assessment. However, the maximum concentration that was screened represents a single detection of chromium and given the areal extent of the area defined by the drainage ditch within SWMU 27T, it is unlikely that chromium will leach into groundwater in concentrations that will have an adverse effect upon human health.

- Benzo(*b*)fluoranthene was identified as an HHCOPC in surface soil. The HHCOPCs identified in sediment included cadmium and the following SVOCs (all PAHs): benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-c d*)pyrene. A human health baseline risk assessment was performed to address the risks associated with the HHCOPCs identified in surface soil and sediment (see Attachment 10.14A). The risk estimates for all of the potential receptor populations were below the target risk values. The total HI for both the current and future on-site juvenile trespasser was more than three orders of magnitude below the target risk value, 7.94×10^{-4} as compared to a target value of 1.0. The total ILCRs for the on-site Installation worker (ILCR = 3.00×10^{-7}), on-site juvenile trespasser (ILCR = 1.21×10^{-7}), and on-site resident child (ILCR = 9.17×10^{-7}) were below the target risk value of 1×10^{-6}. Therefore, the risks associated with exposure of the identified receptor populations to COPCs in surface soil and sediment are within the acceptable range, and no further investigation and/or evaluation is required.

- As indicated in the first bullet, cadmium was identified as a CMCOPC in sediment based on potential leaching to groundwater, but subsequent risk could not be quantified. Because of the uncertainty associated with the one elevated concentration of cadmium in sediment, Fort Stewart recommends that additional sediment samples be collected in the drainage ditch to confirm the believed limited areal extent of cadmium. The sediment investigation would be implemented in a two-phase approach. Initially, three additional sediment samples would be collected, one upgradient and two downgradient of the OWS. The two downstream sediment samples would be collected upgradient and downgradient of the previous downgradient sample (SWS2) in which cadmium was detected to confirm the areal extent of potential cadmium contamination. The sediment samples would be analyzed for cadmium only. If cadmium was detected below the reference background criterion, then Fort Stewart would conclude that the one elevated concentration of cadmium was an anomaly and that cadmium is not a COC in sediment at SWMU 27T. If cadmium was detected above the reference background criterion during the resampling, then three permanent 2-inch-diameter monitoring wells (one upgradient and two downgradient) would be installed for determining groundwater direction and for collection of groundwater samples. Groundwater would be sampled using low-flow techniques. No soil except that for geotechnical analysis would be collected during the installation of the permanent monitoring wells. The groundwater would

be analyzed for only total and dissolved cadmium. Geotechnical analysis would be performed on the soil collected from the installation of the permanent monitoring wells to support potential fate and transport analysis. In addition, three more sediment sample locations would be collected to determine the downgradient extent of cadmium. All sampling procedures for sediment, soil (geotechnical only), and groundwater will be in accordance with the procedures outlined in the SAP for the Phase II RFIs of the 16 SWMUs (SAIC 1997).

- The presence of sediment COPCs in the drainage ditch adjacent to SWMU 27T is unlikely to be the result of environmental releases from this OWS. SWMU 27T discharges directly to the NGTC Equalization Basin; therefore, environmental releases from this SWMU would be the result of subsurface releases caused by leakage from the OWS. However, the absence of SVOCs in subsurface soil and the fact that only one SVOC was detected in groundwater indicate that the OWS is not leaking. The source of COPCs in the drainage ditch is probably upstream, given that the drainage ditch receives runoff from upstream sources within the industrialized area of the garrison (e.g., parking area of adjacent motorpool). This conclusion is supported by the data collected during the second round of sediment sampling, which included an upgradient sediment sample. The concentrations of all of the SVOCs detected in the downgradient SWMU 27T sediment sample were lower than those detected in the upgradient sample.

- Pyrene was indicated as an ECOPC (by default) in groundwater for its potential hazard to aquatic biota if the groundwater discharges to nearby surface water bodies. As stated in Section 10.14.6.1, the groundwater does not discharge to any nearby surface water bodies (the ditch is not a habitat for aquatic biota). Pyrene was detected in only one of four groundwater samples. No other SVOCs were detected in the groundwater. Given the typical groundwater flow rates in the garrison area and the lack of any nearby receptors, the concentration of pyrene would probably be removed by natural attenuation processes (e.g., biodegradation) prior to reaching a receptor. The single elevated concentration of pyrene in groundwater is not considered to indicate an ECOPC requiring further investigation and/or evaluation.

- The information obtained from the additional sampling proposed above will be submitted to GEPD as an addendum to this report that will be issued separately. The addendum to this report will be issued to GEPD in July 2000.

Table 10.14-1. Summary of Analytes Detected in Surface Soil, SWMU 27T

Station	Reference Background Criteria	8FGP2[a]	8FGP3[a]	8FGP4
Sample ID		8F1212	8F1312	8F1411
Date		05/06/98	05/06/98	01/18/98
Depth (feet)		0 to 2	0 to 2	0 to 2
Sample Type		Grab	Grab	Grab
Semivolatile Organic Compounds (mg/kg)				
Benzo(*b*)fluoranthene	0.00		**1.14**	
Chrysene	0.00			**0.215**
Phenanthrene	0.00		**0.79**	
Pyrene	0.00		**1.33**	**0.22**
Metals (mg/kg)				
Lead	8.81	7.5	6.1	7.1

Bold indicates concentrations above reference background criteria.
[a]The analytical laboratory inadvertently missed the holding times for VOCs and SVOCs for soil during the January 1998 sampling endeavor. Soil was resampled May 6, 1998.

Table 10.14-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27T

Station	Reference Background Criteria	8FGP1[a]
Sample ID		8F1112
Date		05/06/98
Depth (feet)		2 to 3
Sample Type		Grab
Metals (mg/kg)		
Lead	11.10	5.5

[a]The analytical laboratory inadvertently missed the holding times for VOCs and SVOCs for soil during the January 1998 sampling endeavor. Soil was resampled May 6, 1998.

Table 10.14-3. Summary of Analytes Detected in Groundwater, SWMU 27T

Station	Reference Background Criteria	MCL	8FGP1	8FGP2	8FGP3	8FGP4
Sample ID			8F4111	8F4211	8F4311	8F4411
Date			01/19/98	01/19/98	01/19/98	01/18/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
Acetone	0.00				**50.2**	
Semivolatile Organic Compounds (µg/L)						
Pyrene	0.00					**26.2**
Metals (µg/L)						
Lead	4.69	15	0.86	0.81		

Bold indicates concentrations above reference background criteria.

Table 10.14-4. Summary of Analytes Detected in Sediment, SWMU 27T

Station	Site-specific Reference Background Criteria[a]	8FSWS1	8FSWS2	8FSWS3[b]
Sample ID		8F2111	8F2211	8F2311
Date		02/01/98	09/23/99	09/23/99
Depth (ft)		0 to 1	0 to 1	0 to 1
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
2-Butanone	0.0412		0.0227	0.0206
2-Hexanone	0.00		**0.0023**	
4-Methyl-2-pentanone	0.00		**0.0052**	
Acetone	0.782		0.099	0.391
Semivolatile Organic Compounds (mg/kg)				
Benzo(*a*)anthracene	1.18	1.07	0.405	0.592
Benzo(*a*)pyrene	1.48	**1.95**	0.677	0.738
Benzo(*b*)fluoranthene	1.93	**3.51**	1.06	0.965
Benzo(*g,h,i*)perylene	0.996	**1.81**	0.633	0.498
Benzo(*k*)fluoranthene	1.81	**2.4**	0.851	0.907
Chrysene	0.0928	**2.54**		0.0464
Fluoranthene	1.99	**2.92**	1	0.994
Indeno(*1,2,3-cd*)pyrene	0.878	**1.65**	0.582	0.439
Pyrene	2.68	**3.25**	1.12	1.34
Metals (mg/kg)				
Arsenic	2.8	NA	1.3	1.4
Barium	73.6	NA	29.2	36.8
Cadmium	**4.4**	NA	**19.3**	2.2
Chromium	31.2	NA	15.3	15.6
Lead	123	33.3	57.9	61.5
Mercury	0.24	NA	0.02	0.12
Selenium	1.64	NA	0.58	0.82

[a]Site-specific background criteria for sediment equals two times background concentrations (SWS3).
[b]Site-specific background location.
NA = Not analyzed.
Bold indicates concentrations above site-specific reference background criteria.

Table 10.14-5. Summary of Site-related Contaminants, SWMU 27T

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
2-Butanone	ND	ND	0.0227	ND	NC
2-Hexanone	ND	ND	0.0023	ND	NC
4-Methyl-2-pentanone	ND	ND	0.0052	ND	NC
Acetone	ND	ND	0.099	50.2	NC
Semivolatile Organic Compounds					
Benzo(*a*)anthracene	ND	ND	1.07	ND	NC
Benzo(*a*)pyrene	ND	ND	1.95	ND	NC
Benzo(*b*)fluoranthene	1.14	ND	3.51	ND	NC
Benzo(*g,h,i*)perylene	ND	ND	1.81	ND	NC
Benzo(*k*)fluoranthene	ND	ND	2.4	ND	NC
Chrysene	0.215	ND	2.54	ND	NC
Fluoranthene	ND	ND	2.92	ND	NC
Indeno(*1,2,3-cd*)pyrene	ND	ND	1.65	ND	NC
Phenanthrene	0.79	ND	ND	ND	NC
Pyrene	1.33	ND	3.25	26.2	NC
Metals					
Cadmium	NA	NA	19.3	NA	NC

NA = Not analyzed.
NC = Not collected; no surface water present in February 1998.
ND = Not detected.

Table 10.14-6. GSSL Screening of Site-related Contaminants in Soil, SWMU 27T

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
SOIL			
Semivolatile Organic Compounds (mg/kg)			
Benzo(*b*)fluoranthene	1.14	5	No
Chrysene	0.215	160	No
Phenanthrene[b,c]	0.79	80.4	No
Pyrene	1.33	4,200	No
SEDIMENT			
Volatile Organic Compounds (mg/kg)			
2-Butanone	0.0227	7.685	No
2-Hexanone	0.0023	6.9	No
4-Methyl-2-pentanone	0.0052	NA	NA
Acetone	0.099	16	No
Semivolatile Organic Compounds (mg/kg)			
Benzo(*a*)anthracene	1.07	2	No
Benzo(*a*)pyrene	1.95	8	No
Benzo(*b*)fluoranthene	3.51	5	No
Benzo(*g,h,i*)perylene[b]	1.81	394	No
Benzo(*k*)fluoranthene	2.4	49	No
Chrysene	2.54	160	No
Fluoranthene	2.92	4,300	No
Indeno(*1,2,3-cd*)pyrene	1.65	14	No
Pyrene	3.25	4,200	No
Metals (mg/kg)			
Cadmium	19.3	8	Yes

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

[c]RBC of surrogate pyrene is used to develop GSSL for phenanthrene.

NA = Not available.

Table 10.14-7. Human Health Risk Screening for Surface Soil, Groundwater, and Sediment, SWMU 27T

SURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Semivolatile Organic Compounds (mg/kg)						
Benzo(*b*)fluoranthene	1/3	1.14	1.14	0.88	Yes	Max Detect > Risk Criteria
Chrysene	1/3	0.215	0.215	88	No	Max Detect < Risk Criteria
Phenanthrene	1/3	0.79	0.79	235	No	Max Detect < Risk Criteria
Pyrene	2/3	0.22	1.33	230	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Freq. of Detection**	**Minimum Result**	**Maximum Result**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
Acetone	1/3	50.2	50.2	61	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (µg/L)						
Pyrene	1/3	26.2	26.2	110	No	Max Detect < Risk Criteria

SEDIMENT						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
2-Butanone	1/2	0.0227	0.0227	4,700	No	Max Detect < Risk Criteria
2-Hexanone	1/2	0.0023	0.0023	4,700	No	Max Detect < Risk Criteria
4-Methyl-2-pentanone	1/2	0.0052	0.0052	630	No	Max Detect < Risk Criteria
Acetone	1/2	0.099	0.099	780	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Benzo(*a*)anthracene	1/1	1.07	1.07	0.88	Yes	Max Detect > Risk Criteria
Benzo(*a*)pyrene	1/1	1.95	1.95	0.09	Yes	Max Detect > Risk Criteria
Benzo(*b*)fluoranthene	1/1	3.51	3.51	0.88	Yes	Max Detect > Risk Criteria
Benzo(*g,h,i*)perylene[a]	1/1	1.81	1.81	8.8	No	Max Detect < Risk Criteria
Benzo(*k*)fluoranthene	1/1	2.4	2.4	8.8	No	Max Detect < Risk Criteria
Chrysene	1/1	2.54	2.54	88	No	Max Detect < Risk Criteria
Fluoranthene	1/1	2.92	2.92	310	No	Max Detect < Risk Criteria
Indeno(*1,2,3-cd*)pyrene	1/1	1.65	1.65	0.88	Yes	Max Detect > Risk Criteria
Pyrene	1/1	3.25	3.25	230	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Cadmium	1/1	19.3	19.3	3.9	Yes	Max Detect > Risk Criteria

[a]A TEF of 0.01 was used for this PAH (see Section 7.3, Selection of Screening Values).

Table 10.14-8. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27T

Analyte	SWMU 27T Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Acetone	50.2	1,500[a]	No	Max Detect < ESV
Semivolatile Organic Compounds (µg/L)				
Pyrene	26.2	No ESV	Yes	ECOPC by Default

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.

ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 10.14-9. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27T

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) $= C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) $= C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Semivolatile Organic Compounds								
Benzo(*b*)fluoranthene	1.14	5.00E-02	3.02E-02	1.58E+01	1.91E-03	8.66E-02	1.24E+01	6.99E-03
Chrysene	0.215	5.00E-02	5.70E-03	1.58E+01	3.60E-04	1.63E-02	1.24E+01	1.32E-03
Phenanthrene	0.79	5.00E-02	2.09E-02	1.19E+00	1.76E-02	6.00E-02	9.97E+00	6.02E-03
Pyrene	1.33	5.00E-02	3.52E-02	1.19E+00	2.96E-02	1.01E-01	9.97E+00	1.01E-02
				HI =	4.95E-02		HI =	2.45E-02

ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

Table 10.14-10. Preliminary Risk Calculations for ECOPCs in Drainage Ditch Sediment, SWMU 27T

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
2-Butanone	0.0227	5.00E-02	6.02E-04	3.89E+03	1.55E-07	1.73E-03	No TRV	No HQ
2-Hexanone	0.0023	1.00E+00	1.22E-03	No TRV	No HQ	3.50E-03	No TRV	No HQ
4-Methyl-2-pentanone	0.0052	5.00E-02	1.38E-04	5.49E+01	2.51E-06	3.95E-04	No TRV	No HQ
Acetone	0.099	5.00E-02	2.62E-03	2.20E+01	1.19E-04	7.52E-03	No TRV	No HQ
				HI =	1.16E-03		**HI =**	0.00E+00
Semivolatile Organic Compounds								
Benzo(*a*)anthracene	1.07	5.00E-02	2.84E-02	1.58E+01	1.79E-03	8.13E-02	1.24E+01	6.56E-03
Benzo(*a*)pyrene	1.95	5.00E-02	5.17E-02	1.19E+00	4.35E-02	1.48E-01	9.97E+00	1.49E-02
Benzo(*b*)fluoranthene	3.51	5.00E-02	9.30E-02	1.58E+01	5.88E-03	2.67E-01	1.24E+01	2.15E-02
Benzo(*g,h,i*)perylene	1.81	5.00E-02	4.80E-02	1.58E+01	3.03E-03	1.38E-01	1.24E+01	1.11E-02
Benzo(*k*)fluoranthene	2.4	5.00E-02	6.36E-02	1.19E+00	5.35E-02	1.82E-01	9.97E+00	1.83E-02
Chrysene	2.54	5.00E-02	6.73E-02	1.58E+01	4.26E-03	1.93E-01	1.24E+01	1.56E-02
Fluoranthene	2.92	5.00E-02	7.74E-02	5.95E+01	1.30E-03	2.22E-01	1.95E+02	1.14E-03
Indeno(*1,2,3-cd*)pyrene	1.65	5.00E-02	4.37E-02	1.58E+01	2.76E-03	1.25E-01	1.24E+01	1.01E-02
Pyrene	3.25	5.00E-02	8.61E-02	1.19E+00	7.24E-02	2.47E-01	9.97E+00	2.48E-02
				HI =	1.90E-01		**HI =**	1.24E-01
Metals								
Cadmium	19.3	1.10E+01	1.13E+02	2.12E+00	5.31E+01	3.23E+02	1.45E+00	2.23E+02

ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.
Cells with double borders indicate HQs > 1.

Table 10.14-11. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27T

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ =ADD/ TRV
Semivolatile Organic Compounds				
Pyrene	26.2	2.10E-03	2.66E-01	7.88E-03

0.001 (mg/µg) = conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).

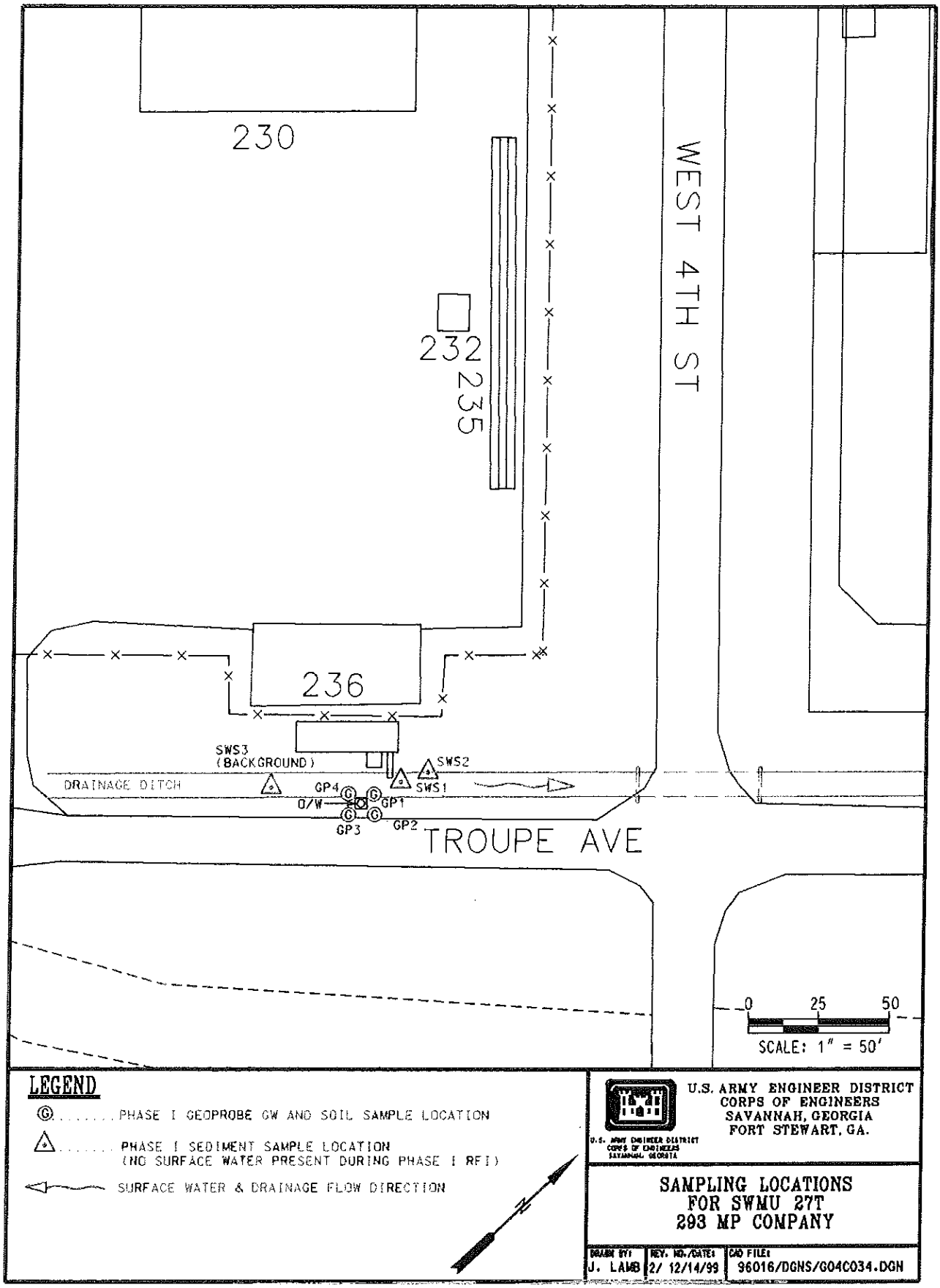

Figure 10.14-1. Sampling Locations, SWMU 27T

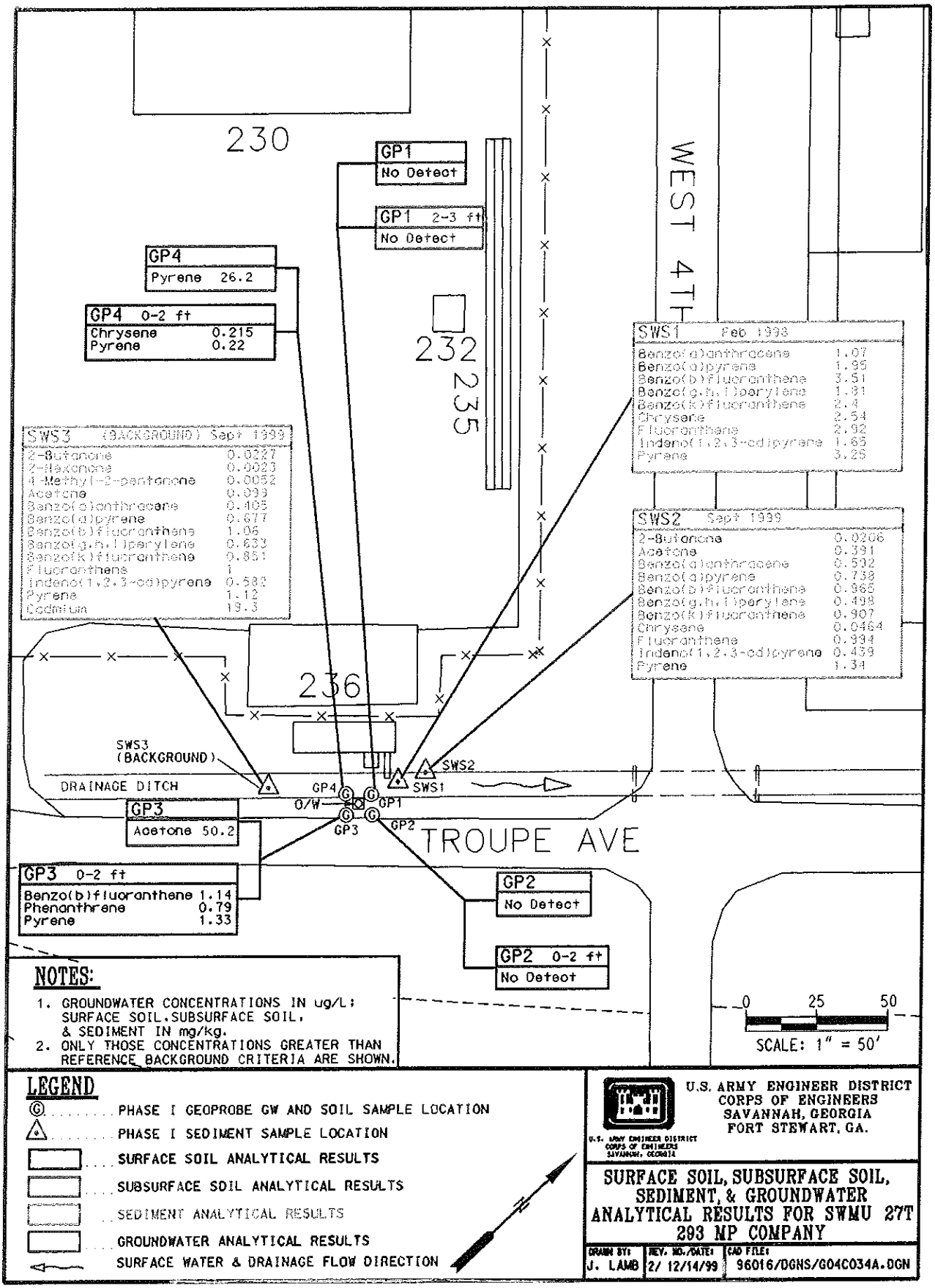

Figure 10.14-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, Groundwater, and Sediment, SWMU 27T

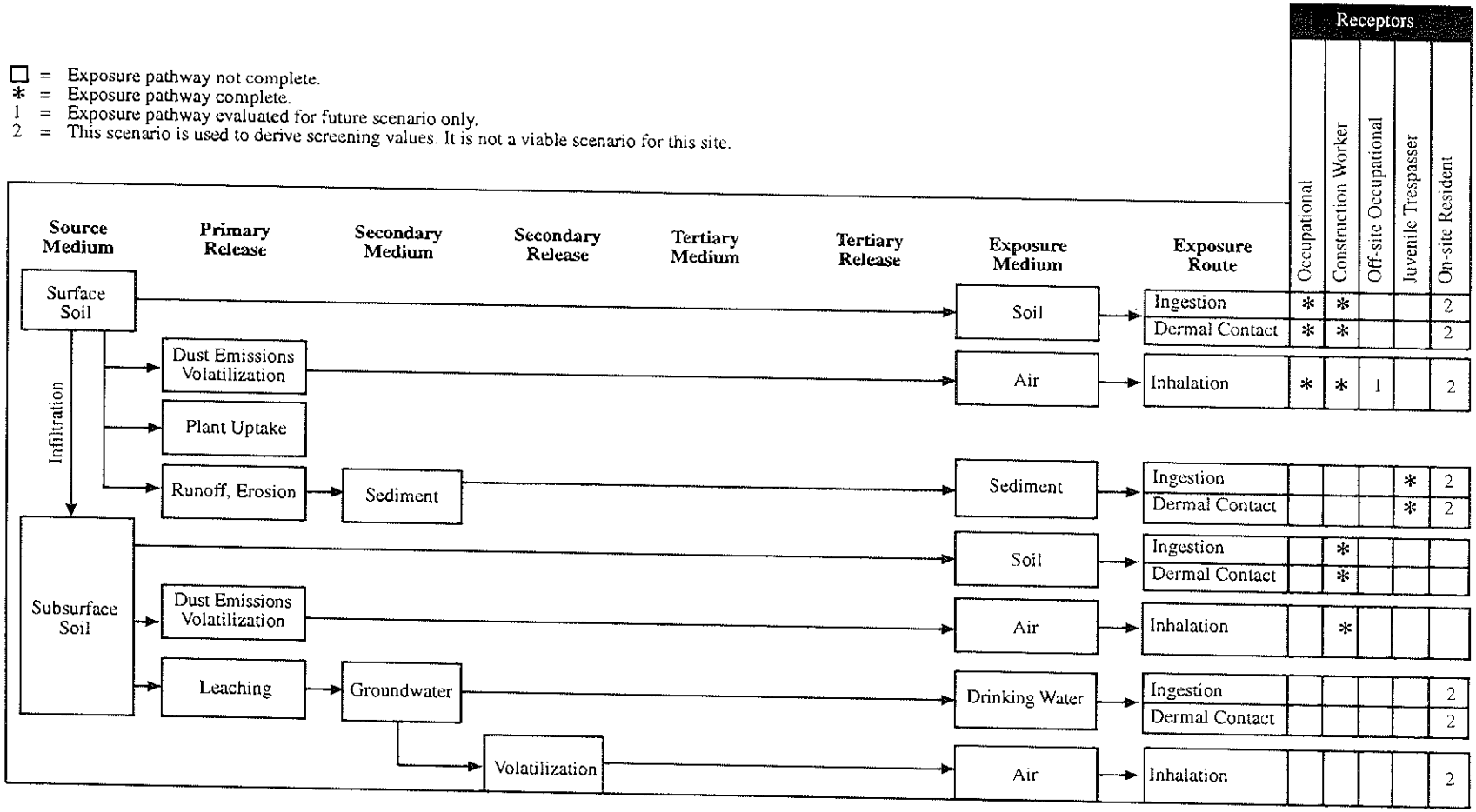

Figure 10.14-3. Potential Migration and Exposure Pathways, SWMU 27T

ATTACHMENT 10.14A
SWMU 27T: 293 MP COMPANY

HUMAN HEALTH BASELINE RISK ASSESSMENT

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ATTACHMENT 10.14A
SWMU 27T: 293 MP COMPANY
HUMAN HEALTH BASELINE RISK ASSESSMENT

The human health baseline risk assessment consists of five elements: (1) identification of COPCs, (2) exposure assessment, (3) toxicity assessment, (4) risk characterization, and (5) assessment of uncertainty.

10.14A.1 IDENTIFICATION OF COPCS

The CMCOPCs and HHCOPCs have been discussed in the sections on contaminant fate and transport (Section 10.14.5) and the HHPRE (Section 10.14.6), respectively. Cadmium was identified as a CMCOPC in sediment. No CMCOPCs were identified for soils.

HHCOPCs were identified in surface soil and sediment. Benzo(*b*)fluoranthene was identified as a HHCOPC in surface soil. The HHCOPCs identified in sediment include cadmium and the following PAHs: benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-cd*)pyrene.

10.14A.2 EXPOSURE ASSESSMENT

The exposure assessment quantifies the amount of a COPC an individual may come in contact with at each site. The exposure assessment considers all pathways of potential human exposure, the magnitude of exposure, and the frequency and duration of exposure. The process for estimating exposure consists of the following elements: (1) characterization of the exposure setting in terms of the physical and demographic characteristics of the site, (2) identification of receptor populations, (3) identification of the exposure pathways by which an individual may come in contact with a COPC, (4) estimation of the exposure point concentration, and (5) quantification of the intake or dose to which an individual may be exposed.

10.14A.2.1 Exposure Setting

The exposure setting describes the physical features at the site that are important when identifying the human populations that may be exposed to COPCs, either currently or in the future.

SWMU 27T is one of eight OWSs located in the NGTC along Troupe Avenue. This OWS site encompasses an area of approximately 0.01 acre, covered primarily by concrete and gravel. Maintained grass covers the remainder of the site. An open drainage ditch, which runs parallel to Troupe Avenue, is located adjacent to the site. The OWS is located between Troupe Avenue and the drainage ditch. The site is not secured and can be accessed from Troupe Avenue.

10.14A.2.2 Identification of Potential Receptor Populations and Exposure Pathways

A complete exposure pathway consists of four elements: (1) a source of contamination, (2) a transport or retention medium, (3) a point of contact with the chemical, and (4) a route of exposure (i.e., ingestion, dermal absorption, or inhalation) at the point of contact through which the chemical may be taken into the body. When all of these elements are present, the pathway is considered to be complete.

HHCOPCs are present in surface soil and sediment. An Installation worker may be exposed to HHCOPCs in surfaee soil when that person is working at the site. It is unlikely that the Installation worker would spend any significant amount of time in the drainage ditch. This receptor may be exposed to benzo(*b*)fluoranthene in surface soil via incidental ingestion and dermal contact. The current site cover is likely to limit the generation of fugitive dust. Therefore, there are no current off-site migration pathways, and current off-site receptors are not likely to be exposed to HHCOPCs.

Given that the site is open and can be accessed from Troupe Avenue, a juvenile trespasser may access the site. This juvenile receptor may be exposed while playing at the site and in the adjacent ditch. The juvenile trespasser may be exposed to HHCOPCs in surface soil and sediment via incidental ingestion.

No HHCOPCs were identified in groundwater. Potential exposure to CMCOPCs in groundwater would not occur until some point in the future, after the constituent leached to groundwater.

The site is located within an industrial area on a narrow area between a drainage ditch and an unpaved road (sand, gravel, and dirt). The only change that may occur in the foreseeable future is that the groundcover currently present at the site may be removed, and as a result, receptors may be exposed via fugitive dust from surface soil. Therefore, the on-site receptors are likely to remain an Installation worker and a juvenile trespasser. The off-site receptor populations include an Installation worker and off-site resident that may be exposed via inhalation of fugitive dust.

To be conservative, it is assumed that a groundwater drinking well had been placed at the site. The future on-site Installation worker may be exposed to the CMCOPC cadmium as a result of ingestion of groundwater.

The future on-site resident is presented for baseline purposes and is not considered to be a viable receptor population. Potential exposure pathways for the on-site resident include ingestion and dermal contact of surface soil and inhalation of fugitive dust from surface soil. If a residence is built on the site, it is assumed that the drainage ditch would probably be filled and would not exist. In addition, it is assumed that the residence would have a groundwater drinking well and that receptors might be exposed to cadmium via ingestion and dermal contact.

10.14A.2.3 Estimation of Exposure Concentrations

The estimation of exposure concentrations for on-site receptors to COPCs in surface soil and sediment is discussed in Appendix I, Section I.2.3. Exposure concentrations were calculated using either analytical results or environmental fate and transport models. The analytical results from the surface soil and sediment samples were used to calculate the exposure concentrations for HHCOPCs in surface soil and sediment, respectively. The exposure point concentrations were equal to the 95 percent upper confidence limit of the mean, unless this value was greater than the maximum detected concentration. In that case, the exposure concentration defaulted to the maximum concentration. The exposure concentrations are given in Table 10.14A-1.

Exposure concentrations of fugitive dust in air were calculated using the formulas described in Appendix I, Section I.2.3. These values were based on the exposure concentrations for surface soil. For the purposes of estimating exposure of an off-site receptor to fugitive dust, it was assumed that no dilution of the air concentrations occurred and that the exposure concentrations for both on-site and off-site receptors were the same.

Insufficient groundwater data were available to model the leaching of cadmium into groundwater. However, the maximum concentration that was screened represents a single detection of cadmium, and

given the areal extent of the area defined by the drainage ditch within SWMU 27T, it is unlikely that cadmium will leach into groundwater in concentrations that will have an adverse effect upon human health.

10.14A.2.4 Quantification of Exposure

The equations used to estimate exposures to receptor populations are discussed in Appendix I, Section I.2.4. The default exposure factors for the current on-site trespasser assume that the child divides his or her time between the drainage ditch and the area of the OWS. The exposure parameter values used to estimate potential exposure are given in Table 10.14A-2.

Exposure concentrations in groundwater could not be estimated using the current information; therefore, quantification of exposure to constituents in groundwater was not addressed.

Exposure of off-site receptors for SWMU 27T would be limited to inhalation of fugitive dust resulting from wind erosion of the surface soils. Benzo(*b*)fluoranthene is the only surface soil COPC, and this constituent does not have either an inhalation reference dose or an inhalation cancer slope factor; therefore, the potential risks to off-site receptors cannot be quantified. Given that the risk to these receptors cannot be evaluated, the estimated intakes for these receptors are not reported.

A potential intake was estimated for each receptor population for all applicable pathways. The estimated intakes for the current on-site receptors, the Installation worker and the juvenile trespasser, are given in Tables 10.14A-3 and 10.14A-4, respectively. There are no current off-site receptor populations.

Future on-site receptor populations include an Installation worker, a juvenile trespasser, and a resident. Exposure pathways for the future on-site Installation worker and the juvenile trespasser include all of the exposure pathways for the current on-site receptors, with the addition of exposure to the surface soil COPC, benzo(*b*)fluoranthene, via inhalation of fugitive dust. Inhalation toxicity values have not been derived for benzo(*b*)fluoranthene (EPA 1999a; EPA 1997c). Therefore, the calculated risk values for the future on-site Installation worker and the future on-site juvenile trespasser will be equal to the risk values for the respective current on-site receptors. For the purposes of this risk assessment, the potential risks to these receptors will not be quantified, and the discussion will be limited to the current on-site Installation worker and current on-site juvenile trespasser.

The resident population is divided into a child and an adult resident, given the differences in behavior, exposure duration, and physiology between an adult and a child. Because of the increased amount of hand-to-mouth behavior in children, the incidental soil ingestion for a child is twice that of an adult. Given the higher ingestion rate and the lower body weight for a child, the resident child is at greater risk from incidental ingestion of surface soil than the resident adult. For the purposes of this risk assessment, the estimated intakes and potential risks will be calculated for the resident child. The estimated intakes for the child resident and the adult resident are given in Table 10.14A-5

Future off-site receptors include an Installation worker and a resident adult. These receptors may be exposed to benzo(*b*)fluoranthene in surface soil via inhalation of fugitive dust. However, benzo(*b*)fluoranthene does not have an inhalation cancer slope factor, so the potential risks to these receptors cannot be evaluated due to the lack of appropriate toxicological data. Therefore, the potential intakes for these receptors will not be quantified.

10.14A.3 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to determine the increased likelihood and magnitude of adverse human health effects based on the extent of exposure to contamination. The toxicity assessment for SWMU 27T was carried out as described in Appendix I, Section I.3. The toxicity values used in the risk assessment are given in Table 10.14A-6.

Separate oral reference doses are given for cadmium depending on whether the receptor receives the dose via food or water. These different reference doses reflect differences in the rate of gastrointestinal absorption between cadmium administered in food or administered in water. Given that cadmium was identified as an HHCOPC in sediment, the reference dose for food was used because the absorption of cadmium from soil is likely to be closer to the absorption from food than to the absorption from water.

Carcinogenic slope factors have not been directly derived for the carcinogenic PAHs benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-cd*)pyrene. Instead, a TEF is used to estimate the carcinogenic slope factors. The TEF indicates the carcinogenic potency of the PAH relative to benzo(*a*)pyrene, which has a carcinogenic slope factor. Therefore, if the carcinogenic potency of a PAH is an order of magnitude less than that for benzo(*a*)pyrene, the TEF is 0.1. Benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-cd*)pyrene have a TEF value of 0.1.

10.14A.4 RISK CHARACTERIZATION RESULTS

The risk characterization followed the procedures outlined in Appendix I, Section I.4. Quantitative estimates of noncarcinogenic risks were calculated for each potentially complete exposure pathway.

10.14A.4.1 Current Land-use Scenarios

The current on-site receptor populations are an Installation worker and a juvenile trespasser. There are no current off-site receptor populations. The potential risk to each of the on-site receptor populations is discussed below.

On-site Installation Worker. This receptor is exposed to only benzo(*b*)fluoranthene in surface soil. A reference dose has not been calculated for this constituent, but this constituent does have a cancer slope factor. The total ILCR for this receptor is 3.00×10^{-7}, which is below the target risk value of 1×10^{-6} (Table 10.14A-7); therefore, the carcinogenic risk for this receptor is within acceptable limits.

On-site Juvenile Trespasser. The calculated risk values for the current on-site juvenile trespasser are given in Table 10.14A-8.

The HI for this receptor is 7.94×10^{-4}, which is more than three orders of magnitude below the target value of 1.0; therefore, adverse systemic health risks are not expected for this receptor population.

The total ILCR is 1.21×10^{-7}, which is below the target value of 1×10^{-6}; therefore, the carcinogenic risk for this receptor is within acceptable limits.

10.14A.4.2 Future Land-use Scenarios

Future potential on-site receptors are an Installation worker, a juvenile trespasser, and a resident child. The potential risk to the on-site resident was evaluated for only a child, given that the child is at greater potential risk from exposure to COPCs in surface soil because of this receptor's higher ingestion rate and

lower body weight relative to those of an adult. The potential risks to each of these receptor populations are discussed below.

The off-site receptors include an Installation worker, a juvenile trespasser, and a resident adult. These receptors may potentially be exposed to benzo(*b*)fluoranthene via inhalation of fugitive dust resulting from the wind erosion of surface soils. However, inhalation toxicity values for this constituent have not been derived. Therefore, the potential risks to these receptors cannot be assessed.

On-site Installation Worker and Juvenile Trespasser. The exposure pathways for these receptors include all of the exposure pathways discussed for the current on-site receptor, with the addition of potential exposure of fugitive dust via inhalation. Inhalation toxicity values (i.e., inhalation reference concentrations or an inhalation cancer slope factor) have not been derived for the surface soil COPC, benzo(*b*)fluoranthene. Therefore, the risk values for the future on-site receptors are the same as those given for the respective current on-site receptors. The risk values for the current on-site Installation worker and the current on-site juvenile trespasser are below the target risk values. The reader is referred to the section on current land-use scenarios (Section 10.14A.4.1) for a discussion of the potential risk to these receptors.

On-site Resident Child. The calculated risk values for the on-site resident child are given in Table 10.14A-9. The total ILCR for this receptor is 9.17×10^{-7}, which is below the target risk value of 1×10^{-6}; therefore, the cancer risks for this receptor are within acceptable limits.

10.14A.5 UNCERTAINTY ASSESSMENT

A discussion of the general uncertainties associated with the analysis of risks at sites within the 16 SWMUs is provided in Appendix I, Section I.5.

The toxicity values for many of the PAHs were not derived directly from laboratory studies, but were estimated based on the relative toxicity of the PAH to benzo(*a*)pyrene. In addition, none of the PAHs had reference doses; therefore, the potential systemic toxicity of these constituents could not be assessed.

Benzo(*b*)fluoranthene does not have inhalation toxicity values; therefore, the potential risks for on-site receptors are likely to be underestimated. In addition, the risk to off-site receptors could not be assessed.

The potential exposure concentration of cadmium (CMCOPC) in groundwater resulting from leaching from sediment could not be estimated (modeled) given our current knowledge (Phase I RFI) of the site; therefore, the risks associated with the potential for cadmium in groundwater could not be addressed.

10.14A.6 RISK SUMMARY

The risk estimates for all of the potential receptor populations were below the target risk values. The total HI for the both the current and future on-site juvenile trespasser was more than three orders of magnitude below the target risk value, 7.94×10^{-4} as compared to a target value of 1.0. The total ILCRs for the on-site Installation worker (ILCR = 3.00×10^{-7}), on-site juvenile trespasser (ILCR = 1.21×10^{-7}), and on-site resident child (ILCR = 9.17×10^{-7}) were below the target risk value of 1×10^{-6}; therefore, the risks associated with exposure of the identified receptor populations to COPCs in surface soil and sediment are within the acceptable range.

The potential risks associated with cadmium in sediment leaching to groundwater could not be assessed for this site. The significance of cadmium contamination at the site could not be assessed, and leaching to groundwater could not be assessed because of the lack of data on the groundwater aquifer at this site.

Table 10.14A-1. Selected Exposure and Modeled Concentrations, SWMU 27T

Medium	Constituent	Maximum Detected Concentration (mg/kg)	95 Percent Upper Confidence Limit
Surface soil	Benzo(*b*)fluoranthene	**1.14**	1.49
Sediment	Benzo(*a*)anthracene	**1.07**	2.84
	Benzo(*a*)pyrene	**1.95**	5.33
	Benzo(*b*)fluoranthene	**3.51**	10
	Indeno(*1,2,3-cd*)pyrene	**1.65**	4.49
	Cadmium	**19.3**	NA

NA = Not available; could not be calculated.
Bold indicates exposure concentration selected.

Table 10.14A-2. Exposure Parameters for Potential Receptor Populations, SWMU 27T

Parameter	Units	Current On-site Installation Worker	Current On-site Trespasser	Future On-site Installation Worker	Future On-site Trespasser	Future On-site Resident Adult	Future On-site Resident Child	Future Off-site Installation Worker	Future Off-site Resident Adult	Future Off-site Resident Child
SURFACE SOIL										
Incidental Ingestion										
Soil ingestion rate	g/day	0.1	0.1	0.1	0.1	0.1	0.2	NA	NA	NA
Fraction ingested from area	unitless	1	0.25	1	0.25	1	1	NA	NA	NA
Exposure frequency	days/year	250	52	250	52	350	350	NA	NA	NA
Exposure duration	years	25	10	25	10	30	6	NA	NA	NA
Body weight	kg	70	45	70	45	70	15	NA	NA	NA
Carcinogen averaging time	days	25,550	25,550	25,550	25,550	25,550	NA	NA	NA	NA
Noncarcinogen averaging time	days	9,125	3,650	9,125	3,650	NA	2,190	NA	NA	NA
Dermal Contact										
Skin area	cm^2/event	5,000	3,700	5,000	3,700	5,000	1,700	NA	NA	NA
Adherence factor	mg/cm^2	0.2	0.2	0.2	0.2	0.2	0.2	NA	NA	NA
Exposure frequency	events/year	250	52	250	52	350	350	NA	NA	NA
Exposure duration	years	25	10	25	10	30	6	NA	NA	NA
Body weight	kg	70	45	70	45	70	15	NA	NA	NA
Carcinogen averaging time	days	25,550	25,550	25,550	25,550	25,550	NA	NA	NA	NA
Noncarcinogen averaging time	days	9,125	3,650	9,125	3,650	NA	2,190	NA	NA	NA
Inhalation of Dust										
Inhalation rate	m^3/hour	NA	NA	2.5	1.9	0.80	0.68	2.5	0.80	0.68
Exposure time	hours/day	NA	NA	8	6	18.4	18.4	8	18.4	18.4
Exposure frequency	days/year	NA	NA	250	52	350	350	250	350	350
Exposure duration	years	NA	NA	25	10	30	6	25	30	6
Body weight	kg	NA	NA	70	45	70	15	70	70	15
Carcinogen averaging time	days	NA	NA	25,550	25,550	25,550	NA	25,550	25,550	NA
Noncarcinogen averaging time	days	NA	NA	9,125	3,650	NA	2,190	9,125	NA	2,190
SEDIMENT										
Incidental Ingestion										
Sediment ingestion rate	kg/day	NA	0.1	NA	0.1	NA	NA	NA	NA	NA
Fraction ingested from area	unitless	NA	0.13	NA	0.13	NA	NA	NA	NA	NA
Exposure frequency	days/year	NA	52	NA	52	NA	NA	NA	NA	NA
Exposure duration	years	NA	10	NA	10	NA	NA	NA	NA	NA
Body weight	kg	NA	45	NA	45	NA	NA	NA	NA	NA
Carcinogen averaging time	days	NA	25,550	NA	25,550	NA	NA	NA	NA	NA
Noncarcinogen averaging time	days	NA	3,650	NA	3,650	NA	NA	NA	NA	NA

NA = Not applicable; this receptor is not exposed via this pathway.

Table 10.14A-3. Estimated Intakes for Current On-site Installation Worker, SWMU 27T

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)	Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)
Surface soil	Benzo(*b*)fluoranthene	1.14	mg/kg	1.12E-06	3.98E-07	1.12E-07	3.98E-08

[a]The equations used to calculate oral and dermal exposures for surface soil are presented in Appendix I, Section I.2.4.2.

Table 10.14A-4. Estimated Intakes for Current On-site Juvenile Trespasser, SWMU 27T

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)	Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)
Surface soil	Benzo(*b*)fluoranthene	1.14	mg/kg	9.02E-08	1.29E-08	2.67E-08	3.82E-09
Sediment	Benzo(*a*)anthracene	1.07	mg/kg	4.40E-08	6.29E-09	NA	NA
	Benzo(*a*)pyrene	1.95	mg/kg	8.03E-08	1.15E-08	NA	NA
	Benzo(*b*)fluoranthene	3.51	mg/kg	1.44E-07	2.06E-08	NA	NA
	Indeno(*1,2,3-cd*)pyrene	1.65	mg/kg	6.79E-08	9.70E-09	NA	NA
	Cadmium	19.3	mg/kg	7.94E-07	1.13E-07	NA	NA

[a]The equations used to calculate oral and dermal exposures for soil and sediment are presented in Appendix I, Sections I.2.4.2 and I.2.4.5, respectively.
NA = Not applicable; this exposure pathway is not applicable to sediment.

Table 10.14A-5. Estimated Intakes for Future On-site Resident Child, SWMU 27T

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]		Inhalation Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)	Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)	Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)
Surface soil	Benzo(*b*)fluoranthene	1.14	mg/kg	ND	1.25E-06	ND	2.12E-08	ND	ND

[a]The equations used to calculate oral, dermal, and inhalation exposures for surface soil are presented in Appendix I, Section I.2.4.2.
ND = The toxicological values required to assess this pathway are not available.

Table 10.14A-6. Toxicity Values for Constituents of Potential Concern, SWMU 27T

Chemical	Oral Reference Dose (mg/kg/d)	Ref.[a]	Oral Cancer Slope Factor $(mg/kg/d)^{-1}$	Ref.[a]	Gastrointestinal Absorption Factor[b]	Dermal Reference Dose[c] (mg/kg/d)	Dermal Cancer Slope Factor[d] $(mg/kg/d)^{-1}$	Inhalation Reference Dose $(mg/kg/d)^{-1}$	Ref.[a]	Inhalation Cancer Slope Factor $(mg/kg/d)^{-1}$	Ref.[a]
Benzo(*a*)anthracene	ND		7.30E-01	E	0.31	ND	2.35E+00	ND		ND	
Benzo(*a*)pyrene	ND		7.30E+00	I	0.31	ND	2.35E+00	ND		3.10E+00	E
Benzo(*b*)fluoranthene	ND		7.30E-01	E	0.31	ND	2.35E+00	ND		ND	
Indeno(*1,2,3-cd*)pyrene	ND		7.30E-01	E	0.31	ND	2.35E+00	ND		ND	
Cadmium[e]	1.00E-03	I	ND		0.025	2.50E-05	ND	ND		6.30E+00	I

[a]References: I = IRIS (EPA 1999a); H = HEAST (EPA 1997a); E = EPA National Center for Environmental Assessment (EPA 1999b).
[b]ORNL 1999.
[c]Dermal reference dose calculated using the following formula: oral reference dose ÷ gastrointestinal absorption factor.
[d]Dermal cancer slope factor calculated using the following formula: oral reference dose × gastrointestinal absorption factor. Value for cadmium obtained from the literature (Appendix I, Section I.3.3.)
[e]Toxicity values given are for cadmium in food.
ND = No data available.

Table 10.14A-7. Hazard Indices and Carcinogenic Risks for Current On-site Installation Worker, SWMU 27T

Chemical	Surface Soil			Total Hazard Index
	Oral HQ	Dermal HQ	Total	
Benzo(*b*)fluoranthene	ND	ND	—	—
Pathway Total	**ND**	**ND**	—	—

Chemical	Surface Soil[a]			Total Cancer Risk[a]
	Oral ILCR	Dermal ILCR	Total	
Benzo(*b*)fluoranthene	2.91E-07	9.02E-09	3.00E-07	3.00E-07
Pathway Total	**2.91E-07**	**9.02E-09**	**3.00E-07**	**3.00E-07**

[a]The equations used to calculate carcinogenic risk are presented in Appendix I, Section 1.4.1.
ND = The toxicological values required to assess this pathway are not available.
— = No data.

Table 10.14A-8. Hazard Indices and Carcinogenic Risks for Current Ou-site Juvenile Trespasser, SWMU 27T

Chemical	Surface Soil[a]			Sediment[a]		Total Hazard Index[a]
	Oral HQ	Dermal HQ	Total	Oral HQ	Total	
Benzo(*a*)anthracene	NA	NA	NA	ND	—	—
Benzo(*a*)pyrene	NA	NA	NA	ND	—	—
Benzo(*b*)fluoranthene	ND	ND	—	ND	—	—
Indeno(*1,2,3-cd*)pyrene	NA	NA	NA	ND	—	—
Cadmium	NA	NA	NA	7.94E-04	7.94E-04	7.94E-04
Pathway Total	—	—	—	**7.94E-04**	**7.94E-04**	**7.94E-04**

Chemical	Surface Soil[b]			Sediment[b]		Total Cancer Risk[b]
	Oral ILCR	Dermal ILCR	Total	Oral ILCR	Total	
Benzo(*a*)anthracene	NA	NA	NA	4.59E-09	4.59E-09	4.59E-09
Benzo(*a*)pyrene	NA	NA	NA	8.37E-08	8.37E-08	8.37E-08
Benzo(*b*)fluoranthene	9.41E-09	8.63E-10	1.03E-08	1.51E-08	1.51E-08	2.53E-08
Indeno(*1,2,3-cd*)pyrene	NA	NA	NA	7.08E-09	7.08E-09	7.08E-09
Cadmium	NA	NA	NA	ND	ND	—
Pathway Total	**9.41E-09**	**8.63E-10**	**1.03E-08**	**1.10E-07**	**1.10E-07**	**1.21E-07**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section 1.4.2.
[b]The equations used to calculate carcinogenic risk are presented in Appendix I, Section 1.4.1.
NA = Not applicable; these constituents were not present in surface soil.
ND = The toxicological values required to assess this pathway are not available.
— = No data.

Table 10.14A-9. Hazard Indices and Carcinogenic Risks for Future On-site Resident Child, SWMU 27T

Chemical	Surface Soil				Total Hazard Index
	Oral HQ	Dermal HQ	Inhalation HQ	Total	
Benzo(*b*)fluoranthene	ND	ND	ND	—	—
Pathway Total	**ND**	**ND**	**ND**	—	—

Chemical	Surface Soil[a]				Total Cancer Risk[a]
	Oral ILCR	Dermal ILCR	Inhalation ILCR	Total	
Benzo(*b*)fluoranthene	9.12E-07	4.81E-09	ND	9.17E-07	9.17E-07
Pathway Total	**9.12E-07**	**4.81E-09**	**ND**	**9.17E-07**	**9.17E-07**

[a]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1.
ND = The toxicological values required to assess this pathway are not available.
— = No data.

REVISED FINAL

FORSCOM

PHASE II RCRA FACILITY INVESTIGATION REPORT

3d Inf Div (Mech)

FOR

16 SOLID WASTE MANAGEMENT UNITS AT FORT STEWART, GEORGIA

VOLUME II OF III: APPENDICES A–G

Prepared for

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-95-D-0022
Delivery Order 0009

April 2000

99-183P(PPT)/021600

SAIC®

SWMU 27A

3D SQUADRON, 7TH CAVALRY MOTORPOOL AND FOUR ASSOCIATED OIL/WATER SEPARATORS (BUILDING 1339B)

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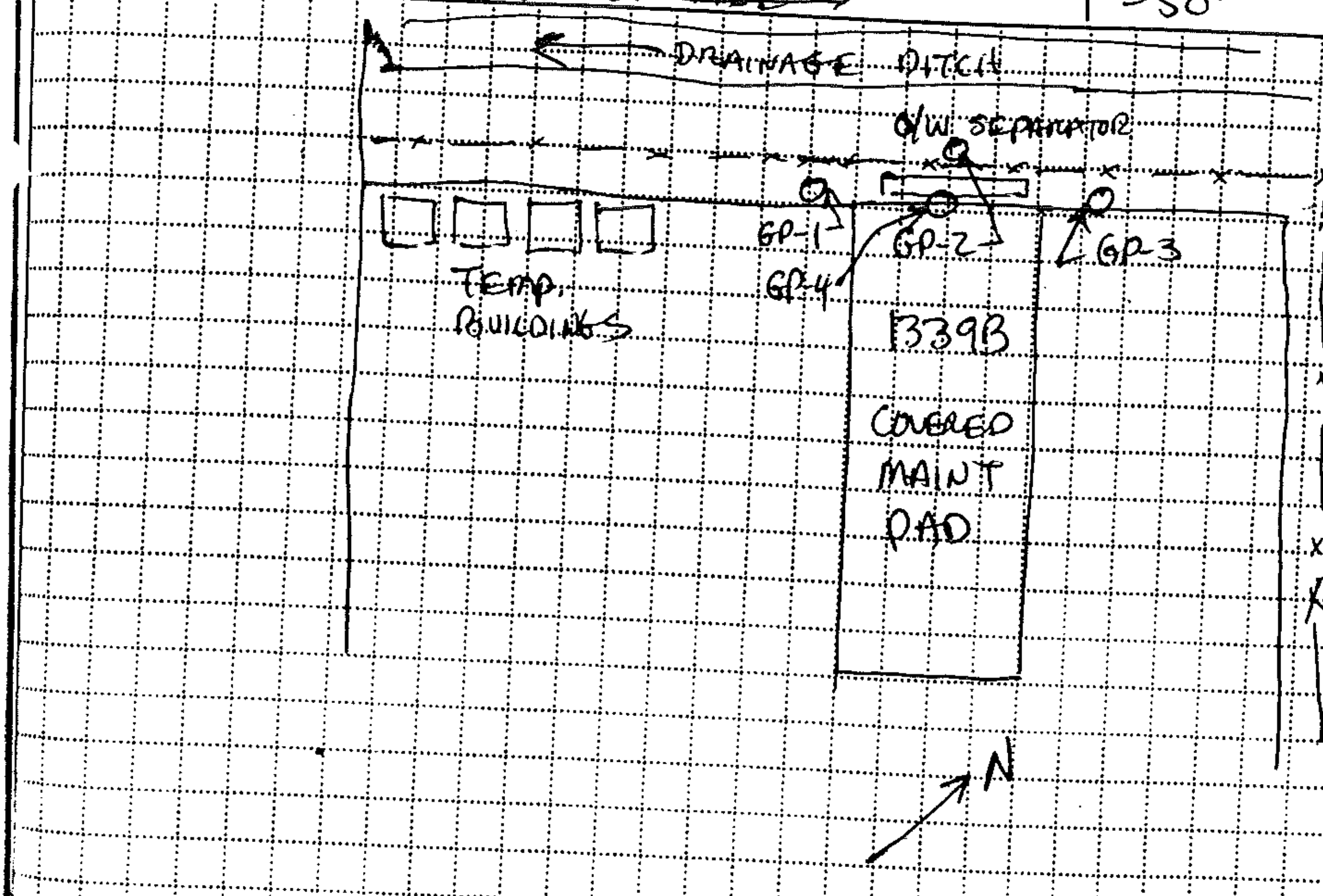
HTRW DRILLING LOG

Field	Entry
DISTRICT	SAVANNAH
HOLE NUMBER	7A-GP-01
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	REWRIGHT / SAIC
SHEET	1 of 3 SHEETS
3. PROJECT	FT. STEWART 16 SWMUS
4. LOCATION	~~SMU~~ SWMU 27A
5. NAME OF DRILLER	J. HASELHOFF
6. MANUFACTURER'S DESIGNATION OF DRILL	GEOPROBE SYSTEMS – 5M
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	2" RODS; 1" PVC PIEZOMETER; PERISTALTIC PUMP
8. HOLE LOCATION	NAD 83 7A-GP-01 E-822486.03' N-683827.74'
9. SURFACE ELEVATION	NAVD-88 69.44'
10. DATE STARTED	1/17/98
11. DATE COMPLETED	1/17/98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	NA
14. TOTAL DEPTH OF HOLE	
15. DEPTH GROUNDWATER ENCOUNTERED	17.5' BGS
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	NA; DISTURBED: NA; UNDISTURBED: NA
19. TOTAL NUMBER OF CORE BOXES	NA
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: X; METALS: ; OTHER (SPECIFY): SVOC; OTHER (SPECIFY): LEAD; OTHER (SPECIFY):
21. TOTAL CORE RECOVERY	NA %
22. DISPOSITION OF HOLE	BACKFILLED: ; MONITORING WELL: ; OTHER (SPECIFY): TEMP. PIEZ.
23. SIGNATURE OF INSPECTOR	[signature]

LOCATION SKETCH/COMMENTS

~~SEE SKETCH ON PAGE #3~~

SCALE: 1" = 50'



(Signature and Date)

PROJECT	HOLE NO.
FT. STEWART 16 SWMUS	7AGP01

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER
FT. STEWART 16 SWMUS	LUIS MERCADO	7AGP01
		SHEET 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBROUNDED, GRAYISH BROWN (10YR 5/2), DRY.	0-2' 0ppm			PUSHED 0-4' (2.0' RECOVERY) SOME ORGANIC MATERIAL GRASS, ROOTS FROM 0-3".
	2	0.5': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, AS ABOVE, REDDISH BROWN (5YR 5/4), MOIST.				
	3	1': WELL GRADED SAND WITH SILT (SW-SM), AS ABOVE, VERY DARK GRAY (7.5YR 3/1), MOIST.	2-4' 0ppm			
	4	3.5': WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY, FINE TO MEDIUM SAND, SUBANGULAR, LIGHT BROWNISH GRAY (10YR 6/2), MOIST.				PUSHED 4-8' (1.5' RECOVERY)
	5		4-6' 0.5ppm			
	6					
	7		6-8' 0.8ppm			
	8	8.2': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, SUB-ROUNDED, GRAY (2.5Y 5/1), MOIST.				PUSHED 8-12' (1.8' RECOVERY)
	9		8-10' 1.8ppm			
	10					

PROJECT FT. STEWART 16 SWMUS HOLE NO 7AGP01

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7AGP01 | SHEET: 3 of 3

TIME (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11	11': ~~CLAY~~ SANDY CLAY (CL), ~~40~~ 60% FINE SAND, LOW PLASTICITY, MEDIUM DRY STRENGTH, NO DILATENCY, MEDIUM TOUGHNESS, LIGHT BROWNISH GRAY (2.5Y 6/2), DRY.	10-12' 2.0 ppm			
	12					PUSHED 12-16' (4.0 RECOVERY)
	13		12-14' 2.2 ppm			
	14					
	15		14-16' 1.9 ppm			
	16	15.5': LEAN CLAY (CL), HIGH PLASTICITY, MEDIUM DRY STRENGTH, NO DILATENCY, MEDIUM TOUGHNESS, LIGHT GRAY (2.5Y 7/1), DRY.				PUSHED 16-18' (2.0' RECOVERY)
	17		16-18' 10.2 ppm		16-18' SAMPLE # 7A1111	GW @ 17.5' bgs ▽
	18	17.5': WELL GRADED SAND (SW), TRACE OF CLAY (<5%), MEDIUM SAND, SUBROUNDED, LIGHT GRAY (2.5Y 7/1), WET. 18': End of Log				1" PVC PIEZOMETER INSTALLED TO 24' bgs SCREEN AT 19-24'.

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah	HOLE NUMBER: 7A-GP02
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
4. NAME OF DRILLER: A. Knickerbocker	4. LOCATION: SWMU-27A	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" macrocore sampler, acetate liners, LLDPE tubing, master flex peristaltic pump, stainless steel spoons	6. MANUFACTURERS DESIGNATION OF DRILL: Geoprobe GH-40	
	8. HOLE LOCATION: NAD-83 E - 922490.16' N - 693845.62'	
	9. SURFACE ELEVATION: NAVD-88 65.13'	
	10. DATE STARTED: 1/31/98	11. DATE COMPLETED: 1/31/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 3.75'	
14. TOTAL DEPTH OF HOLE: 13.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA — DISTURBED — UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Piezometer	Paul J. Jucat		

LOCATION SKETCH/COMMENTS: See Logbook #27 page 42 for sketch

SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO: 7A-GP-02

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

etc.)

HRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7A-GP-02 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0'	Fine SAND with some clay (SW-SC), brown (10YR 5/3), very soft, moist, non-plastic	0.0			
	1.0'	0.0'-0.2': Same as above with some organic silt.				
	2.0'	0.2'-0.4': Clay (CH) with traces of sand, ~~gray~~ greenish gray (10Y 6/1), very plastic	0.0		7A12.11 1540	
	3.0'					
	4.0'					Recovery = 4.0'/4.0'
	5.0'	NA due to recovery				
	6.0'					
	7.0'	NA due to recovery				
	8.0'					Recovery = ~~4.0'~~ 0.6'/4.0' PJC 1/31/98
	9.0'					Piezometer screened from 8.0'-13.0'
	10.0'					

PROJECT: 16 SWMU's | HOLE NO: 7A-GP-02

H TRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER
16 SWMU's		7A-GP-02
		SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					

PROJECT 16 SWMU's HOLE NO 7A-GP-02

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HTRW DRILLING LOG

Field	Entry
DISTRICT	Savannah COE
HOLE NUMBER	7A-GP-03
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	R.E. Wright
SHEET 1 OF 3 SHEETS	
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	SWMU-27A
5. NAME OF DRILLER	A. Knickerbocker
6. MANUFACTURERS DESIGNATION OF DRILL	GeoProbe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	2" Macrocore Rods; Acetate Liner; PVC screen & Riser; Peristaltic Pump; HDPE Tubing
8. HOLE LOCATION	NAD-83 E-822522.64' N-693863.15'
9. SURFACE ELEVATION	NAVD-88 69.16'
10. DATE STARTED	2-3-98
11. DATE COMPLETED	2-3-98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	NA
14. TOTAL DEPTH OF HOLE	15.0'
15. DEPTH GROUNDWATER ENCOUNTERED	4.6'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	NA (DISTURBED: ; UNDISTURBED:)
19. TOTAL NUMBER OF CORE BOXES	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	SVOC	Lead			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	Kennan [signature]

LOCATION SKETCH/COMMENTS

SCALE:

See Logbook #27, page 49 for sketch

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO. 7A-GP-03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: ______ (Signature and Date)

well atmosphere, soil cores, breathing ... etc.)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
16 SWMUs	TODD EARLY	7A-GP-03	2 of 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		WELL GRADED SAND WITH SILT: SW-SM, MEDIUM GRAINED SAND, SOFT, MOIST, BLACK 10YR2/1				AMERS CORE (0-10')
	1	SILT WITH SAND; ML, OLIVE BROWN 2.5Y4/4, MEDIUM TO FINE SAND, SOFT, MOIST	0.0 ppm			PIEZOMETER SET SCREEN (10-15' BGL)
	2		0.0 ppm			
	3	ACCUMULATED LOST CORE	TOE 0.0 ppm 2/24/10			
	4	SAME AS ABOVE	0.0 ppm			
	5	WELL GRADED SAND WITH SILT; SW-SM OLIVE BROWN 2.5Y4/4 MED GRAINED SAND, SOFT, WET, LENSED WITH LEAN CLAY: CL, OLIVE YELLOW 2.5Y6/6 SOFT TO FIRM	0.0 ppm		1330 COVER 7A-GP-03 5-6.5' BGL	
	6					
	7	ACCUMULATED LOST CORE				
		SAME AS ABOVE				
	8		0.0 ppm			
	9	ACCUMULATED LOST CORE				
	10					

PROJECT 16 SWMUs HOLE NO 7A-GP-03

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER
16 SWMU's		7A-GP-03
		SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					
	14					
	15					

PROJECT 16 SWMU's HOLE NO 7A-GP-03

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7A-GP-04
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
4. NAME OF DRILLER: A. Knickerbakers	4. LOCATION: SWMU-27A	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Macro Core Rods; Acetate Liner; PVC screen + Riser; Peristaltic Pump	6. MANUFACTURERS DESIGNATION OF DRILL: GeoProbe.	
	8. HOLE LOCATION: NAD-83 E - 822504.40' N - 683833.53'	
	9. SURFACE ELEVATION: NAVD-88 69.05'	
	10. DATE STARTED: 2-3-98	11. DATE COMPLETED: 2-3-98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 4.5'	
13. DEPTH (DRILLED) INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 15'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA; DISTURBED; UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	Lead	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Piezometer	[signature] Tony		

LOCATION SKETCH/COMMENTS: See Logbook #27 page 42 for sketch

SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 7A-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, breathing zone, venting compressed air, etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMUs | DIRECTOR: | HOLE NUMBER: 7A-GP-04 | SHEET: 2 of 3

FROM (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	GRASS/ROOT ZONE (0-0.2') WELL GRADED SAND WITH SILT: SW-SM VERY DARK GRAY 10YR 3/1, MEDIUM GRAINED SAND, MOIST, SOFT				MACRO CORE (0-8') PIEZ. SET 10-15' BGL
	1	WELL GRADED SAND WITH SILT: SW-SM, YELLOWISH BROWN 10YR 5/6 MEDIUM GRAINED SAND, MOIST, SOFT	0.0 ppm			
	2					
	3	- ACCUMULATED LOST CORE				
	4	SAME AS ABOVE			7A-GP 04 1410 COLLECTED SOIL	
		- SATURATED BELOW 4.5'				
	5		0.0 ppm		7A1431 (SPLIT) 7A1411	
	6		0.0 ppm			
	7	WELL GRADED SAND WITH SILT: SW-SM, BLACK 2.5Y 2.5/1, MEDIUM GRAINED, SOFT	0.0 ppm			
		ACCUMULATED LOST CORE (6A'-8.0') TOE				
	8					
	9					
	10					

PROJECT: - 16 SWMUs | HOLE NO: 7A-GP-04

FHWA DRILLING LOG

PROJECT	16 SWMU's	INSPECTOR	HOLE NUMBER 7A-GT-04
			SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					
	14					
	15					

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PROJECT 16 SWMU's HOLE NO 7A-GT-04

SWMU 27A

3D SQUADRON, 7TH CAVALRY MOTORPOOL AND FOUR ASSOCIATED OIL/WATER SEPARATORS (BUILDING 1339A)

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HTRW DRILLING LOG

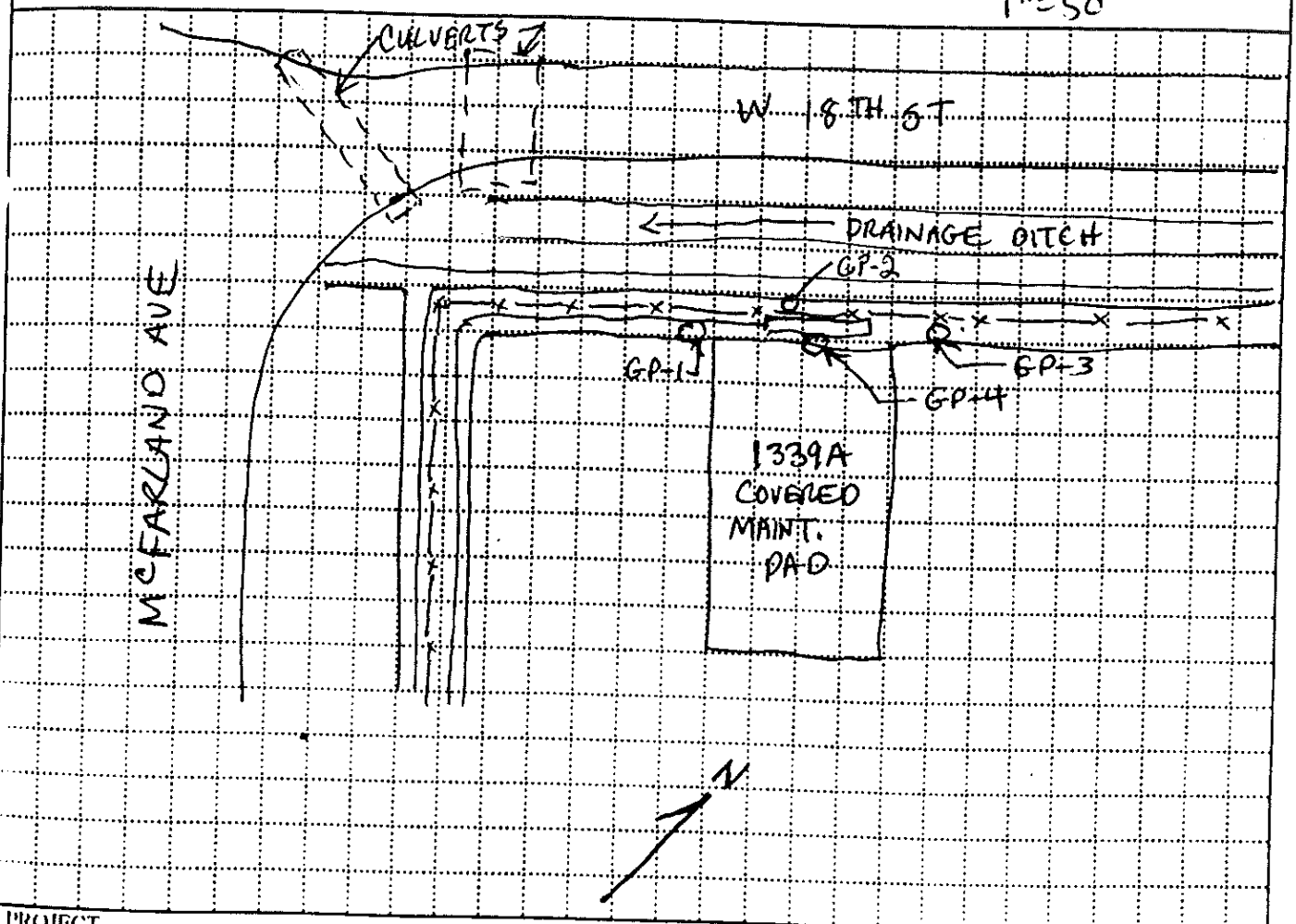
1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 78-GP-01
	2. DRILL SUBCONTRACTOR: RE WRIGHT / SAIC	SHEET 1 OF 1

3. PROJECT: FT. STEWART 16 SWMUs	4. LOCATION: SWMU # 27A
5. NAME OF DRILLER: J HASELHOFF	6. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS 5M
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" RODS; 1" PVC PIEZO; PERISTALTIC PUMP	8. HOLE LOCATION: SEE SKETCH E-822284.87 N-683637.63 NAD-83
	9. SURFACE ELEVATION: 69.27 NAVD-88
	10. DATE STARTED: 1/17/98 — 11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 8' BGS
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE: 15 BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X		SVOC	Lead		NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Temp. Piezo	Luis Mercado		

LOCATION SKETCH/COMMENTS — SCALE: 1" = 50'



PROJECT: FT. STEWART 16 SWMUs

HOLE NO: 78-GP-01

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

(Signature and Date)

etc.)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7BGP01 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	0-1.2': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK REDDISH GRAY (5YR 4/2), MOIST.	0-2' 0 ppm			PUSHED 0-4' (2.5' RECOVERY) SOME ORGANIC MATERIAL GRASS, ROOTS 0-2" bgs.
	2	1.2': WELL GRADED SAND WITH SILT (SW-SM), AS ABOVE, DARK REDDISH BROWN (2.5YR 3/3), MOIST.				
	3		2-4' 26.2 ppm			
	4					
	5		4-6' 20.0 ppm			PUSHED 4-8' (2.0' RECOVERY)
	6					
	7		6-8' 34.6 ppm		6-8' SAMPLE # 7B1111	
	8	7': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK GREENISH GRAY (10Y 3/1), MOIST, SLIGHT HYDROCARBON ODOR.				
	9		8-10 27.9 ppm			PUSHED 8-12' (4.0' RECOVERY) GW @ 8' bgs ▽
	10					

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7BGP01

HTRW DRILLING LOG

PROJECT ~~SWMU~~ FT. STEWART 16 SWMUS | INSPECTOR LUIS MERCADO | HOLE NO. 7BGP01 | SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10		10-12' 19.1 ppm			
	11	11': WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY, FINE TO MEDIUM SAND, SUBROUNDED, BROWNISH YELLOW (10YR 6/8), MOIST.				
	12	12': CLAYEY SAND (SC), 45% CLAY, FINE SAND, SUBROUNDED BROWNISH YELLOW (10YR 6/8), LOW PLASTICITY CLAY.	12-14 5.1 ppm			PUSHED 12-15' (3.0' RECOVERY)
	13	12.5': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBROUNDED, YELLOW (10YR 7/8), WET.				
	14	13': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, ROUNDED, LIGHT BLUISH GRAY, (5B 7/1), WET.	14-15 0.2 ppm			1" PVC PIEZOMETER INSTALLED TO 15' BGS SCREEN FROM 10-15' BGS.
	15	15': End of Boring				

PROJECT FT. STEWART 16 SWMUS | HOLE NO 7BGP01

HTRW DRILLING LOG

DISTRICT	Savanah
HOLE NUMBER	7B-GP-02
SHEET 1 of 2 SHEETS	
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	R.E. Wright
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	SWMU-27A
5. NAME OF DRILLER	A. Knickerbocker
6. MANUFACTURER'S DESIGNATION OF DRILL	GH-40 (Geoprobe)
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	See page #3
8. HOLE LOCATION	NAD-83 E-822289.82', N-683655'
9. SURFACE ELEVATION	NAVD-88 68.07'
10. DATE STARTED	1/30/98
11. DATE COMPLETED	1/30/98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	—
14. TOTAL DEPTH OF HOLE	8.0'/10.0'
15. DEPTH GROUNDWATER ENCOUNTERED	5.0'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	5.77 (0:10)
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	Lead	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS SCALE:

See Logbook #27, Page 3 for sketch

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7B-GP-02

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

RMA DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7B-GP-02 | SHEET: 2 of 2

TEST (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1.0'	Silty SAND with traces of clay (SW-SM) very dark brown (10YR2/2) loose, soft, moist	2.7			
		1.0'-1.1', 1.7'-1.8': Seams of sandy clay				
	2.0'		4.2			
	3.0'					
	4.0'		5.7		7B1211 1045	Recovery = 4.0'/4.0'
	5.0'	5.0'-8.0': Same as above but wet				5.0'-8.0': Wet
	6.0'		NA			
	7.0'	7.1'-7.7': Seam of sandy CLAY (CH), red (10YR5/6), mottled, medium stiff, very plastic, wet				
	8.0'					Recovery = 4.0'/4.0'
						Piezometer screened From 5.0'-10.0'
	9.0'					

PROJECT: Ft. Stewart 16 SWMU's | HOLE: 7B-GP-02

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7B-GP-03
3. PROJECT: FT. STEWART 16 SWMUS	3. DRILL SUBCONTRACTOR: REWRIGHT / SAIC	SHEET 1 OF 3

5. NAME OF DRILLER: J. HASELHOFF	4. LOCATION: SWMU # 27A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" HODS; 1" PVC PIEZOMETER; PERISTALTIC PUMP	6. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS - 8M
	8. HOLE LOCATION: 7B-GP-03 E-922319.67' N-683620.23' NAD-83
	9. SURFACE ELEVATION: 69.44' NAVD-88
	10. DATE STARTED: 11/17/98
12. OVERBURDEN THICKNESS: NA	11. DATE COMPLETED: 11/17/98
13. DEPTH DRILLED INTO ROCK: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 8' BGS
14. TOTAL DEPTH OF HOLE: 16' BGS	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	LEAD		NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)			
			TEMP. PIEZ.			

23. SIGNATURE OF INSPECTOR: Lisa Mercado

LOCATION SKETCH/COMMENTS: SEE PAGE #3

SCALE:

PROJECT	HOLE NO
FT. STEWART 16 SWMUS	7B-GP-03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7B-GP-03 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, SUB-ROUNDED, DARK GRAYISH BROWN (2.5Y 4/2), DRY.	0-2' Ø ppm			PUSHED 0-4' (3.0' RECOVERY) SOME ORGANIC MATERIAL 0-2" GRASS, ROOTS
	1					
	2					
	3		2-4' Ø ppm			
	4					PUSHED (4-8') (3.2' RECOVERY)
	5		4-6' Ø ppm			
	6	5.5': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, SUBROUNDED, DARK YELLOWISH BROWN (10YR 4/4), MOIST.				
	7		6-8 3.1 ppm			
	8					PUSHED 8-12' (3.6' RECOVERY) GW AT 8' BGS ▽
	9	8.5': CLAYEY SAND (SC), ~~15%~~ CLAY, SUBROUNDED SAND, BROWNISH YELLOW (10YR 6/8), LOW PLASTICITY CLAY, MOIST.	8-10' 7.7 ppm			
	10	9.5': WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY RED (10R 4/8), MOIST.				

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7B-GP-03

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERLADO | HOLE NUMBER: TB-GP-03 | SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
		10.5': WELL GRADED SAND WITH CLAY (SW-SC), 20% CLAY, YELLOW (10YR 7/8), MOIST	10-12' 29.9 ppm		10-12' SAMPLE # TB1311	
	11	11': WELL GRADE SAND WITH SILT (SW-SM), 10% SILT, SUBROUNDED, RED (10R 4/8), MOIST.				
	12	12: WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, ROUNDED, FINE TO MEDIUM SAND, LIGHTRED (2.5R 6/8), WET.	12-14' ~~1.2 ppm~~ (MM) 1.2ppm			PUSHED 12-16' (4.0' RECOVERY)
	13					
	14	14': WELL GRADED SAND (SW), TRACE OF SILT (5%), MEDIUM SAND, ROUNDED, LIGHTGRAY (N7/), WET.	14-16' 0.9 ppm			
	15	16': End of Boring				1" PVC PIEZOMETER INSTALLED SCREEN FROM 11-16' BGS.
	16					

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: TB-GP-03

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7B-GP-04
3. DRILL SUBCONTRACTOR: REWRIGHT / SAIC		SHEET 1 of 3
4. PROJECT: FT. STEWART 16 SWMUS	5. LOCATION: SWMU 27A	
7. NAME OF DRILLER: J. HASELHOFF	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE SYSTEMS - 8M	
12. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" RODS; 1" PVC PIEZOMETER LMM; PERISTALTIC PUMP LMM	8. HOLE LOCATION: 7B-GP-04 E - 822239.32' N - 683655.28' NAD-83	
	9. SURFACE ELEVATION: 68.07' NAVD-88	
	10. DATE STARTED: 1/17/98	11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NA	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 11' BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	CEAO		NA %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			TEMP. DEF	Luis Morcad		

LOCATION SKETCH/COMMENTS: SEE SKETCH PAGE #3

SCALE:

PROJECT: FT. STEWART 16 SWMUS

HOLE NO: 7BGP04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well attributes, soil survey, etc.)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7B6P04 | SHEET: 2 of 3

FROM (A)	TO (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
0	2	WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK GRAY (10YR 4/1), MOIST.	0-2' 0.4ppm			PUSHED 0-4' (2.0' RECOVERY)
2	4	2': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, SUBANGULAR, BROWN (10YR 4/3), MOIST.	2-4' 17.5ppm	2-4' SAMPLE #7B141	LMM	
4	8		4-6' 0.6ppm 6-8' 6.4ppm			PUSHED 4-8' (2.8' RECOVERY)
8	10	8': WELL GRADED SAND WITH SILT (10%), FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAYISH BROWN (2.5Y4/2), MOIST.	8-10' 0.0ppm			PUSHED 8-10' (1.0' RECOVERY)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7BGP04 | SHEET: 3 of 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10		10-11' 0 ppm			PUSHED 10-11' (0.3' RECOVERY) REFUSAL @ 11' BGS
	11	11' END OF BORING REFUSAL				NO PIEZOMETER INSTALLED

SWMU 27A

3D SQUADRON, 7TH CAVALRY MOTORPOOL AND FOUR ASSOCIATED OIL/WATER SEPARATORS (BUILDING 1322)

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2

HTRW DRILLING LOG

DISTRICT: Savannah COE		HOLE NUMBER: 7C-GP-01
1. COMPANY NAME: SAIL	2. DRILL SUBCONTRACTOR: MIW	SHEET 1 of 2 SHEETS
3. PROJECT: Ft. Stewart 16 SWMU's	4. LOCATION: Hinesville GA SWMU-27A	
5. NAME OF DRILLER: Waz	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4'x2" Sampler; Acetate Sleeve; 3/4" PVC piezometer	8. HOLE LOCATION: NAD-83 E-829646.19', N-683204.96'	
	9. SURFACE ELEVATION: NAVD-88 67.93'	
	10. DATE STARTED: 1/17/98	11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: 10'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 4'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
NA			NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY %**
	✓	✓	SVOC			NA
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
			piezometer	[signature]		

LOCATION SKETCH/COMMENTS

SCALE:

See Location Map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7C-GP-01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: ______ (Signature and Date)

HTRW DRILLING LOG

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR | HOLE NUMBER: 7C-GP-01 | SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	Concrete plus 10"				
	2–3	(SC) clayey sand, fine to coarse grain sands 2.5Y 2.5/1 Black color	HS: 0.0			*slight petro odor at base
	4–6	(SM) fine grain silty sand, grey color 2.5Y 5/1, moist at base	HS: 0.0 HS: 2.1			
	7–8	(CL) fine sandy clay, fine to coarse grain sand, mottled grey matrix 2.5Y 6/1, with olive yellow 2.5Y, 6/6 mottles				▽WT
	9–10	Insufficient Recovery, due Seepy sand				
	10					Tcl Screen

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: 7C-GP-01

HTRW DRILLING LOG

DISTRICT	Savannah COE
HOLE NUMBER	7C-GP-02
SHEET	1 of 2 SHEETS
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	MHW
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	[illegible] GA SWMU-27A
5. NAME OF DRILLER	W. ?
6. MANUFACTURER'S DESIGNATION OF DRILL	Mobile B-47
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4' x 2" Sampler; 4' x 1" rods; 3/4" PVC prepared; acetate sleeves
8. HOLE LOCATION	NAD-83 E-822661.69', N-683187.69'
9. SURFACE ELEVATION	NAVD-88 68.17'
10. DATE STARTED	1/17/98
11. DATE COMPLETED	1-17-98
12. OVERBURDEN THICKNESS	10'
13. DEPTH DRILLED INTO ROCK	0'
14. TOTAL DEPTH OF HOLE	10'
15. DEPTH GROUNDWATER ENCOUNTERED	≈ 3' BGS
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Grouted	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See location map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7C-GP-02

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

QA CHECK BY: ______ (Signature and Date)

well atmosphere, soil core, breathing zone, venting ... etc.)

PROJECT Ft. Stewart 16 SWMU's | INSPECTOR [illegible] | HOLE NUMBER 7C-GP-02 | SHEET 1 2 of 2

CLASS (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(SM) Fine grain silty sand	45'6.6'			
	2	Grey color 2.5Y 5/1, saturated below 3' bgs				
	3					▽
	4	~~Note: top of~~ C G				
	5	Note: 0-1' had coarse gravel pack with silty sand (from sample from (~3' bgs)				
	6					
	7	(CL) Firm sandy clay, fine to medium grain 2.5Y 6/1				
	8	Mottles = olive yellow 2.5Y 6/6				
	9	same as above				
	10					

PROJECT Ft. Stewart 16 SWMU's | HOLE NO 7C-GP-02

HTRW DRILLING LOG

DISTRICT	Savannah COE
HOLE NUMBER	7C-GP-03
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	Miller Drilling
SHEET 1 OF 2 SHEETS	
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	Hinesville GA SWMU-27A
5. NAME OF DRILLER	H. Hontoon
6. MANUFACTURERS DESIGNATION OF DRILL	Mobile B-47
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	3/4" PVC; 2" x 4' Sampler steel; 1" x 4' rods
8. HOLE LOCATION	NAD-83 E-822673.75', N-683164.98'
9. SURFACE ELEVATION	NAVD-88 68.00'
10. DATE STARTED	1/17/99
11. DATE COMPLETED	1/17/99
12. OVERBURDEN THICKNESS	16'
15. DEPTH GROUNDWATER ENCOUNTERED	≈ 4'
13. DEPTH DRILLED INTO ROCK	0'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE	16'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓		SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			[illegible]	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See Location Map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7C-GP-03

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

QA CHECK BY: ______ (Signature and Date)

well atmosphere, soil core, breathing zone, venting ... etc.)

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR | SHEET: 2 of 2

USCS (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		Concrete plug				
	1–2	(SM) fine grain silty sand, 5Y 2.5Y 5/1 saturated	HS: 2.7			
	3–4		HS: 2.8			WT
	5		HS: 2.9			
	6–9	(CL) (fine sand) clay, fine to med grain sand, mottled, grey matrix 2.5Y 6/1 with olive yellow 2.5Y 6/6 mottles moist to saturated in areas	HS: 2.5 HS: 2.4			
	11–14	(SM) fine grain silty sand, light olive brown color 2.5Y 5/3 moist to saturated	HS: 2.8 HS: 3.1			
	15–16	(SW) fine grain sand grey 2.5Y 6/1 soupy, very saturated				Set piezometer

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: TC-GP-03

well atmosphere, soil core, breathing zone, venting compressor, etc.)

QA CHECK BY: ______ (Signature and Date)

HTRW DRILLING LOG

DISTRICT: Savannah COE		HOLE NUMBER: 7C-GP-04
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
3. PROJECT: Ft. Stewart 16 SWMU's	4. LOCATION: Hinesville GA SWMU-27A	
5. NAME OF DRILLER: Haz	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2' steel sampler; 4' x 1" rods; 3/4" PVC piezometer	8. HOLE LOCATION: NAD-83 E-822649.88', N-683166.33'	
	9. SURFACE ELEVATION: NAVD-88 67.89'	
	10. DATE STARTED: 11/17/98	11. DATE COMPLETED: 11/17/98
12. OVERBURDEN THICKNESS: 10'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈4'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
NA			NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY %**
	✓	✓	SVOC			NA
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
			piezometer	[signature]		

LOCATION SKETCH/COMMENTS

SCALE:

See location map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7C GP-04

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7C-GP04 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(SM) fine grain silty, sand, saturated at base, grey 2.5 Y 5/1	HS: 0 U			
	2					
	3		HS: 0 U			
	4					
	5	(SM) fine grain silty, sand, same as above only sandy & very saturated				
	6	(CL) firm sandy clay mottled, grey matrix 2.5 Y 6/1 w/ olive yellow 2.5 Y 6/6, saturated				
	7					
	8					
	9	Sandy mixture released. No recovery				
	10					Set piezometer

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: 7C-GP-04

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7C-GP-05
3. PROJECT: Ft. Stewart 16 SWMU's	2. DRILL SUBCONTRACTOR: Mid Dr.	SHEET 1 OF 2
5. NAME OF DRILLER: W&Z	4. LOCATION: Hinesville, GA	SWMU 27A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4" x 2' Sensor; 4" x 1" Russ; 3/4" Core Retriever	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-822628.52', N-683170.62'	
	9. SURFACE ELEVATION: NAVD-88 67.65'	
	10. DATE STARTED: 1/17/96	11. DATE COMPLETED: 1/17/96
12. OVERBURDEN THICKNESS: 12'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 4'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer	CO		

LOCATION SKETCH/COMMENTS — SCALE:

See Location Map

PROJECT: Ft. Stewart 16 SWMU's — HOLE NO: 7C-GP-05

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, ... etc.)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
16 SWMU's		7C-GP-05	2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0–1	(SM) fine grain silty sand, moist to saturated at base, grey 2.5Y 5/1	HS: 0.2			
	3		HS: 1.2			
	4					▽ WT
	5–6		HS: 0.8			
	6–8	(CL) firm sandy clay, mottled grey matrix 2.5Y 6/1, w/ olive yellow 2.5Y 6/6 mottles, wet soil	HS: 0.0			
	8–11	(SM) soupy fine grain silty sand, very saturated				
	11–12	(SC) very firm clayey sand, moist dark grey, 5Y 4/1				

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO. 7C-GP-05

SWMU 27B

1ST BN, 3D ADA MOTORPOOL AND ASSOCIATED OIL/WATER SEPARATOR

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: M.I.L.	DISTRICT: Savannah COE; HOLE NUMBER: 7D-GP-01; SHEET: 1 OF 2
3. PROJECT: Ft. Stewart 16 SWMU's	4. LOCATION: Hunter G.D. SWMU 27B	
5. NAME OF DRILLER: H. Hontoon	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
7. SIZE AND TYPE OF DRILLING AND SAMPLING EQUIPMENT: 4" x 2" Split Spoon; 6" I.D. Hollow Stem Auger; 3/4" to 2" PVC Riser and Screen	8. HOLE LOCATION: NAD-83 E-822594.60', N-682514.12'	
	9. SURFACE ELEVATION: NAVD-88 68.03'	
	10. DATE STARTED: 1/15/98	11. DATE COMPLETED: 1/19/98
12. OVERBURDEN THICKNESS: 12'	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 3'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 15'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES: NA	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %: NA
	✓		SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer			

LOCATION SKETCH/COMMENTS — SCALE:

See Location Map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7D-GP-01

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

well atmosphere, soil core, breathing zone, vehicle, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

PROJECT Ft. Stewart 16 SWMU's	INSPECTOR	HOLE NO. 7D-GP-01	SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		(SM) fine to med. grain silty sand 2.5Y 3/1 very dark gray				
	1	(SC) clayey sand 2.5Y 4/1 dark gray color saturated from 3' to base	45: [illegible] ppm			
	2					
	3					▽ WT [illegible]
	4					
	5					
	6					
	7					
	8					
	9					
	10	(CL) mottled gray, browns, grays, red & yellow colors				
		(SW) light gray clean fine to med. grain sand				
	11					
	12					
	13					

PROJECT Ft. Stewart 16 SWMU's

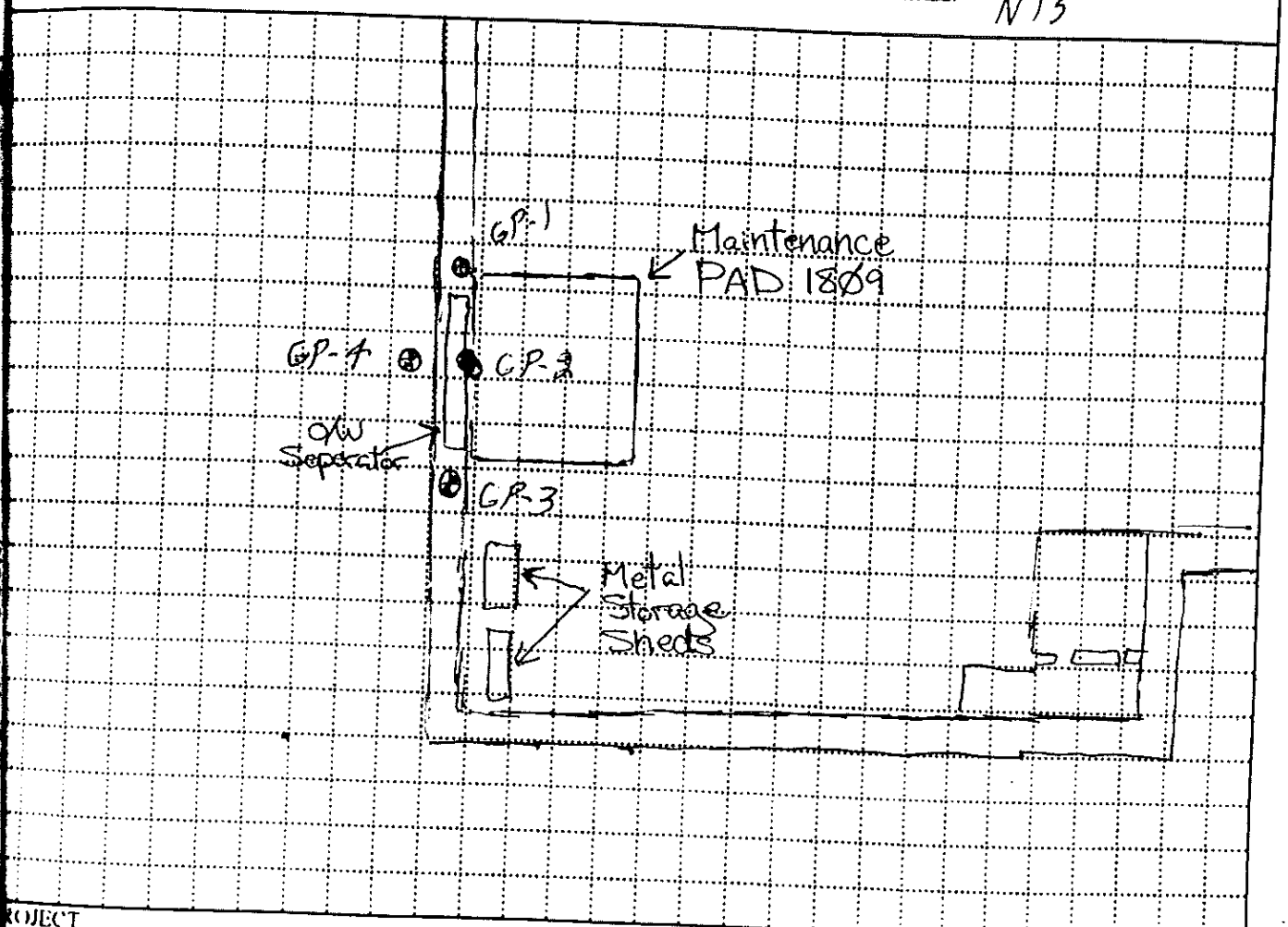
HOLE NO. 7D-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savanah COE	HOLE NUMBER: 7D-GP-02
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3 SHEETS
4. NAME OF DRILLER: Al Root	5. LOCATION: SWMU-27B	
5. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" MacroCore Rods; Acetate Liner; Peristaltic Pump; PVC screen & riser	6. MANUFACTURERS DESIGNATION OF DRILL: Geoprobe 5400	
	8. HOLE LOCATION: NAD-83 E-822610.34', N-682459.98'	
	9. SURFACE ELEVATION: NAVD-88 67.93'	
	10. DATE STARTED: 1/18/98	11. DATE COMPLETED: 1/18/98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: 3.5'	
13. DEPTH DRILLED INTO ROCK: —	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 4.18' (@ 10)	
14. TOTAL DEPTH OF HOLE: 12.0'/11.88'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED:	UNDISTURBED:
19. TOTAL NUMBER OF CORE BOXES: NA		
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: ✓	METALS: Lead
	OTHER (SPECIFY): 3 VOC	OTHER (SPECIFY):
	OTHER (SPECIFY):	31. TOTAL CORE RECOVERY: NA
21. DISPOSITION OF HOLE	BACKFILLED:	MONITORING WELL:
	OTHER (SPECIFY): Piezometer	23. SIGNATURE OF INSPECTOR: Paul J. Zweck

LOCATION SKETCH/COMMENTS

SCALE: NTS



PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 7D-GP-02

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air,

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7D-GP02 | SHEET: 2 of 3

DEPTH (A)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO	REMARKS (G)
1.0'	Clayey SAND (SC), olive (5Y4/A), slightly plastic, very soft, moist	3.1			
2.0'	2.1'				
3.0'	Silty SAND (SM), dark olive gray (5Y 3/2), nonplastic, very soft, wet	12.6			3.5'-12.0': Wet. therefore, no field screening. Continued through aquatard to get to clean sand at 11.0'
	Thin 3.0'-11.0': Clayey seams widely spaced				
4.0'					
5.0'					
6.0'					
7.0'					
8.0'					
9.0'					

PROJECT: Ft. Stewart | 16 SWMU's | HOLE NO: 7D-GP-02

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7D-GP-02 | SHEET: 3 of 3

CLASS (A)	DEPTH (ft) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	9.0					
	10.0'					
	11.0'	11.0' Silty SAND (SM), white (5Y8/1), nonplastic, very soft, moist				
	12.0'	Bottom of Boring = 12.0'				Screen piezometer from 6.88' to 11.88'

PROJECT: Ft. Stewart | 16 SWMU's | HOLE NO: 7D-GP-02

HTRW DRILLING LOG

7D

1. COMPANY NAME: SAIC	2. DISTRICT: Savanah COE	HOLE NUMBER: ~~7G~~-GP-03
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 2
4. NAME OF DRILLER: Al Root	4. LOCATION: SWMU-27B	
5. SIZE AND TYPE OF DRILLING AND SAMPLING EQUIPMENT: 2" Macro Core Sampler; Acetate Liner; Peristaltic Pump; PVC screen & Riser	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400	
	8. HOLE LOCATION: NAD-83 E-922613.91', N-682486.93'	
	9. SURFACE ELEVATION: NAVD-88 68.01'	
	10. DATE STARTED: 1/18/98	11. DATE COMPLETED: 1/18/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK:	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 8.05' (6:05)	
14. TOTAL DEPTH OF HOLE: 8.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED / UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: ✓ / METALS: — / OTHER (SPECIFY): Lead / OTHER (SPECIFY): SVOC / OTHER (SPECIFY):	21. TOTAL CORE RECOVERY: NA
22. DISPOSITION OF HOLE	BACKFILLED / MONITORING WELL / OTHER (SPECIFY): Temp. Piezo.	23. SIGNATURE OF INSPECTOR: Paul Hunt

LOCATION SKETCH/COMMENTS: See page #3 SCALE:

PROJECT: Ft. Stewart 16 SWMU's SKL HOLE NO.: ~~7G~~-GP-03

ENG FORM 5056-R, AUG 94

7D (Proponent CECW-EG)

* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NO.	SHEET
16 SWMU's		~~7B~~ 7D-GP-Ø3	2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Clayey SAND (SC), olive (5Y4/4), slightly plastic, very soft, moist	Ø.3			
	1.0'					
	2.0'	2.0'-4.0': No recovery	~~Ø.6~~ PSL 1/18/98			
	3.0'					
	4.0'	4.0' ~~Bottom of Boring=4.0'~~	Ø.6			
	5.0'					
	6.0'	6.0'-8.0': No recovery				
	7.0'					
	8.0'	Bottom of Boring=8.0'				

PROJECT Ft. Stewart 16 SWMU's HOLE NO. ~~7B~~ 7D-GP-Ø3 SKL

16

HTRW DRILLING LOG

1 COMPANY NAME: SAIC	2 DISTRICT: Savanah	HOLE NUMBER: 7D-GP-04
3 PROJECT: Ft. Stewart 16 SWMU's	3 DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 of 3
4 NAME OF DRILLER: A. Knickerbocker	4 LOCATION: SWMU-27B	
5 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: See page #3	6 MANUFACTURERS DESIGNATION OF DRILL: Geoprobe GH-40	
	8 HOLE LOCATION: NAD-83 E-822602.27' N-6993493.49'	
	9 SURFACE ELEVATION: NAVD-88 67.56'	
12 OVERBURDEN THICKNESS: NA	10 DATE STARTED: 2/1/98	11 DATE COMPLETED: 2/1/98
13 DEPTH DRILLED INTO ROCK: —	15 DEPTH GROUNDWATER ENCOUNTERED: 3.5'	
14 TOTAL DEPTH OF HOLE: 11.4'	16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
	17 OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18 GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19 TOTAL NUMBER OF CORE BOXES
NA			NA

20 SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21 TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA
22 DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23 SIGNATURE OF INSPECTOR		
			Piezometer	Paul G. Smart		

LOCATION SKETCH/COMMENTS: See Logbook #58 page 3 for sketch SCALE:

PROJECT: Ft. Stewart 16 SWMU's HOLE NO: 7D-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)
well atmosphere, soil core, breathing zone, venting compressed air, etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7D-GP-04 | SHEET: 2 of 3

FROM (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1.0'	SAND with some clay (SW-SC), yellowish brown (10YR 5/4), very soft, nonplastic, moist	Ø.Ø			
	2.0'					Recovery = 2.0'/2.0'
			Ø.Ø		7D1411 1430	
	3.0'					
	3.5'	Clayey SAND (SW-SC), dark gray (5Y4/1), very soft, slightly plastic, wet				3.5'-8.0': Wet
	4.0'		Ø.Ø			Recovery = 2.0'/2.0'
	5.0'					
	6.0'		Ø.Ø			Recovery = 2.0'/2.0'
	7.0'					
	8.0'					Recovery = 2.0'/2.0'
	9.0'					Piezometer installed to 11.4'
	10.0'					

PROJECT: Ft. Stewart '' A.13-11 IMU's | HOLE NO: 7D-GP-04

HTRW DRILLING LOG

PROJECT	16 SWMU's	INSPECTOR	HOLE NUMBER	7D-GP-04
			SHEET	3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					

PROJECT 16 SWMU's HOLE NO 7D-GP-04

SWMU 27C

92D ECB (H) MOTORPOOL AND ASSOCIATED OIL/WATER SEPARATOR

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH 3. DRILL SUBCONTRACTOR: REWRIGHT / SAIC	HOLE NUMBER: 7EGP01 SHEET 1 OF 3
4. PROJECT: FT. STEWART 16 SWMUS	5. LOCATION: SWMU #27C	
6. NAME OF DRILLER: J. HASELHOFF	7. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS 5M	
8. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" MODS 1" PVC CASING/SCREEN PERISTALTIC PUMP	9. HOLE LOCATION: 7EGP01 E-913803.21' N-679894.42' NAD-83	
	10. SURFACE ELEVATION: NAVD-88 69.19'	
12. OVERBURDEN THICKNESS: NA	13. DATE STARTED: 1/18/98	14. DATE COMPLETED: 1/18/98
13. DEPTH DRILLED INTO ROCK: NA	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 9.5' bgs	
14. TOTAL DEPTH OF HOLE	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA — DISTURBED: NA — UNDISTURBED: NA	19. TOTAL NUMBER OF CORE BOXES: NA	
20. SAMPLES FOR CHEMICAL ANALYSIS: VOC: X — METALS: — OTHER (SPECIFY): SVOC — OTHER (SPECIFY): LEAD — OTHER (SPECIFY): —	21. TOTAL CORE RECOVERY: NA	
22. DISPOSITION OF HOLE: BACKFILLED: — MONITORING WELL: — OTHER (SPECIFY): TEMP. PIEZO.	23. SIGNATURE OF INSPECTOR: Lisa Mercado	

LOCATION SKETCH/COMMENTS: SEE PAGE # 3 FOR SKETCH

SCALE:

PROJECT: FT. STEWART 16 SWMUS

HOLE NO.: 7EGP01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

etc.)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP01 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		0-0.7': CONCRETE WITH AGGREGATE.				PUSHED 0.7' - 4.7' (1.8' RECOVERY)
	1	0.7': WELL GRADED SAND WITH SILT, 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, REDDISH YELLOW (10YR 7/8), MOIST (SW-SM).	0-2' 1.4ppm		0-2' SAMPLE # 7E1111	
	2	1.2': WELL GRADED SAND WITH SILT, 20% SILT, TRACE OF CLAY (5%), FINE TO MEDIUM SAND, SUBROUNDED, PINK (7.5YR 7/4), MOIST, (SW-SM)	2-4' 1.1ppm			
	3					
	4					
	5		4-6' 0.2ppm			PUSHED 4.7' - 8.7' (2.5' RECOVERY)
	6					
	7	6.3': CLAYEY SAND (SC), 35% CLAY, TRACE OF SILT (5%), FINE TO MEDIUM SAND, GRAYISH BROWN (2.5Y 5/2), MOIST,	6-8' 0.3ppm			
	8					
	9		8-10' 1.1ppm			PUSHED 8.7 - 12.7' (3.0' RECOVERY) 9.5' - GW ▽
	10	9.5': AS ABOVE; WET				

PROJECT: FT. STEWART 16 [illegible]AS | HOLE NO: 7EGP01

HTRW DRILLING LOG

PROJECT: FT. STEWART / L. SWMU | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP01 | SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10		10-12'			
		10.5': WELL GRADED SAND WITH SILT, 20% SILT, FINE TO MEDIUM SAND, SUBROUNDED, GRAY (2.5Y 5/1), WET.	~~11 ppm~~ 0.5 ppm			
	11					
		11.5': WELL GRADED SAND WITH SILT, 20% SILT, MEDIUM SAND, SUBROUNDED, DARK GRAY (2.5Y 4/1), WET.				1" PVC PIEZOMETER INSTALLED TO 15.7' BGS WITH SCREEN FROM 10.7 - 15.7' BGS
	12	12.7': End of LOG				
	13					
	14					
	15					

PROJECT: FT. STEWART 16

HOLE NO: 7EGP01

HTRW DRILLING LOG

Field	Entry
District	SAVANNAH
Hole Number	7EGP02
1. Company Name	SAIC
2. Drill Subcontractor	REWRIGHT/SAIC
Sheet	1 of 3 Sheets
3. Project	FT. STEWART 16 SWMUS
4. Location	SWMU # 27C
5. Name of Driller	J. HASELHOFF
6. Manufacturer's Designation of Drill	GEOPROBE SYSTEMS – SM
7. Sizes and Types of Drilling and Sampling Equipment	2" RODS 1" PVC PIEZOMETER PERISTALTIC PUMP
8. Hole Location	7E-GP-02 E-819788.40' N-679899.00' NAD-83
9. Surface Elevation	NAVD-88 68.90'
10. Date Started	1/18/98
11. Date Completed	1/18/98
12. Overburden Thickness	NA
13. Depth Drilled into Rock	NA
14. Total Depth of Hole	
15. Depth Groundwater Encountered	
16. Depth to Water and Elapsed Time after Drilling Completed	
17. Other Water Level Measurements (Specify)	
18. Geotechnical Samples	NA
Disturbed	NA
Undisturbed	NA
19. Total Number of Core Boxes	NA
20. Samples for Chemical Analysis – VOC	X
Metals	
Other (Specify)	SVOC
Other (Specify)	LEAD
Other (Specify)	
21. Total Core Recovery %	NA
22. Disposition of Hole – Backfilled	
Monitoring Well	
Other (Specify)	TEMP. PIEZ.
23. Signature of Inspector	[illegible]

LOCATION SKETCH/COMMENTS

SEE PAGE # 3 FOR SKETCH

SCALE:

PROJECT: FT. STEWART 16 SWMUS

HOLE NO. 7EGP02

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP02 | SHEET: 2 of 3

FROM (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		0-0.8': CONCRETE WITH AGGREGATE				PUSH 0.8 - 4.8' (2.1' RECOVERY)
	1	0.8': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, TRACE OF CLAY (5%), SUBROUNDED FINE TO MEDIUM SAND, REDDISH YELLOW (7.5YR 7/8), DRY.	0-2' 0.3ppm			
	2					
	3		2-4' 0.2ppm			
	4					
	5		4-6' 0.3ppm			PUSHED 4.8 - 8.8' (2.5' RECOVERY)
	6	5.8': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, TRACE OF CLAY (5%), SUBROUNDED, DARK GRAY (10YR 4/1), MOIST.				
	7		6-8' 1.2ppm	6-8' SAMPLE # 7E1211		
	8	8.2': CLAYEY SAND (SC), 30% CLAY, 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAY (10YR 4/1), MOIST.				
	9	9': WELL GRADED SAND WITH SILT, 15% SILT, FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAY (10YR 4/1), WET.	8-10' 0.7ppm			PUSHED 8.8 - 12.8' (3.2' RECOVERY) 9.0' GW ▽
	10					

PROJECT: FT. STEWART | HOLE NO: 7EGP02

H1RW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERLADO | HOLE NUMBER: 7EGA02 | SHEET: 3 of 3

(A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10		10-12'			
	11	11.0-11.1: WELL GRADED SAND (SW), TRACE OF SILT (<5%) MEDIUM SAND, SUBROUNDED, LIGHT GRAY (10YR 7/1), WET.	0.5'			
	12	11.1': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAY (10YR 4/1), WET.				1" PVC PIEZOMETER INSTALLED TO 15.8' BG-S, SCREEN FROM 10.8-15.8' DGS.
	13	12.8': End OF LOG				

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7EGP03
	2. DRILL SUBCONTRACTOR: REINRIGHT/SAIC	SHEET 1 OF 3 SHEETS

3. PROJECT: FT. STEWART 16 SWMUS

4. LOCATION: SWMU # 27C

5. NAME OF DRILLER: J. HASELHOFF

6. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" CASING; 1" PVC PIEZOMETER; PERISTALTIC PUMP

8. HOLE LOCATION: 7E-GP-03 E-819819.61' N-679925.66' NAD-83

9. SURFACE ELEVATION: NAVD-88 63.93'

10. DATE STARTED: 1/18/98

11. DATE COMPLETED: 1/18/98

12. OVERBURDEN THICKNESS: NA

13. DEPTH DRILLED INTO ROCK: NA

14. TOTAL DEPTH OF HOLE: 15.6' bgs

15. DEPTH GROUNDWATER ENCOUNTERED: 12' bgs

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

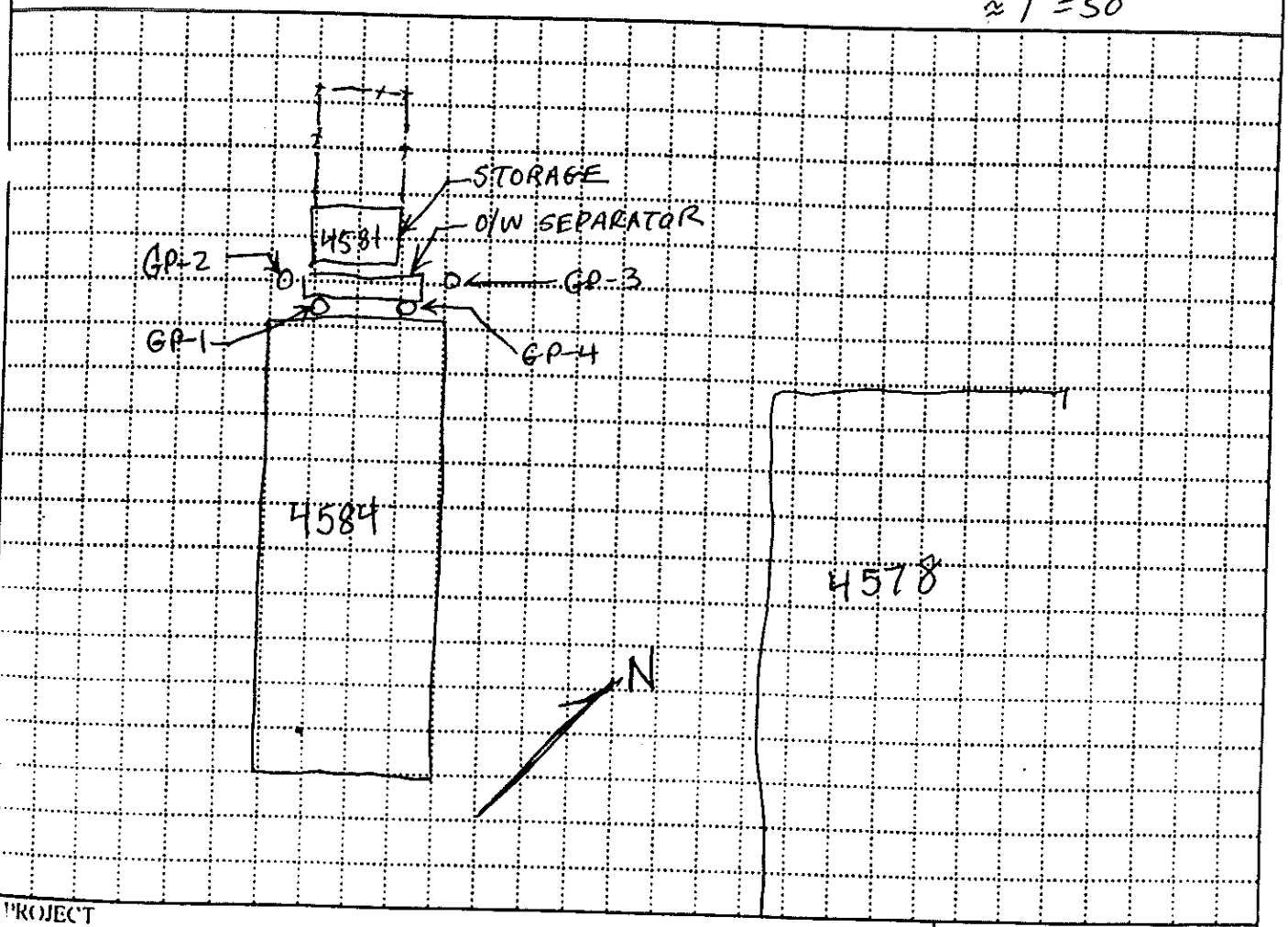
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	LEAD		NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			TEMP. PIEZO	L. Mercado

LOCATION SKETCH/COMMENTS

SCALE: ≈ 1" = 50'



PROJECT: FT. STEWART 16 SWMUS

HOLE NO.: 7EGP03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

etc.)

(Signature and Date)

QA CHECK BY:

RCRA DRILLING LOG

PROJECT: FT. STEWART 16SWMUS | INSPECTOR: LUIS MERCADO | SHEET: 2 of 3 | 7EGP03

DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0-0.6': CONCRETE REINFORCED WITH AGGREGATE				PUSHED (LMM) 1 0.6-4.6' (2.0' RECOVERY)
1	0.6': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, REDDISH YELLOW (7.5YR 7/6), DRY.	0-2' 0.4ppm			
2					
3		2-4' 0.7ppm			
4					
					PUSHED (LMM) 4.6-8.6' (1.8' RECOVERY)
5		4-6' 0.4ppm			
6	6': WELL GRADED SAND WITH SILT (SW-SM), 20% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK GRAY ~~(5Y 4/1)~~ (4/N), DRY.				
7		6-8' ~~0.4ppm~~ (LMM) 0 ppm			
8	7.5-8.5': WELL GRADED SAND WITH SILT (SW-SM), AS ABOVE, WET.				
					PUSHED (LMM) 8.6-12.6' (4.0' RECOVERY)
9	8.5': WELL GRADED SAND WITH SILT (SW-SM), 30% SILT, TRACE OF CLAY (<5%), FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAY (10YR 4/1), MOIST.	8-10 0.7ppm			
10					

PROJECT: FT. STEWART 16S | HOLE NO: 7EGP03

HTRW DRILLING LOG

PROJECT	FT. STEWART 16 SWMUS	INSPECTOR	LUIS MERCADO	HOLE NO.	7EGP03
				SHEET	3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10	10.5' WELL GRADED SAND WITH SILT (SW-SM), 20% SILT, MEDIUM SAND, SUBROUNDED, LIGHT GRAY (10YR 7/1), WET	10-12 1.0 ppm		10-12' SAMPLE # 7E1311	GW @ 10' BGS ▽
	11					1" PVC PIEZOMETER INSTALLED TO 15.6 BGS, SCREENED FROM 10.6 TO 15.6 BGS
		~~12': End of Log~~ (LMA)				
	12	12.6': End of Log				

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7EGP04
	2. DRILL SUBCONTRACTOR: REWRIGHT/SAIC	SHEET: 1 OF 3

3. PROJECT: FT. STEWART 16 SWMUS

4. LOCATION: SWMU # 27C

5. NAME OF DRILLER: J. HASELHOFF

6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE SYSTEMS - 8M

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 1" PVC PIEZOMETER; 2" MODS; PERISTALTIC PUMP

8. HOLE LOCATION: 7EGP04 E-819822.74' N-629911.03' NAD-83

9. SURFACE ELEVATION: NAVD-88 69.35'

10. DATE STARTED: 1/16/98

11. DATE COMPLETED: 1/16/98

12. OVERBURDEN THICKNESS: NA

13. DEPTH DRILLED INTO ROCK: NA

14. TOTAL DEPTH OF HOLE:

15. DEPTH GROUNDWATER ENCOUNTERED:

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: NA — DISTURBED: NA — UNDISTURBED: NA

19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	LEAD		NA %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)			
			TEMP. PIEZ			

23. SIGNATURE OF INSPECTOR: Luis Mercado

LOCATION SKETCH/COMMENTS: SEE SKETCH MAP ON PAG#3

SCALE:

PROJECT	HOLE NO.
FT. STEWART 16 SWMU'S	7EGP04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

H TRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP04 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	0-0.7': CONCRETE WITH AGGREGATE				PUSHED 0.7'-4.7' (1.3' RECOVERY)
	1	0.7': WELL GRADED SAND WITH SILT, 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, REDDISH YELLOW (5YR 7/8), WET. (SW-SM)		0-2' 0.3ppm		
	2	1.2': WELL GRADED SAND WITH SILT (SW-SM), AS ABOVE, DRY.				
	3			2-4' 0.4ppm		
	4					
	5			4-6' 0.4ppm		PUSHED 4-8' (CMM) 4.7-8.7' (1.9' RECOVERY)
	6	6.2': WELL GRADED SAND WITH SILT, 20% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK GRAY (4/N), DRY.				
	7			6-8' 0.4ppm		
	8					
	9	8.4': WELL GRADED SAND WITH SILT (20%) (SW-SM), TRACE OF CLAY (<5%), SUBROUNDED FINE TO MEDIUM SAND, DARK GRAYISH BROWN (10YR 4/2), WET.		8-10' 0.5 ppm		PUSHED 8-12' 8.7'-12.7' (2.7' RECOVERY)
	10	9.1': WELL GRADED SAND W/SILT (SW-SM), 20% SILT, FINE TO MED. SAND, SUBROUNDED, BLACK (2.5/N) WET.				GW @ 9' bgs ▽

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7EGP04

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP04 | SHEET: 3 of 3

(A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10	10': WELL GRADED SAND WITH SILT, 20% SILT, FINE TO MEDIUM SAND, SUBROUNDED, GRAY (10YR 6/1), WET.	10-12 0.0PPM		10-12' Sample # 7E1411 & Sample # 7E1431	1" PVC PIEZOMETER INSTALLED TO 15.7' BGS, SCREENED FROM 10.7 - 15.7' BGS
	11					
	12	12.7': End of Log				
	13					

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7EGP04

SWMU 27D

26TH SPT BN MOTORPOOL
AND ASSOCIATED TWO OIL/WATER SEPARATORS

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: TF-GP-01
3. PROJECT: Fort Stewart	2. DRILL SUBCONTRACTOR: Miller	SHEET: 1 OF 2
4. NAME OF DRILLER: H. Hamtoon	4. LOCATION: Hinesville	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4" Geoprobe Sleeves; Steel tube; PVC Piezometer	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-818917.04', N-679013.38'	
	9. SURFACE ELEVATION: NAVD-88 68.43'	
12. OVERBURDEN THICKNESS: NA	10. DATE STARTED: 1-20-98	11. DATE COMPLETED: 1-20-98
13. DEPTH DRILLED INTO ROCK: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 4' bgs	
14. TOTAL DEPTH OF HOLE: 14 bgs	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Degreaser	Greg Bryant

LOCATION SKETCH/COMMENTS

SCALE:

See location maps

PROJECT: Fort Stewart

HOLE NO: TF-GP-01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

QA CHECK BY:

etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR: | HOLE NUMBER: TF-GP-01 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1–4	(CL) Predominantly, fine to med grain sandy clay fill material, dark gray 2.5Y 4/1	3.4 ppm 2.1 ppm			
	4–7	(CL) Predominantly, fine to med. grain sandy clay fill material very dark gray 2.5Y 3/1 with some clay mottling				▽
	7–14	(CL/SC) Firm, coarse/fine grained ~~sandy~~ Clayey ~~clay~~ sand, gray 2.5Y 5/1 brown upward				Sol piezometer

PROJECT: Fort Stewart 16 SWMU's | HOLE NO: TF-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SNIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 75-GP-62
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
4. NAME OF DRILLER: Id=2	4. LOCATION: Winnie, GA SWMU-27D	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Acetate liners + sleeves; Hand pump; Steel rods	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-818990.40', N-679000.18'	
	9. SURFACE ELEVATION: NAVD-88 68.74'	
	10. DATE STARTED: 1/19/98	11. DATE COMPLETED: 1/19/98
12. OVERBURDEN THICKNESS: 20'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 2' bgs (Perched)	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 20'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES: NA	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA				
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: NA %	
	✓	✓	SVOC				
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR			
			Piezometer	Chris Miller			

LOCATION SKETCH/COMMENTS

SCALE:

See Location Map

PROJECT: Ft. Stewart 16 SWMU's	HOLE NO. 75-GP-62

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

QA CHECK BY:

etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7F-GP-02 | SHEET 2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1–6	(CL) soft, saturated clay, 10YR 7/6 yellow color with reddish streaks	20.1 ppm			▽ (at 2)
	6–9	(CL) saturated fine to med. grain sandy clay, dark grey color 2.5Y 4/1 with some small gravel lines				
	9–14	layers of the soft clay noted above mixed				
	14	(CL) very hard sandy clay				
	14–16	(SM) fine to coarse grain silty sand, very saturated, lt. brownish grey color 2.5Y 6/2				~~Set piezometer~~
	16–20	Insufficient Recovery (fall in)				(Set piezometer at 20')

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO. 7F-GP-02

HTRW DRILLING LOG

Field	Entry
DISTRICT	Savannah COE
HOLE NUMBER	7F-GP-03
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	Miller
SHEET 1 OF 2 SHEETS	
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	Hinesville, GA SWMU-27D
5. NAME OF DRILLER	Haz
6. MANUFACTURERS DESIGNATION OF DRILL	Mobile B-47
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	Acetate tubing & Sleeves; Haz pump; Steel drill rods
8. HOLE LOCATION	NAD-83 E-819003.66', N-678982.69'
9. SURFACE ELEVATION	NAVD-88 68.84'
10. DATE STARTED	1/19/98
11. DATE COMPLETED	1/19/98
12. OVERBURDEN THICKNESS	16'
13. DEPTH DRILLED INTO ROCK	0'
14. TOTAL DEPTH OF HOLE	16'
15. DEPTH GROUNDWATER ENCOUNTERED	≈ 6'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓		SVOC			N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See Location Map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7F-GP-03

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

QA CHECK BY: ____________ (Signature and Date)

well atmosphere, soil core, breathing zone, venting comp... etc.)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
Ft. Stewart	[illegible]	7F-GP03	

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1	(CL) Predominantly fine to medium grain sandy, clay silt material, dark grey 2.5Y 4/1, mixture of yellow and clays and coarse grained areas thin layers of mottling (unnatural) mixed within lithology	HS:65.7			
	2					
	3		HS:19.1			
	4					
	5		HS:35.7			
	6					▽WT
	7					
	8					
	9					
	10					
	11	(SC) Fine to coarse grain clayey sand 10YR 7/1 lt. grey				
	12					Piezometer
	13	Transitional Data (fall in not representative) Saturated				
	14					
	15					
	16					

PROJECT: Ft. Stewart | HOLE NO. 7F-GP-03

HTRW DRILLING LOG

1 COMPANY NAME: SAIC	2 DISTRICT: Savannah COE	HOLE NUMBER: 75-GP-04
	3 DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 3

4 PROJECT: Ft. Stewart	5 LOCATION: Hinesville GD
6 NAME OF DRILLER: Hal	7 MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47
8 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: PVC Piezometer (5' screen); Acetate Sleeves & Hand pump	8 HOLE LOCATION: NAD-83 E-819015.75', N-678983.94'
	9 SURFACE ELEVATION: NAVD-88 68.47'
	10 DATE STARTED: 1/19/99 — 11. DATE COMPLETED: 1/15/99
12 OVERBURDEN THICKNESS: 12'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈11' bgl not sure
13 DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14 TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18 GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19 TOTAL NUMBER OF CORE BOXES
NA			NA

20 SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	

LOCATION SKETCH/COMMENTS — SCALE:

Site Location Map

PROJECT	HOLE NO
Ft. Stewart	75-GP-04

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

well atmosphere, soil cores, cuttings, etc.)

(Signature and Date)

QA CHECK BY: _____

HTRW DRILLING LOG

PROJECT: Ft. Stewart | INSPECTOR: [illegible] | SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(CL) sandy clay, fine to med. grain sand 2.5Y 6/1, grey color, saturated from surface water	[illegible]			
	2					
	3	(CL) fine grain sandy clay, 2.5Y 6/1 & mottles of 7.5YR 7/6	[illegible]			
	4	(SM) fine to medium grain silty sand, black 5Y 2.5/1				▽ WT (approx)
	5					
	6	Insufficient return, flowing sands & surface water				
	7					
	8					
	9					
	10					
	11					
	12					

PROJECT: FORT STEWART | HOLE NO: 1F-GP04

SWMU 27E

703D SPT BN (MAIN) MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (WASH RACK 1628)

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 76-GP-01
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET: 1 of 2
5. NAME OF DRILLER: A. Knickerbocker	4. LOCATION: SWMU-27E	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Macro Core Rods; Acetate Liner; Peristaltic Pump; PVC screen & riser; HDPE Tubing	6. MANUFACTURER'S DESIGNATION OF DRILL: GeoProbe	
	8. HOLE LOCATION: NAD-83 E-822785.47' N-691432.81'	
	9. SURFACE ELEVATION: NAVD-88 70.57'	
	10. DATE STARTED: 2-3-98	11. DATE COMPLETED: 2-3-98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 4.0'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED:	UNDISTURBED:
19. TOTAL NUMBER OF CORE BOXES: NA		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Piezometer	Jim Caley		

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO: 76-GP-01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

well atmosphere, soil core, breathing zone, venting compressed air, etc.)

AFRA DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: Todd Fahy | HOLE NUMBER: 76-GP-01 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		CONCRETE (0-1')				MACRO CORE (0-8')
	1	SANDY LEAN CLAY: CL, gray 5Y5/1 MEDIUM TO COARSE ANGULAR SAND, LENSES WITH, WELL GRADED SAND WITH SILT: SW-SM, gray 5Y5/1 <1Cm THICK Moist				PIEZOMETER (5-10') SCREENED
	2		0.0 ppm		1520 761111 COLLECTED SOIL	
		- ORGANIC MATERIAL/FRAGMENTS				
	3	TDE 2/3/98	0.0 ppm			
		TDE 2/3/98	0.0 ppm			
	4	CLAY: CH, PLASTIC, COHESIVE, moderate gray olive; 10GY 5/1, SLIGHT SAND 25%, SOFT				(3.5-3.8) POORLY GRADED SAND WITH SILT SP-SM, 10GY 5/1, SOFT MED. TO COARSE GRAINED SAND MOIST
		- ACCUMULATED LOST CORE				
		SAME AS ABOVE - SATURATED				
	5		0.0 ppm			
	6					
		- ACCUMULATED LOST CORE				
	7					
	8					
	9					
						10

PROJECT: 16 SWMU's | HOLE NO: 76-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: TG-GP-02
3. PROJECT: Fort Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: Miller	SHEET: 1 OF 2
5. NAME OF DRILLER: Hart	4. LOCATION: Hinesville GA	
6. SIZE AND TYPE OF DRILLING AND SAMPLING EQUIPMENT: 2" x 4' Samples; 2" x 1' Vent; Acetate Sleeves; 3/4 PVC piezometer	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-829803.08', N-6814404.01'	
	9. SURFACE ELEVATION: NAVD-88 70.37'	
	10. DATE STARTED: 1/20/98	11. DATE COMPLETED: 1/20/98
12. OVERBURDEN THICKNESS: 12'	13. DEPTH GROUNDWATER ENCOUNTERED: 4 bgs	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED / UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer	Greg Lappin		

LOCATION SKETCH/COMMENTS — SCALE:

See location Map

PROJECT: Fort Stewart 16 SWMU's — HOLE NO: TG-GP-02

EM FORM 5056-R, AUG 94 (Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, breathing zone, vehicle exhaust, etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR: | HOLE NUMBER: TG-GP-02 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(CL) SANDY CLAY 7.5YR 6/6 REDISH YELLOW(MOTTLED)	0 ppm			
	2					
	3	(CL) SANDY CLAY 5Y 5/1 GRAY	0 ppm			
	4					DWT
	5	NO SOIL DATA DUE SOIL COLLAPSE				
	6					
	7					
	8					
	9	(CL) SANDY CLAY 5Y 5/1 GRAY				
	10					
	11					
	12	(SM) SILTY SAND-FINE to COARSE GRAVELS 5Y 5/1, GRAY				SET PIEZOMETER

PROJECT: Fort Stewart 16 SWMU's | HOLE NO: TG-GP-02

HTRW DRILLING LOG

Field	Entry
1. District	Savanah
Hole Number	76-GP-03
Company Name	SAIC
2. Drill Subcontractor	R.E. Wright
Sheet	1 of 3 sheets
3. Project	Ft. Stewart 16 SWMU's
4. Location	SWMU-27E
5. Name of Driller	A. Knickerbocker
6. Manufacturer's Designation of Drill	Hand Geoprobe (large-bore sampler)
7. Sizes and Types of Drilling and Sampling Equipment	jack-hammer (electric), 1" large-bore sampler with acetate liners, stainless steel spoons, master-Flex peristaltic pump w/LDPE tubing
8. Hole Location	NAD-83 E-822788.46', N-681385.31'
9. Surface Elevation	NAVD-88 70.67'
10. Date Started	2/1/98
11. Date Completed	2/1/98
12. Overburden Thickness	NA
13. Depth Drilled Into Rock	
14. Total Depth of Hole	14.45'
15. Depth Groundwater Encountered	3.8'
16. Depth to Water and Elapsed Time After Drilling Completed	3.0' (0:10)
17. Other Water Level Measurements (Specify)	
18. Geotechnical Samples	NA
Disturbed	
Undisturbed	
19. Total Number of Core Boxes	NA

20. Samples for Chemical Analysis	VOC	Metals	Other (Specify)	Other (Specify)	Other (Specify)	21. Total Core Recovery %
	✓	Lead	SVOC			NA

22. Disposition of Hole	Backfilled	Monitoring Well	Other (Specify)	23. Signature of Inspector
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, ...)

QA CHECKED BY: ______ (Signature and Date)

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	76-GP-03

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 76 GP-03 | SHEET: 2 of 3

LOG (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	PSL 2/1/98	SAND with some clay ~~Clayey SAND~~ (SW-SC), yellowish brown (10YR 5/4), very soft, nonplastic, moist. (Sand is fine to medium texture).	Ø.Ø			
	1.0'				761311 Ø955	
	2.0'		Ø.Ø			PSL 2/1/98 Recovery = 2.0'/2.0'
	3.0'					3.8'-6.0': Wet
	3.8'					
	4.0'	Clayey SAND (SW-SC), dark gray (5Y4/1), very soft, slightly plastic, wet (Sand is medium texture).	NA			PSL 2/1/98 Recovery = 2.0'/2.0'
	5.0'					
	6.0'					Recovery = 2.0'/2.0' Piezometer screened From 4.45'-14.45'
	7.0'					
	8.0'					
	9.0'					
	10.0'					

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: 76-GP-03

HTRW DRILLING LOG

PROJECT: 16 SWMU's	INSPECTOR:	HOLE NUMBER: ~~TG-GP-03~~ JKL	SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					
	14					
	15					

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savanah COE	HOLE NUMBER: 76-GP-04
	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
4. PROJECT: Ft. Stewart 16 SWMU's	5. LOCATION: SWMU-27E	
6. NAME OF DRILLER: A. Knickerbocker	7. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe GH-40	
8. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Macrocore Rods; Acetate Liner; Peristaltic Pump; PVC screen & riser	9. HOLE LOCATION: NAD-83 E-822774.32', N-681409.93'	
	10. SURFACE ELEVATION: NAVD-88 20.85'	
	11. DATE STARTED: 2/1/98	12. DATE COMPLETED: 2/1/98
13. OVERBURDEN THICKNESS: NA	14. DEPTH GROUNDWATER ENCOUNTERED	
15. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 2.04'	
17. TOTAL DEPTH OF HOLE: 14.5'	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
19. GEOTECHNICAL SAMPLES: NA	DISTURBED	UNDISTURBED
20. TOTAL NUMBER OF CORE BOXES: NA		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	Paul J. Lucas

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 76-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

NOTE: TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

CHECK BY:

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NO.
16 SWMU's		76-GP-04
		SHEET 2 of 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1.0'	SAND with some clay (SW-SC), yellowish brown (10YR 5/4), very soft, non plastic, moist. (Sand is fine to medium texture)	Ø.Ø			
		0.8'-1.0': Sandy CLAY (CH), red (10R 4/8), stiff, plastic				
	2.0'		Ø.Ø			
	3.0'					
		3.1				
		Clayey SAND (SW-SC), dark gray (5Y4/1), very soft, slightly plastic, moist				Recovery = 4.0'/4.0'
	4.0'		Ø.Ø			
	5.0'					
		5.5'-10.0': Seams of Sandy CLAY (CH), spaced 0.5'-1.0' apart and 0.2'-0.4' thick, greenish gray (10GY 6/1), stiff, very plastic				Recovery = 3.0'/3.0'
	6.0'					
	7.0'				761411 761431 1145	
	8.0'					
	9.0'					
	10.0'	Bottom of Boring @ 10.0'				- Piezometer screened from 9.5'-14.5' Recovery = 3.0'/3.0'

PROJECT		HOLE NO.
Ft. Stewart	16 SWMU's	76-GP-04

HTRW DRILLING LOG

PROJECT	16 SWMU's	INSPECTOR	HOLE NUMBER 7G-GP-04
			SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					
	14					
	15					

PROJECT 16 SWMU's HOLE NO 7G-GP-04

SWMU 27E

703D SPT BN (MAIN) MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (BUILDING 1720)

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: TH-GP-01
3. PROJECT: Ft. Stewart 16 SWMU's	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2
4. NAME OF DRILLER: Hez	4. LOCATION: Hinesville, GA SWMU-27E	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 55 Mobile; 4' x 2" sampler; 4' x 1" Rods; Acetate Sleeve	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-823768.45', N-681284.59'	
	9. SURFACE ELEVATION: NAVD-88 66.24'	
	10. DATE STARTED: 1/14/98	11. DATE COMPLETED: 1/16/98
12. OVERBURDEN THICKNESS: 10'	15. DEPTH GROUNDWATER ENCOUNTERED: 3.5' bgs	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA — DISTURBED — UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: NA
	✓	✓	SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer			

LOCATION SKETCH/COMMENTS — SCALE:

See Location Map

PROJECT: Ft. Stewart 16 SWMU's — HOLE NO.: TH-GP-01

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

(Signature and Date) Well atmosphere, soil core, breathing zone, venting compressed air, etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart | INSPECTOR: [illegible signature] | HOLE NUMBER: 74-GP-01 | SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1–2	[illegible] (Clayey sand fine to med grain sand, few pebbles, 2.5Y 5/2 grayish brown color	hs: 1.9			
	2–4	(CL) Fine-grained soil sandy clay, firm clay, mottled 2.5Y 7/2, lt. gray matrix with 5YR 5/6 yellowish red mottles	hs: 2.8			
	4–5	Same as above	hs: 2.3			
	5–6	Same as above but no yellowish red mottles				
	6–8	(SM) [illegible] white 5YR 8/1 sand fine grain saturated				▽ WT
	8–10	Same as above (very saturated)				

PROJECT: Ft. Ste[illegible] | HOLE NO: 74-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7H-GP-62
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: Miller Drilling	SHEET 1 OF 2 SHEETS
5. NAME OF DRILLER: Dale	4. LOCATION: Hinesville GA	
6. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" x 4' sampler; 4" x 1" cores; Acetate sleeves; 3/4" PVC piezometer	5. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-825446.54', N-675373.57'	
	9. SURFACE ELEVATION: NAVD-88 75.57'	
	10. DATE STARTED: 1/17/94	11. DATE COMPLETED: 1/19/94
12. OVERBURDEN THICKNESS: 12'	15. DEPTH GROUNDWATER ENCOUNTERED: 6.00'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	

LOCATION SKETCH/COMMENTS — SCALE:

See location map

PROJECT: Ft. Stewart 16 SWMU's — HOLE NO.: 7H-GP-62

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

* NOTE TYPE OF MONITORING (i.e., borehole cuttings, mc ng well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

PROJECT: Ft. Stewart | INSPECTOR: [illegible] | HOLE NUMBER: 7H-GP-02 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(Sm) FINE to MED GRAIN SILTY SAND DARK GRAY 7.5YR 3/2 AND BROWN MIX OF SHADES	0.5 ppm			
	2					
	3		0.6 ppm			
	4					
	5	SAME AS ABOVE but DARKER BROWN-BLACK	0.8 ppm			
	6					▼ W/T
	7	See Above				
	8					
	9	See Above				
	10					
	11	(SW) Saturated white 7.5YR 8/1 CLEAN Fine Grain SAND				
	12					Set Piezometer

PROJECT: Ft. Stewart 11 SWMU's | HOLE NO: 7H-GP-02

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7H-GP-03
3. PROJECT: Fort Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
5. NAME OF DRILLER: HAZ	4. LOCATION: Hinesville GA	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" x 8' Sampler; 4" x 11" Roots; Hollow Stem Auger; PVC 3/4 piezometer	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-925448.97', N-678362.26'	
	9. SURFACE ELEVATION: NAVD-88 75.30'	
	10. DATE STARTED: 1/17/98	11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: 12'	15. DEPTH GROUNDWATER ENCOUNTERED: Dry	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED
		19. TOTAL NUMBER OF CORE BOXES: NA
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: ✓	METALS: ✓
	OTHER (SPECIFY): SVOC	OTHER (SPECIFY):	OTHER (SPECIFY):	21. TOTAL CORE RECOVERY: NA %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL
	OTHER (SPECIFY): Piezometer	23. SIGNATURE OF INSPECTOR: Lee Hopper

LOCATION SKETCH/COMMENTS — SCALE:

See Location Map

PROJECT: Fort Stewart 16 SWMU's — HOLE NO: 7H-GP-03

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compd air, etc.)

QA CHECK BY: (Signature and Date)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7H-GP-03 | SHEET: 16

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0–4	(SM) fine to med grain silty sand dark grey 7.5YR 3/2 and brown (mix of shades)	[illegible] (1); [illegible] (3)			
	4–6	(CL) sandy clay mottled light grey 7.5Y 7/1 matrix and reddish yellow 7.5Y 6/8 mottles	2.2			
	6–10	(SW) saturated white 7.5YR 8/1 clean fine grain sand				WT
	10–12	(SC) Clayey sand saturated, light grey color 7.5YR 7/1				Set [illegible]

PROJECT: 16 SWMU's

A.17-8

HOLE NO: 7H-GP-03

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7N-GP-04
3. PROJECT: Ft. Stewart 16 SWMU's	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
4. NAME OF DRILLER: Hare	4. LOCATION: Hinesville	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2" Sampler; 4' x 1" Steel rods; 3/4" Piezometer; Auger sleeves	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-825434.83', N-678364.38	
	9. SURFACE ELEVATION: NAVD-88 75.15'	
	10. DATE STARTED: 1/18/98	11. DATE COMPLETED: 1/18/98
12. OVERBURDEN THICKNESS: 10'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈6'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	SVOC			NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	

LOCATION SKETCH/COMMENTS

SCALE:

See location map

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 7N-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

well drillers, soil scientists, etc.)

HTRW DRILLING LOG

PROJECT	16 SWMU's	HOLE NUMBER	7H-GP-04
	INSPECTOR	SHEET	2 of 2

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UNIT (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(SM) Silty SAND w/some mottles SANDY CLAY 2.5Y 3/1 MIX SHADES	1.4 ppm			
	2					OMH
	3		1.5 ppm			
	4	SAME AS Above				
	5		1.8 ppm			
	6					▼ WT
	7	(CL) Saturated gray tan/white Sandy clay				
	8	See Above				
	9	(SW) Saturated white 7.5YR 8/1 CLEAN Fine grained SAND				
	10					Set piezometer

PROJECT Ft. Stewart 11 SWMU's HOLE NO 7H-GP-04

SWMU 27F

3D ENGINEER BRIGADE MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (NORTHWEST OF BUILDING 1340)

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HTRW DRILLING LOG

DISTRICT	Savanah COE
HOLE NUMBER	TJ-GP-01
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	RE, Wright
SHEET / SHEETS	1 of 3
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	SWMU-27F
5. NAME OF DRILLER	Al Root
6. MANUFACTURERS DESIGNATION OF DRILL	Geoprobe 5400
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	2" dia. macrocore sampler w/Acetate liners, stainless steel spoons, peristaltic pump w/HDPE tubing
8. HOLE LOCATION	NAD-83 E-821509.30', N-684398.37'
9. SURFACE ELEVATION	NAVD-88 68.71'
10. DATE STARTED	1/18/98
11. DATE COMPLETED	1/18/98
12. OVERBURDEN THICKNESS	NA
15. DEPTH GROUNDWATER ENCOUNTERED	12.0'
13. DEPTH DRILLED INTO ROCK	—
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	8.10' (0:10)
14. TOTAL DEPTH OF HOLE	16.0'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
—			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	2	—	Lead	SVOC		NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS See page #39 SCALE:

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	TJ-GP-01

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

QA CHECK BY: ________ (Signature and Date)

Well (atmosphere, soil ... etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: TJ-GP-01 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0'	~~Silty SAND~~ TSL 1/18/98 SAND with some silt (SW-SM), olive (5Y5/3), nonplastic, soft, moist	Ø.5			
	1.0'					
	2.0'		1.6			
	3.0'					
	3.0'	~~Silty SAND~~ TSL 1/18/98 Silty SAND with traces of clay (SM), olive (5Y4/3), nonplastic, soft, moist				
	4.0'		Ø.Ø			
	5.0'					
	6.0'		1.6			
	7.0'					
	8.0'		6.8		751111 Ø940	
	8.5'	Sandy CLAY (CL), white (5Y8/1), slightly plastic, medium stiff, moist				
	9.0'					

PROJECT: 16 | HOLE NO: TJ-GP-01

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NO.: 25-GP-01 | SHEET: 3 of 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	9.0'					
	10'		1.1			
	11'					
		11.5' Silty SAND (SM), white (5Y 8/1), nonplastic, very soft, moist				12.0'-16.0': Wet
	12'	12.0'-16.0': Wet				
	13'					
	14'					
	15'					
	16'	Bottom of Boring = 16.0'				

PROJECT: Ft. Stewart 16 SWMU's HOLE NO. 25-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7J-GP-02
3. PROJECT: Ft. Stewart Georgia 16 SWMU's	3. DRILL SUBCONTRACTOR: N/A	SHEET 2 OF 2 SHEETS
5. NAME OF DRILLER: Andy Knickerbocker	4. LOCATION: SWMU # 27F	
6. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe - Macrosampler 6-7836	6. MANUFACTURERS DESIGNATION OF DRILL: Geoprobe	
	8. HOLE LOCATION: 7J-GP-02 E: 821527.80' N: 684379.47' NAD-83	
	9. SURFACE ELEVATION: NAVD-88 68.50'	
12. OVERBURDEN THICKNESS: NA	10. DATE STARTED: 2/3/98	11. DATE COMPLETED: 2/3/98
13. DEPTH DRILLED INTO ROCK: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: ~ 9.75' BGL	
14. TOTAL DEPTH OF HOLE: ~ 14.75' BGL	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer	Todd Ecday		

LOCATION SKETCH/COMMENTS: See Page 29 SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO: 7J-GP-02

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

(Signature and Date)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 75-GP-02 | SHEET: 2 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		GRASS ROOT ZONE (0-0.2') SAME AS BELOW				MACRO CORE (0-10')
		WELL GRADED SAND WITH SILT; SW-SM FINE GRAINED SAND, YELLOWISH BROWN 10YR 5/4, SOFT				PIEZOMETER SET (14.15 - 9.75')
	1	SANDY SILT; ML, VERY FINE SAND, SOFT, DARK BROWN 7.5 YR 3/3, LENSED WITH YELLOWISH RED 5YR 5/8	0.0 ppm			
	2	WELL GRADED SAND WITH SILT; SW-SM DARK YELLOWISH BROWN 10YR 3/6, FINE TO MED. GRAINED SAND, SOFT, MOIST, LENSED WITH; SMALL < 1cm CLAY-FAT CLAY LIGHT GREY 10YR 7/1 AND VERY FINE TO MED SAND WITH SILT SW-SM, SOFT, VERY DARK BROWN 10YR 2/2, MEDIUM GRAINED	0.0 ppm			
	3		0.0 ppm			
	4		0.0 ppm			
		TOE				
	5		0.2 ppm		1127 SAMPLE 75-GP-02	
		SANDY SILT: ML, SOFT, MOIST/SATURATED, VERY DARK GRAY 10YR 3/1, FINE TO MED. GRAINED SAND	0.7 ppm			
	6		0.2 ppm			-SATURATED
	7	SANDY FAT CLAY; CH, PALE YELLOW 5Y 7/3 POORLY GRADED SAND, SOFT, SATURATED, LENSED WITH; MED. TO COARSE GRAINED WELL GRADED SAND WITH SILT SW-SM AND POORLY GRADED SAND WITH SILT 5Y 3/2	0.1 ppm			
	8		0.7 ppm			
	9		0.4 ppm			
			0.2 ppm			

PROJECT: 16 SWMU's | HOLE NO: 75-GP-02

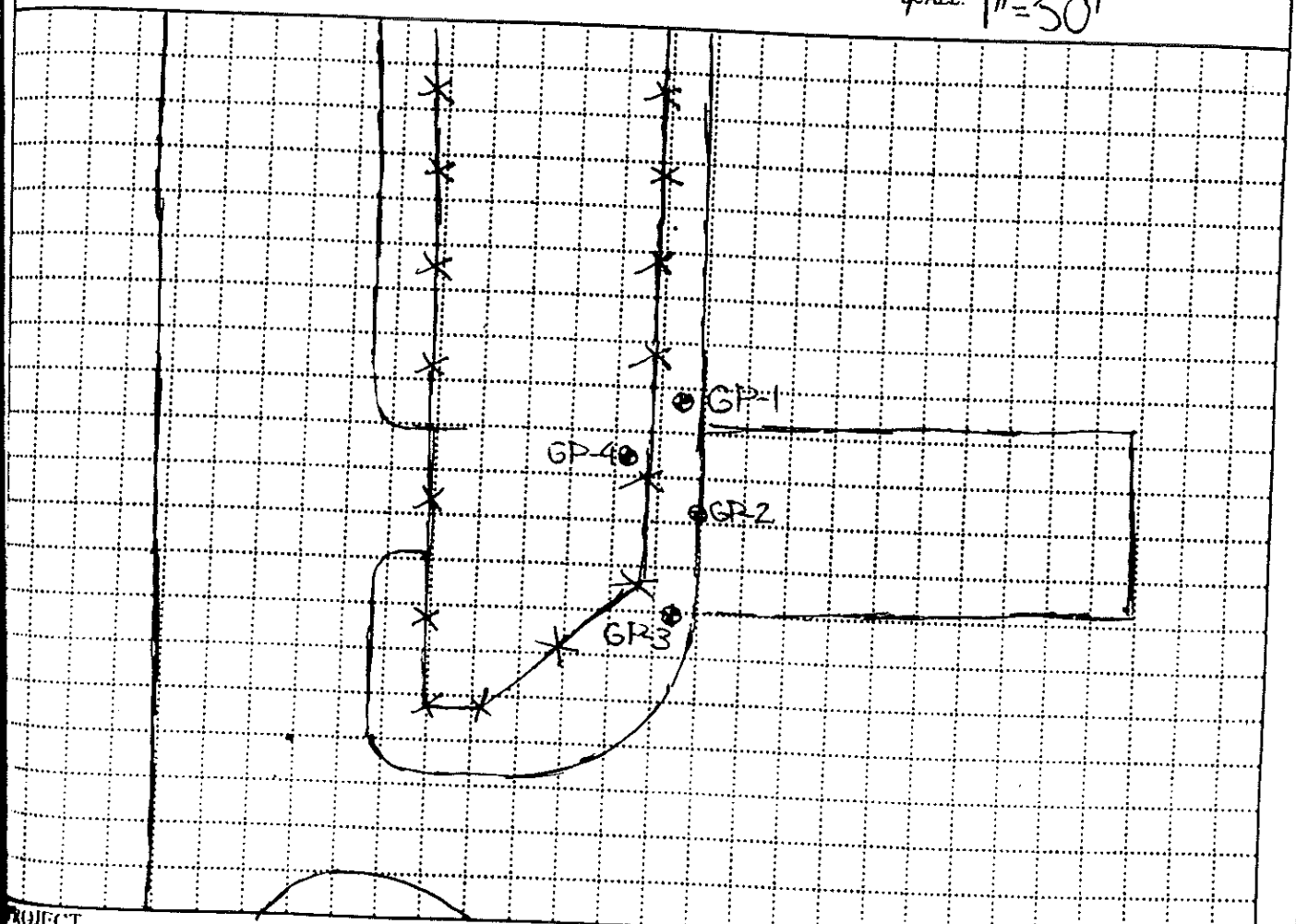
HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 75-GP-03
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
4. NAME OF DRILLER: Al Root	4. LOCATION: SWMU-27F	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" dia. Macrocore sampler w/Acetate liners	5. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400	
	6. HOLE LOCATION: E-821538.38', N-684358.35' NAD-83	
	7. SURFACE ELEVATION: NAVD-88 67.97'	
	8. DATE STARTED: 1/17/98	9. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: N/A	13. DEPTH GROUNDWATER ENCOUNTERED: 11.4'	
13. DEPTH DRILLED INTO ROCK:	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.13' (0:10)	
14. TOTAL DEPTH OF HOLE: 12.0'/14.1'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: N/A %
	2	Lead 0/0	SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: Paul J. Jucat		
			Piezometer			

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



PROJECT: Ft. Stewart 16 SWMU's

HOLE NO: 75-GP-03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil cover, groundwater, etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart | INSPECTOR: | HOLE NUMBER: 75-GP-03 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		~~Clayey SAND~~ PSL 1/17/98 SAND with some clay (SW-SC), slightly plastic, soft, moist	3.4			Hydrocarbon odor From 1.0'-12.0'
	1.0'					
	2.0'		5.5			
	3.0'					
	4.0'		44.5			
	5.0'					
		5.8'				
	6.0'	~~Clayey SAND~~ PSL 1/17/98 Sandy CLAY (CL), medium plastic, medium stiff, moist, pale yellow (5Y 7/4)	311.		751321 1610	
	7.0'	7.1'-7.3': Black wet layer w/petroleum odor				
		7.5'-8.0': Mottled clay				
	8.0'		178			
	9.0'					
		Continued on next page				

PROJECT: Ft. Stewart | 11 WMU's | HOLE NO: 75-GP-03

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INJECTOR: | HOLE NUMBER: TJ-GP-03 | SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	9.0'					
	10.0'	10.0'-10.5': Mottled	303			
	11.0'					
		11.4' Fine to medium SAND w/ some silt (SW-SM), yellow (5Y 7/6), nonplastic, wet				
	12.0'	Bottom of Boring = 12.0'				

PROJECT: Ft. Stewart 11 & WMU's | HOLE NO: TJ-GP-03

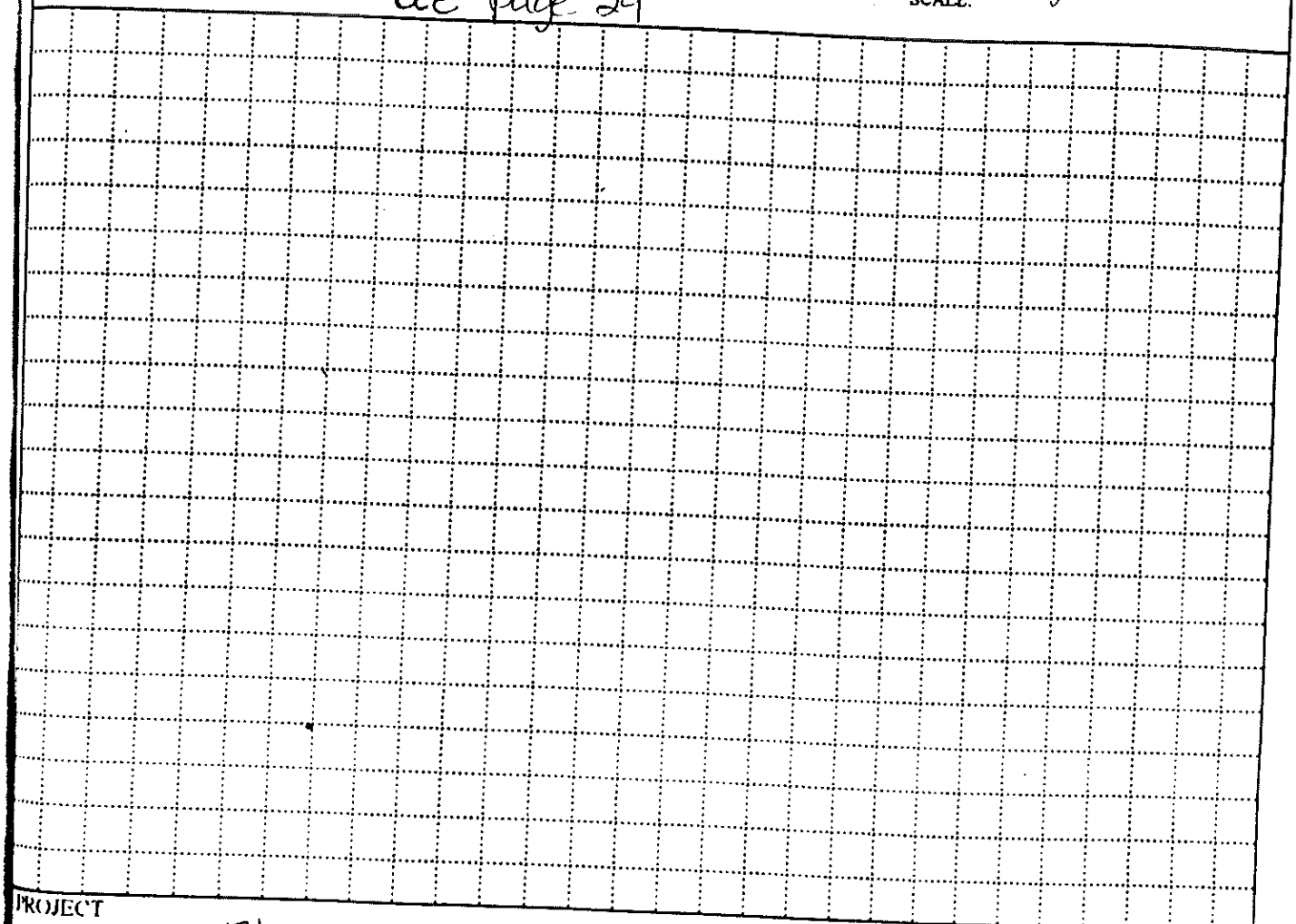
HTRW DRILLING LOG

1. COMPANY NAME: SAIC.	2. DISTRICT: Savannah COE.	HOLE NUMBER: 7J-GP-04
3. PROJECT: Ft. Stewart, Georgia 16 SWMU's	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2
4. NAME OF DRILLER: Hardy Knickerbocker	4. LOCATION: SWMU #27F	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe - Direct push 6.7" EGL	6. MANUFACTURER'S DESIGNATION OF DRILL: GL. CT. KOBE	
	8. HOLE LOCATION: 7A-GP-04 E - 821513.22' N - 684375.51' NAD-83	
	9. SURFACE ELEVATION: NAVD-88 67.86'	
	10. DATE STARTED: 2/3/98	11. DATE COMPLETED: 2/3/98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ~9.5 BGL	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: ~14.5' BGL	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer	Hardy Knickerbocker		

LOCATION SKETCH/COMMENTS: See page 29 SCALE:



PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 7J-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | LOCATION: | HOLE NUMBER: 7J-GP-04 | SHEET: 2 of 2

FEET (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		VERY COARSE SAND/GRAVEL SUB-BASE				MACRO CORE (0-10')
	1	WELL GRADED SAND WITH SILT: SW-SM, 50% VERY FINE GRAINED SAND, YELLOWISH RED 5YR 5/6	0.0 ppm			PIEZOMETER SET (9.5-14.5' BGL)
	2	POORLY GRADED SAND WITH CLAY: SP-SC, FIRM, STRONG BROWN 7.5YR 5/6 TO 7.5YR 5/8, LENSED WITH SANDY LEAN CLAY: CL < 2cm	0.0 ppm			
	3		0.0 ppm			
	4		0.0 ppm			
	5		0.0 ppm			
		SANDY LEAN CLAY: CL, COARSE SAND, HARD, YELLOW 10YR 8/8				
	6		0.0 ppm			
	7		0.0 ppm			
		LEAN CLAY WITH SAND: CL, HARD, VERY FINE SAND ~ 5% GRADING DOWNWARD TO ~ 25% VERY FINE SAND, WHITE 2.5 Y8/1			1210 7J-GP-04 COLLECTED 8-10' BGL	
	8					
	9					
		VERY FINE SAND: SW, SATURATED RAPID DILATENCY, WHITE 2.5 Y8/1				

PROJECT: 16 SWMU's | A.18-12 | HOLE NO: 7JGP-04

3

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-01

SHEET 1 OF 4

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers

5. NAME OF DRILLER: Darren Penn /

6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-59 / CME-85

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: For S. Casing ⇒ 8¼" ID augers - Sch. 80 PVC (6.6'long) 2" Split Spoons (2' long)

8. HOLE LOCATION: See map. 27F-MW1 N684433.25 E821537.79

9. SURFACE ELEVATION: TOC 69.16

10. DATE STARTED: 10/9/99

11. DATE COMPLETED:

12. OVERBURDEN THICKNESS: N/A

13. DEPTH DRILLED INTO ROCK: N/A

14. TOTAL DEPTH OF HOLE: 21 FT

15. DEPTH GROUNDWATER ENCOUNTERED:

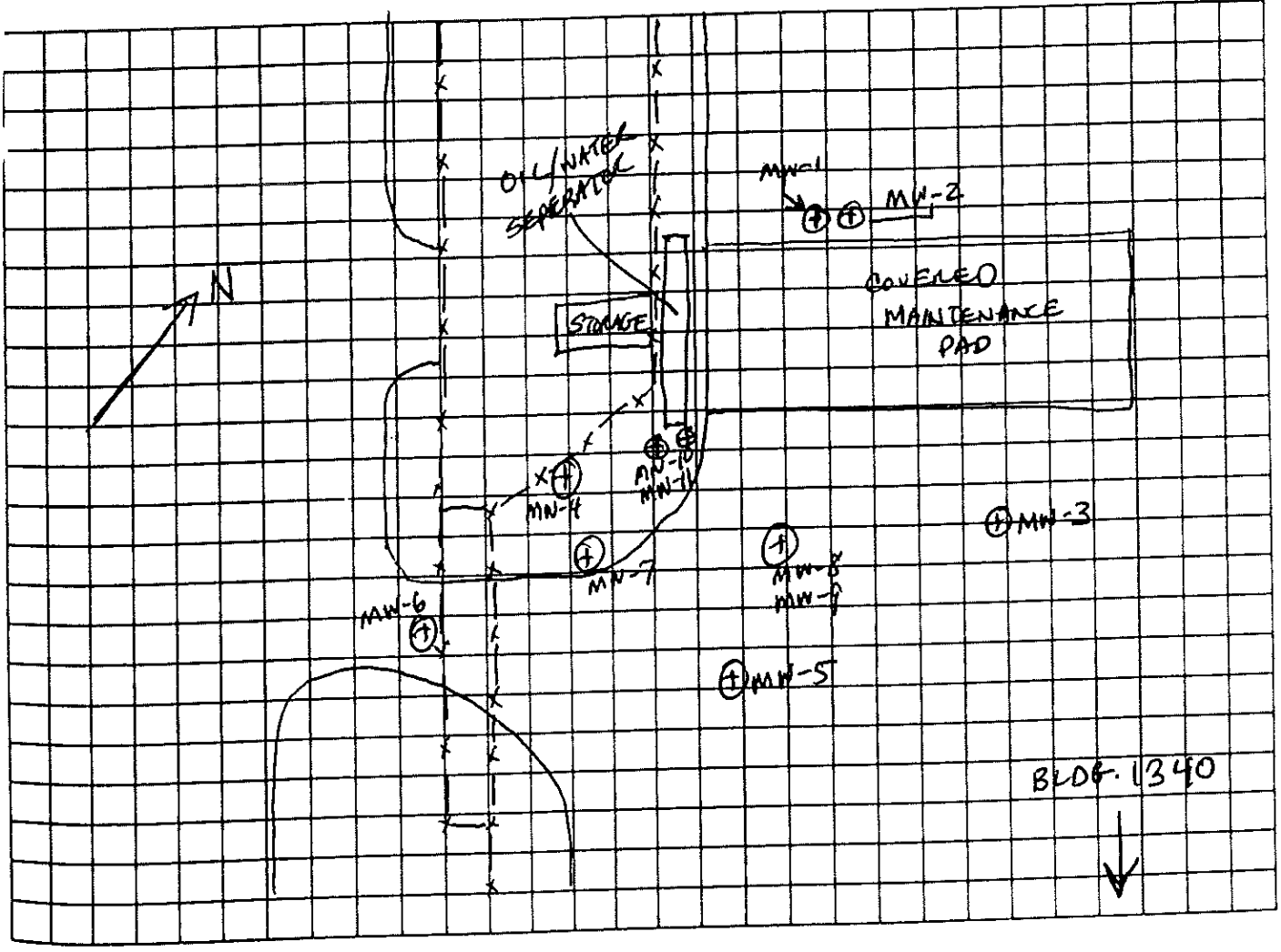
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	RCRA METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	BTEX	NOC / TOC				
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
		2" ID		H Smith		

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

UA CHECK BY:

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs | INSPECTOR Heather Smith | SHEET 2 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0–1	SC- Clayey Sand med → fine gr. sand angular → subrounded moist, soft to firm Predominantly 5YR7/1 Lt Grey mottled w/ 10YR 5/6 yellowish red	(headspace 0-2' bgs) 2.5ppm		0.0 Samp. ID # 7J1171 @1535 1.0	RUN #1 RUN 2' Rec. 1.25' LOSS .75'
	1–2	LOSS				RUN from Bottom of Concrete Concrete Plug .83' above g.s.
	2–3	Same as above - wet (but only because water was used to core the concrete here this morning - Not Natural g.w.	(headspace 2-4' bgs) 3.1ppm			RUN #2 RUN 2.0 Rec 2.0 LOSS 0
	3–4	CL- Lean Clay w/ some sand high plasticity, moist, soft to firm (same color as above) SM- Silty Sand - black/grey grains dry, soft (10YR2/1)(5YR1/1) SM- Silty Sand med → fine gr. sub.rounded → subang. 10YR 3/3 dk brown		3.5 geotech	3.0 Samp. ID# 7J1172 @1550 4.0	Both sections are SM from 3.1 → 3.6 but there is a DISTINCT color change between the 2 @
	4–5	wet - due to coring. SC - Clayey Sand. ~40% clayey ~60% sand med. grains - (predominantly) some cs (10%) some fine (10%) Med. plasticity → high plasticity 10YR 6/1 GREY	(headspace 4-6' bgs) 2.0ppm	4.0		RUN #3 RUN 2.0 Rec 1.5 LOSS 0.5
	5–6	LOSS				SET SURFACE CASING
	6–8.6					
	8.6–10	8.6': CLAY (CL); LIGHT GRAY (2.5Y 7/1), WITH RED MOTTLING STREAKING, STIFF, MED TO HIGH PLASTICITY, MOIST				CLAY AT 8.6' BASED ON LOG FROM 27F-MW2

HTRW DRILLING LOG 27F-MW2

HOLE NUMBER

SHEET 3 OF 4

PROJECT: Fort Stewart USTs

INSPECTOR L. MERCADO

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	10': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-SAND ROUNDED, SLIGHT PLASTICITY, MOIST				BASED ON LOG FROM LMM 10/11/99 WELL 27F-MW2
	11	11': SANDY CLAY (CL), LIGHT GRAY (5Y 7/1), F-SAND, SLIGHT PLASTICITY, MOIST				
	12	12': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-M SAND, SUBROUNDED, ~~LOOSE~~ ~~SAT~~ MED. DENSE, WET. LMM 10/11/99				▽ GW ENCOUNTERED ≡ AT 12 FT.
	13					
	14	13.5': SAND (SP), YELLOW (2.5Y 7/6), F-M SAND, SUBROUNDED, LOOSE SAND, LITTLE TO NO FINES, WET.				
	15					
	16					2" SCH-40 PVC WELL SET AT 19.65 FT
	17	16': SAND (SP), YELLOW (2.5Y 7/6), F-M SAND, SUBROUNDED, LOOSE LITTLE TO NO FINES.				
	18	18': INCREASE IN GRAIN SIZE				
	19					
	20					

HTRW DRILLING LOG 27F-MW1

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR L. Mercado

SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
						HSA TO 21 FT
	21	21' END OF BORING				
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW2

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: MDC

SHEET ___ OF ___

3. PROJECT: Fort Stewart

4. LOCATION: SWMU 27F

5. NAME OF DRILLER: B. UPCHURCH

6. MANUFACTURERS DESIGNATION OF DRILL: CME-85

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" HSA; 5' CONTINUOUS SAMPLER

8. HOLE LOCATION: 27F-MW2

9. SURFACE ELEVATION: TOC 69.27 N 684435.72 E 821540.10

10. DATE STARTED: 10/10/99

11. DATE COMPLETED: 10/10/99

12. OVERBURDEN THICKNESS: N/A

13. DEPTH DRILLED INTO ROCK: N/A

14. TOTAL DEPTH OF HOLE: 45 FT

15. DEPTH GROUNDWATER ENCOUNTERED: ~12 FT

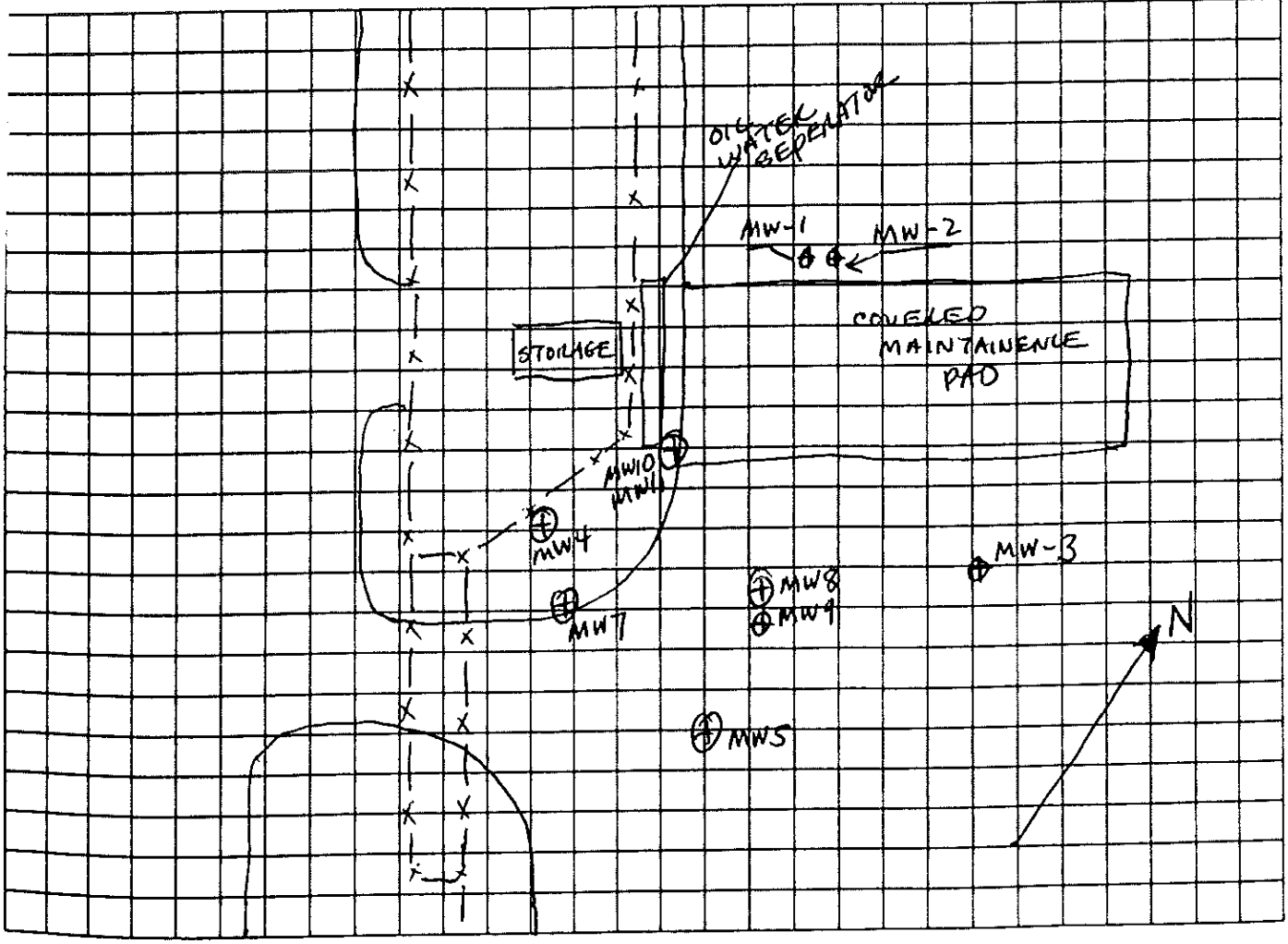
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	RCRA	SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			2" PVC	L. Mucak		

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere soil core, breathing zone, venting compressed air, etc.)

QA CHEC

(Signature and Date)

HTRW DRILLING LOG — 27F-MW2 — HOLE NUMBER — 4

PROJECT: Fort Stewart USTs — INSPECTOR L. MERCADO — SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	0-0.85': CONCRETE FROM MOTOR POOL				
	1	0.85': CLAYEY SAND(SC): LIGHT GRAY(5YR 7/1) & RED (2.5YR 4/8), F-SAND TO M-SAND, DENSE, SLIGHT PLASTICITY, DRY	0.85-2.5 (3.2)	1-2' SOIL SAMPLES TJ1271 TJ1221 @ 1245		0.85-5': (4.15/4.15)
	2					
	3	2.6': CLAYEY SAND(SC), MOTTLED LIGHT GRAY(5YR 7/1) RED (2.5YR 4/8) & YELLOWISH BROWN (10YR 5/6), F-M SAND, SLIGHT PLASTICITY, DRY.	2.5-5' (2.8)	2.5-5' SOIL SAMPLE TJ1272 @ 1320		
	4	3.2': SILTY SAND(SM), VERY DARK GRAY (10YR 3/1), F-SAND, WITH SOME SILT (~20%), DRY.				
	5	4.2': SILTY SAND(SM), LIGHT YELLOWISH BROWN (2.5Y 6/4), AS ABOVE, MOIST.				
	6	5': SANDY CLAY(CL), LIGHT GRAY (2.5Y 7/1) & OLIVE YELLOW (2.5Y 6/6), F-M SAND, SLIGHT PLASTICITY, MOIST.	5-7.5' (0.6)			5-10': (4.8/5)
	7					
	8	7': SANDY CLAY(CL), AS ABOVE BUT MOTTLED WITH REDDISH BROWN (5YR 4/4), MOIST.	7.5-10' (0.4)			
	9	8.6': CLAY(CL), LIGHT GRAY (2.5Y 7/1) WITH RED (10R 5/6) MOTTLING/STREAKS, STIFF, MED TO HIGH PLASTICITY, MOIST.				
	10					

HTRW DRILLING LOG — 27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	10': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-SAND, ROUNDED, SLIGHT TO NO PLASTICITY, MOIST.		10-12 (0.7)		10-15': (3.7/5)
	11	11': SANDY CLAY (CL), LIGHT GRAY (5Y 7/1), F-SAND, SLIGHT PLASTICITY, MOIST.				
	12					▽ GW ENCOUNTERED AT 12 FT
	13	12': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-M SAND, SUBROUNDED, MED DENSE, WET				
	14	13.5': SAND (SP), LIGHT GRAY (5Y 7/1), F-SAND, SUBROUNDED, LOOSE SAND, LITTLE TO NO FINES, WET.				
	15					15-20': (NO RECOVERY)
	16	16': SAND (SP), YELLOW (2.5Y 7/6), F-M SAND, SUBROUNDED, LOOSE SAND, LITTLE TO NO FINES, WET.				
	17					
	18	18': INCREASE GRAIN SIZE				
	19					
	20					

HTRW DRILLING LOG

27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR L. MERCADO

SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	20	20': SAND(SP), YELLOW (2.5Y 7/6), M-SAND, SUB-ROUNDED, LOOSE, WET.				20-25': (NO RECOVERY)
	21					
	22					
	23					
	24					
	25	25': SAND(SP), PALE YELLOW (2.5Y 8/4), F-M SAND, LOOSE, SUBROUNDED, WET.				25-30': (1,5/5)
	26					
	27	27': SAND(SP), GREENISH GRAY (10Y 6/1), F-M SAND, LOOSE SUBROUNDED, WET.				
	28					
	29					
	30					

HTRW DRILLING LOG — 27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	30	30': SAND (SP), GREENISH GRAY (10Y6/1), F-M SAND, LOOSE, SUBROUNDED, WET.				30-35': (0.5/5)
	31					
	32					
	33					
	34					
	35					35-40': (0/5)
	36					
	37			37-40' GEOTECH SAMPLE NO. 7J1273 @ 1615		
	38					
	39	39': SAND (SP), AS ABOVE WITH TRACE OF COARSE SAND, WET.				
	40					

8

HTRW DRILLING LOG

27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR L. MERCADO

SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	41	40': SANDY CLAY (CL), LIGHT GREENISH GRAY (5GY 7/1) F-CRS SAND, STIFF, SLIGHT PLASTICITY, ~~WET~~ MOIST. LMM 10/10/99				40-45': (5/5) (HAWTHORNE?)
	42	41': CLAYEY SAND (SC), LIGHT GREENISH GRAY (5GY 7/1), F-CRS SAND, ROUNDED, DENSE, SLIGHT TO NO PLASTICITY, MOIST.				
	43					
	44	43-45': CLAYEY SAND (SC), AS ABOVE WITH TRACE OF BIVALVE SHELL FRAGMENTS, MOIST.				
	45	45': END OF BORING				
	46					
	47					
	48					
	49					
	50					

48

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: ZTF-MW-63(TJ)

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 4

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers Brigade Motorpool.

5. NAME OF DRILLER: Doug Bishop

6. MANUFACTURERS DESIGNATION OF DRILL: CME 75

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME Model 75 Drill rig; 4¼-in. ID, Hollow-stem augers, with 9-in. diam. bit, 3½-in. ID x 5-Ft Spl. + spoons.

8. HOLE LOCATION: E. of covered Maint. pad. N 684392.10

9. SURFACE ELEVATION: TOC 68.45 ft E 821630.44

10. DATE STARTED: 10-10-99

11. DATE COMPLETED: 10-10-99

12. OVERBURDEN THICKNESS: N/A

15. DEPTH GROUNDWATER ENCOUNTERED: 14 Ft BGS

13. DEPTH DRILLED INTO ROCK: N/A

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 12.3 Ft BTOC - 7.7 Ft BGS / 2 hrs.

14. TOTAL DEPTH OF HOLE: 25.0 Ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: DISTURBED / UNDISTURBED

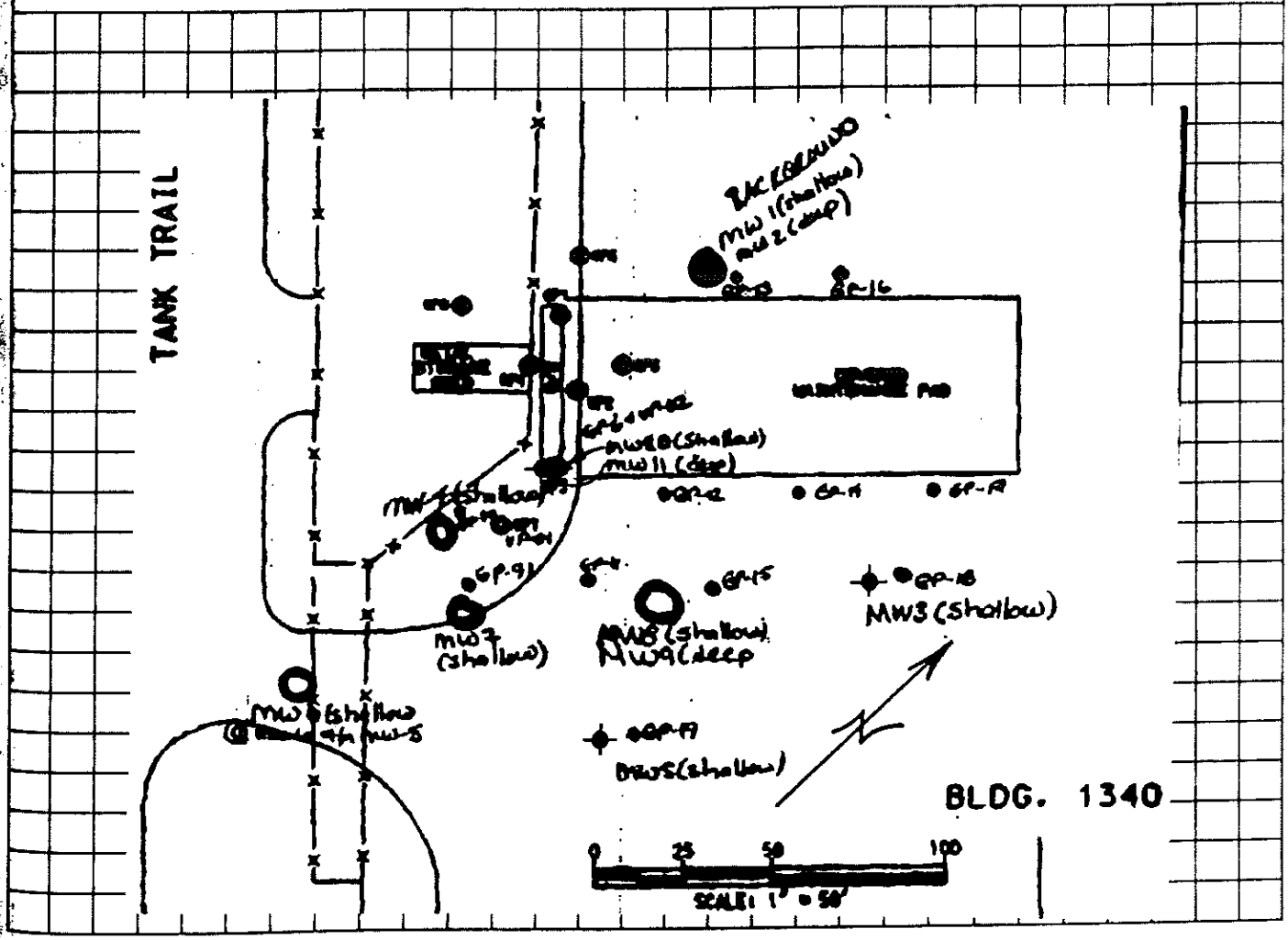
19. TOTAL NUMBER OF CORE BOXES: N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	X	SVOC			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		

LOCATION SKETCH/COMMENTS

SCALE: 1-in. = 50 Ft



HTRW DRILLING LOG

HOLE NUMBER [illegible] 49

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 2 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete pavement	N/A	N/A	N/A	
	1	Lt. red (10R 6/6) sandy clay: moist, mottled, med plast.	1.3ppm		7J1371	Drill: 4.3 Ft Recover: 3.2 Ft
	2	Lt. yell-brn (10YR 6/4) silty gravel sand: moist, F-to C-grnd, loosely packed.				
	3	Black (10YR 2/1) silty sand Dry, F-grnd, ~~dark top~~, massive, loosely packed.	7.5ppm	N/A	N/A	
	4	V. pale brn (10YR 8/3) sand: dry, massive, F-grnd, dark top, loose.				
	5	No Recovery	N/A		N/A	
	6	Gray (10YR 6/1) and Lt. yell-brn (10YR 6/4) sandy clay: moist, plastic, mottled to stratified	1.8ppm	N/A	N/A	Drill: 5.0 Ft Recover: 5.0 Ft
	7					
	8					
	9	gray and Lt. red sandy clay: moist, stiff, plastic, mottled.	76ppm		7J1372	
	10					

HTRW DRILLING LOG

HOLE NUMBER ZTF-MW-03(TS) 50

PROJECT: Fort Stewart USTs

INSPECTOR Timothy Coffey

SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Gray clay: moist, stiff plastic, thinly laminated/ stratified	13ppm.	N/A	N/A	Drill: 5.0 Rt Recover: 4.2 Rt
	12	V. pale brn: clay sand: wet, stratified/ thin-lam, F-grnd.		751373		
	13	Yellow (10YR 7/6) clay sand: wet, mottled, graded, F- to C-grnd, mod. packed to loose.	1.3ppm		N/A	Coarse sand bed.
	14					Water @ 14 Rt
	15	No Recovery	N/A	N/A	N/A	
	16	Yellow (10YR 8/6) clay silt: wet, F- to M-grnd, sl. plastic.				No sampling, lith from cuttings.
	17			751373		
	18		N/A		N/A	
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-03 (75) 51

PROJECT: Fort Stewart USTs

INSPECTOR Timothy Coffey

SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Yellow clay sand (as above)		751373		
	22		N/A	N/A	N/A	
	23					
	24					
	25					TD = 25.0 ft.
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-04

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller

SHEET 1 OF ___

3. PROJECT: Fort Stewart

4. LOCATION: 27F

5. NAME OF DRILLER:

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID HSA, 5ft continuous split spoon

8. HOLE LOCATION: See Map Below

9. SURFACE ELEVATION: TOC 68.02 ft N 684325.34 E 821587.60

10. DATE STARTED: 11 Oct 99

11. DATE COMPLETED: 11 Oct 99

12. OVERBURDEN THICKNESS: NA

15. DEPTH GROUNDWATER ENCOUNTERED:

13. DEPTH DRILLED INTO ROCK: NA

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.4 / 4 hrs (auger string @ 15 ft bls)

14. TOTAL DEPTH OF HOLE: 18.0 ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: (DISTURBED) UNDISTURBED

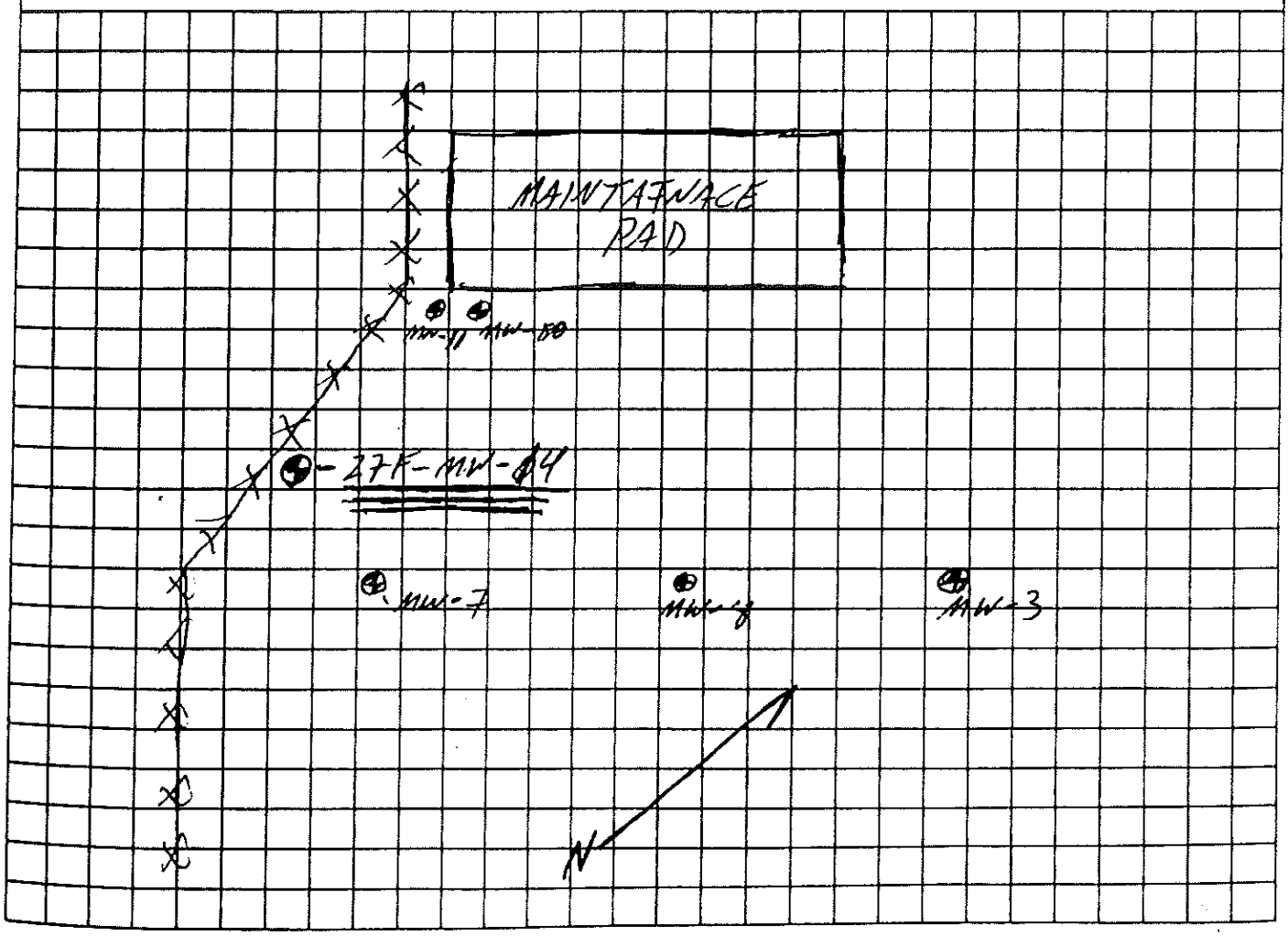
19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOA			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		✓		

LOCATION SKETCH/COMMENTS

SCALE: NA



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

QA CHEL

HTRW DRILLING LOG

HOLE NUMBER 27F-MW04

PROJECT: Fort Stewart USTs | INSPECTOR Brad Baker | SHEET 1 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	SAND; sand: med ~ 95% silt ~ 5%; Lt Brownish Gray 10YR 6/2; subrounded; mod sorted; soft; nonplastic; moist roots present (SM)	0.2 ppm		0-1 ft ID: 7J1471 0930 hrs	Run #1 0-5 ft 3.4 ft recovery
	1	CLAYEY SAND; sand: med-coarse ~ 70%, clay ~ 30%; Lt Brownish Gray 10YR 6/2 variegated red and yellowish orange; subrounded; poorly sorted; firm low plasticity; moist (SC)		NA		
	2					
	3	SAND; sand: fine-med ~ 85% silt ~ 15%, DK Gray, Lt Brown 10YR 6/2 banded dk brown and light Gray; mod sorted; soft-firm; nonplastic; moist (SM)	0.6 ppm			
	4					
	5					
	6	SANDY CLAY; sand: med-coarse ~ 40%, clay ~ 60%; Yellow 10YR 7/6 w/ wisps of lt. gray clay; subrounded; poorly sorted; firm; mod. plasticity; moist; (CL)	0.6 ppm		7J1442 R.inste 5.0-6.9 ft ID: 7J1472 1010 hrs	0935 R.inste sample collected prior to 5-10 ft run. DI H2O to wash decon split spoon
	7	SAND; med-coarse ~ 80%, silt ~ 20%; Yellow 10YR 7/6 w/ thick wisps of red and lt. gray; subrounded; mod sorted; firm; nonplastic; moist (SM)		NA		Run #2 5-10 ft 1.9 ft recovery
	8					
	9					
	10					

HTRW DRILLING LOG

HOLE NUMBER 27F.MW [illegible]

PROJECT: Fort Stewart USTs | INSPECTOR [illegible] | SHEET 2 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	No Recovery				Run #3 10 - 15 ft - 12.0 ft bls drilling became soft
	12		NA	NA	NA	- BZ - 0.0 ppm cuttings 70.0 ppm @ 13 ft bls
	13					- Outside of spoon wet bottom 2.5 ft ∴ 12.5 ft bls - 1040 hrs. H_2O heard @ 9.5 ft bls
	14					- No free product or saturated soils throughout sample intervals - 1120 hrs - H_2O @ 8.3 ft bls auger string @ 15.0 ft
	15	Drilled out	14.2 ppm	Bag Sample 15-16 ft bls 1500 hrs		1445 H_2O @ 7.4 ft bls
	16		NA		NA	
	17					
	18	TD = 18.0 ft bls.				
	19					
	20					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: ZTF-MW-05(DS)

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 3

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers Brigade Motorpool.

5. NAME OF DRILLER: Doug Bishop

6. MANUFACTURERS DESIGNATION OF DRILL: CME 75

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME Model 75 Drill rig; 4¼-in. ID Hollow stem augers, with 9-in. diam. bit; 3½-in. ID x 5-ft split-spoon samplers

8. HOLE LOCATION: E. of covered maint. pad.

9. SURFACE ELEVATION: TOC 67.99 ft N 684814.94 E 821614.36

10. DATE STARTED: 10-10-99

11. DATE COMPLETED: 10-10-99

12. OVERBURDEN THICKNESS: N/A

13. DEPTH DRILLED INTO ROCK: N/A

14. TOTAL DEPTH OF HOLE: 20.0 ft

15. DEPTH GROUNDWATER ENCOUNTERED: 13.5 ft BGS

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: DISTURBED / UNDISTURBED

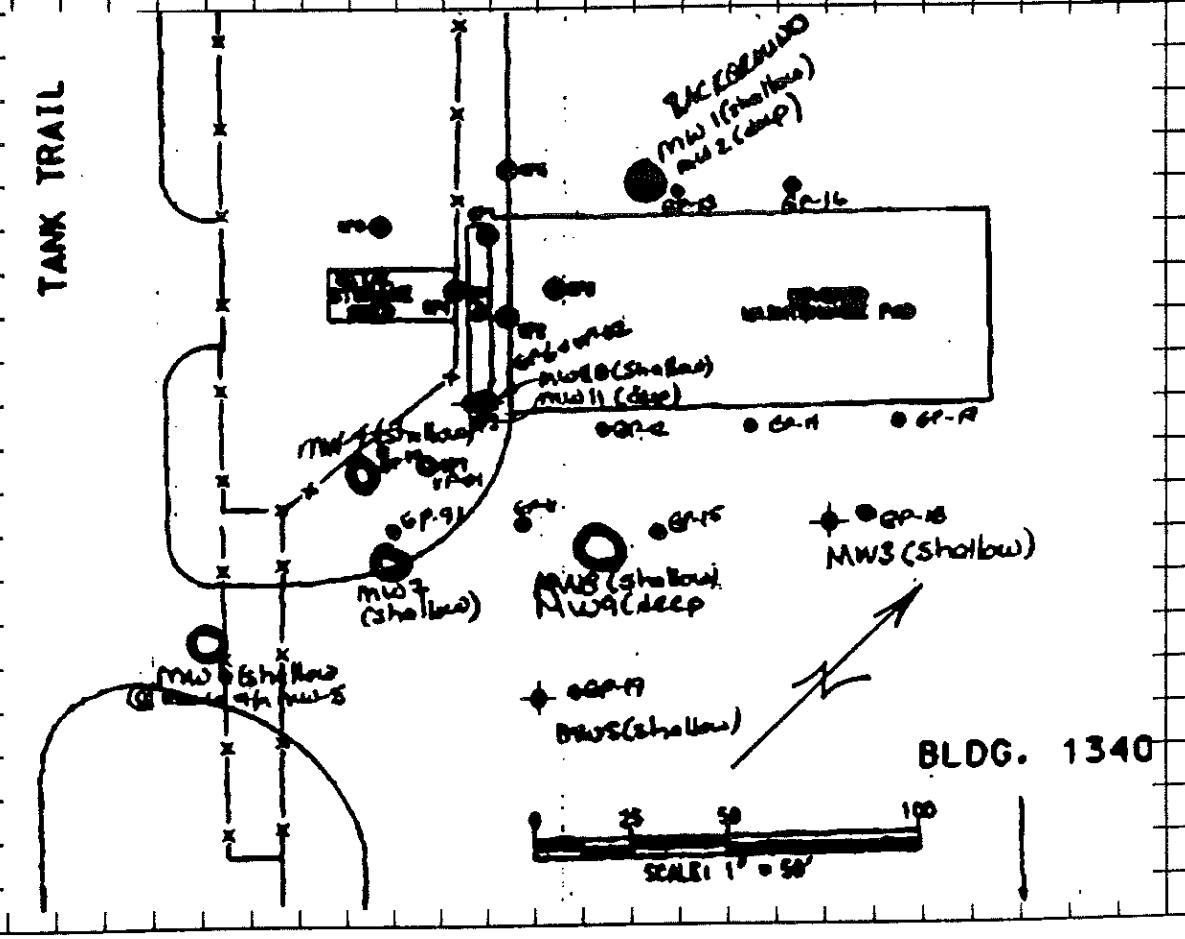
19. TOTAL NUMBER OF CORE BOXES: N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	X	SVOC			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Timothy Coffey

LOCATION SKETCH/COMMENTS

SCALE: 1-in. = 50 ft.



HTRW DRILLING LOG

HOLE NUMBER ZTF-MW-06(75) 64

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete Pavement	N/A	N/A	N/A	
	1	Lt red (10R 6/6) sandy clay; moist, Sl. plastic (50% clay / 50% sand), M-grnd, mottled.	6.6ppm		TJ1571	Drill. 4.4 Ft Recover. 3.9 Ft
	2					
	3	Black (10YR 2/1) silty sand w/clay; dry, F-grnd, massive, rel. stiff (±5% clay)	10.1ppm	N/A	TJ1572	
	4	Pale yellow (2.5Y 7/3) sandy clay (see below)				
	5	No Recovery	N/A		N/A	
		Pale yellow sandy clay; moist, mottled, stiff, plastic.	1.1ppm	N/A	N/A	Drill. 5.0 Ft Recover. 4.5 Ft
	7	Gray (10YR 7/1) and red (10R 4/6) sandy clay.				
	8	Lt-green-gray (10GY 8/1) Sandy clay; moist, strata/thinly lam, very stiff, plastic.	1.0ppm		N/A	
	9	More sand/silt than clay.		TJ1573		
	10	No Recovery	N/A	N/A	N/A	

HTRW DRILLING LOG

HOLE NUMBER ZTF-MW-06 (ZT) 05

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Very pale brn (10YR 8/2) sand: wet, massive, F-grnd, pretty;	N/A	TI1573	N/A	Drill: 5.0 Ft Recover: 2.6 Ft
	12					
	13	No Recovery	N/A	N/A	N/A	water @ 13.5 Ft.
	14					
	15	Very pale brn sand (as above)				No core, lith. from cuttings.
	16					
	17		N/A	TI1573	N/A	
	18					
	19			N/A		TD = 20.0 Ft
	20					

33

HTRW DRILLING LOG

HTRW DRILLING LOG	DISTRICT: USACE - Savannah	HOLE NUMBER 27F-MW-06 (TJ)
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller Drilling Co	SHEET 1 OF __

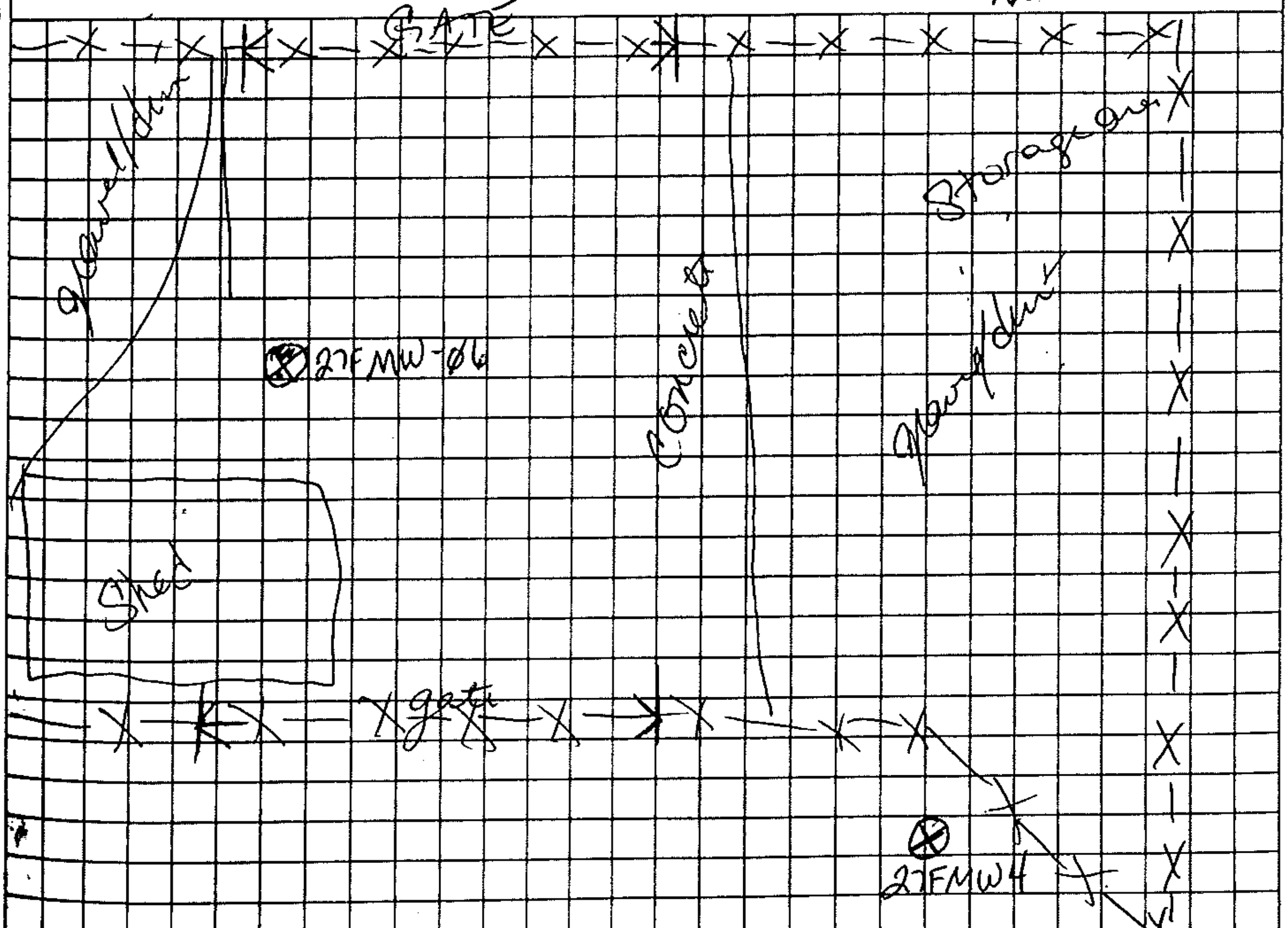
3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engineering
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" augers; 5' by 4" split spoon samplers	8. HOLE LOCATION: See map
	9. SURFACE ELEVATION: TOC 67.88 N 684253.33 E 821526.08
	10. DATE STARTED: 10/11/99 — 11. DATE COMPLETED: 10/11/99
12. OVERBURDEN THICKNESS: Greater than TD	15. DEPTH GROUNDWATER ENCOUNTERED: 9.1' BGS = Sand wet
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.75 after ~2 min of piercing clay zone.
14. TOTAL DEPTH OF HOLE: 20' BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 7.25' BGS ~30 min. after setting well.

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	RCRA METALS / SVOCS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X					NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Heather L Smith

LOCATION SKETCH/COMMENTS — SCALE: NONE



NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

QA CHEM...

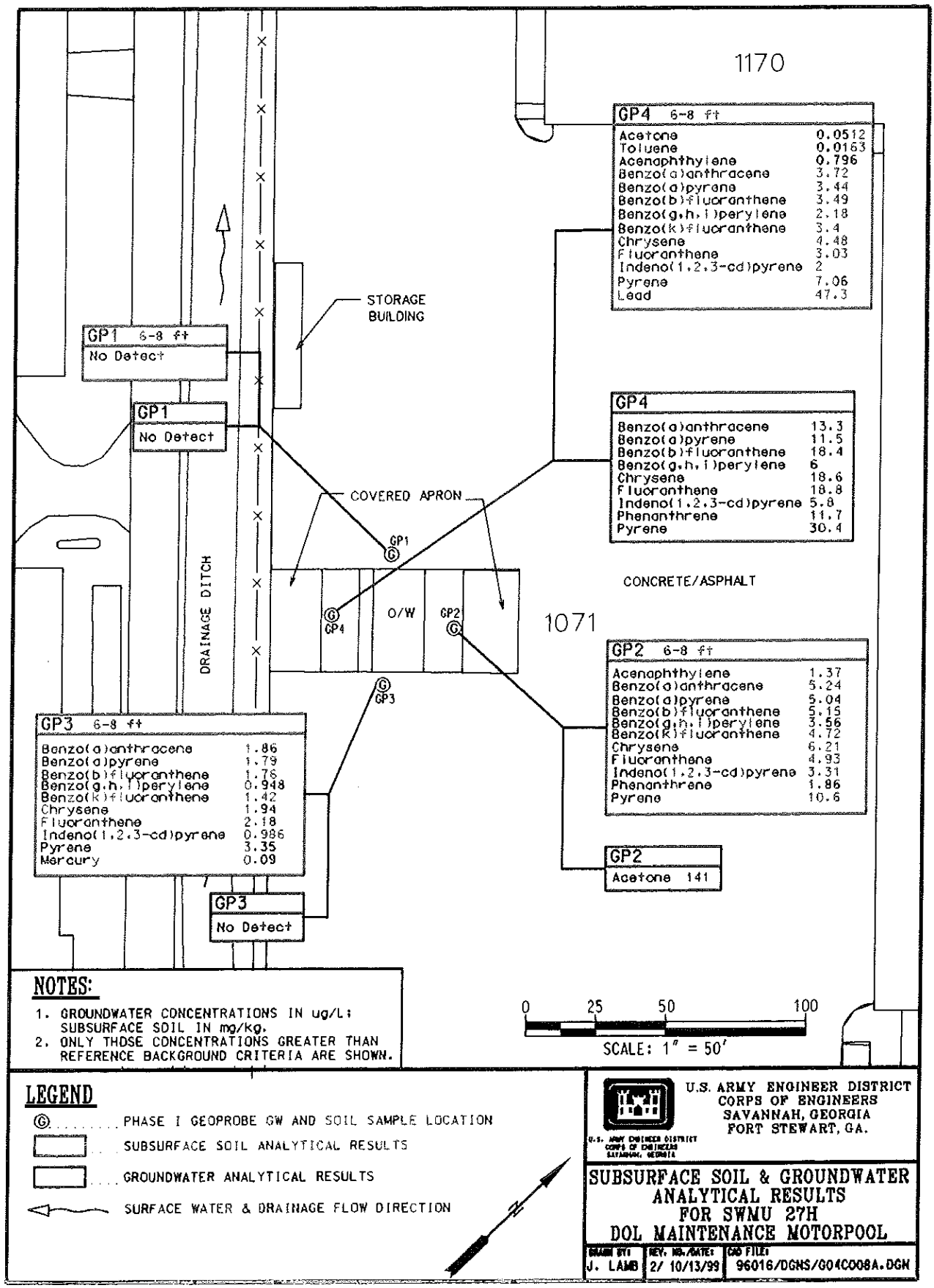


Figure 10.11-2. Summary of Analytical Results in Subsurface Soil and Groundwater, SWMU 27H (Building 1071)

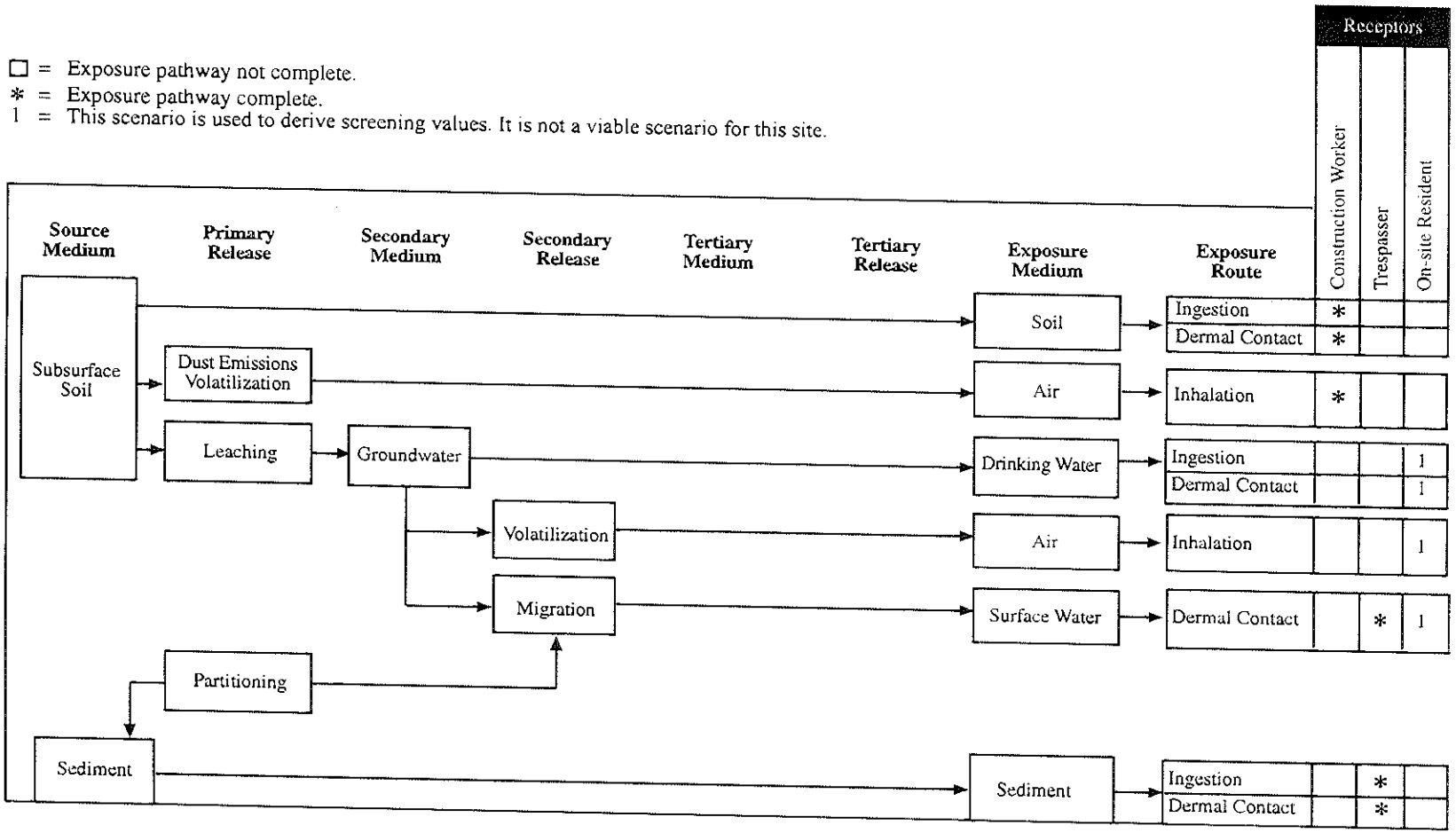


Figure 10.11-3. Potential Migration and Exposure Pathways, SWMU 27H (Building 1071)

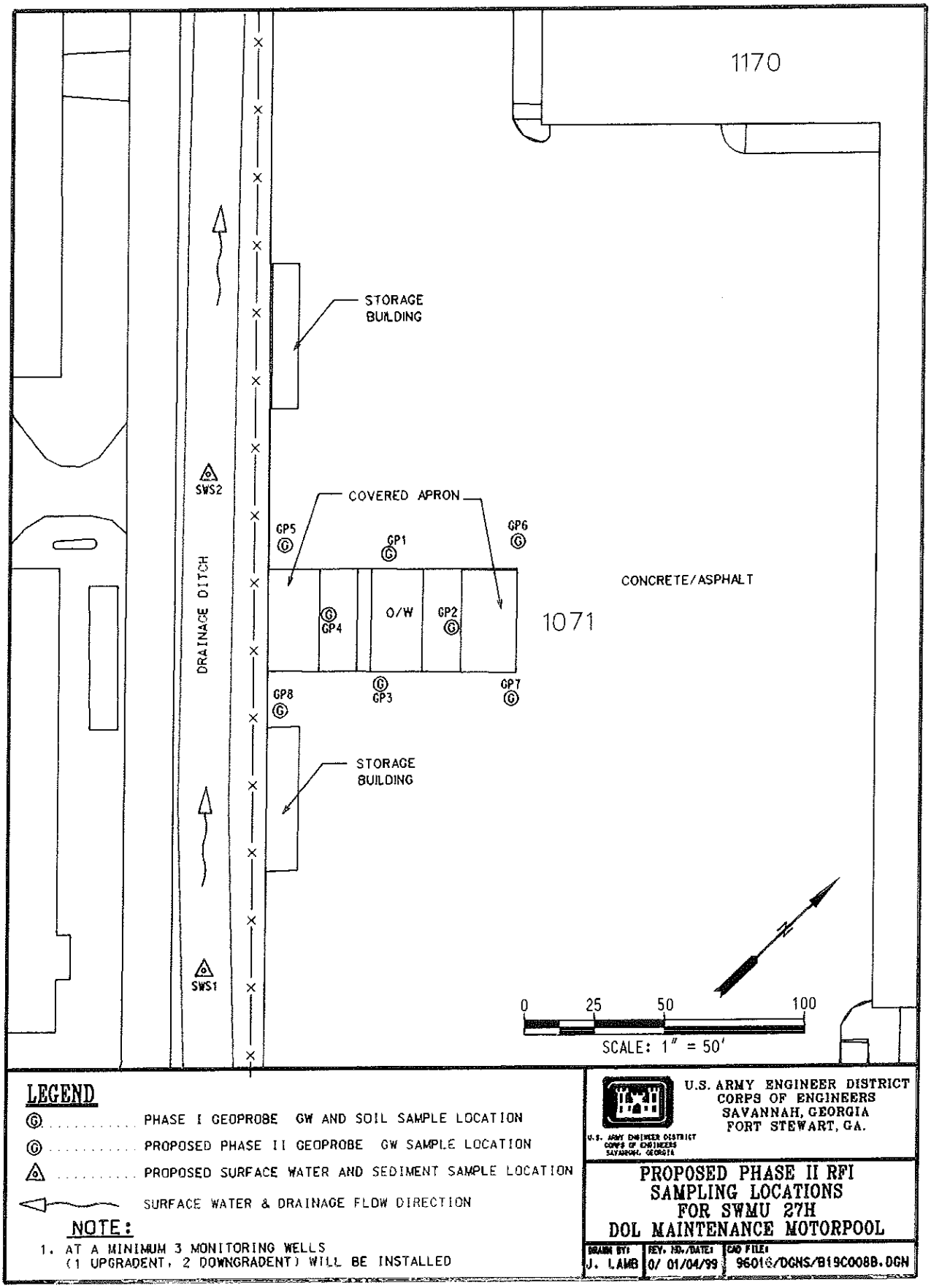


Figure 10.11-4. Proposed Phase II RFI Sampling Locations, SWMU 27H (Building 1071)

10.12 SWMU 27J: GANG MATES, Building 10531

10.12.1 History and Description of SWMU 27J, GANG MATES, Building 10531

SWMU 27J is one of two OWSs that support vehicle maintenance activities under GANG MATES. The OWS is located in the southeastern corner of the armor vehicle parking area, southeast of Building 10531 (Figure 10.12-1). The OWS receives wastewater from floor drains located in Building 10531. The site has visually stained soil and stressed vegetation, potentially due to numerous overflows of the OWS. No previous investigations have been performed at the site. The OWS discharges into the sanitary sewer system.

10.12.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 10.12-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

10.12.3 Physical Characteristics of the Site

10.12.3.1 Topography

The topography of the OWS site is essentially level. The OWS area is located in the grass border between the vehicle parking area and the boundary fence (Figure 10.12-1). The area to the west is a concrete vehicle parking area and a road. The surface elevation is approximately 57.5 feet amsl.

10.12.3.2 Surface drainage

A concrete drainage channel that receives runoff from the vehicle parking area is located approximately 50 feet to the east of the OWS. The runoff from the parking area discharges through the drainage channel to a low area northeast of the site, where the runoff percolates into the soil (Figure 10.12-1). Surface water that contacts potentially contaminated surface soil at the OWS could migrate by overland flow to this low area also. In addition, because groundwater was encountered at approximately 1.5 feet bgs, groundwater may intercept the surface water discharging to the low area to the east. The OWS discharges to the sanitary sewer system.

10.12.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

10.12.3.4 Hydrogeology

Groundwater was encountered at approximately 1.3 feet to 1.57 feet bgs.

10.12.3.5 Ecology

As stated in Section 8.2, SWMU 27J (Building 10531) is classified as an "industrialized area with managed grasslands" (Figure 10.12-1). The site encompasses approximately 0.02 acre and is located in the southeastern corner of the garrison area. The area is comprised mainly of concrete surface, fence, and man-made structures. This SWMU contains a small section of managed grasses, and a forest borders the SWMU toward the east.

10.12.4 Nature and Extent of Contamination

10.12.4.1 Surface soil

Four surface soil samples were collected based on field screening for VOCs. The results of the soil analysis are presented in Table 10.12-1 and Figure 10.12-2.

VOCs. Total xylenes were detected in the samples from GP1 and GP2 at concentrations of 0.0034 mg/kg and 0.0027 mg/kg, respectively; therefore, total xylenes are considered to be SRCs in surface soil.

SVOCs. Di-*N*-octyl phthalate was detected in the sample taken from GP2 at a concentration of 0.433 mg/kg. Di-*N*-octyl phthalate is considered to be an SRC.

Lead. Lead was detected in the surface soil samples taken from all four sampling locations at concentrations ranging from 0.95 mg/kg at GP3 to 7.9 mg/kg at GP1. None of these concentrations exceeded the reference background criterion; therefore, lead is not considered to be an SRC.

10.12.4.2 Subsurface soil

No subsurface soil samples were collected at this site during the field investigation.

10.12.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 10.12-2 and Figure 10.12-2.

VOCs. No VOCs were detected in groundwater.

SVOCs. Benzo(*a*)pyrene was detected in the samples taken from GP2, GP3, and GP4 at concentrations of 6.1 µg/L, 5.7 µg/L, and 9.4 µg/L, respectively. In addition, the concentration levels for benzo(*a*)pyrene exceeded its MCL (0.2 µg/L). The sample taken from GP4 indicated di-*N*-octyl phthalate at a concentration of 13.2 µg/L. Both benzo(*a*)pyrene and di-*N*-octyl phthalate are considered to be SRCs in groundwater.

Lead. Lead was not detected at any of the four sampling locations; therefore, lead is not considered to be an SRC in groundwater.

10.12.4.4 Surface water

No surface water was collected at this site during the field investigation.

10.12.4.5 Sediment

No sediment samples were collected at this site during the field investigation.

10.12.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 10.12-3.

10.12.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of soil SRCs to the respective GSSLs.

Of the SRCs identified in soil, none of the analytes exceeded their respective GSSLs (Table 10.12-4); therefore, there are no CMCOPCs in surface soil at SWMU 27J based on leaching to groundwater.

10.12.6 Human Health Preliminary Risk Evaluation of SWMU 27J, Building 10531

SRCs were identified for surface soil and groundwater. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

10.12.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area. However, surface soil contaminants may migrate off-site to a nearby ditch via runoff and/or discharge of groundwater. Therefore, off-site receptors (i.e., juveniles) may be exposed as a result of playing in the ditch. The potential receptor populations include:

- occupational populations (individuals working on the site),
- juvenile trespassers,
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater, surface soil runoff, release of volatile compounds into the air, and groundwater discharge. The site is comprised mainly of concrete surface, fence, and man-made structures. This SWMU contains a small section of managed grasses, and a forest borders the site toward the east. However, there is a drainage ditch located adjacent to the site. This ditch may receive some runoff from the site. The groundwater at the site is close to the surface and may discharge into the ditch during periods of elevated groundwater levels, such as rain events.

The potential migration and exposure pathways for the various receptors are presented in Figure 10.12-3. The on-site resident scenario is not considered to be a viable scenario for the site. However, in accordance with RBCA guidance, it is used to derive screening valves. The exposure pathways associated with this scenario are presented to show what pathways are taken into consideration when deriving the screening values.

10.12.6.2 Risk evaluation

The results of the human health risk screening are given below.

The SRCs for surface soils included total xylenes and di-*N*-octyl phthalate. The concentrations of these contaminants were below their respective screening values (Table 10.12-5); therefore, there are no HHCOPCs in surface soils.

The SRCs for groundwater consisted of two SVOCs [benzo(*a*)pyrene (a PAH) and di-*N*-octyl phthalate]. The maximum concentration of benzo(*a*)pyrene (9.4 µg/L) exceeded its screening value [0.0092 µg/L (Table 10.12-5)]. Benzo(*a*)pyrene was above its MCL (0.2 µg/L) in three of four groundwater samples. Di-*N*-octyl phthalate had a maximum concentration that was below its screening value. Benzo(*a*)pyrene is an HHCOPC in groundwater.

10.12.6.3 Uncertainties

The human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

10.12.7 Ecological Preliminary Risk Evaluation of SWMU 27J, Building 10531

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

10.12.7.1 Ecological screening value comparison (Step i)

No surface water or sediment samples were collected at the site.

Two SVOCs were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 10.12-6. The ECOPCs identified by the ESV comparison for groundwater are benzo(*a*)pyrene and di-*N*-octyl phthalate. There is no ESV for di-*N*-octyl phthalate, so it is an ECOPC by default (GEPD 1997a). Benzo(*a*)pyrene was detected at concentrations exceeding the ESVs.

Because there are no ESVs for soil, all analytes detected in soil were evaluated further in EPRE Steps ii through v.

10.12.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 10.12.3.5. The preliminary assessment endpoints, ecological receptors, and species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

10.12.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

10.12.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated soil or biota exposed to contaminated soil and by ingestion of drinking water. The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

10.12.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil are presented in Table 10.12-7. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. There are no ECOPCs present in surface soil at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for shrews exposed to VOCs in surface soil does not exceed one.

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 10.12-8. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for the raccoon exposed to SVOCs does not exceed one.

10.12.8 Conclusions and Risk Management and Site Recommendations for SWMU 27J, Building 10531

10.12.8.1 Conclusions

Nature and Extent of Contamination

- Total xylenes were detected in the surface soil samples; therefore, they are considered to be SRCs.
- Di-*N*-octyl phthalate was detected in one of the surface soil samples; therefore, it is an SRC.
- No VOCs were detected in groundwater.
- Benzo(*a*)pyrene and di-*N*-octyl phthalate were detected in groundwater. In addition, the concentration levels for benzo(*a*)pyrene exceeded its MCL.

- Lead was nondetect at all four sampling locations; therefore, lead is not considered to be an SRC for groundwater.

Fate and Transport

- SRCs identified in soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for surface soils.

- Benzo(*a*)pyrene is an HHCOPC for groundwater.

Ecological Preliminary Risk Evaluation

- The ECOPCs in groundwater are benzo(*a*)pyrene and di-*N*-octyl phthalate. These ECOPCs are a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.

- There are no ECOPCs in groundwater for terrestrial receptors.

- There are no ECOPCs in surface soil for terrestrial receptors.

10.12.8.2 Risk management and site recommendations

- Staining of the surface soil is visible at this site, and only surface soil samples were collected based on elevated field headspace readings during the Phase I investigation. Benzo(*a*)pyrene exceeded its MCL in three of four groundwater samples; therefore, the vertical and horizontal extent of groundwater contamination at this site must be determined. At a minimum, four groundwater screening samples will be collected using DPT and analyzed for VOCs and to determine the groundwater gradient. At a minimum, one vertical-profile boring will be installed adjacent to the DPT location having the most elevated concentration of VOCs. At a minimum, three permanent monitoring wells will be installed on-site (one upgradient and two downgradient) for delineation of the horizontal extent of groundwater contamination. Because potential contamination at the site is confined to groundwater and with the concurrence of GEPD, no soil samples will be collected during the installation of the monitoring wells (GEPD 1999b). All wells will be sampled using low-flow techniques. Because overland surface flow and groundwater from the OWS may reach the adjacent drainage ditch, two surface water and sediment samples (downstream of the OWS) will be collected downgradient of the concrete drainage channel. No surface water/sediment location exists upgradient of the OWS. The proposed sampling locations are presented in Figure 10.12-4. The groundwater, surface water, and sediment samples will be analyzed for VOCs, SVOCs, and RCRA metals.

- The information obtained from the additional sampling proposed above will be submitted to GEPD as an addendum to this report to be submitted to GEPD before July 21, 2000. The addendum to the Phase II RFI Report will address any additional human health and/or ecological risk assessments required.

Table 10.12-1. Summary of Analytes Detected in Surface Soil, SWMU 27J (Building 10531)

Station	Reference Background Criteria	7UGP1	7UGP2	7UGP3	7UGP4
Sample ID		7U1111	7U1211	7U1311	7U1411
Date		01/29/98	01/29/98	01/29/98	01/30/98
Depth (feet)		0 to 2	0 to 2	1 to 2	1 to 2
Sample Type		Grab	Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)					
Xylenes, total	0.00	**0.0034**	**0.0027**		
Semivolatile Organic Compounds (mg/kg)					
Di-*N*-octyl phthalate	0.00		**0.433**		
Metals (mg/kg)					
Lead	8.81	7.9	3.7	0.95	2

Bold indicates concentrations above reference background criteria.

Table 10.12-2. Summary of Analytes Detected in Groundwater, SWMU 27J (Building 10531)

Station	Reference Background Criteria	MCL	7UGP1	7UGP2	7UGP3	7UGP4
Sample ID			7U4111	7U4211	7U4311	7U4411
Date			01/29/98	01/28/98	01/29/98	01/30/98
Sample Type			Grab	Grab	Grab	Grab
Semivolatile Organic Compounds (µg/L)						
Benzo(*a*)pyrene	0.00	0.2		***6.1***	***5.7***	***9.4***
Di-*N*-octyl phthalate	0.00					**13.2**

Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.

Table 10.12-3. Summary of Site-related Contaminants, SWMU 27J (Building 10531)

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
Xylenes, total	0.0034	NC	NP	ND	NP
Semivolatile Organic Compounds					
Benzo(*a*)pyrene	ND	NC	NP	9.4	NP
Di-*N*-octyl phthalate	0.433	NC	NP	13.2	NP

NC = Soil samples not collected based on field headspace analysis.
ND = Not detected.
NP = No pathway exists.

Table 10.12-4. GSSL Screening of Site-related Contaminants in Soil, SWMU 27J (Building 10531)

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
Volatile Organic Compounds (mg/kg)			
Xylenes, total	0.0034	190	No
Semivolatile Organic Compounds (mg/kg)			
Di-*N*-octyl phthalate	0.433	10,000	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

Table 10.12-5. Human Health Risk Screening for Surface Soil and Groundwater, SWMU 27J (Building 10531)

SURFACE SOIL						
Analyte	Results > Detection Limit	Minimum Detect	Maximum Detect	EPA Region III Residential	HHCOPC?	Justification
Volatile Organic Compounds (mg/kg)						
Xylenes, total	2/4	0.0027	0.0034	16,000	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Di-*N*-octyl phthalate	1/4	0.433	0.433	160	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	Freq. of Detection	Minimum Detect	Maximum Detect	Human Health Criteria	HHCOPC?	Justification
Semivolatile Organic Compounds (µg/L)						
Benzo(*a*)pyrene	3/4	5.7	9.4	0.0092	Yes	Max Detect > Risk Criteria
Di-*N*-octyl phthalate	1/4	13.2	13.2	73	No	Max Detect < Risk Criteria

Table 10.12-6. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27J (Building 10531)

Analyte	SWMU 27J (Building 10531) Maximum	ESV	ECOPC Aquatic Biota?	Justification
Semivolatile Organic Compounds (µg/L)				
Benzo(*a*)pyrene	9.4	0.014[a]	Yes	Max Detect > ESV
Di-*N*-octyl phthalate	13.2	No ESV	Yes	Max Detect > ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 10.12-7. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27J (Building 10531)

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = C_{Max} × $BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = C_{Max} × $BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
Xylenes, total	0.0034	5.00E-02	9.01E-05	2.45E+00	4.10E-06	2.58E-04	No TRV	No HQ
					HI= 4.10E-06			
Semivolatile Organic Compounds								
Di-*N*-octyl phthalate	0.433	5.00E-02	1.15E-02	No TRV	No HQ	3.29E-02	No TRV	No HQ

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

Table 10.12-8. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27J (Building 10531)

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/TRV
Semivolatile Organic Compounds				
Benzo(*a*)pyrene	9.4	7.52E-04	2.66E-01	2.83E-03
Di-*N*-octyl phthalate	13.2	1.06E-03	No TRV	--
			HI=	2.83E-03

0.001 (mg/µg) = conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.
-- = Cannot be calculated due to the lack of data.

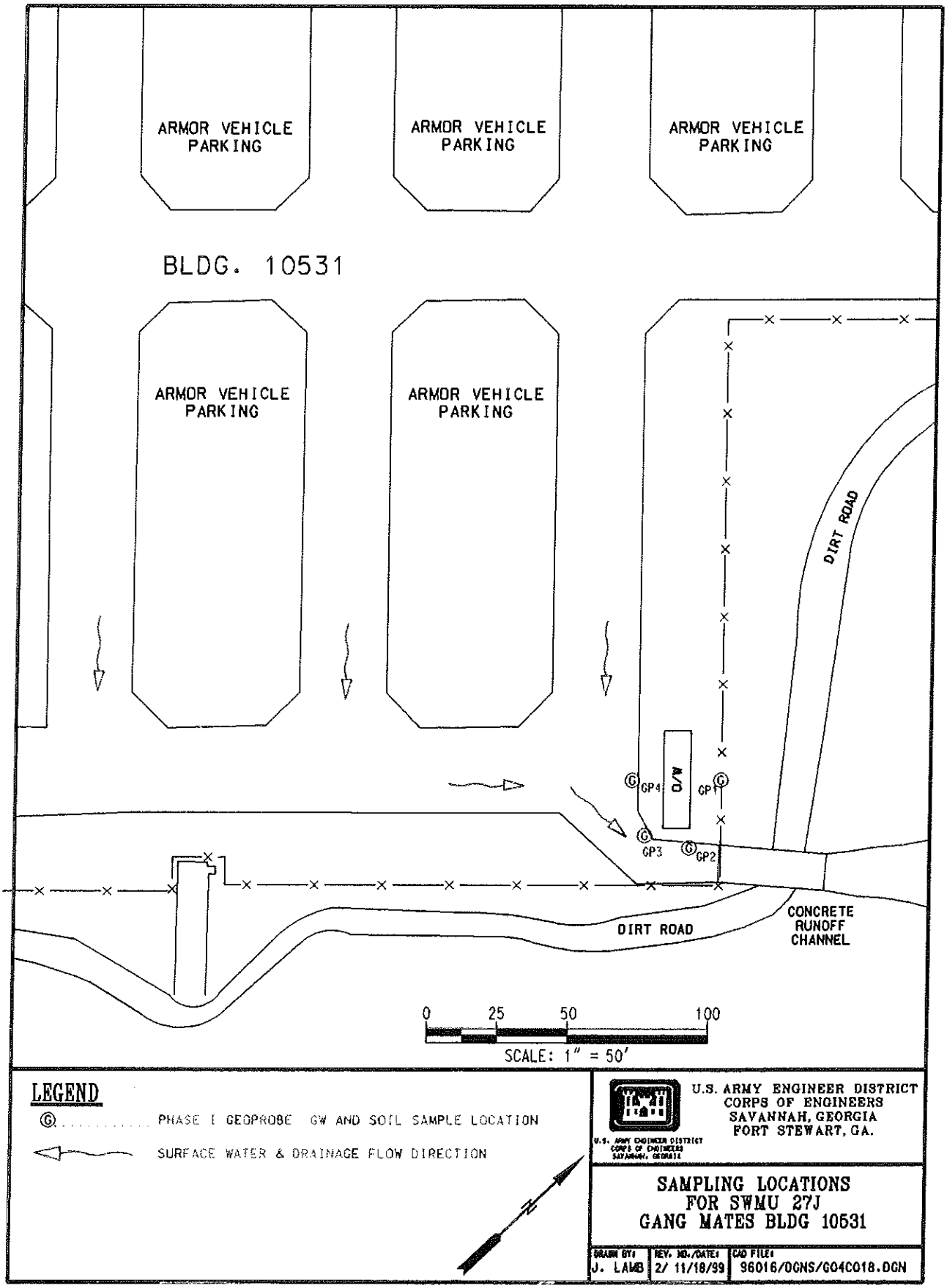


Figure 10.12-1. Sampling Locations, SWMU 27J (Building 10531)

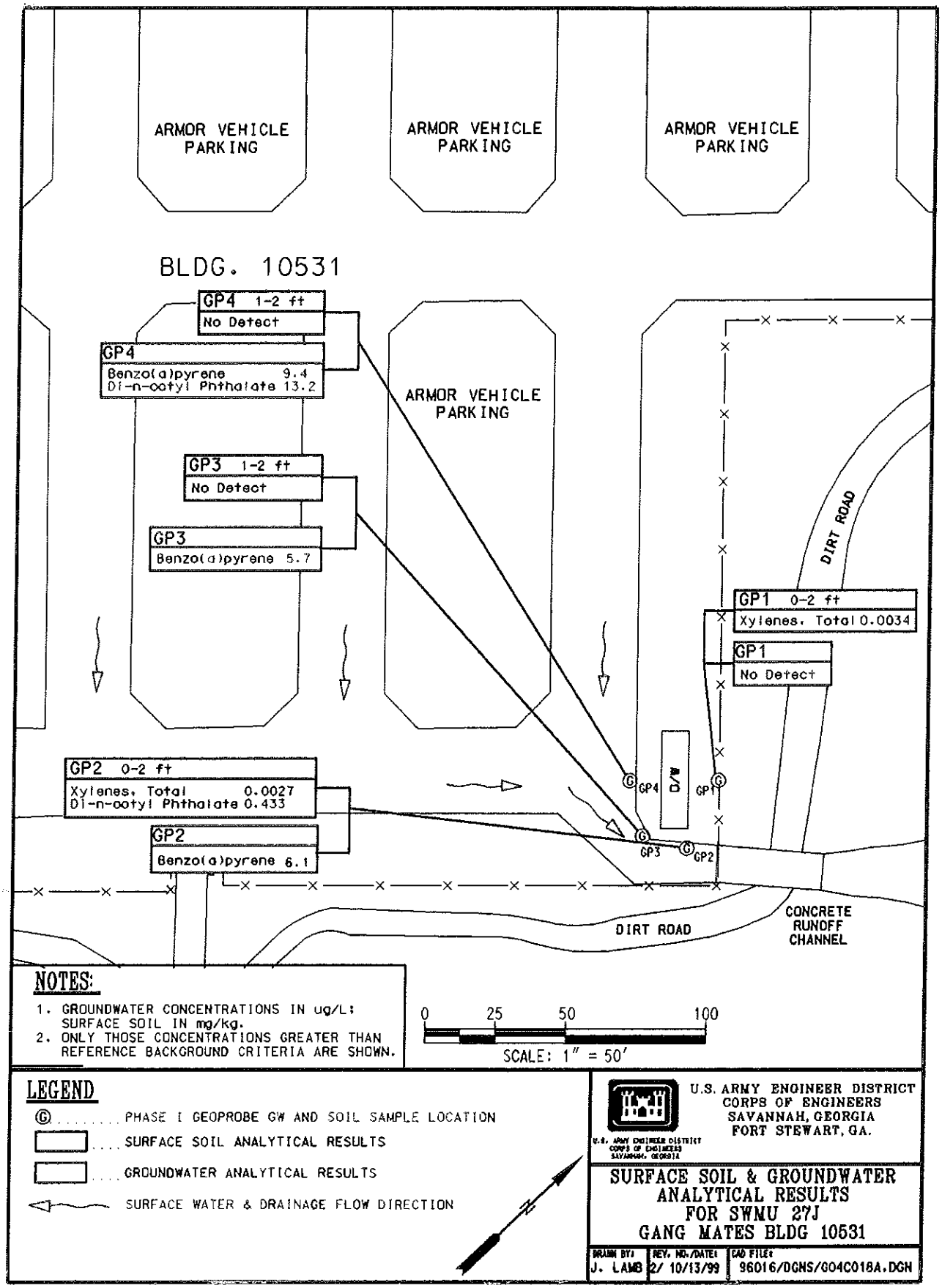


Figure 10.12-2. Summary of Analytical Results in Surface Soil and Groundwater, SWMU 27J (Building 10531)

❑ = Exposure pathway not complete.
* = Exposure pathway complete.
1 = Exposure pathway evaluated for future scenario only.
2 = This scenario is used to derive screening values. It is not a viable scenario for this site.

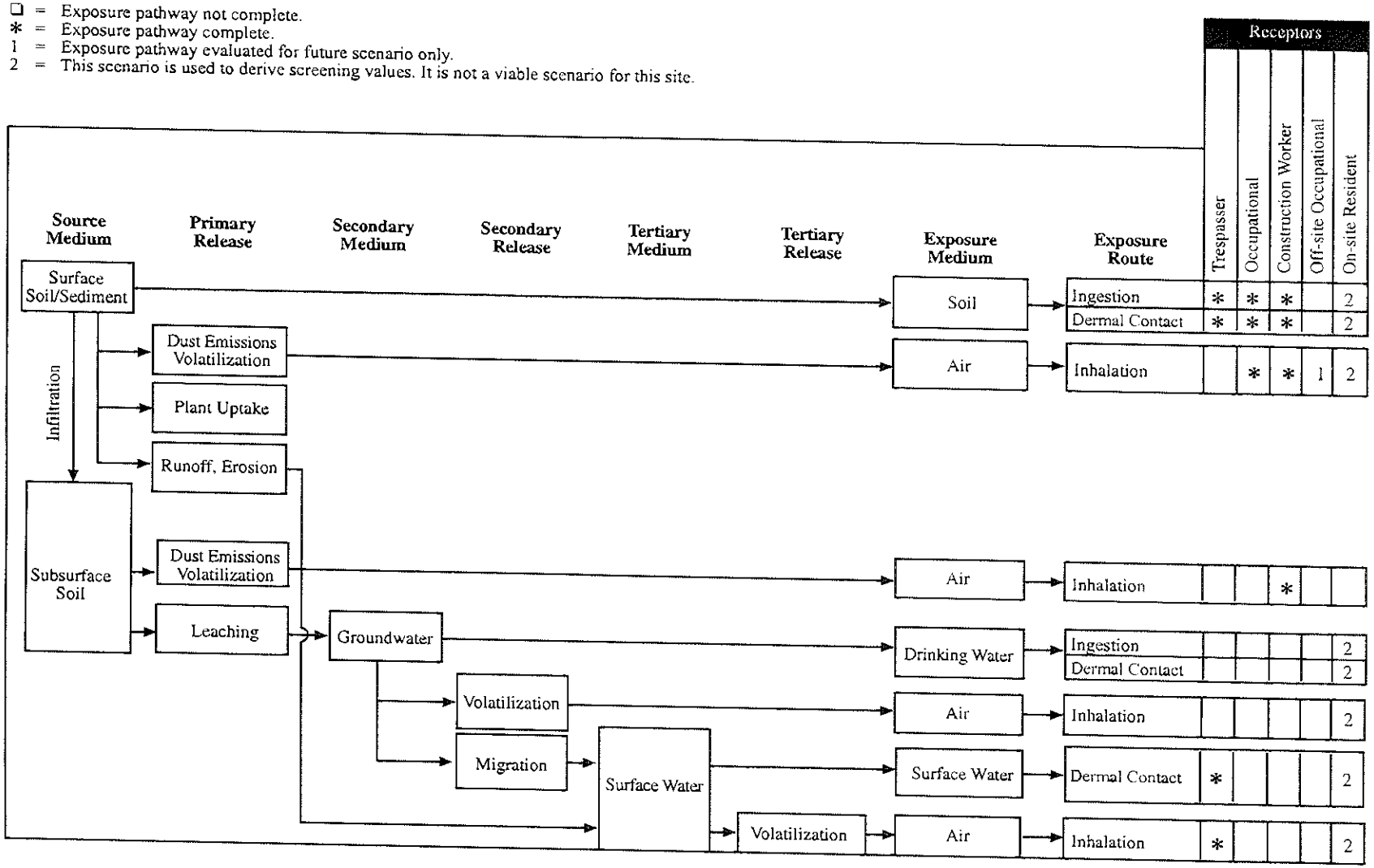


Figure 10.12-3. Potential Migration and Exposure Pathways, SWMU 27J (Building 10531)

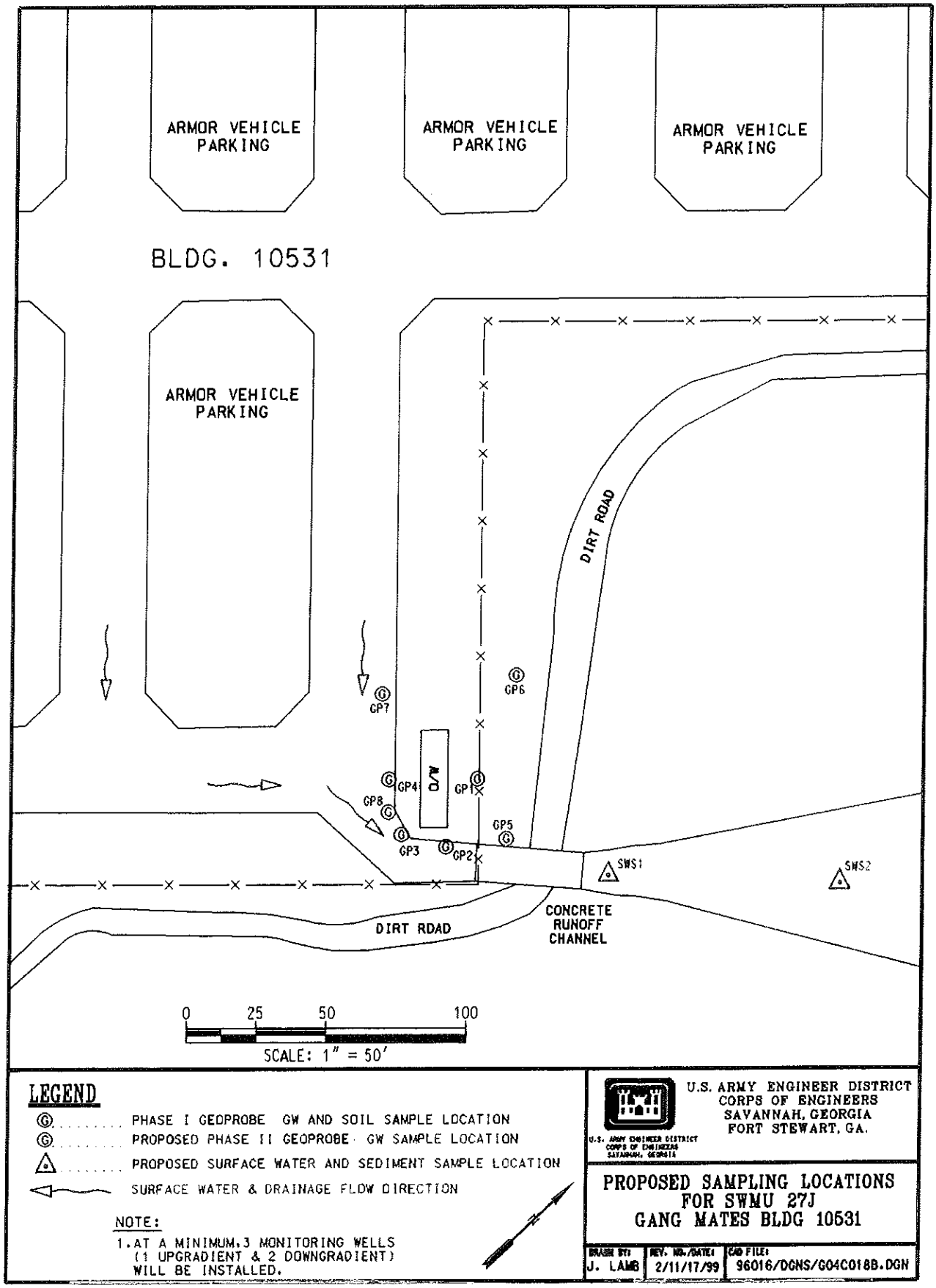


Figure 10.12-4. Proposed Phase II RFI Sampling Locations, SWMU 27J (Building 10531)

10.13 SWMU 27L: NGTC BLOCK 10200

10.13.1 History and Description of SWMU 27L, Block 10200

This OWS is one of eight located in the NGTC along Troupe Avenue. The OWS is located in the southwestern corner of Block 10200. The OWS receives wastewater from an adjacent vehicle wash rack (Figure 10.13-1). Troughs from the wash rack are piped to the OWS. The effluent from the OWS discharges into a drainage ditch located southeast of the OWS along Troupe Avenue. The wash rack is not presently in use and is scheduled for removal during 2000. Units rarely use the motorpool, and when assigned to the facility, they are strictly forbidden from using the wash rack. All equipment and vehicles are washed at a centralized location in the National Guard area. Thus, only rainwater currently collects in the OWS, which is an open unit. No previous investigations have been performed at the site.

10.13.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at the site. The locations of the soil and groundwater sampling are presented in Figure 10.13-1. The four soil samples were collected based on field headspace screening for VOCs. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

One surface water/sediment sample was collected in the drainage ditch at approximately the point at which the effluent pipe from the OWS discharges into the ditch. The surface water and sediment samples were analyzed for VOCs, SVOCs, and lead.

10.13.3 Physical Characteristics of the Site

10.13.3.1 Topography

The topography of the site is essentially flat, with a gravel vehicle parking area adjacent to the north and a grass border between the OWS and wash rack and the fence to the southeast. The surface elevation ranges from 72.02 feet to 72.92 feet amsl.

10.13.3.2 Surface drainage

A drainage ditch is located approximately 25 feet southeast of the OWS. The effluent from the OWS discharges to the drainage ditch. Surface water is present in the drainage ditch only during rainfall events or when the OWS discharges to it. Water flow in the drainage ditch is toward the southwest. Potential surface water drainage from this site discharges to the drainage ditch/swale along Troupe Avenue, which ultimately discharges to a low area southeast of the site, where it is allowed to percolate into the soil (see Section 3.3).

10.13.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

10.13.3.4 Hydrogeology

Groundwater was encountered at approximately 3.5 feet to 4.7 feet bgs.

10.13.3.5 Ecology

As stated in Section 8.2, SWMU 27L is classified as an "industrialized area with managed grasslands." The site lies along the southeastern portion of the garrison area and comprises approximately 0.01 acre (Figure 10.13-1). The only ecological habitat at this SWMU consists of a small grassy area and a storm water ditch that parallels the road. The drainage ditch contains water only after rainfall events. Water flow in the drainage ditch is toward the southwest. Industrial facilities exist across the road from the SWMU.

10.13.4 Nature and Extent of Contamination

10.13.4.1 Surface soil

Two surface soil samples were collected because the field headspace screening for VOCs indicated that interval as having the most elevated level. The results of the surface soil analysis are presented in Figure 10.13-2 and Table 10.13-1.

VOCs. No VOCs were detected in surface soil.

SVOCs. No SVOCs were detected in surface soil.

Lead. Lead was detected in the samples taken from GP2 and GP3 at concentrations of 5.2 mg/kg and 5.4 mg/kg, respectively, which are below the reference background criterion; therefore, lead is not considered to be an SRC for surface soil.

10.13.4.2 Subsurface soil

Two subsurface soil samples were collected based on field headspace screening for VOCs. The results of the soil analysis are presented in Figure 10.13-2 and Table 10.13-2.

VOCs. Toluene was detected in the sample collected at GP4 at a concentration of 0.0253 mg/kg; therefore, toluene is considered to be an SRC for subsurface soil.

SVOCs. The sample collected at GP4 indicated the presence of bis(2-ethylhexyl)phthalate at a concentration of 0.23 mg/kg; therefore, bis(2-ethylhexyl)phthalate is considered to be an SRC for subsurface soil.

Lead. Lead was detected in the samples taken from GP1 and GP4 at concentrations of 9.1 mg/kg and 4.9 mg/kg, respectively, which are below the reference background criterion; therefore, lead is not considered to be an SRC.

10.13.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 10.13-3 and Figure 10.13-2.

VOCs. The samples taken at GP1, GP2, and GP4 indicated the presence of 1,1,2-trichloroethane at concentrations of 16.2 µg/L, 5.5 µg/L, and 6.2 µg/L, respectively. In addition, these concentration levels exceeded the MCL for this constituent. Also, the samples collected from GP1, GP2, and GP4 indicated the presence of 4-methyl-2-pentanone at concentrations of 17.7 µg/L, 11.3 µg/L, and 7.4 µg/L, respectively. Bromodichloromethane and toluene were detected in the samples collected from GP1 at concentrations of 53.6 µg/L and 24.6 µg/L, respectively. 2-Butanone was detected at GP1 and GP4 at concentrations of

89.2 µg/L and 14.8 µg/L, respectively. The samples collected from GP2 and GP4 indicated the presence of 2-hexanone at concentrations of 8.6 µg/L and 7 µg/L, respectively. Ethylbenzene was detected in the samples collected from GP1 and GP4 at concentrations of 198 µg/L and 2.2 µg/L, respectively. Total xylenes were detected at a concentration of 810 µg/L at GP1.

All of these analytes—1,1,2-trichloroethane; 2-butanone; 2-hexanone; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; toluene; and total xylenes—are considered to be SRCs for groundwater.

SVOCs. The sample collected from GP1 indicated the presence of 2-methylnaphthalene and naphthalene at concentrations of 22.6 µg/L and 54.1 µg/L, respectively. Both chemicals are considered to be SRCs for groundwater.

Lead. Lead was considered nondetect at all four sampling locations; therefore, lead is not considered to be an SRC for groundwater.

10.13.4.4 Surface water

One surface water sample was collected. The results of the surface water analysis are presented in Table 10.13-4 and Figure 10.13-2.

VOCs. Acetone was detected in the sample collected at SWS1 at a concentration of 73.8 µg/L; therefore, acetone is considered to be an SRC for surface water.

SVOCs. No SVOCs were detected in surface water.

Lead. Lead was not detected in surface water.

10.13.4.5 Sediment

One sediment sample was collected. The results of the sediment analysis are presented in Table 10.13-4 and Figure 10.13-2.

VOCs. No VOCs were detected in sediment.

SVOCs. No SVOCs were detected in sediment.

Lead. Lead was detected in the sediment sample taken from SWS1 at a concentration of 2.2 mg/kg, which does not exceed the reference background criterion; therefore, lead is not considered to be an SRC in sediment.

10.13.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 10.13-5.

10.13.5 Fate and Transport Considerations

The potential for soil contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of subsurface soil SRCs to their respective GSSLs.

Of the SRCs identified in subsurface soil, none of the analytes exceeded their respective GSSLs (Table 10.13-6); therefore, there are no CMCOPCs in soil at SWMU 27L based on leaching to groundwater.

10.13.6 Human Health Preliminary Risk Evaluation of SWMU 27L

SRCs were identified for the following media: subsurface soil, groundwater, surface water, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

10.13.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active, secured site within the garrison area; however, the OWS discharges to an open ditch outside the fence, but water is present only during rain events. The potential receptor populations include:

- construction workers,
- juvenile trespassers, and
- off-site occupational receptors.

On-site soil contamination at this site is limited to subsurface soil; therefore, only a construction worker or other individuals working within an excavation are likely to be exposed to contaminants. Juvenile trespassers playing in the drainage ditch may be exposed to contaminants present in sediment. It is unlikely that other receptors would come in contact with these contaminants. However, release of volatiles from the sediment may result in exposure of off-site occupational receptors.

Land use at this site is not likely to change; therefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

The site is relatively flat and consists primarily of concrete structures; however, a small grassy area and storm water ditch parallel the road. Potential migration pathways for soils include leaching into groundwater. Soil contamination at the site is limited to subsurface soils; therefore, air migration pathways (volatilization, fugitive dust, etc.) and surface water runoff are not viable migration pathways.

As previously discussed, the OWS discharges to a ditch adjacent to the site. Contaminants in the water may become adsorbed to soil particles within the ditch. Potential migration pathways for sediment include leaching into subsurface soils and volatilization into the air. The drainage ditch is vegetated, so releases via fugitive dust are not likely.

Because groundwater is lower than the adjacent drainage ditch and no other surface bodies are nearby, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 10.13-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

Given that water is present only during rain events, exposure, if any, to contaminants in surface water would be sporadic; therefore, potential exposure to contaminants in surface water is not considered to be a chronic exposure and is generally not addressed. However, surface water samples were taken at this site during a storm event. For the purposes of completeness, the risk characterization addressed potential risks associated with contaminants in the surface water.

10.13.6.2 Risk evaluation

The results of the human health risk screening are given below.

Toluene and bis(2-ethylhexyl)phthalate were identified as SRCs for subsurface soil. The concentrations of these contaminants were below their respective screening values (Table 10.13-7); therefore, there are no HHCOPCs in subsurface soil.

SRCs for groundwater included eight volatile organics and two SVOCs (PAHs 2-methylnaphthalene and naphthalene). The maximum concentrations of 1,1,2-trichloroethane; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; 2-methylnaphthalene; and naphthalene exceeded their respective screening values (Table 10.13-7). The maximum concentrations for the remaining volatile organics were below their respective screening values. Therefore, 1,1,2-trichloroethane; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; 2-methylnaphthalene; and naphthalene are HHCOPCs for groundwater.

Acetone was identified as an SRC in surface water. There is no AWQC for acetone. However, the maximum concentration of acetone (73.8 µg/L) was above the risk-based screening level for tap water (61 µg/L). Given that incidental ingestion is the only potential pathway, the RBC for tap water is a more representative screening value; therefore, acetone is an HHCOPC in surface water.

10.13.6.3 Uncertainties

The potential risks associated with 2-hexanone could not be evaluated. A surrogate screening value was used for 2-methylnaphthalene; therefore, this contaminant might or might not be a true HHCOPC. The removal of 2-hexanone and 2-methylnaphthalene might result in an underestimation of risk. Additional human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

10.13.7 Ecological Preliminary Risk Evaluation of SWMU 27L

The EPRE was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

10.13.7.1 Ecological screening value comparison (Step i)

Lead was not detected in surface water. Only acetone was detected in surface water. The results of the ESV comparison for surface water are presented in Table 10.13-8. No ECOPCs were identified by the ESV comparison for surface water. Surface water was not evaluated further in the EPRE.

Eight VOCs and two SVOCs were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 10.13-9. The ECOPCs identified by the ESV comparison for groundwater were bromodichloromethane, total xylenes, and 2-methylnaphthalene. Only total xylenes were detected at a concentration exceeding the ESV. There are no ESVs for the other two organics, so they are ECOPCs by default (GEPD 1997a).

No SRCs were detected in surface soil or the drainage ditch sediment.

10.13.7.2 Preliminary problem formulation (Step ii)

The ecological habitat is described in Section 10.13.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

10.13.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for raccoons are presented in Table 8-5.

10.13.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of drinking water. The exposure parameters for the surrogate species—raccoons—are presented in Table 8-6.

10.13.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 10.13-10. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species. The HI calculated for VOCs does not exceed one.

10.13.8 Conclusions and Risk Management and Site Recommendations for SWMU 27L

10.13.8.1 Conclusions

Nature and Extent of Contamination

- No contaminants were indicated in surface soil.
- Toluene and bis(2-ethylhexyl)phthalate were detected in subsurface soil and are considered to be SRCs for subsurface soil.
- Groundwater samples indicated the presence of 1,1,2-trichloroethane; 2-butanone; 2-hexanone; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; toluene; total xylenes; 2-methylnaphthalene; and naphthalene. 1,1,2-Trichloroethane was detected above its MCL in three of the four groundwater samples. These analytes are considered to be SRCs.
- Lead was not detected in groundwater at concentrations exceeding the reference background criterion; therefore, lead is not considered to be an SRC.
- Acetone was detected in the surface water sample and is considered to be an SRC for surface water.
- No VOCs or SVOCs were detected in the sediment.
- Lead was detected in sediment below the reference background criterion; therefore, lead is not considered to be an SRC in sediment.

Fate and Transport

- SRCs identified in subsurface soil did not exceed their respective GSSLs; therefore, there are no CMCOPCs in soil based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- There are no HHCOPCs for subsurface soil or surface water.
- The following contaminants were identified as HHCOPCs for groundwater: 1,1,2-trichloroethane; 4-methyl-2-pentanone; bromodichloromethane; ethylbenzene; 2-methylnaphthalene; and naphthalene.

Ecological Preliminary Risk Evaluation

- There are no ECOPCs in surface water at the site.
- The ECOPCs in groundwater are bromodichloromethane, total xylenes, and 2-methylnaphthalene. These ECOPCs are a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.
- There are no ECOPCs in groundwater for terrestrial receptors.

10.13.8.2 Risk management and site recommendations

- 1,1,2,2-Tetrachloroethane was detected above the MCL in three of four groundwater samples. The extent of potential groundwater contamination was not determined during the Phase I investigation; therefore, the vertical and horizontal extent of groundwater contamination at this site must be determined. At a minimum, four groundwater screening samples will be collected using DPT techniques and analyzed for VOCs to evaluate the horizontal extent of potential contamination and to estimate the groundwater direction. At a minimum, one vertical-profile boring will be installed adjacent to the DPT location having the most elevated concentration of VOCs. The field screening results for VOCs from the four DPT and vertical-profile samples will be used to locate at least three shallow monitoring wells (one upgradient and two downgradient) and potentially three deep monitoring wells (one upgradient and two downgradient). The deep monitoring wells will be installed only if vertical contamination is indicated. The field screening results and recommended locations of monitoring wells will be presented to GEPD for its concurrence prior to installation. At each well, two soil samples will be collected following the procedures outlined in the revised final version of the SAP for Phase II RFIs of the 16 SWMUs (SAIC 1997). Surface soil samples (0 foot to 2 feet bgs) will be collected at each monitoring well location to evaluate the potential risk to ecological receptors. All wells will be sampled using low-flow techniques. Because overland surface flow from the OWS may reach the adjacent drainage ditch, two surface water and two sediment samples (one upstream and one downstream of the OWS) will be collected in the drainage ditch. The proposed sampling locations are presented in Figure 10.13-4. The soil, surface water, sediment, and groundwater samples will be analyzed for VOCs, SVOCs, and RCRA metals. Geotechnical samples will be collected to support the fate and transport analysis, if it is required.

- The information obtained from the additional sampling proposed above will be submitted to GEPD as an addendum to this report to be submitted to GEPD before July 21, 2000. The addendum to the Phase II RFI Report will any address additional human health and/or ecological risk assessments required.

Table 10.13-1. Summary of Analytes Detected in Surface Soil, SWMU 27L

Station	Reference Background Criteria	7XGP2	7XGP3
Sample ID		7X1211	7X1311
Date		01/27/98	01/27/98
Depth (feet)		0 to 2	0 to 2
Sample Type		Grab	Grab
Metals (mg/kg)			
Lead	8.81	5.2	5.4

Table 10.13-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27L

Station	Reference Background Criteria	7XGP1	7XGP4
Sample ID		7X1111	7X1411
Date		01/27/98	01/27/98
Depth (feet)		2 to 5	2 to 5
Sample Type		Grab	Grab
Volatile Organic Compounds (mg/kg)			
Toluene	0.00		**0.0253**
Semivolatile Organic Compounds (mg/kg)			
Bis(2-ethylhexyl)phthalate	0.00		**0.23**
Metals (mg/kg)			
Lead	11.10	9.1	4.9

Bold indicates concentrations above reference background criteria.

Table 10.13-3. Summary of Analytes Detected in Groundwater, SWMU 27L

Station	Reference Background Criteria	MCL	7XGP1	7XGP2	7XGP3	7XGP4
Sample ID			7X4111	7X4211	7X4311	7X4411
Date			01/27/98	01/27/98	01/27/98	01/27/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
1,1,2-Trichloroethane	0.00	5	***16.2***	***5.5***		***6.2***
2-Butanone	0.00		**89.2**			**14.8**
2-Hexanone	0.00			**8.6**		**7**
4-Methyl-2-pentanone	0.00		**17.7**	**11.3**		**7.4**
Bromodichloromethane	0.00	100	**53.6**			
Ethylbenzene	0.00	700	**198**			**2.2**
Toluene	0.00	1,000	**24.6**			
Xylenes, total	0.00	10,000	**810**			
Semivolatile Organic Compounds (µg/L)						
2-Methylnaphthalene	0.00		**22.6**			
Naphthalene	0.00		**54.1**			

Bold indicates concentrations above reference background criteria.
Boxed *italic* indicates concentrations above MCLs.

Table 10.13-4. Summary of Analytes Detected in Surface Water and Sediment, SWMU 27L

SURFACE WATER		
Station	**Reference Background Criteria**	**7XSWS1**
Sample ID		**7X3111**
Date		**02/01/98**
Sample Type		**Grab**
Volatile Organic Compounds (µg/L)		
Acetone	0.00	**73.8**

SEDIMENT		
Station	**Reference Background Criteria**	**7XSWS1**
Sample ID		**7X2111**
Date		**02/01/98**
Sample Type		**Grab**
Metals (mg/kg)		
Lead	8.81	2.2

Bold indicates concentrations above reference background criteria.

Table 10.13-5. Summary of Site-related Contaminants, SWMU 27L

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
1,1,2-Trichloroethane	ND	ND	ND	16.2	ND
2-Butanone	ND	ND	ND	89.2	ND
2-Hexanone	ND	ND	ND	8.6	ND
4-Methyl-2-pentanone	ND	ND	ND	17.7	ND
Acetone	ND	ND	ND	ND	73.8
Bromodichloromethane	ND	ND	ND	53.6	ND
Ethylbenzene	ND	ND	ND	198	ND
Toluene	ND	0.0253	ND	24.6	ND
Trichloroethene	ND	ND	ND	ND	ND
Xylenes, total	ND	ND	ND	810	ND
Semivolatile Organic Compounds					
2-Methylnaphthalene	ND	ND	ND	22.6	ND
Bis(2-ethylhexyl)phthalate	ND	0.23	ND	ND	ND
Naphthalene	ND	ND	ND	54.1	ND

ND = Not detected above reference background criteria.

Table 10.13-6. GSSL Screening of Site-related Contaminants in Soil, SWMU 27L

SOIL			
Site-related Contaminant	**Maximum Concentration**	**GSSL[a]**	**CMCOPC?**
Volatile Organic Compounds (mg/kg)			
Toluene	0.0253	12	No
Semivolatile Organic Compounds (mg/kg)			
Bis(2-ethylhexyl)phthalate	0.23	3,600	No

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

Table 10.13-7. Human Health Risk Screening for Subsurface Soil, Groundwater, and Surface Water, SWMU 27L

SUBSURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
Toluene	1/2	0.0253	0.0253	1,600	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Bis(2-ethylhexyl)phthalate	1/2	0.23	0.23	46	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Freq. of Detection**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
1,1,2-Trichloroethane	3/4	5.5	16.2	0.19	Yes	Max Detect > Risk Criteria
2-Butanone	2/4	14.8	89.2	190	No	Max Detect < Risk Criteria
2-Hexanone	2/4	7	8.6	146	No	Max Detect < Risk Criteria
4-Methyl-2-pentanone	3/4	7.4	17.7	14	Yes	Max Detect > Risk Criteria
Bromodichloromethane	1/4	53.6	53.6	0.17	Yes	Max Detect > Risk Criteria
Ethylbenzene	2/3	2.2	198	130	Yes	Max Detect > Risk Criteria
Toluene	1/4	24.6	24.6	75	No	Max Detect < Risk Criteria
Xylenes, total	1/3	810	810	1,200	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (µg/L)						
2-Methylnaphthalene	1/4	22.6	22.6	12	Yes	Max Detect > Risk Criteria
Naphthalene	1/4	54.1	54.1	0.65	Yes	Max Detect > Risk Criteria

SURFACE WATER						
Analyte	**Freq. of Detection**	**Minimum Detect**	**Maximum Detect**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
Acetone	1/1	73.8	73.8	61	Yes	Max Detect > Risk Criteria

Table 10.13-8. Ecological Screening Value Comparison for Analytes Detected in Surface Water, SWMU 27L

Analyte	SWMU 27L Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Acetone	73.8	1,500[a]	No	Max Detect < ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.

Table 10.13-9. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27L

Analyte	SWMU 27L Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
1,1,2-Trichloroethane	16.2	940	No	Max Detect < ESV
2-Butanone	89.2	14,000[a]	No	Max Detect < ESV
2-Hexanone	8.6	99[a]	No	Max Detect < ESV
4-Methyl-2-pentanone	17.7	170[a]	No	Max Detect < ESV
Bromodichloromethane	53.6	No ESV	Yes	ECOPC by default
Ethylbenzene	198	453	No	Max Detect < ESV
Toluene	24.6	175	No	Max Detect < ESV
Xylenes, total	810	1.8[a]	Yes	Max Detect > ESV
Semivolatile Organic Compounds (µg/L)				
2-Methylnaphthalene	22.6	No ESV	Yes	ECOPC by default
Naphthalene	54.1	62	No	Max Detect < ESV

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.
ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs.
Cells with double borders indicate concentrations exceeding ESVs or, when there is no ESV, concentrations that become ECOPCs by default.

Table 10.13-10. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27L

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds				
Bromodichloromethane	53.6	4.29E-03	4.76E-01	9.01E-03
Xylenes, total	810	6.48E-02	5.48E-01	1.18E-02
			HI=	2.08E-02
Semivolatile Organic Compounds				
2-Methylnaphthalene	22.6	1.81E-03	2.46E+00	7.36E-04

0.001 (mg/µg) = Conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).

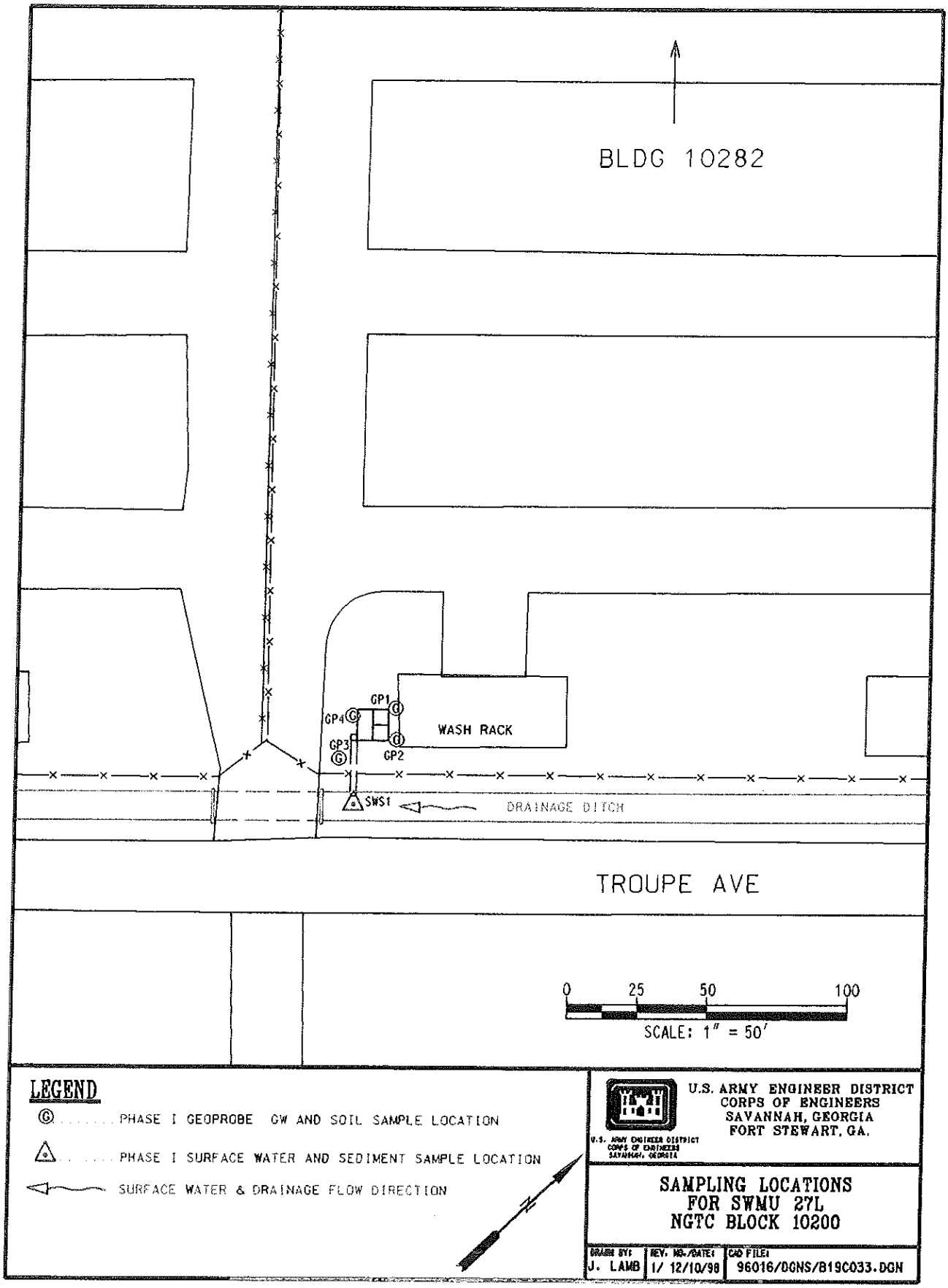


Figure 10.13-1. Sampling Locations, SWMU 27L

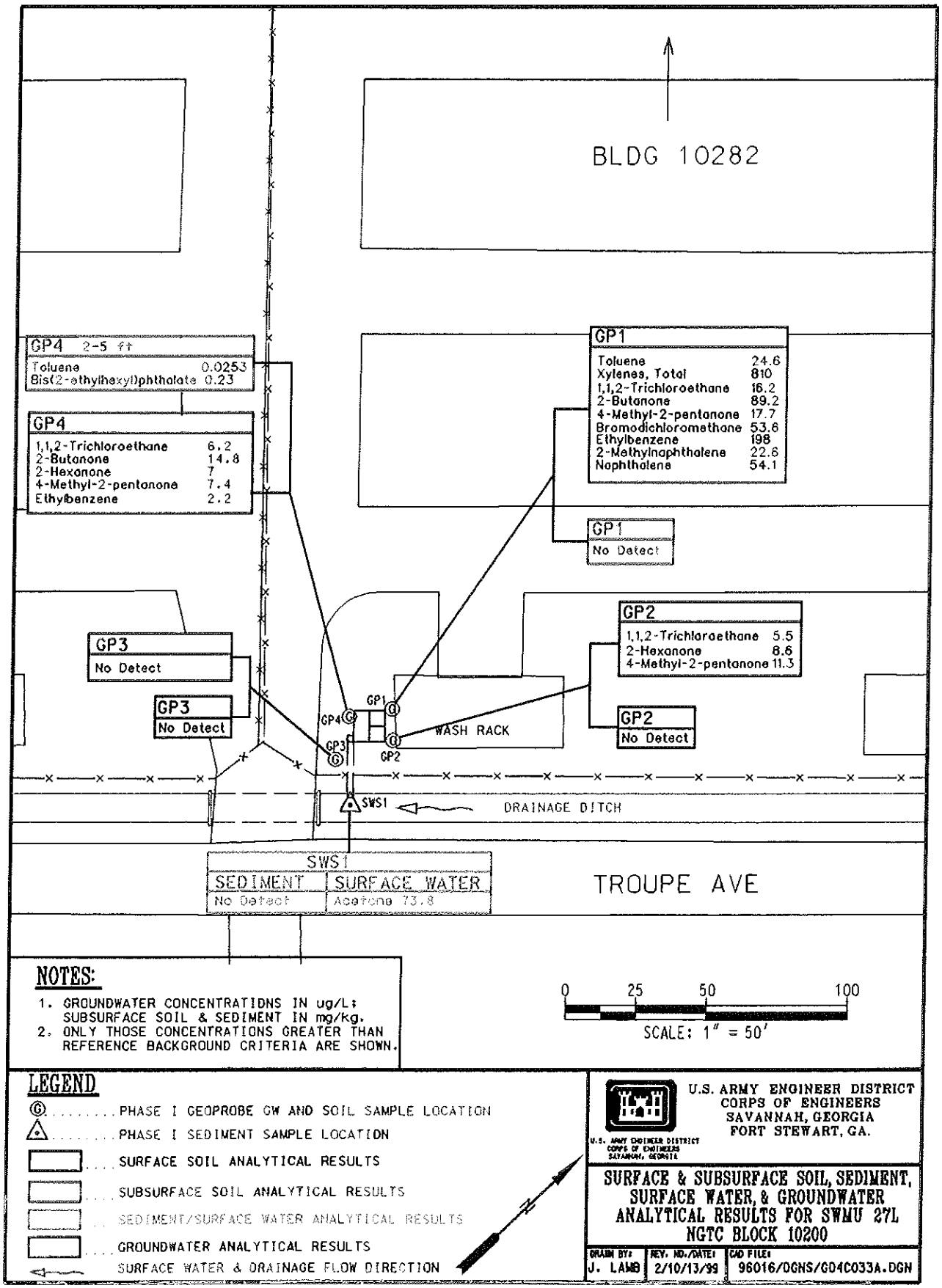


Figure 10.13-2. Summary of Analytical Results in Subsurface Soil, Groundwater, Surface Water, and Sediment, SWMU 27L

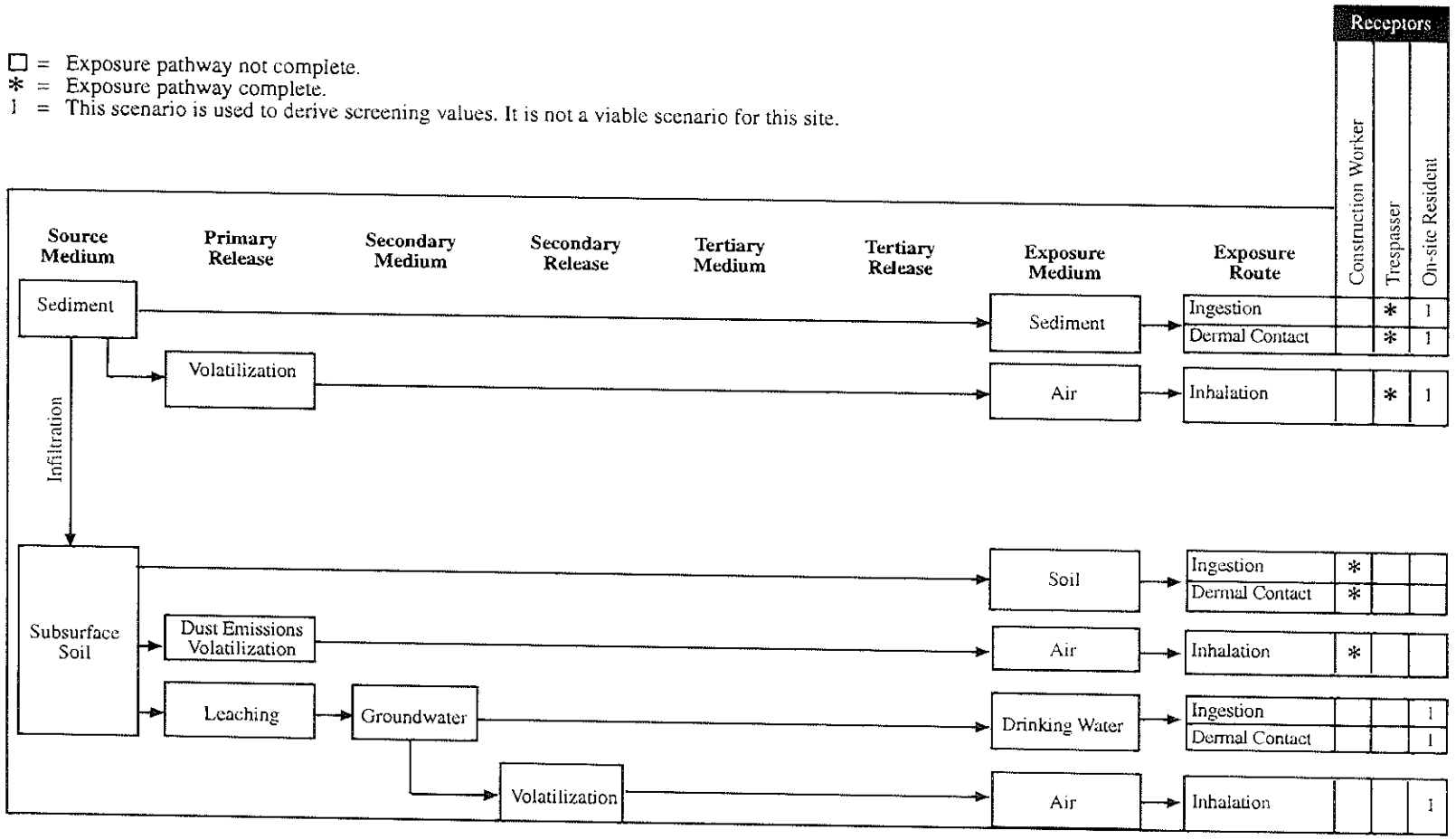


Figure 10.13-3. Potential Migration and Exposure Pathways, SWMU 27L

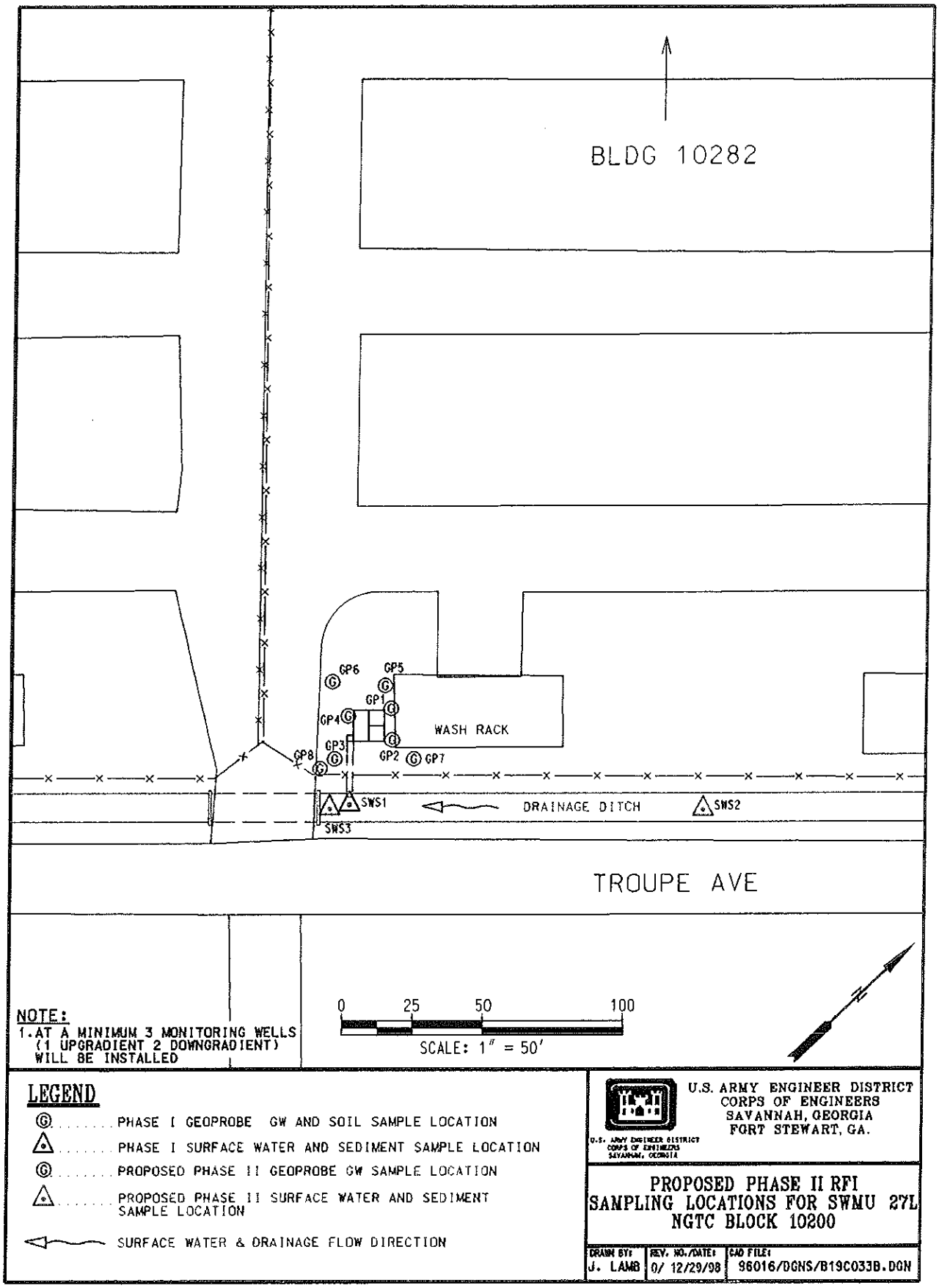


Figure 10.13-4. Proposed Phase II RFI Sampling Locations, SWMU 27L

10.14 SWMU 27T: 293 MP COMPANY

10.14.1 History and Description of SWMU 27T, 293 MP Company

SWMU 27T consists of one OWS that supports the vehicle maintenance activities of the 293 MP Company. The OWS is located in the southeastern corner outside the fenced boundary of the motorpool at the corner of Troupe Avenue and West 4th Street (Figure 10.14-1). The OWS receives wastewater from a vehicle wash rack located to the northwest. The effluent from the OWS discharges to the NGTC Equalization Basin (SWMU 37), and the waste oil is pumped out of the holding unit and burned at the Central Energy Plant. No previous investigations have been performed at the site.

10.14.2 Summary of Investigative Activities

DPT techniques were used to collect four soil and groundwater samples at SWMU 27T. The locations of the soil and groundwater sampling are presented in Figure 10.14-1. The four soil samples were collected based on field headspace screening for VOCs. The analytical laboratory inadvertently missed the holding times for VOCs and SVOCs for soil at GP1, GP2, and GP3 during the initial sampling endeavor (January 1998). Soil was resampled on May 6, 1998. The soil and groundwater samples were analyzed for VOCs, SVOCs, and lead.

Three sediment samples were collected from the drainage ditch. Initially, only a sediment sample downstream of the OWS was collected in February 2, 1998. To confirm that upstream sources were impacting the sediment downstream of the OWS, an upstream and a downstream sediment sample were collected September 23, 1999. The first sediment sample was analyzed for VOCs, SVOCs, and lead. The second set of sediment samples was analyzed for VOCs, SVOCs, and RCRA metals. No surface water was available during the Phase I RFI.

10.14.3 Physical Characteristics of the Site

10.14.3.1 Topography

The topography of the site is essentially flat. The surface elevation is approximately 85 feet amsl. The OWS is surrounded by grass that extends to unpaved Troupe Avenue to the southeast.

10.14.3.2 Surface drainage

A drainage ditch is located between the OWS and the wash rack (Figure 10.14-1). The effluent (i.e., separated water) from the OWS discharges to the NGTC Equalization Basin (SWMU 37). Surface water is present in the drainage ditch only during rainfall events.

10.14.3.3 Soils

The soils across the site consist of alternating layers of sand and silty to clayey sands, as indicated in the DPT logs (Appendix A).

10.14.3.4 Hydrogeology

Groundwater was encountered at approximately 4.4 feet to 6.0 feet bgs.

10.14.3.5 Ecology

As stated in Section 8.2, SWMU 27T is classified as an "industrialized area with managed grasslands." SWMU 27T comprises approximately 0.01 acre (Figure 10.14-1), is covered largely by concrete, and includes an area of managed grass within the SWMU boundaries. Additionally, a storm water ditch separates the SWMU from the road.

10.14.4 Nature and Extent of Contamination

10.14.4.1 Surface soil

Three surface soil samples were collected based on field headspace screening for VOCs. The analytical laboratory missed the holding times for VOCs and SVOCs for soil at GP2 and GP3 during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. The results of the soil analysis are presented in Table 10.14-1 and Figure 10.14-2.

VOCs. No VOCs were detected in surface soil.

SVOCs. Benzo(*b*)fluoranthene and phenanthrene were detected in the sample collected from GP3 at concentrations of 1.14 mg/kg and 0.79 mg/kg, respectively. The sample collected from GP4 indicated the presence of chrysene at a concentration of 0.215 mg/kg. Pyrene was detected in the samples collected from GP3 and GP4 at concentrations of 1.33 mg/kg and 0.22 mg/kg, respectively. Benzo(*b*)fluoranthene, chrysene, phenanthrene, and pyrene are considered to be SRCs in surface soil.

Lead. Lead was detected in the samples taken from all three locations at concentrations ranging from 6.1 mg/kg at GP3 to 7.5 mg/kg at GP2. None of the concentrations exceeded the respective reference background criteria; therefore, lead is not considered to be an SRC for surface soil.

10.14.4.2 Subsurface soil

One subsurface soil sample was collected based on field headspace screening for VOCs. The analytical laboratory missed the holding times for VOCs and SVOCs for soil at GP1 during the initial sampling endeavor (January 1998), so the soil was resampled in May 1998. The results of the soil analysis are presented in Table 10.14-2 and Figure 10.14-2.

VOCs. No VOCs were detected in subsurface soil.

SVOCs. No SVOCs were detected in subsurface soil.

Lead. Lead was detected in the sample taken from GP1 at a concentration of 5.5 mg/kg, which does not exceed the reference background criterion; therefore, lead is not considered to be an SRC in subsurface soil.

10.14.4.3 Groundwater

Four groundwater samples were collected from the four Geoprobe locations at the site. The results of the groundwater analysis are presented in Table 10.14-3 and Figure 10.14-2.

VOCs. Acetone was detected in GP3 at a concentration of 50.2 µg/L. Acetone is considered to be an SRC in groundwater.

SVOCs. Pyrene was detected in the sample collected from GP4 at a concentration of 26.2 µg/L; therefore, pyrene is considered to be an SRC in groundwater.

Lead. Lead was below the reference background criterion at GP1 and GP2 and not detected at GP3 and GP4; therefore, lead is not considered to be an SRC in groundwater.

10.14.4.4 Surface water

There was no surface water present at the site during the Phase I field investigation.

10.14.4.5 Sediment

Three sediment samples were collected, initially (February 1, 1998) only one downstream of the OWS, followed by a resampling (September 23, 1999) of the sediment samples both upstream and downstream (see Section 10.14.2). The results of the sediment analyses are presented in Table 10.14-4 and Figure 10.14-2.

VOCs. No VOCs were detected in the initial downstream sediment sample. However, four VOCs were detected in the sediment samples collected September 23, 1999. 2-Butanone, 2-hexanone, 4-methyl-2-pentanone, and acetone were detected at concentrations of 0.0227 mg/kg, 0.0023 mg/kg, 0.0052 mg/kg, and 0.099 mg/kg, respectively. 2-Butanone and acetone were also detected in the upstream sediment sample at concentrations of 0.0206 mg/kg and 0.391 mg/kg, respectively. 2-Butanone, 2-hexanone, 4-methyl-2-pentanone, and acetone are considered to be SRCs in sediment; however, only two of the VOCs (2-hexanone and 4-methyl-2-pentanone) were detected above their site-specific background criteria, indicating that a source upstream of the OWS is impacting the sediment characteristics. The probable source is surface runoff from the parking area of the adjacent motorpool that drains into the drainage ditch upstream of the OWS.

SVOCs. Benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, fluoranthene, indeno(*1,2,3-cd*)pyrene, and pyrene were detected in the downstream sediment samples. Chrysene was also detected at a concentration of 2.54 mg/kg in the downstream sediment sample collected on February 1, 1998. All of these constituents were detected in the upstream sediment sample as well. The sediment sample initially collected (February 1998) had the higher concentrations of detected SVOCs. The concentrations of benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, fluoranthene, indeno(*1,2,3-cd*)pyrene, and pyrene from the February 1998 and September 1999 samples were 1.07 mg/kg and 0.405 mg/kg, 1.95 mg/kg and 0.677 mg/kg, 3.51 mg/kg and 1.06 mg/kg, 1.81 mg/kg and 0.633 mg/kg, 2.4 mg/kg and 0.851 mg/kg, 2.92 mg/kg and 1 mg/kg, 1.65 mg/kg and 0.582 mg/kg, and 3.25 mg/kg and 1.12 mg/kg, respectively. Except for benzo(*a*)anthracene, all of the constituents detected in the sediment samples collected February 1998 were at concentrations that were above the site-specific background criteria of September 1999. No site-specific background sample was collected during the February 1998 sampling endeavor. Benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, fluoranthene, indeno(*1,2,3-cd*)pyrene, and pyrene are considered to be SRCs in sediment; however, the presence of these constituents in the upstream sediment sample indicates that a source upstream of the OWS is impacting the sediment characteristics. The probable source is surface runoff from the parking area of the adjacent motorpool that drains into the drainage ditch upstream of the OWS.

RCRA Metals. Arsenic, barium, cadmium, chromium, lead, mercury, and selenium were detected in the upstream and downstream sediment samples. However, only cadmium was detected above the site-specific reference background criterion. Cadmium is an SRC in sediment; however, the presence of these constituents in the upstream sediment sample indicates that a source upstream of the OWS is impacting the sediment characteristics. The probable source is surface runoff from the parking area of the adjacent motorpool that drains into the drainage ditch upstream of the OWS.

10.14.4.6 Site-related contaminant summary

SRCs by medium and the corresponding maximum concentrations are presented in Table 10.14-5.

10.14.5 Fate and Transport Considerations

The potential for soil and sediment contaminants to migrate (i.e., their leachability) to groundwater was evaluated by comparing the maximum concentrations of soil and sediment SRCs to their respective GSSLs.

Of the SRCs identified in soil and sediment, only cadmium exceeded its GSSL (Table 10.14-6). Cadmium is a CMCOPC in sediment based on leaching to groundwater.

10.14.6 Human Health Preliminary Risk Evaluation of SWMU 27T

SRCs for SWMU 27T were identified for the following media: surface soil, groundwater, and sediment. Evaluation of the potential risks resulting from exposure to these constituents and the identification of HHCOPCs are addressed in this section.

10.14.6.1 Exposure evaluation

The exposure evaluation addresses what human receptor populations, both on-site and off-site, might be exposed to contaminants present at the site. The exposure evaluation also addresses how contaminants might migrate and the potential exposure pathways for the various receptors.

Receptor Assessment

This is an active site within the garrison area. The potential receptor populations include:

- occupational populations (individuals working on the site),
- construction workers, and
- off-site occupational receptors.

Land use at this site is not likely to change; tberefore, future receptor populations are likely to be the same as the current ones.

Migration and Exposure Pathway Analysis

Potential migration pathways for soils include leaching into groundwater and release of volatile compounds into the air. The site is relatively flat and is covered largely by concrete. An area of managed grass occurs within the SWMU boundaries. Additionally, a storm water ditch separates the SWMU from the road. Therefore, soil erosion via fugitive dust is not a viable migration pathway. Given the proximity of the OWS to the storm water ditch, contaminants in surface soils may migrate to the drainage ditch. However, a road is located alongside the ditch, and this road may be contributing to the organic and lead concentrations detected in the drainage ditch sediment. In addition, the storm water drainage system for the entire 200-motorpool block discharges to this ditch.

Because the elevation of groundwater is lower than the adjacent drainage ditch and no other surface bodies are nearby, groundwater at the site does not discharge into any nearby surface waters; therefore, migration via discharge of groundwater is not a viable migration pathway.

The potential migration and exposure pathways for the various receptors are presented in Figure 10.14-3. The on-site resident scenario is not considered to be a viable scenario for this site; however, in accordance with RBCA guidance, it is used to derive screening values. The exposure pathways associated with this scenario are presented to show what pathways would be associated with an on-site resident exposure scenario.

10.14.6.2 Risk evaluation

The results of the human health risk screening are given below.

Four SVOCs [PAHs benzo(*b*)fluoranthene, chrysene, phenanthrene, and pyrene] were identified as SRCs in surface soil. The maximum concentration for benzo(*b*)fluoranthene (1.14 mg/kg) exceeded its screening criterion for ingestion (0.88 mg/kg) (Table 10.14-7). All of the concentrations for the remaining compounds were below their respective screening values. Therefore, benzo(*b*)fluoranthene is an HHCOPC in surface soil.

Acetone and pyrene were identified as SRCs for groundwater. The maximum concentrations of these constituents were below their respective screening values (Table 10.14-7); therefore, there are no HHCOPCs for groundwater.

Four VOCs, nine SVOCs (PAHs), and cadmium were identified as SRCs in sediment. None of the maximum concentrations of VOCs exceeded their respective screening criteria for exposure via ingestion (Table 10.14-7). With the exception of benzo(*k*)fluoranthene, benzo(*g,h,i*)perylene, chrysene, fluoranthene, and pyrene, the maximum concentrations for the SVOCs [PAHs benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, and indeno(*1,2,3-c,d*)pyrene] were above the screening criteria for exposure via ingestion (Table 10.14-7). The maximum concentration of cadmium was also above its screening value. Benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, indeno(*1,2,3-cd*)pyrene, and cadmium are considered to be HHCOPCs for sediment.

The maximum value for benzo(*a*)pyrene in sediment was more than an order of magnitude greater than the screening value for ingestion. The maximum concentrations for the other SVOCs identified as HHCOPCs and for cadmium were within an order of magnitude of their respective screening values.

10.14.6.3 Uncertainties

A screening value for a surrogate compound was used for phenanthrene, possibly resulting in exclusion of this PAH when it should be an HHCOPC. Other human health uncertainties have been addressed in Section 7.5 of the HHPRE (Chapter 7.0).

10.14.7 Ecological Preliminary Risk Evaluation of SWMU 27T

The EPRE of SWMU 27T was conducted in accordance with GEPD (1996) guidance (see Chapter 8.0). At sites where surface water, sediment, or groundwater was collected, an ESV comparison was conducted. If ECOPCs for aquatic biota were identified in surface water, sediment, or groundwater based on the ESV comparison (Step i), then further evaluation was required for those media. If no ECOPCs were identified based on the Step i screening of those media, then those ECOPCs were not considered further. At sites where surface soil was collected, substances detected in surface soil were evaluated in EPRE Steps ii through v because there are no ESVs for surface soil. The results of the five steps of the EPRE are presented below.

10.14.7.1 Ecological screening value comparison (Step i)

There is no surface water at SWMU 27T. The sediment is treated as surface soil (see Section 10.14.7.5).

One VOC and one SVOC were detected in groundwater. The results of the ESV comparison for groundwater are presented in Table 10.14-8. The only ECOPC identified by the ESV comparison for groundwater was pyrene. Pyrene is an ECOPC by default because it has no ESV (GEPD 1997a).

Because there are no ESVs for soil, all analytes detected in soil and drainage ditch sediment were evaluated further in EPRE Steps ii through v.

10.14.7.2 Preliminary problem formulation (Step ii)

Ecological habitat is described in Section 10.14.3.5. The preliminary assessment endpoints, ecological receptors, and surrogate species representative of those receptors selected for evaluation in the preliminary risk calculation are described in Section 8.2.

10.14.7.3 Preliminary effects (Step iii)

In the EPRE, TRVs were required for shrews and robins ingesting contaminated biota exposed to surface soil or drainage ditch sediment at the site and for raccoons ingesting water. The derivation of TRVs is discussed in Section 8.3. The TRVs derived for shrews and raccoons are presented in Table 8-5, and TRVs for robins are presented in Table 8-6.

10.14.7.4 Preliminary exposure (Step iv)

Ecological receptors are probably exposed by ingestion of contaminated soil or drainage ditch sediment, of biota exposed to contaminated soil or drainage ditch sediment, or of drinking water. The exposure parameters for the surrogate species—shrews, raccoons, and robins—are presented in Table 8-7.

10.14.7.5 Preliminary risk calculation (Step v)

The preliminary risk calculation (Step v) uses HQs, the ratios of the measured maximum concentrations and the TRVs, to evaluate the potential for risk. The HQs of ECOPCs with consistent modes of toxicity and effects endpoints are added to calculate an HI. Metals are assumed to have distinct modes of toxicity and effects endpoints; therefore, HIs are calculated for only VOCs and SVOCs when no individual ECOPC has an HQ greater than one and HQs are calculated for more than one chemical. ECOPCs with HQs and HIs less than one indicate little to no likelihood of risk to the ecological receptors. An ERA using site-specific data is indicated for those ECOPCs with calculated HQs or HIs exceeding one (GEPD 1996).

Surface Soil. The preliminary risk calculations for shrews and robins exposed to ECOPCs detected in surface soil and drainage ditch sediment are presented in Tables 10.14-9 and 10.14-10, respectively. These tables show the maximum detected concentrations, ADDs, TRVs, and HQs for shrews and robins. HQs exceeding one are shown bordered by a double line.

There are no ECOPCs present in surface soil at concentrations resulting in ADDs exceeding the TRV for the surrogate species (Table 10.14-9). The HIs calculated for VOCs and SVOCs do not exceed one.

Cadmium was the only ECOPC in sediment from the drainage ditch that had an HQ exceeding one (Table 10.14-10). The cadmium HQs are 53.1 for shrews and 223 for robins. The HIs calculated for VOCs and SVOCs do not exceed one.

Groundwater. The preliminary risk calculations for raccoons exposed to ECOPCs detected in groundwater are presented in Table 10.14-11. This table shows the maximum detected concentrations, ADDs, TRVs, and HQs for the receptors. There are no ECOPCs present in groundwater at concentrations resulting in ADDs exceeding the TRVs for the surrogate species.

10.14.8 Conclusions and Risk Management and Site Recommendations for SWMU 27T

10.14.8.1 Conclusions

Nature and Extent of Contamination

- No VOCs were detected in surface soil. The SVOCs benzo(*b*)fluoranthene, chrysene, phenanthrene, and pyrene were detected in surface soil and are considered to be SRCs in surface soil.
- No SRCs were identified in subsurface soil.
- Acetone and pyrene were detected in groundwater and are considered to be SRCs in groundwater.
- Lead in groundwater was below the reference background criterion at GP1 and GP2 and not detected at GP3 and GP4; therefore, lead is not considered to be an SRC.
- 2-Butanone, 2-hexanone, 4-methyl-2-pentanone, acetone, benzo(*a*)anthracene, benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*g,h,i*)perylene, benzo(*k*)fluoranthene, chrysene, fluoranthene, indeno(*1,2,3-cd*)pyrene, pyrene, and cadmium were detected in the sediment samples and are considered to be SRCs for sediment.
- Cadmium was detected in the sediment sample at a concentration that exceeded the reference background criterion; therefore, cadmium is considered to be an SRC in sediment.

Fate and Transport

- Cadmium is a CMCOPC in sediment based on leaching to groundwater.

Human Health Preliminary Risk Evaluation

- Benzo(*b*)fluoranthene was identified as an HHCOPC in surface soil.
- There are no HHCOPCs in groundwater.
- HHCOPCs in sediment included cadmium and the following SVOCs (all PAHs): benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-cd*)pyrene.

Ecological Preliminary Risk Evaluation

- The only ECOPC in groundwater (i.e., aquatic biota) is pyrene (by default). This ECOPC is a potential hazard to aquatic biota if groundwater discharges to nearby surface water bodies.

- There are no ECOPCs in groundwater for terrestrial receptors.

- The only ECOPC in drainage ditch sediment for terrestrial receptors is cadmium.

- There are no ECOPCs in surface soil for terrestrial receptors.

10.14.8.2 Risk management and site recommendations

- Cadmium was identified as a CMCOPC in sediment. Insufficient groundwater data were available to model the leaching of cadmium into groundwater for its evaluation in a human health baseline risk assessment. However, the maximum concentration that was screened represents a single detection of chromium and given the areal extent of the area defined by the drainage ditch within SWMU 27T, it is unlikely that chromium will leach into groundwater in concentrations that will have an adverse effect upon human health.

- Benzo(*b*)fluoranthene was identified as an HHCOPC in surface soil. The HHCOPCs identified in sediment included cadmium and the following SVOCs (all PAHs): benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-c d*)pyrene. A human health baseline risk assessment was performed to address the risks associated with the HHCOPCs identified in surface soil and sediment (see Attachment 10.14A). The risk estimates for all of the potential receptor populations were below the target risk values. The total HI for both the current and future on-site juvenile trespasser was more than three orders of magnitude below the target risk value, 7.94×10^{-4} as compared to a target value of 1.0. The total ILCRs for the on-site Installation worker (ILCR = 3.00×10^{-7}), on-site juvenile trespasser (ILCR = 1.21×10^{-7}), and on-site resident child (ILCR = 9.17×10^{-7}) were below the target risk value of 1×10^{-6}. Therefore, the risks associated with exposure of the identified receptor populations to COPCs in surface soil and sediment are within the acceptable range, and no further investigation and/or evaluation is required.

- As indicated in the first bullet, cadmium was identified as a CMCOPC in sediment based on potential leaching to groundwater, but subsequent risk could not be quantified. Because of the uncertainty associated with the one elevated concentration of cadmium in sediment, Fort Stewart recommends that additional sediment samples be collected in the drainage ditch to confirm the believed limited areal extent of cadmium. The sediment investigation would be implemented in a two-phase approach. Initially, three additional sediment samples would be collected, one upgradient and two downgradient of the OWS. The two downstream sediment samples would be collected upgradient and downgradient of the previous downgradient sample (SWS2) in which cadmium was detected to confirm the areal extent of potential cadmium contamination. The sediment samples would be analyzed for cadmium only. If cadmium was detected below the reference background criterion, then Fort Stewart would conclude that the one elevated concentration of cadmium was an anomaly and that cadmium is not a COC in sediment at SWMU 27T. If cadmium was detected above the reference background criterion during the resampling, then three permanent 2-inch-diameter monitoring wells (one upgradient and two downgradient) would be installed for determining groundwater direction and for collection of groundwater samples. Groundwater would be sampled using low-flow techniques. No soil except that for geotechnical analysis would be collected during the installation of the permanent monitoring wells. The groundwater would

be analyzed for only total and dissolved cadmium. Geotechnical analysis would be performed on the soil collected from the installation of the permanent monitoring wells to support potential fate and transport analysis. In addition, three more sediment sample locations would be collected to determine the downgradient extent of cadmium. All sampling procedures for sediment, soil (geotechnical only), and groundwater will be in accordance with the procedures outlined in the SAP for the Phase II RFIs of the 16 SWMUs (SAIC 1997).

- The presence of sediment COPCs in the drainage ditch adjacent to SWMU 27T is unlikely to be the result of environmental releases from this OWS. SWMU 27T discharges directly to the NGTC Equalization Basin; therefore, environmental releases from this SWMU would be the result of subsurface releases caused by leakage from the OWS. However, the absence of SVOCs in subsurface soil and the fact that only one SVOC was detected in groundwater indicate that the OWS is not leaking. The source of COPCs in the drainage ditch is probably upstream, given that the drainage ditch receives runoff from upstream sources within the industrialized area of the garrison (e.g., parking area of adjacent motorpool). This conclusion is supported by the data collected during the second round of sediment sampling, which included an upgradient sediment sample. The concentrations of all of the SVOCs detected in the downgradient SWMU 27T sediment sample were lower than those detected in the upgradient sample.

- Pyrene was indicated as an ECOPC (by default) in groundwater for its potential hazard to aquatic biota if the groundwater discharges to nearby surface water bodies. As stated in Section 10.14.6.1, the groundwater does not discharge to any nearby surface water bodies (the ditch is not a habitat for aquatic biota). Pyrene was detected in only one of four groundwater samples. No other SVOCs were detected in the groundwater. Given the typical groundwater flow rates in the garrison area and the lack of any nearby receptors, the concentration of pyrene would probably be removed by natural attenuation processes (e.g., biodegradation) prior to reaching a receptor. The single elevated concentration of pyrene in groundwater is not considered to indicate an ECOPC requiring further investigation and/or evaluation.

- The information obtained from the additional sampling proposed above will be submitted to GEPD as an addendum to this report that will be issued separately. The addendum to this report will be issued to GEPD in July 2000.

Table 10.14-1. Summary of Analytes Detected in Surface Soil, SWMU 27T

Station	Reference Background Criteria	8FGP2[a]	8FGP3[a]	8FGP4
Sample ID		8F1212	8F1312	8F1411
Date		05/06/98	05/06/98	01/18/98
Depth (feet)		0 to 2	0 to 2	0 to 2
Sample Type		Grab	Grab	Grab
Semivolatile Organic Compounds (mg/kg)				
Benzo(*b*)fluoranthene	0.00		**1.14**	
Chrysene	0.00			**0.215**
Phenanthrene	0.00		**0.79**	
Pyrene	0.00		**1.33**	**0.22**
Metals (mg/kg)				
Lead	8.81	7.5	6.1	7.1

Bold indicates concentrations above reference background criteria.
[a]The analytical laboratory inadvertently missed the holding times for VOCs and SVOCs for soil during the January 1998 sampling endeavor. Soil was resampled May 6, 1998.

Table 10.14-2. Summary of Analytes Detected in Subsurface Soil, SWMU 27T

Station	Reference Background Criteria	8FGP1[a]
Sample ID		8F1112
Date		05/06/98
Depth (feet)		2 to 3
Sample Type		Grab
Metals (mg/kg)		
Lead	11.10	5.5

[a]The analytical laboratory inadvertently missed the holding times for VOCs and SVOCs for soil during the January 1998 sampling endeavor. Soil was resampled May 6, 1998.

Table 10.14-3. Summary of Analytes Detected in Groundwater, SWMU 27T

Station	Reference Background Criteria	MCL	8FGP1	8FGP2	8FGP3	8FGP4
Sample ID			8F4111	8F4211	8F4311	8F4411
Date			01/19/98	01/19/98	01/19/98	01/18/98
Sample Type			Grab	Grab	Grab	Grab
Volatile Organic Compounds (µg/L)						
Acetone	0.00				**50.2**	
Semivolatile Organic Compounds (µg/L)						
Pyrene	0.00					**26.2**
Metals (µg/L)						
Lead	4.69	15	0.86	0.81		

Bold indicates concentrations above reference background criteria.

Table 10.14-4. Summary of Analytes Detected in Sediment, SWMU 27T

Station	Site-specific Reference Background Criteria[a]	8FSWS1	8FSWS2	8FSWS3[b]
Sample ID		8F2111	8F2211	8F2311
Date		02/01/98	09/23/99	09/23/99
Depth (ft)		0 to 1	0 to 1	0 to 1
Sample Type		Grab	Grab	Grab
Volatile Organic Compounds (mg/kg)				
2-Butanone	0.0412		0.0227	0.0206
2-Hexanone	0.00		**0.0023**	
4-Methyl-2-pentanone	0.00		**0.0052**	
Acetone	0.782		0.099	0.391
Semivolatile Organic Compounds (mg/kg)				
Benzo(*a*)anthracene	1.18	1.07	0.405	0.592
Benzo(*a*)pyrene	1.48	**1.95**	0.677	0.738
Benzo(*b*)fluoranthene	1.93	**3.51**	1.06	0.965
Benzo(*g,h,i*)perylene	0.996	**1.81**	0.633	0.498
Benzo(*k*)fluoranthene	1.81	**2.4**	0.851	0.907
Chrysene	0.0928	**2.54**		0.0464
Fluoranthene	1.99	**2.92**	1	0.994
Indeno(*1,2,3-cd*)pyrene	0.878	**1.65**	0.582	0.439
Pyrene	2.68	**3.25**	1.12	1.34
Metals (mg/kg)				
Arsenic	2.8	NA	1.3	1.4
Barium	73.6	NA	29.2	36.8
Cadmium	**4.4**	NA	**19.3**	2.2
Chromium	31.2	NA	15.3	15.6
Lead	123	33.3	57.9	61.5
Mercury	0.24	NA	0.02	0.12
Selenium	1.64	NA	0.58	0.82

[a]Site-specific background criteria for sediment equals two times background concentrations (SWS3).
[b]Site-specific background location.
NA = Not analyzed.
Bold indicates concentrations above site-specific reference background criteria.

Table 10.14-5. Summary of Site-related Contaminants, SWMU 27T

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Volatile Organic Compounds					
2-Butanone	ND	ND	0.0227	ND	NC
2-Hexanone	ND	ND	0.0023	ND	NC
4-Methyl-2-pentanone	ND	ND	0.0052	ND	NC
Acetone	ND	ND	0.099	50.2	NC
Semivolatile Organic Compounds					
Benzo(*a*)anthracene	ND	ND	1.07	ND	NC
Benzo(*a*)pyrene	ND	ND	1.95	ND	NC
Benzo(*b*)fluoranthene	1.14	ND	3.51	ND	NC
Benzo(*g,h,i*)perylene	ND	ND	1.81	ND	NC
Benzo(*k*)fluoranthene	ND	ND	2.4	ND	NC
Chrysene	0.215	ND	2.54	ND	NC
Fluoranthene	ND	ND	2.92	ND	NC
Indeno(*1,2,3-cd*)pyrene	ND	ND	1.65	ND	NC
Phenanthrene	0.79	ND	ND	ND	NC
Pyrene	1.33	ND	3.25	26.2	NC
Metals					
Cadmium	NA	NA	19.3	NA	NC

NA = Not analyzed.
NC = Not collected; no surface water present in February 1998.
ND = Not detected.

Table 10.14-6. GSSL Screening of Site-related Contaminants in Soil, SWMU 27T

Site-related Contaminant	Maximum Concentration	GSSL[a]	CMCOPC?
SOIL			
Semivolatile Organic Compounds (mg/kg)			
Benzo(*b*)fluoranthene	1.14	5	No
Chrysene	0.215	160	No
Phenanthrene[b,c]	0.79	80.4	No
Pyrene	1.33	4,200	No
SEDIMENT			
Volatile Organic Compounds (mg/kg)			
2-Butanone	0.0227	7.685	No
2-Hexanone	0.0023	6.9	No
4-Methyl-2-pentanone	0.0052	NA	NA
Acetone	0.099	16	No
Semivolatile Organic Compounds (mg/kg)			
Benzo(*a*)anthracene	1.07	2	No
Benzo(*a*)pyrene	1.95	8	No
Benzo(*b*)fluoranthene	3.51	5	No
Benzo(*g,h,i*)perylene[b]	1.81	394	No
Benzo(*k*)fluoranthene	2.4	49	No
Chrysene	2.54	160	No
Fluoranthene	2.92	4,300	No
Indeno(*1,2,3-cd*)pyrene	1.65	14	No
Pyrene	3.25	4,200	No
Metals (mg/kg)			
Cadmium	19.3	8	Yes

[a]GSSL = EPA GSSL with a DAF of 20 for volatile and semivolatile organics is used; unless otherwise indicated, GSSL is taken from Soil Screening Guidance: Technical Background Document (EPA 1996a).

[b]EPA–suggested GSSL is not available; GSSL is calculated following Soil Screening Guidance: Technical Background Document (EPA 1996a). GSSLs are back-calculated from MCL, if available; otherwise, GSSLs are back-calculated based on EPA Region III RBCs corresponding to 10^{-6} risk or HQ = 1 (SAIC 1999a).

[c]RBC of surrogate pyrene is used to develop GSSL for phenanthrene.

NA = Not available.

Table 10.14-7. Human Health Risk Screening for Surface Soil, Groundwater, and Sediment, SWMU 27T

SURFACE SOIL						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Semivolatile Organic Compounds (mg/kg)						
Benzo(*b*)fluoranthene	1/3	1.14	1.14	0.88	Yes	Max Detect > Risk Criteria
Chrysene	1/3	0.215	0.215	88	No	Max Detect < Risk Criteria
Phenanthrene	1/3	0.79	0.79	235	No	Max Detect < Risk Criteria
Pyrene	2/3	0.22	1.33	230	No	Max Detect < Risk Criteria

GROUNDWATER						
Analyte	**Freq. of Detection**	**Minimum Result**	**Maximum Result**	**Human Health Criteria**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (µg/L)						
Acetone	1/3	50.2	50.2	61	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (µg/L)						
Pyrene	1/3	26.2	26.2	110	No	Max Detect < Risk Criteria

SEDIMENT						
Analyte	**Results > Detection Limit**	**Minimum Detect**	**Maximum Detect**	**EPA Region III Residential**	**HHCOPC?**	**Justification**
Volatile Organic Compounds (mg/kg)						
2-Butanone	1/2	0.0227	0.0227	4,700	No	Max Detect < Risk Criteria
2-Hexanone	1/2	0.0023	0.0023	4,700	No	Max Detect < Risk Criteria
4-Methyl-2-pentanone	1/2	0.0052	0.0052	630	No	Max Detect < Risk Criteria
Acetone	1/2	0.099	0.099	780	No	Max Detect < Risk Criteria
Semivolatile Organic Compounds (mg/kg)						
Benzo(*a*)anthracene	1/1	1.07	1.07	0.88	Yes	Max Detect > Risk Criteria
Benzo(*a*)pyrene	1/1	1.95	1.95	0.09	Yes	Max Detect > Risk Criteria
Benzo(*b*)fluoranthene	1/1	3.51	3.51	0.88	Yes	Max Detect > Risk Criteria
Benzo(*g,h,i*)perylene[a]	1/1	1.81	1.81	8.8	No	Max Detect < Risk Criteria
Benzo(*k*)fluoranthene	1/1	2.4	2.4	8.8	No	Max Detect < Risk Criteria
Chrysene	1/1	2.54	2.54	88	No	Max Detect < Risk Criteria
Fluoranthene	1/1	2.92	2.92	310	No	Max Detect < Risk Criteria
Indeno(*1,2,3-cd*)pyrene	1/1	1.65	1.65	0.88	Yes	Max Detect > Risk Criteria
Pyrene	1/1	3.25	3.25	230	No	Max Detect < Risk Criteria
Metals (mg/kg)						
Cadmium	1/1	19.3	19.3	3.9	Yes	Max Detect > Risk Criteria

[a]A TEF of 0.01 was used for this PAH (see Section 7.3, Selection of Screening Values).

Table 10.14-8. Ecological Screening Value Comparison for Analytes Detected in Groundwater, SWMU 27T

Analyte	SWMU 27T Maximum	ESV	ECOPC Aquatic Biota?	Justification
Volatile Organic Compounds (µg/L)				
Acetone	50.2	1,500[a]	No	Max Detect < ESV
Semivolatile Organic Compounds (µg/L)				
Pyrene	26.2	No ESV	Yes	ECOPC by Default

[a]Chronic National Ambient Water Quality Criteria or Tier II values as reported in Suter and Tsao (1996), Table 1 or Table 3.

ESV = EPA Region IV ESVs (EPA 1996d) and, where indicated, alternative values for analytes without ESVs. Cells with double borders indicate concentrations exceeding ESV or, when there is no ESV, compounds that become ECOPCs by default.

Table 10.14-9. Preliminary Risk Calculations for ECOPCs in Surface Soil, SWMU 27T

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) $= C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) $= C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Semivolatile Organic Compounds								
Benzo(*b*)fluoranthene	1.14	5.00E-02	3.02E-02	1.58E+01	1.91E-03	8.66E-02	1.24E+01	6.99E-03
Chrysene	0.215	5.00E-02	5.70E-03	1.58E+01	3.60E-04	1.63E-02	1.24E+01	1.32E-03
Phenanthrene	0.79	5.00E-02	2.09E-02	1.19E+00	1.76E-02	6.00E-02	9.97E+00	6.02E-03
Pyrene	1.33	5.00E-02	3.52E-02	1.19E+00	2.96E-02	1.01E-01	9.97E+00	1.01E-02
				HI =	4.95E-02		HI =	2.45E-02

ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.

Table 10.14-10. Preliminary Risk Calculations for ECOPCs in Drainage Ditch Sediment, SWMU 27T

ECOPC	C_{Max} (mg/kg)	BAF_i	Short-tailed Shrew			American Robin		
			ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_S$	TRV (mg/kg/d)	HQ = ADD/TRV	ADD (mg/kg/d) = $C_{Max} \times BAF_i \times IR_R$	TRV (mg/kg/d)	HQ = ADD/TRV
Volatile Organic Compounds								
2-Butanone	0.0227	5.00E-02	6.02E-04	3.89E+03	1.55E-07	1.73E-03	No TRV	No HQ
2-Hexanone	0.0023	1.00E+00	1.22E-03	No TRV	No HQ	3.50E-03	No TRV	No HQ
4-Methyl-2-pentanone	0.0052	5.00E-02	1.38E-04	5.49E+01	2.51E-06	3.95E-04	No TRV	No HQ
Acetone	0.099	5.00E-02	2.62E-03	2.20E+01	1.19E-04	7.52E-03	No TRV	No HQ
				HI =	1.16E-03		**HI =**	0.00E+00
Semivolatile Organic Compounds								
Benzo(*a*)anthracene	1.07	5.00E-02	2.84E-02	1.58E+01	1.79E-03	8.13E-02	1.24E+01	6.56E-03
Benzo(*a*)pyrene	1.95	5.00E-02	5.17E-02	1.19E+00	4.35E-02	1.48E-01	9.97E+00	1.49E-02
Benzo(*b*)fluoranthene	3.51	5.00E-02	9.30E-02	1.58E+01	5.88E-03	2.67E-01	1.24E+01	2.15E-02
Benzo(*g,h,i*)perylene	1.81	5.00E-02	4.80E-02	1.58E+01	3.03E-03	1.38E-01	1.24E+01	1.11E-02
Benzo(*k*)fluoranthene	2.4	5.00E-02	6.36E-02	1.19E+00	5.35E-02	1.82E-01	9.97E+00	1.83E-02
Chrysene	2.54	5.00E-02	6.73E-02	1.58E+01	4.26E-03	1.93E-01	1.24E+01	1.56E-02
Fluoranthene	2.92	5.00E-02	7.74E-02	5.95E+01	1.30E-03	2.22E-01	1.95E+02	1.14E-03
Indeno(*1,2,3-cd*)pyrene	1.65	5.00E-02	4.37E-02	1.58E+01	2.76E-03	1.25E-01	1.24E+01	1.01E-02
Pyrene	3.25	5.00E-02	8.61E-02	1.19E+00	7.24E-02	2.47E-01	9.97E+00	2.48E-02
				HI =	1.90E-01		**HI =**	1.24E-01
Metals								
Cadmium	19.3	1.10E+01	1.13E+02	2.12E+00	5.31E+01	3.23E+02	1.45E+00	2.23E+02

ADD = Average daily dose (mg/kg/d).
BAF_i = Soil-to-invertebrate bioaccumulation factor (HAZWRAP 1994).
C_{Max} = Maximum detected surface soil concentration (mg/kg).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_R = Robin food ingestion rate (kg/kgBW/d) = 1.52.
IR_S = Shrew food ingestion rate (kg/kgBW/d) = 0.53.
TRV = NOAEL (mg/kg/d); see Tables 8-5 and 8-6.
Cells with double borders indicate HQs > 1.

Table 10.14-11. Preliminary Risk Calculations for ECOPCs in Groundwater, SWMU 27T

ECOPC	C_{Max} (µg/L)	Raccoon		
		ADD (mg/kg/d) = C_{Max} × 0.001 × IR_W	TRV (mg/kg/d)	HQ =ADD/ TRV
Semivolatile Organic Compounds				
Pyrene	26.2	2.10E-03	2.66E-01	7.88E-03

0.001 (mg/µg) = conversion from µg to mg.
ADD = Average daily dose (mg/kg/d).
C_{Max} = Maximum detected concentration (µg/L).
HQ = Hazard quotient; HI = hazard index = sum of HQs.
IR_W = Raccoon water ingestion rate (L/kg/d) = 0.080.
TRV = NOAEL (mg/kg/d).

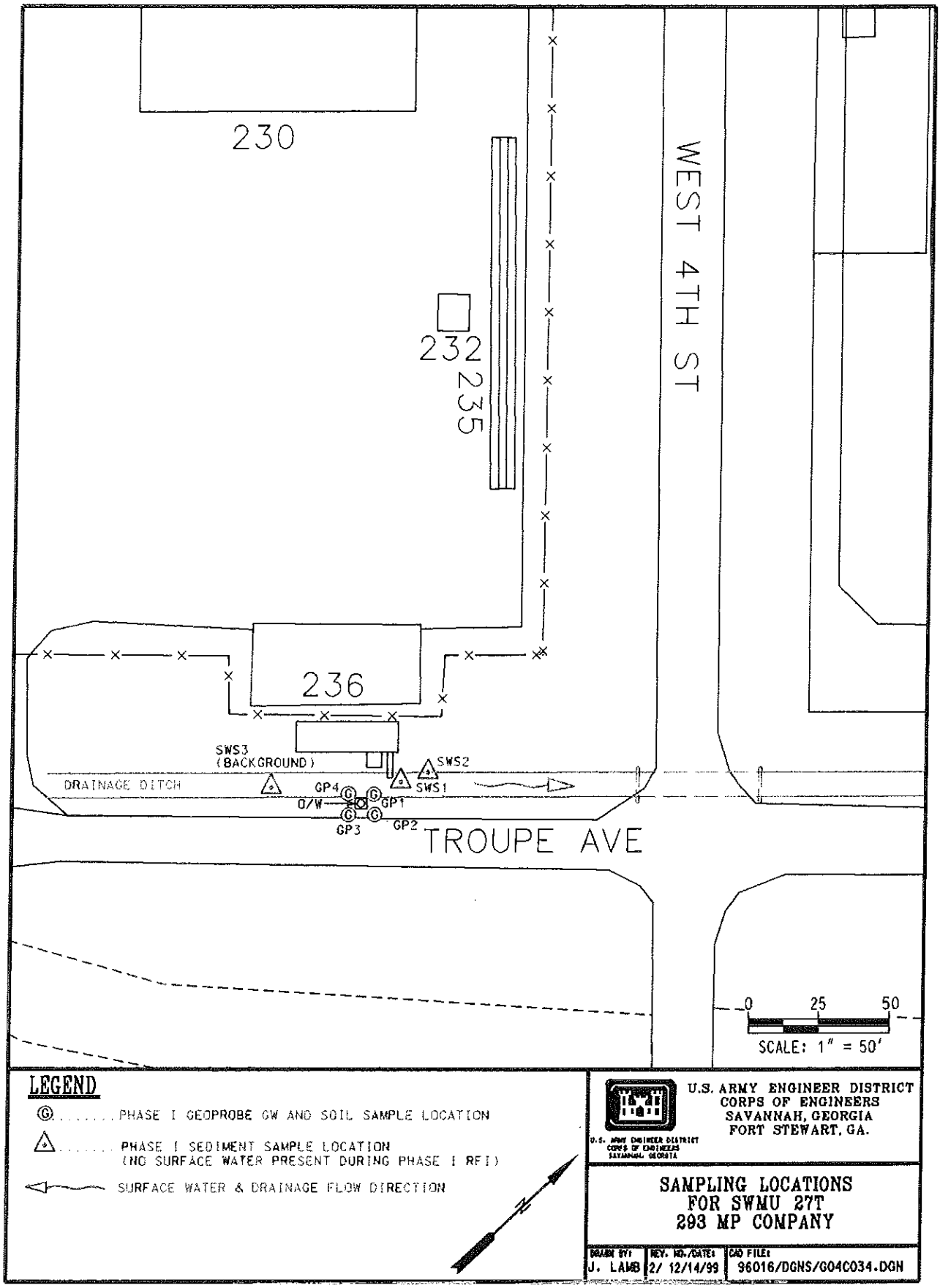


Figure 10.14-1. Sampling Locations, SWMU 27T

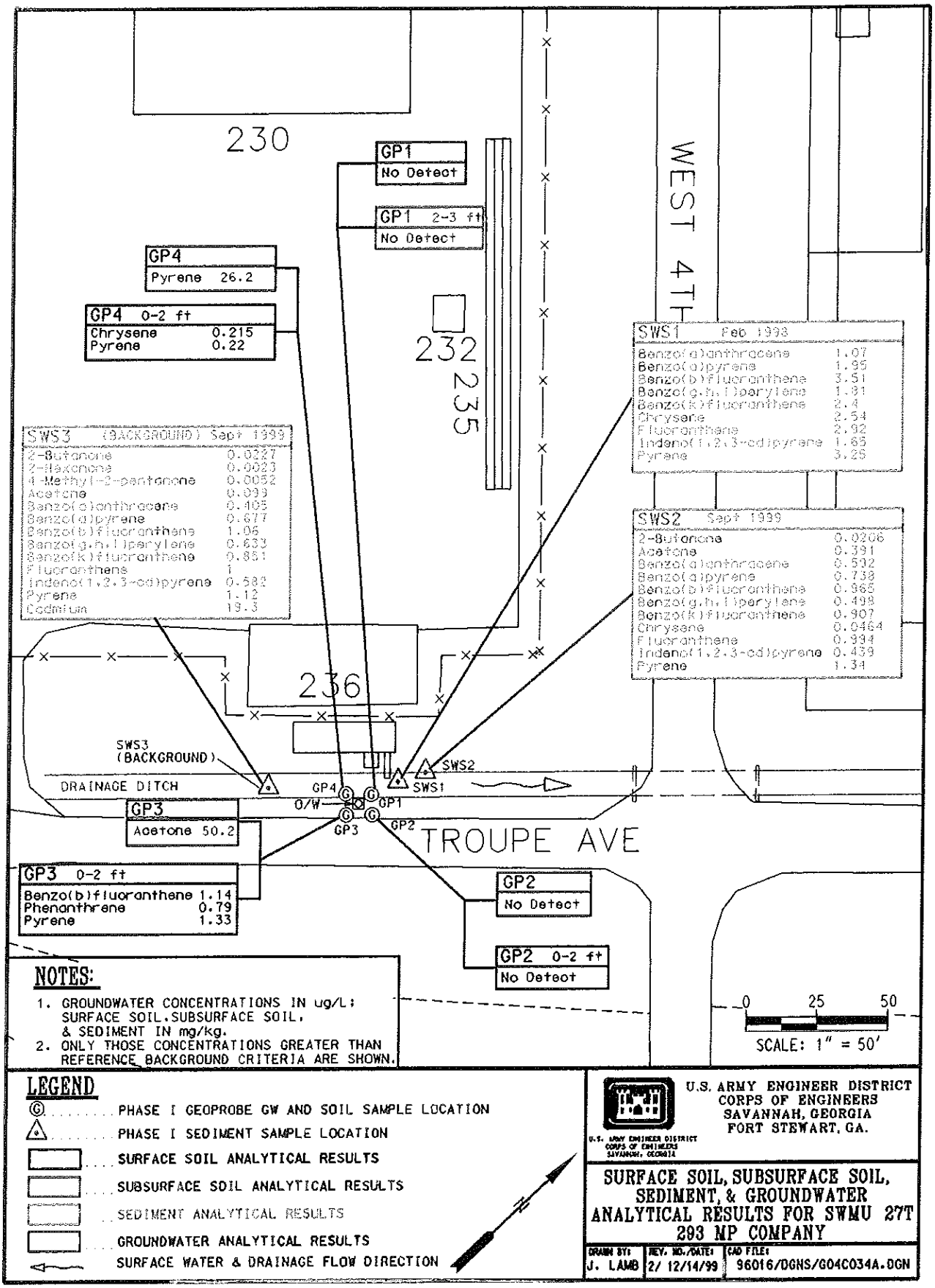


Figure 10.14-2. Summary of Analytical Results in Surface Soil, Subsurface Soil, Groundwater, and Sediment, SWMU 27T

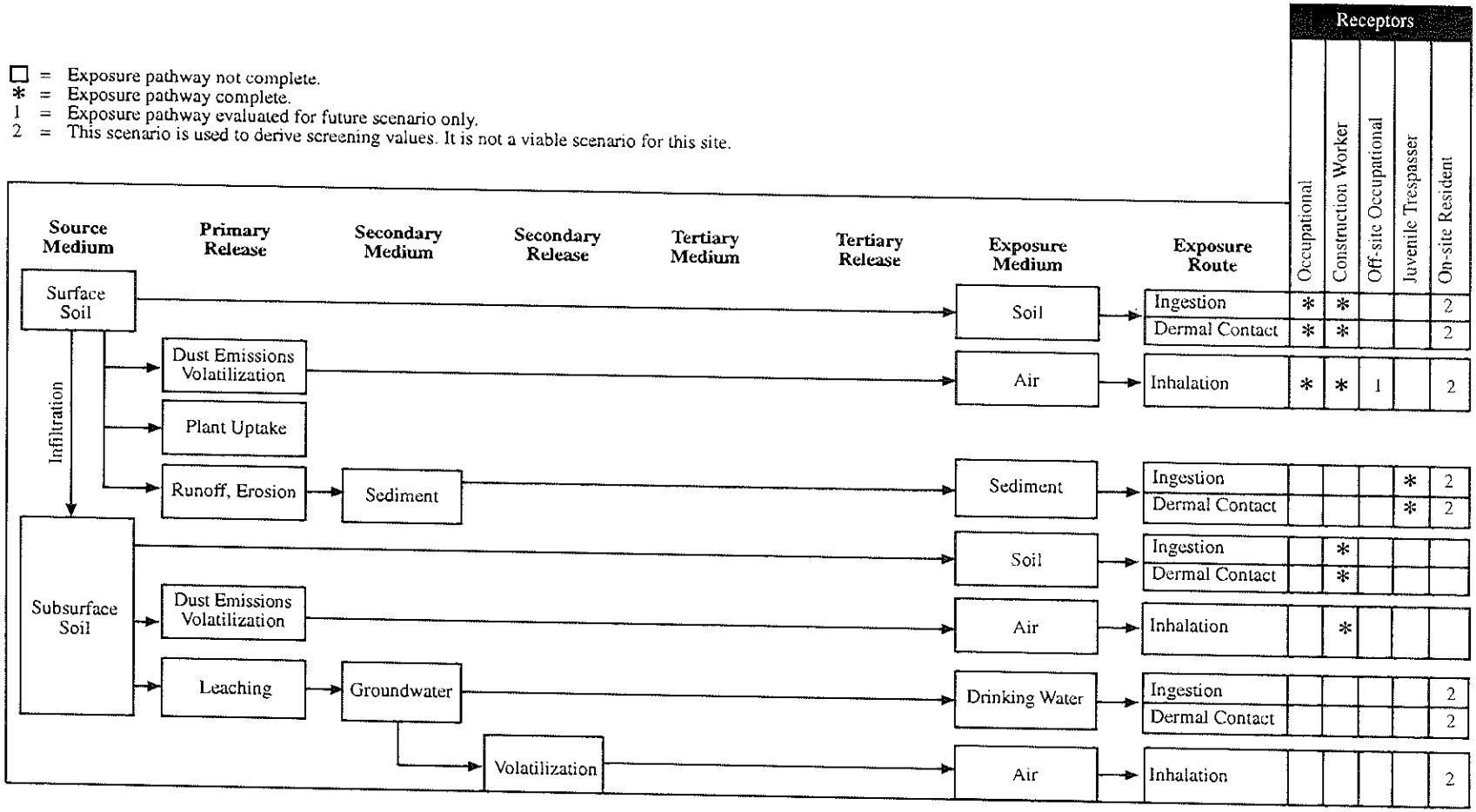


Figure 10.14-3. Potential Migration and Exposure Pathways, SWMU 27T

ATTACHMENT 10.14A
SWMU 27T: 293 MP COMPANY

HUMAN HEALTH BASELINE RISK ASSESSMENT

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ATTACHMENT 10.14A
SWMU 27T: 293 MP COMPANY
HUMAN HEALTH BASELINE RISK ASSESSMENT

The human health baseline risk assessment consists of five elements: (1) identification of COPCs, (2) exposure assessment, (3) toxicity assessment, (4) risk characterization, and (5) assessment of uncertainty.

10.14A.1 IDENTIFICATION OF COPCS

The CMCOPCs and HHCOPCs have been discussed in the sections on contaminant fate and transport (Section 10.14.5) and the HHPRE (Section 10.14.6), respectively. Cadmium was identified as a CMCOPC in sediment. No CMCOPCs were identified for soils.

HHCOPCs were identified in surface soil and sediment. Benzo(*b*)fluoranthene was identified as a HHCOPC in surface soil. The HHCOPCs identified in sediment include cadmium and the following PAHs: benzo(*a*)pyrene, benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-cd*)pyrene.

10.14A.2 EXPOSURE ASSESSMENT

The exposure assessment quantifies the amount of a COPC an individual may come in contact with at each site. The exposure assessment considers all pathways of potential human exposure, the magnitude of exposure, and the frequency and duration of exposure. The process for estimating exposure consists of the following elements: (1) characterization of the exposure setting in terms of the physical and demographic characteristics of the site, (2) identification of receptor populations, (3) identification of the exposure pathways by which an individual may come in contact with a COPC, (4) estimation of the exposure point concentration, and (5) quantification of the intake or dose to which an individual may be exposed.

10.14A.2.1 Exposure Setting

The exposure setting describes the physical features at the site that are important when identifying the human populations that may be exposed to COPCs, either currently or in the future.

SWMU 27T is one of eight OWSs located in the NGTC along Troupe Avenue. This OWS site encompasses an area of approximately 0.01 acre, covered primarily by concrete and gravel. Maintained grass covers the remainder of the site. An open drainage ditch, which runs parallel to Troupe Avenue, is located adjacent to the site. The OWS is located between Troupe Avenue and the drainage ditch. The site is not secured and can be accessed from Troupe Avenue.

10.14A.2.2 Identification of Potential Receptor Populations and Exposure Pathways

A complete exposure pathway consists of four elements: (1) a source of contamination, (2) a transport or retention medium, (3) a point of contact with the chemical, and (4) a route of exposure (i.e., ingestion, dermal absorption, or inhalation) at the point of contact through which the chemical may be taken into the body. When all of these elements are present, the pathway is considered to be complete.

HHCOPCs are present in surface soil and sediment. An Installation worker may be exposed to HHCOPCs in surfaee soil when that person is working at the site. It is unlikely that the Installation worker would spend any significant amount of time in the drainage ditch. This receptor may be exposed to benzo(*b*)fluoranthene in surface soil via incidental ingestion and dermal contact. The current site cover is likely to limit the generation of fugitive dust. Therefore, there are no current off-site migration pathways, and current off-site receptors are not likely to be exposed to HHCOPCs.

Given that the site is open and can be accessed from Troupe Avenue, a juvenile trespasser may access the site. This juvenile receptor may be exposed while playing at the site and in the adjacent ditch. The juvenile trespasser may be exposed to HHCOPCs in surface soil and sediment via incidental ingestion.

No HHCOPCs were identified in groundwater. Potential exposure to CMCOPCs in groundwater would not occur until some point in the future, after the constituent leached to groundwater.

The site is located within an industrial area on a narrow area between a drainage ditch and an unpaved road (sand, gravel, and dirt). The only change that may occur in the foreseeable future is that the groundcover currently present at the site may be removed, and as a result, receptors may be exposed via fugitive dust from surface soil. Therefore, the on-site receptors are likely to remain an Installation worker and a juvenile trespasser. The off-site receptor populations include an Installation worker and off-site resident that may be exposed via inhalation of fugitive dust.

To be conservative, it is assumed that a groundwater drinking well had been placed at the site. The future on-site Installation worker may be exposed to the CMCOPC cadmium as a result of ingestion of groundwater.

The future on-site resident is presented for baseline purposes and is not considered to be a viable receptor population. Potential exposure pathways for the on-site resident include ingestion and dermal contact of surface soil and inhalation of fugitive dust from surface soil. If a residence is built on the site, it is assumed that the drainage ditch would probably be filled and would not exist. In addition, it is assumed that the residence would have a groundwater drinking well and that receptors might be exposed to cadmium via ingestion and dermal contact.

10.14A.2.3 Estimation of Exposure Concentrations

The estimation of exposure concentrations for on-site receptors to COPCs in surface soil and sediment is discussed in Appendix I, Section I.2.3. Exposure concentrations were calculated using either analytical results or environmental fate and transport models. The analytical results from the surface soil and sediment samples were used to calculate the exposure concentrations for HHCOPCs in surface soil and sediment, respectively. The exposure point concentrations were equal to the 95 percent upper confidence limit of the mean, unless this value was greater than the maximum detected concentration. In that case, the exposure concentration defaulted to the maximum concentration. The exposure concentrations are given in Table 10.14A-1.

Exposure concentrations of fugitive dust in air were calculated using the formulas described in Appendix I, Section I.2.3. These values were based on the exposure concentrations for surface soil. For the purposes of estimating exposure of an off-site receptor to fugitive dust, it was assumed that no dilution of the air concentrations occurred and that the exposure concentrations for both on-site and off-site receptors were the same.

Insufficient groundwater data were available to model the leaching of cadmium into groundwater. However, the maximum concentration that was screened represents a single detection of cadmium, and

given the areal extent of the area defined by the drainage ditch within SWMU 27T, it is unlikely that cadmium will leach into groundwater in concentrations that will have an adverse effect upon human health.

10.14A.2.4 Quantification of Exposure

The equations used to estimate exposures to receptor populations are discussed in Appendix I, Section I.2.4. The default exposure factors for the current on-site trespasser assume that the child divides his or her time between the drainage ditch and the area of the OWS. The exposure parameter values used to estimate potential exposure are given in Table 10.14A-2.

Exposure concentrations in groundwater could not be estimated using the current information; therefore, quantification of exposure to constituents in groundwater was not addressed.

Exposure of off-site receptors for SWMU 27T would be limited to inhalation of fugitive dust resulting from wind erosion of the surface soils. Benzo(*b*)fluoranthene is the only surface soil COPC, and this constituent does not have either an inhalation reference dose or an inhalation cancer slope factor; therefore, the potential risks to off-site receptors cannot be quantified. Given that the risk to these receptors cannot be evaluated, the estimated intakes for these receptors are not reported.

A potential intake was estimated for each receptor population for all applicable pathways. The estimated intakes for the current on-site receptors, the Installation worker and the juvenile trespasser, are given in Tables 10.14A-3 and 10.14A-4, respectively. There are no current off-site receptor populations.

Future on-site receptor populations include an Installation worker, a juvenile trespasser, and a resident. Exposure pathways for the future on-site Installation worker and the juvenile trespasser include all of the exposure pathways for the current on-site receptors, with the addition of exposure to the surface soil COPC, benzo(*b*)fluoranthene, via inhalation of fugitive dust. Inhalation toxicity values have not been derived for benzo(*b*)fluoranthene (EPA 1999a; EPA 1997c). Therefore, the calculated risk values for the future on-site Installation worker and the future on-site juvenile trespasser will be equal to the risk values for the respective current on-site receptors. For the purposes of this risk assessment, the potential risks to these receptors will not be quantified, and the discussion will be limited to the current on-site Installation worker and current on-site juvenile trespasser.

The resident population is divided into a child and an adult resident, given the differences in behavior, exposure duration, and physiology between an adult and a child. Because of the increased amount of hand-to-mouth behavior in children, the incidental soil ingestion for a child is twice that of an adult. Given the higher ingestion rate and the lower body weight for a child, the resident child is at greater risk from incidental ingestion of surface soil than the resident adult. For the purposes of this risk assessment, the estimated intakes and potential risks will be calculated for the resident child. The estimated intakes for the child resident and the adult resident are given in Table 10.14A-5

Future off-site receptors include an Installation worker and a resident adult. These receptors may be exposed to benzo(*b*)fluoranthene in surface soil via inhalation of fugitive dust. However, benzo(*b*)fluoranthene does not have an inhalation cancer slope factor, so the potential risks to these receptors cannot be evaluated due to the lack of appropriate toxicological data. Therefore, the potential intakes for these receptors will not be quantified.

10.14A.3 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to determine the increased likelihood and magnitude of adverse human health effects based on the extent of exposure to contamination. The toxicity assessment for SWMU 27T was carried out as described in Appendix I, Section I.3. The toxicity values used in the risk assessment are given in Table 10.14A-6.

Separate oral reference doses are given for cadmium depending on whether the receptor receives the dose via food or water. These different reference doses reflect differences in the rate of gastrointestinal absorption between cadmium administered in food or administered in water. Given that cadmium was identified as an HHCOPC in sediment, the reference dose for food was used because the absorption of cadmium from soil is likely to be closer to the absorption from food than to the absorption from water.

Carcinogenic slope factors have not been directly derived for the carcinogenic PAHs benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-cd*)pyrene. Instead, a TEF is used to estimate the carcinogenic slope factors. The TEF indicates the carcinogenic potency of the PAH relative to benzo(*a*)pyrene, which has a carcinogenic slope factor. Therefore, if the carcinogenic potency of a PAH is an order of magnitude less than that for benzo(*a*)pyrene, the TEF is 0.1. Benzo(*b*)fluoranthene, benzo(*a*)anthracene, and indeno(*1,2,3-cd*)pyrene have a TEF value of 0.1.

10.14A.4 RISK CHARACTERIZATION RESULTS

The risk characterization followed the procedures outlined in Appendix I, Section I.4. Quantitative estimates of noncarcinogenic risks were calculated for each potentially complete exposure pathway.

10.14A.4.1 Current Land-use Scenarios

The current on-site receptor populations are an Installation worker and a juvenile trespasser. There are no current off-site receptor populations. The potential risk to each of the on-site receptor populations is discussed below.

On-site Installation Worker. This receptor is exposed to only benzo(*b*)fluoranthene in surface soil. A reference dose has not been calculated for this constituent, but this constituent does have a cancer slope factor. The total ILCR for this receptor is 3.00×10^{-7}, which is below the target risk value of 1×10^{-6} (Table 10.14A-7); therefore, the carcinogenic risk for this receptor is within acceptable limits.

On-site Juvenile Trespasser. The calculated risk values for the current on-site juvenile trespasser are given in Table 10.14A-8.

The HI for this receptor is 7.94×10^{-4}, which is more than three orders of magnitude below the target value of 1.0; therefore, adverse systemic health risks are not expected for this receptor population.

The total ILCR is 1.21×10^{-7}, which is below the target value of 1×10^{-6}; therefore, the carcinogenic risk for this receptor is within acceptable limits.

10.14A.4.2 Future Land-use Scenarios

Future potential on-site receptors are an Installation worker, a juvenile trespasser, and a resident child. The potential risk to the on-site resident was evaluated for only a child, given that the child is at greater potential risk from exposure to COPCs in surface soil because of this receptor's higher ingestion rate and

lower body weight relative to those of an adult. The potential risks to each of these receptor populations are discussed below.

The off-site receptors include an Installation worker, a juvenile trespasser, and a resident adult. These receptors may potentially be exposed to benzo(*b*)fluoranthene via inhalation of fugitive dust resulting from the wind erosion of surface soils. However, inhalation toxicity values for this constituent have not been derived. Therefore, the potential risks to these receptors cannot be assessed.

On-site Installation Worker and Juvenile Trespasser. The exposure pathways for these receptors include all of the exposure pathways discussed for the current on-site receptor, with the addition of potential exposure of fugitive dust via inhalation. Inhalation toxicity values (i.e., inhalation reference concentrations or an inhalation cancer slope factor) have not been derived for the surface soil COPC, benzo(*b*)fluoranthene. Therefore, the risk values for the future on-site receptors are the same as those given for the respective current on-site receptors. The risk values for the current on-site Installation worker and the current on-site juvenile trespasser are below the target risk values. The reader is referred to the section on current land-use scenarios (Section 10.14A.4.1) for a discussion of the potential risk to these receptors.

On-site Resident Child. The calculated risk values for the on-site resident child are given in Table 10.14A-9. The total ILCR for this receptor is 9.17×10^{-7}, which is below the target risk value of 1×10^{-6}; therefore, the cancer risks for this receptor are within acceptable limits.

10.14A.5 UNCERTAINTY ASSESSMENT

A discussion of the general uncertainties associated with the analysis of risks at sites within the 16 SWMUs is provided in Appendix I, Section I.5.

The toxicity values for many of the PAHs were not derived directly from laboratory studies, but were estimated based on the relative toxicity of the PAH to benzo(*a*)pyrene. In addition, none of the PAHs had reference doses; therefore, the potential systemic toxicity of these constituents could not be assessed.

Benzo(*b*)fluoranthene does not have inhalation toxicity values; therefore, the potential risks for on-site receptors are likely to be underestimated. In addition, the risk to off-site receptors could not be assessed.

The potential exposure concentration of cadmium (CMCOPC) in groundwater resulting from leaching from sediment could not be estimated (modeled) given our current knowledge (Phase I RFI) of the site; therefore, the risks associated with the potential for cadmium in groundwater could not be addressed.

10.14A.6 RISK SUMMARY

The risk estimates for all of the potential receptor populations were below the target risk values. The total HI for the both the current and future on-site juvenile trespasser was more than three orders of magnitude below the target risk value, 7.94×10^{-4} as compared to a target value of 1.0. The total ILCRs for the on-site Installation worker (ILCR = 3.00×10^{-7}), on-site juvenile trespasser (ILCR = 1.21×10^{-7}), and on-site resident child (ILCR = 9.17×10^{-7}) were below the target risk value of 1×10^{-6}; therefore, the risks associated with exposure of the identified receptor populations to COPCs in surface soil and sediment are within the acceptable range.

The potential risks associated with cadmium in sediment leaching to groundwater could not be assessed for this site. The significance of cadmium contamination at the site could not be assessed, and leaching to groundwater could not be assessed because of the lack of data on the groundwater aquifer at this site.

Table 10.14A-1. Selected Exposure and Modeled Concentrations, SWMU 27T

Medium	Constituent	Maximum Detected Concentration (mg/kg)	95 Percent Upper Confidence Limit
Surface soil	Benzo(*b*)fluoranthene	**1.14**	1.49
Sediment	Benzo(*a*)anthracene	**1.07**	2.84
	Benzo(*a*)pyrene	**1.95**	5.33
	Benzo(*b*)fluoranthene	**3.51**	10
	Indeno(*1,2,3-cd*)pyrene	**1.65**	4.49
	Cadmium	**19.3**	NA

NA = Not available; could not be calculated.
Bold indicates exposure concentration selected.

Table 10.14A-2. Exposure Parameters for Potential Receptor Populations, SWMU 27T

Parameter	Units	Current On-site Installation Worker	Current On-site Trespasser	Future On-site Installation Worker	Future On-site Trespasser	Future On-site Resident Adult	Future On-site Resident Child	Future Off-site Installation Worker	Future Off-site Resident Adult	Future Off-site Resident Child
SURFACE SOIL										
Incidental Ingestion										
Soil ingestion rate	g/day	0.1	0.1	0.1	0.1	0.1	0.2	NA	NA	NA
Fraction ingested from area	unitless	1	0.25	1	0.25	1	1	NA	NA	NA
Exposure frequency	days/year	250	52	250	52	350	350	NA	NA	NA
Exposure duration	years	25	10	25	10	30	6	NA	NA	NA
Body weight	kg	70	45	70	45	70	15	NA	NA	NA
Carcinogen averaging time	days	25,550	25,550	25,550	25,550	25,550	NA	NA	NA	NA
Noncarcinogen averaging time	days	9,125	3,650	9,125	3,650	NA	2,190	NA	NA	NA
Dermal Contact										
Skin area	cm^2/event	5,000	3,700	5,000	3,700	5,000	1,700	NA	NA	NA
Adherence factor	mg/cm^2	0.2	0.2	0.2	0.2	0.2	0.2	NA	NA	NA
Exposure frequency	events/year	250	52	250	52	350	350	NA	NA	NA
Exposure duration	years	25	10	25	10	30	6	NA	NA	NA
Body weight	kg	70	45	70	45	70	15	NA	NA	NA
Carcinogen averaging time	days	25,550	25,550	25,550	25,550	25,550	NA	NA	NA	NA
Noncarcinogen averaging time	days	9,125	3,650	9,125	3,650	NA	2,190	NA	NA	NA
Inhalation of Dust										
Inhalation rate	m^3/hour	NA	NA	2.5	1.9	0.80	0.68	2.5	0.80	0.68
Exposure time	hours/day	NA	NA	8	6	18.4	18.4	8	18.4	18.4
Exposure frequency	days/year	NA	NA	250	52	350	350	250	350	350
Exposure duration	years	NA	NA	25	10	30	6	25	30	6
Body weight	kg	NA	NA	70	45	70	15	70	70	15
Carcinogen averaging time	days	NA	NA	25,550	25,550	25,550	NA	25,550	25,550	NA
Noncarcinogen averaging time	days	NA	NA	9,125	3,650	NA	2,190	9,125	NA	2,190
SEDIMENT										
Incidental Ingestion										
Sediment ingestion rate	kg/day	NA	0.1	NA	0.1	NA	NA	NA	NA	NA
Fraction ingested from area	unitless	NA	0.13	NA	0.13	NA	NA	NA	NA	NA
Exposure frequency	days/year	NA	52	NA	52	NA	NA	NA	NA	NA
Exposure duration	years	NA	10	NA	10	NA	NA	NA	NA	NA
Body weight	kg	NA	45	NA	45	NA	NA	NA	NA	NA
Carcinogen averaging time	days	NA	25,550	NA	25,550	NA	NA	NA	NA	NA
Noncarcinogen averaging time	days	NA	3,650	NA	3,650	NA	NA	NA	NA	NA

NA = Not applicable; this receptor is not exposed via this pathway.

Table 10.14A-3. Estimated Intakes for Current On-site Installation Worker, SWMU 27T

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)	Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)
Surface soil	Benzo(*b*)fluoranthene	1.14	mg/kg	1.12E-06	3.98E-07	1.12E-07	3.98E-08

[a]The equations used to calculate oral and dermal exposures for surface soil are presented in Appendix I, Section I.2.4.2.

Table 10.14A-4. Estimated Intakes for Current On-site Juvenile Trespasser, SWMU 27T

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)	Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)
Surface soil	Benzo(*b*)fluoranthene	1.14	mg/kg	9.02E-08	1.29E-08	2.67E-08	3.82E-09
Sediment	Benzo(*a*)anthracene	1.07	mg/kg	4.40E-08	6.29E-09	NA	NA
	Benzo(*a*)pyrene	1.95	mg/kg	8.03E-08	1.15E-08	NA	NA
	Benzo(*b*)fluoranthene	3.51	mg/kg	1.44E-07	2.06E-08	NA	NA
	Indeno(*1,2,3-cd*)pyrene	1.65	mg/kg	6.79E-08	9.70E-09	NA	NA
	Cadmium	19.3	mg/kg	7.94E-07	1.13E-07	NA	NA

[a]The equations used to calculate oral and dermal exposures for soil and sediment are presented in Appendix I, Sections I.2.4.2 and I.2.4.5, respectively.
NA = Not applicable; this exposure pathway is not applicable to sediment.

Table 10.14A-5. Estimated Intakes for Future On-site Resident Child, SWMU 27T

Environmental Medium	Chemical	Exposure Concentration	Units	Oral Exposure[a]		Dermal Exposure[a]		Inhalation Exposure[a]	
				Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)	Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)	Average Daily Dose for Noncarcinogens (mg/kg/d)	Average Daily Dose for Carcinogens (mg/kg/d)
Surface soil	Benzo(*b*)fluoranthene	1.14	mg/kg	ND	1.25E-06	ND	2.12E-08	ND	ND

[a]The equations used to calculate oral, dermal, and inhalation exposures for surface soil are presented in Appendix I, Section I.2.4.2.
ND = The toxicological values required to assess this pathway are not available.

Table 10.14A-6. Toxicity Values for Constituents of Potential Concern, SWMU 27T

Chemical	Oral Reference Dose (mg/kg/d)	Ref.[a]	Oral Cancer Slope Factor $(mg/kg/d)^{-1}$	Ref.[a]	Gastrointestinal Absorption Factor[b]	Dermal Reference Dose[c] (mg/kg/d)	Dermal Cancer Slope Factor[d] $(mg/kg/d)^{-1}$	Inhalation Reference Dose $(mg/kg/d)^{-1}$	Ref.[a]	Inhalation Cancer Slope Factor $(mg/kg/d)^{-1}$	Ref.[a]
Benzo(*a*)anthracene	ND		7.30E-01	E	0.31	ND	2.35E+00	ND		ND	
Benzo(*a*)pyrene	ND		7.30E+00	I	0.31	ND	2.35E+00	ND		3.10E+00	E
Benzo(*b*)fluoranthene	ND		7.30E-01	E	0.31	ND	2.35E+00	ND		ND	
Indeno(*1,2,3-cd*)pyrene	ND		7.30E-01	E	0.31	ND	2.35E+00	ND		ND	
Cadmium[e]	1.00E-03	I	ND		0.025	2.50E-05	ND	ND		6.30E+00	I

[a]References: I = IRIS (EPA 1999a); H = HEAST (EPA 1997a); E = EPA National Center for Environmental Assessment (EPA 1999b).
[b]ORNL 1999.
[c]Dermal reference dose calculated using the following formula: oral reference dose ÷ gastrointestinal absorption factor.
[d]Dermal cancer slope factor calculated using the following formula: oral reference dose × gastrointestinal absorption factor. Value for cadmium obtained from the literature (Appendix I, Section I.3.3.)
[e]Toxicity values given are for cadmium in food.
ND = No data available.

Table 10.14A-7. Hazard Indices and Carcinogenic Risks for Current On-site Installation Worker, SWMU 27T

Chemical	Surface Soil			Total Hazard Index
	Oral HQ	Dermal HQ	Total	
Benzo(*b*)fluoranthene	ND	ND	—	—
Pathway Total	**ND**	**ND**	—	—

Chemical	Surface Soil[a]			Total Cancer Risk[a]
	Oral ILCR	Dermal ILCR	Total	
Benzo(*b*)fluoranthene	2.91E-07	9.02E-09	3.00E-07	3.00E-07
Pathway Total	**2.91E-07**	**9.02E-09**	**3.00E-07**	**3.00E-07**

[a]The equations used to calculate carcinogenic risk are presented in Appendix I, Section 1.4.1.
ND = The toxicological values required to assess this pathway are not available.
— = No data.

Table 10.14A-8. Hazard Indices and Carcinogenic Risks for Current Ou-site Juvenile Trespasser, SWMU 27T

Chemical	Surface Soil[a]			Sediment[a]		Total Hazard Index[a]
	Oral HQ	Dermal HQ	Total	Oral HQ	Total	
Benzo(*a*)anthracene	NA	NA	NA	ND	—	—
Benzo(*a*)pyrene	NA	NA	NA	ND	—	—
Benzo(*b*)fluoranthene	ND	ND	—	ND	—	—
Indeno(*1,2,3-cd*)pyrene	NA	NA	NA	ND	—	—
Cadmium	NA	NA	NA	7.94E-04	7.94E-04	7.94E-04
Pathway Total	—	—	—	**7.94E-04**	**7.94E-04**	**7.94E-04**

Chemical	Surface Soil[b]			Sediment[b]		Total Cancer Risk[b]
	Oral ILCR	Dermal ILCR	Total	Oral ILCR	Total	
Benzo(*a*)anthracene	NA	NA	NA	4.59E-09	4.59E-09	4.59E-09
Benzo(*a*)pyrene	NA	NA	NA	8.37E-08	8.37E-08	8.37E-08
Benzo(*b*)fluoranthene	9.41E-09	8.63E-10	1.03E-08	1.51E-08	1.51E-08	2.53E-08
Indeno(*1,2,3-cd*)pyrene	NA	NA	NA	7.08E-09	7.08E-09	7.08E-09
Cadmium	NA	NA	NA	ND	ND	—
Pathway Total	**9.41E-09**	**8.63E-10**	**1.03E-08**	**1.10E-07**	**1.10E-07**	**1.21E-07**

[a]The equations used to calculate noncarcinogenic risk are presented in Appendix I, Section 1.4.2.
[b]The equations used to calculate carcinogenic risk are presented in Appendix I, Section 1.4.1.
NA = Not applicable; these constituents were not present in surface soil.
ND = The toxicological values required to assess this pathway are not available.
— = No data.

Table 10.14A-9. Hazard Indices and Carcinogenic Risks for Future On-site Resident Child, SWMU 27T

Chemical	Surface Soil				Total Hazard Index
	Oral HQ	Dermal HQ	Inhalation HQ	Total	
Benzo(*b*)fluoranthene	ND	ND	ND	—	—
Pathway Total	**ND**	**ND**	**ND**	—	—

Chemical	Surface Soil[a]				Total Cancer Risk[a]
	Oral ILCR	Dermal ILCR	Inhalation ILCR	Total	
Benzo(*b*)fluoranthene	9.12E-07	4.81E-09	ND	9.17E-07	9.17E-07
Pathway Total	**9.12E-07**	**4.81E-09**	**ND**	**9.17E-07**	**9.17E-07**

[a]The equations used to calculate carcinogenic risk are presented in Appendix I, Section I.4.1.
ND = The toxicological values required to assess this pathway are not available.
— = No data.

REVISED FINAL

FORSCOM

PHASE II RCRA FACILITY INVESTIGATION REPORT

3d Inf Div (Mech)

FOR

16 SOLID WASTE MANAGEMENT UNITS AT FORT STEWART, GEORGIA

VOLUME II OF III: APPENDICES A–G

Prepared for

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-95-D-0022
Delivery Order 0009

April 2000

99-183P(PPT)/021600

SAIC®

SWMU 27A

3D SQUADRON, 7TH CAVALRY MOTORPOOL AND FOUR ASSOCIATED OIL/WATER SEPARATORS (BUILDING 1339B)

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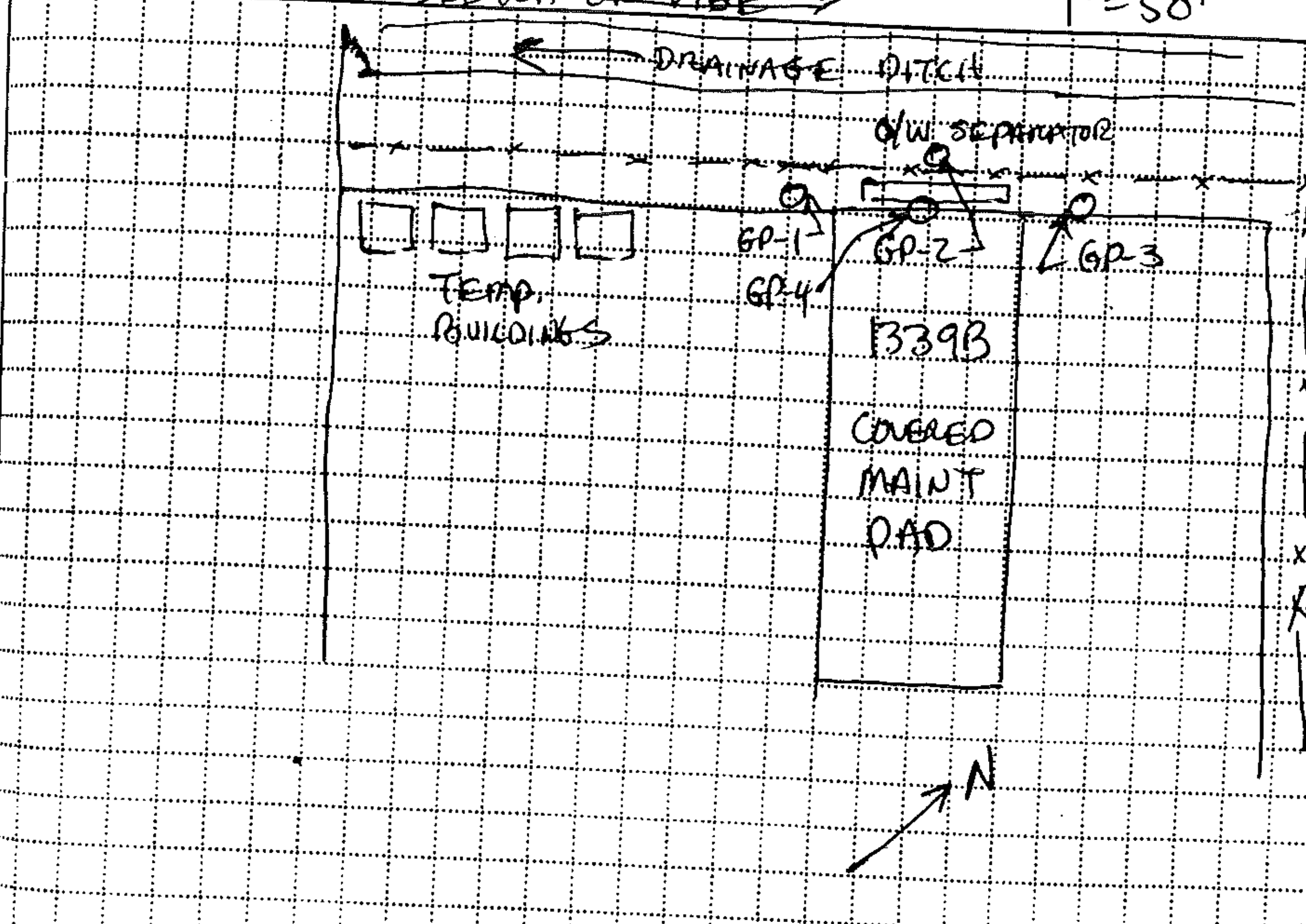
HTRW DRILLING LOG

Field	Entry
District	SAVANNAH
Hole Number	7A-GP-01
Company Name	SAIC
2. Drill Subcontractor	REINRIGHT / SAIC
Sheet	1 of 3 Sheets
3. Project	FT. STEWART 16 SWMUS
4. Location	~~SWMU~~ SWMU 27A
5. Name of Driller	J. HASELHOFF
6. Manufacturer's Designation of Drill	GEOPROBE SYSTEMS - 5M
7. Sizes and Types of Drilling and Sampling Equipment	2" RODS; 1" PVC PIEZOMETER; PERISTALTIC PUMP
8. Hole Location	NAD 83 7A-GP-01 E-822486.03' N-683827.74'
9. Surface Elevation	NAVD-88 69.44'
10. Date Started	1/17/98
11. Date Completed	1/17/98
12. Overburden Thickness	NA
13. Depth Drilled into Rock	NA
14. Total Depth of Hole	
15. Depth Groundwater Encountered	17.5' BGS
16. Depth to Water and Elapsed Time after Drilling Completed	
17. Other Water Level Measurements (Specify)	
18. Geotechnical Samples	NA; Disturbed: NA; Undisturbed: NA
19. Total Number of Core Boxes	NA
20. Samples for Chemical Analysis	VOC: X; Metals: ; Other (Specify): SVOC; Other (Specify): LEAD; Other (Specify):
21. Total Core Recovery	NA %
22. Disposition of Hole	Backfilled: ; Monitoring Well: ; Other (Specify): TEMP. PIEZ.
23. Signature of Inspector	[signature]

LOCATION SKETCH/COMMENTS

~~SEE SKETCH ON PAGE #3~~

SCALE: 1" = 50'



PROJECT

FT. STEWART 16 SWMUS

HOLE NO. 7AGP01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER
FT. STEWART 16 SWMUS	LUIS MERCADO	7AGP01
		SHEET 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBROUNDED, GRAYISH BROWN (10YR 5/2), DRY.	0-2' 0ppm			PUSHED 0-4' (2.0' RECOVERY) SOME ORGANIC MATERIAL GRASS, ROOTS FROM 0-3".
	2	0.5': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, AS ABOVE, REDDISH BROWN (5YR 5/4), MOIST.				
	3	1': WELL GRADED SAND WITH SILT (SW-SM), AS ABOVE, VERY DARK GRAY (7.5YR 3/1), MOIST.	2-4' 0ppm			
	4	3.5': WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY, FINE TO MEDIUM SAND, SUBANGULAR, LIGHT BROWNISH GRAY (10YR 6/2), MOIST.				PUSHED 4-8' (1.5' RECOVERY)
	5		4-6' 0.5ppm			
	6					
	7		6-8' 0.8ppm			
	8	8.2': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, SUB-ROUNDED, GRAY (2.5Y 5/1), MOIST.				PUSHED 8-12' (1.8' RECOVERY)
	9		8-10' 1.8ppm			
	10					

PROJECT FT. STEWART 16 SWMUS HOLE NO 7AGP01

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7AGP01 | SHEET: 3 of 3

TIME (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11	11': ~~CLAY~~ SANDY CLAY (CL), ~~40~~ 60% FINE SAND, LOW PLASTICITY, MEDIUM DRY STRENGTH, NO DILATENCY, MEDIUM TOUGHNESS, LIGHT BROWNISH GRAY (2.5Y 6/2), DRY.	10-12' 2.0 ppm			
	12					PUSHED 12-16' (4.0 RECOVERY)
	13		12-14' 2.2 ppm			
	14					
	15		14-16' 1.9 ppm			
	16	15.5': LEAN CLAY (CL), HIGH PLASTICITY, MEDIUM DRY STRENGTH, NO DILATENCY, MEDIUM TOUGHNESS, LIGHT GRAY (2.5Y 7/1), DRY.				PUSHED 16-18' (2.0' RECOVERY)
	17		16-18' 10.2 ppm		16-18' SAMPLE # 7A1111	GW @ 17.5' bgs ▽
	18	17.5': WELL GRADED SAND (SW), TRACE OF CLAY (<5%), MEDIUM SAND, SUBROUNDED, LIGHT GRAY (2.5Y 7/1), WET. 18': End of Log				1" PVC PIEZOMETER INSTALLED TO 24' bgs SCREEN AT 19-24'.

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah	HOLE NUMBER: 7A-GP02
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
4. NAME OF DRILLER: A. Knickerbocker	4. LOCATION: SWMU-27A	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" macrocore sampler, acetate liners, LLDPE tubing, master flex peristaltic pump, stainless steel spoons	6. MANUFACTURERS DESIGNATION OF DRILL: Geoprobe GH-40	
	8. HOLE LOCATION: NAD-83 E - 922490.16' N - 693845.62'	
	9. SURFACE ELEVATION: NAVD-88 65.13'	
	10. DATE STARTED: 1/31/98	11. DATE COMPLETED: 1/31/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 3.75'	
14. TOTAL DEPTH OF HOLE: 13.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA — DISTURBED — UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Piezometer	Paul J. Jucat		

LOCATION SKETCH/COMMENTS: See Logbook #27 page 42 for sketch

SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO: 7A-GP-02

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

etc.)

HRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7A-GP-02 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0'	Fine SAND with some clay (SW-SC), brown (10YR 5/3), very soft, moist, non-plastic	0.0			
	1.0'	0.0'-0.2': Same as above with some organic silt.				
	2.0'	0.2'-0.4': Clay (CH) with traces of sand, ~~gray~~ greenish gray (10Y 6/1), very plastic	0.0		7A12.11 1540	
	3.0'					
	4.0'					Recovery = 4.0'/4.0'
	5.0'	NA due to recovery				
	6.0'					
	7.0'	NA due to recovery				
	8.0'					Recovery = ~~4.0'~~ 0.6'/4.0' PJC 1/31/98
	9.0'					Piezometer screened from 8.0'-13.0'
	10.0'					

PROJECT: 16 SWMU's | HOLE NO: 7A-GP-02

H TRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER
16 SWMU's		7A-GP-02
		SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					

PROJECT 16 SWMU's HOLE NO 7A-GP-02

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: Savannah COE	HOLE NUMBER: 7A-GP-03
3. PROJECT: Ft. Stewart 16 SWMU's	2. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3 SHEETS
5. NAME OF DRILLER: A. Knickerbocker	4. LOCATION: SWMU-27A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Macrocore Rods; Acetate Liner; PVC screen & Riser; Peristaltic Pump; HDPE Tubing	6. MANUFACTURERS DESIGNATION OF DRILL: GeoProbe	
	8. HOLE LOCATION: NAD-83 E-822522.64' N-693863.15'	
	9. SURFACE ELEVATION: NAVD-88 69.16'	
	10. DATE STARTED: 2-3-98	11. DATE COMPLETED: 2-3-98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 4.6'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	
14. TOTAL DEPTH OF HOLE: 15.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
NA			NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	SVOC	Lead			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Piezometer	Kennon Robertson		

LOCATION SKETCH/COMMENTS SCALE:

See Logbook #27, page 49 for sketch

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 7A-GP-03

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

QA CHECK BY: (Signature and Date)

well atmosphere, soil color, staining, etc.)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
16 SWMUs	TODD EARLY	7A-GP-03	2 of 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		WELL GRADED SAND WITH SILT: SW-SM, MEDIUM GRAINED SAND, SOFT, MOIST, BLACK 10YR2/1				AMERS CORE (0-10')
	1	SILT WITH SAND; ML, OLIVE BROWN 2.5Y4/4, MEDIUM TO FINE SAND, SOFT, MOIST	0.0 ppm			PIEZOMETER SET SCREEN (10-15' BGL)
	2		0.0 ppm			
	3	ACCUMULATED LOST CORE	TOE 0.0 ppm 2/24/10			
	4	SAME AS ABOVE	0.0 ppm			
	5	WELL GRADED SAND WITH SILT; SW-SM OLIVE BROWN 2.5Y4/4 MED GRAINED SAND, SOFT, WET, LENSED WITH LEAN CLAY: CL, OLIVE YELLOW 2.5Y6/6 SOFT TO FIRM	0.0 ppm		1330 COVER 7A-GP-03 5-6.5' BGL	
	6					
	7	ACCUMULATED LOST CORE				
		SAME AS ABOVE				
	8		0.0 ppm			
	9	ACCUMULATED LOST CORE				
	10					

PROJECT 16 SWMUs HOLE NO 7A-GP-03

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER
16 SWMU's		7A-GP-03
		SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					
	14					
	15					

PROJECT 16 SWMU's HOLE NO 7A-GP-03

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7A-GP-04
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
4. NAME OF DRILLER: A. Knickerbakers	4. LOCATION: SWMU-27A	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Macro Core Rods; Acetate Liner; PVC screen + Riser; Peristaltic Pump	6. MANUFACTURERS DESIGNATION OF DRILL: GeoProbe.	
	8. HOLE LOCATION: NAD-83 E - 822504.40' N - 683833.53'	
	9. SURFACE ELEVATION: NAVD-88 69.05'	
	10. DATE STARTED: 2-3-98	11. DATE COMPLETED: 2-3-98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 4.5'	
13. DEPTH (DRILLED) INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 15'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA; DISTURBED; UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	Lead	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Piezometer	[signature] Tony		

LOCATION SKETCH/COMMENTS: See Logbook #27 page 42 for sketch

SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 7A-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, breathing zone, venting compressed air, etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMUs | DIRECTOR: | HOLE NUMBER: 7A-GP-04 | SHEET: 2 of 3

FROM (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	GRASS/ROOT ZONE (0-0.2') WELL GRADED SAND WITH SILT: SW-SM VERY DARK GRAY 10YR 3/1, MEDIUM GRAINED SAND, MOIST, SOFT				MACRO CORE (0-8') PIEZ. SET 10-15' BGL
	1	WELL GRADED SAND WITH SILT: SW-SM, YELLOWISH BROWN 10YR 5/6 MEDIUM GRAINED SAND, MOIST, SOFT	0.0 ppm			
	2					
	3	- ACCUMULATED LOST CORE				
	4	SAME AS ABOVE			7A-GP 04 1410 COLLECTED SOIL	
		- SATURATED BELOW 4.5'				
	5		0.0 ppm		7A1431 (SPLIT) 7A1411	
	6		0.0 ppm			
	7	WELL GRADED SAND WITH SILT: SW-SM, BLACK 2.5Y 2.5/1, MEDIUM GRAINED, SOFT	0.0 ppm			
		ACCUMULATED LOST CORE (6A'-8.0') TOE				
	8					
	9					
	10					

PROJECT: - 16 SWMUs | HOLE NO: 7A-GP-04

FHWA DRILLING LOG

PROJECT	16 SWMU's	INSPECTOR	HOLE NUMBER 7A-GT-04
			SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					
	14					
	15					

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PROJECT 16 SWMU's HOLE NO 7A-GT-04

SWMU 27A

3D SQUADRON, 7TH CAVALRY MOTORPOOL AND FOUR ASSOCIATED OIL/WATER SEPARATORS (BUILDING 1339A)

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HTRW DRILLING LOG

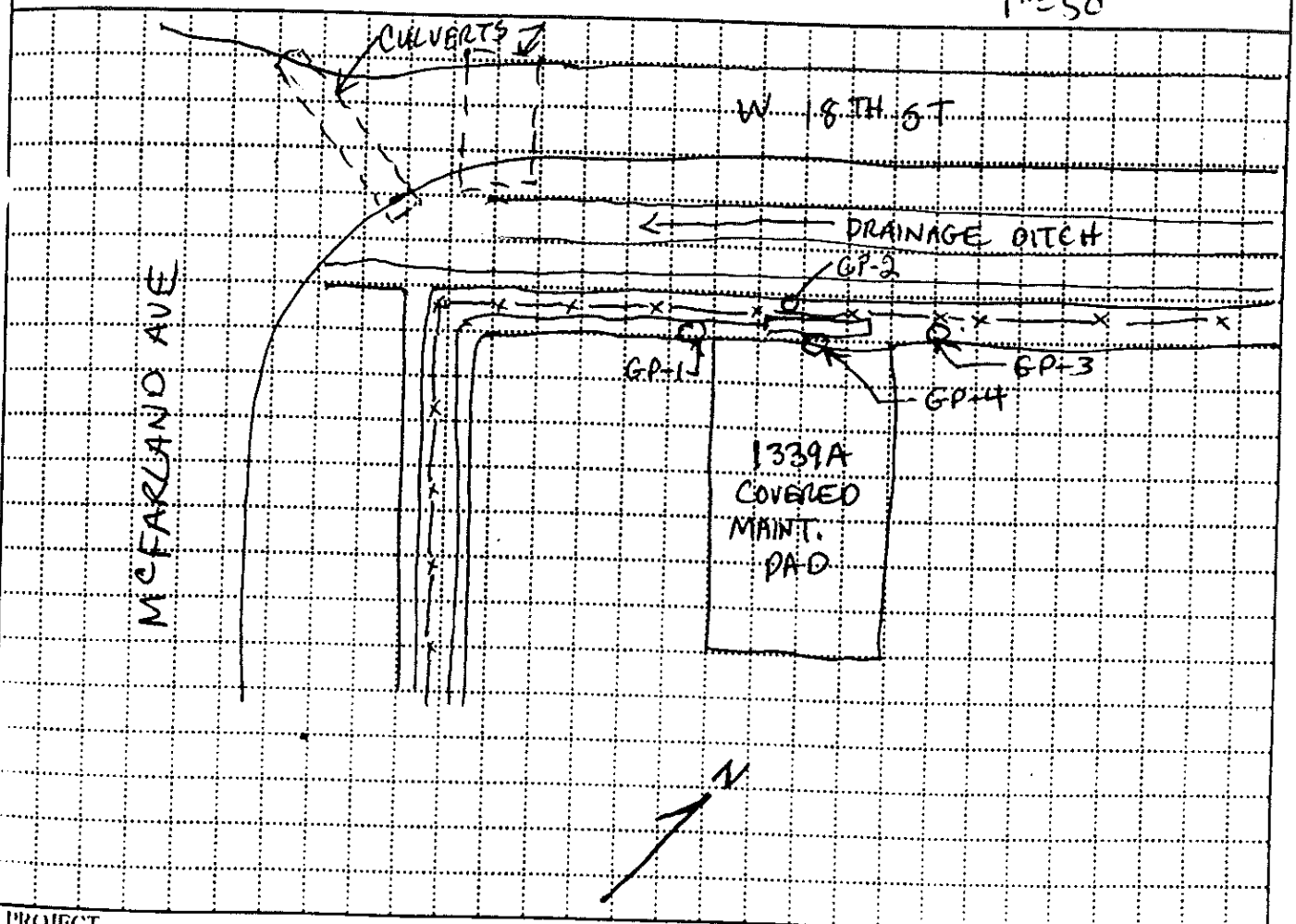
1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 78-GP-01
	2. DRILL SUBCONTRACTOR: RE WRIGHT / SAIC	SHEET 1 OF 1

3. PROJECT: FT. STEWART 16 SWMUs	4. LOCATION: SWMU # 27A
5. NAME OF DRILLER: J HASELHOFF	6. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS 5M
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" RODS; 1" PVC PIEZO; PERISTALTIC PUMP	8. HOLE LOCATION: SEE SKETCH E-822284.87 N-683637.63 NAD-83
	9. SURFACE ELEVATION: 69.27 NAVD-88
	10. DATE STARTED: 1/17/98 — 11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 8' BGS
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE: 15 BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X		SVOC	Lead		NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Temp. Piezo	Luis Mercado		

LOCATION SKETCH/COMMENTS — SCALE: 1" = 50'



PROJECT: FT. STEWART 16 SWMUs

HOLE NO: 78-GP-01

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

(Signature and Date)

etc.)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7BGP01 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	0-1.2': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK REDDISH GRAY (5YR 4/2), MOIST.	0-2' 0 ppm			PUSHED 0-4' (2.5' RECOVERY) SOME ORGANIC MATERIAL GRASS, ROOTS 0-2" bgs.
	2	1.2': WELL GRADED SAND WITH SILT (SW-SM), AS ABOVE, DARK REDDISH BROWN (2.5YR 3/3), MOIST.				
	3		2-4' 26.2 ppm			
	4					
	5		4-6' 20.0 ppm			PUSHED 4-8' (2.0' RECOVERY)
	6					
	7		6-8' 34.6 ppm		6-8' SAMPLE # 7B1111	
	8	7': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK GREENISH GRAY (10Y 3/1), MOIST, SLIGHT HYDROCARBON ODOR.				
	9		8-10 27.9 ppm			PUSHED 8-12' (4.0' RECOVERY) GW @ 8' bgs ▽
	10					

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7BGP01

HTRW DRILLING LOG

PROJECT ~~SWMU~~ FT. STEWART 16 SWMUS | INSPECTOR LUIS MERCADO | HOLE NO. 7BGP01 | SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10		10-12' 19.1 ppm			
	11	11': WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY, FINE TO MEDIUM SAND, SUBROUNDED, BROWNISH YELLOW (10YR 6/8), MOIST.				
	12	12': CLAYEY SAND (SC), 45% CLAY, FINE SAND, SUBROUNDED BROWNISH YELLOW (10YR 6/8), LOW PLASTICITY CLAY.	12-14 5.1 ppm			PUSHED 12-15' (3.0' RECOVERY)
	13	12.5': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBROUNDED, YELLOW (10YR 7/8), WET.				
	14	13': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, ROUNDED, LIGHT BLUISH GRAY, (5B 7/1), WET.	14-15 0.2 ppm			1" PVC PIEZOMETER INSTALLED TO 15' BGS SCREEN FROM 10-15' BGS.
	15	15': End of Boring				

PROJECT FT. STEWART 16 SWMUS | HOLE NO 7BGP01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: Savanah	2. DRILL SUBCONTRACTOR: R.E. Wright	HOLE NUMBER: 7B-GP-02; SHEET 1 of 2 SHEETS
3. PROJECT: Ft. Stewart 16 SWMU's		4. LOCATION: SWMU-27A	
5. NAME OF DRILLER: A. Knickerbocker		6. MANUFACTURER'S DESIGNATION OF DRILL: GH-40 (Geoprobe)	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: See page #3		8. HOLE LOCATION: NAD-83 E-822289.82', N-683655'	
		9. SURFACE ELEVATION: NAVD-88 68.07'	
12. OVERBURDEN THICKNESS: NA		10. DATE STARTED: 1/30/98	11. DATE COMPLETED: 1/30/98
13. DEPTH DRILLED INTO ROCK: —		15. DEPTH GROUNDWATER ENCOUNTERED: 5.0'	
14. TOTAL DEPTH OF HOLE: 8.0'/10.0'		16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 5.77 (0:10)	
		17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES		
NA			NA		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	Lead	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See Logbook #27, Page 3 for sketch

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7B-GP-02

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

RMA DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7B-GP-02 | SHEET: 2 of 2

TEST (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1.0'	Silty SAND with traces of clay (SW-SM) very dark brown (10YR2/2) loose, soft, moist	2.7			
		1.0'-1.1', 1.7'-1.8': Seams of sandy clay				
	2.0'		4.2			
	3.0'					
	4.0'		5.7		7B1211 1045	Recovery = 4.0'/4.0'
	5.0'	5.0'-8.0': Same as above but wet				5.0'-8.0': Wet
	6.0'		NA			
	7.0'	7.1'-7.7': Seam of sandy CLAY (CH), red (10YR5/6), mottled, medium stiff, very plastic, wet				
	8.0'					Recovery = 4.0'/4.0'
						Piezometer screened From 5.0'-10.0'
	9.0'					

PROJECT: Ft. Stewart 16 SWMU's | HOLE: 7B-GP-02

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7B-GP-03
3. PROJECT: FT. STEWART 16 SWMUS	3. DRILL SUBCONTRACTOR: REWRIGHT / SAIC	SHEET 1 OF 3

5. NAME OF DRILLER: J. HASELHOFF	4. LOCATION: SWMU # 27A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" HODS; 1" PVC PIEZOMETER; PERISTALTIC PUMP	6. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS - 8M
	8. HOLE LOCATION: 7B-GP-03 E-922319.67' N-683620.23' NAD-83
	9. SURFACE ELEVATION: 69.44' NAVD-88
	10. DATE STARTED: 11/17/98
12. OVERBURDEN THICKNESS: NA	11. DATE COMPLETED: 11/17/98
13. DEPTH DRILLED INTO ROCK: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 8' BGS
14. TOTAL DEPTH OF HOLE: 16' BGS	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	LEAD		NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)			
			TEMP. PIEZ.			

23. SIGNATURE OF INSPECTOR: Lisa Mercado

LOCATION SKETCH/COMMENTS: SEE PAGE #3

SCALE:

PROJECT	HOLE NO
FT. STEWART 16 SWMUS	7B-GP-03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7B-GP-03 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, SUB-ROUNDED, DARK GRAYISH BROWN (2.5Y 4/2), DRY.	0-2' Ø ppm			PUSHED 0-4' (3.0' RECOVERY) SOME ORGANIC MATERIAL 0-2" GRASS, ROOTS
	1					
	2					
	3		2-4' Ø ppm			
	4					PUSHED (4-8') (3.2' RECOVERY)
	5		4-6' Ø ppm			
	6	5.5': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, SUBROUNDED, DARK YELLOWISH BROWN (10YR 4/4), MOIST.				
	7		6-8 3.1 ppm			
	8					PUSHED 8-12' (3.6' RECOVERY) GW AT 8' BGS ▽
	9	8.5': CLAYEY SAND (SC), ~~15%~~ CLAY, SUBROUNDED SAND, BROWNISH YELLOW (10YR 6/8), LOW PLASTICITY CLAY, MOIST.	8-10' 7.7 ppm			
	10	9.5': WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY RED (10R 4/8), MOIST.				

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7B-GP-03

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERLADO | HOLE NUMBER: TB-GP-03 | SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
		10.5': WELL GRADED SAND WITH CLAY (SW-SC), 20% CLAY, YELLOW (10YR 7/8), MOIST	10-12' 29.9 ppm		10-12' SAMPLE # TB1311	
	11	11': WELL GRADE SAND WITH SILT (SW-SM), 10% SILT, SUBROUNDED, RED (10R 4/8), MOIST.				
	12	12: WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, ROUNDED, FINE TO MEDIUM SAND, LIGHTRED (2.5R 6/8), WET.	12-14' ~~1.2 ppm~~ (MM) 1.2ppm			PUSHED 12-16' (4.0' RECOVERY)
	13					
	14	14': WELL GRADED SAND (SW), TRACE OF SILT (5%), MEDIUM SAND, ROUNDED, LIGHTGRAY (N7/), WET.	14-16' 0.9 ppm			
	15	16': End of Boring				1" PVC PIEZOMETER INSTALLED SCREEN FROM 11-16' BGS.
	16					

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: TB-GP-03

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7B-GP-04
3. DRILL SUBCONTRACTOR: REWRIGHT / SAIC		SHEET 1 of 3
4. PROJECT: FT. STEWART 16 SWMUS	5. LOCATION: SWMU 27A	
7. NAME OF DRILLER: J. HASELHOFF	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE SYSTEMS - 8M	
12. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" RODS; 1" PVC PIEZOMETER LMM; PERISTALTIC PUMP LMM	8. HOLE LOCATION: 7B-GP-04 E - 822239.32' N - 683655.28' NAD-83	
	9. SURFACE ELEVATION: 68.07' NAVD-88	
	10. DATE STARTED: 1/17/98	11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: NA	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 11' BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	CEAO		NA %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			TEMP. DEF	Luis Morcad		

LOCATION SKETCH/COMMENTS: SEE SKETCH PAGE #3

SCALE:

PROJECT: FT. STEWART 16 SWMUS

HOLE NO: 7BGP04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well attributes, soil survey, etc.)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7B6P04 | SHEET: 2 of 3

FROM (A)	TO (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
0	2	WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK GRAY (10YR 4/1), MOIST.	0-2' 0.4ppm			PUSHED 0-4' (2.0' RECOVERY)
2	4	2': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, SUBANGULAR, BROWN (10YR 4/3), MOIST.	2-4' 17.5ppm	2-4' SAMPLE #7B141	LMM	
4	8		4-6' 0.6ppm 6-8' 6.4ppm			PUSHED 4-8' (2.8' RECOVERY)
8	10	8': WELL GRADED SAND WITH SILT (10%), FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAYISH BROWN (2.5Y4/2), MOIST.	8-10' 0.0ppm			PUSHED 8-10' (1.0' RECOVERY)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7BGP04 | SHEET: 3 of 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10		10-11' 0 ppm			PUSHED 10-11' (0.3' RECOVERY) REFUSAL @ 11' BGS
	11	11' END OF BORING REFUSAL				NO PIEZOMETER INSTALLED

SWMU 27A

3D SQUADRON, 7TH CAVALRY MOTORPOOL AND FOUR ASSOCIATED OIL/WATER SEPARATORS (BUILDING 1322)

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HTRW DRILLING LOG

Field	Entry
DISTRICT	Savannah COE
HOLE NUMBER	7C-GP-01
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	MWV
SHEET	1 of 2 SHEETS
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	Hinesville GA SWMU-27A
5. NAME OF DRILLER	Haz
6. MANUFACTURERS DESIGNATION OF DRILL	Mobile B-47
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4'x2" Sampler; Plastic Sleeves; 3/4" PVC Prepacked
8. HOLE LOCATION	NAD-83 E-829646.19', N-683204.96'
9. SURFACE ELEVATION	NAVD-88 67.93'
10. DATE STARTED	1/17/98
11. DATE COMPLETED	1/17/98
12. OVERBURDEN THICKNESS	10'
13. DEPTH DRILLED INTO ROCK	0'
14. TOTAL DEPTH OF HOLE	10'
15. DEPTH GROUNDWATER ENCOUNTERED	≈4'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			piezometer	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See Location Map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7C-GP-01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: ____________ (Signature and Date)

HTRW DRILLING LOG

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7C-GP-01 | SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	Concrete plus 10"				
	2–3	(SC) clayey sand, fine to coarse grain sands 2.5Y 2.5/1 Black color	HS: 0.0			*slight petro odor at base
	3–6	(SM) fine grain silty sand / grey color 2.5Y 5/1, moist at base	HS: 0.0 HS: 2.1			
	6–8	(CL) fine sandy clay, fine to coarse grain sand, mottled grey matrix 2.5Y 6/1, with olive yellow 2.5Y, 6/6 mottles				▽WT
	8–10	Insufficient Recovery, too soupy, sand				
	10					End screen

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: 7C-GP-01

HTRW DRILLING LOG

DISTRICT	Savannah COE
HOLE NUMBER	7C-GP-02
SHEET	1 of 2
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	M.I.C.
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	[illegible], GA SWMU-27A
5. NAME OF DRILLER	[illegible]
6. MANUFACTURER'S DESIGNATION OF DRILL	Mobile B-47
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4' x 2" sampler; 4' x 1" core; 3/4" PVC prepared; acetate sleeves
8. HOLE LOCATION	NAD-83 E-822661.65', N-683187.65'
9. SURFACE ELEVATION	NAVD-88 68.17'
10. DATE STARTED	1/17/98
11. DATE COMPLETED	1-17-98
12. OVERBURDEN THICKNESS	10'
13. DEPTH DRILLED INTO ROCK	0'
14. TOTAL DEPTH OF HOLE	10'
15. DEPTH GROUNDWATER ENCOUNTERED	≈ 3' BGS
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	NA
20. SAMPLES FOR CHEMICAL ANALYSIS: VOC	✓
METALS	✓
OTHER (SPECIFY)	SVOC
OTHER (SPECIFY)	
OTHER (SPECIFY)	
21. TOTAL CORE RECOVERY %	NA
22. DISPOSITION OF HOLE: BACKFILLED	
MONITORING WELL	
OTHER (SPECIFY)	[illegible]
23. SIGNATURE OF INSPECTOR	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See location map

PROJECT	Ft. Stewart 16 SWMU's
HOLE NO.	7C-GP-02

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

well atmosphere, soil core, breathing zone, verifying sample, etc.)

QA CHECK BY: __________ (Signature and Date)

PROJECT Ft. Stewart 16 SWMU's | INSPECTOR [illegible] | HOLE NUMBER 7C-GP-02 | SHEET 1 2 of 2

CLASS (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(SM) Fine grain silty sand	45'6.6'			
	2	Grey color 2.5Y 5/1, saturated below 3' bgs				
	3					▽
	4	~~Note: top of~~ C G				
	5	Note: 0-1' had coarse gravel pack with silty sand (from sample from (~3' bgs)				
	6					
	7	(CL) Firm sandy clay, fine to medium grain 2.5Y 6/1				
	8	Mottles = olive yellow 2.5Y 6/6				
	9	same as above				
	10					

PROJECT Ft. Stewart 16 SWMU's | HOLE NO 7C-GP-02

HTRW DRILLING LOG

DISTRICT: Savannah COE		HOLE NUMBER: 7C-GP-03	
1. COMPANY NAME: SAIL	2. DRILL SUBCONTRACTOR: Miller Drilling	SHEET 1 of 2 SHEETS	
3. PROJECT: Ft. Stewart 16 SWMU's	4. LOCATION: Hinesville GA SWMU-27A		
5. NAME OF DRILLER: H. Hontoon	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47		
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 3/4" PVC; 2" x 4' Sampler steel; 1" x 4' rods	8. HOLE LOCATION: NAD-83 E-822673.75', N-683164.98'		
	9. SURFACE ELEVATION: NAVD-88 68.00'		
	10. DATE STARTED: 1/17/99	11. DATE COMPLETED: 1/17/99	
12. OVERBURDEN THICKNESS: 16'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 4'		
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:		
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):		

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES		
NA			NA		
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**
	✓		SVOC		

21. TOTAL CORE RECOVERY %: NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Abandoned	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See Location Map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7C-GP-03

ENG FORM 5056-R, AUG 94

(Proponent: CECW-EG)

well atmosphere, soil core, breathing zone, venting etc.)

QA CHECK BY: ____________ (Signature and Date)

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR | SHEET: 2 of 2

USCS (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		Concrete plug				
	1–2	(SM) fine grain silty sand, 5Y 2.5Y 5/1 saturated	HS: 2.7			
	3–4		HS: 2.8			WT
	5		HS: 2.9			
	6–9	(CL) (fine sand) clay, fine to med grain sand, mottled, grey matrix 2.5Y 6/1 with olive yellow 2.5Y 6/6 mottles moist to saturated in areas	HS: 2.5 HS: 2.4			
	11–14	(SM) fine grain silty sand, light olive brown color 2.5Y 5/3 moist to saturated	HS: 2.8 HS: 3.1			
	15–16	(SW) fine grain sand grey 2.5Y 6/1 soupy, very saturated				Set piezometer

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: TC-GP-03

8

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: Savannah COE	HOLE NUMBER: 7C-GP-04
3. PROJECT: Ft. Stewart 16 SWMU's	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
5. NAME OF DRILLER: Haz	4. LOCATION: Hinesville GA SWMU-27A	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4" x 2' steel sampler; 4" x 1" rods; 3/4" PVC piezometer	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-822649.88', N-683166.33'	
	9. SURFACE ELEVATION: NAVD-88 67.89'	
	10. DATE STARTED: 11/17/98	11. DATE COMPLETED: 11/17/98
12. OVERBURDEN THICKNESS: 10'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈4'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
NA			NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer	[signature]		

LOCATION SKETCH/COMMENTS

SCALE:

See location map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7C GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

well atmosphere, soil core, breathing zone, venting ... etc.)

QA CHECK BY: ______ (Signature and Date)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7C-GP04 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(SM) fine grain silty, sand, saturated at base, grey 2.5 Y 5/1	HS: 0 U			
	2					
	3		HS: 0 U			
	4					
	5	(SM) fine grain silty, sand, same as above only sandy & very saturated				
	6	(CL) firm sandy clay mottled, grey matrix 2.5 Y 6/1 w/ olive yellow 2.5 Y 6/6, saturated				
	7					
	8					
	9	Sandy mixture released. No recovery				
	10					Set piezometer

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: 7C-GP-04

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7C-GP-05
3. PROJECT: Ft. Stewart 16 SWMU's	2. DRILL SUBCONTRACTOR: Mid Dr.	SHEET 1 OF 2
5. NAME OF DRILLER: W&Z	4. LOCATION: Hinesville, GA	SWMU 27A
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4" x 2' Sensor; 4" x 1" Russ; 3/4" Core Retriever	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-822628.52', N-683170.62'	
	9. SURFACE ELEVATION: NAVD-88 67.65'	
	10. DATE STARTED: 1/17/96	11. DATE COMPLETED: 1/17/96
12. OVERBURDEN THICKNESS: 12'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 4'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer	CO		

LOCATION SKETCH/COMMENTS — SCALE:

See Location Map

PROJECT: Ft. Stewart 16 SWMU's — HOLE NO: 7C-GP-05

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, ... etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMU's	INSPECTOR:	HOLE NUMBER: 7C-GP-05
		SHEET 2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1	(SM) fine grain silty sand, moist to saturated at base, grey 2.5Y5/1	HS: 0.2			
	2					
	3		HS: 1.2			
	4					▽ WT
	5		HS: 0.8			
	6					
	7	(CL) firm sandy clay mottled grey matrix 2.5Y6/1, w/ olive yellow 2.5Y6/6 mottles, wet soil	HS: 0.0			
	8					
	9	(SM) soupy fine grain silty sand, very saturated				
	10					
	11	(SC) very firm clayey sand, moist dark grey, 5Y 4/1				
	12					

PROJECT: Ft. Stewart 16 SWMU's HOLE NO. 7C-GP-05

SWMU 27B

1ST BN, 3D ADA MOTORPOOL AND ASSOCIATED OIL/WATER SEPARATOR

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: M.I.L.	DISTRICT: Savannah COE; HOLE NUMBER: 7D-GP-01; SHEET: 1 OF 2
3. PROJECT: Ft. Stewart 16 SWMU's	4. LOCATION: Hunter G.D. SWMU 27B	
5. NAME OF DRILLER: H. Hontoon	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
7. SIZE AND TYPE OF DRILLING AND SAMPLING EQUIPMENT: 4" x 2" Split Spoon; 6" I.D. Hollow Stem Auger; 3/4" to 2" PVC Riser and Screen	8. HOLE LOCATION: NAD-83 E-822594.60', N-682514.12'	
	9. SURFACE ELEVATION: NAVD-88 68.03'	
	10. DATE STARTED: 1/15/98	11. DATE COMPLETED: 1/19/98
12. OVERBURDEN THICKNESS: 12'	13. DEPTH GROUNDWATER ENCOUNTERED: ≈ 3'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 15'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES: NA	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %: NA
	✓		SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer			

LOCATION SKETCH/COMMENTS — SCALE:

See Location Map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7D-GP-01

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

well atmosphere, soil core, breathing zone, vehicle, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR: | SHEET 2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		(SM) fine to med. grain silty sand 2.5Y 3/1 very dark gray				
	1	(SC) clayey sand 2.5Y [illegible] dark gray color [illegible] to base	45: [illegible] ppm			
	2					
	3					▽ WT [illegible]
	4					
	5					
	6					
	7					
	8					
	9					
	10	(CL) mottled gray, browns, grey, red & yellow colors				
		(SW) light gray clean fine to med. grain sand	[illegible]			
	11					
	12					
	13					

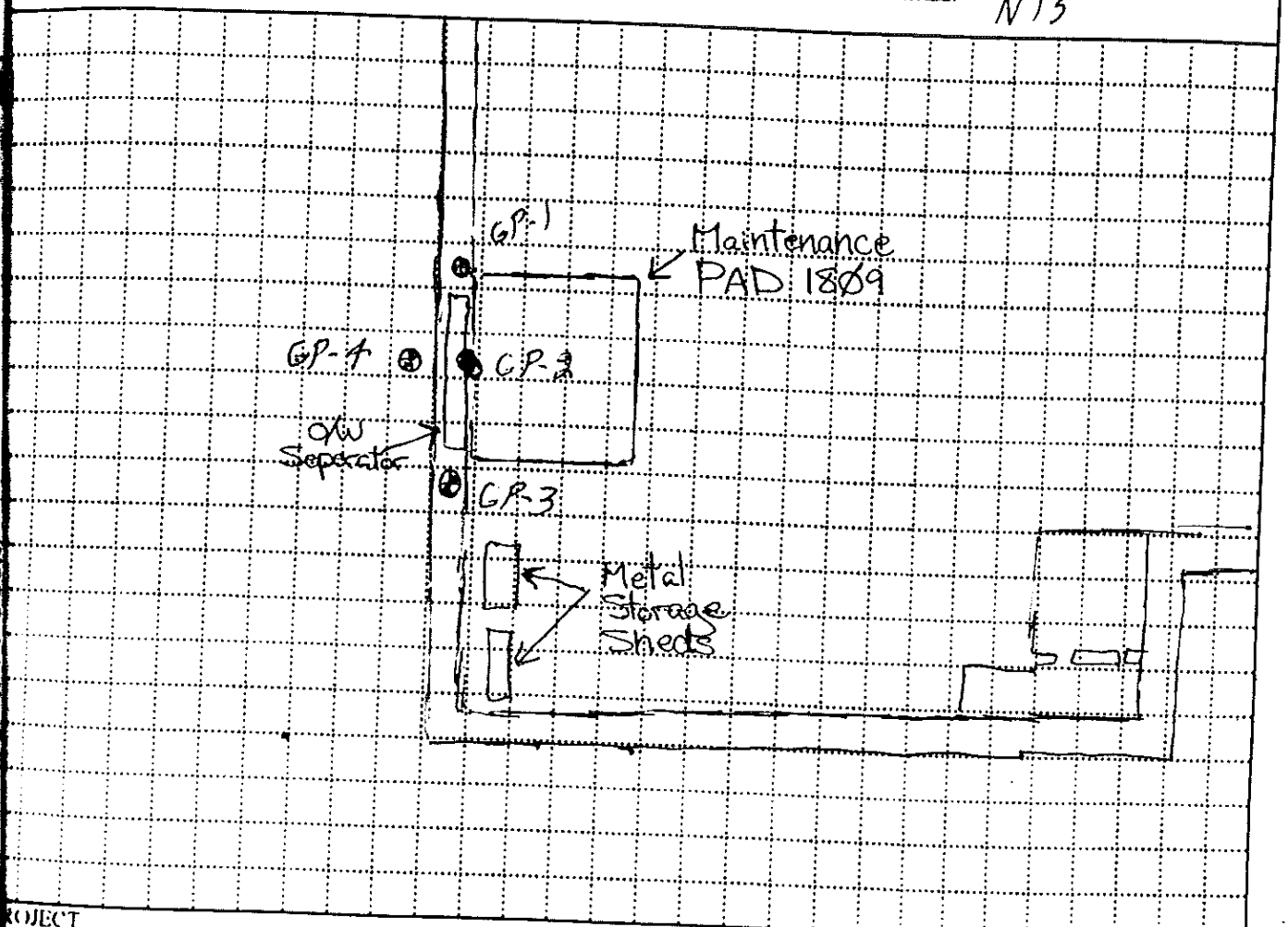
PROJECT: Ft. Stewart 16 SWMU's | HOLE NO. 7D-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savanah COE	HOLE NUMBER: 7D-GP-02
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3 SHEETS
4. NAME OF DRILLER: Al Root	5. LOCATION: SWMU-27B	
5. SIZE AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" MacroCore Rods; Acetate Liner; Peristaltic Pump; PVC screen & riser	6. MANUFACTURERS DESIGNATION OF DRILL: Geoprobe 5400	
	8. HOLE LOCATION: NAD-83 E-822610.34', N-682459.98'	
	9. SURFACE ELEVATION: NAVD-88 67.93'	
	10. DATE STARTED: 1/18/98	11. DATE COMPLETED: 1/18/98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: 3.5'	
13. DEPTH DRILLED INTO ROCK: —	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 4.18' (@ 10)	
14. TOTAL DEPTH OF HOLE: 12.0'/11.88'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED:	UNDISTURBED:
19. TOTAL NUMBER OF CORE BOXES: NA		
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: ✓	METALS: Lead
	OTHER (SPECIFY): 3 VOC	OTHER (SPECIFY):
	OTHER (SPECIFY):	31. TOTAL CORE RECOVERY: NA
21. DISPOSITION OF HOLE	BACKFILLED:	MONITORING WELL:
	OTHER (SPECIFY): Piezometer	23. SIGNATURE OF INSPECTOR: Paul J. Zweck

LOCATION SKETCH/COMMENTS

SCALE: NTS



PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 7D-GP-02

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air,

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7D-GP02 | SHEET: 2 of 3

DEPTH (A)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO	REMARKS (G)
1.0'	Clayey SAND (SC), olive (5Y4/A), slightly plastic, very soft, moist	3.1			
2.0'	2.1'				
3.0'	Silty SAND (SM), dark olive gray (5Y 3/2), nonplastic, very soft, wet	12.6			3.5'-12.0': Wet. therefore, no field screening. Continued through aquatard to get to clean sand at 11.0'
	Thin 3.0'-11.0': Clayey seams widely spaced				
4.0'					
5.0'					
6.0'					
7.0'					
8.0'					
9.0'					

PROJECT: Ft. Stewart | 16 SWMU's | HOLE NO: 7D-GP-02

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7D-GP-02 | SHEET: 3 of 3

CLASS (A)	DEPTH (ft) (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	9.0					
	10.0'					
	11.0'	11.0' Silty SAND (SM), white (5Y8/1), nonplastic, very soft, moist				
	12.0'	Bottom of Boring = 12.0'				Screen piezometer from 6.88' to 11.88'

PROJECT: Ft. Stewart | 16 SWMU's | HOLE NO: 7D-GP-02

HTRW DRILLING LOG

7D

1. COMPANY NAME: SAIC	2. DISTRICT: Savanah COE	HOLE NUMBER: ~~7G~~-GP-03
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 2
4. NAME OF DRILLER: Al Root	4. LOCATION: SWMU-27B	
5. SIZE AND TYPE OF DRILLING AND SAMPLING EQUIPMENT: 2" Macro Core Sampler; Acetate Liner; Peristaltic Pump; PVC screen & Riser	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400	
	8. HOLE LOCATION: NAD-83 E-922613.91', N-682486.93'	
	9. SURFACE ELEVATION: NAVD-88 68.01'	
	10. DATE STARTED: 1/18/98	11. DATE COMPLETED: 1/18/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED	
13. DEPTH DRILLED INTO ROCK:	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 8.05' (6:05)	
14. TOTAL DEPTH OF HOLE: 8.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED / UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: ✓ / METALS: — / OTHER (SPECIFY): Lead / OTHER (SPECIFY): SVOC / OTHER (SPECIFY):	21. TOTAL CORE RECOVERY: NA
22. DISPOSITION OF HOLE	BACKFILLED / MONITORING WELL / OTHER (SPECIFY): Temp. Piezo.	23. SIGNATURE OF INSPECTOR: Paul Hunt

LOCATION SKETCH/COMMENTS: See page #3 SCALE:

PROJECT: Ft. Stewart 16 SWMU's SKL HOLE NO.: ~~7G~~-GP-03

ENG FORM 5056-R, AUG 94

7D (Proponent CECW-EG)

* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
16 SWMU's		~~76~~ 7D-GP-Ø3	2 of 2

16

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Clayey SAND (SC), olive (5Y4/4), slightly plastic, very soft, moist	Ø.3			
	1.0'					
	2.0'	2.0'-4.0': No recovery	~~Ø.6~~ PSL 1/18/98			
	3.0'					
	4.0'	4.0' ~~Bottom of Boring=4.0'~~	Ø.6			
	5.0'					
	6.0'	6.0'-8.0': No recovery				
	7.0'					
	8.0'	Bottom of Boring=8.0'				

PROJECT: Ft. Stewart 16 SWMU's — HOLE NO. ~~76~~ 7D-GP-Ø3 SKL

HTRW DRILLING LOG

1 COMPANY NAME: SAIC	2 DISTRICT: Savanah	HOLE NUMBER: 7D-GP-04
3 PROJECT: Ft. Stewart 16 SWMU's	3 DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 of 3
4 NAME OF DRILLER: A. Knickerbocker	4 LOCATION: SWMU-27B	
5 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: See page #3	6 MANUFACTURERS DESIGNATION OF DRILL: Geoprobe GH-40	
	8 HOLE LOCATION: NAD-83 E-822602.27' N-6993493.49'	
	9 SURFACE ELEVATION: NAVD-88 67.56'	
12 OVERBURDEN THICKNESS: NA	10 DATE STARTED: 2/1/98	11 DATE COMPLETED: 2/1/98
13 DEPTH DRILLED INTO ROCK: —	15 DEPTH GROUNDWATER ENCOUNTERED: 3.5'	
14 TOTAL DEPTH OF HOLE: 11.4'	16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
	17 OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18 GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19 TOTAL NUMBER OF CORE BOXES
NA			NA

20 SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21 TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA
22 DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23 SIGNATURE OF INSPECTOR		
			Piezometer	Paul G. Smart		

LOCATION SKETCH/COMMENTS: See Logbook #58 page 3 for sketch SCALE:

PROJECT: Ft. Stewart 16 SWMU's HOLE NO: 7D-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)
well atmosphere, soil core, breathing zone, venting compressed air, etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7D-GP-04 | SHEET: 2 of 3

FROM (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1.0'	SAND with some clay (SW-SC), yellowish brown (10YR 5/4), very soft, nonplastic, moist	Ø.Ø			
	2.0'					Recovery = 2.0'/2.0'
			Ø.Ø		7D1411 1430	
	3.0'					
	3.5'	Clayey SAND (SW-SC), dark gray (5Y4/1), very soft, slightly plastic, wet				3.5'-8.0': Wet
	4.0'		Ø.Ø			Recovery = 2.0'/2.0'
	5.0'					
	6.0'		Ø.Ø			Recovery = 2.0'/2.0'
	7.0'					
	8.0'					Recovery = 2.0'/2.0'
	9.0'					Piezometer installed to 11.4'
	10.0'					

PROJECT: Ft. Stewart '' A.13-11 IMU's | HOLE NO: 7D-GP-04

HTRW DRILLING LOG

PROJECT	16 SWMU's	INSPECTOR	HOLE NUMBER	7D-GP-04
			SHEET	3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					

PROJECT 16 SWMU's HOLE NO 7D-GP-04

SWMU 27C

92D ECB (H) MOTORPOOL AND ASSOCIATED OIL/WATER SEPARATOR

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH 3. DRILL SUBCONTRACTOR: REWRIGHT / SAIC	HOLE NUMBER: 7EGP01 SHEET 1 OF 3
4. PROJECT: FT. STEWART 16 SWMUS	5. LOCATION: SWMU #27C	
6. NAME OF DRILLER: J. HASELHOFF	7. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS 5M	
8. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" MODS 1" PVC CASING/SCREEN PERISTALTIC PUMP	9. HOLE LOCATION: 7EGP01 E-913803.21' N-679894.42' NAD-83	
	10. SURFACE ELEVATION: NAVD-88 69.19'	
12. OVERBURDEN THICKNESS: NA	13. DATE STARTED: 1/18/98	14. DATE COMPLETED: 1/18/98
13. DEPTH DRILLED INTO ROCK: NA	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 9.5' bgs	
14. TOTAL DEPTH OF HOLE	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA — DISTURBED: NA — UNDISTURBED: NA	19. TOTAL NUMBER OF CORE BOXES: NA	
20. SAMPLES FOR CHEMICAL ANALYSIS: VOC: X — METALS: — OTHER (SPECIFY): SVOC — OTHER (SPECIFY): LEAD — OTHER (SPECIFY): —	21. TOTAL CORE RECOVERY: NA	
22. DISPOSITION OF HOLE: BACKFILLED: — MONITORING WELL: — OTHER (SPECIFY): TEMP. PIEZO.	23. SIGNATURE OF INSPECTOR: Lisa Mercado	

LOCATION SKETCH/COMMENTS: SEE PAGE # 3 FOR SKETCH

SCALE:

PROJECT: FT. STEWART 16 SWMUS

HOLE NO.: 7EGP01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

etc.)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP01 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		0-0.7': CONCRETE WITH AGGREGATE.				PUSHED 0.7' - 4.7' (1.8' RECOVERY)
	1	0.7': WELL GRADED SAND WITH SILT, 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, REDDISH YELLOW (10YR 7/8), MOIST (SW-SM).	0-2' 1.4ppm		0-2' SAMPLE # 7E1111	
	2	1.2': WELL GRADED SAND WITH SILT, 20% SILT, TRACE OF CLAY (5%), FINE TO MEDIUM SAND, SUBROUNDED, PINK (7.5YR 7/4), MOIST, (SW-SM)	2-4' 1.1ppm			
	3					
	4					
	5		4-6' 0.2ppm			PUSHED 4.7' - 8.7' (2.5' RECOVERY)
	6					
	7	6.3': CLAYEY SAND (SC), 35% CLAY, TRACE OF SILT (5%), FINE TO MEDIUM SAND, GRAYISH BROWN (2.5Y 5/2), MOIST,	6-8' 0.3ppm			
	8					
	9		8-10' 1.1ppm			PUSHED 8.7 - 12.7' (3.0' RECOVERY) 9.5' - GW ▽
	10	9.5': AS ABOVE; WET				

PROJECT: FT. STEWART 16 [illegible]AS | HOLE NO: 7EGP01

HTRW DRILLING LOG

PROJECT: FT. STEWART / L. SWMU | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP01 | SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10		10-12'			
		10.5': WELL GRADED SAND WITH SILT, 20% SILT, FINE TO MEDIUM SAND, SUBROUNDED, GRAY (2.5Y 5/1), WET.	~~11 ppm~~ 0.5 ppm			
	11					
		11.5': WELL GRADED SAND WITH SILT, 20% SILT, MEDIUM SAND, SUBROUNDED, DARK GRAY (2.5Y 4/1), WET.				1" PVC PIEZOMETER INSTALLED TO 15.7' BGS WITH SCREEN FROM 10.7 - 15.7' BGS
	12	12.7': End of LOG				
	13					
	14					
	15					

PROJECT: FT. STEWART 16

HOLE NO: 7EGP01

HTRW DRILLING LOG

DISTRICT	SAVANNAH
HOLE NUMBER	7EGP02
SHEET 1 OF 3 SHEETS	
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	REWRIGHT/SAIC
3. PROJECT	FT. STEWART 16 SWMUS
4. LOCATION	SWMU # 27C
5. NAME OF DRILLER	J. HASELHOFF
6. MANUFACTURER'S DESIGNATION OF DRILL	GEOPROBE SYSTEMS - 5M
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	2" RODS 1" PVC PIEZOMETER PERISTALTIC PUMP
8. HOLE LOCATION	7E-GP-02 E - 819788.40' N - 679899.00' NAD-83
9. SURFACE ELEVATION	NAVD-88 68.90'
10. DATE STARTED	1/18/98
11. DATE COMPLETED	1/18/98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	NA
14. TOTAL DEPTH OF HOLE	
15. DEPTH GROUNDWATER ENCOUNTERED	
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X		SVOC	LEAD		NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			TEMP. PIEZ.	[signature]

LOCATION SKETCH/COMMENTS

SEE PAGE # 3 FOR SKETCH

SCALE:

PROJECT	HOLE NO.
FT. STEWART 16 SWMUS	7EGP02

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP02 | SHEET: 2 of 3

FROM (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		0-0.8': CONCRETE WITH AGGREGATE				PUSH 0.8 - 4.8' (2.1' RECOVERY)
	1	0.8': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, TRACE OF CLAY (5%), SUBROUNDED FINE TO MEDIUM SAND, REDDISH YELLOW (7.5YR 7/8), DRY.	0-2' 0.3ppm			
	2					
	3		2-4' 0.2ppm			
	4					
	5		4-6' 0.3ppm			PUSHED 4.8 - 8.8' (2.5' RECOVERY)
	6	5.8': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, TRACE OF CLAY (5%), SUBROUNDED, DARK GRAY (10YR 4/1), MOIST.				
	7		6-8' 1.2ppm	6-8' SAMPLE # 7E1211		
	8	8.2': CLAYEY SAND (SC), 30% CLAY, 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAY (10YR 4/1), MOIST.				
	9	9': WELL GRADED SAND WITH SILT, 15% SILT, FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAY (10YR 4/1), WET.	8-10' 0.7ppm			PUSHED 8.8 - 12.8' (3.2' RECOVERY) 9.0' GW ▽
	10					

PROJECT: FT. STEWART | HOLE NO: 7EGP02

H1RW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERLADO | HOLE NUMBER: 7EGA02 | SHEET: 3 of 3

(A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10		10-12'			
	11	11.0-11.1: WELL GRADED SAND (SW), TRACE OF SILT (<5%) MEDIUM SAND, SUBROUNDED, LIGHT GRAY (10YR 7/1), WET.	0.5'			
	12	11.1': WELL GRADED SAND WITH SILT (SW-SM), 15% SILT, FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAY (10YR 4/1), WET.				1" PVC PIEZOMETER INSTALLED TO 15.8' BG-S, SCREEN FROM 10.8-15.8' DGS.
	13	12.8': End OF LOG				

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7EGP03
	2. DRILL SUBCONTRACTOR: REINRIGHT/SAIC	SHEET 1 OF 3 SHEETS

3. PROJECT: FT. STEWART 16 SWMUS

4. LOCATION: SWMU # 27C

5. NAME OF DRILLER: J. HASELHOFF

6. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" CASING; 1" PVC PIEZOMETER; PERISTALTIC PUMP

8. HOLE LOCATION: 7E-GP-03 E-819819.61' N-679925.66' NAD-83

9. SURFACE ELEVATION: NAVD-88 63.93'

10. DATE STARTED: 1/18/98

11. DATE COMPLETED: 1/18/98

12. OVERBURDEN THICKNESS: NA

13. DEPTH DRILLED INTO ROCK: NA

14. TOTAL DEPTH OF HOLE: 15.6' bgs

15. DEPTH GROUNDWATER ENCOUNTERED: 12' bgs

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

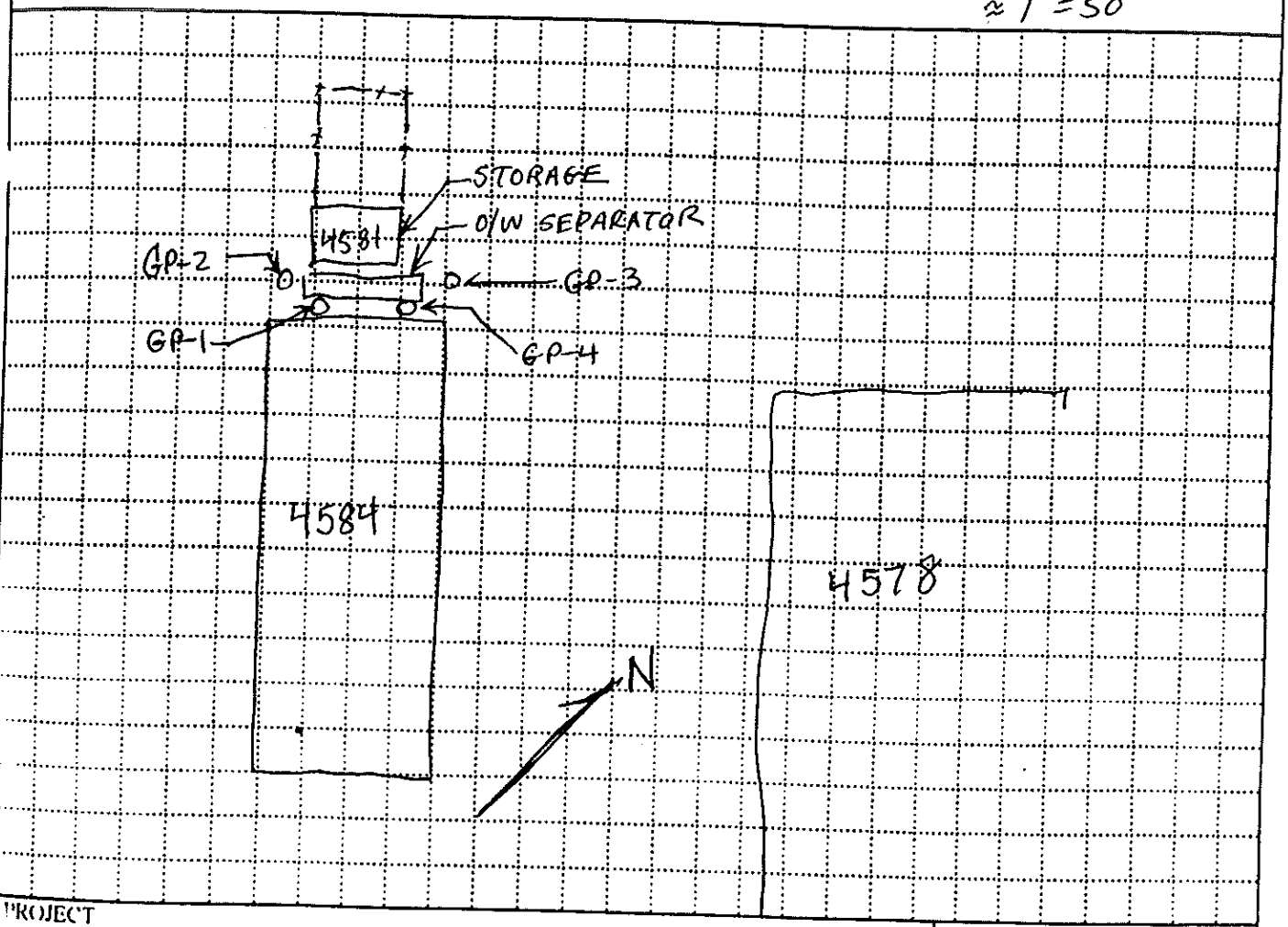
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	LEAD		NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			TEMP. PIEZO	L. Mercado

LOCATION SKETCH/COMMENTS

SCALE: ≈ 1" = 50'



PROJECT: FT. STEWART 16 SWMUS

HOLE NO.: 7EGP03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

etc.)

(Signature and Date)

QA CHECK BY:

RCRA DRILLING LOG

PROJECT: FT. STEWART 16SWMUS | INSPECTOR: LUIS MERCADO | SHEET: 2 of 3 | 7EGP03

DEPTH (ft)	DESCRIPTION OF MATERIALS	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0-0.6': CONCRETE REINFORCED WITH AGGREGATE				PUSHED (LMM) 1 0.6-4.6' (2.0' RECOVERY)
1	0.6': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, REDDISH YELLOW (7.5YR 7/6), DRY.	0-2' 0.4ppm			
2					
3		2-4' 0.7ppm			
4					
					PUSHED (LMM) 4.6-8.6' (1.8' RECOVERY)
5		4-6' 0.4ppm			
6	6': WELL GRADED SAND WITH SILT (SW-SM), 20% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK GRAY ~~(5Y 4/1)~~ (4/N), DRY.				
7		6-8' ~~0.4ppm~~ (LMM) 0 ppm			
8	7.5-8.5': WELL GRADED SAND WITH SILT (SW-SM), AS ABOVE, WET.				
					PUSHED (LMM) 8.6-12.6' (4.0' RECOVERY)
9	8.5': WELL GRADED SAND WITH SILT (SW-SM), 30% SILT, TRACE OF CLAY (<5%), FINE TO MEDIUM SAND, SUBROUNDED, DARK GRAY (10YR 4/1), MOIST.	8-10 0.7ppm			
10					

PROJECT: FT. STEWART 16S | HOLE NO: 7EGP03

HTRW DRILLING LOG

PROJECT	FT. STEWART 16 SWMUS	INSPECTOR	LUIS MERCADO	HOLE NO.	7EGP03
				SHEET	3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10	10.5' WELL GRADED SAND WITH SILT (SW-SM), 20% SILT, MEDIUM SAND, SUBROUNDED, LIGHT GRAY (10YR 7/1), WET	10-12 1.0 ppm		10-12' SAMPLE # 7E1311	GW @ 10' BGS ▽
	11					1" PVC PIEZOMETER INSTALLED TO 15.6 BGS, SCREENED FROM 10.6 TO 15.6 BGS
		~~12': End of Log~~ (LMA)				
	12	12.6': End of Log				

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7EGP04
	2. DRILL SUBCONTRACTOR: REWRIGHT/SAIC	SHEET: 1 OF 3

3. PROJECT: FT. STEWART 16 SWMUS

4. LOCATION: SWMU # 27C

5. NAME OF DRILLER: J. HASELHOFF

6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE SYSTEMS - 8M

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 1" PVC PIEZOMETER; 2" MODS; PERISTALTIC PUMP

8. HOLE LOCATION: 7EGP04 E-819822.74' N-629911.03' NAD-83

9. SURFACE ELEVATION: NAVD-88 69.35'

10. DATE STARTED: 1/16/98

11. DATE COMPLETED: 1/16/98

12. OVERBURDEN THICKNESS: NA

13. DEPTH DRILLED INTO ROCK: NA

14. TOTAL DEPTH OF HOLE:

15. DEPTH GROUNDWATER ENCOUNTERED:

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: NA — DISTURBED: NA — UNDISTURBED: NA

19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	LEAD		NA %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)			
			TEMP. PIEZ			

23. SIGNATURE OF INSPECTOR: Luis Mercado

LOCATION SKETCH/COMMENTS: SEE SKETCH MAP ON PAG#3

SCALE:

PROJECT	HOLE NO.
FT. STEWART 16 SWMU'S	7EGP04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

H TRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP04 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	0-0.7': CONCRETE WITH AGGREGATE				PUSHED 0.7'-4.7' (1.3' RECOVERY)
	1	0.7': WELL GRADED SAND WITH SILT, 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, REDDISH YELLOW (5YR 7/8), WET. (SW-SM)		0-2' 0.3ppm		
	2	1.2': WELL GRADED SAND WITH SILT (SW-SM), AS ABOVE, DRY.				
	3			2-4' 0.4ppm		
	4					
	5			4-6' 0.4ppm		PUSHED 4-8' (CMM) 4.7-8.7' (1.9' RECOVERY)
	6	6.2': WELL GRADED SAND WITH SILT, 20% SILT, FINE TO MEDIUM SAND, SUBANGULAR, DARK GRAY (4/N), DRY.				
	7			6-8' 0.4ppm		
	8					
	9	8.4': WELL GRADED SAND WITH SILT (20%) (SW-SM), TRACE OF CLAY (<5%), SUBROUNDED FINE TO MEDIUM SAND, DARK GRAYISH BROWN (10YR 4/2), WET.		8-10' 0.5 ppm		PUSHED 8-12' 8.7'-12.7' (2.7' RECOVERY)
	10	9.1': WELL GRADED SAND W/SILT (SW-SM), 20% SILT, FINE TO MED. SAND, SUBROUNDED, BLACK (2.5/N) WET.				GW @ 9' bgs ▽

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7EGP04

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7EGP04 | SHEET: 3 of 3

(A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10	10': WELL GRADED SAND WITH SILT, 20% SILT, FINE TO MEDIUM SAND, SUBROUNDED, GRAY (10YR 6/1), WET.	10-12 0.0PPM		10-12' Sample # 7E1411 & Sample # 7E1431	1" PVC PIEZOMETER INSTALLED TO 15.7' BGS, SCREENED FROM 10.7 - 15.7' BGS
	11					
	12	12.7': End of Log				
	13					

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7EGP04

SWMU 27D

26TH SPT BN MOTORPOOL
AND ASSOCIATED TWO OIL/WATER SEPARATORS

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: TF-GP-01
3. PROJECT: Fort Stewart	2. DRILL SUBCONTRACTOR: Miller	SHEET: 1 OF 2
4. NAME OF DRILLER: H. Hamtoon	4. LOCATION: Hinesville	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4" Geoprobe Sleeves; Steel tube; PVC Piezometer	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-818917.04', N-679013.38'	
	9. SURFACE ELEVATION: NAVD-88 68.43'	
12. OVERBURDEN THICKNESS: NA	10. DATE STARTED: 1-20-98	11. DATE COMPLETED: 1-20-98
13. DEPTH DRILLED INTO ROCK: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 4' bgs	
14. TOTAL DEPTH OF HOLE: 14 bgs	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Degreaser	Greg Bryant

LOCATION SKETCH/COMMENTS

SCALE:

See location maps

PROJECT: Fort Stewart

HOLE NO: TF-GP-01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

QA CHECK BY:

etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR: | HOLE NUMBER: TF-GP-01 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1–4	(CL) Predominantly, fine to med grain sandy clay fill material, dark gray 2.5Y 4/1	3.4 ppm 2.1 ppm			
	4–7	(CL) Predominantly, fine to med. grain sandy clay fill material very dark gray 2.5Y 3/1 with some clay mottling				▽
	7–14	(CL/SC) Firm, coarse/fine grained ~~sandy~~ Clayey ~~clay~~ sand, gray 2.5Y 5/1 brown upward				Sol piezometer

PROJECT: Fort Stewart 16 SWMU's | HOLE NO: TF-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SNIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 75-GP-62
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
4. NAME OF DRILLER: Id=2	4. LOCATION: Winnie, GA SWMU-27D	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Acetate liners + sleeves; Hand pump; Steel rods	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-818990.40', N-679000.18'	
	9. SURFACE ELEVATION: NAVD-88 68.74'	
	10. DATE STARTED: 1/19/98	11. DATE COMPLETED: 1/19/98
12. OVERBURDEN THICKNESS: 20'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 2' bgs (Perched)	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 20'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES: NA	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA				
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: NA %	
	✓	✓	SVOC				
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR			
			Piezometer	Chris Miller			

LOCATION SKETCH/COMMENTS

SCALE:

See Location Map

PROJECT: Ft. Stewart 16 SWMU's	HOLE NO. 75-GP-62

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

QA CHECK BY:

etc.)

HTRW DRILLING LOG

PROJECT	Ft. Stewart 16 SWMU's	INSPECTOR		HOLE NUMBER 7F-GP-02
				SHEET 2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0–6	(CL) soft, saturated clay, 10YR 7/6 yellow color with reddish streaks	20.1 ppm			▽ (at 2)
	6–9	(CL) saturated fine to med. grain sandy clay, dark grey color 2.5Y 4/1 with some small gravel.				
	9–14	layers of the soft clay noted above ~~mixed~~				
	14	(CL) very hard sandy clay				
	14–16	(SM) fine to coarse grain silty sand, very saturated, lt. brownish grey color 2.5Y 6/2				~~Set piezometer~~ cont
	16–20	Insufficient Recovery (Fall in)				(at 20' Set piezometer)

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7F-GP-02

HTRW DRILLING LOG

DISTRICT: Savannah COE		HOLE NUMBER: 7F-GP-03
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
3. PROJECT: Ft. Stewart 16 SWMU's	4. LOCATION: Hinesville, GA SWMU-27D	
5. NAME OF DRILLER: Waz	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile [illegible]	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: [illegible] sleeves; [illegible] pump; Steel drill rods	8. HOLE LOCATION: NAD-83 E-819003.66', N-678982.69'	
	9. SURFACE ELEVATION: NAVD-88 68.84'	
	10. DATE STARTED: 1/19/98	11. DATE COMPLETED: 1/19/98
12. OVERBURDEN THICKNESS: 16'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 6'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 16'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES		
NA			N/A		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓		SVOC			N/A

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See Location Map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7F-GP-03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: ______ (Signature and Date)

well atmosphere, soil core, breathing zone, venting compressor etc.)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER	SHEET
Ft. Stewart	[illegible]	7F-GP03	

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1	(CL) Predominantly fine to medium grain sandy, clay silt material, dark grey 2.5Y 4/1, mixture of yellow and clays and coarse sand areas thin layers of mottling (unnatural) mixed within lithology	HS:65.7			
	2					
	3					
	4		HS:19.1			
	5		HS:35.7			
	6					▽WT
	7					
	8					
	9					
	10					
	11	(SC) Fine to coarse grain clayey sand 10YR 7/1 lt. grey				
	12					Piezometer
	13	Transitional Data (fall in not representative) Saturated				
	15					
	16					

PROJECT	HOLE NO.
Ft. Stewart	7F-GP-03

HTRW DRILLING LOG

1 COMPANY NAME: SAIC	2 DISTRICT: Savannah COE	HOLE NUMBER: 75-GP-04
	3 DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 3

4 PROJECT: Ft. Stewart	5 LOCATION: Hinesville GD
6 NAME OF DRILLER: Hal	7 MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47
8 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: PVC Piezometer (5' screen); Acetate Sleeves & Hand pump	8 HOLE LOCATION: NAD-83 E-819015.75', N-678983.94'
	9 SURFACE ELEVATION: NAVD-88 68.47'
	10 DATE STARTED: 1/19/99 — 11. DATE COMPLETED: 1/15/99
12 OVERBURDEN THICKNESS: 12'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈11' bgl not sure
13 DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED
14 TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18 GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19 TOTAL NUMBER OF CORE BOXES
NA			NA

20 SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	

LOCATION SKETCH/COMMENTS — SCALE:

Site Location Map

PROJECT	HOLE NO
Ft. Stewart	75-GP-04

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

well atmosphere, soil cores, cuttings, etc.)

(Signature and Date)

QA CHECK BY: _____

HTRW DRILLING LOG

PROJECT	INSPECTOR	SHEET
Ft. Stewart	[illegible]	2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0–3	(CL) sandy clay, fine to med. grain sand 2.5Y 6/1, grey color, saturated from surface water	[illegible] 0.0 (1); [illegible] 0.0 (3)			
	3	(CL) fine grain sandy clay, 2.5Y 6/1 + mottles of 7.5YR 7/6				
	3–4	(SM) fine to medium grain silty sand, black 5Y 2.5/1				▽ WT (approx.)
	5–8	Insufficient data, flowing sands + surface water				

PROJECT	HOLE NO.
FORT STEWART	1F-GA04

SWMU 27E

703D SPT BN (MAIN) MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (WASH RACK 1628)

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 76-GP-01
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET: 1 of 2
5. NAME OF DRILLER: A. Knickerbocker	4. LOCATION: SWMU-27E	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Macro Core Rods; Acetate Liner; Peristaltic Pump; PVC screen & riser; HDPE Tubing	6. MANUFACTURER'S DESIGNATION OF DRILL: GeoProbe	
	8. HOLE LOCATION: NAD-83 E-822785.47' N-691432.81'	
	9. SURFACE ELEVATION: NAVD-88 70.57'	
	10. DATE STARTED: 2-3-98	11. DATE COMPLETED: 2-3-98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 4.0'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED:	UNDISTURBED:
19. TOTAL NUMBER OF CORE BOXES: NA		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Piezometer	Jim Caley		

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO: 76-GP-01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

well atmosphere, soil core, breathing zone, venting compressed air, etc.)

AFRA DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: Todd Fahy | HOLE NUMBER: 76-GP-01 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		CONCRETE (0-1')				MACRO CORE (0-8')
	1	SANDY LEAN CLAY: CL, gray 5Y5/1 MEDIUM TO COARSE ANGULAR SAND, LENSES WITH, WELL GRADED SAND WITH SILT: SW-SM, gray 5Y5/1 <1Cm THICK Moist				PIEZOMETER (5-10') SCREENED
	2		0.0 ppm		1520 761111 COLLECTED SOIL	
		- ORGANIC MATERIAL/FRAGMENTS				
	3	TDE 2/3/98	0.0 ppm			
		TDE 2/3/98	0.0 ppm			
	4	CLAY: CH, PLASTIC, COHESIVE, moderate gray olive; 10GY 5/1, SLIGHT SAND 25%, SOFT				(3.5-3.8) POORLY GRADED SAND WITH SILT SP-SM, 10GY 5/1, SOFT MED. TO COARSE GRAINED SAND MOIST
		- ACCUMULATED LOST CORE				
		SAME AS ABOVE - SATURATED				
	5		0.0 ppm			
	6					
		- ACCUMULATED LOST CORE				
	7					
	8					
	9					
						10

PROJECT: 16 SWMU's | HOLE NO: 76-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: TG-GP-02
3. PROJECT: Fort Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: Miller	SHEET: 1 OF 2
5. NAME OF DRILLER: Hart	4. LOCATION: Hinesville GA	
6. SIZE AND TYPE OF DRILLING AND SAMPLING EQUIPMENT: 2" x 4' Samples; 2" x 1' Vent; Acetate Sleeves; 3/4 PVC piezometer	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-829803.08', N-6814404.01'	
	9. SURFACE ELEVATION: NAVD-88 70.37'	
	10. DATE STARTED: 1/20/98	11. DATE COMPLETED: 1/20/98
12. OVERBURDEN THICKNESS: 12'	13. DEPTH GROUNDWATER ENCOUNTERED: 4 bgs	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED / UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer	Greg Lappin		

LOCATION SKETCH/COMMENTS — SCALE:

See location Map

PROJECT: Fort Stewart 16 SWMU's — HOLE NO: TG-GP-02

EM FORM 5056-R, AUG 94 (Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, breathing zone, vehicle exhaust, etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart 16 SWMU's | INSPECTOR: | HOLE NUMBER: TG-GP-02 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(CL) SANDY CLAY 7.5YR 6/6 REDISH YELLOW(MOTTLED)	0 ppm			
	2					
	3	(CL) SANDY CLAY 5Y 5/1 GRAY	0 ppm			
	4					DWT
	5	NO SOIL DATA DUE SOIL COLLAPSE				
	6					
	7					
	8					
	9	(CL) SANDY CLAY 5Y 5/1 GRAY				
	10					
	11					
	12	(SM) SILTY SAND-FINE to COARSE GRAVELS 5Y 5/1, GRAY				SET PIEZOMETER

PROJECT: Fort Stewart 16 SWMU's | HOLE NO: TG-GP-02

HTRW DRILLING LOG

Field	Entry
DISTRICT	Savanah
HOLE NUMBER	76-GP-03
COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	R.E. Wright
SHEET / SHEETS	1 of 3
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	SWMU-27E
5. NAME OF DRILLER	A. Knickerbocker
6. MANUFACTURERS DESIGNATION OF DRILL	Hand Geoprobe (large-bore sampler)
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	jack-hammer (electric), 1" large-bore sampler with acetate liners, stainless steel spoons, master-Flex peristaltic pump w/LDPE tubing
8. HOLE LOCATION	NAD-83 E-822788.46', N-681385.31'
9. SURFACE ELEVATION	NAVD-88 70.67'
10. DATE STARTED	2/1/98
11. DATE COMPLETED	2/1/98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	
14. TOTAL DEPTH OF HOLE	14.45'
15. DEPTH GROUNDWATER ENCOUNTERED	3.8'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	3.0' (0:10)
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	Lead	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air,

QA CHECKED BY: ______ (Signature and Date)

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO. 76-GP-03

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 76 GP-03 | SHEET: 2 of 3

LOG (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	PSL 2/1/98	SAND with some clay ~~Clayey SAND~~ (SW-SC), yellowish brown (10YR 5/4), very soft, nonplastic, moist. (Sand is fine to medium texture).	Ø.Ø			
	1.0'				761311 Ø955	
	2.0'		Ø.Ø			PSL 2/1/98 Recovery = 2.0'/2.0'
	3.0'					3.8'-6.0': Wet
	3.8'					
	4.0'	Clayey SAND (SW-SC), dark gray (5Y4/1), very soft, slightly plastic, wet (Sand is medium texture).	NA			PSL 2/1/98 Recovery = 2.0'/2.0'
	5.0'					
	6.0'					Recovery = 2.0'/2.0' Piezometer screened From 4.45'-14.45'
	7.0'					
	8.0'					
	9.0'					
	10.0'					

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: 76-GP-03

HTRW DRILLING LOG

PROJECT: 16 SWMU's	INSPECTOR:	HOLE NUMBER: ~~TG-GP-03~~ JKL	SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					
	14					
	15					

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savanah COE	HOLE NUMBER: 76-GP-04
	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
4. PROJECT: Ft. Stewart 16 SWMU's	5. LOCATION: SWMU-27E	
6. NAME OF DRILLER: A. Knickerbocker	7. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe GH-40	
8. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Macrocore Rods; Acetate Liner; Peristaltic Pump; PVC screen & riser	9. HOLE LOCATION: NAD-83 E-822774.32', N-681409.93'	
	10. SURFACE ELEVATION: NAVD-88 20.85'	
	11. DATE STARTED: 2/1/98	12. DATE COMPLETED: 2/1/98
13. OVERBURDEN THICKNESS: NA	14. DEPTH GROUNDWATER ENCOUNTERED	
15. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 2.04'	
17. TOTAL DEPTH OF HOLE: 14.5'	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
19. GEOTECHNICAL SAMPLES: NA	DISTURBED	UNDISTURBED
20. TOTAL NUMBER OF CORE BOXES: NA		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	Paul J. Lucas

LOCATION SKETCH/COMMENTS

SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 76-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

NOTE: TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

CHECK BY:

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NO.
16 SWMU's		76-GP-04
		SHEET 2 of 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1.0'	SAND with some clay (SW-SC), yellowish brown (10YR 5/4), very soft, non plastic, moist. (Sand is fine to medium texture)	Ø.Ø			
		0.8'-1.0': Sandy CLAY (CH), red (10R 4/8), stiff, plastic				
	2.0'		Ø.Ø			
	3.0'					
		3.1				
		Clayey SAND (SW-SC), dark gray (5Y4/1), very soft, slightly plastic, moist				Recovery = 4.0'/4.0'
	4.0'		Ø.Ø			
	5.0'					
		5.5'-10.0': Seams of Sandy CLAY (CH), spaced 0.5'-1.0' apart and 0.2'-0.4' thick, greenish gray (10GY 6/1), stiff, very plastic				Recovery = 3.0'/3.0'
	6.0'					
	7.0'				761411 761431 1145	
	8.0'					
	9.0'					
	10.0'	Bottom of Boring @ 10.0'				- Piezometer screened from 9.5'-14.5' Recovery = 3.0'/3.0'

PROJECT		HOLE NO.
Ft. Stewart	16 SWMU's	76-GP-04

HTRW DRILLING LOG

PROJECT	16 SWMU's	INSPECTOR	HOLE NUMBER 7G-GP-04
			SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10					
	11					
	12					
	13					
	14					
	15					

PROJECT 16 SWMU's HOLE NO 7G-GP-04

SWMU 27E

703D SPT BN (MAIN) MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (BUILDING 1720)

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: TH-GP-01
3. PROJECT: Ft. Stewart 16 SWMU's	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2
4. NAME OF DRILLER: Hez	4. LOCATION: Hinesville, GA SWMU-27E	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 55 Mobile; 4' x 2" sampler; 4' x 1" Rods; Acetate Sleeve	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-823768.45', N-681284.59'	
	9. SURFACE ELEVATION: NAVD-88 66.24'	
	10. DATE STARTED: 1/14/98	11. DATE COMPLETED: 1/16/98
12. OVERBURDEN THICKNESS: 10'	15. DEPTH GROUNDWATER ENCOUNTERED: 3.5' bgs	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA — DISTURBED — UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA	

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: NA
	✓	✓	SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer			

LOCATION SKETCH/COMMENTS — SCALE:

See Location Map

PROJECT: Ft. Stewart 16 SWMU's — HOLE NO.: TH-GP-01

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

(Signature and Date) Well atmosphere, soil core, breathing zone, venting compressed air, etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart	INSPECTOR				HOLE NUMBER: 74-GP-01	SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1–2	[illegible] sand [illegible] pebbles, 2.5Y 5/2 [illegible]	[illegible] 1.9			
	2–4	(CL) [illegible] sandy clay, firm clay, mottled 2.5Y 7/2, [illegible] matrix with 5YR 5/6 yellowish red mottles	HS: 2.8			
	4–5	Same as above	HS: 2.3			
	5–6	Same as above but no yellowish mottles				
	6–8	(SM) [illegible] white 5YR 8/1 sand, fine grain saturated				▽ WT
	8–10	same as above (very saturated)				

PROJECT: Ft. Ste

HOLE NO: 74-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7H-GP-62
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: Miller Drilling	SHEET 1 OF 2 SHEETS
5. NAME OF DRILLER: Dale	4. LOCATION: Hinesville GA	
6. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" x 4' sampler; 4" x 1" cores; Acetate sleeves; 3/4" PVC piezometer	5. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-825446.54', N-675373.57'	
	9. SURFACE ELEVATION: NAVD-88 75.57'	
	10. DATE STARTED: 1/17/94	11. DATE COMPLETED: 1/19/94
12. OVERBURDEN THICKNESS: 12'	15. DEPTH GROUNDWATER ENCOUNTERED: 6.00'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	

LOCATION SKETCH/COMMENTS — SCALE:

See location map

PROJECT: Ft. Stewart 16 SWMU's — HOLE NO.: 7H-GP-62

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

* NOTE TYPE OF MONITORING (i.e., borehole cuttings, mc ng well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

PROJECT: Ft. Stewart | INSPECTOR: [illegible] | HOLE NUMBER: 7H-GP-02 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(Sm) FINE to MED GRAIN SILTY SAND DARK GRAY 7.5YR 3/2 AND BROWN MIX OF SHADES	0.5 ppm			
	2					
	3		0.6 ppm			
	4					
	5	SAME AS ABOVE but DARKER BROWN-BLACK	0.8 ppm			
	6					▼ W/T
	7	See Above				
	8					
	9	See Above				
	10					
	11	(SW) Saturated white 7.5YR 8/1 CLEAN Fine Grain SAND				
	12					Set Piezometer

PROJECT: Ft. Stewart 11 SWMU's | HOLE NO: 7H-GP-02

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7H-GP-03
3. PROJECT: Fort Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
5. NAME OF DRILLER: HAZ	4. LOCATION: Hinesville GA	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" x 8' Sampler; 4" x 11" Roots; Hollow Stem Auger; PVC 3/4 piezometer	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-925448.97', N-678362.26'	
	9. SURFACE ELEVATION: NAVD-88 75.30'	
	10. DATE STARTED: 1/17/98	11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: 12'	15. DEPTH GROUNDWATER ENCOUNTERED: Dry	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED
		19. TOTAL NUMBER OF CORE BOXES: NA
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: ✓	METALS: ✓
	OTHER (SPECIFY): SVOC	OTHER (SPECIFY):	OTHER (SPECIFY):	21. TOTAL CORE RECOVERY: NA %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL
	OTHER (SPECIFY): Piezometer	23. SIGNATURE OF INSPECTOR: Lee Hopper

LOCATION SKETCH/COMMENTS — SCALE:

See Location Map

PROJECT: Fort Stewart 16 SWMU's — HOLE NO: 7H-GP-03

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compd air, etc.)

QA CHECK BY: (Signature and Date)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7H-GP-03 | SHEET: 16

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1, 2, 3, 4	(SM) fine to med grain silty sand dark grey 7.5YR 3/2 and brown (mix of shades)	15.6 / 15.6			
	5, 6	(CL) sandy clay mottled light grey 7.5Y 7/1 matrix and reddish yellow 7.5YR 6/8 mottles	2.2			SWT
	7, 8, 9, 10	(SW) saturated white 7.5YR 8/1 clean fine grain sand				
	11, 12	(SC) Clayey sand saturated, light grey color 7.5YR 7/1				Sat. recovered

PROJECT: 16 SWMU's

HOLE NO. 7H-GP-03

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7N-GP-04
3. PROJECT: Ft. Stewart 16 SWMU's	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
4. NAME OF DRILLER: Hare	4. LOCATION: Hinesville	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2" Sampler; 4' x 1" Steel rods; 3/4" Piezometer; Auger sleeves	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
	8. HOLE LOCATION: NAD-83 E-825434.83', N-678364.38	
	9. SURFACE ELEVATION: NAVD-88 75.15'	
	10. DATE STARTED: 1/18/98	11. DATE COMPLETED: 1/18/98
12. OVERBURDEN THICKNESS: 10'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈6'	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	✓	SVOC			NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	

LOCATION SKETCH/COMMENTS

SCALE:

See location map

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 7N-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

well drillers, soil scientists, etc.)

HTRW DRILLING LOG

PROJECT	16 SWMU's	HOLE NUMBER	7H-GP-04
	INSPECTOR	SHEET	2 of 2

28

UNIT (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(SM) Silty SAND w/some mottles SANDY CLAY 2.5Y 3/1 MIX SHADES	1.4 ppm			
	2					OMH
	3		1.5 ppm			
	4	SAME AS Above				
	5		1.8 ppm			
	6					▼ WT
	7	(CL) Saturated gray tan/white Sandy clay				
	8	See Above				
	9	(SW) Saturated white 7.5YR 8/1 CLEAN Fine grained SAND				
	10					Set piezometer

PROJECT Ft. Stewart 11 SWMU's HOLE NO 7H-GP-04

SWMU 27F

3D ENGINEER BRIGADE MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (NORTHWEST OF BUILDING 1340)

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HTRW DRILLING LOG

Field	Entry
DISTRICT	Savanah COE
HOLE NUMBER	TJ-GP-Ø1
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	RE, Wright
SHEET 1 OF 3 SHEETS	
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	SWMU-27F
5. NAME OF DRILLER	Al Root
6. MANUFACTURER'S DESIGNATION OF DRILL	Geoprobe 5400
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	2" dia. macrocore sampler w/Acetate liners, stainless steel spoons, peristaltic pump w/HDPE tubing
8. HOLE LOCATION	NAD-83 E-821509.30', N-684398.37'
9. SURFACE ELEVATION	NAVD-88 68.71'
10. DATE STARTED	1/18/98
11. DATE COMPLETED	1/18/98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	——
14. TOTAL DEPTH OF HOLE	16.0'
15. DEPTH GROUNDWATER ENCOUNTERED	12.0'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	8.10' (Ø:10)
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
——			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	2	——	Lead	SVOC		NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS See page #39 SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO. TJ-GP-Ø1

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

QA CHECK BY: ____ (Signature and Date)

Well atmosphere, Screening, etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: TJ-GP-01 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0'	~~Silty SAND~~ TSL 1/18/98 SAND with some silt (SW-SM), olive (5Y5/3), nonplastic, soft, moist	Ø.5			
	1.0'					
	2.0'		1.6			
	3.0'					
	3.0'	~~Silty SAND~~ TSL 1/18/98 Silty SAND with traces of clay (SM), olive (5Y4/3), nonplastic, soft, moist				
	4.0'		Ø.Ø			
	5.0'					
	6.0'		1.6			
	7.0'					
	8.0'		6.8		751111 Ø940	
	8.5'	Sandy CLAY (CL), white (5Y8/1), slightly plastic, medium stiff, moist				
	9.0'					

PROJECT: 16 | HOLE NO: TJ-GP-01

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NO.: 25-GP-01 | SHEET: 3 of 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	9.0'					
	10'		1.1			
	11'					
		11.5' Silty SAND (SM), white (5Y 8/1), nonplastic, very soft, moist				12.0'-16.0': Wet
	12'	12.0'-16.0': Wet				
	13'					
	14'					
	15'					
	16'	Bottom of Boring = 16.0'				

PROJECT: Ft. Stewart 16 SWMU's HOLE NO. 25-GP-01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7J-GP-02
3. PROJECT: Ft. Stewart Georgia 16 SWMU's	3. DRILL SUBCONTRACTOR: N/A	SHEET 2 OF 2 SHEETS
5. NAME OF DRILLER: Andy Knickerbocker	4. LOCATION: SWMU # 27F	
6. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe - Macrosampler 6-7836	6. MANUFACTURERS DESIGNATION OF DRILL: Geoprobe	
	8. HOLE LOCATION: 7J-GP-02 E: 821527.80' N: 684379.47' NAD-83	
	9. SURFACE ELEVATION: NAVD-88 68.50'	
12. OVERBURDEN THICKNESS: NA	10. DATE STARTED: 2/3/98	11. DATE COMPLETED: 2/3/98
13. DEPTH DRILLED INTO ROCK: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: ~ 9.75' BGL	
14. TOTAL DEPTH OF HOLE: ~ 14.75' BGL	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	✓	Lead	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer	Todd Ecday		

LOCATION SKETCH/COMMENTS: See Page 29 SCALE:

PROJECT: Ft. Stewart 16 SWMU's

HOLE NO: 7J-GP-02

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

(Signature and Date)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 75-GP-02 | SHEET: 2 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		GRASS ROOT ZONE (0-0.2') SAME AS BELOW				MACRO CORE (0-10')
		WELL GRADED SAND WITH SILT; SW-SM FINE GRAINED SAND, YELLOWISH BROWN 10YR 5/4, SOFT				PIEZOMETER SET (14.15 - 9.75')
	1	SANDY SILT; ML, VERY FINE SAND, SOFT, DARK BROWN 7.5 YR 3/3, LENSED WITH YELLOWISH RED 5YR 5/8	0.0 ppm			
	2	WELL GRADED SAND WITH SILT; SW-SM DARK YELLOWISH BROWN 10YR 3/6, FINE TO MED. GRAINED SAND, SOFT, MOIST, LENSED WITH; SMALL < 1cm CLAY-FAT CLAY LIGHT GREY 10YR 7/1 AND VERY FINE TO MED SAND WITH SILT SW-SM, SOFT, VERY DARK BROWN 10YR 2/2, MEDIUM GRAINED	0.0 ppm			
	3		0.0 ppm			
	4		0.0 ppm			
		TOE				
	5		0.2 ppm		1127 SAMPLE 75-GP-02	
		SANDY SILT: ML, SOFT, MOIST/SATURATED, VERY DARK GRAY 10YR 3/1, FINE TO MED. GRAINED SAND	0.7 ppm			
	6		0.2 ppm			-SATURATED
	7	SANDY FAT CLAY; CH, PALE YELLOW 5Y 7/3 POORLY GRADED SAND, SOFT, SATURATED, LENSED WITH; MED. TO COARSE GRAINED WELL GRADED SAND WITH SILT SW-SM AND POORLY GRADED SAND WITH SILT 5Y 3/2	0.1 ppm			
	8		0.7 ppm			
	9		0.4 ppm			
			0.2 ppm			

PROJECT: 16 SWMU's | HOLE NO: 75-GP-02

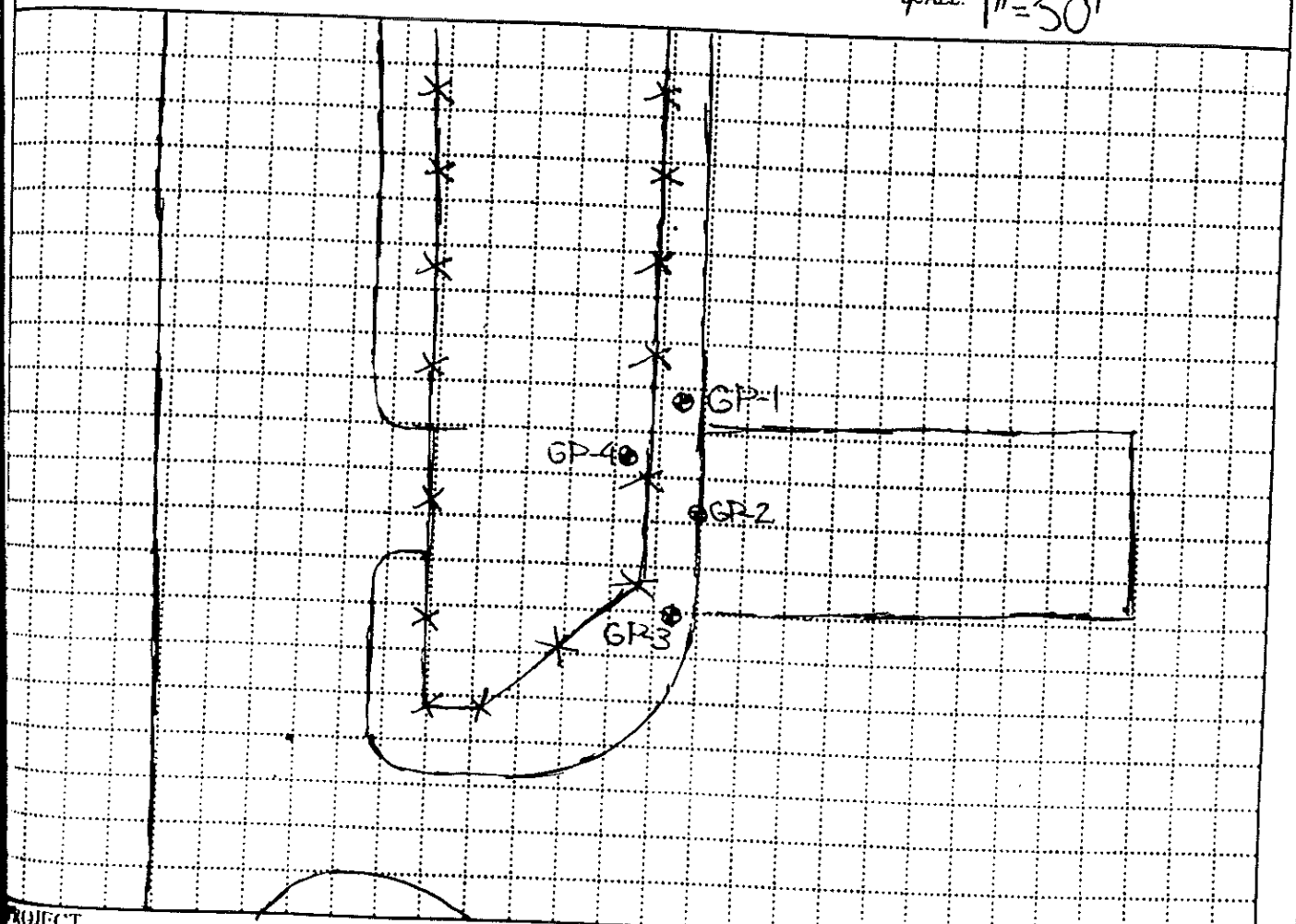
HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 75-GP-03
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
4. NAME OF DRILLER: Al Root	4. LOCATION: SWMU-27F	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" dia. Macrocore sampler w/Acetate liners	5. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400	
	6. HOLE LOCATION: E-821538.38', N-684358.35' NAD-83	
	7. SURFACE ELEVATION: NAVD-88 67.97'	
	8. DATE STARTED: 1/17/98	9. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: N/A	13. DEPTH GROUNDWATER ENCOUNTERED: 11.4'	
13. DEPTH DRILLED INTO ROCK:	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.13' (0:10)	
14. TOTAL DEPTH OF HOLE: 12.0'/14.1'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: N/A			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: N/A %
	2	Lead 0/0	SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: Paul J. Jucat		
			Piezometer			

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



PROJECT: Ft. Stewart 16 SWMU's

HOLE NO: 75-GP-03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil cover, groundwater, etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart | INSPECTOR: | HOLE NUMBER: 75-GP-03 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		~~Clayey SAND~~ PSL 1/17/98 SAND with some clay (SW-SC), slightly plastic, soft, moist	3.4			Hydrocarbon odor From 1.0'-12.0'
	1.0'					
	2.0'		5.5			
	3.0'					
	4.0'		44.5			
	5.0'					
		5.8'				
	6.0'	~~Clayey SAND~~ PSL 1/17/98 Sandy CLAY (CL), medium plastic, medium stiff, moist, pale yellow (5Y 7/4)	311.		751321 1610	
	7.0'	7.1'-7.3': Black wet layer w/petroleum odor				
		7.5'-8.0': Mottled clay				
	8.0'		178			
	9.0'					
		Continued on next page				

PROJECT: Ft. Stewart | 11 WMU's | HOLE NO: 75-GP-03

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INJECTOR: | HOLE NUMBER: TJ-GP-03 | SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	9.0'					
	10.0'	10.0'-10.5': Mottled	303			
	11.0'					
		11.4' Fine to medium SAND w/ some silt (SW-SM), yellow (5Y 7/6), nonplastic, wet				
	12.0'	Bottom of Boring = 12.0'				

PROJECT: Ft. Stewart 11 & WMU's | HOLE NO: TJ-GP-03

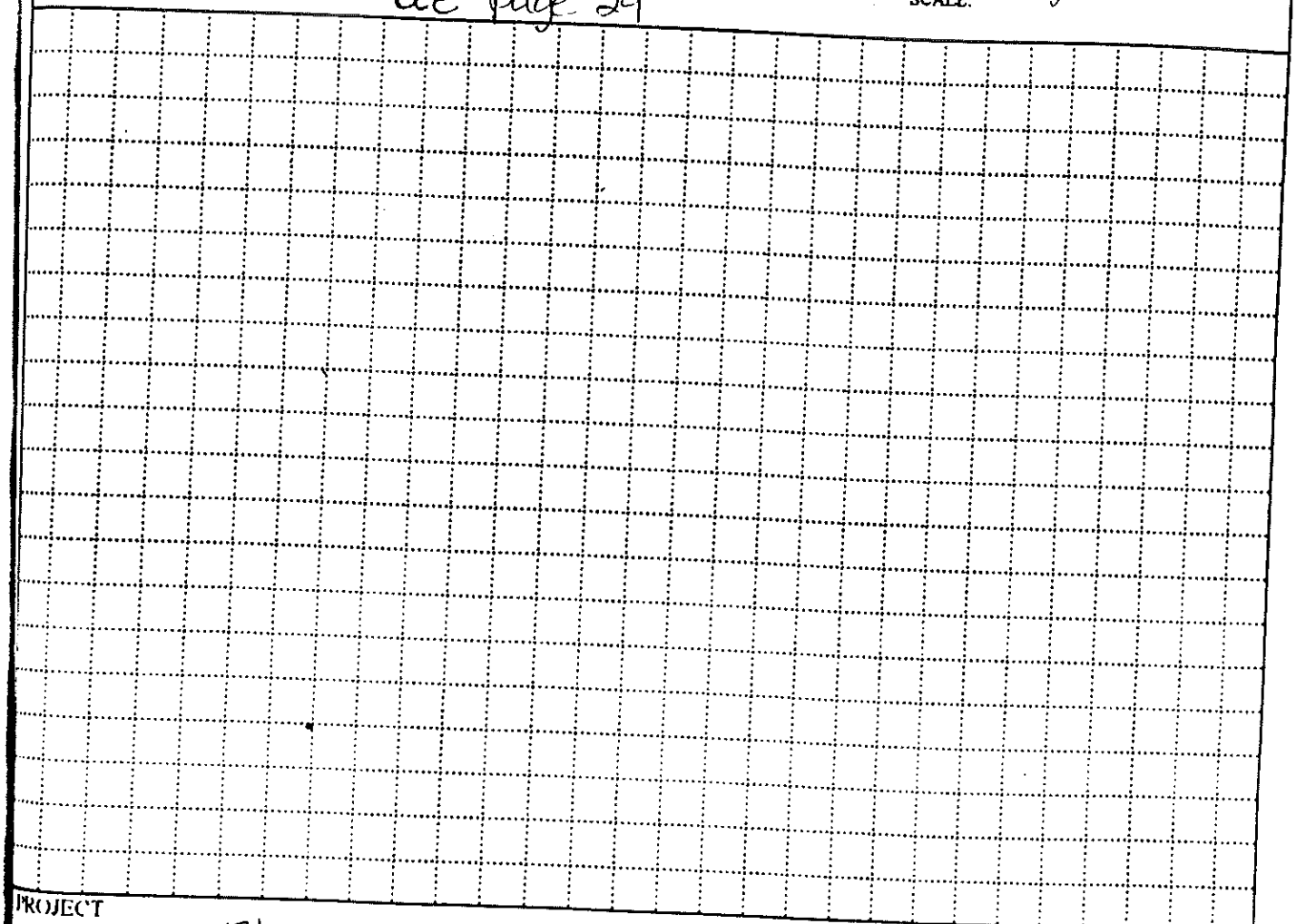
HTRW DRILLING LOG

1. COMPANY NAME: SAIC.	2. DISTRICT: Savannah COE.	HOLE NUMBER: 7J-GP-04
3. PROJECT: Ft. Stewart, Georgia 16 SWMU's	2. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2
4. NAME OF DRILLER: Hardy Knickerbocker	4. LOCATION: SWMU #27F	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Geoprobe - Direct push 6.7" EGL	6. MANUFACTURER'S DESIGNATION OF DRILL: GL. CT. KOBE	
	8. HOLE LOCATION: 7A-GP-04 E - 821513.22' N - 684375.51' NAD-83	
	9. SURFACE ELEVATION: NAVD-88 67.86'	
	10. DATE STARTED: 2/3/98	11. DATE COMPLETED: 2/3/98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: ~9.5 BGL	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: ~14.5' BGL	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			piezometer	Hardy Knickerbocker		

LOCATION SKETCH/COMMENTS: See page 29 SCALE:



PROJECT: Ft. Stewart 16 SWMU's

HOLE NO.: 7J-GP-04

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

(Signature and Date)

etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | LOCATION: | HOLE NUMBER: 7J-GP-04 | SHEET: 2 of 2

FEET (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		VERY COARSE SAND/GRAVEL SUB-BASE				MACRO CORE (0-10')
	1	WELL GRADED SAND WITH SILT: SW-SM, 50% VERY FINE GRAINED SAND, YELLOWISH RED 5YR 5/6	0.0 ppm			PIEZOMETER SET (9.5-14.5' BGL)
	2	POORLY GRADED SAND WITH CLAY: SP-SC, FIRM, STRONG BROWN 7.5YR 5/6 TO 7.5YR 5/8, LENSED WITH SANDY LEAN CLAY: CL < 2cm	0.0 ppm			
	3		0.0 ppm			
	4		0.0 ppm			
	5		0.0 ppm			
		SANDY LEAN CLAY: CL, COARSE SAND, HARD, YELLOW 10YR 8/8				
	6		0.0 ppm			
	7		0.0 ppm			
		LEAN CLAY WITH SAND: CL, HARD, VERY FINE SAND ~ 5% GRADING DOWNWARD TO ~ 25% VERY FINE SAND, WHITE 2.5 Y8/1			1210 7J-GP-04 COLLECTED 8-10' BGL	
	8					
	9					
		VERY FINE SAND: SW, SATURATED RAPID DILATENCY, WHITE 2.5 Y8/1				

PROJECT: 16 SWMU's | A.18-12 | HOLE NO: 7JGP-04

3

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-01

SHEET 1 OF 4

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers

5. NAME OF DRILLER: Darren Penn /

6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-59 / CME-85

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: For S. Casing ⇒ 8¼" ID augers - Sch. 80 PVC (6.6'long) 2" Split Spoons (2' long)

8. HOLE LOCATION: See map. 27F-MW1 N684433.25 E821537.79

9. SURFACE ELEVATION: TOC 69.16

10. DATE STARTED: 10/9/99

11. DATE COMPLETED:

12. OVERBURDEN THICKNESS: N/A

13. DEPTH DRILLED INTO ROCK: N/A

14. TOTAL DEPTH OF HOLE: 21 FT

15. DEPTH GROUNDWATER ENCOUNTERED:

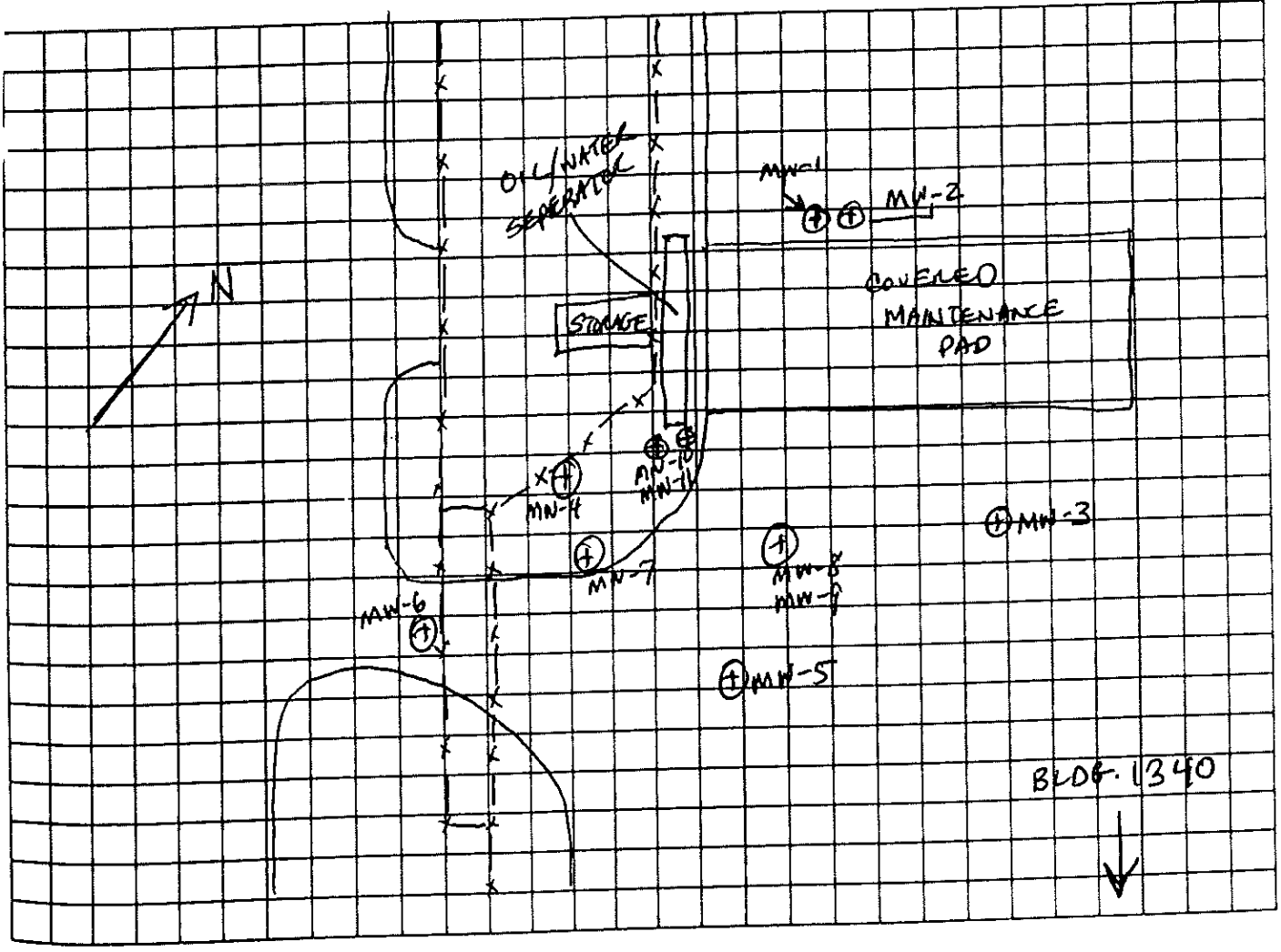
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	RCRA METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	BTEX	NOC / TOC				
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
		2" ID		H Smith		

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

UA CHECK BY:

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs | INSPECTOR: Heather Smith | SHEET 2 OF 4

4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0–1	SC - Clayey Sand med → fine gr. sand angular → subrounded moist, soft to firm Predominantly 5YR7/1 Lt Grey mottled w/ 10YR 5/6 yellowish red	(headspace 0-2' bgs) 2.5 ppm		0.0 Samp. ID # 7J1171 @1535 1.0	RUN #1 RUN 2' Rec. 1.25' LOSS .75' (1)
	1–2	LOSS				RUN from Bottom of Concrete. Concrete Plug .83' above g.s. (2)
	2–3	Same as above - wet (but only because water was used to core the concrete here this morning - Not Natural g.w.	(headspace 2-4' bgs) 3.1 ppm		3.0	RUN #2 RUN 2.0 Rec 2.0 LOSS 0 (3)
	3–4	CL - Lean Clay w/ some Sand high plasticity, moist, soft to firm (Same color as above) SM - Silty Sand - black? (5YR 2/1) grey grains dry, soft (10YR 2/1) SM - Silty Sand med → fine gr. sub.rounded → subang. 10YR 3/3 dk brown wet - due to coring.		3.5 geotech	Samp. ID # 7J1172 4.0 @ 1550	Both sections are SM from 3.1 → 3.6 but there is a DISTINCT color change between the 2 @ (4)
	4–6	SC - Clayey Sand. ~40% clayey ~60% Sand med. grains - (predominantly) Some cs (10%) Some fine (10%) Med. plasticity → high plasticity 10YR 6/1 GREY LOSS	(headspace 4-6' bgs) 2.0 ppm	4.0		RUN #3 RUN 2.0 REC 1.5 LOSS 0.5 (5) SET SURFACE CASING (6)
	7					
	8					
	8.6–9	8.6': CLAY (CL); LIGHT GRAY (2.5Y 7/1), WITH RED MOTTLING STREAKING, STIFF, MED TO HIGH PLASTICITY, MOIST				CLAY AT 8.6' BASED ON LOG FROM 27F-MW2
	10					

HTRW DRILLING LOG 27F-MW2

HOLE NUMBER

SHEET 3 OF 4

PROJECT: Fort Stewart USTs

INSPECTOR L. MERCADO

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	10': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-SAND ROUNDED, SLIGHT PLASTICITY, MOIST				BASED ON LOG FROM LMM 10/11/99 WELL 27F-MW2
	11	11': SANDY CLAY (CL), LIGHT GRAY (5Y 7/1), F-SAND, SLIGHT PLASTICITY, MOIST				
	12	12': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-M SAND, SUBROUNDED, ~~LOOSE~~ ~~SAT~~ MED. DENSE, WET. LMM 10/11/99				▽ GW ENCOUNTERED ≡ AT 12 FT.
	13					
	14	13.5': SAND (SP), YELLOW (2.5Y 7/6), F-M SAND, SUBROUNDED, LOOSE SAND, LITTLE TO NO FINES, WET.				
	15					
	16					2" SCH-40 PVC WELL SET AT 19.65 FT
	17	16': SAND (SP), YELLOW (2.5Y 7/6), F-M SAND, SUBROUNDED, LOOSE LITTLE TO NO FINES.				
	18	18': INCREASE IN GRAIN SIZE				
	19					
	20					

HTRW DRILLING LOG 27F-MW1

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR L. Mercado

SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
						HSA TO 21 FT
	21	21' END OF BORING				
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW2

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: MDC

SHEET ___ OF ___

3. PROJECT: Fort Stewart

4. LOCATION: SWMU 27F

5. NAME OF DRILLER: B. UPCHURCH

6. MANUFACTURERS DESIGNATION OF DRILL: CME-85

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" HSA; 5' CONTINUOUS SAMPLER

8. HOLE LOCATION: 27F-MW2

9. SURFACE ELEVATION: TOC 69.27 N 684435.72 E 821540.10

10. DATE STARTED: 10/10/99

11. DATE COMPLETED: 10/10/99

12. OVERBURDEN THICKNESS: N/A

13. DEPTH DRILLED INTO ROCK: N/A

14. TOTAL DEPTH OF HOLE: 45 FT

15. DEPTH GROUNDWATER ENCOUNTERED: ~12 FT

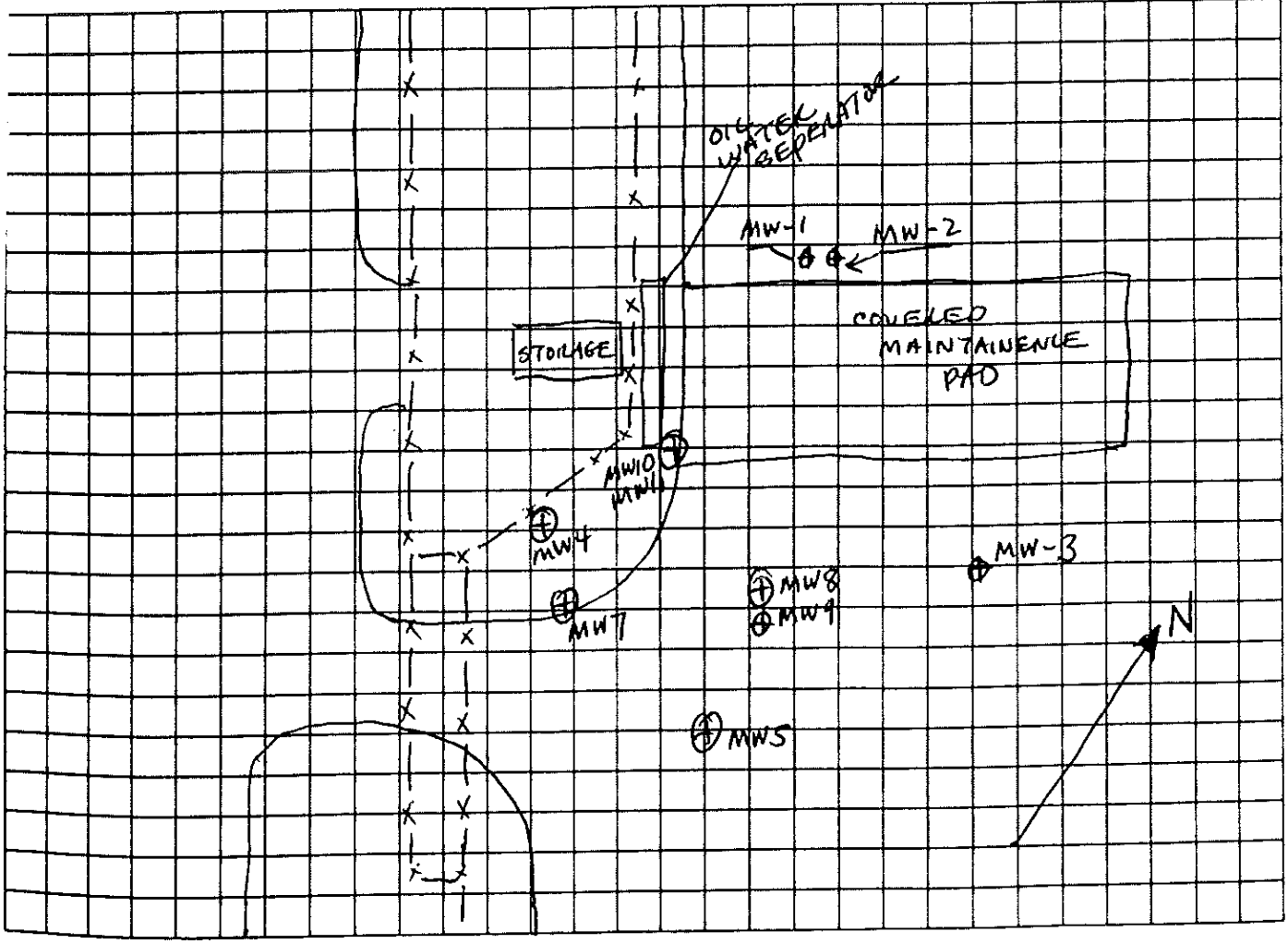
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	RCRA	SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			2" PVC	L. Mucak		

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere soil core, breathing zone, venting compressed air, etc.)

QA CHEC

(Signature and Date)

HTRW DRILLING LOG — 27F-MW2 — HOLE NUMBER — 4

PROJECT: Fort Stewart USTs — INSPECTOR L. MERCADO — SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	0-0.85': CONCRETE FROM MOTOR POOL				
	1	0.85': CLAYEY SAND(SC): LIGHT GRAY(5YR 7/1) & RED (2.5YR 4/8), F-SAND TO M-SAND, DENSE, SLIGHT PLASTICITY, DRY	0.85-2.5 (3.2)	1-2' SOIL SAMPLES TJ1271 TJ1221 @ 1245		0.85-5': (4.15/4.15)
	2					
	3	2.6': CLAYEY SAND(SC), MOTTLED LIGHT GRAY(5YR 7/1) RED (2.5YR 4/8) & YELLOWISH BROWN (10YR 5/6), F-M SAND, SLIGHT PLASTICITY, DRY.	2.5-5' (2.8)	2.5-5' SOIL SAMPLE TJ1272 @ 1320		
	4	3.2': SILTY SAND(SM), VERY DARK GRAY (10YR 3/1), F-SAND, WITH SOME SILT (~20%), DRY.				
	5	4.2': SILTY SAND(SM), LIGHT YELLOWISH BROWN (2.5Y 6/4), AS ABOVE, MOIST.				
	6	5': SANDY CLAY(CL), LIGHT GRAY (2.5Y 7/1) & OLIVE YELLOW (2.5Y 6/6), F-M SAND, SLIGHT PLASTICITY, MOIST.	5-7.5' (0.6)			5-10': (4.8/5)
	7					
	8	7': SANDY CLAY(CL), AS ABOVE BUT MOTTLED WITH REDDISH BROWN (5YR 4/4), MOIST.	7.5-10' (0.4)			
	9	8.6': CLAY(CL), LIGHT GRAY (2.5Y 7/1) WITH RED (10R 5/6) MOTTLING/STREAKS, STIFF, MED TO HIGH PLASTICITY, MOIST.				
	10					

HTRW DRILLING LOG — 27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	10': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-SAND, ROUNDED, SLIGHT TO NO PLASTICITY, MOIST.		10-12 (0.7)		10-15': (3.7/5)
	11	11': SANDY CLAY (CL), LIGHT GRAY (5Y 7/1), F-SAND, SLIGHT PLASTICITY, MOIST.				
	12					▽ GW ENCOUNTERED AT 12 FT
	13	12': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-M SAND, SUBROUNDED, MED DENSE, WET				
	14	13.5': SAND (SP), LIGHT GRAY (5Y 7/1), F-SAND, SUBROUNDED, LOOSE SAND, LITTLE TO NO FINES, WET.				
	15					15-20': (NO RECOVERY)
	16	16': SAND (SP), YELLOW (2.5Y 7/6), F-M SAND, SUBROUNDED, LOOSE SAND, LITTLE TO NO FINES, WET.				
	17					
	18	18': INCREASE GRAIN SIZE				
	19					
	20					

HTRW DRILLING LOG

27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR L. MERCADO

SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	20	20': SAND(SP), YELLOW (2.5Y 7/6), M-SAND, SUB-ROUNDED, LOOSE, WET.				20-25': (NO RECOVERY)
	21					
	22					
	23					
	24					
	25	25': SAND(SP), PALE YELLOW (2.5Y 8/4), F-M SAND, LOOSE, SUBROUNDED, WET.				25-30': (1,5/5)
	26					
	27	27': SAND(SP), GREENISH GRAY (10Y 6/1), F-M SAND, LOOSE SUBROUNDED, WET.				
	28					
	29					
	30					

HTRW DRILLING LOG — 27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	30	30': SAND (SP), GREENISH GRAY (10Y6/1), F-M SAND, LOOSE, SUBROUNDED, WET.				30-35': (0.5/5)
	31					
	32					
	33					
	34					
	35					35-40': (0/5)
	36					
	37			37-40' GEOTECH SAMPLE NO. 7J1273 @ 1615		
	38					
	39	39': SAND (SP), AS ABOVE WITH TRACE OF COARSE SAND, WET.				
	40					

8

HTRW DRILLING LOG

27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR L. MERCADO

SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	41	40': SANDY CLAY (CL), LIGHT GREENISH GRAY (5GY 7/1) F-CRS SAND, STIFF, SLIGHT PLASTICITY, ~~WET~~ MOIST. LMM 10/10/99				40-45': (5/5) (HAWTHORNE?)
	42	41': CLAYEY SAND (SC), LIGHT GREENISH GRAY (5GY 7/1), F-CRS SAND, ROUNDED, DENSE, SLIGHT TO NO PLASTICITY, MOIST.				
	43					
	44	43-45': CLAYEY SAND (SC), AS ABOVE WITH TRACE OF BIVALVE SHELL FRAGMENTS, MOIST.				
	45	45': END OF BORING				
	46					
	47					
	48					
	49					
	50					

48

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: ZTF-MW-63(TJ)

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 4

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers Brigade Motorpool.

5. NAME OF DRILLER: Doug Bishop

6. MANUFACTURERS DESIGNATION OF DRILL: CME 75

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME Model 75 Drill rig; 4¼-in. ID, Hollow-stem augers, with 9-in. diam. bit, 3½-in. ID x 5-Ft Spl. + spoons.

8. HOLE LOCATION: E. of covered Maint. pad. N 684392.10

9. SURFACE ELEVATION: TOC 68.45 ft E 821630.44

10. DATE STARTED: 10-10-99

11. DATE COMPLETED: 10-10-99

12. OVERBURDEN THICKNESS: N/A

15. DEPTH GROUNDWATER ENCOUNTERED: 14 Ft BGS

13. DEPTH DRILLED INTO ROCK: N/A

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 12.3 Ft BTOC - 7.7 Ft BGS / 2 hrs.

14. TOTAL DEPTH OF HOLE: 25.0 Ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: DISTURBED / UNDISTURBED

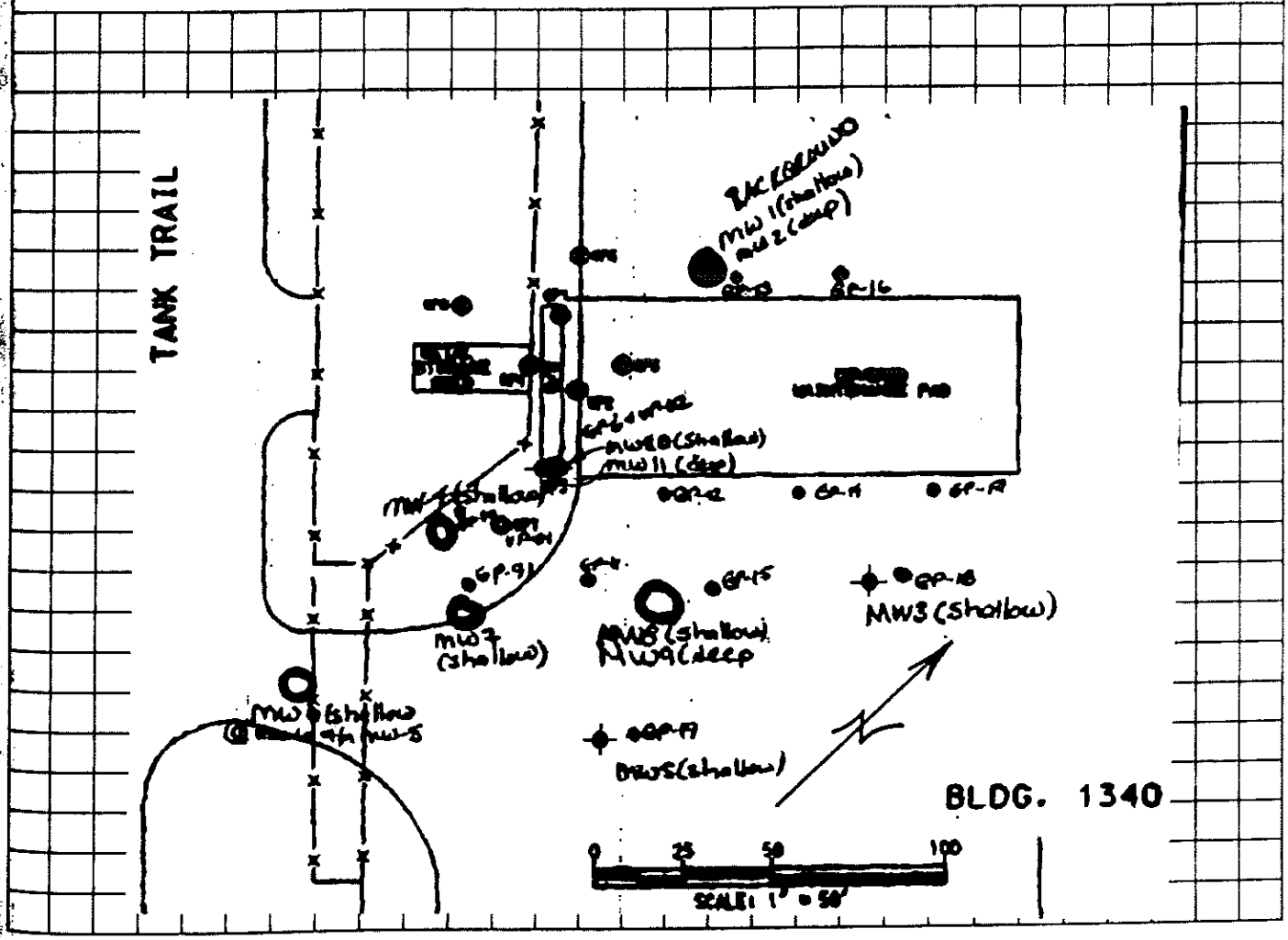
19. TOTAL NUMBER OF CORE BOXES: N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	X	SVOC			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		

LOCATION SKETCH/COMMENTS

SCALE: 1-in. = 50 Ft



HTRW DRILLING LOG

HOLE NUMBER [illegible] 49

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 2 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete pavement	N/A	N/A	N/A	
	1	Lt. red (10R 6/6) sandy clay: moist, mottled, med plast.	1.3ppm		7J1371	Drill: 4.3 Ft Recover: 3.2 Ft
	2	Lt. yell-brn (10YR 6/4) silty gravel sand: moist, F-to C-grnd, loosely packed.				
	3	Black (10YR 2/1) silty sand Dry, F-grnd, ~~dark top~~, massive, loosely packed.	7.5ppm	N/A	N/A	
	4	V. pale brn (10YR 8/3) sand: dry, massive, F-grnd, dark top, loose.				
	5	No Recovery	N/A		N/A	
	6	Gray (10YR 6/1) and Lt. yell-brn (10YR 6/4) sandy clay: moist, plastic, mottled to stratified	1.8ppm	N/A	N/A	Drill: 5.0 Ft Recover: 5.0 Ft
	7					
	8					
	9	gray and Lt. red sandy clay: moist, stiff, plastic, mottled.	76ppm		7J1372	
	10					

HTRW DRILLING LOG

HOLE NUMBER ZTF-MW-03(TS) 50

PROJECT: Fort Stewart USTs

INSPECTOR Timothy Coffey

SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Gray clay: moist, stiff plastic, thinly laminated/ stratified	13ppm.	N/A	N/A	Drill: 5.0 Rt Recover: 4.2 Rt
	12	V. pale brn: clay sand: wet, stratified/ thin-lam, F-grnd.		751373		
	13	Yellow (10YR 7/6) clay sand: wet, mottled, graded, F- to C-grnd, mod. packed to loose.	1.3ppm		N/A	Coarse sand bed.
	14					Water @ 14 Rt
	15	No Recovery	N/A	N/A	N/A	
	16	Yellow (10YR 8/6) clay silt: wet, F- to M-grnd, sl. plastic.				No sampling, lith from cuttings.
	17			751373		
	18		N/A		N/A	
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-03 (75) 51

PROJECT: Fort Stewart USTs

INSPECTOR Timothy Coffey

SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Yellow clay sand (as above)		751373		
	22		N/A	N/A	N/A	
	23					
	24					
	25					TD = 25.0 ft.
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-04

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller

SHEET 1 OF ___

3. PROJECT: Fort Stewart

4. LOCATION: 27F

5. NAME OF DRILLER:

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID HSA, 5ft continuous split spoon

8. HOLE LOCATION: See Map Below

9. SURFACE ELEVATION: TOC 68.02 ft N 684325.34 E 821587.60

10. DATE STARTED: 11 Oct 99

11. DATE COMPLETED: 11 Oct 99

12. OVERBURDEN THICKNESS: NA

15. DEPTH GROUNDWATER ENCOUNTERED:

13. DEPTH DRILLED INTO ROCK: NA

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.4 / 4 hrs (auger string @ 15 ft bls)

14. TOTAL DEPTH OF HOLE: 18.0 ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: (DISTURBED) UNDISTURBED

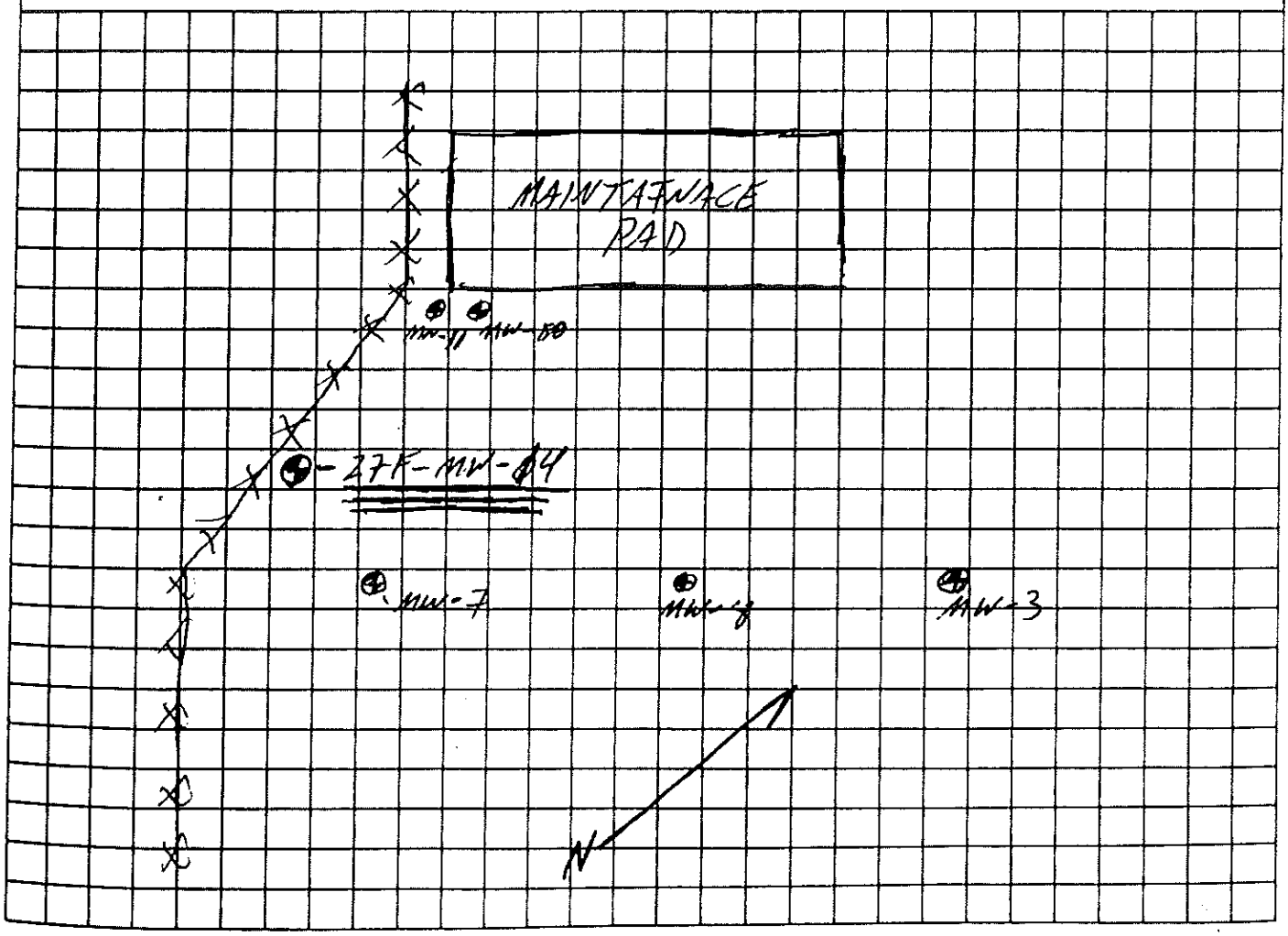
19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOA			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		✓		

LOCATION SKETCH/COMMENTS

SCALE: NA



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

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HTRW DRILLING LOG

HOLE NUMBER 27F-MW04

PROJECT: Fort Stewart USTs | INSPECTOR Brad Baker | SHEET 1 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	SAND; sand: med ~ 95% silt ~ 5%; Lt Brownish Gray 10YR 6/2; subrounded; mod sorted; soft; nonplastic; moist roots present (SM)	0.2 ppm		0-1 ft ID: 7J1471 0930 hrs	Run #1 0-5 ft 3.4 ft recovery
	1	CLAYEY SAND; sand: med-coarse ~ 70%, clay ~ 30%; Lt Brownish Gray 10YR 6/2 variegated red and yellowish orange; subrounded; poorly sorted; firm low plasticity; moist (SC)		NA		
	2					
	3	SAND; sand: fine-med ~ 85% silt ~ 15%, DK Gray, Lt Brown 10YR 6/2 banded dk brown and light Gray; mod sorted; soft-firm; nonplastic; moist (SM)	0.6 ppm			
	4					
	5					
	6	SANDY CLAY; sand: med-coarse ~ 40%, clay ~ 60%; Yellow 10YR 7/6 w/ wisps of lt. gray clay; subrounded; poorly sorted; firm; mod. plasticity; moist; (CL)	0.6 ppm		7J1442 R.inste 5.0-6.9 ft ID: 7J1472 1010 hrs	0935 R.inste sample collected prior to 5-10 ft run. DI H2O to wash decon split spoon
	7	SAND; med-coarse ~ 80%, silt ~ 20%; Yellow 10YR 7/6 w/ thick wisps of red and lt. gray; subrounded; mod sorted; firm; nonplastic; moist (SM)		NA		Run #2 5-10 ft 1.9 ft recovery
	8					
	9					
	10					

HTRW DRILLING LOG

HOLE NUMBER 27F.MW [illegible]

PROJECT: Fort Stewart USTs | INSPECTOR [illegible] | SHEET 2 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	No Recovery				Run #3 10 - 15 ft - 12.0 ft bls drilling became soft
	12		NA	NA	NA	- BZ - 0.0 ppm cuttings 70.0 ppm @ 13 ft bls
	13					- Outside of spoon wet bottom 2.5 ft ∴ 12.5 ft bls - 1040 hrs. H_2O heard @ 9.5 ft bls
	14					- No free product or saturated soils throughout sample intervals - 1120 hrs - H_2O @ 8.3 ft bls auger string @ 15.0 ft
	15	Drilled out	14.2 ppm	Bag Sample 15-16 ft bls 1500 hrs		1445 H_2O @ 7.4 ft bls
	16		NA		NA	
	17					
	18	TD = 18.0 ft bls.				
	19					
	20					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: ZTF-MW-05(DS)

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 3

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers Brigade Motorpool.

5. NAME OF DRILLER: Doug Bishop

6. MANUFACTURERS DESIGNATION OF DRILL: CME 75

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME Model 75 Drill rig; 4¼-in. ID Hollow stem augers, with 9-in. diam. bit; 3½-in. ID x 5-ft split-spoon samplers

8. HOLE LOCATION: E. of covered maint. pad.

9. SURFACE ELEVATION: TOC 67.99 ft N 684814.94 E 821614.36

10. DATE STARTED: 10-10-99

11. DATE COMPLETED: 10-10-99

12. OVERBURDEN THICKNESS: N/A

13. DEPTH DRILLED INTO ROCK: N/A

14. TOTAL DEPTH OF HOLE: 20.0 ft

15. DEPTH GROUNDWATER ENCOUNTERED: 13.5 ft BGS

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: DISTURBED / UNDISTURBED

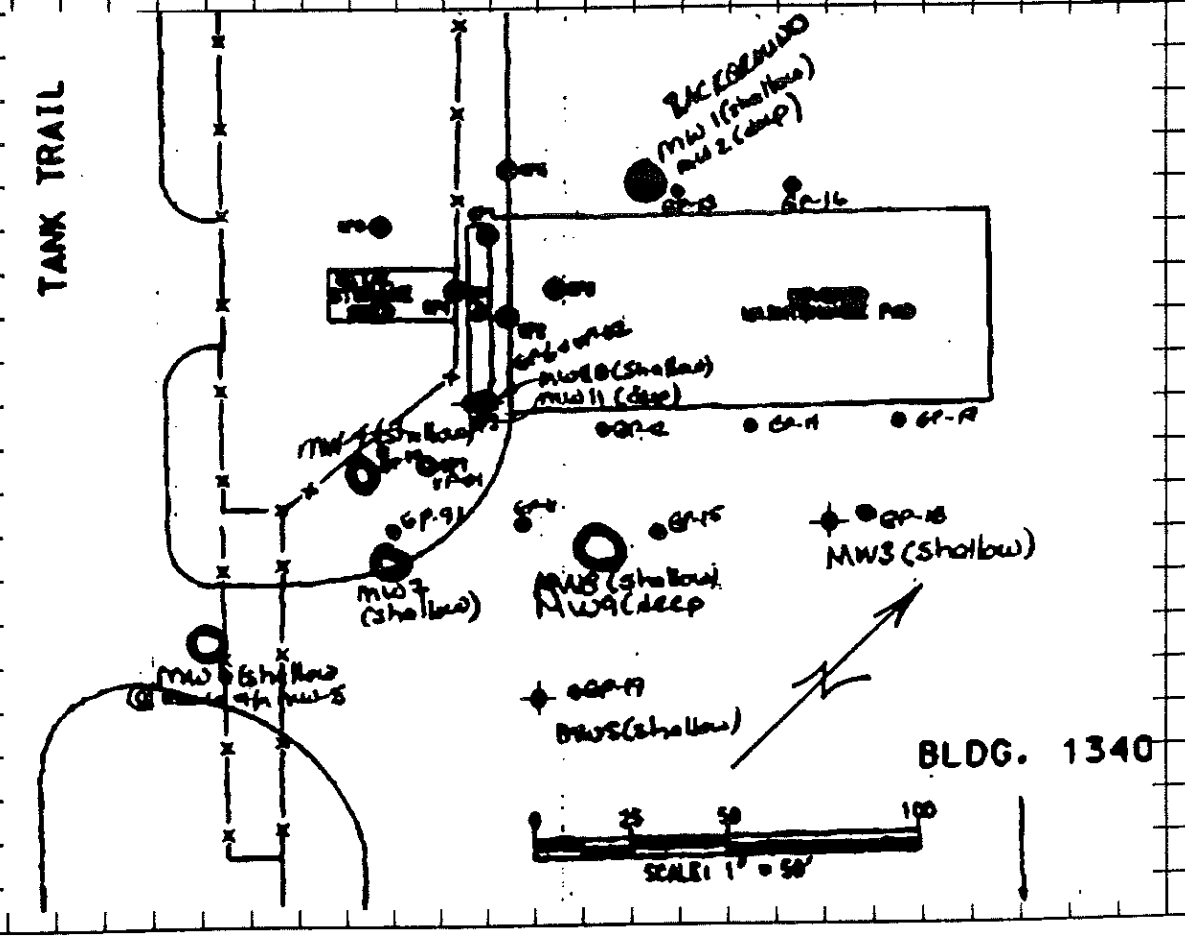
19. TOTAL NUMBER OF CORE BOXES: N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	X	SVOC			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Timothy Coffey

LOCATION SKETCH/COMMENTS

SCALE: 1-in. = 50 ft.



HTRW DRILLING LOG

HOLE NUMBER ZTF-MW-06(75) 64

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete Pavement	N/A	N/A	N/A	
	1	Lt red (10R 6/6) sandy clay; moist, Sl. plastic (50% clay / 50% sand), M-grnd, mottled.	6.6ppm		TJ1571	Drill. 4.4 Ft Recover. 3.9 Ft
	2					
	3	Black (10YR 2/1) silty sand w/clay; dry, F-grnd, massive, rel. stiff (±5% clay)	10.1ppm	N/A	TJ1572	
	4	Pale yellow (2.5Y 7/3) sandy clay (see below)				
	5	No Recovery	N/A		N/A	
		Pale yellow sandy clay; moist, mottled, stiff, plastic.	1.1ppm	N/A	N/A	Drill. 5.0 Ft Recover. 4.5 Ft
	7	Gray (10YR 7/1) and red (10R 4/6) sandy clay.				
	8	Lt-green-gray (10GY 8/1) Sandy clay; moist, strata/thinly lam, very stiff, plastic.	1.0ppm		N/A	
	9	More sand/silt than clay.		TJ1573		
	10	No Recovery	N/A	N/A	N/A	

HTRW DRILLING LOG

HOLE NUMBER ZTF-MW-06 (ZT) 05

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 3 OF 3

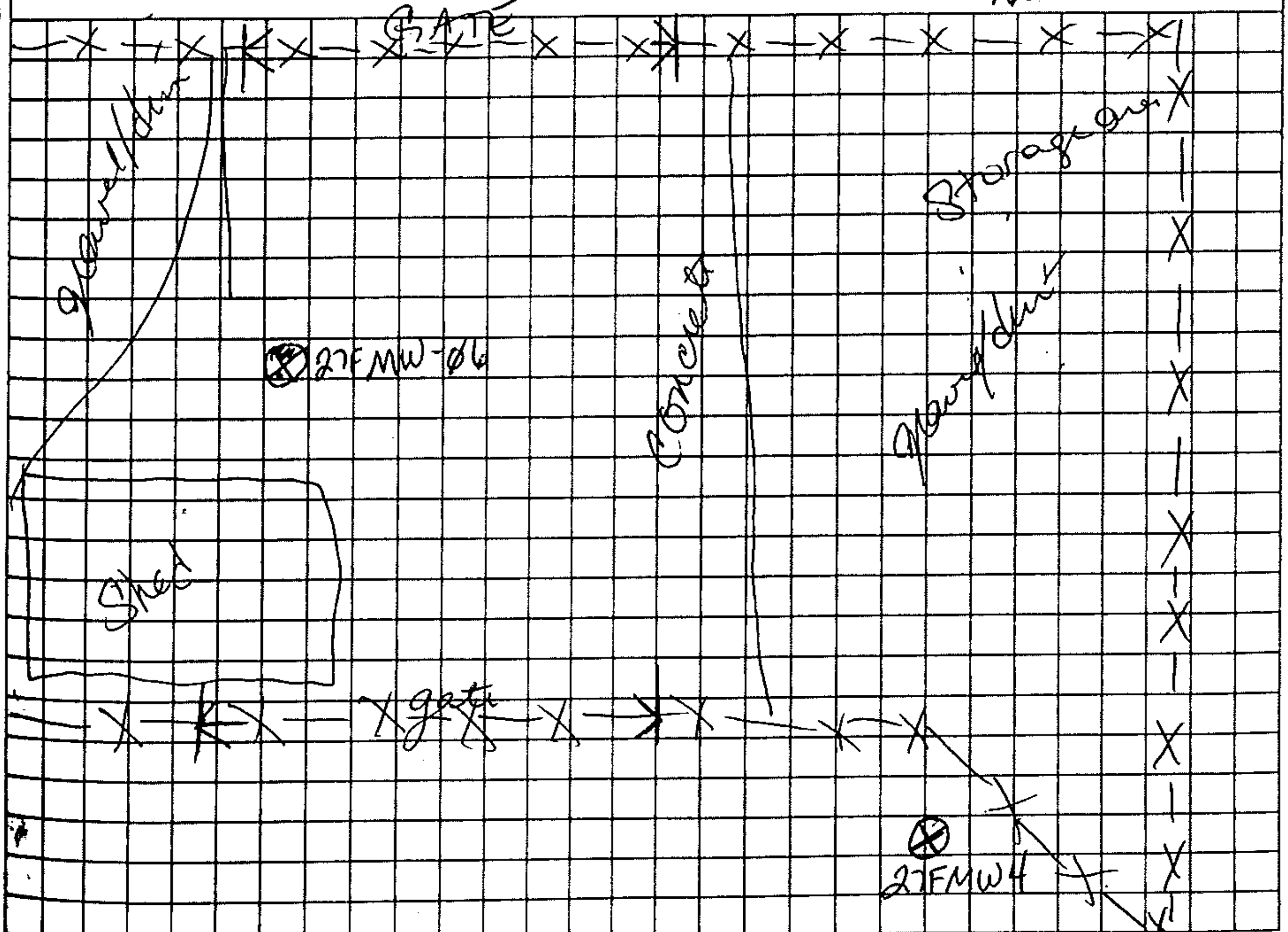
ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Very pale brn (10YR 8/2) sand: wet, massive, F-grnd, pretty;	N/A	TI1573	N/A	Drill: 5.0 Ft Recover: 2.6 Ft
	12					
	13	No Recovery	N/A	N/A	N/A	water @ 13.5 Ft.
	14					
	15	Very pale brn sand (as above)				No core, lith. from cuttings.
	16					
	17		N/A	TI1573	N/A	
	18					
	19			N/A		TD = 20.0 Ft
	20					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah	HOLE NUMBER 27F-MW-06 (TJ)
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller Drilling Co
SHEET 1 OF __	
3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engineering
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" augers; 5' by 4" split spoon samplers	8. HOLE LOCATION: see map
	9. SURFACE ELEVATION: TOC 67.88 N 684253.33 E 821526.08
10. DATE STARTED: 10/11/99	11. DATE COMPLETED: 10/11/99
12. OVERBURDEN THICKNESS: Greater than TD	15. DEPTH GROUNDWATER ENCOUNTERED: 9.1' BGS = Sand wet
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.75 after ~2 min of piercing clay zone.
14. TOTAL DEPTH OF HOLE: 20' BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 7.25' BGS ~30 min. after setting well.

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES	NA		
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	RCRA METALS /	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X	SVOCS				NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
		X		Heather Smith		

LOCATION SKETCH/COMMENTS SCALE: NONE



NOTE: TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

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HTRW DRILLING LOG

HOLE NUMBER 27F-MW6 35

PROJECT: Fort Stewart USTs

INSPECTOR Heather Smith

SHEET 3 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete core			Sample ID # 7J1671 @1215 1.0	
	Ø1	SC - Clayey Sand. w/ Silt ~15% Lean(Hard) Clay nodules intermixed w/ Base mtrl. of ~20% fat clay & ~50% Med→cs. grained angular Sand. ~15% Silts/fines mottled color - predominantly 5YR 5/4 Reddish brown w/ 5YR 3/3 dk. reddish brown, 5YR 7/1 grey	2.2 ppm			RUN #1 RUN 5' Rec. 3.1 + .6 concrete Loss 1.3' FILL lt. grey = lean clay nodes.
	Ø2	SM - Silty Sand. med→fine subrounded→subangular grains, soft dry, nonplastic 10YR 3/1 very dk. grey w/ some 10YR 7/1 grey streaks.	5.3 ppm			
	Ø3	SC - Clayey Sand - hard dry ~55-45% Sand. Med. gr. Lean clay.				SC clay layer is 10YR 3/1 v. dk. grey
		SM - Silty Sand. Med→fine grained, subrounded→subangular Sands dry to slightly moist. 10YR 6/4 light yellowish brown				
	Ø4	Loss				No ODOR ON THIS RUN
	Ø5	SM - Silty Sand as above.				
		CL - Lean Clay w/ Sand. firm, hard, high plasticity, 5YR 7/1 lt. grey. slightly Mottled w/ 5YR 3/3 dk. reddish brown, & 10YR 5/4 yellowish brown	2.3 ppm			RUN #2 RUN 5.Ø' Rec. 4.3 LOSS Ø.7
	Ø6					
	Ø7	Slightly moist [Where DRY - this clay breaks apart w/ blocky weathering]	2.5 ppm			*Water rose to 7.75' almost immediately after breaking clay seal
	Ø8	Sand is fine grained subrounded. (~25% sand) Slightly moist			7.5-9.1 Sample ID# 7J1672 @1238	No ODOR ON THIS RUN
	Ø9	SM - Silty Sand - Saturated soft, med→fine gr. subrounded→subangular			9.1 ▽	definate contact line @ 9.1' BGS hard lean Clay to soft Saturated Sand.
		LOSS				
	10	SM - Silty Sand Saturated	2.3 ppm			

HTRW DRILLING LOG

HOLE NUMBER 27-MW-36

PROJECT: Fort Stewart USTs

INSPECTOR Heather L Smith

SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	SM - Silty Sands. ~~Some~~ Wet Soft Color = 10YR 4/3 Brown No Smell from cuttings fine → med. gr. Sands.	over cuttings 1.2ppm			Log by cuttings only
	12					*NO ODOR DURING DRILLING NO PID HITS ON CUTTINGS OR B.2 over S. Profile
	13	gradually getting wetter & lighter in color....				
	14	SM - Silty Sand Saturated fine gr. Subrounded Sands. 10YR 7/6 yellow				unsure of exact contact, but just Before last 5' RUN facies change to runny Saturated fine Sands. (looks like cookie dough)
	15					
	16		Headspace 1.8ppm	Sample ID TJ1673		
	17					
	18					
	19					
	20					B.O.B. 20.0

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-07

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller

SHEET 1 OF ___

3. PROJECT: Fort Stewart

4. LOCATION: 27F

5. NAME OF DRILLER: Darron Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Hollow Stem 4¼" ID Auger 5 ft continuous split spoon 8¼" ID HSA

8. HOLE LOCATION: See Map Below N 684315.20 E 821556.65

9. SURFACE ELEVATION: TOC 68.14 ft

10. DATE STARTED: 10 Oct 99

11. DATE COMPLETED: 10 Oct 99

12. OVERBURDEN THICKNESS: NA

15. DEPTH GROUNDWATER ENCOUNTERED: 9.5

13. DEPTH DRILLED INTO ROCK: NA

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

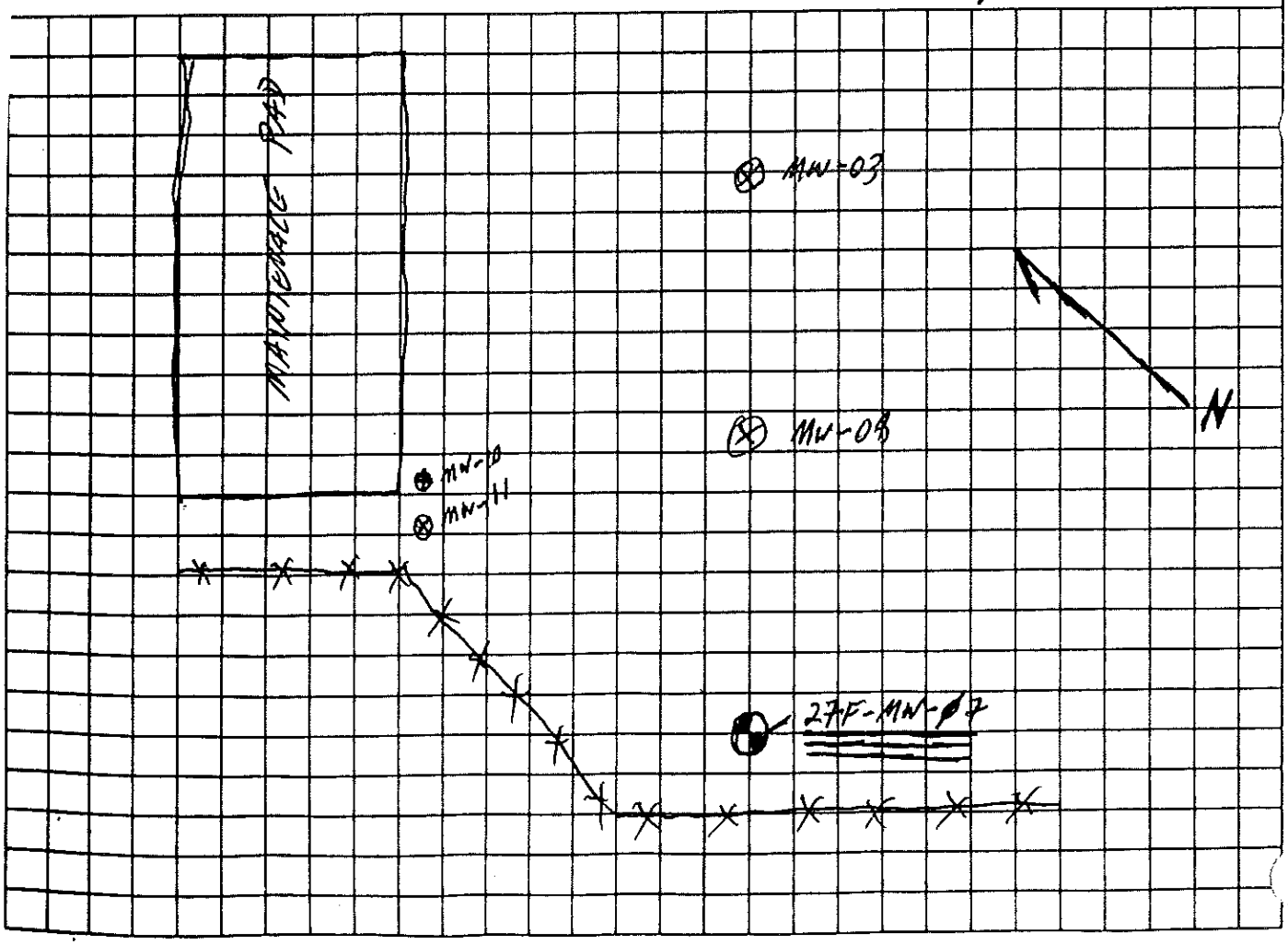
14. TOTAL DEPTH OF HOLE: 21.0 ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC ✓	METALS ✓	OTHER (SPECIFY) TOC	OTHER (SPECIFY) SVOC	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL ✓	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		

LOCATION SKETCH/COMMENTS

SCALE: NA



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

HOLE NUMBER 27F.MW07

PROJECT: Fort Stewart USTs | INSPECTOR Brad Bell | SHEET 1 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		CONCRETE SLAB 0 - 0.85 ft				
	1	SAND; med - fine ~40% silt 20%; Black 10YR 2/1; subrounded; poorly sorted; non plastic; soft; moist (SM)		actual 0.85-1.85 ft labeled as 0.0-1.0 ft	1419 hrs 7J1771	0-5 ft run 0.0 ppm BZ
	2	SANDY CLAY; sand; med-fine ~40% clay ~60%; Lt Red 2.5YR 7/6; variegated white and yellow; firm; subrounded; poorly sorted; moist (CL) med. plasticity	1.8 ppm			Bottom 1.0 ft of spoon (outside) is wet
	3	SAND; med - fine ~80% silt ~20%; GRAY 5Y5; banded med. brown; subrounded; mod sorted; firm, non plastic; moist (SM)	45.6 ppm	NA	1425 7J1772 2.5-5.0 ft	Recovery 4.3 ft ∴ 100%
	4	SANDY CLAY; sand; med-fine ~35% clay ~65%; Lt Grey 7/1 banded yellow 10YR 8/6; subrounded; poorly sorted; med. plasticity; moist (CL)				
	5	SAME AS ABOVE (4.9-5.0 ft description) coarse grained sand, FIRM				
	6		4.6			5-10 ft Run 60% Recovery (3.0 ft)
	7	Clayey SAND; sand ~70% med-coarse, clay ~30%; Red 10R 5/6 banded yellow 10YR 8/6; subrounded; poorly sorted; low plasticity; soft; moist (SC)		NA	NA	
	8	CLAY; sand: fine ~20%, clay ~80%; White 5Y 8/1; hard; poorly sorted; subrounded; med plasticity; moist				
	9					
	10					

HTRW DRILLING LOG

HOLE NUMBER 27F.MW67

PROJECT: Fort Stewart USTs | INSPECTOR Brad Baker | SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11					Run 10-15 Ft 0.0 recovery H_2O tagged @ 9.5 Ft Tagged inside 15 Ft auger string - TD @ 12.5 Ft ∴ 2.5 Ft of heaving soil
	12		NA	NA	NA	
	13					
	14					
	15					
	16	Drilled Out No Split Spoon				Lt Red - Brown saturated sands med - coarse
	17		NA	1510 hr 17-18.0 Ft 751773 Bag Sample	NA	
	18					
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW47

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 3 OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Drilled OUT No Split Spoon				Lt Red-Brown Saturated med-coarse sand
	21	TD = 21.0 Ft				
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 29F-MW-08

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 5

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineering

5. NAME OF DRILLER: Darren Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" split spoons; 4¼" augers; 8¼" augers.

8. HOLE LOCATION: See map N 684345.97 E 821585.83

9. SURFACE ELEVATION: TOC 68.34 ft

10. DATE STARTED: 10/9/99

11. DATE COMPLETED: 10/10/99

12. OVERBURDEN THICKNESS: greater than T.D.

15. DEPTH GROUNDWATER ENCOUNTERED: Soil wet @ 9.2

13. DEPTH DRILLED INTO ROCK: NA

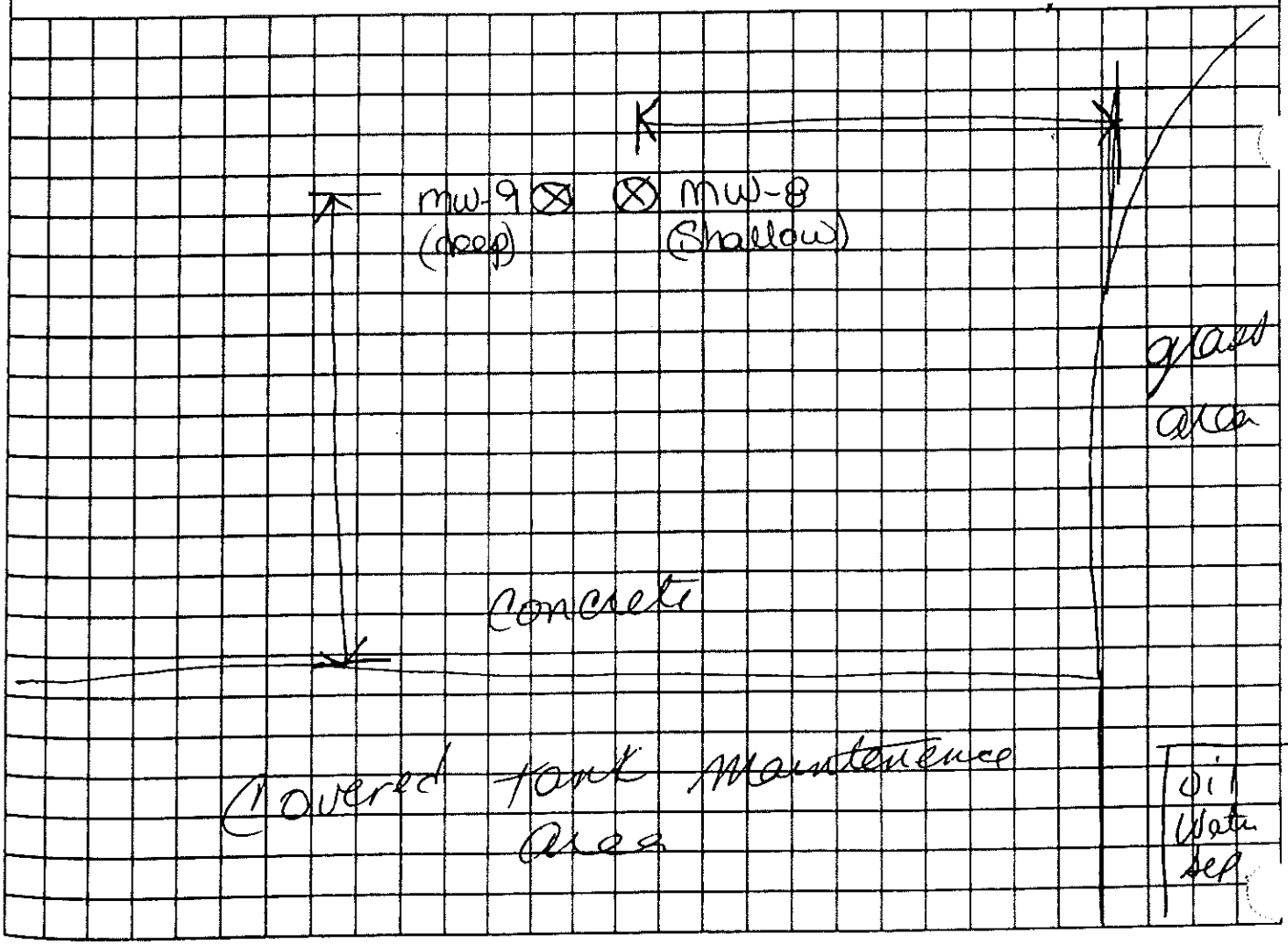
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: WL up to 8.46 after 15 min

14. TOTAL DEPTH OF HOLE: 15' BGS.

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): WL @ 7.9' BGS after ~12 hrs.

18. GEOTECHNICAL SAMPLES	DISTURBED X	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: ~~BTEX~~	RCRA METALS: SVOC/TOC	OTHER (SPECIFY):	OTHER (SPECIFY):	OTHER (SPECIFY):	21. TOTAL CORE RECOVERY: NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL: X	OTHER (SPECIFY):	23. SIGNATURE OF INSPECTOR: Heather L Smith		

LOCATION SKETCH/COMMENTS — SCALE: NONE



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-08 21

PROJECT: Fort Stewart USTs | INSPECTOR Heather Smith | SHEET 2 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete			Sample ID Ø-1'	Concrete cored out earlier
	Ø1	SC - Clayey Sand med→cs gr. sand w/ ~15% fines, angular→subrounded, low to med. plasticity, soft moist	Ø.9 ppm			RUN #1 Ø.7→2.45 Loss: .25'
	Ø2	Predominantly 5YR7/1 lt. grey w/ mottled 10YR5/6 yellowish red.				Ø
		SM Silty Sand 10YR2/1 Black soft, dry, nonplastic med gr, Subang. Sands Loss				
	Ø3	gradational color change to 10YR6/1 GREY	3.1 ppm			RUN #2 2.7 - 4.7 Ø
	Ø4	Same mtrl as above.				Ø
		SC - Clayey Sand med. gr. ang→ subrounded grains, med. plasticity				
	Ø5	Soft to slightly firm - Color mottled from 5YR7/1 lt. grey w/ 10YR5/6 yellowish red. Loss	1.8 ppm			RUN #3 RUN 4.7 - 5.7 Resistance after 4.9' Rec: 45 Ø
						Loss
	Ø6	SC - Clayey Sand w/ med→CS. gr., angular to subrounded in fat clay				RUN #4 RUN 5.7→7.7 Rec 2' Loss Ø Augered to 5.7' BGS Pass thru resistance Run S.S. from 5.7-7.7
	Ø7	med→high plasticity Soft moist (firm from 7.1→7.7' BGS) Same color as above.	~~Ø.5~~ Soft			~~RUN~~ Ø WL after 12hrs ▽
		CL - Lean Clay w/ fine gr. Sand. 5YR7/1 lt. grey.	30.7 ppm			RUN #5 RUN 7.7 - 9.7
	Ø8	SC - Clayey Sand. fat clay w/ med.→CS. gr. sand ang.→subrounded grains. Soft Moist 10YR7/1 lt. grey w/ 10YR5/6 yellowish red.		8½		WL after ~20 min ▽
		CL - Lean Clay HARD/firm, dense, moist				
	Ø9	5Y7/1 lt. grey high plasticity	30.4 ppm	geotech sample ID# 7J1873		9
	10	SM Silty Sand ▽	CORE WET @ 9.9' BGS W.T.	10'	Same ID#	RUN #6 RUN 9.7→10.7 10

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-08
SHEET 3 OF 5
22

PROJECT: Fort Stewart USTs
INSPECTOR

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	SM - Silty Sand fine gr. Sand. Subrounded Saturated, Soft, nonplastic 10R8/1 White	29.1 ppm		Sample ID# CONTINUED	Sample taken from RUN #6 @10.7
	11	SM as above color Begins to change to brown - As depth increases Smell goes away in auger cuttings until it is gone ~13'BGS and entire cuttings are Brown.				Log w/ Cuttings ONLY 10.7-15.0 RUN #7 - 5' auger
	12					
	13	SM - Silty Sand Complete color change to 10YR7/2 lt. grey.				
	14	No odor - Same mtrl as above.				
	15					B.O.B. #3 ~~15.0'~~ 10-11-99 ~~BGS~~
	16	SM - Silty Sand med → CS grained Subangular to angular grains Saturated soft nonplastic 10YR7/2 light grey	headspace 29.3 ppm			Decided to make this a deep hole We will overdrill the set well & continue to set screen @ 30-40' BGS
	17	Strong odor from cuttings				RUN #8
	18					
	19					
	20					

HTRW DRILLING LOG						HOLE NUMBER 27F-MW-08 23
PROJECT: Fort Stewart USTs		INSPECTOR Heather L Smith				SHEET 4 OF 5
ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Same as above SM-Silty Sand Saturated Slight increase in cs. gr. mtr'. Same color as above	HS overcore cuttings 15.7ppm headspace 33.6ppm BZ. ∅			logging cuttings only RUN # 9
	22					
	23					
	24					
	25					
	26	Same as above SM- silty Sand Saturated smell decreases color still 10YR 7/2 lt. grey	overcuttings ∅.5ppm B.Z. ∅ headspace 28.2ppm			Logging Cuttings only RUN # 10 headspace taken from composite of cuttings during 5' Run.
	27					
	28					
	29					
	30					

27F-MW-08

Core description	headspace PID	GeoTech Sample	Analytical Samp	Remarks
SM- Silty Sand Saturated Color change to: 10YR7/4 Very pale brown Soft med→cs. gr material Subrounded→ angular. ODOROUS!	overcuttings 2.4ppm B.Z. ∅ headspace 22.8			RUN# headspace is a composite of samples from entire 5' auger run. RUN #11
Same material as above.	overcuttings ∅			RUN#12
Material in cuttings matched material as above, but material stuck to the augers is a dk. greenish gray fat clay w/ v.cs. angular grained sands & shell fragments. high plasticity. contact is purely estimated. There was ~6' of stiff clay adhered to the augers from ~36-42' BGS. I don't know how far we actually ~~Same as above~~ augered in to this Hawthorne Formation. Best Guess from Geo. & Driller	B.Z. ∅ headspace 25.6ppm			Material in cuttings looks exactly the same as the earlier 20'.

B. O B. 42' BGS

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HTRW DRILLING LOG

DISTRICT: USACE - Savannah

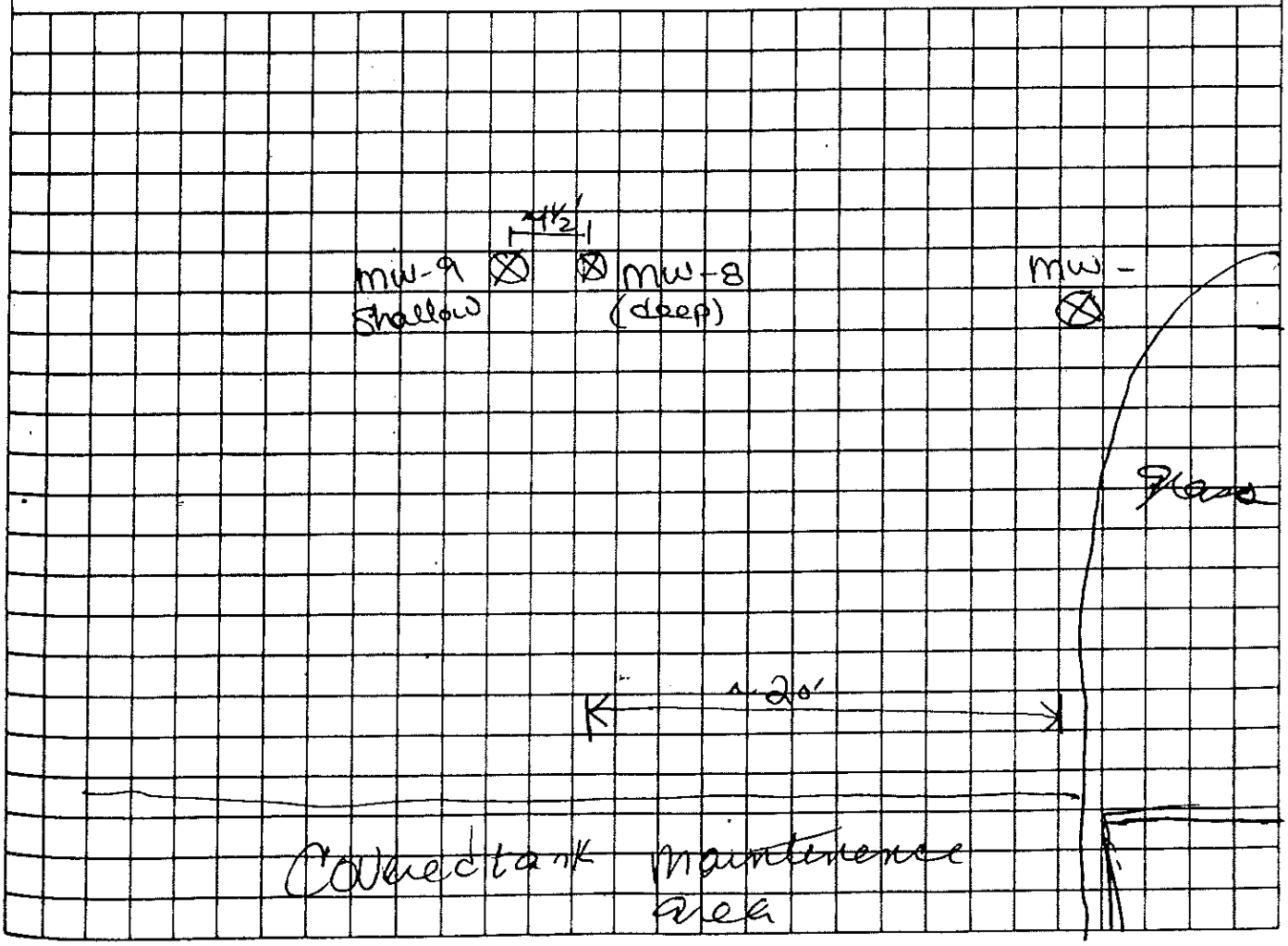
HOLE NUMBER: 27F-MW-09

SHEET 1 OF 4

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller Drilling Company
3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engineering
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID augers; 3½ 4'-5' long sample barrels	8. HOLE LOCATION: See map.
	9. SURFACE ELEVATION: TOC 68.46ft N 684317.37 E 821587.85
	10. DATE STARTED: 10/12/99 11. DATE COMPLETED: 10/12/99
12. OVERBURDEN THICKNESS: greater than T.D.	15. DEPTH GROUNDWATER ENCOUNTERED: Cuttings saturated @ 15
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE: 22.0' BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED X	~~UNDISTURBED~~	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: X	RCRA METALS: SVOC	OTHER (SPECIFY): —	OTHER (SPECIFY): —	OTHER (SPECIFY): —	21. TOTAL CORE RECOVERY: NA
22. DISPOSITION OF HOLE	BACKFILLED: —	MONITORING WELL: X	OTHER (SPECIFY): —	23. SIGNATURE OF INSPECTOR: Heather L. Smith		

LOCATION SKETCH/COMMENTS — SCALE: NONE



(Signature and Date)

QA CHECK BY

HTRW DRILLING LOG

HOLE NUMBER 27F-MW3-09

PROJECT: Fort Stewart USTs | INSPECTOR Heather Smith | SHEET 2 OF 4

49

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete Core				RUN 5.0' Rec. 4.4 Loss 0.6 0.6 = Concrete
	1	SC - Clayey Sand fat clay, f. gr. Sand Subangular → angular mottled Colors Predominantly 5YR 6/1 grey w/ 5YR 5/6 yellowish red. & 5YR 3/2 dk reddish brown. FILL - dry. soft.	0.6 ppm		1.0	
	2					
	3	SM - Silty Sand., med → fine gr. subrounded to Subangular grains dry Soft nonplastic 10YR3/1 V. dk. grey	44.6 ppm			
	4	SM - Silty Sand. med → fine gr. Subrounded to Subangular 10YR6/2 lt. brownish grey dry, soft nonplastic				
	5					
	6	SC - Clayey Sand fat clay w/ Sand. Sub. ang. → subrounded. Soft, moist, Some lt. grey Lean clay Nodules. 10YR7/4 V. Pale Brown	103 ppm			
	7	CL Lean clay w/ sand Lean Clay w/ ~30% Sand - med. to fine grained subangular to subrounded Sands Soft to firm - Predominantly firm - stiff clay 5Y7/1 lt. grey	225 ppm		8.0	
	8					
	9	CL - lean clay w/ trace fine gr. subrounded sand. firm, dense, moist High Plasticity lt. grey. 5Y7/1 lt. grey				
	10					

HTRW DRILLING LOG — Heather Smith — HOLE NUMBER 27F-MW-95D

PROJECT: Fort Stewart USTs — INSPECTOR — SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	CL - w/trace sand go above 5Y7/1 lt. grey MOIST	headspace from cuttings 144 ppm			no more coring - logging from cuttings only.
	11	CL w/ Sand (increasing sand content over depth. Sand increased to med. gr. size 5Y6/1 grey Moist STRONG ODOR				unsure of exact depth of contact
	12					
	13	SC - ~~Sandy Clay~~ Clayey Sand predominantly fine gr. Sand. some med. gr. rounded to subrounded grains Cuttings wet - ball up as leaving augers 5Y6/1 grey	headspace from cuttings 123 ppm			
	14					
	15	STRONG ODOR				
	16	Sm - Silty Sand Saturated med grained subang. to subrounded grains Soft nonplastic ~~5Y6/1 grey~~ 5Y4/1 STRONG ODOR 10YR 7/4 Very pale brown	headspace from cuttings 61.5 ppm			unsure of exact contact depth due to travel time up augers. dashed line is best educated depth.
	17					
	18					
	19		headspace from cuttings 36.1 ppm			
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F.MW-9 51

PROJECT: Fort Stewart USTs | INSPECTOR Keith Mc Smith | SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	SM - Silty Sand as above				
	22	B.O.B.	22.0' BGS.			
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

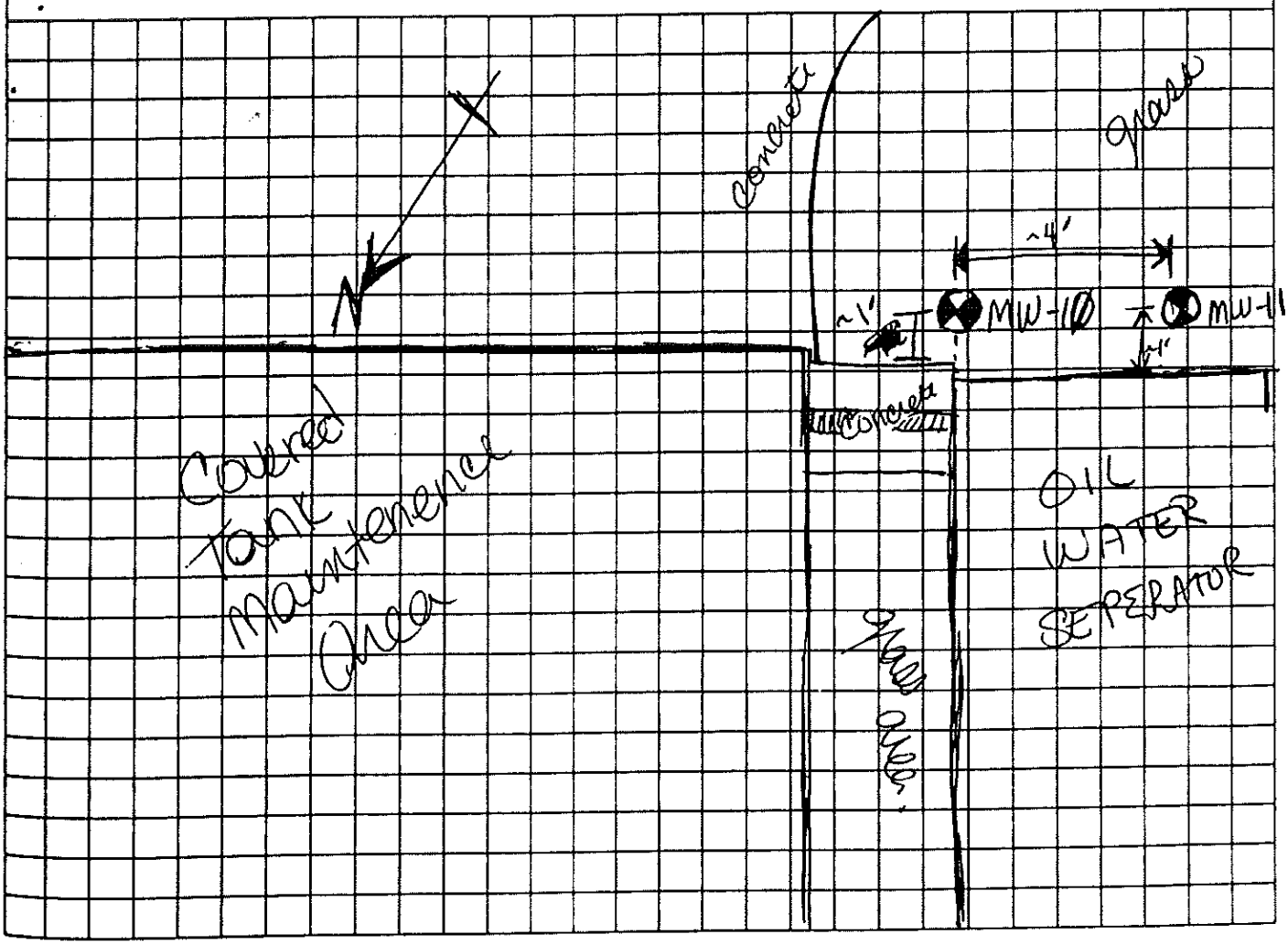
HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: USACE - Savannah	HOLE NUMBER: 97F-MW-10
	2. DRILL SUBCONTRACTOR: Miller Drilling Co.	SHEET 1 OF 4

3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engineering
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Sch 80 12" ID PVC; 8¼" auger; 4¼" augers.	8. HOLE LOCATION: see map
	9. SURFACE ELEVATION: TOC 68.70 N 684362.91 E 821540.80
	10. DATE STARTED: 10/10/99 11. DATE COMPLETED:
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED:
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED		UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: BTEX	RCRA METALS: SVOC/TOC	OTHER (SPECIFY): —	OTHER (SPECIFY): —	OTHER (SPECIFY): —	21. TOTAL CORE RECOVERY: %	
22. DISPOSITION OF HOLE	BACKFILLED: —	MONITORING WELL: X	OTHER (SPECIFY): —	23. SIGNATURE OF INSPECTOR: Heather L Smith			

LOCATION SKETCH/COMMENTS — SCALE:



(Signature and Date)

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs	INSPECTOR Heather Smith	SHEET 2 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		grass w/ rootlets/ topsoil			Sample #7JIA71 ~~BTEX~~ VOC (Encore) 8oz Jar @0910	RUN #1 RUN 2' Rec 2' Loss Ø
	1	SM - Silty Sand - DRY soft, med. grains subangular to subrounded 10YR4/4 dk. yellowish brown STRONG ODOR	headspace Ø.7 ppm			
		CH - Fat clay w/ Sand med plasticity, moist, soft 10YR6/1 grey				
	2	SC - Clayey Sand med → fine gr. sand Subangular → subrounded Moist, low plasticity. Moist, Soft 10YR 3/1 v. Dk. grey. STRONG ODOR	headspace 1.4 ppm		Sample #7JIA74 ~~BTEX~~ VOC @0915 2-4' BGS	RUN #2 RUN 2.Ø' Rec 2.Ø Loss Ø
	3					
	4	SM - Silty Sand.				
		SC - Clayey Sand (w/silt) Med → fine gr. subrounded to sub angular, soft, moist ~20% clay ~20% silt ~60% Moist, Soft 5Y 7/3 Pale yellow	headspace 5.5 ppm		Sample # ~~BTEX~~ VOC 4-6' BGS #7JIA75 @0930	RUN #3 RUN: 2.Ø Rec: 1.1 Loss Ø.9
	5	(unsure of contact) - Loss				LOSS
	6	SM - Silty Sand (product in sand zone) wet, med. grains Subang. → subrounded.			Sample # ~~BTEX~~ VOC 6-8' BGS #7JIA76 @0940	RUN #4 RUN 2.Ø Rec. 1.9 Loss Ø.1
		CL - lean clay layer firm, wet Stiff clay firm. Saturated color ~15% sand. High plasticity				6.6- CL layer: 2.5YR 3/6 d. red 10YR 5/6 Yellowish brown
	7	SC - Clayey Sand	headspace (6-8) 62.3 ppm			
		SM - Silty Sand Very ODOROUS, wet - looks like product in sand. med. grains, subrounded → subang. Soft Wet to saturated				PRODUCT ON CORE Soil cuttings btwn 7½-9½' BGS read 7ppm → 9ppm during augering Bz <5ppm.
	8	Loss 10YR 3/2 V. dk. greyish brown	headspace 8½-9' BGS 35.7 ppm		Sample ~~BTEX~~ (Encore) & 8oz Jar 7JIA72 @0941	RUN #5 RUN 1' Rec 1.8 extra due to sluff
	9	SC - Clayey Sand - CSgr angular sand w/ fat clay. Sand 2.5YR 7/1 lt reddish grey w/ 10YR 5/2 greyish brown V. Strong odor Saturated w/ what smells like Product!	headspace 9-10' BGS 39.5 ppm		Sample BTEX VOC (Encore) #7JIA77 @0950	RUN #6 RUN 1' Rec. 1.4 - sluff Product seems to sit on top of tight clean clay layer Sands were saturated 9½-9' Band covered w/ oil
		CL - Lean Clay Tight - fine grsand <10% high plasticity 5YR 7/2 lt. gray, firm, moist				
	10	SC - Clayey Sand lean clay w/ fine sand - low plasticity 10YR 7/2 lt. grey				

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-103

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Very pale brown (10YR 7/3) sandy clay silt: wet, F-grnd sand. Returned in soupy mix, some clumps.		N/A Shelby tube sample		No core; Lithology from cuttings.
	12	Sand increases w/ depth. Sand predominates. clay sand or silty sand				
	13					
	14		N/A	N/A	N/A	
	15					
	16					
	17					
	18					
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-136

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Very pale brown silty sand/clay sand (as above).				
	22					TD = 22.0 ft
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

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HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-11

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Comp.

SHEET 1 OF 5

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers

5. NAME OF DRILLER: Darren Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" augers 8¼" augers.

8. HOLE LOCATION: See map N 684358.83 E 821536.44

9. SURFACE ELEVATION: TOC 68.66 ft

10. DATE STARTED: 10/10/99

11. DATE COMPLETED:

12. OVERBURDEN THICKNESS

15. DEPTH GROUNDWATER ENCOUNTERED:

13. DEPTH DRILLED INTO ROCK

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

14. TOTAL DEPTH OF HOLE

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: Encore's	METALS: RCRA + SVOCs	OTHER (SPECIFY): —	OTHER (SPECIFY): —	OTHER (SPECIFY): —	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL: X	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		

LOCATION SKETCH/COMMENTS

SCALE: NONE

See map on page 33

Heather L. Smith 10/10/99

breathing zone, venting compressed air, etc.)

(Signature and Date)

QA CHECK BY

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs | INSPECTOR Heather L Smith | SHEET 2 OF 5 | HOLE NUMBER 27-MW-11 | 49

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		grass/rootlets/topsoil				
		SM - Silty Sand soft, dry, med gr. subrounded sand. 7.5YR 4/4 Brown	0-2' BGS ϕ ppm		Sample ID# VOC's JJ1871 SVOC's/RCRA Metals 1115	RUN #1 RUN: 2.0 REC: 2.0 LOSS: ϕ
	1	SC - Clayey Sand med. gr. sand., low plasticity 7.5YR 5/6 Strong Brown				ϕ1
		SM - BLACK 10YR 2/1 med-fine gr. subang-subrounded				
	2	SC - Clayey Sand w/ silt Mottled med. gr. mottled w/ 2.5YR 3/4 (dk. reddish brown) 10YR 3/1 v. dk. gray				2
		SM - Silty Sand w/ some clay - low plasticity med→fine gr. sands Soft, moist 10YR 3/1 v. dk. gray	2-4' BGS 1.3 ppm			RUN #2 RUN: 2.0 REC: 2.0 LOSS: ϕ
	3					3
	4	CH - fat clay <20% fine/med. sand Soft, moist 10YR 6/1 gray mottled w/ 10YR 7/6 yellowish brown				4
		SC - Clayey Sand CS. grained, angular to subangular moist fat clay, soft 5Y 6/1 grey Mottled w/ 5Y 3/1 v. dk. gray & 7.5YR 4/4 Brown	4-6' BGS 52.1 ppm			RUN # 3 RUN: 2.ϕ REC: 1.7 LOSS: ϕ.3
	5					5
	6	LOSS (unsure of contact)				Loss 6
		SM - Silty Sand. Wet - Product in sand Sheen - Strong odor - Soft, nonplastic, med. gr. angular to Subrounded. some clay <10% STRONG SMELL	6-8' BGS 73.6 ppm			RUN #4 RUN: 2.ϕ REC: 1.5 LOSS: ϕ.5
	7					7
	8	LOSS			8.ϕ' BGS.	Loss 8
		Same as above saturated w/ product on top of clay.	8-8½ 57.6 ppm ~~8-10 BGS~~		Sample ID# 1145 TJ1872	RUN #5 RUN: 2.ϕ REC: 1.6 LOSS: .4
	9	CL - Lean Clay - w/ fine gr. Sand. firm → HARD high plasticity, 10YR 6/2 lt. brownish gray dense - oil/product sitting on top of clay	8½-9½' BGS 88.1 ppm (2nd 8½-9½ H.S. reading 79.2 ppm)			9
	10				10'	Loss 10

HTRW DRILLING LOG

27F-MW-11 | HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 3 OF 5

50

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	Lt. green-gray (10Y 8/1) silty clay: moist, plastic, mottled				Drill: 5.0 Ft Recover: 3.7 Ft.
	11	V. pale brown (10YR 8/2) clay sand: moist, F-grnd, stratified, mod. packed, sl- to unplastic	61.2 ppm			
	12	Yellow (10YR 8/6) sand: wet, F- to m-grnd, generally massive, but mottled; uniform near bottom of interval.				
	13					
	14	No Recovery				Water at 14 Ft BGS.
	15					
	16	Pale yellow (2.5Y 7/3) sand: wet, F-to m-grnd.				
	17					
	18					
	19					
	20					

HTRW DRILLING LOG

27F-MW-11

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR

SHEET 4 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Pale yellow sand (as above)				
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG 27F-MW-11 | HOLE NUMBER

PROJECT: Fort Stewart UST's | INSPECTOR | SHEET 5 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	31	Pale Yellow Sand (as above)				
	32					
	33					
	34					
	35					
	36					DK gray-green Clay on augers at bottom. Bottom of Rt.
	37					
	38					
	39					
	40					TD = 40.0 ft

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HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-12

SHEET 1 OF 2

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Co

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engeneering

5. NAME OF DRILLER: Darren Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" auger Wood plus

8. HOLE LOCATION: See Map

9. SURFACE ELEVATION: TOC 68.74 ft N 681363.88 E 821543.07

10. DATE STARTED: 10/12/99

11. DATE COMPLETED: 10/12/99

12. OVERBURDEN THICKNESS: greater than T.D.

13. DEPTH DRILLED INTO ROCK: NA

14. TOTAL DEPTH OF HOLE: 10'

15. DEPTH GROUNDWATER ENCOUNTERED: Not DRILLING FOR GW.

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: DRILLING FOR PRODUCT

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: DISTURBED NONE UNDISTURBED

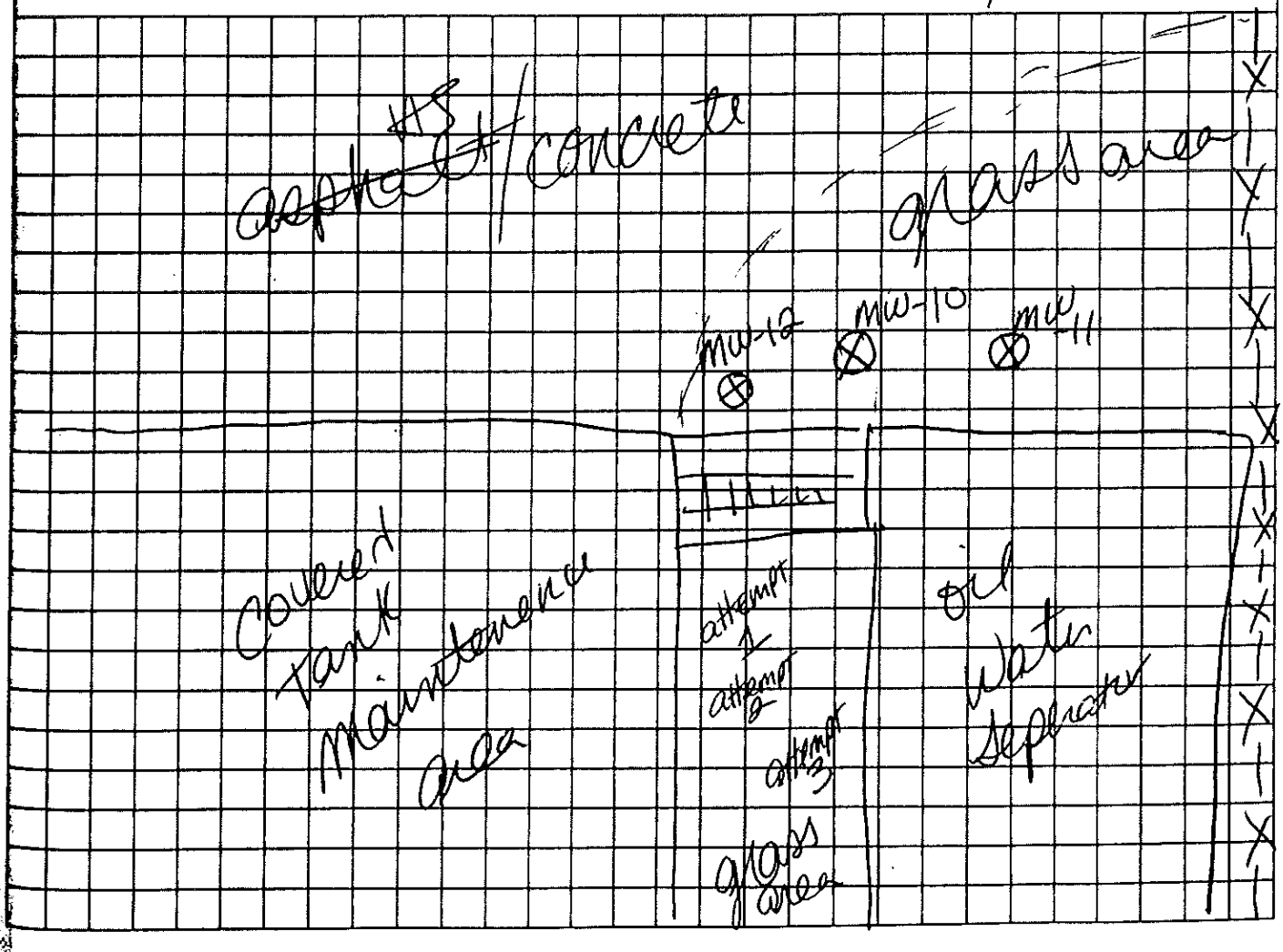
19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	NONE					NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Heather L Smith

LOCATION SKETCH/COMMENTS

SCALE: NONE



(Signature and Date)

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-12 6

PROJECT: Fort Stewart USTs | INSPECTOR Heather Smith | SHEET 2 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		SM - Silty Sand top soil & organics in top .3' dry				Logged by cuttings only depths are estimates
	Ø1	nonplastic soft med gr. sands	89.9			Ø1
		Subrounded → Subangular				
	Ø2	10YR 5/3 Brown				Ø2
		Very odorous				
	Ø3					Ø3
			22.2			
		SC - Clayey Sand w/ some silt				
	Ø4	med gr. Subangular to subrounded sand				Ø4
	Ø5	grains w/ ~~wet~~ moist fat clay, med. plasticity				Ø5
		Soft. 10YR 3/2				
	Ø6	V. dk. grayish brown	38.7			Ø6
		very odorous				
	Ø7	Clay content increases w/ depth still less than 30% of total material				Ø7
	Ø8		102			Ø8
		Saturated @ ~ 8.6' BGS				NOT Water level.
	Ø9					Ø9
		SC Clayey Sand Color Change				We have not pierced clay into G.Wath zone this is a Perch zone w/ Product in soil
	10	10YR 4/3 Brown				10
		Subang → ang. Sand grains				

SWMU 27F

3D ENGINEER BRIGADE MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (NORTHEAST OF BUILDING 1340)

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7K-GP-01
3. DRILL SUBCONTRACTOR: REWRIGHT/SAIC		SHEET 1 of 3 SHEETS

4. PROJECT: FT. STEWART 16 SWMUS

5. LOCATION: SWMU 27F

6. NAME OF DRILLER: J. HASELHOFF

7. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE SYSTEMS 8-M

8. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" MODS; 1" PVC PIEZOMETER; PERISTALTIC PUMP

8. HOLE LOCATION: 7K-GP-01 E- 821927.43' N- 634694.33' NAD-83

9. SURFACE ELEVATION: NAVD-88 67.68'

10. DATE STARTED: 1/17/98

11. DATE COMPLETED: 1/17/98

12. OVERBURDEN THICKNESS: NA

13. DEPTH DRILLED INTO ROCK: NA

14. TOTAL DEPTH OF HOLE: ~~NA~~ 15' BGS

15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 12' bgs

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)

18. GEOTECHNICAL SAMPLES: NA — DISTURBED: NA — UNDISTURBED: NA

19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSES	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X		SVOC	LEAD		NA
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
			TEMP. PIEZ	Lisa Morad		

LOCATION SKETCH/COMMENTS: SEE PAGE # 55 LOGBOOK #27

SCALE:

PROJECT: FT. STEWART 16 SWMUS

HOLE NO.: 7K-GP-01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, organic, etc.)

HTRW DRILLING LOG

7K6P01

PROJECT FT. STEWART 16 SWMU 5 | INSPECTOR LUIS MERCADO | SHEET 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, ROUNDED, YELLOWISH BROWN, (10YR5/4), DRY.	0-2' 0ppm			PUSHED 0-4' (1.4' RECOVERY)
	2					
	3	2.5': ~~GRA~~ WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY, FINE TO MEDIUM SAND, ROUNDED, YELLOW (10YR7/6), DRY.	2-4' 0.1ppm			
	4	3': CLAYEY SAND (SC), 40% CLAY, FINE TO MEDIUM SAND, SUBROUNDED, VERY DARK GRAY (10YR 3/1), DRY				PUSHED 4-8' (3.8' RECOVERY)
	5		4-6' 0.2ppm			
	6					
	7	7': SANDY LEAN CLAY (CL), 40% FINE SAND, MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, NO DILATENCY,	6-8' 1.4ppm			
	8					
	9		8-10' 1.0ppm			PUSHED 8-12' (4.0' RECOVERY)
	10					

PROJECT FT. STEWART 16 S A.19-4 | HOLE NO 7K6P01

SWMU 27F

3D ENGINEER BRIGADE MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (NORTHWEST OF BUILDING 1340)

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: Savanah COE	HOLE NUMBER: 7J-GP-01
3. PROJECT: Ft. Stewart 16 SWMU's	2. DRILL SUBCONTRACTOR: RE, Wright	SHEET 1 of 3 SHEETS
5. NAME OF DRILLER: Al Root	4. LOCATION: SWMU-27F	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" dia. macrocore sampler w/Acetate liners, Stainless steel spoons, peristaltic pump w/HDPE tubing	6. MANUFACTURERS DESIGNATION OF DRILL: Geoprobe 5400	
	8. HOLE LOCATION: NAD-83 E-821509.30', N-684398.37'	
	9. SURFACE ELEVATION: NAVD-88 68.71'	
12. OVERBURDEN THICKNESS: NA	10. DATE STARTED: 1/18/98	11. DATE COMPLETED: 1/18/98
13. DEPTH DRILLED INTO ROCK: —	15. DEPTH GROUNDWATER ENCOUNTERED: 12.0'	
14. TOTAL DEPTH OF HOLE: 16.0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 8.10' (0:10)	
	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES		
—			NA		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	2	—	Lead	SVOC		NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS See page #39 SCALE:

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7J-GP-01

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: TJ-GP-01 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0.0	~~Silty SAND~~ PSL 1/18/18 SAND with some silt (SW-SM), olive (5Y 5/3), nonplastic, soft, moist	Ø.5			
	1.0'					
	2.0'		1.6			
	3.0'					
	3.0	~~0.0~~ PSL 1/18/18 Silty SAND with traces of clay (SM), olive (5Y 4/3), nonplastic, soft, moist				
	4.0'		Ø.Ø			
	5.0'					
	6.0'		1.6			
	7.0'					
	8.0'		6.8		751111 Ø940	
	8.5'					
	9.0'	Sandy CLAY (CL), white (5Y 8/1), slightly plastic, medium stiff, moist				

PROJECT: 16 A.18-4 1/3 HOLE NO: TJ-GP-01

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HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR | HOLE NO: 25-GP-01 | SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	9.0'					
	10'		1.1			
	11'					
		11.5'				
	12'	Silty SAND (SM), white (5Y 8/1), nonplastic, very soft, moist 12.0'-16.0': Wet				12.0'-16.0': Wet
	13'					
	14'					
	15'					
	16'	Bottom of Boring = 16.0'				

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: 25-GP-01

HTRW DRILLING LOG

Field	Entry
DISTRICT	Savannah COE
HOLE NUMBER	7J-GP-02
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	N/A
SHEET ... SHEETS	2 of 2
3. PROJECT	Ft. Stewart Georgia 16 SWMU's
4. LOCATION	SWMU # 27F
5. NAME OF DRILLER	Andy Knickerbocker
6. MANUFACTURERS DESIGNATION OF DRILL	Geoprobe
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	Geoprobe - Macrosampler 0-7BGL
8. HOLE LOCATION	7J-GP-02 E-321597.80' N-684379.47' NAD-83
9. SURFACE ELEVATION	NAVD-88 68.50'
10. DATE STARTED	2/3/98
11. DATE COMPLETED	2/3/98
12. OVERBURDEN THICKNESS	NA
13. DEPTH DRILLED INTO ROCK	N/A
14. TOTAL DEPTH OF HOLE	~ 14.75' BGL
15. DEPTH GROUNDWATER ENCOUNTERED	~ 9.75' BGL
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	Lead	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			piezometer	[signature]

LOCATION SKETCH/COMMENTS See page 29 SCALE:

PROJECT Ft. Stewart 16 SWMU's

HOLE NO. 7J-GP-02

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7J-GP-02 | SHEET: 2 OF 2

USCS (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	GRASS ROOT ZONE (0-0.2') SAME AS BELOW				MACRO CORE (0-10')
		WELL GRADED SAND WITH SILT: SW-SM FINE GRAINED SAND, YELLOWISH BROWN 10YR 5/4, SOFT				PIEZOMETER SET (14.15 - 9.75')
	1		0.0 ppm			
		SANDY SILT: ML, VERY FINE SAND, SOFT, DARK BROWN 7.5 YR 3/3, LENSED WITH YELLOWISH RED 5YR 5/8				
		WELL GRADED SAND WITH SILT: SW-SM DARK YELLOWISH BROWN 10YR 3/6, FINE TO MED. GRAINED SAND, SOFT, MOIST, LENSED WITH: SMALL < 1cm CLAY-FAT CH LIGHT GREY 10YR 7/1 AND VERY TOP SAND WITH SILT SW-SM, SOFT, VERY DARK BROWN 10YR 2/2, MEDIUM GRAINED				
	2		0.0 ppm			
	3		0.0 ppm			
	4		0.0 ppm			
		TOE				
	5		0.2 ppm			
			0.7 ppm		1127 SAMPLE 7J-GP-02	
		SANDY SILT: ML, SOFT, MOIST/SATURATED, VERY DARK GREY 10YR 3/1, FINE TO MED. GRAINED SAND				
	6		0.2 ppm			- SATURATED
		SANDY FAT CLAY: CH, PALE YELLOW 5Y 7/3 POORLY GRADED SAND, SOFT, SATURATED, LENSED WITH: MED. TO COARSE GRAINED WELL GRADED SAND WITH SILT SW-SM AND POORLY GRADED SAND WITH SILT 5Y 3/2				
	7		0.1 ppm			
	8		0.7 ppm			
	9		0.4 ppm			
			0.2 ppm			

PROJECT: - 16 SWMU's | HOLE NO: 7J-GP-02

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE
3. DRILL SUBCONTRACTOR: R.E. Wright	HOLE NUMBER: TS-GP-03
4. PROJECT: Ft. Stewart 16 SWMU's	SHEET 1 OF 3
5. NAME OF DRILLER: Al Root	6. LOCATION: SWMU-27F
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" dia. Macrocore sampler w/Acetate liners	8. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe 5400
	9. HOLE LOCATION: E-821538.38', N-684358.35' NAD-83
	10. SURFACE ELEVATION: NAVD-88 67.97'
	11. DATE STARTED: 1/16/98
	12. DATE COMPLETED: 1/17/98
13. OVERBURDEN THICKNESS: N/A	14. DEPTH GROUNDWATER ENCOUNTERED: 11.4'
15. DEPTH DRILLED INTO ROCK:	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.13' (0:10)
17. TOTAL DEPTH OF HOLE: 12.0'/14.1'	18. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

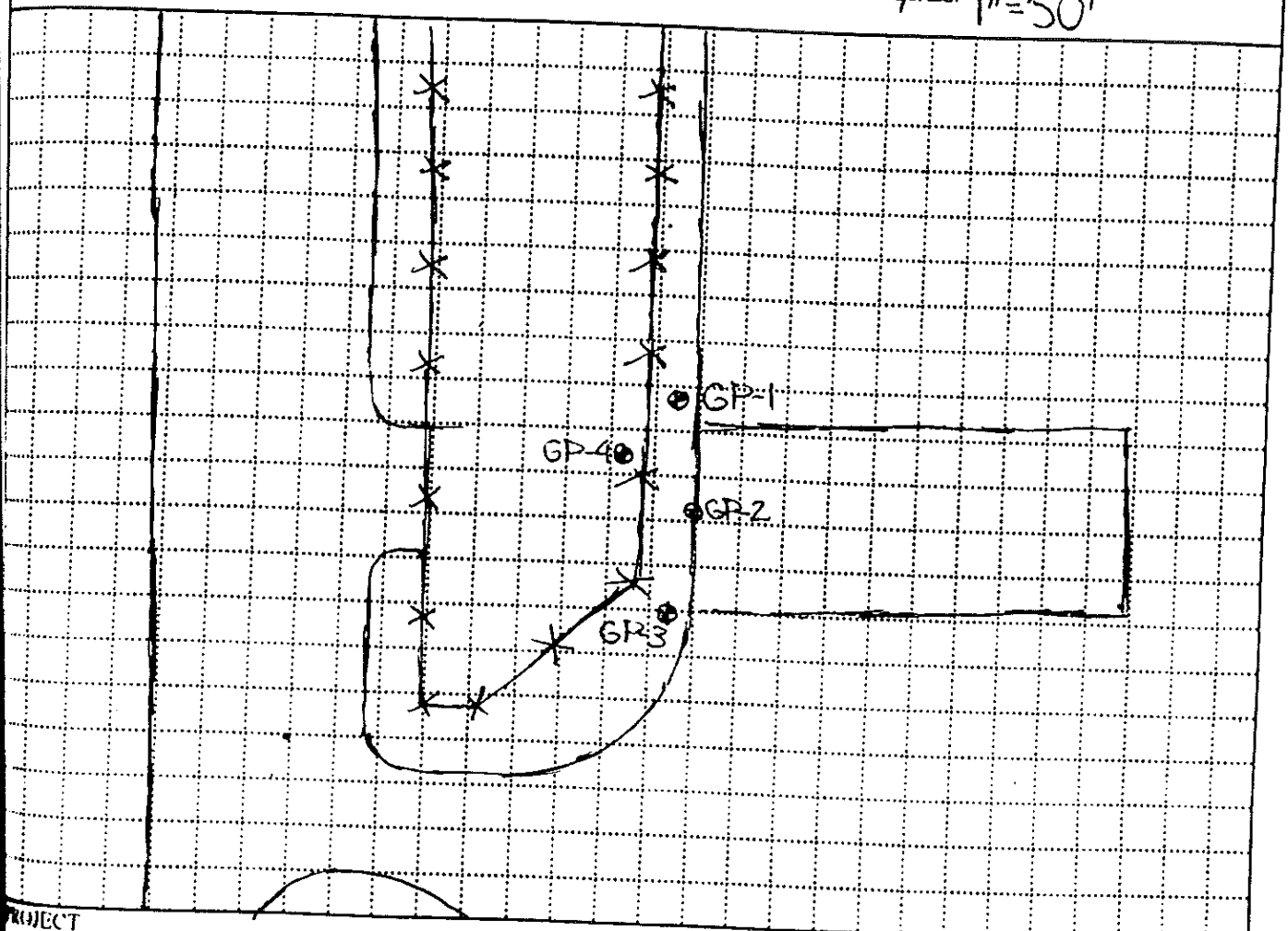
19. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	20. TOTAL NUMBER OF CORE BOXES
			N/A

21. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	22. TOTAL CORE RECOVERY %
	2	Lead (T/D	SVOC			N/A

23. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	24. SIGNATURE OF INSPECTOR
			Piezometer	Paul J. Root

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



PROJECT: Ft. Stewart 16 SWMU's

HOLE NO: TS-GP-03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil cover, etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart | INSPECTOR: | HOLE NUMBER: 75-GP-03 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1.0'	~~Clayey SAND~~ PSL 1/17/98 SAND with some clay (SW-SC), slightly plastic, soft, moist	3.4			Hydrocarbon odor From 1.0'-12.0'
	2.0'		5.5			
	3.0'					
	4.0'		44.5			
	5.0'					
	5.8'					
	6.0'	~~Clayey SAND~~ PSL 1/17/98 Sandy CLAY (CL), medium plastic, medium stiff, moist, pale yellow (5Y 7/4)	311.		75 1321 1610	
	7.0'	7.1'-7.3': Black wet layer w/ petroleum odor				
		7.5'-8.0': Mottled clay				
	8.0'		178			
	9.0'	Continued on next page				

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: TJ-GP-03 | SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	9.0'					
	10.0'	10.0'-10.5': Mottled	303			
	11.0'					
		11.4' Fine to medium SAND w/ some silt (SW-SM), yellow (5Y 7/6), nonplastic, wet				
	12.0'	Bottom of Boring = 12.0'				

PROJECT: Ft. Stewart 11 SWMU's | HOLE NO: TJ-GP-03

HTRW DRILLING LOG

Field	Entry
DISTRICT	Savannah COE
HOLE NUMBER	7J-GP-04
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	N/A
SHEET / SHEETS	1 of 2
3. PROJECT	Ft. Stewart, Georgia 16 SWMU's
4. LOCATION	SWMU #27F
5. NAME OF DRILLER	Andy Knickerbocker
6. MANUFACTURERS DESIGNATION OF DRILL	GEOPROBE
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	Geoprobe - Macrosampler 0-7' BGL
8. HOLE LOCATION	7A-GP-04 E - 821513.22' N - 684315.51' NAD-83
9. SURFACE ELEVATION	NAVD-88 67.86'
10. DATE STARTED	2/3/98
11. DATE COMPLETED	2/3/98
12. OVERBURDEN THICKNESS	NA
15. DEPTH GROUNDWATER ENCOUNTERED	~9.5 BGL
13. DEPTH DRILLED INTO ROCK	N/A
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE	~14.5' BGL
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	Lead	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			piezometer	[signature]

LOCATION SKETCH/COMMENTS See page 29 SCALE:

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7J-GP-04

ENG FORM 5056-R, AUG 94 (Proponent: CECW-EG)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7J-GP-04 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	VERY COARSE SAND/GRAVEL SUB-BASE				MACRO CORE (0-10')
	1	WELL GRADED SAND WITH SILT: SW-SM, SOFT, VERY FINE GRAINED SAND, YELLOWISH RED 5YR 5/6	0.0 ppm			PIEZOMETER SET (9.5-14.5' BGL)
	2	POORLY GRADED SAND WITH CLAY: SP-SC, FIRM, STRONG BROWN 7.5YR 5/6 TO 7.5YR 5/8, LENSED WITH SANDY LEAN CLAY: CL < 2cm	0.0 ppm			
	3		0.0 ppm			
	4		0.0 ppm			
	5		0.0 ppm			
	6	SANDY LEAN CLAY: CL, COARSE SAND, HARD, YELLOW 10YR 8/8	0.0 ppm			
	7		0.0 ppm			
	8	LEAN CLAY WITH SAND: CL, HARD, VERY FINE SAND ~ 5% GRADING DOWNWARD TO ~ 25% VERY FINE SAND, WHITE 2.5 Y8/1			1210 7J-GP-04 COLLECTED 8-10' BGL	
	9					
		VERY FINE SAND: SW, SATURATED RAPID DILATENCY, WHITE 2.5 Y8/1				
	10					

PROJECT: 16 SWMU's | A.18-12 | HOLE NO: 7JGP-04

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-01

SHEET 1 OF 4

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers

5. NAME OF DRILLER: Darren Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-59 / CME-85

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: For S. Casing ⇒ 8¼" ID Auger - Sch. 80 PVC (6.6" OD) 2" Split Spoons (2' long)

8. HOLE LOCATION: See map. 27F-MW1 N684433.25 E821537.79

9. SURFACE ELEVATION: TOC 69.16

10. DATE STARTED: 10/9/99

11. DATE COMPLETED:

12. OVERBURDEN THICKNESS: N/A

13. DEPTH DRILLED INTO ROCK: N/A

14. TOTAL DEPTH OF HOLE: 21 FT

15. DEPTH GROUNDWATER ENCOUNTERED:

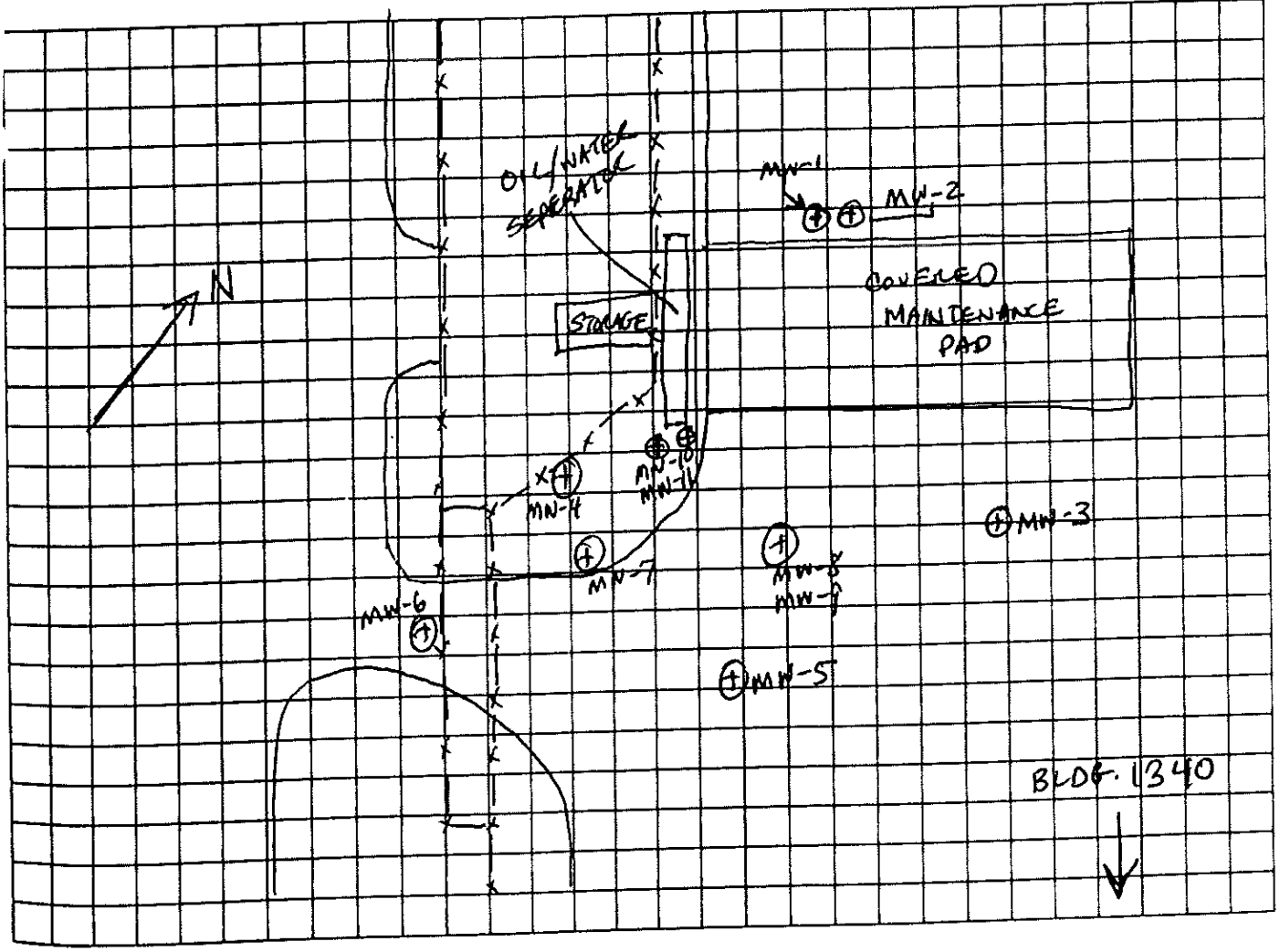
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: BTEX	RCRA METALS: SVOC / TOC	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL: 2" ID	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: H Smith		

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



(Signature and Date)

QA CHECK BY:

NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs | INSPECTOR Heather Smith | SHEET 2 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	SC - Clayey Sand med → fine gr. Sand angular → Subrounded moist, soft to firm	(headspace 0-2' BGS) 0.5 ppm		0.5' Samp. ID # 7J1171 @1535	RUN #1 RUN 2' Rec. 1.25' Loss .75'
	1	Predominantly 5YR7/1 or Grey mottled w/ 10YR 5/6 yellowish red			1.0	RUN from Bottom of Concrete Concrete Plug .83' above G.S.
		Loss				
	2	Same as above - Wet (but only because water was used to core the concrete here this morning - Not Natural G.W.	(headspace 2-4' BGS) 3.1 ppm			RUN #2 RUN 2.0 Rec 2.0 Loss 0
	3	CL - Lean Clay w/ Some Sand high plasticity, moist, soft to firm (5YR7/1) Grey		3.5' geotech	3.0 Samp. ID# 7J1172	
		SM - Silty Sand - black to (same color as above) dry, soft (10YR7/1)				Both sections are SM from 3.1 → 3.6 but there is a DISTINCT color change between the 2 @
	4	SM - Silty Sand med → fine gr. Sub.rounded → Subang. 10YR 3/3 dk brown Wet - due to coring.		4.0	4.0 1550	RUN #3
		SC - Clayey Sand: ~40% clayey ~60% Sand med. grains - (predominantly) Some cs (10%) Some fine (10%) Med. plasticity → high plasticity 10YR 6/1 GREY	(headspace 4-6' BGS) 2.0 ppm			RUN 2.0 Rec 1.5 Loss 0.5
	5	Loss				
	6					SET SURFACE CASING
	7					
	8					
	9	8.6': CLAY (CL), LIGHT GRAY (2.5Y 7/1), WITH RED MOTTLING STREAKING, STIFF, MED TO HIGH PLASTICITY, MOIST				CLAY AT 8.6' BASED ON LOG FROM 27F-MW2
	10					

HTRW DRILLING LOG 27F-MW2 | HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	10': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-SAND ROUNDED, SLIGHT PLASTICITY, MOIST				BASED ON LOG ~~FROM~~ LMM 10/11/99 WELL 27F-MW2
	11	11': SANDY CLAY (CL), LIGHT GRAY (5Y 7/1), F-~~S~~AND, SLIGHT PLASTICITY, MOIST				
	12	12': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-M LMM 10/11/99 SAND, SUBROUNDED, ~~LOOSE~~ ~~SAT~~ MED. DENSE, WET.				▽ GW ENCOUNTERED AT 12 FT.
	13					
	14	13.5': SAND (SP), YELLOW (2.5Y 7/6), F-M SAND, SUBROUNDED, LOOSE SAND, LITTLE TO NO FINES, WET.				
	15					
	16					2" SCH-40 PVC WELL SET AT 19.65 FT
	17	16': SAND (SP), YELLOW (2.5Y 7/6), F-M SAND, SUBROUNDED, LOOSE, LITTLE TO NO FINES.				
	18	18': INCREASE IN GRAIN SIZE				
	19					
	20					

HTRW DRILLING LOG 27F-MW1

HOLE NUMBER

SHEET 4 OF 4

PROJECT: Fort Stewart USTs

INSPECTOR L. Mercado

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
						HSA TO 21 FT
	21	21' END OF BORING				
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW2

SHEET ___ OF ___

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: MDC

3. PROJECT: Fort Stewart

4. LOCATION: SWMU 27F

5. NAME OF DRILLER: B. UPCHURCH

6. MANUFACTURERS DESIGNATION OF DRILL: CME-85

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" HSA; 5' CONTINUOUS SAMPLER

8. HOLE LOCATION: 27F-MW2

9. SURFACE ELEVATION: TOC 69.27 N 684435.72 E 821540.10

10. DATE STARTED: 10/10/99

11. DATE COMPLETED: 10/10/99

12. OVERBURDEN THICKNESS: N/A

13. DEPTH DRILLED INTO ROCK: N/A

14. TOTAL DEPTH OF HOLE: 45 FT

15. DEPTH GROUNDWATER ENCOUNTERED: ~12 FT

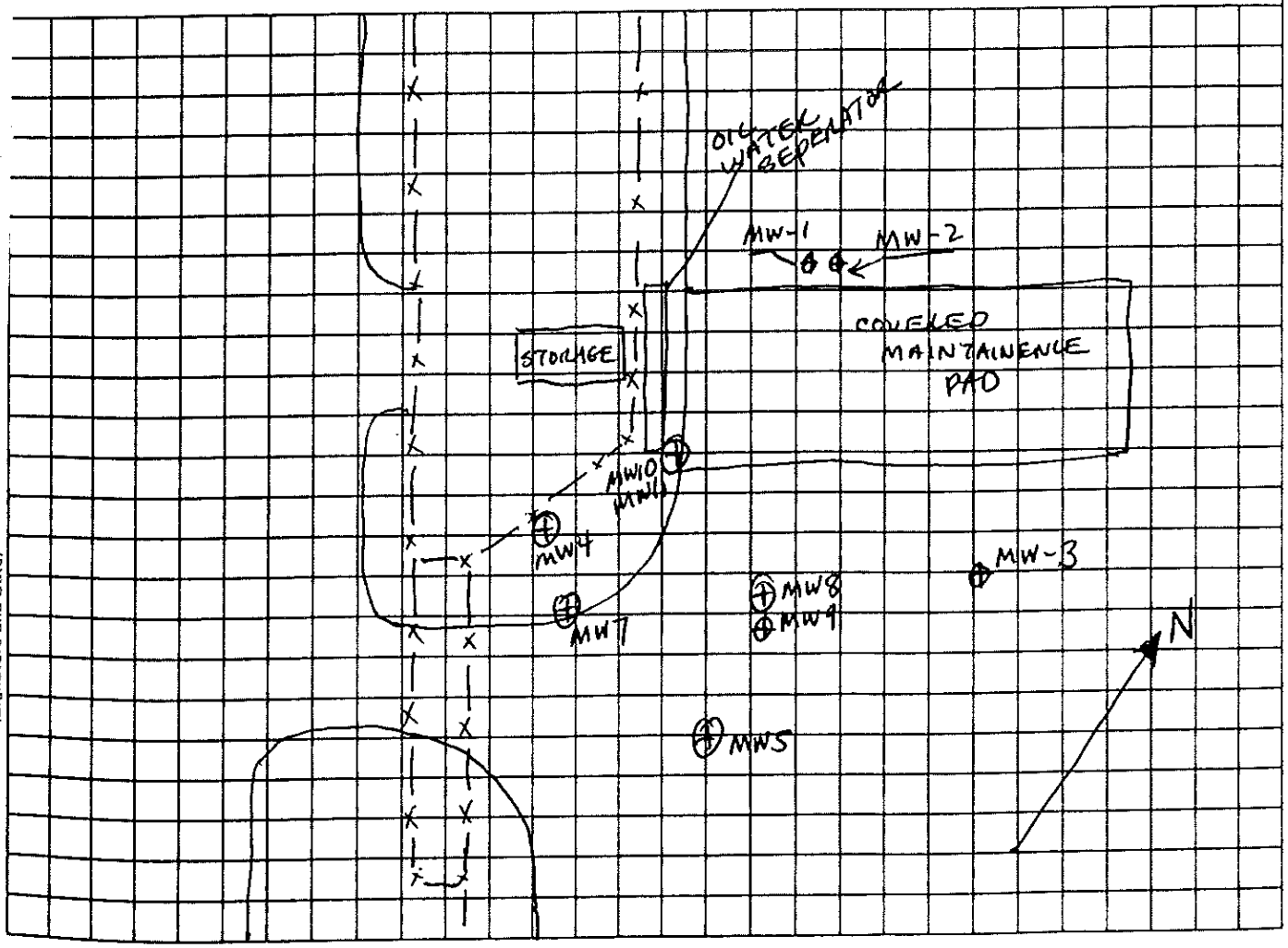
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	RCRA	SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			2" PVC	L. Mucak		

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

QA CHEC

HTRW DRILLING LOG

27F-MW2 | HOLE NUMBER | 4

PROJECT: Fort Stewart USTs | INSPECTOR C. MERCADO | SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		0-0.85': CONCRETE FROM MOTOR POOL				
	1	0.85': CLAYEY SAND(SC); LIGHT GRAY(5YR 7/1) & RED (2.5YR 4/8), F-SAND, TO M-SAND, DENSE, SLIGHT PLASTICITY, DRY	0.85-2.5 (3.2)	1-2' SOIL SAMPLES TJ1271 & TJ1221 @ 1245		0.85-5': (4.15/4.15)
	2					
	3	2.6': CLAYEY SAND(SC), MOTTLED LIGHT GRAY(5YR 7/1) RED (2.5YR 4/8), & YELLOWISH BROWN (10YR 5/6), F-M SAND, SLIGHT PLASTICITY, DRY.	2.5-5' (2.8)	2.5-5' SOIL SAMPLE TJ1272 @ 1320		
	4	3.2': SILTY SAND(SM), VERY DARK GRAY (10YR 3/1), F-SAND, WITH SOME SILT (~20%), DRY.				
	5	4.2': SILTY SAND(SM), LIGHT YELLOWISH BROWN (2.5Y 6/4), AS ABOVE, MOIST.				
	6	5': SANDY CLAY(CL), LIGHT GRAY (2.5Y 7/1) & OLIVE YELLOW (2.5Y 6/6), F-M SAND, SLIGHT PLASTICITY, MOIST.	5-7.5' (0.6)			5-10': (4.8/5)
	7	7': SANDY CLAY(CL), AS ABOVE BUT MOTTLED WITH REDDISH BROWN (5YR 4/4), MOIST.				
	8		7.5-10' (0.4)			
	9	8.6': CLAY(CL), LIGHT GRAY (2.5Y 7/1) WITH RED (10R 5/6) MOTTLING/STREAKS, STIFF, MED TO HIGH PLASTICITY, MOIST.				
	10					

HTRW DRILLING LOG — 27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	10': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-SAND, ROUNDED, SLIGHT TO NO PLASTICITY, MOIST.		10-12 (0.7)		10-15': (3.7/5)
	11	11': SANDY CLAY (CL), LIGHT GRAY (5Y 7/1), F-SAND, SLIGHT PLASTICITY, MOIST.				
	12	12': CLAYEY SAND (SC), LIGHT GRAY (5Y 7/1), F-M SAND, SUBROUNDED, MED DENSE, WET				▽ GW ENCOUNTERED AT 12 FT
	13					
	14	13.5': SAND (SP), LIGHT GRAY (5Y 7/1), F-SAND, SUBROUNDED, LOOSE SAND, LITTLE TO NO FINES, WET.				
	15					15-20': (NO RECOVERY)
	16	16': SAND (SP), YELLOW (2.5Y 7/6), F-M SAND, SUBROUNDED, LOOSE SAND, LITTLE TO NO FINES, WET.				
	17					
	18	18': INCREASE GRAIN SIZE				
	19					
	20					

HTRW DRILLING LOG — 27F-MW2 — HOLE NUMBER

PROJECT: Fort Stewart USTs — INSPECTOR L. MERCADO — SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	20	20': SAND(SP), YELLOW (2.5Y 7/6), M-SAND, SUB-ROUNDED, LOOSE, WET.				20-25': (NO RECOVERY)
	21					
	22					
	23					
	24					
	25	25': SAND(SP), PALE YELLOW (2.5Y 8/4), F-M SAND, LOOSE, SUBROUNDED, WET.				25-30': (1.5/5)
	26					
	27	27': SAND(SP), GREENISH GRAY (10Y 6/1), F-M SAND, LOOSE SUBROUNDED, WET.				
	28					
	29					
	30					

HTRW DRILLING LOG

27F-MW2

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR L. MERCADO

SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	30	30': SAND (SP), GREENISH GRAY (10Y6/1), F-M SAND, LOOSE, SUBROUNDED, WET.				30-35': (0.5/5)
	31					
	32					
	33					
	34					
	35					35-40': (0/5)
	36					
	37			37-40' GEOTECH SAMPLE NO. 7J1273 @ 1615		
	38					
	39	39': SAND (SP), AS ABOVE WITH TRACE OF COARSE SAND, WET.				
	40					

8

HTRW DRILLING LOG — 27F-MW2 — HOLE NUMBER

PROJECT: Port Stewart USTs — INSPECTOR L. MERCADO — SHEET OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	40	40': SANDY CLAY (CL), LIGHT GREENISH GRAY (5GY 7/1) F-CRS SAND, STIFF, SLIGHT PLASTICITY, ~~WET~~ MOIST. LMM 10/10/99				40-45': (5/5) (HAWTHORNE?)
	41	41': CLAYEY SAND (SC), LIGHT GREENISH GRAY (5GY 7/1), F-CRS SAND, ROUNDED, DENSE, SLIGHT TO NO PLASTICITY, MOIST.				
	43	43-45': CLAYEY SAND (SC), AS ABOVE WITH TRACE OF BIVALVE SHELL FRAGMENTS, MOIST.				
	45	45': END OF BORING				
	46					
	47					
	48					
	49					
	50					

48

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27P-MW-03(7J)

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 4

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers Brigade Motorpool.

5. NAME OF DRILLER: Doug Bishop

6. MANUFACTURERS DESIGNATION OF DRILL: CME 75

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME Model 75 Drill rig; 4¼-in. ID Hollow-stem augers, with 9-in. diam. bit, 3½-in. ID x 5-Ft Spli-t-spoons.

8. HOLE LOCATION: E. of covered maint. pad. N 684392.10

9. SURFACE ELEVATION: TOC 68.45 ft E 821630.44

10. DATE STARTED: 10-10-99

11. DATE COMPLETED: 10-10-99

12. OVERBURDEN THICKNESS: N/A

15. DEPTH GROUNDWATER ENCOUNTERED: 14 Ft BGS

13. DEPTH DRILLED INTO ROCK: N/A

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 12.3 Ft BTOC - 7.7 Ft BGS / 2 hrs.

14. TOTAL DEPTH OF HOLE: 25.0 Ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: DISTURBED / UNDISTURBED

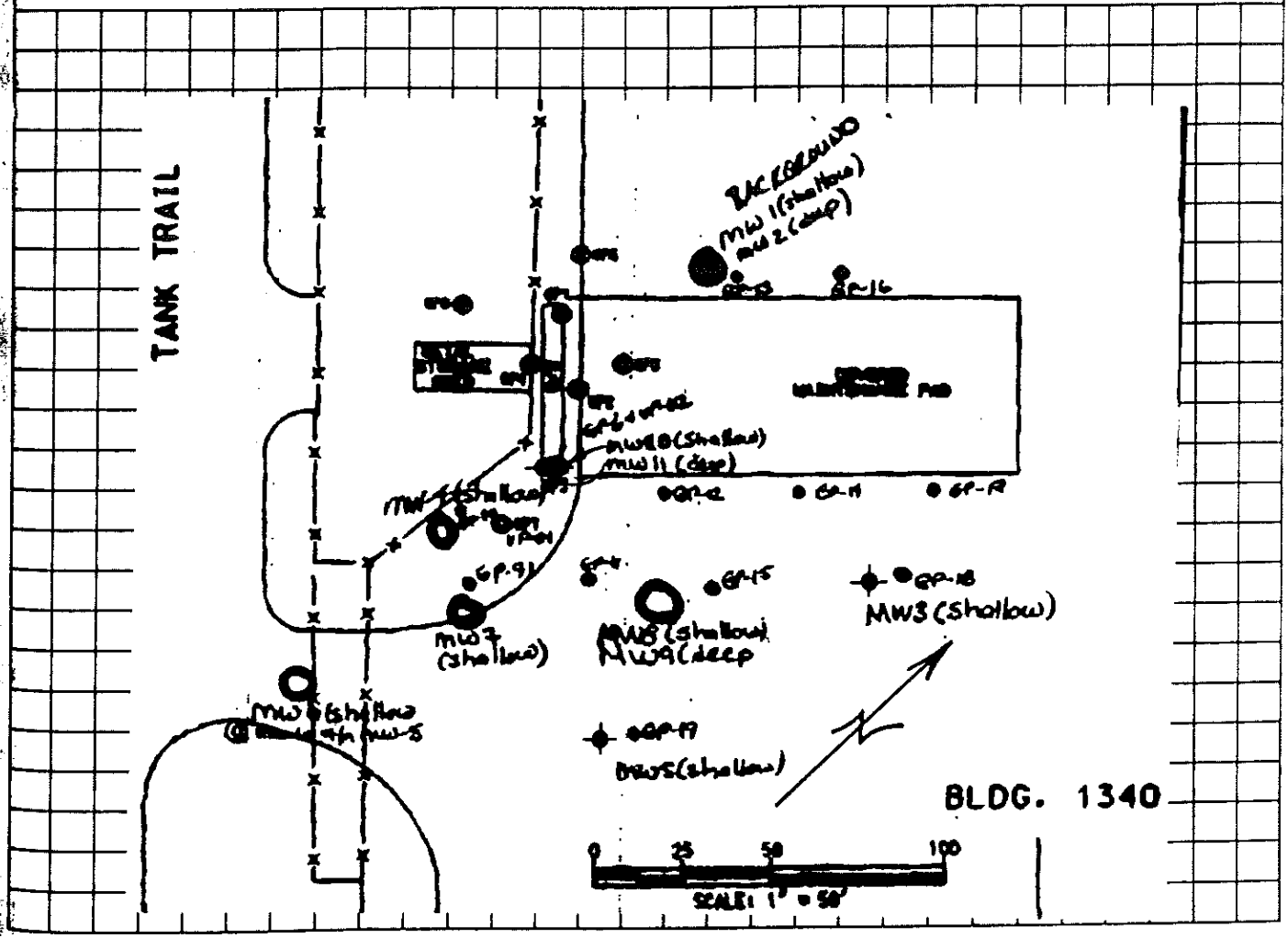
19. TOTAL NUMBER OF CORE BOXES: N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	X	SVOC			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		

LOCATION SKETCH/COMMENTS

SCALE: 1-in. = 50 Ft



HTRW DRILLING LOG

HOLE NUMBER 27F-MW-05(1) 49

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 2 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete pavement	N/A	N/A	N/A	
	1	Lt. red (10R 6/6) sandy clay: moist, mottled, mod plast.	1.3ppm		751371	Drill: 4.3 Ft Recover: 3.2 Ft
	2	Lt. yell-brn (10YR 6/4) silty gravel sand: moist, F-to C-grnd, loosely packed.				
	3	Black (10YR 2/1) silty sand Dry, F-grnd, ~~dark top~~, massive, loosely packed.	7.5ppm	N/A	N/A	
	4	V. pale brn (10YR 8/3) sand: dry, massive, F-grnd, dark top, loose.				
	5	No Recovery	N/A		N/A	
	6	Gray (10YR 6/1) and Lt. yell-brn (10YR 6/4) sandy clay: moist, plastic, mottled to stratified	1.8ppm	N/A	N/A	Drill: 5.0 Ft Recover: 5.0 Ft
	7					
	8	gray and Lt. red sandy clay: moist, stiff, plastic, mottled.	76ppm		751372	
	9					
	10					

HTRW DRILLING LOG

HOLE NUMBER ZTF-MW-03(TS) 50

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Grey clay: moist, stiff plastic, thinly laminated/ stratified	13ppm.	N/A	N/A	Drill: 5.0 Rt Recover: 4.2 Rt
	12	V. pale brn: clay sand: wet, stratified/ thin-lam, F-grnd.		751373		
	13	Yellow (10YR 7/6) clay sand: wet, mottled, graded, F- to C-grnd, mod. packed to loose.	1.3ppm		N/A	Coarse sand bed.
	14					Water @ 14 Rt
	15	No Recovery	N/A	N/A	N/A	
	16	Yellow (10YR 8/6) clay Silt: wet, F- to M-grnd, sl. plastic.				No sampling, lith from cuttings.
	17			751373		
	18		N/A		N/A	
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-05 (75) 51

PROJECT: Fort Stewart USTs

INSPECTOR Timothy Coffey

SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Yellow clay sand (as above)		751373		
	22		N/A	N/A	N/A	
	23					
	24					
	25					TD = 25.0 ft.
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah		HOLE NUMBER: 27F-MW-04
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF

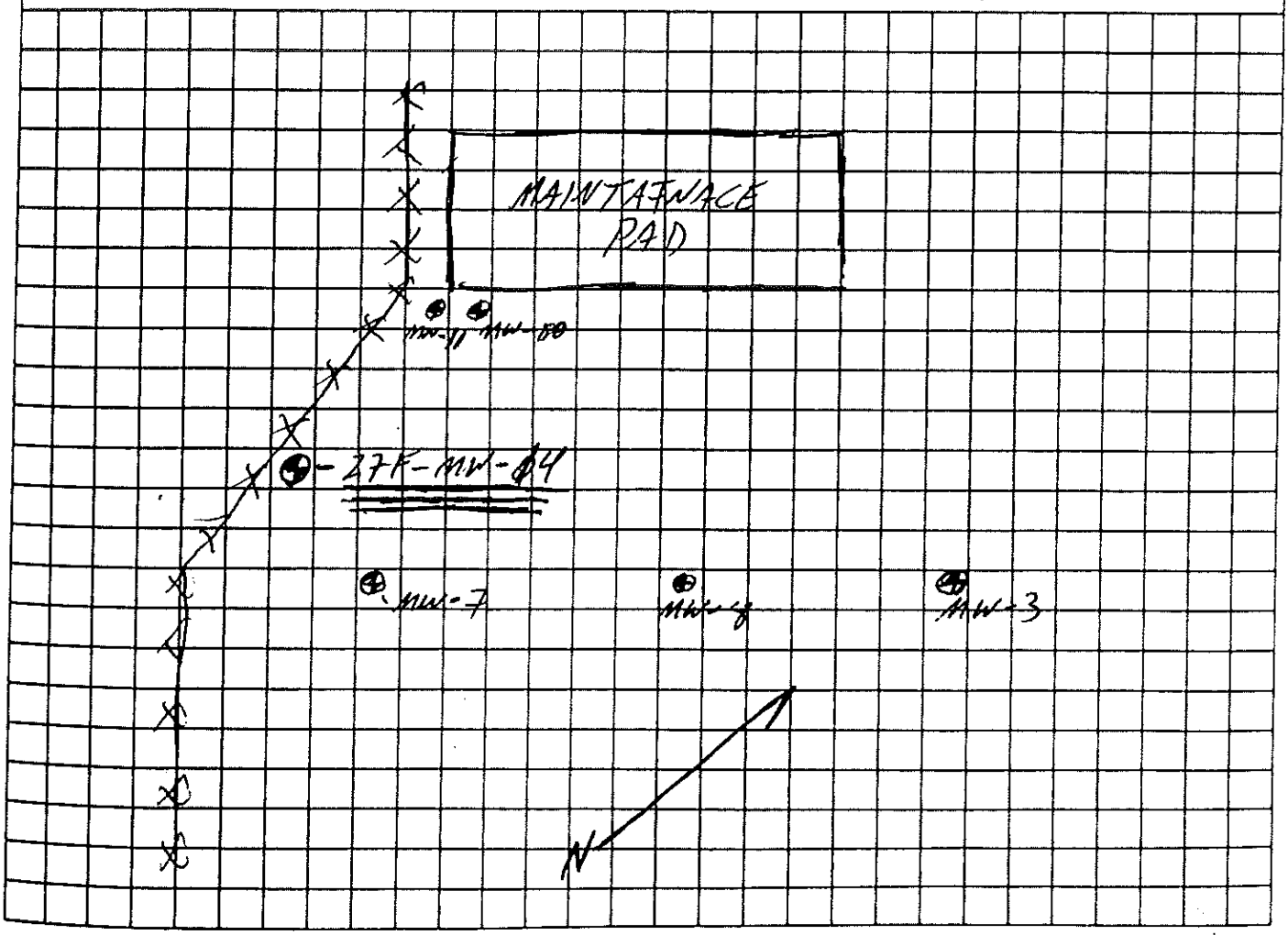
3. PROJECT: Fort Stewart	4. LOCATION: 27F
5. NAME OF DRILLER:	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" I.D. HSA 5ft continuous split spoon	8. HOLE LOCATION: See Map Below
	9. SURFACE ELEVATION: TOC 68.02 ft N 684325.34 E 821527.60
	10. DATE STARTED: 11 Oct 99 / 11. DATE COMPLETED: 11 Oct 99
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED:
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.4 / 4 hrs (auger string @ 15ft bls)
14. TOTAL DEPTH OF HOLE: 18.0 ft	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOA			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		✓		

LOCATION SKETCH/COMMENTS — SCALE: NA



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

QA CHEC

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-04

PROJECT: Fort Stewart USTs | INSPECTOR Brad Butler | SHEET 1 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	SAND; sand: med ~ 95% silt ~ 5%; Lt Brownish Gray 10YR 6/2; subrounded; moderately sorted; soft; nonplastic; moist; roots present (SM)	0.2 ppm		0-1 ft ID: FJ1471 0930 hrs	Run #1 0-5 ft 3.4 ft recovery
	1	CLAYEY SAND; sand; med-coarse ~ 70%, clay ~ 30%; Lt Brownish Gray 10YR 6/2 variegated red and yellowish orange; subrounded; poorly sorted; firm; low plasticity; moist (SC)		NA		
	2					
	3	SAND; sand: fine-med ~ 85% silt ~ 15%, DK Gray, Lt Brown 10YR 6/2 banded dk brown and light Gray; well sorted; soft-firm; non plastic; moist (SM)	0.6 ppm			
	4					
	5					
	6	SANDY CLAY; sand: med-coarse ~ 40%, clay ~ 60%; Yellow 10YR 7/6 w/ whisps of lt. gray clay; subrounded; poorly sorted; firm; med. plasticity; moist; (CL)	0.6 ppm		FJ1442 Rinsate 5.0-6.9 ft ID: FJ1472 1010 hrs	0935 Rinsate sample collected prior to 5-10 ft run. DI H2O through decon split spoon
	7	SAND; med-coarse ~ 80%, silt ~ 20%, Yellow 10YR 7/6 w/ thick whisps of red and lt. gray; subrounded; moderately sorted; firm; nonplastic; moist (SM)		NA		Run #2 5-10 ft 1.9 ft recovery
	8					
	9					
	10					

HTRW DRILLING LOG						HOLE NUMBER ZFF-MW-#?
PROJECT: Fort Stewart USTs			INSPECTOR			SHEET 2 OF 2
ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10–15	No Recovery	NA	NA	NA	Run #3 10 - 15 ft - 12.0 ft bls drilling became soft - BZ-0.0 ppm cuttings 70.0 ppm @ 13 ft bls - Outside of spoon wet bottom 2.5 ft. ∴ 12.5 ft bls - 1040 hrs. H_2O level @ 9.5 ft bls - No free product or saturated soils throughout sample intervals - 1120 hr H_2O @ 8.3 ft bls auger string @ 15.0 ft
	15–18	Drilled Out	14.2 ppm → / NA	Bag Sample 15-16 ft bls 1500 hrs	NA	1445 H_2O @ 7.4 ft bls
	18	TD = 18.0 ft bls				

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HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: ETF-MW-05(63)

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 3

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers Brigade Motorpool.

5. NAME OF DRILLER: Doug Bishop

6. MANUFACTURERS DESIGNATION OF DRILL: CME 75

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME Model 75 Drill rig; 4¼-in. ID Hollow stem augers, with 9-in. diam. bit; 3½-in. ID x 5-ft split-spoon samplers

8. HOLE LOCATION: E. of covered maint. pad.

9. SURFACE ELEVATION: TOC 67.99 ft N 684514.94 E 821614.36

10. DATE STARTED: 10-10-99

11. DATE COMPLETED: 10-10-99

12. OVERBURDEN THICKNESS: N/A

15. DEPTH GROUNDWATER ENCOUNTERED: 13.5 Ft BGS

13. DEPTH DRILLED INTO ROCK: N/A

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

14. TOTAL DEPTH OF HOLE: 20.0 Ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

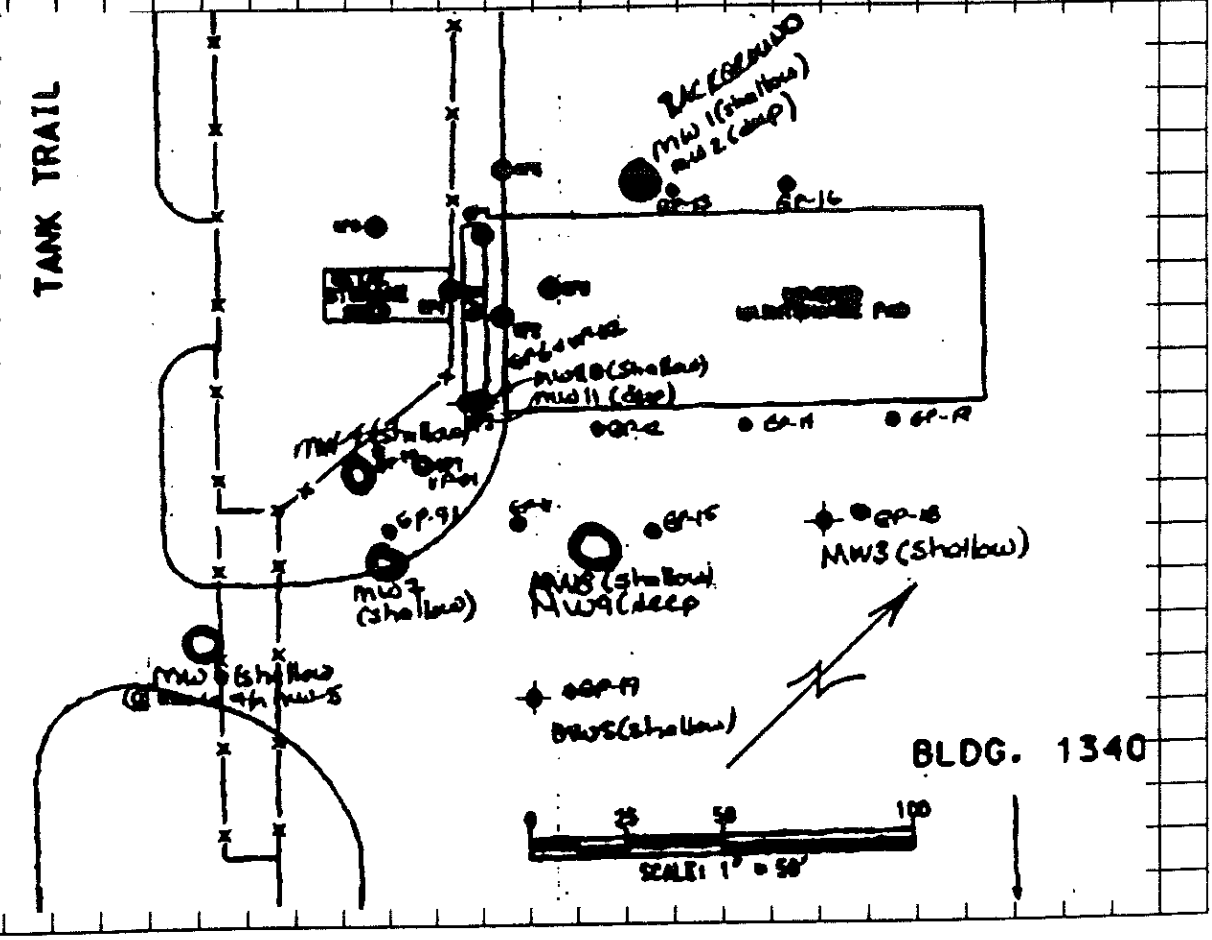
18. GEOTECHNICAL SAMPLES: DISTURBED / UNDISTURBED

19. TOTAL NUMBER OF CORE BOXES: N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	X	SVOC			
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
		X		Timothy Poffley		

LOCATION SKETCH/COMMENTS

SCALE: 1-in. = 50 Ft.



HTRW DRILLING LOG

HOLE NUMBER ZTF-MW-05(75) 64

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete Pavement	N/A	N/A	N/A	
	1	Lt red (10R 6/6) sandy clay; moist, sl. plastic (50% clay / 50% sand), M-grnd, mottled.	6.6ppm		TJ1571	Drill. 4.4 Ft Recover. 3.9 Ft
	2					
	3	Black (10YR 2/1) silty sandy w/clay, dry, F-grnd, massive, rel. stiff (±20% clay)	10.1ppm	N/A	TJ1572	
	4	Pale yellow (2.5Y 7/3) sandy clay (see below)				
	5	No Recovery	N/A		N/A	
	6	Pale yellow sandy clay; moist, mottled, stiff, plastic.	1.1ppm		N/A	Drill. 5.0 Ft Recover. 4.5 Ft
	7			N/A		
		Gray (10YR 7/1) and red (10R 4/6) sandy clay.				
	8	Lt. green-gray (10GY 7/1) Sandy clay; moist, strat/thinly lam, very stiff, plastic.	1.0ppm		N/A	
	9	More sand/silt than clay.		TJ1571		
	10	No Recovery	N/A	N/A	N/A	

HTRW DRILLING LOG

HOLE NUMBER 27F-MW06 (27) 65

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Very pale brn (10YR 8/2) sand: wet, massive, F-grnd, pretty;	N/A	TJ1573	N/A	Drill: 5.0 Ft Recover: 2.6 Ft
	12					
	13	No Recovery	N/A	N/A	N/A	water @ 13.5 Ft.
	14					
	15	Very pale brn sand (as above)				No core, l.f. from cuttings.
	16					
	17		N/A	TJ1573	N/A	
	18					
	19			N/A		TD = 20.0 Ft
	20					

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HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-06-(7F)

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Co

SHEET 1 OF __

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineering

5. NAME OF DRILLER: Darren Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" auger; 5' long 4" split spoon samples

8. HOLE LOCATION: See map

9. SURFACE ELEVATION: TOC 67.88 N 684253.33 E 821526.08

10. DATE STARTED: 10/11/99

11. DATE COMPLETED: 10/11/99

12. OVERBURDEN THICKNESS: Greater than TD

13. DEPTH DRILLED INTO ROCK: NA

14. TOTAL DEPTH OF HOLE: 20' BGS

15. DEPTH GROUNDWATER ENCOUNTERED: 9.1' BGS = Sand wet

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 7.75 after ~2 min of piercing clay zone.

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): 7.25' BGS ~30 min. after setting well.

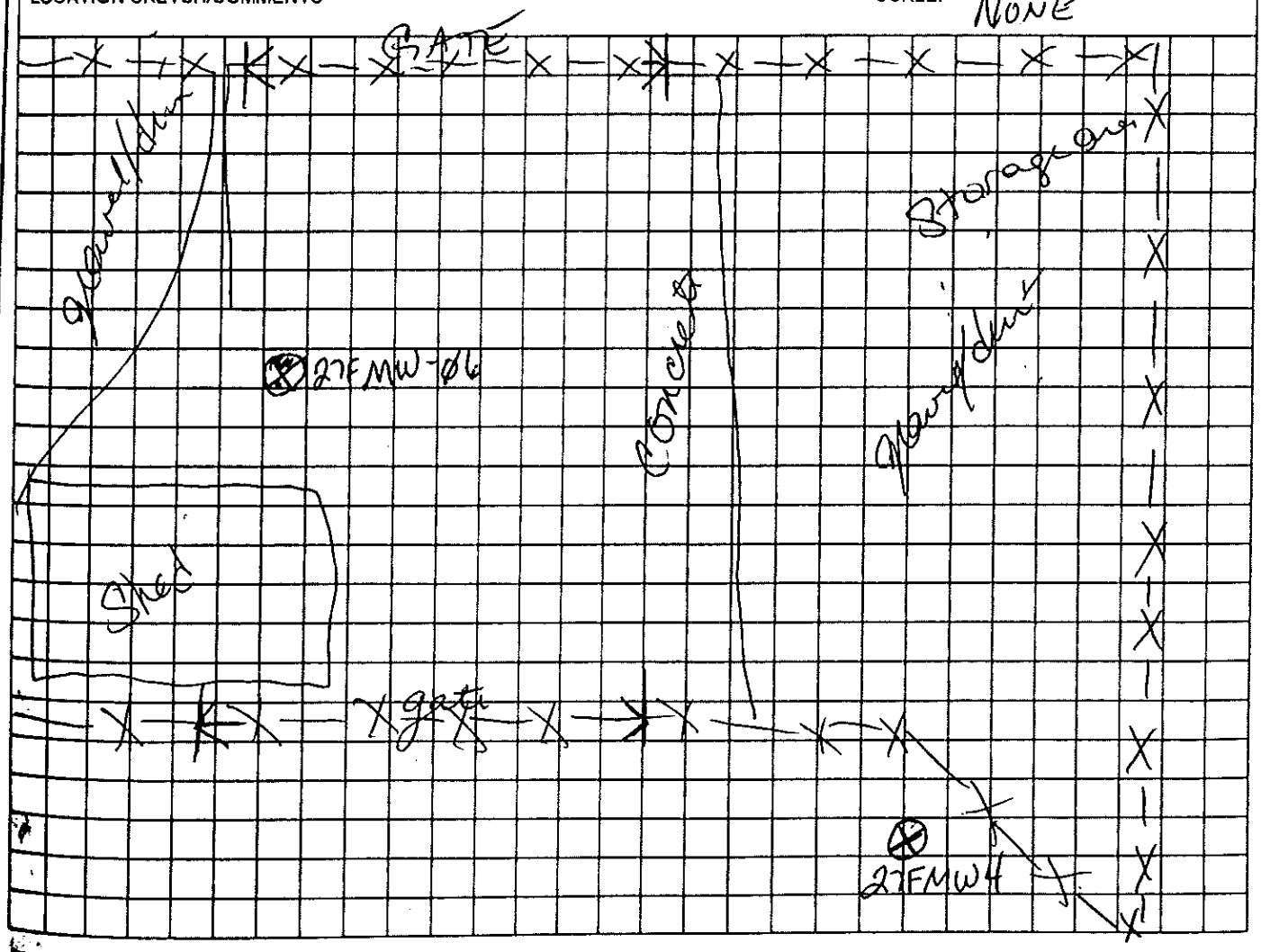
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
			NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	RCRA METALS / SVOCS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X	X				NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Heather Smith

LOCATION SKETCH/COMMENTS

SCALE: NONE



NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: (Signature and Date)

HTRW DRILLING LOG

HOLE NUMBER 27-MW-35

PROJECT: Fort Stewart USTs | INSPECTOR Heather Smith | SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete core			Sample ID # TJ1671 @1215 1.0	RUN #1 RUN 5' Rec. 3.1 + .6 concrete Loss 1.3' FILL lt. grey = lean clay nodes.
	Ø1	SC - Clayey Sand. w/ Silt ~15% lean (Hard) clay nodules intermixed w/ Base mtrl. & ~20% fat clay ? ~ 50% med → cs. grained angular Sand. ~15% Silt/fines mottled color - predominantly 5YR 5/4 Reddish brown w/ 5YR 3/3 dk. reddish brown, 5YR 7/1 grey	2.2 ppm			Ø1
	Ø2					Ø2
		SM - Silty Sand. med → fine Subrounded → Subangular grains, Soft dry, nonplastic 10YR 3/1 very dk. grey w/ some 10YR 7/1 grey streaks.	5.3 ppm			
	Ø3	SC - Clayey Sand - hard dry ~55-45% Sand, med. gr. lean clay.				Sc clay layer is 5cm thick 10YR 3/1 v. dk. grey
	Ø4	SM - Silty Sand. Med → fine grained, SUB rounded → Subangular Sands dry to slightly moist. 10YR 6/4 light yellowish brown				NO ODOR ON THIS RUN Ø4
	Ø5	Loss				Ø5
		SM - Silty Sand - as above				RUN #2 RUN 5.0' Rec. 4.3 Loss 0.7
	Ø6	CL - Lean Clay w/ Sand. firm, hard, high plasticity, 5YR 7/1 lt. grey. Slightly Mottled w/ 5YR 3/3 dk. reddish brown, 3 10YR 5/4 yellowish brown	2.3 ppm			Ø6
	Ø7	Slightly moist [Where DRY - this clay breaks apart w/ blocky weathering]	2.5 ppm			Ø7
	Ø8	Sand is fine grained Subrounded. (~25% sand)			7.5-9.1 Sample ID # TJ1672 @1238	Water rose to 7.75' almost immediately after breaking Clay Seal (SS) NO ODOR ON THIS RUN Ø8
	Ø9	Slightly moist			9.1'	Ø9 definate contact line @ 9.1' BGS hard lean Clay to soft Saturated Sand.
	10	SM - Silty Sand - Saturated soft, med → fine gr. Subrounded → Subangular				
		Loss				
		SM - Silty Sand - Saturated	2.3 ppm			10

HTRW DRILLING LOG

HOLE NUMBER 27F-MW36

PROJECT: Fort Stewart USTs

INSPECTOR Heather Smith

SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	SM - Silty Sands. ~~Some~~ Wet Soft Color = 10YR 4/3 Brown No Smell from cuttings fine → med. gr. Sands.	over cuttings 1,2ppm			Log by cuttings only
	12					*NO ODOR DURING DRILLING NO PID HITS ON CUTTINGS OR B.2 over S. split-spoon
	13	gradually getting wetter & lighter in color....				
	14	SM - Silty Sand Saturated fine gr. Subrounded Sands. 10YR 7/6 yellow				Unsure of exact contact, but just before last 5' RUN facies change to runny Saturated fine Sands. (looks like cookie dough)
	15					
	16		Headspace 1.8ppm	Sample ID 7J1673		
	17					
	18					
	19					
	20					B.O.B. 20.0

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-07

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller

SHEET 1 OF __

3. PROJECT: Fort Stewart

4. LOCATION: 27F

5. NAME OF DRILLER: Darron Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID Hollow Stem Augers; 5 ft continuous split spoon; 8¼" ID HSA

8. HOLE LOCATION: See Map Below — N 684315.20, E 821556.65

9. SURFACE ELEVATION: TOC 68.14 ft

10. DATE STARTED: 10 Oct 99

11. DATE COMPLETED: 10 Oct 99

12. OVERBURDEN THICKNESS: NA

15. DEPTH GROUNDWATER ENCOUNTERED: 9.5

13. DEPTH DRILLED INTO ROCK: NA

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

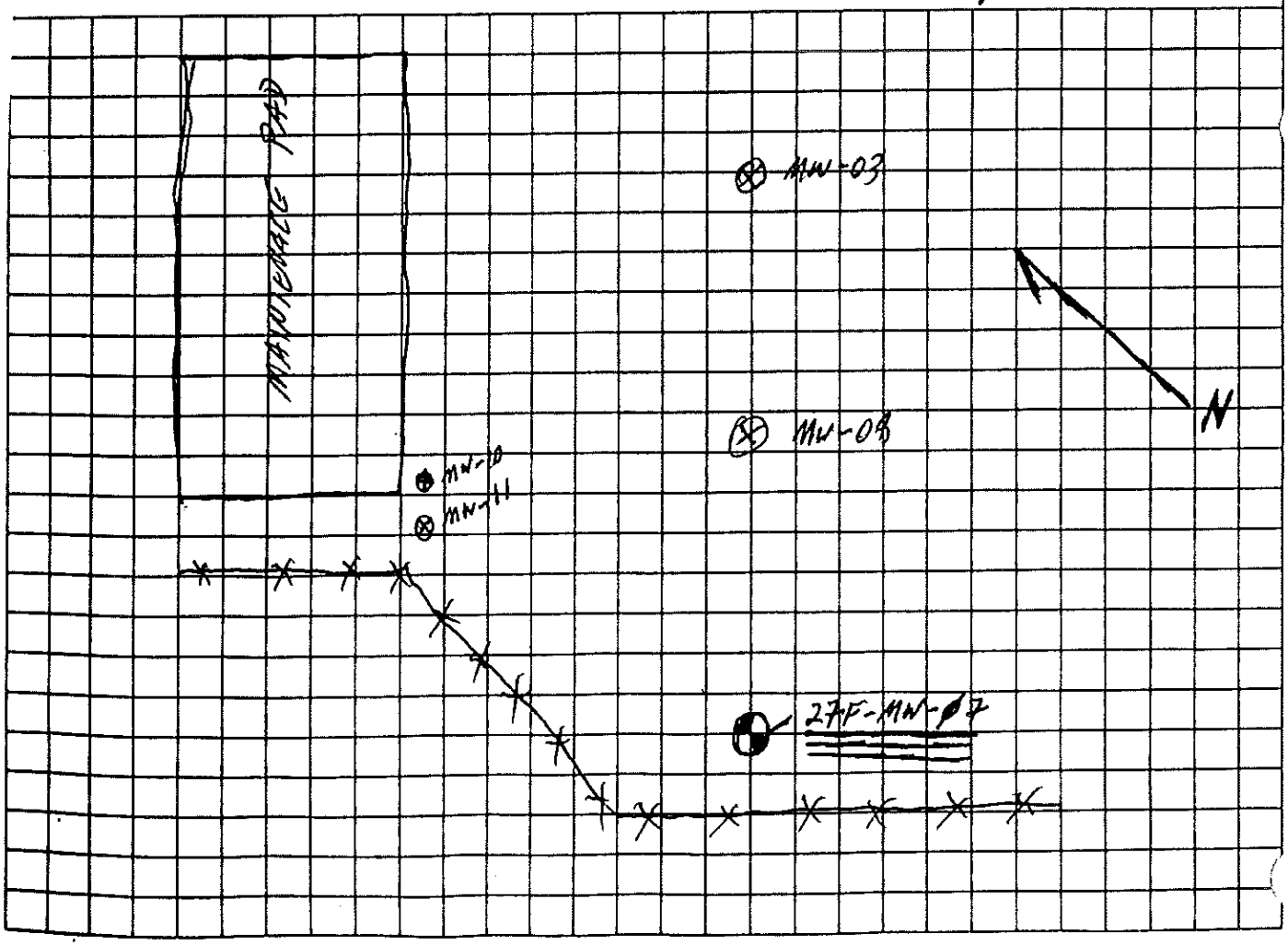
14. TOTAL DEPTH OF HOLE: 21.0 ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	TOC	SVOC		
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
		✓				

LOCATION SKETCH/COMMENTS

SCALE: NA



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

HOLE NUMBER 27F.MW07 4

PROJECT: Fort Stewart USTs | INSPECTOR Brad Baker | SHEET 1 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		CONCRETE SLAB 0 - 0.85 ft				
	1	SAND; med - fine ~80%, silt 20%; Black 10YR 2/1; subrounded; poorly sorted; non plastic; soft; moist (SM)		actual 0.85 - 1.85 ft	1419 hrs 7J1771 labeled as 0.0 - 1.0 ft	0 - 5 ft run 0.0 ppm BZ
	2	SANDY CLAY; sand; med - fine ~40% clay ~60%; Lt Red 2.5 YR 7/6; variegated white and yellow; firm; subrounded; poorly sorted; med plasticity (CL)	1.8 ppm			Bottom 1.0 ft of spoon (outside) is wet
	3	SAND; med - fine ~80%, silt ~20%; GRAY 5Y 5/1, banded med. brown; subrounded; mod sorted; firm, non plastic; moist (SM)	45.6 ppm	NA	1425 7J1772 2.5 - 5.0 ft	Recovery 4.3 ft ∴ 100%
	4	SANDY CLAY; sand; med - fine ~35%, clay ~65%; Lt Grey 7/1 banded yellow 10YR 8/6; subrounded; poorly sorted; med. plasticity; moist (SC)				
	5	~~SAND~~ SAME AS ABOVE (4.9 - 5.0 ft description) coarse grained sand, FIRM				5 - 10 ft Run 50% Recovery (3.0 ft)
	6		4.6			
	7	Clayey SAND; sand ~70% med - coarse, clay ~30%; Red 10R 5/6 banded yellow 10YR 8/6; subrounded; poorly sorted; low plasticity; soft; moist (SC)		NA	NA	
	8	CLAY; sand: fine ~20%, clay ~80%; White 5Y 8/1; hard; poorly sorted; subrounded; med plasticity; moist				
	9					
	10					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW57

PROJECT: Fort Stewart USTs | INSPECTOR Brad Baker | SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11					Run 10-15 Ft 0.0 recovery H_2O tagged @ 9.5 Ft Tagged inside 15 Ft auger string - TD @ 12.5 Ft ∴ 2.5 Ft of heavy soil
	12		NA	NA	NA	
	13					
	14					
	15					
	16	Drilled Out No Split Spoon				Lt Red - Brown saturated sands med - coarse
	17		NA	1510 hr 17-18.0 Ft 751773 Bag Sample	NA	
	18					
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW47 6

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 3 OF

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	20	Drilled out no split spoon				Lt Red-Brown saturated med-coarse sand
	21	TD = 21.0 ft				
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 29F-MW-08

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 5

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineering

5. NAME OF DRILLER: Darren Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" split spoons; 4¼" augers; 8¼" augers.

6. HOLE LOCATION: See map N 684345.97 E 821585.83

9. SURFACE ELEVATION: TOC 68.34 ft

10. DATE STARTED: 10/9/99

11. DATE COMPLETED: 10/10/99

12. OVERBURDEN THICKNESS: greater than T.D.

15. DEPTH GROUNDWATER ENCOUNTERED: Soil wet @ 9.2

13. DEPTH DRILLED INTO ROCK: NA

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: WL up to 8.46 after 15 min

14. TOTAL DEPTH OF HOLE: 15' BGS.

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): WL @ 7.9' BGS after ~12 hrs.

18. GEOTECHNICAL SAMPLES: DISTURBED X; UNDISTURBED

19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSIS: VOC BTEX; PCB/METALS SVOC/TOC; OTHER (SPECIFY); OTHER (SPECIFY); OTHER (SPECIFY)

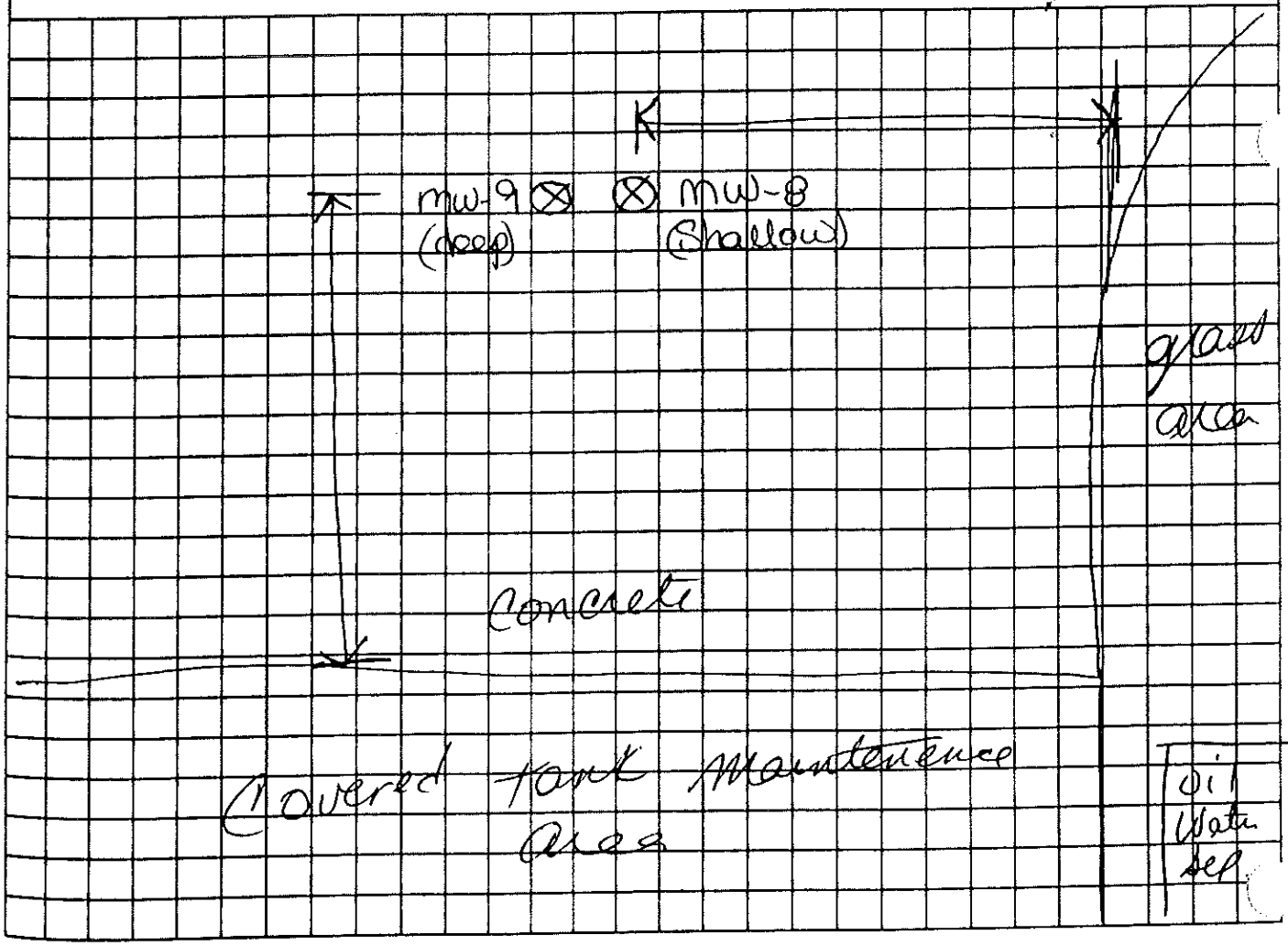
21. TOTAL CORE RECOVERY: NA

22. DISPOSITION OF HOLE: BACKFILLED; MONITORING WELL X; OTHER (SPECIFY)

23. SIGNATURE OF INSPECTOR: Heather L Smith

LOCATION SKETCH/COMMENTS

SCALE: NONE



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-08	SHEET 2 OF 5

PROJECT: Fort Stewart USTs — INSPECTOR Heather Smith

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ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete			Sample ID 0-1'	Concrete cored out earlier
	01	SC - Clayey Sand med→cs gr. sand w/ ~15% fines, angular→subrounded, low to med. plasticity, soft moist. Predominantly 5YR 7/1 lt. grey w/ mottled 10YR 5/6 yellowish red.	0.9 ppm			RUN #1 0.7→2.45 Loss: .25'
	02	SM Silty Sand 10YR 2/1 Black soft, dry, nonplastic, med gr, subang. sands. Loss				
	03	gradational color change to 10YR 6/1 GREY. Same mtrl as above.	3.1 ppm			RUN #2 2.7 - 4.7
	04					
	05	SC - Clayey Sand med. gr. ang→subrounded grains, med. plasticity, soft to slightly firm - Color mottled from 5YR 7/1 lt. grey w/ 10YR 5/6 yellowish red. Loss	1.8 ppm			RUN # 3 RUN 4.7 - 5.7 Resistance after 0.9' Rec: .45 Loss
	06	SC - Clayey Sand w/ med→cs. gr, angular to subrounded in fat clay. Med→high plasticity. Soft moist (firm from 7.1→7.7' BGS). Same color as above.	15			RUN # 4 RUN 5.7→7.7 Rec 2' Loss 0 Augared to 5.7' BGS Pass thru resistance Run S.S. from 5.7-7.7 ~~RUN~~
	07					WL after 12 hrs
		CL - Lean Clay w/ fine gr. sand. 5YR 7/1 lt. grey.	30.7 ppm			
	08	SC - Clayey Sand. Fat clay w/ med.→cs. gr. sand ang.→subrounded grains. Soft moist 10YR 7/1 lt. grey w/ 10YR 5/6 yellowish red.		8 1/2		RUN # 5 RUN 7.7 - 9.7 WL after ~20 min
	09	CL - Lean Clay HARD/firm, dense, moist 5Y 7/1 lt. grey high plasticity	30.4 ppm	geotech sample ID# 7J1873		
	10	SM Silty Sand	CORE WET @ 9.9' BGS. W.T.	10'	Samp ID#	RUN # 6 RUN 9.7→10.7

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-08
SHEET 3 OF 5
22

PROJECT: Fort Stewart USTs
INSPECTOR

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (E)	REMARKS (G)
		SM - Silty Sand fine gr. Sand. Subrounded Saturated, Soft, nonplastic 10R8/1 White	29.1 ppm		Sample ID # CONTINUED	Sample taken from RUN #6 @10.7
	11	SM as above color Begins to change to brown - As depth increases Smell goes away in augar cuttings until it is gone ~13' BGS and entire cuttings are Brown.				Log w/ cuttings ONLY 10.7-15.4 RUN # 7 - 5' augar
	12					
	13	~~SM - Silty Sand~~ Complete color change to 10YR7/2 lt. grey.				
	14	No odor - Same mtel as above.				
	15					~~B.O.B. - 15.4'~~ ~~BGS~~ 10-11-99 Decided to make this a deep hole We will overdrill the set well & continue to set screen @ 30-40' BGS
	16	SM - Silty Sand med → CS grained Subangular to angular grains Saturated Soft nonplastic 10YR7/2 light grey	headspace 29.3 ppm			
	17	Strong odor from cuttings				RUN # 8
	18					
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-23

PROJECT: Fort Stewart USTs | INSPECTOR Heather L Smith | SHEET 4 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Same as above				logging (cuttings) only
		SM-Silty Sand Saturated	Headspace over cuttings 15.7ppm			
	22	Slight increase in cs. gr. mtr'l.				RUN # 9
		Same color as above	Headspace 33.6ppm			
	23		BZ. 0			
	24					
	25					Logging Cuttings only
	26	Same as above				
		SM- silty Sand Saturated	overcuttings 0.5ppm			RUN # 10
	27	smell decreases				
		color still 10YR 7/2 lt. grey	BZ. 0			Headspace taken from composite of cuttings during 5' run.
	28		Headspace 28.2ppm			
	29					
	30					

27F-MW-08

Core description	headspace PID	GeoTech Sample	Analytical Samp	Remarks
SM - Silty Sand Saturated Color change to: 10YR7/4 Very pale brown Soft med→cs. gr material Subrounded→ angular. ODOROUS!	overcuttings 2.4ppm B.Z. ∅ headspace 22.8			RUN# Headspace is a composite of samples from entire 5' auger run. RUN # 11
Same material as above.	overcuttings ∅			RUN #12
Material in cuttings matched material as above, but material Stuck to the augers is a dk. greenish gray fat clay w/ v.cs. angular grained sands & shell fragments. high plasticity. contact is purely estimated. there was ~6' of stiff clay adhered to the augers from ~36-42' BGS.	B.Z. ∅ headspace 25.6ppm			Material in cuttings looks exactly the same as the earlier 20'
I don't know how far we actually ~~same as above~~ augered in to this Hawthorne formation. Best Guess from Geo. & Driller				B. O B. 42' BGS

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HTRW DRILLING LOG

DISTRICT: USACE - Savannah

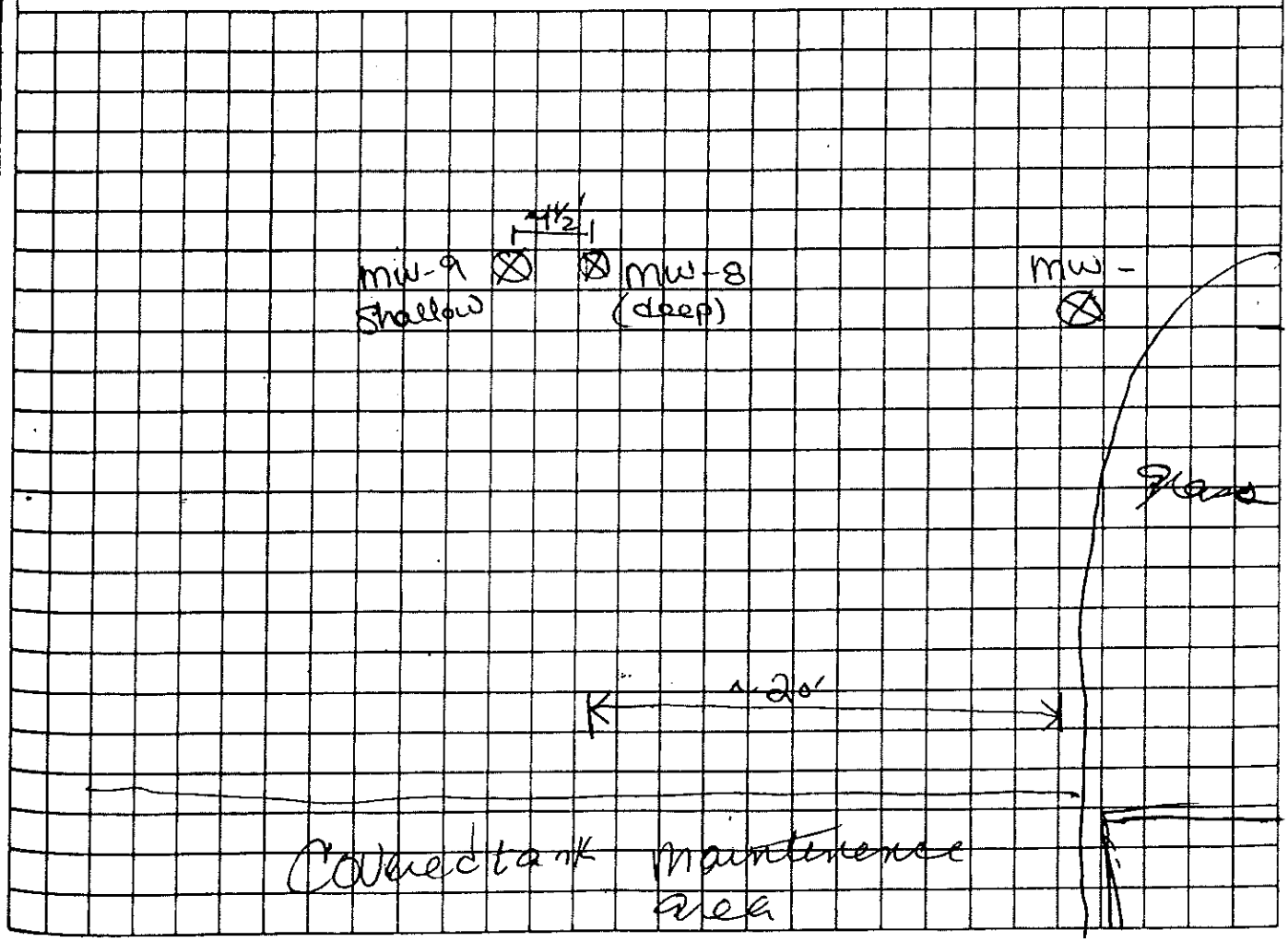
HOLE NUMBER: 27F-MW-09

SHEET 1 OF 4

1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller Drilling Company
3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engineering
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 8 1/4" ID Augers; 3x 4"-5' long Sample barrels	8. HOLE LOCATION: See map. N 684347.37 E 821587.85
	9. SURFACE ELEVATION: TOC 68.46ft
	10. DATE STARTED: 10/12/99 — 11. DATE COMPLETED: 10/12/99
12. OVERBURDEN THICKNESS: Greater Than T.D.	15. DEPTH GROUNDWATER ENCOUNTERED: Cuttings Saturated @ 15
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE: 22.0' BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED X	~~UNDISTURBED~~	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: X	RCRA METALS: 8VOC	OTHER (SPECIFY): —	OTHER (SPECIFY): —	OTHER (SPECIFY): —	21. TOTAL CORE RECOVERY: NA
22. DISPOSITION OF HOLE	BACKFILLED: —	MONITORING WELL: X	OTHER (SPECIFY): —	23. SIGNATURE OF INSPECTOR: Heather L. Smith		

LOCATION SKETCH/COMMENTS — SCALE: NONE



(Signature and Date)

DA CHECK BY

HTRW DRILLING LOG

HOLE NUMBER	27F-MW-09
SHEET	2 OF 4

PROJECT: Fort Stewart USTs   INSPECTOR: Heather Smith

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ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete Core				RUN 5.0' REC. 4.4 LOSS ~~0.~~ 0.6 = Concrete
	1	SC - Clayey Sand fat clay, & gr. Sand Subangular ⇒ angular mottled colors Predominantly 5YR 6/1 grey w/ 5YR 5/6 yellowish red. & 5YR 3/2 dk reddish brown. Fill - dry, soft.	0.0 ppm		1.0	
	2					
	3	SM - Silty Sand. med ⇒ fine gr. subrounded to subangular grains dry soft nonplastic 10YR 3/1 v. dk grey				
	4	SM - Silty Sand. Med ⇒ fine gr. subrounded to subangular 10YR 6/2 lt. brownish grey dry, soft nonplastic	44.6 ppm			
	5					
	6	SC - Clayey Sand fat clay w/ Sand. Sub. ang. ⇒ subrounded. Soft, moist, Some lt. grey lean clay nodules. 10YR 7/4 v. Pale Brown	103 ppm			
	7	CL lean clay w/ sand Lean Clay w/ ~30% Sand - med. to fine grained subangular to subrounded sands Soft to firm - Predominantly firm - stiff clay 5Y 7/1 lt. grey				
	8				8.0	
	9		225 ppm			
	10	CL - lean Clay w/ trace fine gr. subrounded sand. firm, dense, moist high plasticity lt. grey. 5Y 7/1 lt. grey				

HTRW DRILLING LOG

HOLE NUMBER 27F-MW95D

PROJECT: Fort Stewart USTs

INSPECTOR Heather Smith

SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	CL - w/trace sand go above 5Y7/1 lt. grey MOIST	Headspace from cuttings 144 ppm			No more coring - Logging from cuttings only. Unsure of exact depth of contact
	12	CL w/ Sand (increasing sand content over depth. Sand increased to med. gr. size 5Y6/1 grey Moist STRONG ODOR				
	13	~~SC - Sandy Clay~~ Clayey Sand predominantly fine gr. Sand. Some med. gr. rounded to subrounded grains Cuttings Wet - ball up on leaving augers	Headspace from cuttings 123 ppm			
	14	5Y6/1 grey				
	15	STRONG ODOR				
	16	SM - Silty Sand Saturated med grained subang to subrounded grains Soft nonplastic ~~5Y6/1 grey~~ 5Y7/1 STRONG ODOR 10YR 7/4 Very pale brown	Headspace from cuttings 61.5 ppm			Unsure of exact contact depth due to travel time up augers. dashed line is best educated depth.
	17					
	18					
	19		Headspace from cuttings 36.1 ppm			
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-9S1

PROJECT: Fort Stewart USTs

INSPECTOR Heather Smith

SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (E)	REMARKS (G)
	21	SM - Silty Sand as above				
	22	B.O.B.	22.0' BGS.			
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

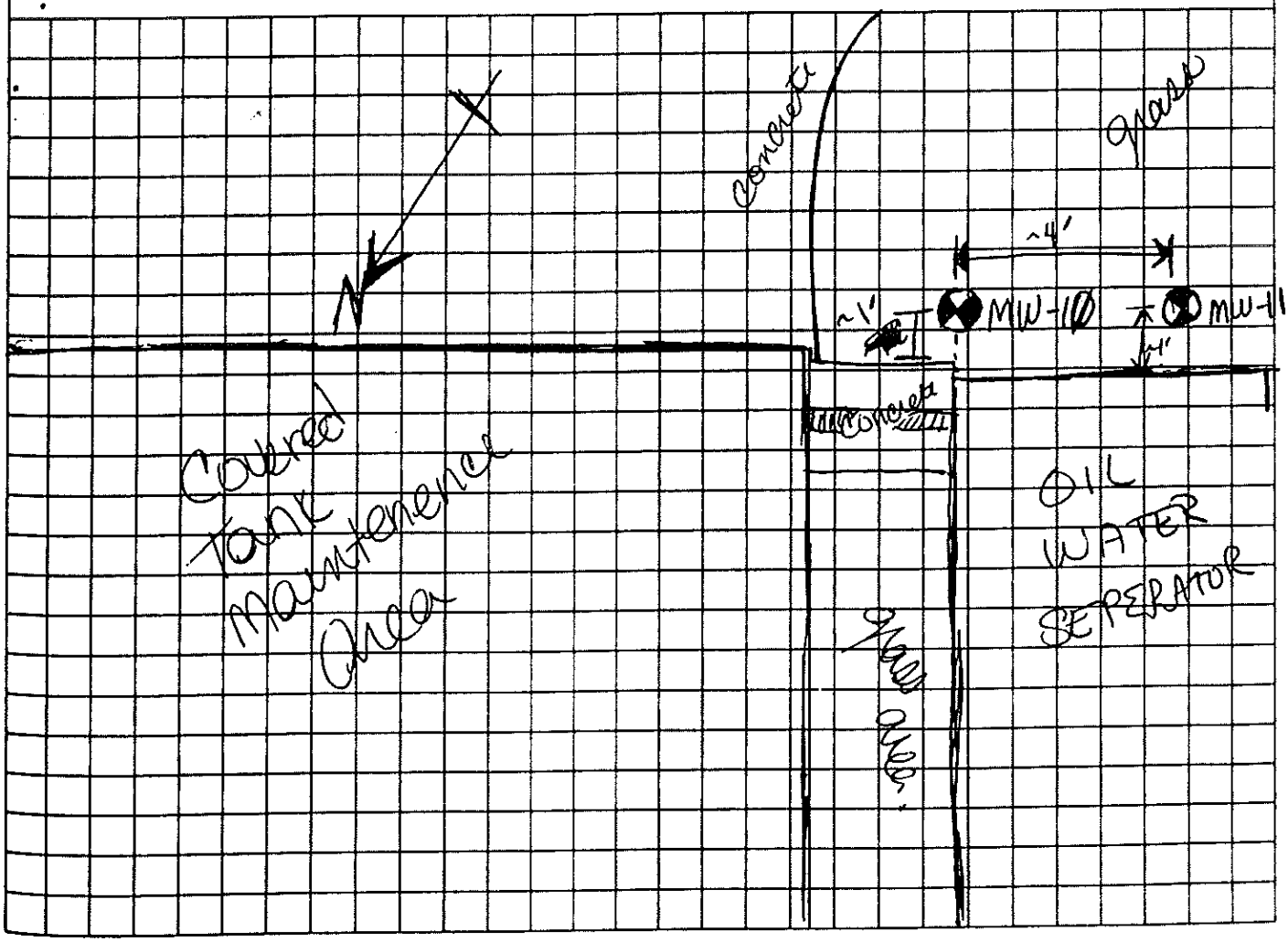
HTRW DRILLING LOG

	DISTRICT: USACE - Savannah	HOLE NUMBER 24F-MW-10
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller Drilling Co.	SHEET 1 OF 4

3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engineering
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Sch 80 12" ID PVC; 8¼" augers; 4¼" augers.	8. HOLE LOCATION: see map; N 684362.91 E 821540.80
	9. SURFACE ELEVATION: TOC 68.70
	10. DATE STARTED: 10/10/99 — 11. DATE COMPLETED:
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED:
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED		UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: BTEX	RCRA METALS: SVOC/TOC	OTHER (SPECIFY): —	OTHER (SPECIFY): —	OTHER (SPECIFY): —	21. TOTAL CORE RECOVERY %	
22. DISPOSITION OF HOLE	BACKFILLED: —	MONITORING WELL: X	OTHER (SPECIFY): —	23. SIGNATURE OF INSPECTOR: Heather L Smith			

LOCATION SKETCH/COMMENTS — SCALE:



(Signature and Date)

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs | INSPECTOR Heather Smith | SHEET 2 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0–1	grass w/ rootlets/ topsoil SM - Silty Sand - DRY soft, med. grains subangular to subrounded 10YR4/4 dk. yellowish brown STRONG ODOR	headspace 0.7 ppm		Sample #7JIA71 BTEX VOC (Encore) 8oz Jar @0910	RUN #1 RUN 2' Rec 2' Loss 0
	1–2	CH - Fat clay w/ Sand med plasticity, moist, soft 10YR6/1 grey				
	2–4	SC - Clayey Sand med → fine gr. sand Subangular → subrounded Moist, low plasticity. Moist, soft STRONG ODOR 10YR 3/1 v. dk. grey.	headspace 1.4 ppm		Sample #7JIA74 BTEX VOC @0915 2-4' bgs	RUN #2 RUN 2.0' Rec 2.0 Loss 0
	4–6	SM - Silty Sand. SC - Clayey Sand (w/silt) Med → fine gr. subrounded to sub angular. Soft, moist ~20% clay ~20% silt ~60% Moist, Soft 5Y 7/3 pale yellow (unsure of contact)	headspace 5.5 ppm		Sample # BTEX VOC 4-6' BGS #7JIA75 @0930	RUN #3 RUN: 2.0 Rec: 1.1 Loss 0.9 LOSS
	6–8	SM - Silty Sand (product in sand zone) wet, med. grain subang. → subrounded. CL - lean clay layer firm, wet, stiff clay, firm. Jangoed color ~15% sand SC - High plasticity clayey sand SM - Silty Sand Very odorous, wet - looks like product in sand. med. grains, subrounded → subang. Soft Wet to saturated	headspace (6-8) 62.3 ppm		Sample # BTEX VOC 6-8' bgs #7JIA76 @0940	RUN #4 RUN 2.0 Rec. 1.9 Loss 0.1 6.1- CL layer. 2.5YR3/4 dk red 10YR5/6 yellowish brown PRODUCT ON CORE Soil cuttings btwn 7½-9½' BGS read 7ppm → 9ppm during augering Bz <5ppm.
	8–9	Loss 10YR 3/2 v. dk. greyish brown SC - Clayey Sand - CSgr angular sand w/ fat clay.	headspace 8½-9' BGS 35.7 ppm		Sample BTEX (encore) & 8oz Jar 7JIA72 @0941	RUN #5 RUN 1' Rec 1.8 extra due to sluff
	9–10	sand 2.5YR7/1 lt reddish grey w/ 10YR 5/2 greyish brown V. Strong odor Saturated - w/ what smells like product! CL - Lean Clay Tight - fine gr sand ~10% high plasticity 5YR7/2 lt. grey, firm moist SC - Clayey Sand. lean clay w/ fine sand - low plasticity 10YR 7/2 lt. grey	headspace 9-10' BGS 39.5 ppm		Sample BTEX VOC (Encore) #7JIA77 @0950	RUN #6 RUN 1' Rec. 1.4 - sluff Product seems to sit on top of tight clean clay layer sands were saturated from 9½ → 9' Barrel covered w/ oil

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-1035

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Very pale brown (10YR 7/3) sandy clay silt: wet, F-grnd sand. Returned in soupy mix, some clumps.		N/A Shelby tube sample		No core; Lithology from cuttings.
	12					
	13	Sand increases w/ depth. Sand predominates. clay sand or silty sand				
	14		N/A	N/A	N/A	
	15					
	16					
	17					
	18					
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-1336

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Very pale brown silty sand/clay sand (as above).				
	22					TD = 22.0 ft
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

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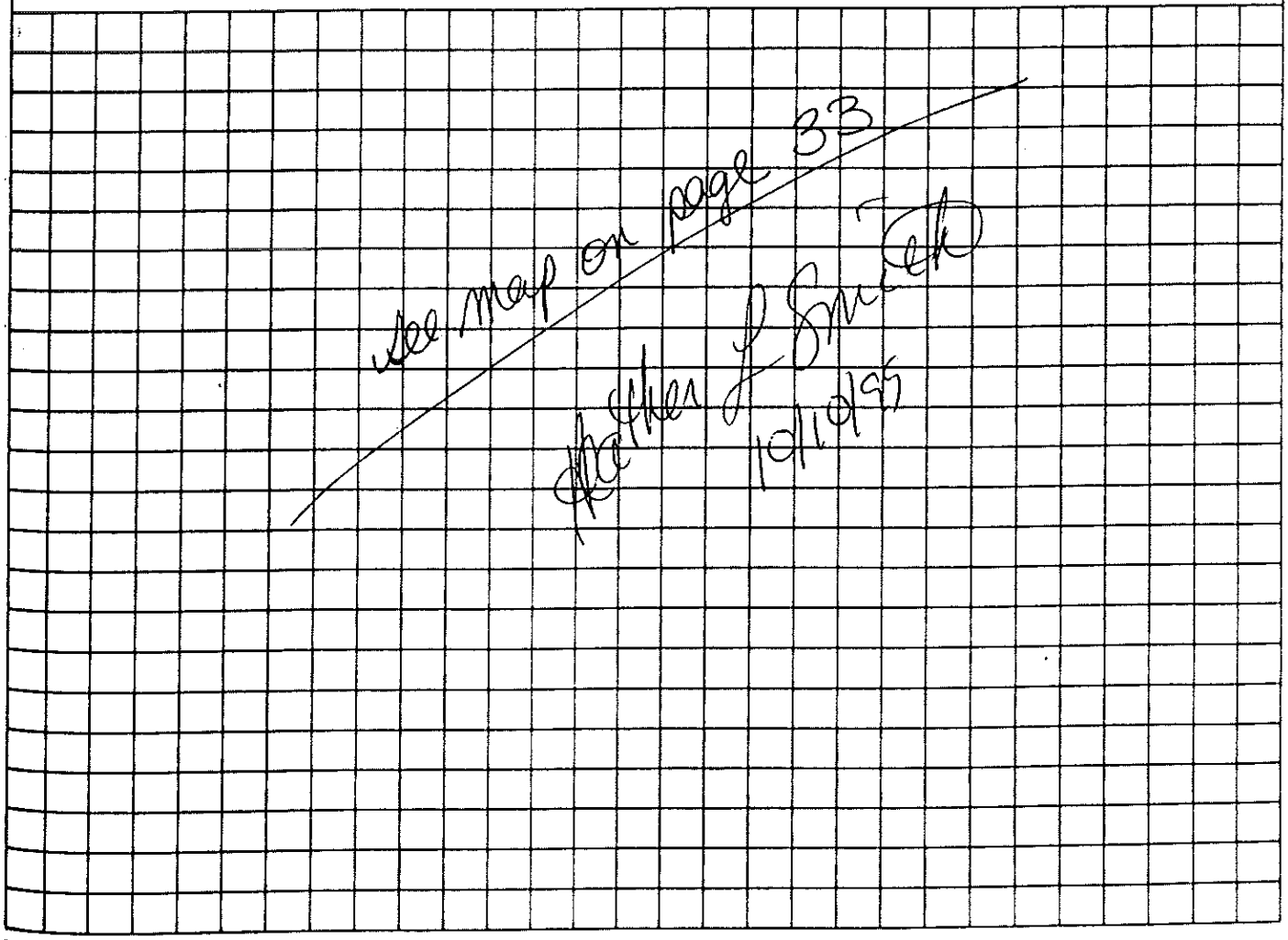
HTRW DRILLING LOG

DISTRICT: USACE - Savannah		HOLE NUMBER 27F-MW-1(
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller Drilling Comp.	SHEET 1 OF 5
3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engineers	
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" augers 8¼" augers.	8. HOLE LOCATION: See map. N 684358.83 E 881536.44	
	9. SURFACE ELEVATION: TOC 68.66 ft	
	10. DATE STARTED: 10/10/99	11. DATE COMPLETED:
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED:	
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC Encore's	RCRA METALS & SVOCs	OTHER (SPECIFY) —	OTHER (SPECIFY) —	OTHER (SPECIFY) —	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL X	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		

LOCATION SKETCH/COMMENTS SCALE: NONE



breathing zone, venting compressed air, etc.)

(Signature and Date)

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs | INSPECTOR Heather L Smith | HOLE NUMBER 2A-MW-1 | SHEET 2 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		grass/rootlets/topsoil			Sample ID# VOC's JJ1871 SVOC's/RCRA metals 1115	RUN#1 RUN: 2.0 REC: 2.0 LOSS: 0
		SM - Silty Sand soft, dry, med gr. SUBROUNDED 7.5YR 4/4 Brown	0-2' BGS 0 ppm			
	1	SC - Clayey Sand Med. gr. Sand., low plasticity 7.5YR 5/6 STRONG BROWN				
		SM - BLACK 10YR2/1 med→fine gr SUBANG→SUBROUNDED				
	2	SC - Clayey Sand w/ Silt Mottled Med. gr. 10YR 3/1 V. dk. gray Mottled w/ 2.5YR 3/4 (dk. reddish brown)				RUN #2 RUN: 2.0 REC: 2.0 LOSS: 0
		SM - Silty Sand w/ some clay - low plasticity Med→fine gr. Sands Soft, moist 10YR 3/1 V. dk. gray	2-4' BGS 1.3 ppm			
	3					
	4	CH - fat clay <20% fine/med. sand Soft, moist 10YR 6/1 gray Mottled w/ 10YR 7/6 yellowish brown				RUN #3 RUN: 2.0 REC: 1.7 LOSS: 0.3
		SC - Clayey Sand CS. grained, angular to subangular moist fat clay, soft 5Y 6/1 grey Mottled w/ 5Y 3/1 V. dk. gray & 7.5YR 4/4 Brown	4-6' BGS 52.1 ppm			
	5					
	6	LOSS (unsure of contact)				Loss
		SM - Silty Sand. Wet - Product in sand Sheen - Strong odor - Soft, non plastic, med. gr. angular to subrounded. some clay <10% STRONG SMELL	6-8' BGS 13.6 ppm			RUN#4 RUN: 2.0 REC: 1.5 LOSS: 0.5
	7					
	8	LOSS			8.0' BGS	Loss
		Same as above saturated w/ product ontop of clay.	8-8½ 57.6 ppm ~~8-10 BGS~~		Sample ID# 1145 TJ1872	RUN#5 RUN: 2.0 REC: 1.6 LOSS: 0.4
	9	CL - Lean Clay - w/ ~35% fine gr. Sand. firm→HARD high plasticity, 10YR 6/2 lt. brownish gray dense - oil/product sitting ontop of clay	8½-9½' BGS 88.1 ppm (2nd 8½-9½ H.S. read. 79.2 ppm)			
	10				10'	Loss

HTRW DRILLING LOG

37F-MW-11 | HOLE NUMBER

SD

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 3 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	Lt. green-grey (10Y 8/1) silty clay: moist, plastic, mottled				Drill: 5.0 Ft
		V. pale brown (10YR 8/2) clay sand: moist, F-grnd, stratified, mod. packed, sl- to unplastic	61.2 ppm			Recover: 3.7 Ft.
	11					
	12	Yellow (10YR 8/6) sand: wet, F- to m-grnd, generally massive, but mottled, uniform near bottom of interval.				
	13					
	14	No Recovery				Water at 14 Ft BGS.
	15					
	16	Pale yellow (2.5Y 7/3) sand: wet, F. to m-grnd.				
	17					
	18					
	19					
	20					

HTRW DRILLING LOG 27F-MW-11 | HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 4 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Pale yellow sand (as above)				
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

27F-MW-11 | HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 5 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	31	Pale Yellow Sand (as above)				
	32					
	33					
	34					
	35					
	36					DK gray-green Clay on augers at bottom. Bottom 7 Rt.
	37					
	38					
	39					
	40					TD=40.0 Rt

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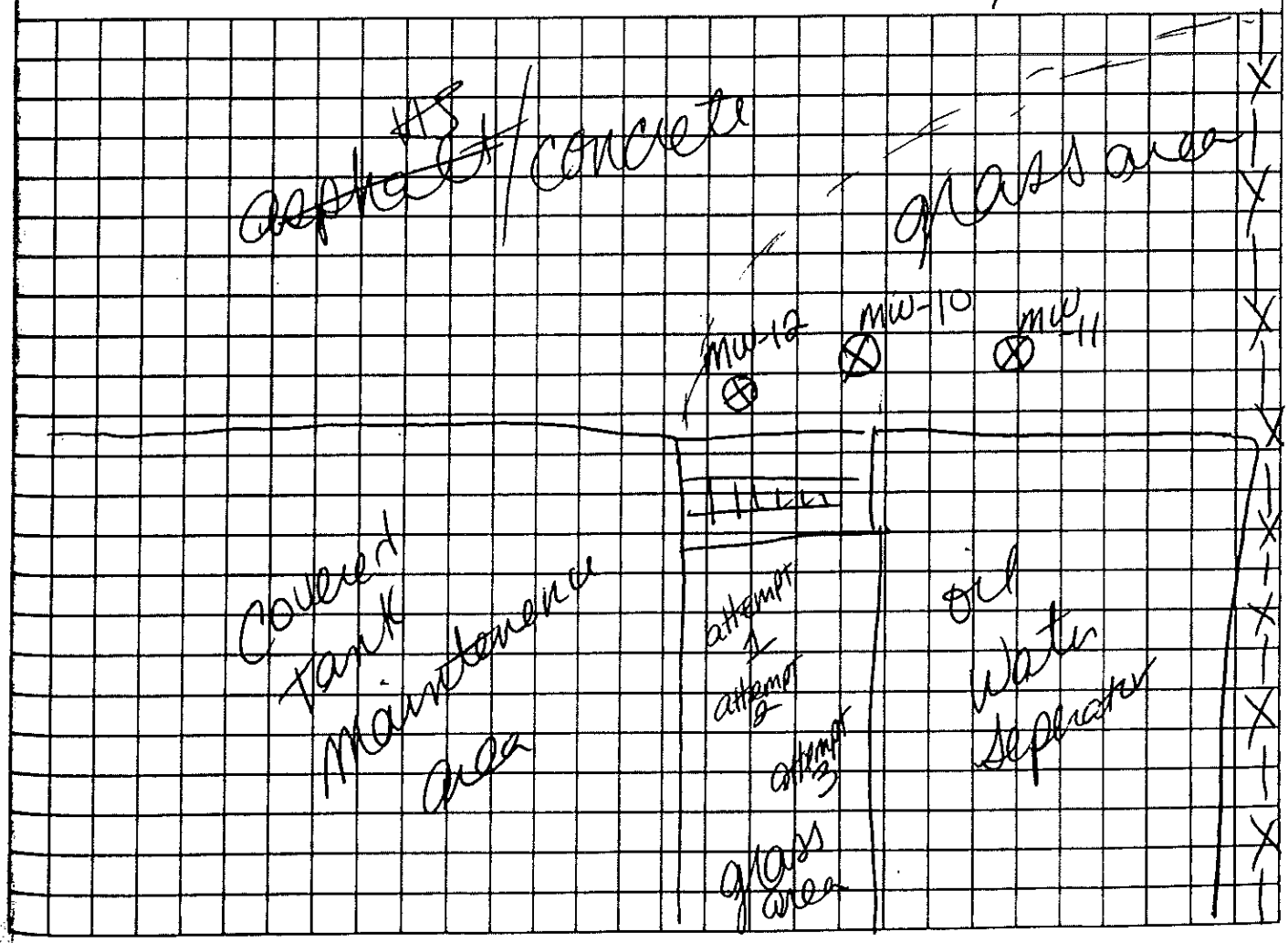
HTRW DRILLING LOG

	DISTRICT: USACE - Savannah	HOLE NUMBER 27F-MW-12
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller Drilling Co	SHEET 1 OF 2
3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engineering
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" auger Wood Plug	8. HOLE LOCATION: See Map
	9. SURFACE ELEVATION: TOC 68.74 ft N 684363.88 E 821543.07
	10. DATE STARTED: 10/12/99 11. DATE COMPLETED: 10/12/99
12. OVERBURDEN THICKNESS: greater than T.D.	15. DEPTH GROUNDWATER ENCOUNTERED: Not Drilling for GW.
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: DRILLING FOR PRODUCT
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED: NONE	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: NONE	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL: X	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: Heather L Smith		

LOCATION SKETCH/COMMENTS — SCALE: NONE



HTRW DRILLING LOG

HOLE NUMBER 27F-MW-12 (6)

PROJECT: Fort Stewart USTs

INSPECTOR Heather Smith

SHEET 2 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		SM - Silty Sand top soil & organics in top .3' dry nonplastic soft med gr. sands Subrounded → Subangular				Logged by cuttings only depths are estimates
	Ø1		89.9			Ø1
	Ø2	10YR5/3 Brown				Ø2
	Ø3	Very odorous				Ø3
			22.2			
	Ø4	SC - Clayey Sand w/ some silt med gr. Subangular to subrounded sand grains w/ ~~wet~~ moist fat clay, med. plasticity				Ø4
	Ø5	Soft. 10YR 3/2				Ø5
	Ø6	V. dk. grayish brown	38.7			Ø6
		very odorous				
	Ø7	Clay content increases w/ depth still less than 30% of total material				Ø7
	Ø8		102			Ø8
		Saturated @ ~ 8.6' BGS				NOT Water level.
	Ø9					Ø9
		SC Clayey Sand Color Change				We have not pierced clay into g. water zone this is a
	10	10YR 4/3 Brown Subang → ang. Sand grains				10 Perch zone w/ Product in soil

SWMU 27F

3D ENGINEER BRIGADE MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (NORTHEAST OF BUILDING 1340)

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7K-GP-01
	2. DRILL SUBCONTRACTOR: REWRIGHT / SAIC	SHEET 1 OF 3 SHEETS

3. PROJECT: FT. STEWART 16 SWMUS

4. LOCATION: SWMU 27F

5. NAME OF DRILLER: J. HASELHOFF

6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE SYSTEMS 8-M

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" HSDS; 1" PVC PIEZOMETER; PERISTALTIC PUMP

8. HOLE LOCATION: 7K-GP-01 E-821327.43' N-634694.33' NAD-83

9. SURFACE ELEVATION: NAVD-88 67.68'

10. DATE STARTED: 1/17/98

11. DATE COMPLETED: 1/17/98

12. OVERBURDEN THICKNESS: NA

13. DEPTH DRILLED INTO ROCK: NA

14. TOTAL DEPTH OF HOLE: ~~NA~~ 15' BGS

15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 12' bgs

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: NA; DISTURBED: NA; UNDISTURBED: NA

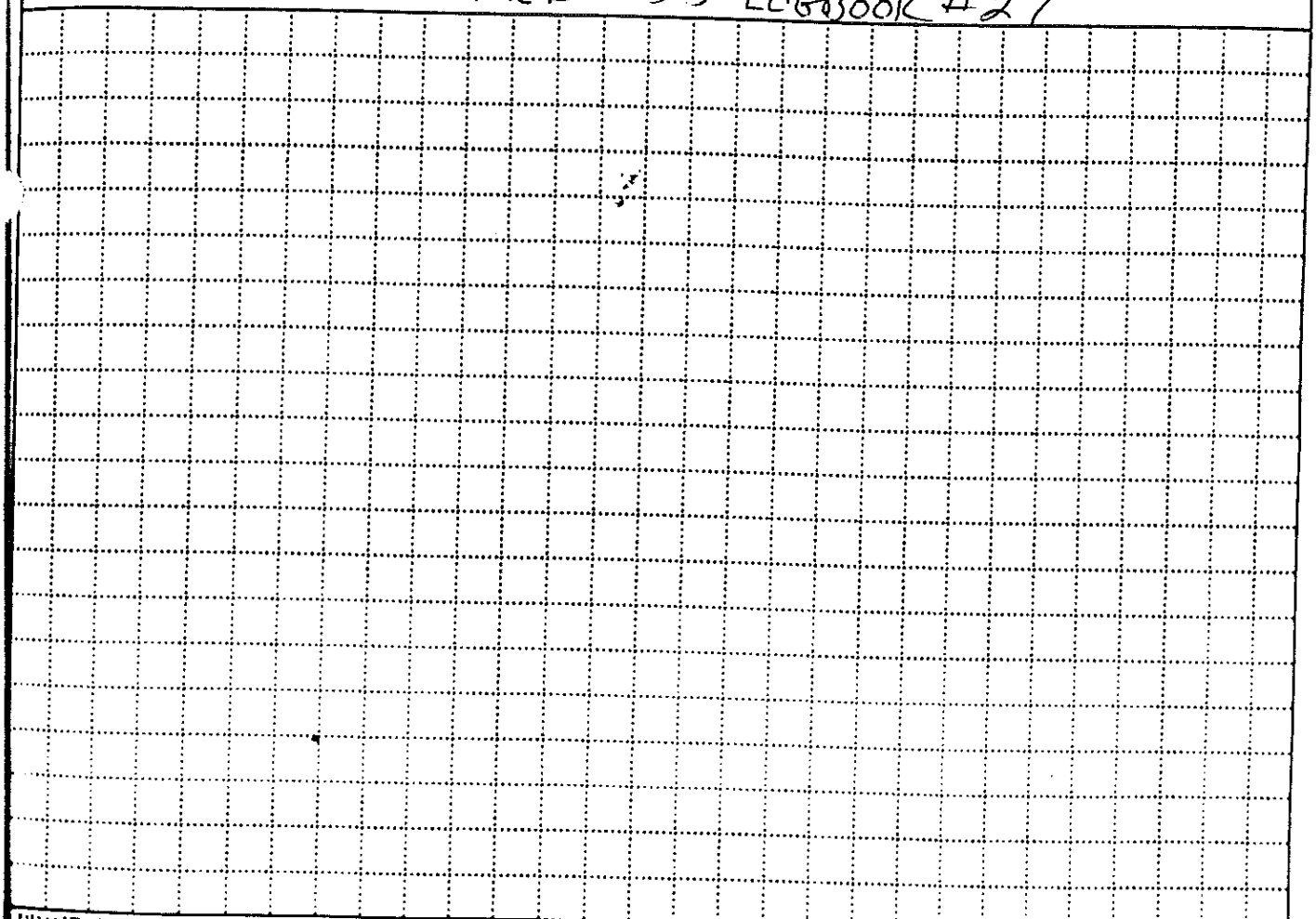
19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X		SVOC	LEAD		NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			TEMP. PIEZ	Luis Morcado

LOCATION SKETCH/COMMENTS: SEE PAGE # 55 LOGBOOK #27

SCALE:



PROJECT	HOLE NO.
FT. STEWART 16 SWMUS	7K-GP-01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, creation ... etc.)

HYKW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NO: 7K6P01 | SHEET: 2 of 3

TEST (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYSIS AT SAMPLE NO (F)	REMARKS (G)
	1	WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, ROUNDED, YELLOWISH BROWN, (10YR 5/4), DRY.	0-2' 0ppm			PUSHED 0-4' (1.4' RECOVERY)
	2					
	3	2.5': ~~GRA~~ WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY, FINE TO MEDIUM SAND, ROUNDED, YELLOW (10YR 7/6), DRY.	2-4' 0.1ppm			
	4	3': CLAYEY SAND (SC), 40% CLAY, FINE TO MEDIUM SAND, SUBROUNDED, VERY DARK GRAY (10YR 3/1), DRY				PUSHED 4-8' (3.8' RECOVERY)
	5		4-6' 0.2ppm			
	6					
	7	7': SANDY LEAN CLAY (CL), 40% FINE SAND, MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, NO DILATENCY,	6-8' 1.4ppm			
	8					
	9		8-10' 1.0ppm			PUSHED 8-12' (4.0' RECOVERY)
	10					

HTRW DRILLING LOG

7K6P01

PROJECT FT. STEWART 16 SWMU 8 INSPECTOR LUIS MERCADO SHEET 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, ROUNDED, YELLOWISH BROWN, (10YR5/4), DRY.	0-2' 0ppm			PUSHED 0-4' (1.8' RECOVERY)
	2					
	3	2.5': ~~GRA~~ WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY, FINE TO MEDIUM SAND, ROUNDED, YELLOW (10YR7/6), DRY.	2-4' 0.1ppm			
	4	3': CLAYEY SAND (SC), 20% CLAY, FINE TO MEDIUM SAND, SUBROUNDED, VERY DARK GRAY (10YR 3/1), DRY				PUSHED 4-8' (3.8' RECOVERY)
	5		4-6' 0.2ppm			
	6					
	7	7': SANDY LEAN CLAY (CL), 40% FINE SAND, MEDIUM PLASTICITY, MEDIUM DRY STRENGTH, NO DILATENCY,	6-8' 1.4ppm			
	8					
	9		8-10' 1.0ppm			PUSHED 8-12' (4.0' RECOVERY)
	10					

PROJECT FT. STEWART 16 S A.19-4 HOLE NO 7K6P01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7K-GP-01
	3. DRILL SUBCONTRACTOR: REWRIGHT/SAIC	SHEET 1 OF 3 SHEETS

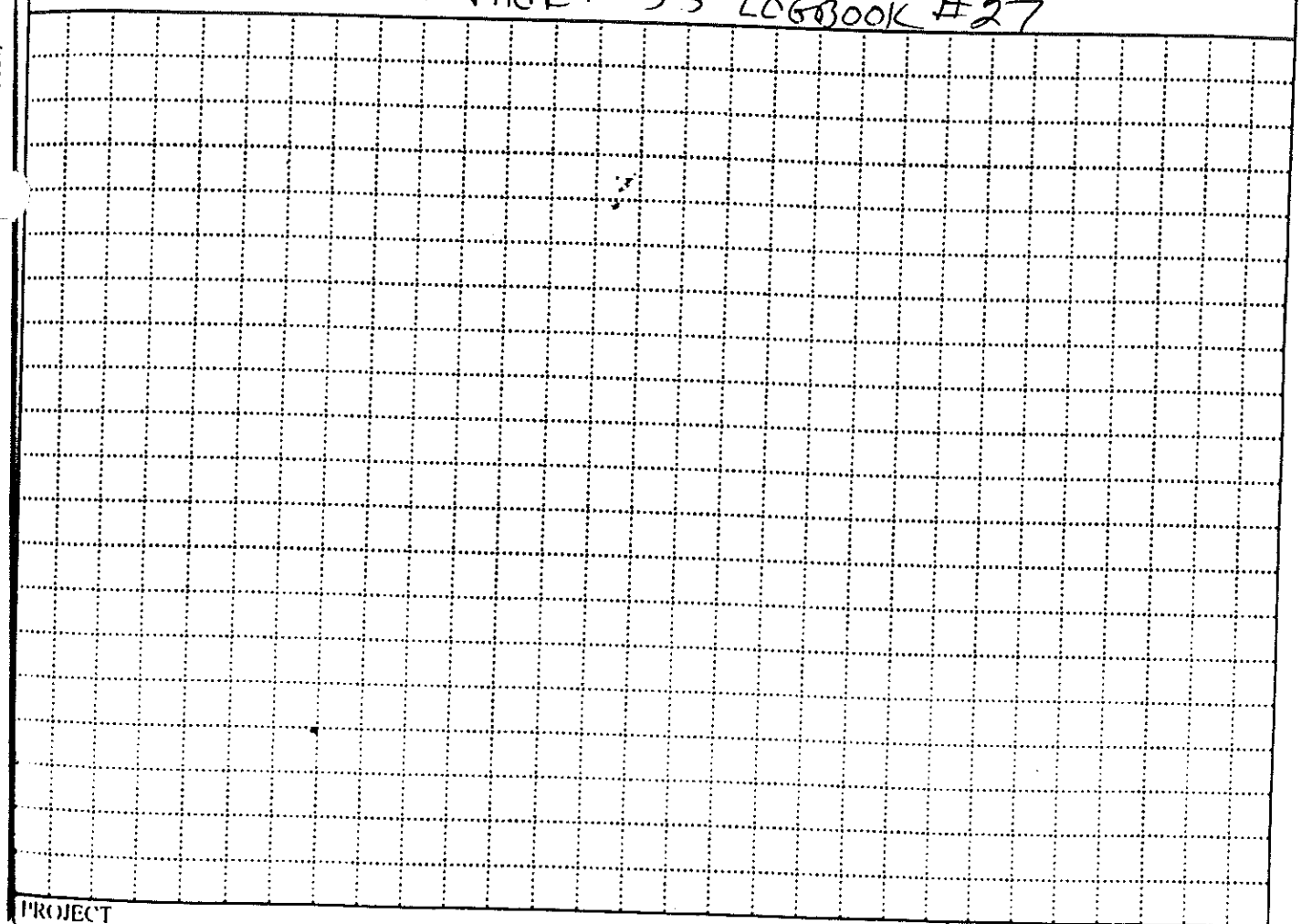
4. PROJECT: FT. STEWART 16 SWMUS	5. LOCATION: SWMU 27F
7. NAME OF DRILLER: J. HASELHOFF	6. MANUFACTURER'S DESIGNATION OF DRILL: GEOPROBE SYSTEMS 8-M
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" HSDS; 1" PVC PIEZOMETER; PERISTALTIC PUMP	8. HOLE LOCATION: 7K-GP-01 E- 821927.43' N- 634694.33' NAD-83
	9. SURFACE ELEVATION: NAVD-88 67.68'
	10. DATE STARTED: 1/17/98 — 11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 12' bgs
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE: ~~NA~~ 15' BGS	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	LEAD		NA %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			TEMP. PIEZ	Lisa Morvad

LOCATION SKETCH/COMMENTS: SEE PAGE # 55 LOGBOOK #27 — SCALE:



PROJECT: FT. STEWART 16 SWMUS — HOLE NO: 7K-GP-01

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

well atmosphere, soil data, etc.) (Signature and Date) GA CHECK BY:

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SWMU 27F

3D ENGINEER BRIGADE MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (NORTHEAST OF BUILDING 1340)

HTRW DRILLING LOG

HOLE NUMBER 27F-MW12 of 6

PROJECT: Fort Stewart USTs

INSPECTOR Heather Smith

SHEET 2 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		SM - Silty Sand top soil & organics in top .3' dry				Logged by cuttings only depths are estimates
	Ø1	nonplastic soft med gr. sands	89.9			Ø1
		Subrounded → Subangular				
	Ø2	10YR5/3 Brown				Ø2
		Very odorous				
	Ø3					Ø3
			22.2			
		SC - Clayey Sand w/ some silt				
	Ø4	med gr. Subangular to subrounded sand				Ø4
	Ø5	grains w/ moist fat clay, med. plasticity				Ø5
		Soft. 10YR 3/2				
	Ø6	V. dk. grayish brown	38.7			Ø6
		very odorous				
	Ø7	Clay content increases w/ depth still less than 30% of total material				Ø7
	Ø8		102			Ø8
		Saturated @ ~ 8.6' BGS				NOT water level.
	Ø9					Ø9
		SC Clayey Sand Color Change				We have not pierced clay into 2. water zone this is a Perch zone w/ Product in soil
	10	10YR4/3 Brown				10
		Subang → ang. Sand grains				

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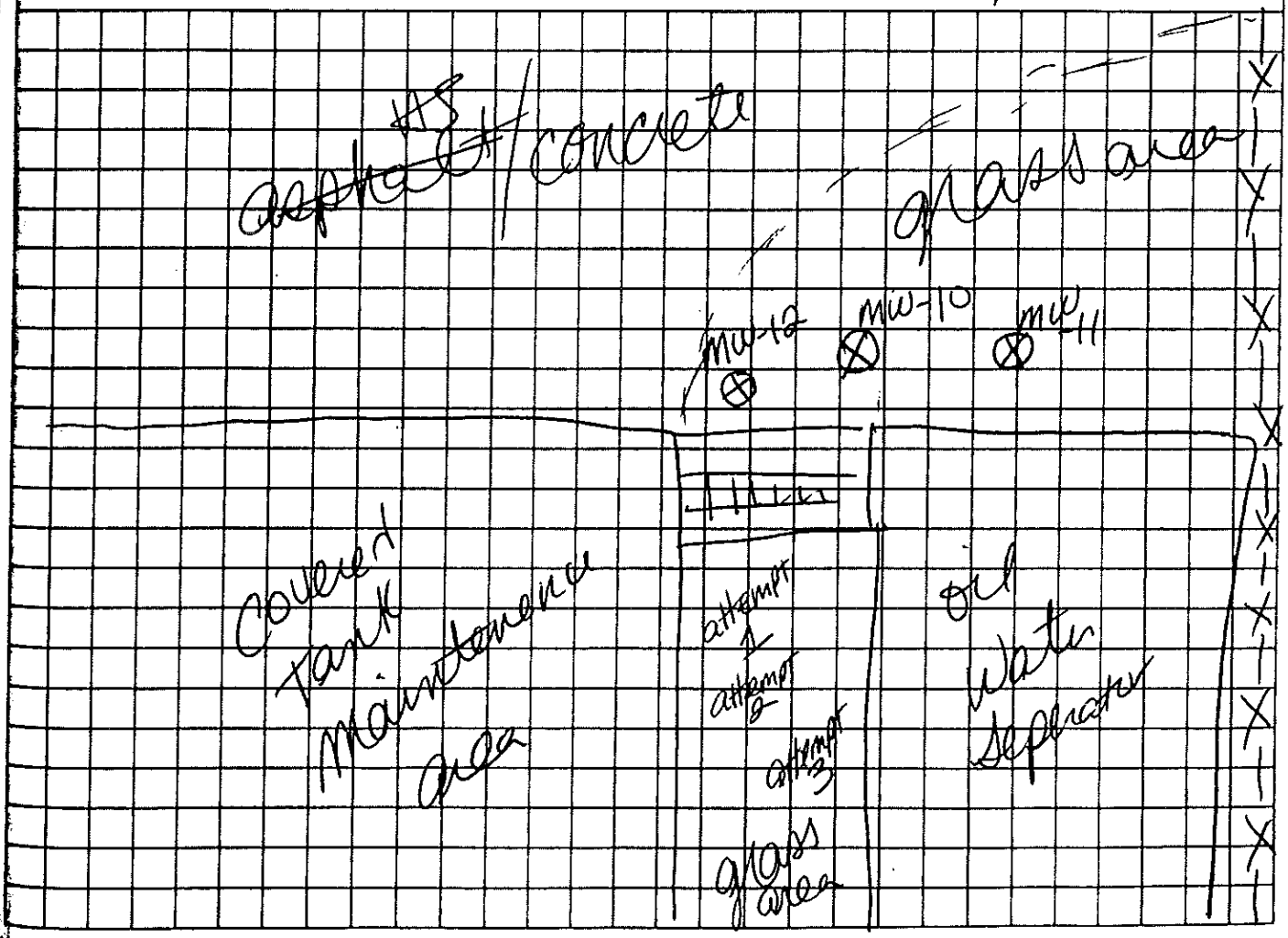
HTRW DRILLING LOG

DISTRICT: USACE - Savannah		HOLE NUMBER: 27F-MW-12
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller Drilling Co	SHEET 1 OF 2
3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engeneering	
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" augar Wood Plug	8. HOLE LOCATION: See Map	
	9. SURFACE ELEVATION: TOC 68.74 ft N 684363.80 E 821543.07	
	10. DATE STARTED: 10/12/99 11. DATE COMPLETED: 10/12/99	
12. OVERBURDEN THICKNESS: greater than T.D.	15. DEPTH GROUNDWATER ENCOUNTERED: Not DRILLING FOR GW.	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: DRILLING FOR PRODUCT	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED NONE	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: NA
	NONE					
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: Heather L Smith		
		X				

LOCATION SKETCH/COMMENTS — SCALE: NONE



HTRW DRILLING LOG

27F-MW-11 | HOLE NUMBER

SHEET 5 OF 5

PROJECT: Fort Stewart USTs | INSPECTOR

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	31	Pale Yellow Sand (as above)				
	32					
	33					
	34					
	35					
	36					DK gray-green Clay on augers at bottom. Bottom 7 Rt.
	37					
	38					
	39					
	40					TD = 40.0 Rt

HTRW DRILLING LOG	27F-MW-11	HOLE NUMBER
PROJECT: Fort Stewart USTs	INSPECTOR	SHEET 4 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Pale yellow sand (as above)				
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG 27F-MW-11 HOLE NUMBER

PROJECT: Fort Stewart USTs INSPECTOR SHEET 3 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	Lt. green-gray (10Y 8/1) silty clay: moist, plastic, mottled				Drill: 5.0 Ft
		V. pale brown (10YR 8/2) clay sand: moist, F-grnd, stratified, mod-packed, sl- to un plastic	61.2 ppm			Recover: 3.7 Ft.
	11					
	12	Yellow (10YR 8/6) sand: wet, F- to m-grnd, generally massive, but mottled; uniform near bottom of interval.				
	13					
	14	No Recovery				Water at 14 Ft BGS.
	15					
	16	Pale yellow (2.5Y 7/3) sand: wet, F. to m-grnd.				
	17					
	18					
	19					
	20					

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HTRW DRILLING LOG

HOLE NUMBER 27-MW-11

PROJECT: Fort Stewart USTs	INSPECTOR Heather L Smith	SHEET 2 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		grass/rootlets/topsoil	0-2' BGS		Sample ID# 7JJB71 VOC's SVOC's/RCRA Metals 1115	RUN#1 RUN: 2.0 Rec: 2.0 LOSS: Ø
		SM - Silty Sand soft, dry, med gr. subrounded-subang. 7.5YR 4/4 Brown	Ø ppm			
	1	SC - Clayey Sand Med. gr. sand, low plasticity 7.5YR 5/6 strong brown				
		SM - Black 10YR 2/1 med→fine gr subang→subrounded				
	2	SC - Clayey Sand w/silt Mottled Med. gr. mottled w/ 2.5YR 3/4 (dk. reddish brown) 10YR 3/1 v. dk. gray				
		SM - Silty Sand w/some clay - low plasticity Med→fine gr. sands Soft, moist 10YR 3/1 v. dk. gray	2-4' BGS 1.3 ppm			RUN #2 RUN: 2.0 REC: 2.0 LOSS: Ø
	4	CH - Fat clay <20% fine/med. sand Soft, moist 10YR 6/1 gray mottled w/ 10YR 5/6 yellowish brown				
		SC - Clayey Sand cs. grained, angular to subangular moist fat clay, soft 5Y 6/1 gray Mottled w/ 5Y 3/1 v. dk. gray & 7.5YR 4/4 Brown	4-6' BGS 52.1 ppm			RUN # 3 RUN: 2.Ø REC: 1.7 LOSS: Ø.3
		LOSS (unsure of contact)				Loss
	6	SM - Silty Sand. Wet - product in sand Sheen - strong odor - Soft, nonplastic, med. gr angular to subrounded. some clay <10% STRONG SMELL	6-8' BGS 173.6 ppm			RUN#4 RUN: 2.Ø Rec: 1.5 LOSS: Ø.5
		LOSS			8.Ø' BGS	Loss
	8	Same as above saturated w/ product on top of clay.	8-8½ 57.6 ppm ~~8-10' BGS~~		Sample ID# 1145 7JJB72	RUN#5 RUN: 2.Ø REC: 1.6 LOSS: .4
		CL - Lean Clay - w/ fine gr. sand. ~35% firm → HARD high plasticity, 10YR 6/2 lt. brownish gray dense - oil/product sitting on top of clay	8½-9½' BGS 88.1 ppm (2nd 8½-9½ H.S. reading 79.2 ppm)			
	10				10'	LOSS

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HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-1(

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Comp.

SHEET 1 OF 5

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineers

5. NAME OF DRILLER: Darren Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" augers, 8¼" augers.

8. HOLE LOCATION: See map. N 684358.83 E 881536.44

9. SURFACE ELEVATION: TOC 68.66 ft

10. DATE STARTED: 10/10/99

11. DATE COMPLETED:

12. OVERBURDEN THICKNESS

15. DEPTH GROUNDWATER ENCOUNTERED:

13. DEPTH DRILLED INTO ROCK

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

14. TOTAL DEPTH OF HOLE

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: Encore's	METALS: RCRA & SVOCs	OTHER (SPECIFY): —	OTHER (SPECIFY): —	OTHER (SPECIFY): —	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL: X	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		

LOCATION SKETCH/COMMENTS

SCALE: NONE

See map on page 33

Heather L. Smith 10/10/99

breathing zone, venting compressed air, etc.)
(Signature and Date)
UA CHECK BY

HTRW DRILLING LOG

HOLE NUMBER 27FMW-136

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	Very pale brown silty sand/ clay sand (as above).				
	22					TD = 22.0 ft
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-1035

SHEET 3 OF 4

PROJECT: Fort Stewart USTs

INSPECTOR

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Very pale brown (10YR 7/3) sandy clay silt: wet, F-grnd sand. Returned in soupy mix, some clumps.		N/A Shelby tube sample		No core; Lithology from cuttings.
	12	Sand increases w/ depth. Sand predominates.				
	13	clay sand or silty sand				
	14		N/A	N/A	N/A	
	15					
	16					
	17					
	18					
	19					
	20					

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs	INSPECTOR Heather Smith	SHEET 2 OF 4

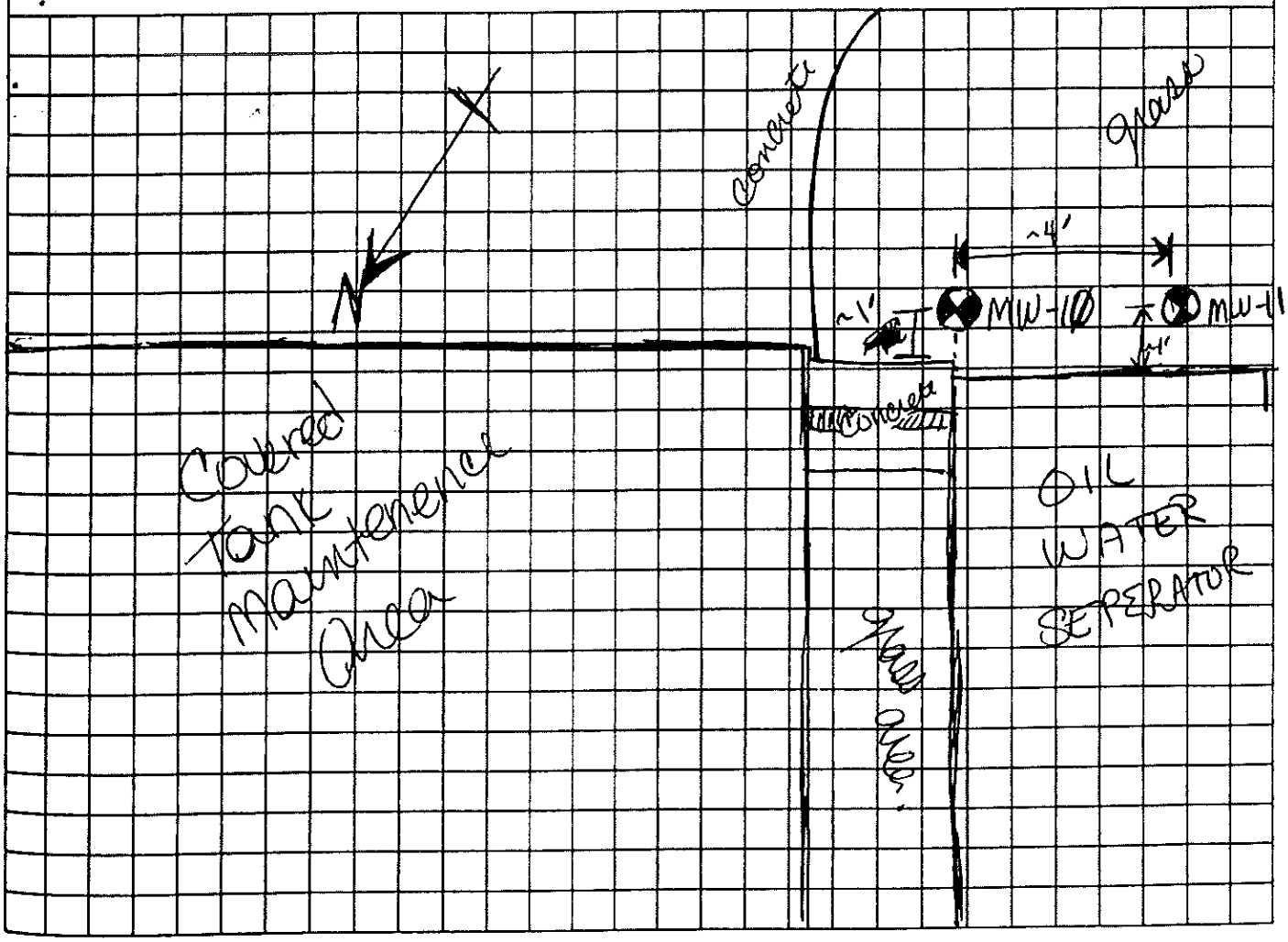
ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0–2	grass w/ rootlets/ topsoil SM - Silty Sand - DRY soft, med. grains subangular to subrounded 10YR4/4 dk. yellowish brown STRONG ODOR CH - Fat clay w/ Sand med plasticity, moist, soft 10YR6/1 grey	headspace 0.7 ppm		Sample #7JIA71 ~~BTEX~~ VOC (Encore) 8oz Jar @0910	RUN #1 RUN 2' Rec 2' Loss 0
	2–4	SC - Clayey Sand med → fine gr. sand Subangular → subrounded Moist, low plasticity. Moist, soft STRONG ODOR 10YR 3/1 v. dk. grey.	headspace 1.4 ppm		Sample #7JIA74 ~~BTEX~~ VOC @0915 2-4' BGS	RUN #2 RUN 2.0' Rec 2.0 Loss 0
	4–6	SM - Silty Sand. SC - Clayey Sand (w/silt) med → fine gr. subrounded to sub angular. Soft, moist ~20% clay ~20% silt ~60% Moist, Soft 5Y 7/3 Pale yellow (unsure of contact) - LOSS	headspace 5.5 ppm		Sample ~~BTEX~~ VOC 4-6' BGS #7JIA75 @0930	RUN #3 RUN: 2.0 Rec: 1.1 Loss 0.9 LOSS
	6–8	SM - Silty Sand (product in sand zone) wet, med. grains Subang. → subrounded. CL - lean clay layer firm, wet Stiff clay firm. ~15% sand SC - High plasticity clayey sand SM - Silty Sand Very ODOROUS, wet - looks like product in sand. med. grains, subrounded → subang. Soft Wet to Saturated ~~XX~~ Loss	headspace (6-8) 62.3 ppm		Sample ~~BTEX~~ VOC 6-8' BGS #7JIA76 @0940	RUN #4 RUN 2.0 Rec. 1.9 Loss 0.1 6.6- CL layer: 2.5YR 3/6 dk red 10YR 5/6 Yellowish brown PRODUCT ON CORE Soil cuttings btwn 7½-9½' BGS read 7ppm → 9ppm during augering Bz <5ppm.
	8–9	10YR 3/2 V. dk. greyish brown	headspace 8½-9' BGS 35.7 ppm		Sample ~~BTEX~~ (Encore) & 8oz Jar 7JIA72 @0944	RUN #5 RUN 1' Rec 1.8 extra due to sluff
	9–10	SC - Clayey Sand - CSgr angular sand w/ fat clay. Sand 2.5YR 7/1 lt reddish grey w/ 10YR 5/2 greyish brown V. Strong odor Saturated w/ what smells like product! CL - Lean Clay Tight - fine gr sand <10% high plasticity (5YR 7/2 lt. grey) firm moist SC - Clayey Sand. (lean clay) w/ fine sand - low plasticity 10YR 7/2 lt. grey	headspace 9-10' BGS 39.5 ppm		Sample ~~BTEX~~ VOC (Encore) #7JIA77 @0950	RUN #6 RUN 1' Rec. 1.4 - sluff Product seems to sit on top of tight clean clay layer Sands were saturated from 9½ → 9' Barrel coated w/ oil

HTRW DRILLING LOG

	DISTRICT: USACE - Savannah	HOLE NUMBER 24F-MW-10
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: Miller Drilling Co.	SHEET 1 OF 4
3. PROJECT: Fort Stewart	4. LOCATION: 3rd Engineering
5. NAME OF DRILLER: Darren Penn	6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: Sch 80 12" ID PVC; 8¼" augers; 4¼" augers.	8. HOLE LOCATION: see map
	9. SURFACE ELEVATION: TOC 68.70 N 684362.91 E 821540.80
	10. DATE STARTED: 10/10/99 11. DATE COMPLETED:
12. OVERBURDEN THICKNESS	15. DEPTH GROUNDWATER ENCOUNTERED:
13. DEPTH DRILLED INTO ROCK	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC: BTEX	RCRA METALS: SVOC/TOC	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL: X	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: Heather L Smeeton		

LOCATION SKETCH/COMMENTS — SCALE:



(Signature and Date)

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-9 51

PROJECT: Fort Stewart USTs

INSPECTOR Heather Smith

SHEET 4 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	SM - Silty Sand as above				
	22					
	23	B.O.B.	22.0' BGS.			
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

HOLE NUMBER 27F.MW95D

PROJECT: Fort Stewart USTs

INSPECTOR Heather Smith

SHEET 3 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	CL - w/trace sand go above 5Y7/1 lt. grey MOIST	Headspace from cuttings 144 ppm			no more coring - Logging from cuttings only. unsure of exact depth of contact
	12	CL w/ Sand (increasing sand content over depth. Sand increases to med. gr. size 5Y6/1 grey Moist STRONG ODOR				
	13	SC - ~~Sandy clay~~ ~~Clayey~~ Sand Predominantly fine gr. Sand. some med.gr. rounded to subrounded grains Cuttings wet - ball up as leaving augers 5Y6/1 grey	Headspace from cuttings 123 ppm			
	14					
	15	STRONG ODOR				
	16	SM - Silty Sand Saturated med grained subang to subrounded grains Soft nonplastic ~~5Y6/1 grey~~ THINLY STRONG ODOR 10YR 7/4 Very pale brown	Headspace from cuttings 61.5 ppm			unsure of exact contact depth due to travel time up augers. dashed line is best educated depth.
	17					
	18					
	19		Headspace from cuttings 36.1 ppm			
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-09

PROJECT: Fort Stewart USTs | INSPECTOR Heather Smith | SHEET 2 OF 4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete Core				RUN 5.0' Rec. 4.4 Loss ~~4.~~
	1	SC - Clayey Sand fat clay, f. gr. Sand Subangular → angular mottled colors Predominantly 5YR 6/1 grey w/ 5YR 5/6 yellowish red. & 5YR 3/2 dk reddish brown. Fill - dry, soft.	0.0 ppm		1.0	0.6 = Concrete
	3	SM - Silty Sand. med → fine gr. subrounded to subangular grains dry soft nonplastic 10YR 3/1 v. dk. grey				
	4–5	SM - Silty Sand. Med → fine gr. subrounded to subangular 10YR 6/2 lt. brownish grey dry, soft nonplastic	44.6 ppm			
	6	SC - Clayey Sand fat clay w/ Sand. Sub. ang. → subrounded. Soft, moist, Some lt. grey Lean clay nodules. 10YR 7/4 V. Pale Brown	103 ppm			
	7–8	CL Lean clay w/ sand Lean Clay w/ ~30% Sand - med. to fine grained subangular to subrounded Sands Soft to firm - Predominantly firm - stiff clay 5Y 7/1 lt. grey	225 ppm		8.0	
	9–10	CL - lean Clay w/ trace fine gr. subrounded sand. firm, dense, moist high plasticity lt. grey. 5Y 7/1 lt. grey				

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HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-09

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 4

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineering

5. NAME OF DRILLER: Darren Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID auger; 3½ 4'- 5' long Sample barrels

8. HOLE LOCATION: See map.

9. SURFACE ELEVATION: TOC 6846ft N 684347.37 E 821587.85

10. DATE STARTED: 10/12/99

11. DATE COMPLETED: 10/12/99

12. OVERBURDEN THICKNESS: greater than T.D.

15. DEPTH GROUNDWATER ENCOUNTERED: Cuttings saturated @ 15

13. DEPTH DRILLED INTO ROCK: NA

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

14. TOTAL DEPTH OF HOLE: 22.0' BGS

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: DISTURBED X ~~UNDISTURBED~~

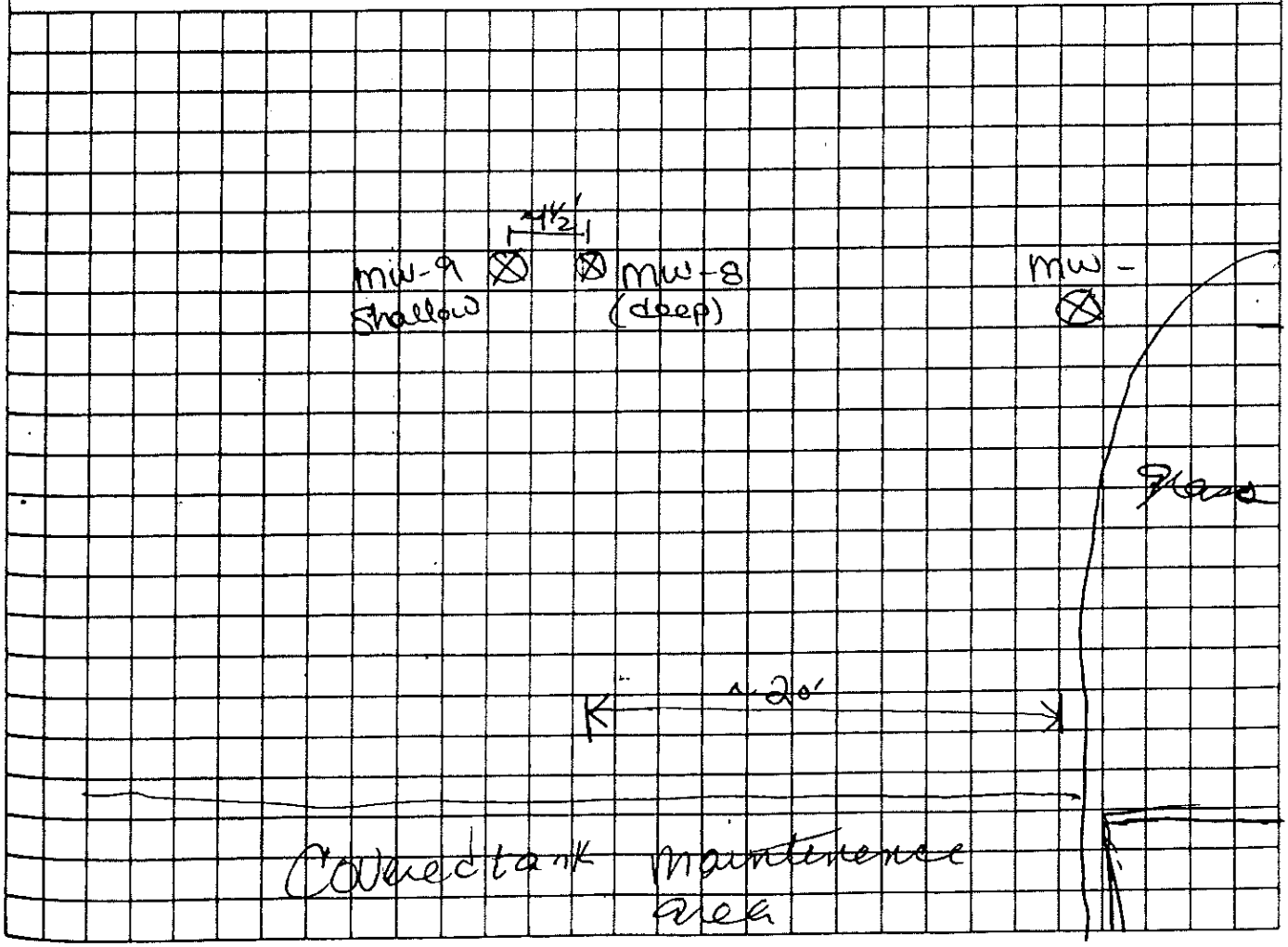
19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	RCRA METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X	SVOC	—	—	—	NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
	—	X	—	Heather L. Smith

LOCATION SKETCH/COMMENTS

SCALE: NONE



(Signature and Date)

QA CHECK BY

27F-MW-08

Core description	headspace PID	GeoTech Sample	analytical Samp	Remarks
SM - Silty Sand Saturated Color change to: 10YR 7/4 Very pale brown Soft med→cs. gr material Subrounded→ angular. ODOROUS!	overcuttings 2.4 ppm B.Z. Ø headspace 22.8			RUN # Headspace is a composite of samples from entire 5' auger run. RUN # 11
Same material as above.	overcuttings Ø			RUN # 12
Material in cuttings matched material as above, but material Stuck to the augers is a dk. greenish gray fat clay w/ v.cs. angular grained sands & Shell fragments. high plasticity. contact is purely estimated. There was ~6' of stiff clay adhered to the augers from ~36-42' BGS. I don't know how far we actually augered in to this Hawthorne formation. Best Guess from Geo. & Driller	B.Z. Ø headspace 25.6 ppm			Material in cuttings looks exactly the same as the earlier 20' B. O B. 42' BGS

HOLE NUMBER 27F-MW-09 23
SHEET 4 OF 5

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs

INSPECTOR Heather L Smith

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Same as above				logging cuttings only
	21	SM-Silty Sand Saturated slight increase in cs. gr. mtrl. Same color as above	overcore cuttings HS initial 15.7ppm			Run # 9
	22		headspace 33.6ppm BZ. ∅			
	23					
	24					
	25					Logging Cuttings only
		Same as above				
	26	SM- silty Sand Saturated smell decreases	overcuttings ∅.5ppm			Run # 10
	27	color still 10YR 7/2 lt. grey	B.Z. ∅			headspace taken from composite of cuttings during 5' run.
	28		headspace 28.2ppm			
	29					
	30					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-08 22

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 3 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	SM - Silty Sand fine gr. Sand. Subrounded Saturated, Soft, nonplastic 10YR8/1 White	29.1 ppm		Sample ID# continued	Sample taken from RUN #6 @10.7
	11	SM as above color Begins to change to brown - As depth increases Smell goes away in auger cuttings until it is gone ~13'BG and entire cuttings are Brown.				Log w/ cuttings only 10.7-15.0 RUN #7 - 5' auger
	12					
	13					
	14	SM - Silty Sand Complete color Change to 10YR7/2 lt. grey. No odor - Same mtrl as above.				
	15					
	16	SM - Silty Sand med → Cs. grained. Subangular to angular grains Saturated soft, nonplastic 10YR7/2 light grey	headspace 29.3 ppm			~~B.G.S. #3 - 15.0' BGS~~ 10-11-99 Decided to make this a deep hole We will overdrill the set well & continue to set screen @ 30-40' BGS
	17	Strong odor from cuttings				RUN #8
	18					
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F-MW-08 21

PROJECT: Fort Stewart USTs

INSPECTOR Heather Smith

SHEET 2 OF 5

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete			Sample ID Ø-1'	Concrete cored out earlier
	Ø1	SC - Clayey Sand Med→CS gr. Sand w/ ~15% fines, angular→subrounded, low to med. plasticity, soft moist Predominantly 5YR 7/1 lt. grey w/ mottled 10YR5/6 yellowish red.	Ø.9 ppm			RUN #1 Ø.7→2.45 Loss: .25'
	Ø2					
		SM Silty Sand 10YR 2/1 Black soft, dry, nonplastic med gr, Subang. Sands				
	Ø3	Loss	3.1 ppm			RUN #2 2.7 - 4.7
		gradational color change to 10YR 6/1 GREY Same mtrl as above.				
	Ø4					
		SC - Clayey Sand med. gr. ang→subrounded grains, med. plasticity Soft to slightly firm - Color mottled from 5YR 7/1 lt. grey w/ 10YR5/6 yellowish red.				RUN #3 RUN 4.7 - 5.7 Resistance after Ø.9' Rec: 45
	Ø5	Loss	1.8 ppm			Loss
	Ø6					RUN #4 RUN 5.7→7.7 Rec 2' Loss Ø Augered to 5.7' BGS Pass thru resistance Run S.S. from 5.7-7.7 RUN
	Ø7	SC - Clayey Sand w/ med→CS. gr., angular to subrounded in fat clay med→high plasticity Soft moist (firm from 7.1→7.7' BGS) Same color as above.	~~Soft~~			WL after 12 hrs
		CL - Lean Clay w/ fine gr. Sand. 5YR 7/1 lt. grey.	30.7 ppm			RUN #5 RUN 7.7 - 9.7
	Ø8	SC - Clayey Sand. Fat clay w/ med.→CS. gr. Sand ang.→Subrounded grains Soft Moist 10YR 7/1 lt. grey w/ 10YR5/6 yellowish red.		8½		WL after ~20 min
		CL - Lean Clay HARD/firm, dense, moist 5Y 7/1 lt. grey high plasticity	30.4 ppm	geotech sample ID# 7J1873		
	Ø9					
	10	SM Silty Sand	Core wet @ 9.9' BGS W.T.	10'	Same ID#	RUN #6 RUN 9.7→10.7

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 29F-MW-08

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 5

3. PROJECT: Fort Stewart

4. LOCATION: 3rd Engineering

5. NAME OF DRILLER: Darren Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" split spoons; 4¼" augers; 8¼" augers.

8. HOLE LOCATION: See map N 681345.97 E 821585.83

9. SURFACE ELEVATION: TOC 68.34 ft

10. DATE STARTED: 10/9/99

11. DATE COMPLETED: 10/10/99

12. OVERBURDEN THICKNESS: greater than T.D.

15. DEPTH GROUNDWATER ENCOUNTERED: Soil wet @ 9.2

13. DEPTH DRILLED INTO ROCK: NA

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: WL up to 8.46 after 15 min

14. TOTAL DEPTH OF HOLE: 15' BGS.

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY): WL @ 7.6' BGS after ~12 mo.

18. GEOTECHNICAL SAMPLES: DISTURBED X; UNDISTURBED

19. TOTAL NUMBER OF CORE BOXES: NA

20. SAMPLES FOR CHEMICAL ANALYSIS: VOC BTEX; RCRA METALS SVOC/TOC; OTHER (SPECIFY); OTHER (SPECIFY); OTHER (SPECIFY)

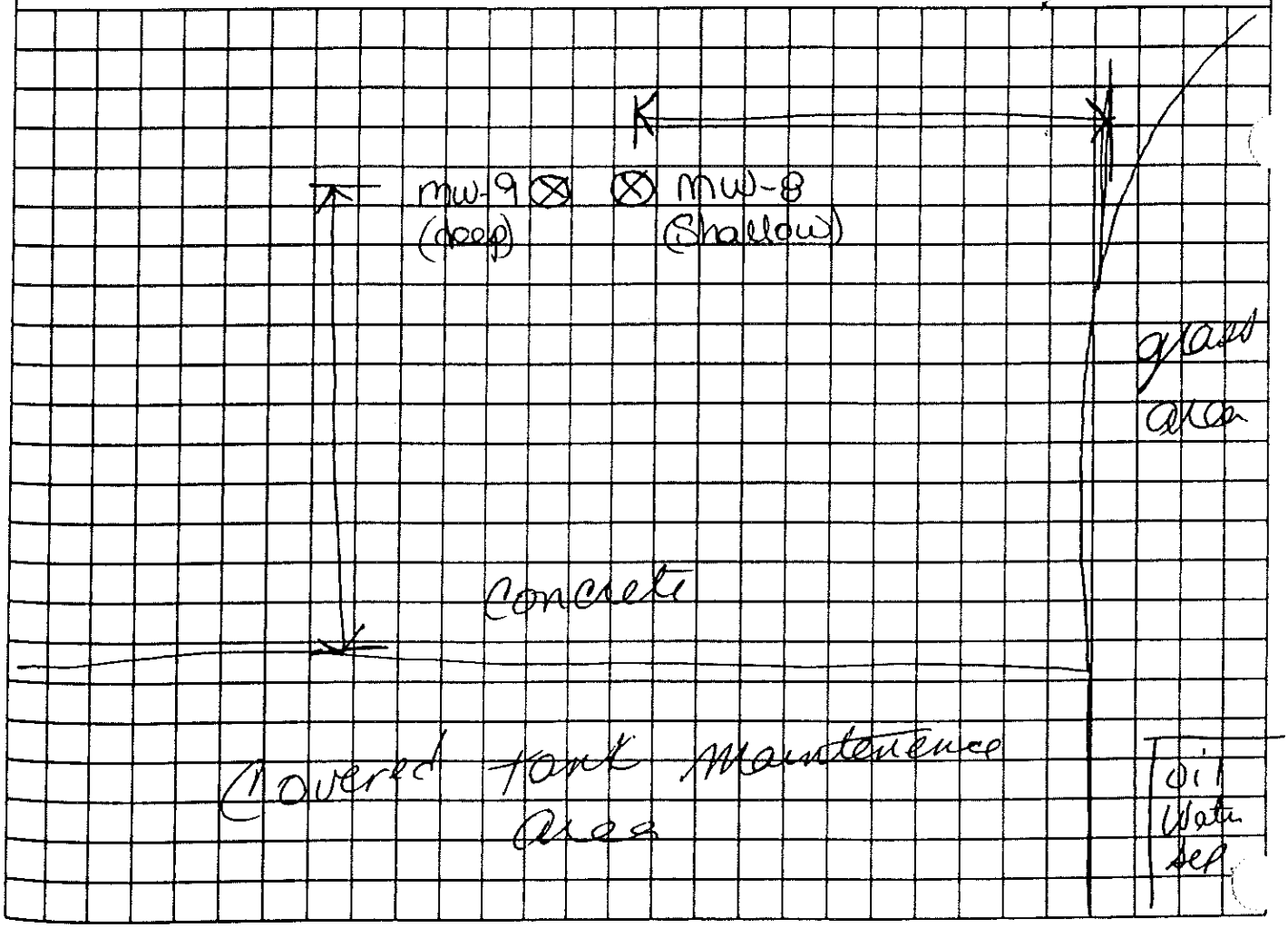
21. TOTAL CORE RECOVERY: NA

22. DISPOSITION OF HOLE: BACKFILLED; MONITORING WELL X; OTHER (SPECIFY)

23. SIGNATURE OF INSPECTOR: Heather L Smith

LOCATION SKETCH/COMMENTS

SCALE: NONE



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG

HOLE NUMBER 27F-MW47

SHEET 3 OF

PROJECT: Fort Stewart USTs

INSPECTOR

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Drilled OVT No Split Spoon				Lt Red-Brown Saturated med-coarse sand
	21	TD = 21.0 ft				

HTRW DRILLING LOG

HOLE NUMBER 27F-MW07S

PROJECT: Fort Stewart USTs | INSPECTOR Brad Baker | SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11					Run 10-15 Ft 0.0 recovery H_2O tagged @ 9.5 Ft Tagged inside 15 Ft auger string - TD @ 12.5 Ft ∴ 2.5 Ft of heaving soil
	12		NA	NA	NA	
	13					
	14					
	15					
	16	Drilled Out No Split Spoon				Lt Red - Brown saturated sands med - coarse
	17		NA	1510 hr 17-18.0 A 751773 Bag Sample	NA	
	18					
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27F.MW07

PROJECT: Fort Stewart USTs | INSPECTOR Brad Bell | SHEET 1 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		CONCRETE SLAB 0 - 0.85 ft				
	1	SAND; med - fine ~40% silt 20%; Black 10YR 2/1; subrounded; poorly sorted; non plastic; soft; moist (SM)		actual 0.85 - 1.85 ft / labeled as 0.0 - 1.0 ft	1419 hrs 7J1771	0 - 5 ft run 0.0 ppm BZ
	2	SANDY CLAY: sand: med-fine ~40% clay ~60%; Lt Red 2.5YR 7/6; variegated white and yellow; firm; subrounded; poorly sorted; moist (CL) med. plasticity	1.8 ppm		1425 7J1772 2.5 - 5.0 ft	Bottom 1.0 ft of spoon (outside) is wet. Recovery 4.3 ft = 100%
	3	SAND; med - fine ~60% silt ~ 20%; GRAY 5Y5/1; banded med. brown; subrounded; mod sorted; firm, hydrocarbon moist (SM)	45.6 ppm	NA		
	4	SANDY CLAY; sand; med-fine ~35%, clay ~ 65%; Lt Grey 7/1 banded yellow 10YR 8/6; subrounded; poorly sorted; med. plasticity moist (CL)				
	5	SAME AS ABOVE (4.8 - 5.0 ft description) coarse grained sand, FIRM				5 - 10 ft Run 50% Recovery (3.0 ft)
	6		4.6			
	7	Clayey SAND; sand ~ 70% med-coarse, clay ~ 30%; Red 10R 3/6 banded yellow 10YR 8/6; subrounded; poorly sorted. low plasticity; soft; moist (SC)		NA	NA	
	8	CLAY; sand: fine ~ 20%, clay ~ 80%; Lt Red 2.5YR 7/1; hard; poorly sorted; subrounded; med plasticity; moist				
	9					
	10					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW-07

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller

SHEET 1 OF ___

3. PROJECT: Fort Stewart

4. LOCATION: 27F

5. NAME OF DRILLER: Darron Penn

6. MANUFACTURERS DESIGNATION OF DRILL: Mobil B-59

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" ID Hollow Stem Augers; 5 ft continuous split spoon; 8¼" ID HSA

8. HOLE LOCATION: See Map Below — N 684315.20, E 821556.65

9. SURFACE ELEVATION: TOC 68.14 ft

10. DATE STARTED: 10 Oct 99

11. DATE COMPLETED: 10 Oct 99

12. OVERBURDEN THICKNESS: NA

15. DEPTH GROUNDWATER ENCOUNTERED: 9.5

13. DEPTH DRILLED INTO ROCK: NA

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

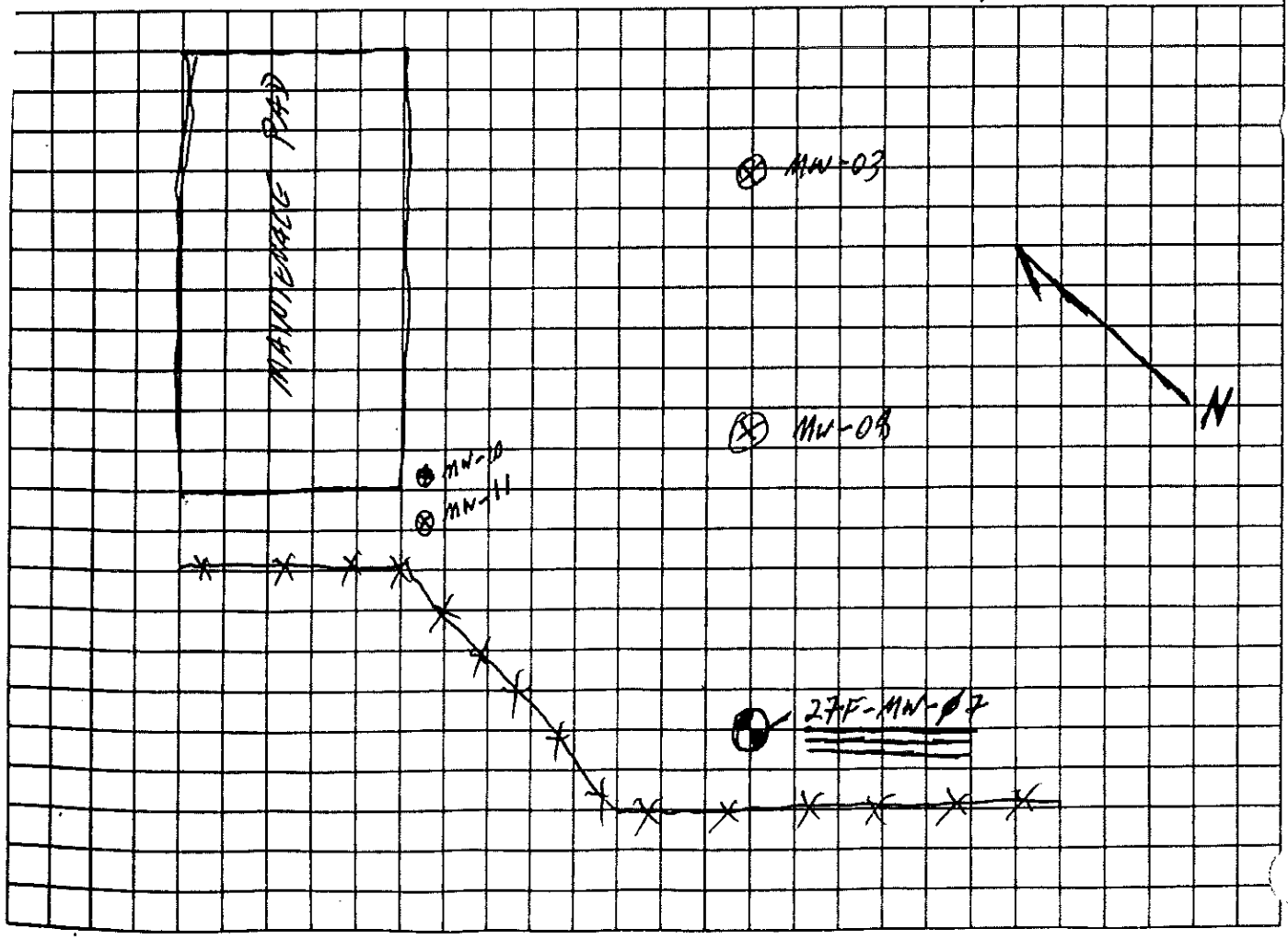
14. TOTAL DEPTH OF HOLE: 21.0 ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	TOC	SVOC		
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
		✓				

LOCATION SKETCH/COMMENTS

SCALE: NA



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: _____ (Signature and Date)

HTRW DRILLING LOG — HOLE NUMBER 27F-MW636

PROJECT: Fort Stewart USTs — INSPECTOR Heather L Smith — SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		SM - Silty sands. ~~some~~ wet soft color = 10YR 4/3 brown				Log by cuttings only
	11	No smell from cuttings fine → med. gr. sands	over cuttings 1.2ppm			
	12					*NO ODOR DURING DRILLING NO PID HITS ON CUTTINGS OR B.Z over 5' [illegible]
	13	gradually getting wetter & lighter in color				
	14	SM - Silty sand Saturated fine gr. subrounded sands. 10YR 7/6 yellow				unsure of exact contact, but just before last 5' RUN facies change to runny saturated fine sands. (looks like cookie dough)
	15					
	16		headspace 1.8ppm	Sample ID 7J1673		
	17					
	18					
	19					
	20					B.O.B. 20.0

RMA DRILLING LOG

PROJECT: FT. STEWART 16 SWMU | INSPECTOR: LUIS MERCADO | SHEET: 3 of 3 | 7KGP01

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10	10': CLAYEY SAND (SC), 40% CLAY, FINE TO MEDIUM SAND, DARK GRAYISH BROWN (10YR 4/2), MOIST.	10-12' 4.2 ppm	SAMPLE # 7K1111 SOIL 10-12' BGS		
	11	11': CLAYEY SAND (SC), AS ABOVE, WET.				
	12	11.5': WELL GRADED SAND WITH CLAY (SW-SC), 10% CLAY, FINE TO MEDIUM SAND, LIGHT BROWNISH GRAY (10YR 5/2), WET. 12': End of Log				1" PVC PIEZOMETER INSTALLED TO 15' BGS, SCREENED FROM 10-15' BGS

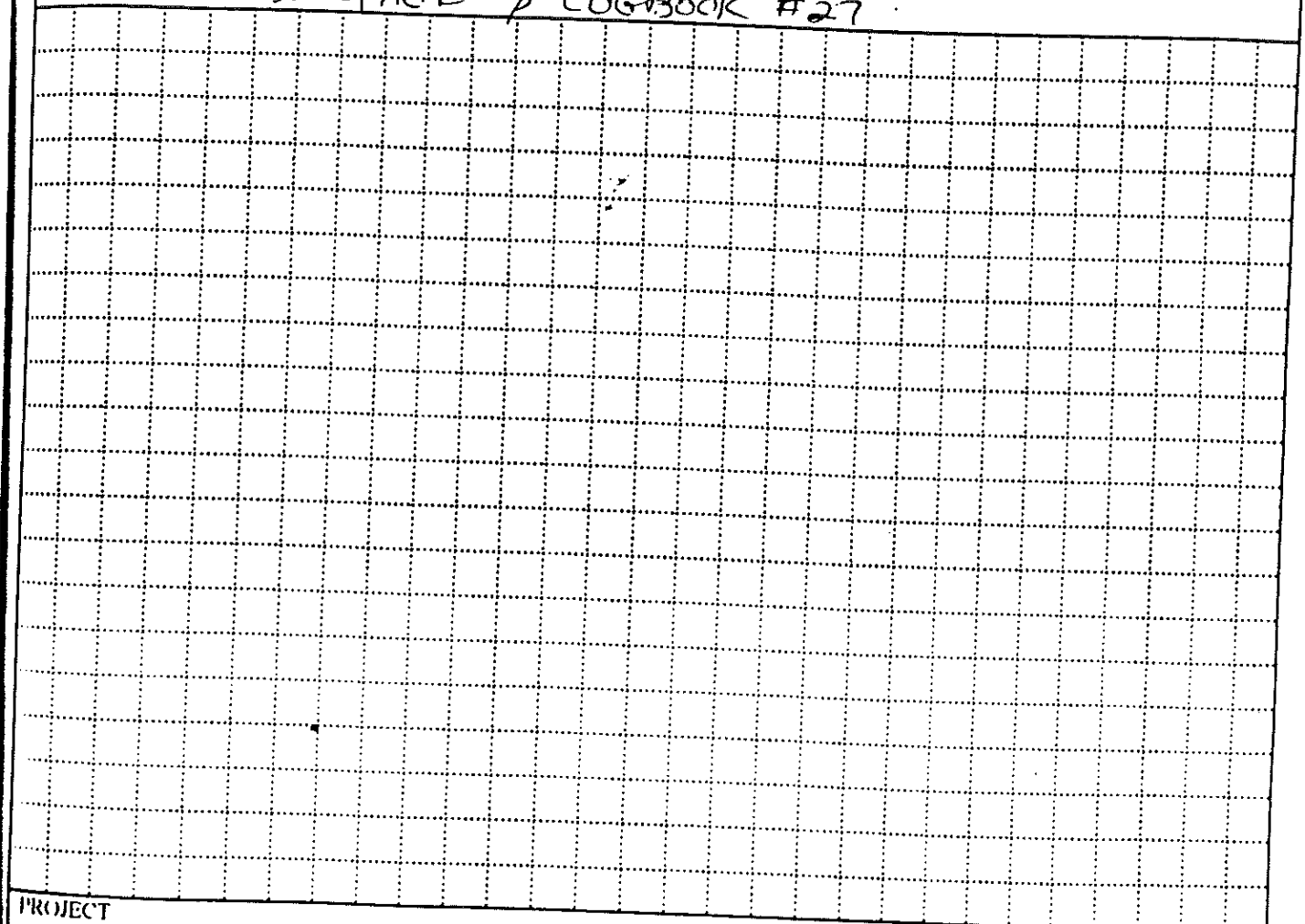
PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7KGP01

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7K-GP-02
3. PROJECT: FT. STEWART 16 SWMUS	3. DRILL SUBCONTRACTOR: REWRIGHT/SAIC	SHEET 1 OF 3
5. NAME OF DRILLER: J. HASELHOFF	4. LOCATION: SWMU 27F	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" RODS, 1" PVC PIEZOMETER, PERISTALTIC PUMP	6. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS 8M	
	8. HOLE LOCATION: 7K-GP-02 E-821353.84' N-684695.41' NAD-83	
	9. SURFACE ELEVATION: NAVD-88 66.79'	
	10. DATE STARTED: 1/17/98	11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 8' bgs	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 15' bgs	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED: NA	UNDISTURBED: NA
19. TOTAL NUMBER OF CORE BOXES: NA		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: NA
	X		SVOC	LEAD		
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: Lui Mercado		
			TEMP. PIEZ			

LOCATION SKETCH/COMMENTS: SEE PAGE # 3 (LMA) LOGBOOK #27 SCALE:



PROJECT	HOLE NO.
FT. STEWART 16 SWMUS	7K-GP-02

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

well atmosphere, soil core, breathing zone, venting compressed air, etc.)

(Signature and Date)

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7KGP02 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	WELL GRADED SAND WITH CLAY (SW-SC), 10% CLAY, FINE TO MEDIUM SAND, SUBROUNDED, REDDISH YELLOW (5YR 6/8), MOIST.	0-2' 0.2PPM			PUSHED 0-4' (3.6' RECOVERY) SOIL BORING IN DRAINAGE DITCH
	2	1.5': WELL GRADED SAND WITH CLAY (SW-SC), AS ABOVE, DARK GRAY (5YR 4/1), MOIST.				
	3		2-4' 2.6 PPM			
	4					PUSHED 4-8' (4.0' RECOVERY)
	5		4-6' 4.7PPM			
	6	6': SANDY LEAN CLAY (CL), 40% FINE SAND, CLAY HAS LOW PLASTICITY, NO DILATENCY, MEDIUM TOUGHNESS, MOIST				
	7		6-8' 15.2PPM	~~6-8'~~ SH	6-8' sample # 7K1211	
	8	8': CLAYEY SAND (SC) 45% CLAY, FINE TO MEDIUM SAND, REDDISH GRAY (5YR 5/2), WET.				PUSHED 8-12' (4.0' RECOVERY) GW @ 8' bgs ▽
	9		8-10' 1.0 PPM			
	10					

PROJECT: FT. STEWART 16 SWMU's | HOLE NO: 7KGP02

HTRW DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERCADO | HOLE NUMBER: 7KGP02 | SHEET: 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10	10% WELL GRADED SAND WITH SILT, 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, LIGHT GRAY (5YR 7/1), WET.	10-12' 1.5ppm			1" PVC PIEZOMETER INSTALLED TO 15' SCREENED FROM 10-15' bgs.
	11					
		End of log				
	12					

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7KGP02

HTRW DRILLING LOG

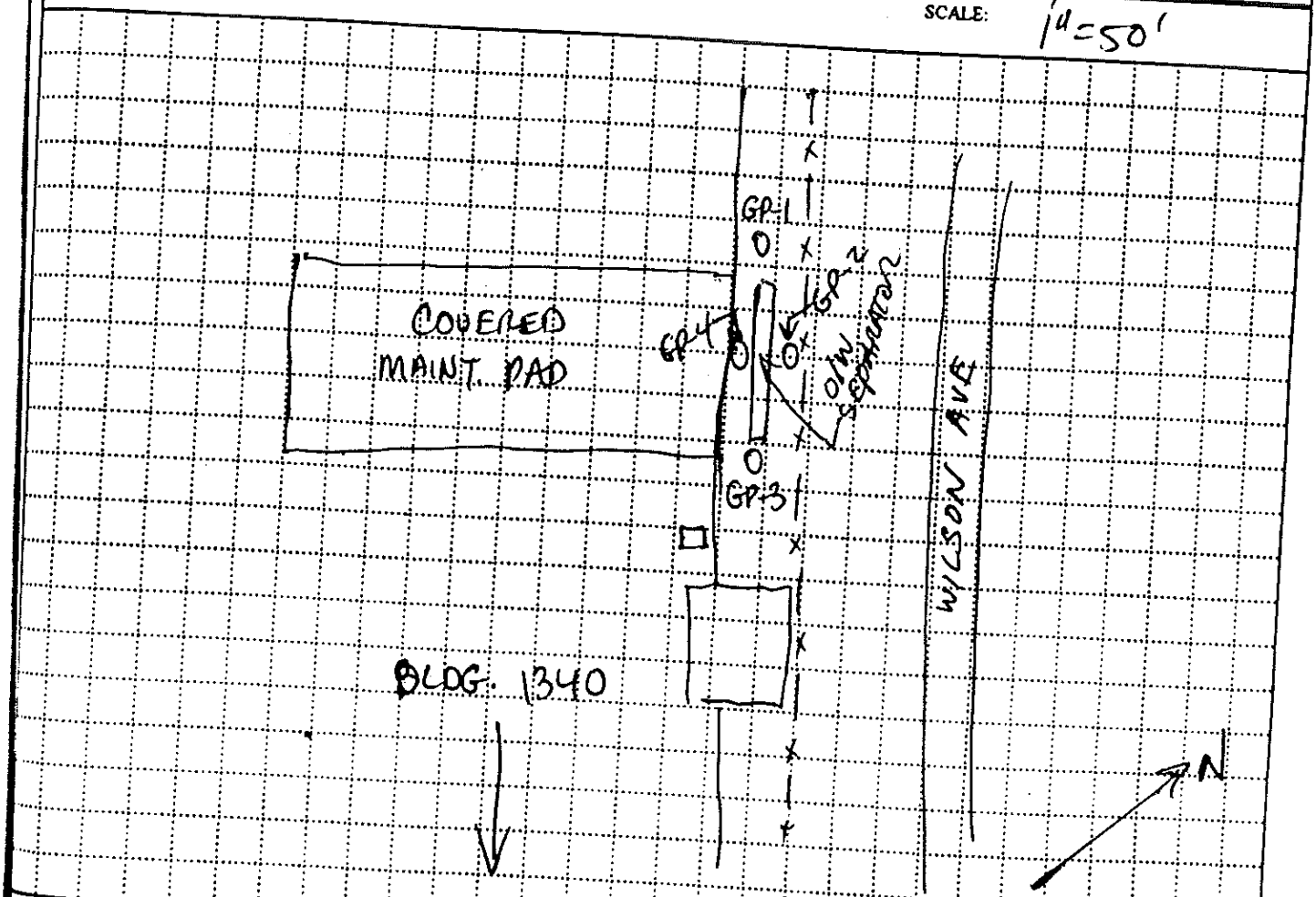
1. COMPANY NAME: SAIC	2. DISTRICT: SAVANNAH	HOLE NUMBER: 7K-GP-03
3. PROJECT: FT. STEWART 16 SWMUS	3. DRILL SUBCONTRACTOR: REWRIGHT/SAIC	SHEET 1 OF 3
5. NAME OF DRILLER: J. HASELHOFF	4. LOCATION: SWMU # 27F	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" RODS; 1" PVC PIEZOMETER; PERISTALTIC PUMP	6. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE SYSTEMS	
	8. HOLE LOCATION: 7K-GP-03 E - 921357.86' N - 684659.34' NAD-83	
	9. SURFACE ELEVATION: NAVD-88 67.60'	
	10. DATE STARTED: 1/17/98	11. DATE COMPLETED: 1/17/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 9 BGS	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA	NA	NA	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	X		SVOC	LEAD		NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			TEMP. PIEZ			

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



PROJECT: FT. STEWART 16 SWMUS

HOLE NO: 7KGP03

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

H I R W DRILLING LOG

PROJECT: FT. STEWART 16 SWMUS | INSPECTOR: LUIS MERLADO | HOLE NUMBER: 7K-GP-03 | SHEET: 2 of 3

FEET (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	0	WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, SUBROUNDED, YELLOWISH BROWN (10YR5/4), DRY.	0-2' 0 ppm			PUSHED 0-4' (1.4' RECOVERY)
	1					
		1': WELL GRADED SAND WITH CLAY (SW-SC), 15% CLAY, FINE TO MEDIUM SAND, SUBROUNDED, LIGHT RED (2.5YR 6/8), DRY.				
	2					
		2.5': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, ROUNDED, DARK GRAYISH BROWN (2.5Y 4/2), DRY.	2-4' 0 ppm			
	3					
	4	4': WELL GRADED SAND WITH SILT (SW-SM), AS ABOVE, MOIST.				PUSHED 4-8' (1.6' RECOVERY)
	5		4-6' 18.3 ppm	4-6' SAMPLE # 7K1311		FREE PRODUCT ON THE RODS FROM 4-8' bgs
	6					
	7		6-8' 0.9 ppm			
	8					PUSHED 8-12' (3.7' RECOVERY) GW @ 9' bgs ▽
	9	9': WELL GRADED SAND WITH SILT (SW-SM), 10% SILT, FINE TO MEDIUM SAND, ROUNDED, LIGHT GRAY (2.5Y 7/1), WET.	8-10' 0.8 ppm			
	10					

PROJECT: FT. STEWART 16 SWMUS | HOLE NO: 7K-GP-03

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NUMBER
FT. STEWART 16 SWMUS		7K-GP-03

SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10		10-12' 3.9ppm			
	11					
	12	12ft. End of Logging				1" PVC PIEZOMETER INSTALLED TO 15' bgs SCREEN FROM 10-15' bgs

PROJECT FT. STEWART 16 SWMUS

HOLE NO 7K-GP-03

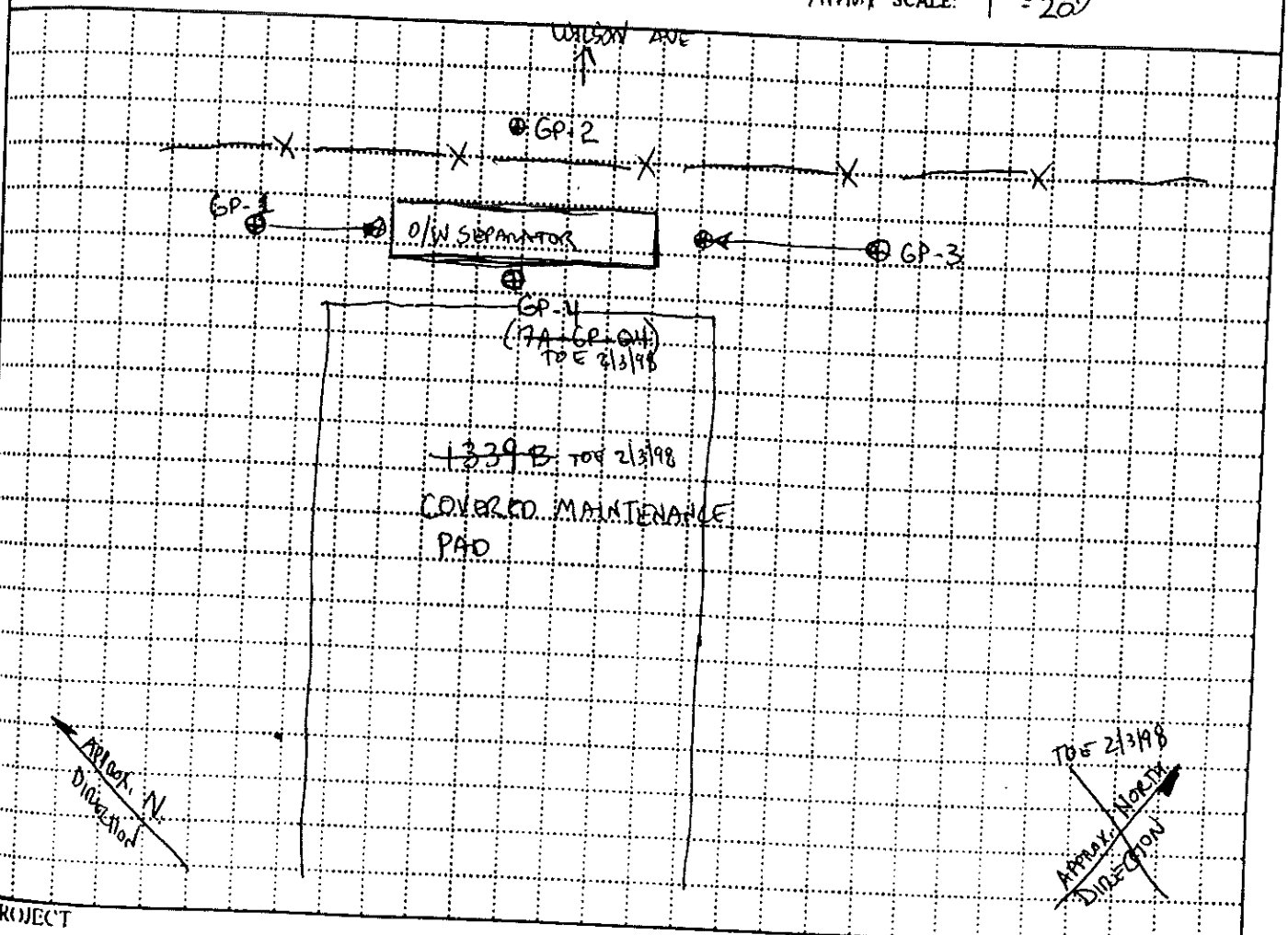
7K-GP-04 ~~7A-GP-04~~ JXL

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: ~~7J-GP-04~~ TOE 2/3/98
3. PROJECT: FT. STEWART GEORGIA 16 SWMU's	4. DRILL SUBCONTRACTOR: N/A	SHEET 1 OF 2
5. NAME OF DRILLER: ANDY KNICKERBOCKER	6. LOCATION: SWMU # 27F	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: GEOPROBE - MACRO SAMPLER 0-7' PW	8. MANUFACTURERS DESIGNATION OF DRILL: GEOPROBE	
	8. HOLE LOCATION: NAD-83 ~~7A-GP-04~~ JXL E - 821837.56' N - 684675.01'	
	9. SURFACE ELEVATION: NAVD-88 68.60'	
	10. DATE STARTED: 2/3/98	11. DATE COMPLETED: 2/3/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: ~6' BGL	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 11' BGL	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED / UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	Lead	SVOC			NA
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Piezometer	Frank Ealey		

LOCATION SKETCH/COMMENTS — APPROX SCALE: 1" = 20'



PROJECT: FT. STEWART GEORGIA 16 SWMU's

HOLE NO: 7K-GP-04 ~~7A-GP-04~~ JXL

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

HTRW DRILLING LOG

PROJECT: FT. STEWART GEORGIA | INSPECTOR: TODD EMBY | HOLE NUMBER: ~~7A-GP-04~~ 1K-GP-04 JKZ | SHEET: 2 OF 2

FROM (ft)	TO (ft)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
0	1	SAND: SW-SM, WELL GRADED, FINE TO VERY FINE SAND, 2.5Y 3/2 VERY DARK GRAYISH BROWN	0.3 ppm			MACRO CORE (0-7' BGL) DIRECT PUSH (7-11' BGL) INSTALL 1" DIAM PVC SCREEN (6-11' BGL)
1	2	SAME AS ABOVE, DARK YELLOWISH BROWN 10YR 4/6,				
2	3	SAND Y SILT: ML, VERY FINE SAND BROWN 7.5YR 4/3; STRONG BROWN 7.5YR 5/8 AND REDDISH YELLOW 7.5YR 6/8 AND GREENISH BLACK GLEY 2 2.5/5BG MOTTLED LENSED TOE 2/3 FT	0.2 ppm			
3	4					
4	5					
5	6	MOIST 5-6'	0.1 ppm			
6	7	SILT WITH SAND: ML, FINE GRAINED SAND, SOFT, ~~MOIST~~ SATURATED TOE, VERY DARK GRAY 10YR 3/1,			0955	
7	8		0.1 ppm			
8	9		0.1 ppm			
9	10					

PROJECT: FT. STEWART GEORGIA 16 A.19-13 | HOLE NO: ~~7A-GP-04~~ 1K-GP-04 JKZ

ITRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27F-MW1(7K)

COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: MDC

SHEET 1 OF 3

PROJECT: Fort Stewart

4. LOCATION: SWMU -27F 3RD ENGINEERING

NAME OF DRILLER: B. UPCHURCH

6. MANUFACTURERS DESIGNATION OF DRILL: CME -85

SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: HSA 4¼"

8. HOLE LOCATION: 27F-MW1(7K)

9. SURFACE ELEVATION: TOC 68.33 ft N 684695.62 E 881829.93

10. DATE STARTED: 10/11/99

11. DATE COMPLETED: 10/11/99

12. OVERBURDEN THICKNESS: N/A

15. DEPTH GROUNDWATER ENCOUNTERED:

13. DEPTH DRILLED INTO ROCK: N/A

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

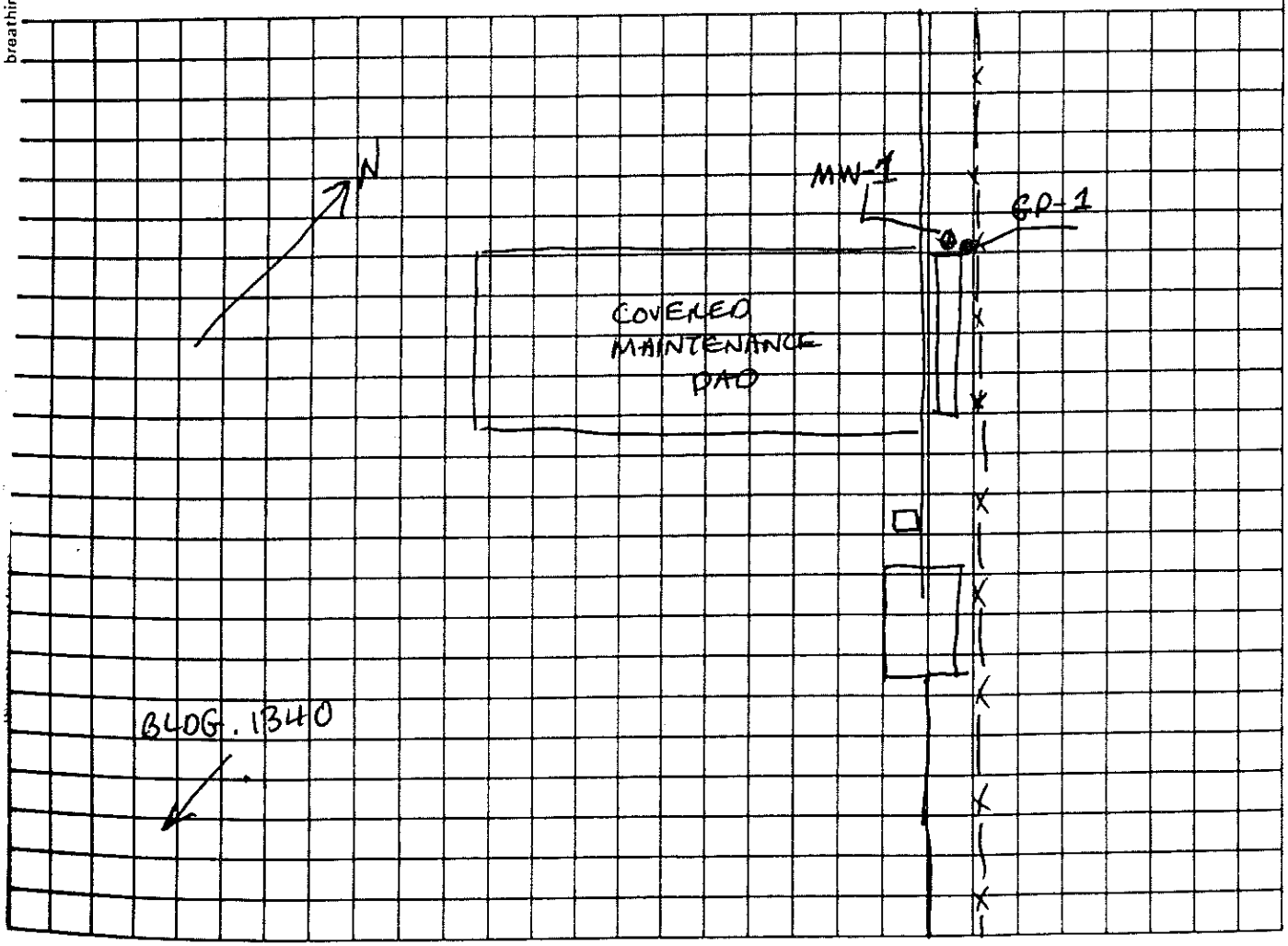
14. TOTAL DEPTH OF HOLE: 15 FT

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	—	—	—	—	—	
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
		2" PVC		L. Mercant		

LOCATION SKETCH/COMMENTS

SCALE: 1" = 50'



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY:

HTRW DRILLING LOG 27F-MW1(LF) HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MELCADO | SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1	SILTY SAND(SM), BROWN 7.5YR(4/3), F-SAND, WITH ABUNDANT SILT, (~35%) WITH SOME ORGANIC MATTER GRASS, ROOTS, , MOIST.				
	2	1.5': SILTY CLAY(CL), VERY DARK BROWN(7.5YR 3/1), SOFT, MED. PLASTICITY, 10-15% F-SAND, MOIST.				
	3					
	4	4': CLAYEY SAND(SP), F-SAND, MED. DENSE, 20-25% CLAY, SLIGHT PLASTICITY, GRAY(7.5YR 5/1), MOIST.				
	5					
	6					
	7					
	8	8': CLAYEY SAND(SP), AS ABOVE INCREASE MOISTURE CONTENT				
	9					
	10					

HTRW DRILLING LOG

27F-MW1(1K)

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR L. MERCADO

SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11			10-12' GEOTECH SAMPLE NO. @ MW		HSA TO 15 FT
	12					2" SCH-40 PVC WELL INSTALLED TO 13.5 FT
	13	12.5': CLAYEY SAND (SC), LIGHT GRAY (10YR 7/2), F-M SAND, SUBROUNDED, WITH 15-20% CLAY, WET.				
	14					
	15	15': END OF BORING				
	16					
	17					
	18					
	19					
	20					

SWMU 27G

DISCOM MOTORPOOL AND ASSOCIATED OIL/WATER SEPARATOR

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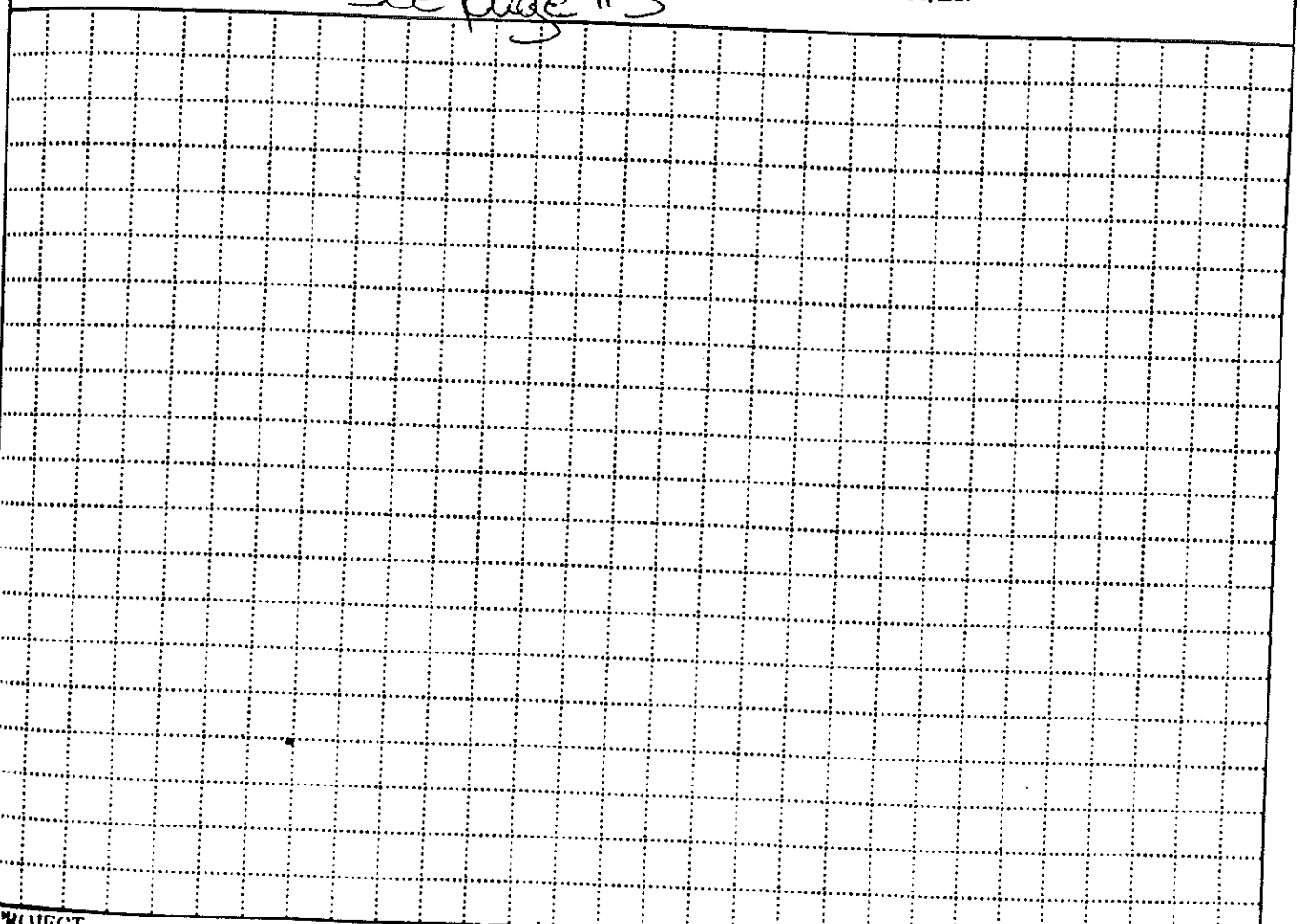
HTRW DRILLING LOG

1 COMPANY NAME: SAIC	DISTRICT: Savanah	HOLE NUMBER: 7M-GP-01
	2 DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 of 3
3 PROJECT: Ft. Stewart 16 SWMU's	4 LOCATION: SWMU 27G	
5 NAME OF DRILLER: Andy Knickerbocker	6 MANUFACTURER'S DESIGNATION OF DRILL: GH-40	
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: See page #3	8 HOLE LOCATION: NAD-83 E- 820111.13', N-678298.52'	
	9 SURFACE ELEVATION: NAVD-88 69.55'	
	10 DATE STARTED: 1/27/98	11 DATE COMPLETED: 1/27/98
12 OVERBURDEN THICKNESS: NA	15 DEPTH GROUNDWATER ENCOUNTERED: 7.5'	
13 DEPTH DRILLED INTO ROCK: —	16 DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 4.70' (0:10)	
14 TOTAL DEPTH OF HOLE: 12.0'/15.0'	17 OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18 GEOTECHNICAL SAMPLES: —	DISTURBED	UNDISTURBED	19 TOTAL NUMBER OF CORE BOXES: NA			
20 SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS*	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21 TOTAL CORE RECOVERY: NA
	✓	—	Lead	SVOC		
22 DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23 SIGNATURE OF INSPECTOR: Brett Turcott		
			Piezometer			

LOCATION SKETCH/COMMENTS: See page #3 SCALE:



PROJECT: Ft. Stewart 16 SWMU's HOLE NO: 7M-GP-01

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, breathing zone, venting combustible etc.)

HTRW DRILLING LOG

PROJECT	16 SWMU's	HOLE NUMBER	7M-GP-01
	INSPECTOR	SHEET	2 of 3

TIES (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1.0'	Silty SAND with some gravel (SW-SM), sand is medium texture, gravel is coarse and subangular, dark gray (7.5YR4/1), nonplastic, soft, moist	8.3			
	2.0'		12.0		7M1321 1130	
	3.0'					
	4.0'					Recovery = 3.5/4.0'
	5.0'					
	6.0'					
	7.0'					
	7.5'	same as above but wet.				
	8.0'	PSL 1/27/98				Recovery = 0.5'/4.0'
	9.0'					

PROJECT Ft. Stew ⊥ A.20-4 16 SWMU's HOLE NO 7M-GP-01

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7M-GP-01 | SHEET: 3 of 3

USCS (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	11.0'					
	12.0'					Recovery = 0.3'/4.0'
						Piezometer Screened between 10.0' - 15.0'

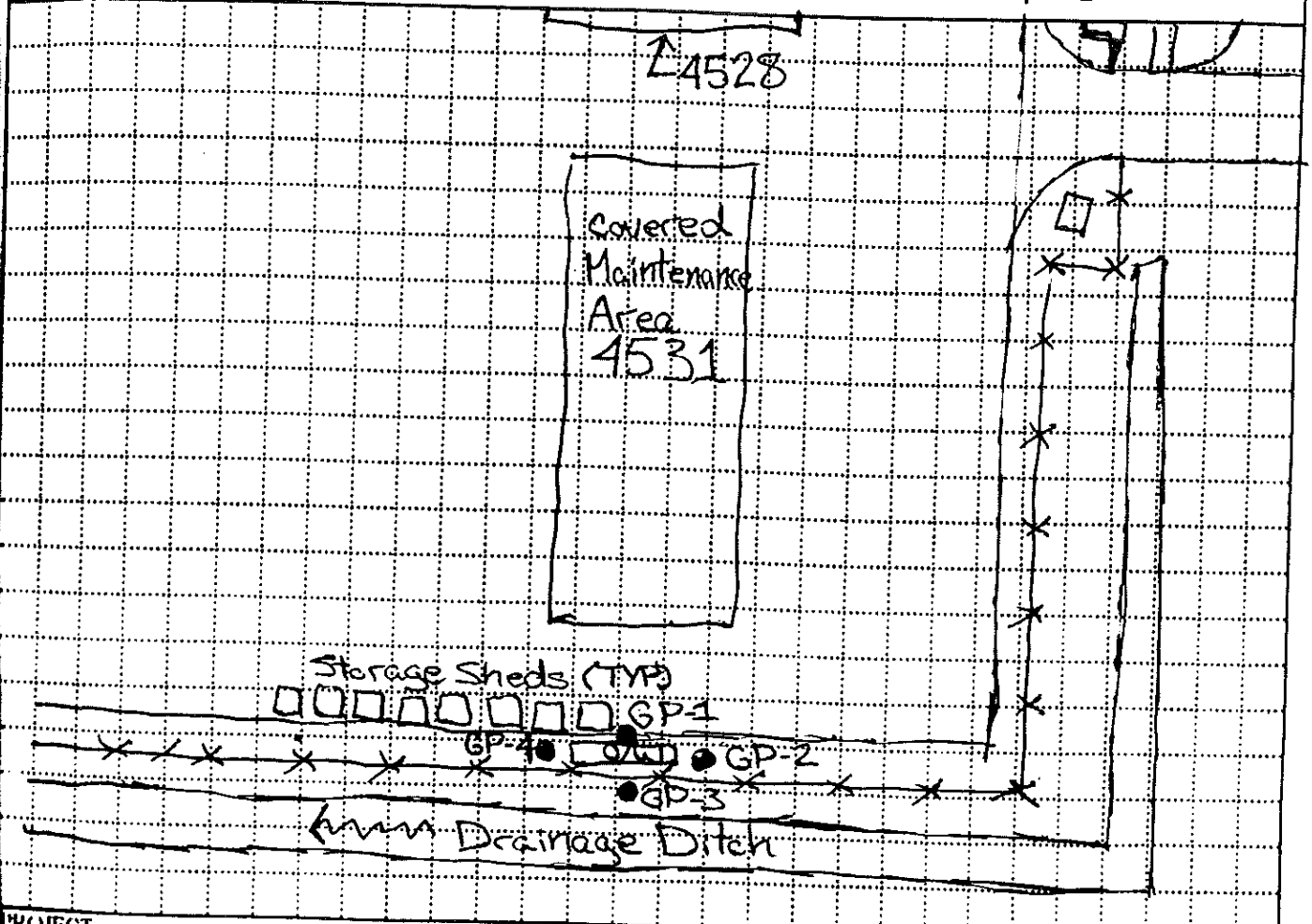
PSL 1/27/98

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah	HOLE NUMBER: 7M-GP-02
	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET: 1 OF 3
4. PROJECT: Ft. Stewart 16 SWMU's	5. LOCATION: SWMU-27G	
6. NAME OF DRILLER: Andy Knickerbocker	7. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe GH-40	
8. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 2" Macrocore samples with acetate liners/core catchers, Stainless steel spoons, poly tubing (HDPE) (LDPE) & mister Flex peristaltic pump	8. HOLE LOCATION: GP-02 E - 320126.03' N - 679305.97' NAD-83	
	9. SURFACE ELEVATION: NAVD-88 69.19'	
	10. DATE STARTED: 1/27/98	11. DATE COMPLETED: 1/27/98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: 7.7'	
13. DEPTH DRILLED INTO ROCK:	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 10.9 (@05)	
14. TOTAL DEPTH OF HOLE: 12.0'/15.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
	→	→	→			
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY**
	✓	✓	SVOC	Lead		NA %
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
			Temp. Piez.	Paul Nuccio		

LOCATION SKETCH/COMMENTS — SCALE: 1" = 50'



PROJECT: Ft. Stewart 16 SWMU's — HOLE NO: 7M-GP-02

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, bleeding, etc.)

HTRW DRILLING LOG

7M-GP-02

PROJECT	16 SWMU's	INSPECTOR	SHEET 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1.0'	Silty SAND with some gravel (SW-SM), sand is medium size, gravel is coarse and sub-angular, dark gray (7.5YR4/1), nonplastic, soft, moist	14.7			Used core catcher for all intervals
	2.0'		32.9		7M1211 0950	
	3.0'					
	4.0'					Recovery = 3.2'/4.0'
	5.0'		NA			
	6.0'					
	7.0'		NA			
	7.7'					
	8.0'	Clayey Sand with some gravel (SW-SC), dark gray (7.5YR4/1), nonplastic, ~~soft, moist~~ wet PJL 1/27/98				Recovery = 0.4'/4.0'
	9.0'		NA			
	10.0'					

PROJECT Ft. Stewart 1/ 21 SWMU's HOLE NO 7M-GP-02

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7M-GP-02 | SHEET: 3 of 3

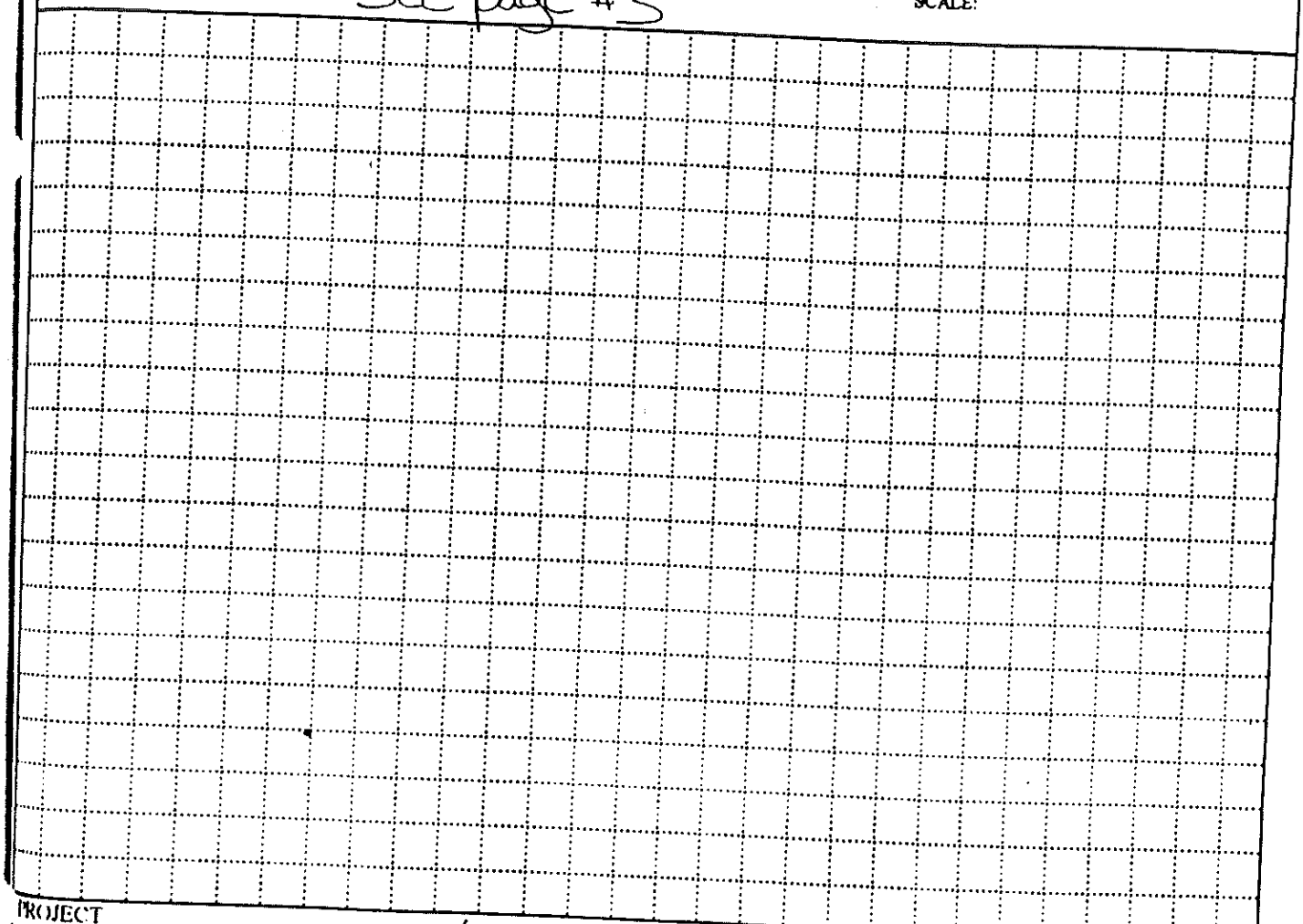
ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	11.0'					
	12.0'					Recovery = 0.4'/4.0'
						Install piezometer to 15.0'

HTRW DRILLING LOG

1 COMPANY NAME: SAIC	DISTRICT: Savannah	HOLE NUMBER: 7M-GP-03
	2 DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
3 PROJECT: Ft. Stewart 16 SWMU's	4 LOCATION: Slandu 276	
5 NAME OF DRILLER: Andy Knickerbocker	6 MANUFACTURER'S DESIGNATION OF DRILL: GH-40	
7 SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: See page #3	8 HOLE LOCATION: NAD-83 E-820115.21', N-678283.09	
	9 SURFACE ELEVATION: NAVD-88 68.89'	
	10 DATE STARTED: 1/27/98	11 DATE COMPLETED: 1/27/98
12 OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 9.0'	
13 DEPTH DRILLED INTO ROCK:	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 4.55' (0:10)	
14 TOTAL DEPTH OF HOLE: 12.0'/15.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18 GEOTECHNICAL SAMPLES: NA	DISTURBED:	UNDISTURBED:
19 TOTAL NUMBER OF CORE BOXES: NA		

20 SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21 TOTAL CORE RECOVERY: NA
	✓	Lead	SVOC			
22 DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Temp. Perc.	Paul A. Tucot		

LOCATION SKETCH/COMMENTS: See page #3 SCALE:



PROJECT: Ft. Stewart 16 SWMU's HOLE NO: 7M-GP-03

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

(Signature and Date)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: TM-GP-03 | SHEET: 2 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1.0'	Sand with some silt (SW-SM), sand is medium texture, dark gray (7.5YR 4/1), soft, moist	2.8			
	2.0'		3.7			
	3.0'					
	4.0'					Recovery = 4.0'/4.0'
	5.0'		NA			
	6.0'					
	7.0'		NA			
	8.0'					Recovery = 0.3'/4.0'
	9.0'	Same as above but wet	1.9			9.0'-12.0', wet

PROJECT: 16 | HOLE NO: TM-GP-03

HTRW DRILLING LOG

PROJECT	16 SWMU's	INSPECTOR	HOLE NUMBER	TM-GP-03
			SHEET	3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	11.0'					9.0' ~~11.0'~~ - 12.0': Wet PS 1/2/1/3
	12.0'					Recovery = 0.6'/4.0'
						Piezometer screened From 10.0' - 15.0'

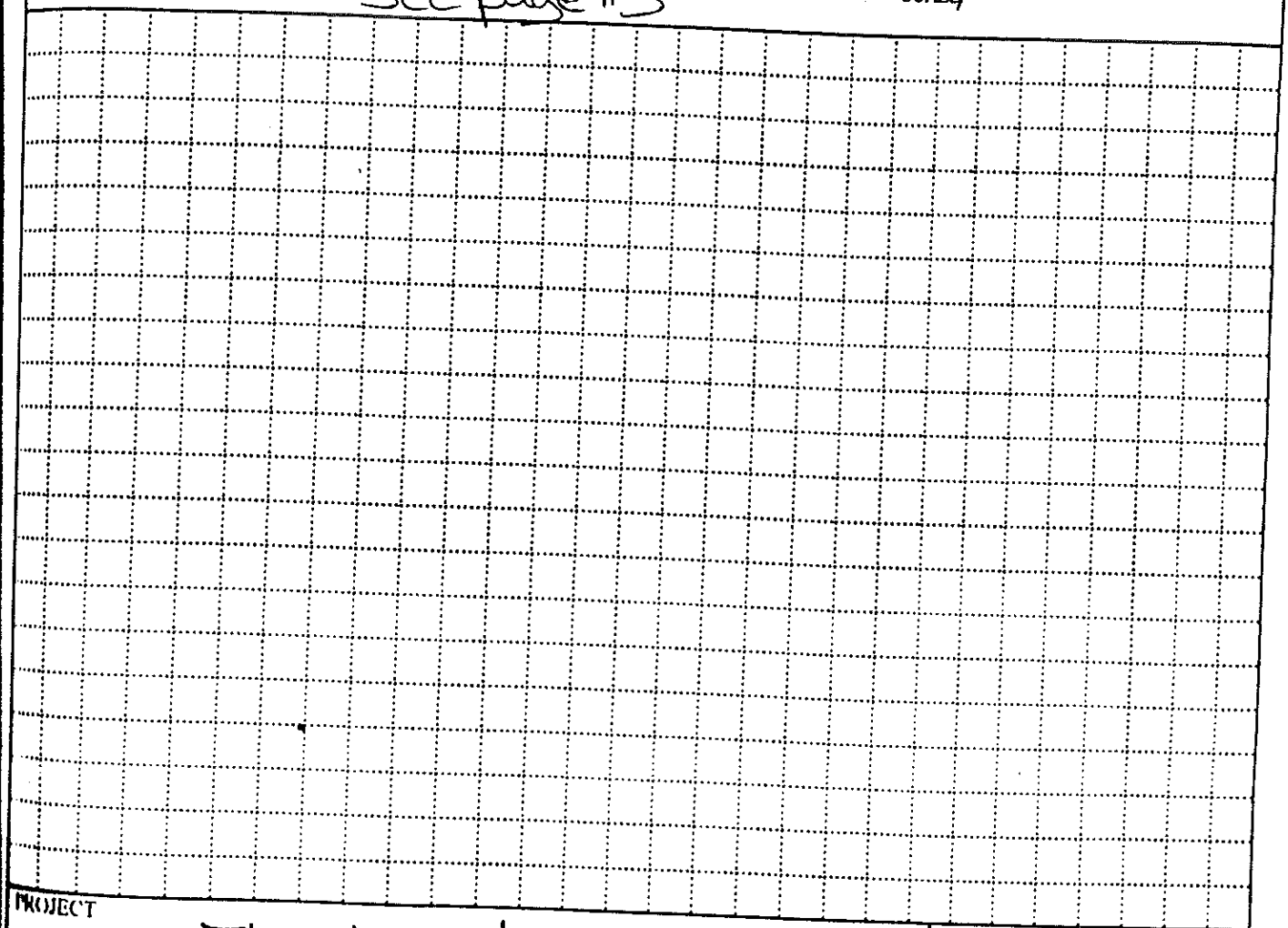
PROJECT 16 SWMU's HOLE NO TM-GP-03

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Ft Stewart	HOLE NUMBER: 7M-GP-04
3. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: R.E. Wright	SHEET 1 OF 3
4. NAME OF DRILLER: Andy Knickerbocker	4. LOCATION: SWMU 27G	
5. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: See page #2	6. MANUFACTURER'S DESIGNATION OF DRILL: Geoprobe	
	8. HOLE LOCATION: NAD-83 E-820092.90', N-67522[illegible]	
	9. SURFACE ELEVATION: NAVD-88 69.67'	
	10. DATE STARTED: 1/27/98	11. DATE COMPLETED: 1/27/98
12. OVERBURDEN THICKNESS: NA	15. DEPTH GROUNDWATER ENCOUNTERED: 7.0'	
13. DEPTH DRILLED INTO ROCK: —	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED: 4.55' (@:10).	
14. TOTAL DEPTH OF HOLE: 12.0'/15.0'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	
18. GEOTECHNICAL SAMPLES: NA	DISTURBED:	UNDISTURBED:
19. TOTAL NUMBER OF CORE BOXES: NA		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: NA %
	✓	—	Lead	SVOC		
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
			Temp. Piez.	Paul J. Lucot		

LOCATION SKETCH/COMMENTS: See page #3 SCALE:



PROJECT: Ft. Stewart 16 SWMU's HOLE NO: 7M-GP-04

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, drilling [illegible] etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: TM-GP-04 | SHEET: 2 of 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0.0'	SAND with some silt (SW-SM), sand is medium texture, dark gray (7.5YR 4/1), nonplastic, soft, moist.	Ø.7			
	1.0'					
	2.0'		Ø.9			
	3.0'					
	4.0'		Ø.3			Recovery = 4.0'/4.0'
	5.0'				TM1911 TM1431 1310	
	6.0'		1.7			
	7.0'					7.0'-12.0': Wet
	8.0'	PSL. 1/27/18				Recovery = 4.0'/4.0'
	9.0'					
	10.0'					

PROJECT: 16 SWMU's | HOLE NO: TM-GP-04

HTRW DRILLING LOG

PROJECT 16 SWMU's | INSPECTOR | HOLE NUMBER TM-GP-04 | SHEET 3 of 3

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	10.0	Clayey SAND (SW-SC) white, nonplastic soft, moist				
	11.0'					
	12.0'					Recovery = 4.0'/4.0'
						Piezometer Screened From 10.0'-15.0'

PROJECT Ft. Stewart | A.20-14 16 SWMU's | HOLE NO TM-GP-04

SWMU 27H

DOL MAINTENANCE MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (BUILDING 1071)

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HTRW DRILLING LOG

DISTRICT	Savannah COE
HOLE NUMBER	7W-GP-61
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	MHW
SHEET / SHEETS	1 of 2
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	Hine
5. NAME OF DRILLER	Hz
6. MANUFACTURER'S DESIGNATION OF DRILL	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4' x 2" Sampler; 4' x 1" Rods; 3/4" piezometer; hand pump; tubing + sleeves
8. HOLE LOCATION	NAD-83 E-826469.36', N-677620.83'
9. SURFACE ELEVATION	NAVD-88 83.34
10. DATE STARTED	1/21/98
11. DATE COMPLETED	1/21/98
12. OVERBURDEN THICKNESS	12'
13. DEPTH DRILLED INTO ROCK	0'
14. TOTAL DEPTH OF HOLE	12'
15. DEPTH GROUNDWATER ENCOUNTERED	8'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	NA
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	NA

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Cased	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See location map

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7W-GP-61

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: __________ (Signature and Date)

well atmosphere, soil core, breathing zone, venting comp... etc.)

HTRW DRILLING LOG

PROJECT: 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7N-GP-01 | SHEET 2 of 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1	SM (SM) sand, fine grain, Black color, moist for entire length	1.6 ppm			
	2					
	3		2.0 ppm			
	4					
	5		0.1 ppm			
	6	SW fine grain sand with 6/3 pale brown				
	7	(SM) fine grain silty sand, very saturated from 8-12' bgs. Black color	0.2 ppm			
	8					GWT
	9					
	10					
	11					
	12					Set piezometer

PROJECT: Ft. Stewart | HOLE NO. 7N-GP-01

HTRW DRILLING LOG

DISTRICT	Savannah COE
HOLE NUMBER	7N-GP-02
1. COMPANY NAME	SAIC
2. DRILL SUBCONTRACTOR	M W
SHEET / SHEETS	1 of 2
3. PROJECT	Ft. Stewart 16 SWMU's
4. LOCATION	Hinesville GA
5. NAME OF DRILLER	H. Z
6. MANUFACTURERS DESIGNATION OF DRILL	[illegible]
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	4 x 2" Sampler; 4 x 1" [illegible]; 3/4" PVC [illegible]; [illegible] pump; Nalgene [illegible]; Acetate Sleeve + [illegible]
8. HOLE LOCATION	SWMU 27H E-826503.84' N-677617.31' NAD-83
9. SURFACE ELEVATION	NAVD-88 83.63'
10. DATE STARTED	1/21/98
11. DATE COMPLETED	1/21/98
12. OVERBURDEN THICKNESS	14'
15. DEPTH GROUNDWATER ENCOUNTERED	7.5'
13. DEPTH DRILLED INTO ROCK	0'
16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE	14'
17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES	✓
DISTURBED	
UNDISTURBED	
19. TOTAL NUMBER OF CORE BOXES	NA
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC ✓; METALS ✓; OTHER (SPECIFY) SVOC; OTHER (SPECIFY); OTHER (SPECIFY)
21. TOTAL CORE RECOVERY %	NA
22. DISPOSITION OF HOLE	BACKFILLED; MONITORING WELL; OTHER (SPECIFY) [illegible]
23. SIGNATURE OF INSPECTOR	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See Location Map

PROJECT	Ft. Stewart 16 SWMU's
HOLE NO.	7N-GP-02

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: ____ (Signature and Date)

well atmosphere, soil core, breathing zone, venting zone, etc.)

HTRW DRILLING LOG

PROJECT: St. Sw... 16 SWMU's | INSPECTOR: | HOLE NUMBER: 7N-GP-02 | SHEET 2 of 2

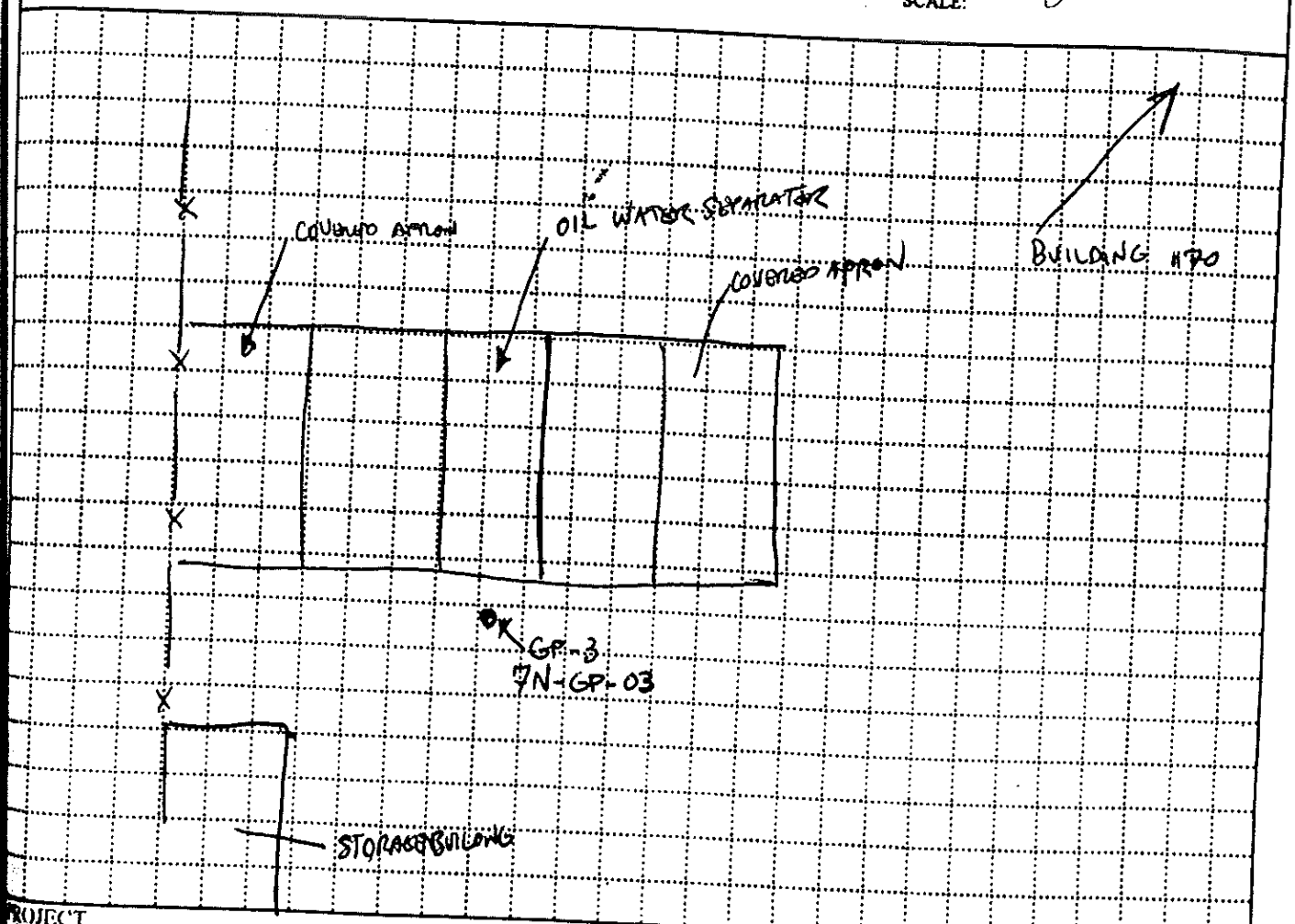
ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO. (E)	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	1	Concrete plug	HS: 9.3			
	2	(SM) silt sand fine... sand; 2.5 Y 2.5/1				
	3	black color; Saturated Sand 7.5' - base	HS: 10.7			
	4					
	5	- Several consolidated Sandstone rocks noted	HS: 19.6			
	6					
	7		HS: 28.2			
	8					∇ WT
	9					
	10					
	11					
	12					
	13					
	14					

PROJECT: St. Sw... 16 SWMU's | HOLE NO. 7N-GP-02

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: Savannah COE	HOLE NUMBER: 7N-GP-03
2. PROJECT: Ft. Stewart 16 SWMU's	3. DRILL SUBCONTRACTOR: K. E. Wright	SHEET 1 OF 2 SHEETS
4. NAME OF DRILLER: A. Knickerbocker	5. LOCATION: SWMU 27H	
6. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT	7. MANUFACTURER'S DESIGNATION OF DRILL: GeoProbe	
	8. HOLE LOCATION: NAD-83 E-826499.15', N-677585.43'	
	9. SURFACE ELEVATION: NAVD-88 83.10'	
	10. DATE STARTED: 2-4-98	11. DATE COMPLETED: 2-4-98
12. OVERBURDEN THICKNESS: NA	13. DEPTH GROUNDWATER ENCOUNTERED: 6.8'	
13. DEPTH DRILLED INTO ROCK: NA	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10.0	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	
18. GEOTECHNICAL SAMPLES: NA — DISTURBED — UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES: NA	
20. SAMPLES FOR CHEMICAL ANALYSIS: VOC ✓ — METALS: RCRA — OTHER (SPECIFY): SVOC — OTHER (SPECIFY) — OTHER (SPECIFY)	21. TOTAL CORE RECOVERY: NA	
22. DISPOSITION OF HOLE: BACKFILLED — MONITORING WELL — OTHER (SPECIFY): piezometer	23. SIGNATURE OF INSPECTOR: Todd Ecklay	

LOCATION SKETCH/COMMENTS — SCALE:



PROJECT: Ft. Stewart 16 SWMU's — HOLE NO.: 7N-GP-03

ENG FORM 5056-R, AUG 94 (Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, drilling rate, remarks, etc.)

HTRW DRILLING LOG

PROJECT: Ft. Stewart 16 SWMUs | INSPECTOR: | HOLE NUMBER: 7N-GP-03 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
		CONCRETE				MACRO CORE (1-10')
	1	POORLY GRADED SAND WITH SILT : SP-SM BLACK N2.5/ FINE GRAINED SAND				PIEZOMETER SCREEN SET (5-10')
	2	POORLY GRADED SAND WITH SILT : SP-SM DARK GRAY 2.5Y 4/1 FINE GRAINED SAND GRAVEL LENSE 1.5-1.6', ANGULAR <1CM				
	3	- ACCUMULATED LOST CORE				
	4	SAME AS ABOVE				
	6	2CM THICK LENSE OF ANGULAR GRAVEL				
	6	SAME AS ABOVE, BUT BLACK STAINED N2.5/ - HYDROCARBON ODOR AND STAINING			0944 COLLECT SAMPLES 7N1321 DUPLICATE 7N1321	- HYDROCARBON ODOR AND STAINING
	7	- ACCUMULATED LOST CORE				- SATURATED
		POORLY GRADED SAND WITH SILT : SP-SM BLACK N2.5/1, FINE GRAINED SAND - SATURATED				
	8					
	9					

PROJECT: Ft. Stewart 16 SWMUs | HOLE NO: 7N-GP-03

HTRW DRILLING LOG

1. COMPANY NAME: SAIC	2. DISTRICT: Savannah COE	HOLE NUMBER: 7N-GP-04
3. PROJECT: Fort Stewart 16 SWMU's	4. LOCATION: Hinesville GA	SHEET 1 OF 2
5. NAME OF DRILLER: HAZ	6. MANUFACTURER'S DESIGNATION OF DRILL: Mobile B-47	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4'x2" Samplers; 4'x1" Rods; Alternate Sampling Sleeve; 3/4" piezometer (PVC)	8. HOLE LOCATION: SWMU 27H E-536468.77' N-677590.73' NAD-83	
	9. SURFACE ELEVATION: NAVD-88 93.65'	
	10. DATE STARTED: 1/21/98	11. DATE COMPLETED: 1-21-98
12. OVERBURDEN THICKNESS: 14'	13. DEPTH GROUNDWATER ENCOUNTERED: 8' bgs	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 14'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
NA			N.A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY
	V	V	SVOC			N/A %

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	Greg Hyatt

LOCATION SKETCH/COMMENTS — SCALE:

See location Map

PROJECT: Fort Stewart 16 SWMU's — HOLE NO: 7N-GP-04

ENG FORM 5056-R, AUG 94 — (Proponent CECW-EG)

QA CHECK BY: _____ (Signature and Date)

well atmosphere, soil core, breathing zone, venting compressed air, etc.)

HTRW DRILLING LOG

PROJECT	16 SWMU's	INSPECTOR	HOLE NO. 7N-GP-04
			SHEET 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	No Recovery				
	2					
	3					
	4					
	5	(Sm) Fine Grained Silty Sand 2.5Y 2.5/1 Black Color Saturated From 8'-14'	16.5 ppm			
	6					
	7		39.0			
	8					▽ WT
	9					
	10					
	11					
	12					
	13					
	14					Set Piezometer

PROJECT		HOLE NO.
Fort Stewart — 11 SWMU's		7N-GP-04

18

HTRW DRILLING LOG

HTRW DRILLING LOG	DISTRICT: USACE - Savannah	HOLE NUMBER 27H-MW1(7N)
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: MDC	SHEET 1 OF 3

3. PROJECT: Fort Stewart	4. LOCATION: SWMU-27H BLDG. 1071
5. NAME OF DRILLER: B. UPCHURCH	6. MANUFACTURERS DESIGNATION OF DRILL: CME-85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" HSA; 5' CONTINUOUS SAMPLERS	8. HOLE LOCATION: 27H-MW1 (7N) N 677550.27 E 826580.39
	9. SURFACE ELEVATION: TOC 83.70
	10. DATE STARTED: 10/8/99 — 11. DATE COMPLETED:
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: ~7.5
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE: 15 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED (circled)	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**21. TOTAL CORE RECOVERY %**
	X	RCRA	SVOC	TOC		
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**		
		2" PVC		L. Mercado		

LOCATION SKETCH/COMMENTS

SCALE:

SEE SKETCH ON PAGE #3 OF THIS LOGBOOK (#18)

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs	INSPECTOR L. MERCADO	SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	0-1': CONCRETE FROM CONCRETE PAD OF THE MOTOR POOL.	(ppm)			
	1					1-5': (4/4)
		1': SILTY SAND (SM), DARK GRAY (2.5Y 4/1), F-SAND WITH SOME SILT (20%), ~~LOOSE~~, DRY.	1-2.5 (1.6)		1-2' SOIL SAMPLE NO. 7N1171 @ 1305	
	2					
		2': SILTY SAND (SM), VERY DARK GRAY (10YR 3/1), F-SAND, WITH INCREASE SILT (30%), MOIST, TRACE OF ROOTS AND ORGANIC MATERIAL.	2.5-5' (1.8)		2.5-5' SOIL SAMPLE NO. 7N1172 @ 1315	
	4					
	5			5-7' GEOTECH SAMPLE NO. 7N1173 @ 1322		5-7': GEOTECH (2/2)
	6					
	7					
		7': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-SAND, ROUNDED, MED. DENSE, WITH ABUNDANT SILT (30%), MOIST				▽ GW ENCOUNTERED = AT 7.5'
	8					
		7.5': AS ABOVE WET				
	9					
	10					

HTRW DRILLING LOG 27H-MW1 (7N)

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	10': SILTY SAND (SM), AS ABOVE				HSA TO 15 FT
	11					2" SCH-40 PVC WELL INSTALLED TO 14 FEET WITH 10 FOOT S-SLOTSCREEN
	12					
	13					
	14					
	15	15 FEET END OF BORING				
	16					
	17					
	18					
	19					
	20					

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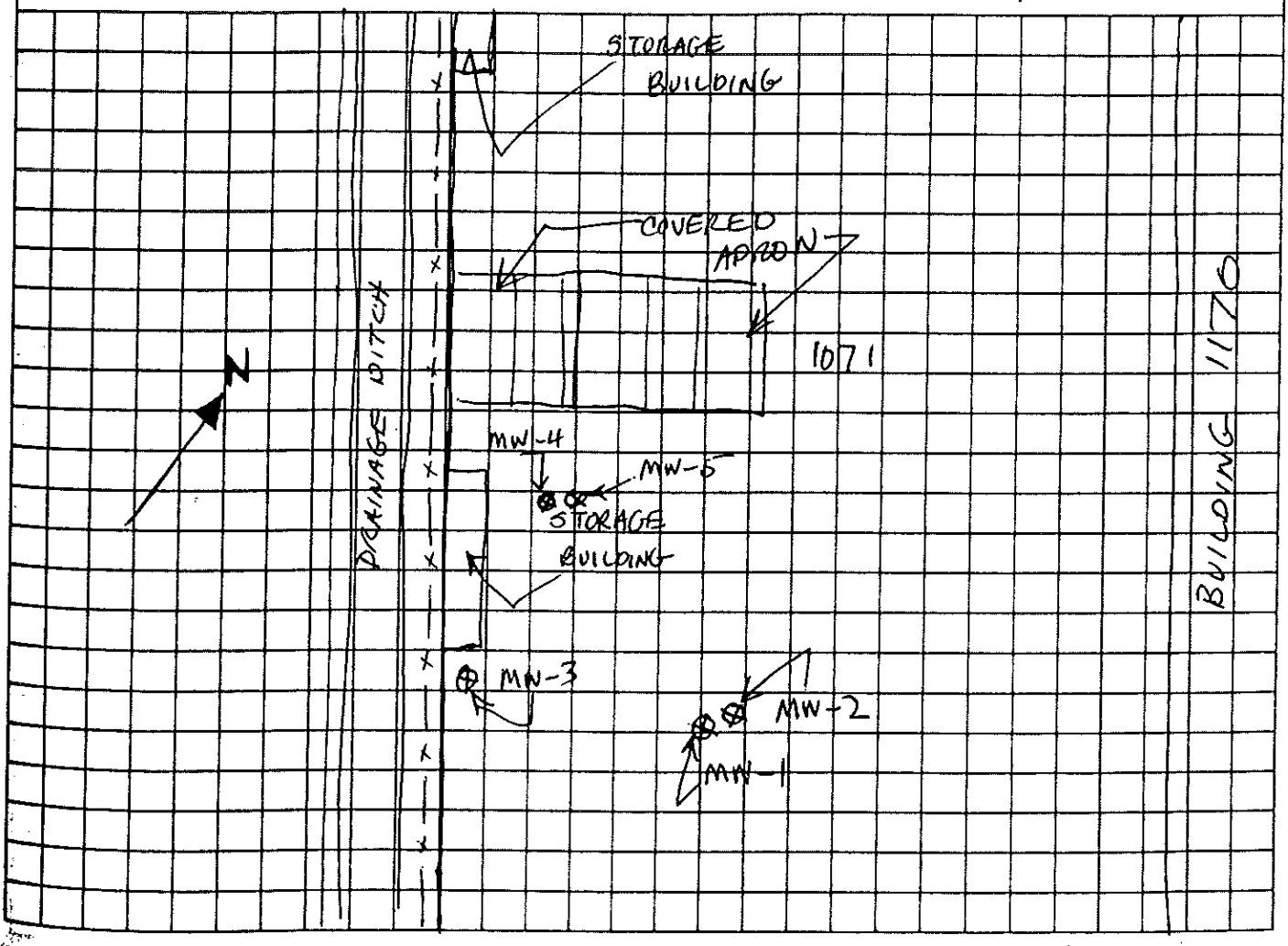
HTRW DRILLING LOG

	DISTRICT: USACE - Savannah	HOLE NUMBER 27H-MW-2(7N)
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: MDC	SHEET 1 OF 6
3. PROJECT: Fort Stewart	4. LOCATION: SMIVU 27H BLDG. 1071	
5. NAME OF DRILLER: B. UPCHURCH	6. MANUFACTURERS DESIGNATION OF DRILL: CME - 85	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" HSA; 5 FT. CONTINUOUS SAMPLERS	8. HOLE LOCATION: 27H-MW2-(7N)	
	9. SURFACE ELEVATION: TOC 83.73 ft N 677552.10 E826582.50	
	10. DATE STARTED: 10/7/99	11. DATE COMPLETED:
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: 9.5'	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	
14. TOTAL DEPTH OF HOLE	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	RCRA	SVOC	TOC		
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR		
		2" PVC				

LOCATION SKETCH/COMMENTS — SCALE: 1" = 50'



breathing zone, vending compressed air, etc.)
(Signature and Date)

HTRW DRILLING LOG

HOLE NUMBER 34

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET 2 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	0-1': CONCRETE PAD FROM MOTOR POOL	(ppm)			0-5': (3,4/4)
	1	1': SAND (SP), VERY DARK GRAY (2.5Y 3/1), F-SAND, ROUNDED, LOOSE, DRY.	1-2.5 (ϕ)		SOIL SAMPLE NO. 7N1271 1-2 FT @ 0930	SOIL SAMPLE CHANGED FROM 0-1 TO 1-2 DUE TO 1 FT CONCRETE CORE.
	2					
	3	2.5': SAND (SP), AS ABOVE, VERY DARK GRAYISH BROWN (10YR 3/2).	2.5-5' (ϕ)			
	4	GRADES INTO ↓				
	5	4.5': SAND (SP), PALE BROWN (10YR 6/3), F-SAND, ROUNDED, LOOSE, MOIST.	5-7.5' (ϕ)			5-10': (2.8/5)
	6					
	7	6.5': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-M SAND, ROUNDED, ABUNDANT SILT, MOIST.	7.5-10' (ϕ)			
	8					
	9	9.5': SILTY SAND (SM), AS ABOVE, WET.			SOIL SAMPLE NO. 7N1271 = SOIL DUP. NO. 7N1222 8.5 TO 9.5'	▽ GW ENCOUNTERED AT 9.5'
	10					

35

HTRW DRILLING LOG

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MELCADO | SHEET 3 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	10': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-M SAND, ROUNDED, WITH ABUNDANT SILT, WET.				HSA AUGER TO 48 FEET SOILS LOGGED FROM CUTTINGS
	15	15': SILTY SAND (SM), AS ABOVE.				

HTRW DRILLING LOG

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET 4 OF 6

36

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	20	20': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-M SAND, ROUNDED WITH ABUNDANT SILT, WET.				HSA TO 48 FT
	21					
	22					
	23					
	24					
	25	25': SILTY SAND (SM), AS ABOVE.				
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET 5 OF 6

37

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	30	30': SILTY SAND(SM), BLACK (2.5Y 2.5/1), F-M SAND, ROUNDED, WITH ABUNDANT SILT, WET.				HSA TO 48 FT
	31					
	32					
	33					
	34					
	35	35': SILTY SAND(SM), AS ABOVE.		GEOTECH SAMPLE NO. 7N1273 FROM CUTTINGS 35-40' @1015		
	36					
	37					
	38					
	39					
	40					

HTRW DRILLING LOG

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET 6 OF 6

38

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	40	40': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-M SAND, ROUNDED, WITH ABUNDANT SILT, WET.				HSA TO 48 FT
	41					
	42					
	43					2" PVC SCH-40 WELL INSTALLED TO 45 FT WITH 10 FT 8-SLOT SCREEN
	44					
	45					
	46					
	47					
	48	48': END OF BORING				
	49					
	50					

63

HTRW DRILLING LOG

	DISTRICT: USACE - Savannah	HOLE NUMBER 27H-MW3(7N)
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: MOC	SHEET 1 OF 3
3. PROJECT: Fort Stewart	4. LOCATION: SWMU 27H BLDG. 1071	
5. NAME OF DRILLER: B. UPCHURCH	6. MANUFACTURERS DESIGNATION OF DRILL: CME-85	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4 1/4" HSA; 5 FT CONTINUOUS SAMPLERS	8. HOLE LOCATION: 27H-MW3(7N)	
	9. SURFACE ELEVATION: TOC 83.34 ft N 677503.53 E 826531.33	
	10. DATE STARTED: 10/7/99	11. DATE COMPLETED: 10/7/99
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: 8 FT	
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER ORILLING COMPLETED:	
14. TOTAL DEPTH OF HOLE: 15 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	(DISTURBED)	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	TCLP	SVOC	TOC		
22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR: L. Mercado		
		2" PVC				

LOCATION SKETCH/COMMENTS: SEE SKETCH MAP ON PAGE #33 OF THIS LOGBOOK (#17)

SCALE:

HTRW DRILLING LOG 27H-MW3(7N) HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR | SHEET 2 OF 3

64

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		0-1': CONCRETE PAD FROM MOTOR POOL	(ppm)			0-5': (3.3/4)
	1	1': SAND (SP), DARK GRAY (5Y 4/1), F-SAND, ROUNDED, LOOSE, MOIST.	1-2.5' (0)		1-2' SOIL SAMPLE NO. 7N1371 @ 1635	
	2	1.5': SAND (SP), AS ABOVE GRAY (5Y 6/1),				
		2.0': SAND (SP), VERY DARK GRAYISH BROWN (10YR 3/2),	2.5-5' (0)			
	3	F-SAND, ROUNDED, MED. DENSE, MOIST.				
		3.5': SAND (SP), LIGHT YELLOWISH BROWN (2.5Y 6/4),				
	4	F-SAND, ROUNDED, MED. DENSE, MOIST.				
	5	5': SILTY SAND (SM), VERY DARK GRAY (2.5Y 3/1), F-SAND, ROUNDED, MED. DENSE, MOIST	5-7.5' (1.4)		5-7.5' SOIL SAMPLE NO. 7N1372 @ 1700	5-10': (4.5/5)
	6	6': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-SAND, ROUNDED, MED. DENSE, WITH ABUNDANT SILT, MOIST.				
	7					
	8					▽ GW ENCOUNTERED AT 8.0 FT
		8': AS ABOVE, WET		8-10' GEOTECH SAMPLE NO. 7N1373 @ 1710		
	9					
	10					

HTRW DRILLING LOG	27H-MW3(7N)	HOLE NUMBER
PROJECT: Fort Stewart USTs	INSPECTOR L. MERCADO	SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	SILTY SAND (SM), BLACK AS ABOVE, WET.				HSA TO 15 FT
	12					
	13					
	14					
	15	15 FT: END OF BORING				
	16					
	17					
	18					
	19					
	20					

HTRW DRILLING LOG — 27MW-4 (7N) — HOLE NUMBER

PROJECT: Fort Stewart USTs — INSPECTOR L. MERCADO — SHEET 2 OF 3

49

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		0-1': CONCRETE PAD FROM MOTOR POOL.	(ppm)			~~4 FO~~ LMM 10/7/97 0-5': (1.5/4) SAMPLER CLOGGED UP WITH WOOD, ROOTS.
	1	1': SAND (SP), VERY DARK GRAY (2.5Y 3/1), F-SAND, ROUNDED, LOOSE, DRY.	1-2.5 (216)		SOIL SAMPLE NO. 7N1471 1-2 FT @ 1410	SAMPLE WAS MOVED FROM 0-1' TO 1-2 FT DUE TO 1 FT CONCRETE CORE.
	2	2.0': SAND (SP), GRAY (10YR 6/1), F-SAND, ROUNDED, LOOSE, DRY, WITH WOOD/ ROOTS.				
	3		2.5-5' NO RECOVERY			
	4					
	5		5-7.5 (37.9)		5-7.5' SOIL SAMPLE NO. 7N1472 @ 1445	5-10': (2.5/5)
	6	5.5': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-SAND, ROUNDED, WITH ABUNDANT SILT, MOIST.				
	7					
	8		5-10' NO RECOVERY			▽ GW ENCOUNTERED AT 8.0 FT BGS
	9			8-13' GEOTECH SAMPLE NO. 7N1473 @ 1500		
	10					

50

HTRW DRILLING LOG — HOLE NUMBER: 27H-MW4(7N)

PROJECT: Fort Stewart USTs — INSPECTOR: L. MERCADO — SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	SILTY SAND (SM), AS ABOVE.				HSA TO 15 FT
	12					2" PVC WELL SET AT 13.5 FT WITH 10 FT 8-SLOT SCREEN
	13					
	14					
	15	15': END OF BORING				
	16					
	17					
	18					
	19					
	20					

3

HTRW DRILLING LOG

DISTRICT: USACE - Savannah		HOLE NUMBER: 27H-MW5 (7N)
1. COMPANY NAME: SAIC	2. DRILL SUBCONTRACTOR: MDC	SHEET 1 OF 6

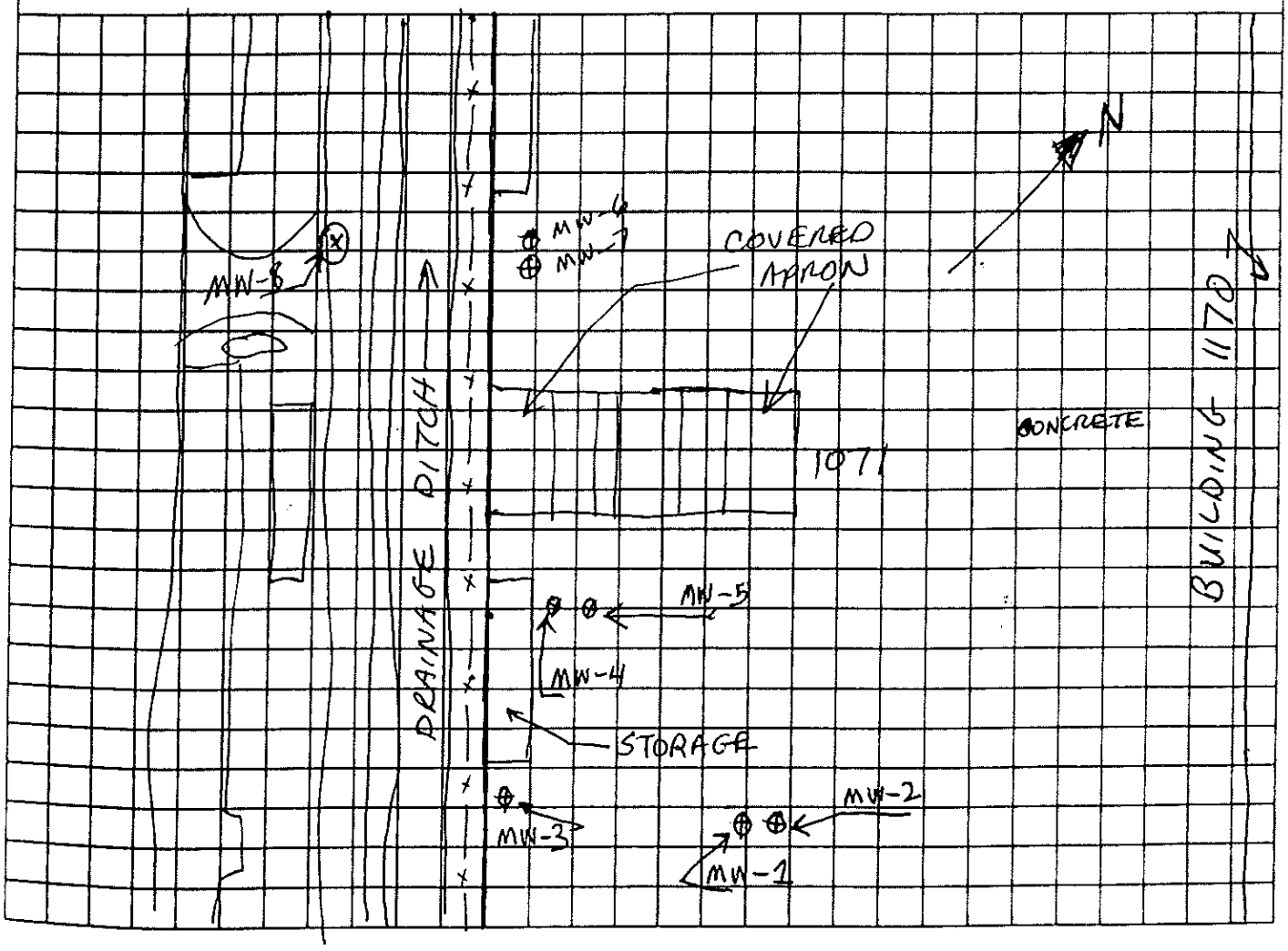
3. PROJECT: Fort Stewart	4. LOCATION: SWMU 27H BLDG. 1071
5. NAME OF DRILLER: B. UPCHURCH	6. MANUFACTURERS DESIGNATION OF DRILL: CME-85
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4¼" HSA; 5' CONTINUOUS SAMPLERS	8. HOLE LOCATION: 27H-MW5 (7N)
	9. SURFACE ELEVATION: TOC 83.68 N 677563.73 E 826517.57
	10. DATE STARTED: 10/8/99 — 11. DATE COMPLETED: 10/8/99
12. OVERBURDEN THICKNESS: N/A	15. DEPTH GROUNDWATER ENCOUNTERED: ~ 7.5 FT
13. DEPTH DRILLED INTO ROCK: N/A	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:
14. TOTAL DEPTH OF HOLE: 48 FT	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	RCRA	SVOC			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		2" PVC		L. Mercado

LOCATION SKETCH/COMMENTS — SCALE: 1" = 50'



(Signature and Date)

HTRW DRILLING LOG — 27A-MW5(7N) — HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET 2 OF 6

4

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	0	0-1': CONCRETE FROM MOTOR POOL CONCRETE PAD	0-2.5'			0-5': (4/4)
	1	1': SILTY SAND(SM), VERY DARK GRAY (2.5Y 3/1), F-SAND, ROUNDED, LOOSE, WITH 30-30% SILT, MOIST, SLIGHT HYDROCARBON ODOR	(169)		1-2' SOIL SAMPLE NO. 7N1571 @ 0900	SAMPLE DEPTH CHANGED FROM 0-1' TO 1-2' DUE TO 1 FT CONCRETE CURE.
	2	2': SAND(SP), GRAY (2.5Y 5/1) F-SAND, ROUNDED, LOOSE, WITH 5-10% SILT, SLIGHT HYDROCARBON ODOR.				
	3	2.8': SAND(SP), DARK GRAY (2.5Y 4/1), AS ABOVE.	2.5-5' (132)		2.5-5' SOIL SAMPLE NO. 7N1572 @ 0920	
	4					
	5	5': SILTY SAND(SM), VERY DARK GRAY (10YR 3/1), F-SAND WITH ABUNDANT SILT (30%), MOIST, TRACE OF ROOTS AND ORGANIC MATERIAL.	5-7.5 (17.5)			5-10': (4.4'/5')
	6					
	7	7.0': SILTY SAND(SM), BLACK (2.5Y 2.5/1), F-SAND, ROUNDED, MED. DENSE, WITH ABUNDANT SILT (30%), WET.				▽ GW ENCOUNTERED AT 7.5'
	8					
	9					
	10					

HTRW DRILLING LOG

27H-MW5 (7N)

HOLE NUMBER

PROJECT: Fort Stewart USTs

INSPECTOR L. MERCADO

SHEET 3 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	10	10': SILTY SAND (SM), AS ABOVE.				HSA TO 48 FT
	11					
	12					
	13					
	14					
	15	15': SILTY SAND (SM), BLACK AS ABOVE.				
	16					
	17					
	18					
	19					
	20					

HTRW DRILLING LOG — 27H-MW5 (7N) — HOLE NUMBER

PROJECT: Fort Stewart USTs — INSPECTOR L. MERCADO — SHEET 4 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	20	20': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-SAND, ROUNDED, WITH ABUNDANT SILT (30%), WET.				HSA TO 48 FT
	21					
	22					
	23					
	24					
	25	25': SILTY SAND (SM), AS ABOVE				
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG 27H-MW5 (7N) | HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET 5 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	30	30': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-SAND, ROUNDED, MED. DENSE, WITH ABUNDANT SILT (30%), WET.				HSA TO 48 FT
	31					
	32					
	33					
	34					
	35	35': SILTY SAND (SM), AS ABOVE.				
	36					
	37					
	38					
	39					
	40					

HTRW DRILLING LOG 27H-MW5 (7N)

HOLE NUMBER

PROJECT: Fort Stewart USTs | INSPECTOR L. MERCADO | SHEET 6 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	40	40': SILTY SAND (SM), BLACK (2.5Y 2.5/1), F-SAND, ROUNDED WITH 30% SILT; WET.		40-42' GEOTECH SAMPLE NO. 7N1573 @ 0950		HSA TO 48 FT
	41					2" SCH-40 PVC WELL INSTALLED TO 45.1 FEET WITH 8-SLOT SCREEN
	42					
	43					
	43.5	43.5': CLAYEY SAND (SC), GREENISH GRAY (5GY 6/1), F-M SAND, 10-15% CLAY, WET. FROM CUTTINGS AFTER AUGERS WERE PULLED AT WELL WAS SET.				
	44					
	45					
	46					
	47					
	48	48' END OF BORING				
	49					
	50					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27H-MW-06(W)

SHEET 1 OF 3

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

3. PROJECT: Fort Stewart

4. LOCATION: DOL Motor Pool

5. NAME OF DRILLER: Doug Bishop

6. MANUFACTURERS DESIGNATION OF DRILL: CME 75

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME Model 75 drill rig; 4¼-in. ID Hollow-stem augers w/ 9-in. diam bit; 3½-in. ID x 5-Ft split-spoon samplers.

8. HOLE LOCATION: Immed east of MW-7

9. SURFACE ELEVATION: TOC 83.47 ft N 677621.31 E 824421.29

10. DATE STARTED: 10-8-99

11. DATE COMPLETED: 10-8-99

12. OVERBURDEN THICKNESS: N/A

13. DEPTH DRILLED INTO ROCK: N/A

14. TOTAL DEPTH OF HOLE: 15.0 Ft

15. DEPTH GROUNDWATER ENCOUNTERED: 8 Ft BGS

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

18. GEOTECHNICAL SAMPLES: DISTURBED | UNDISTURBED

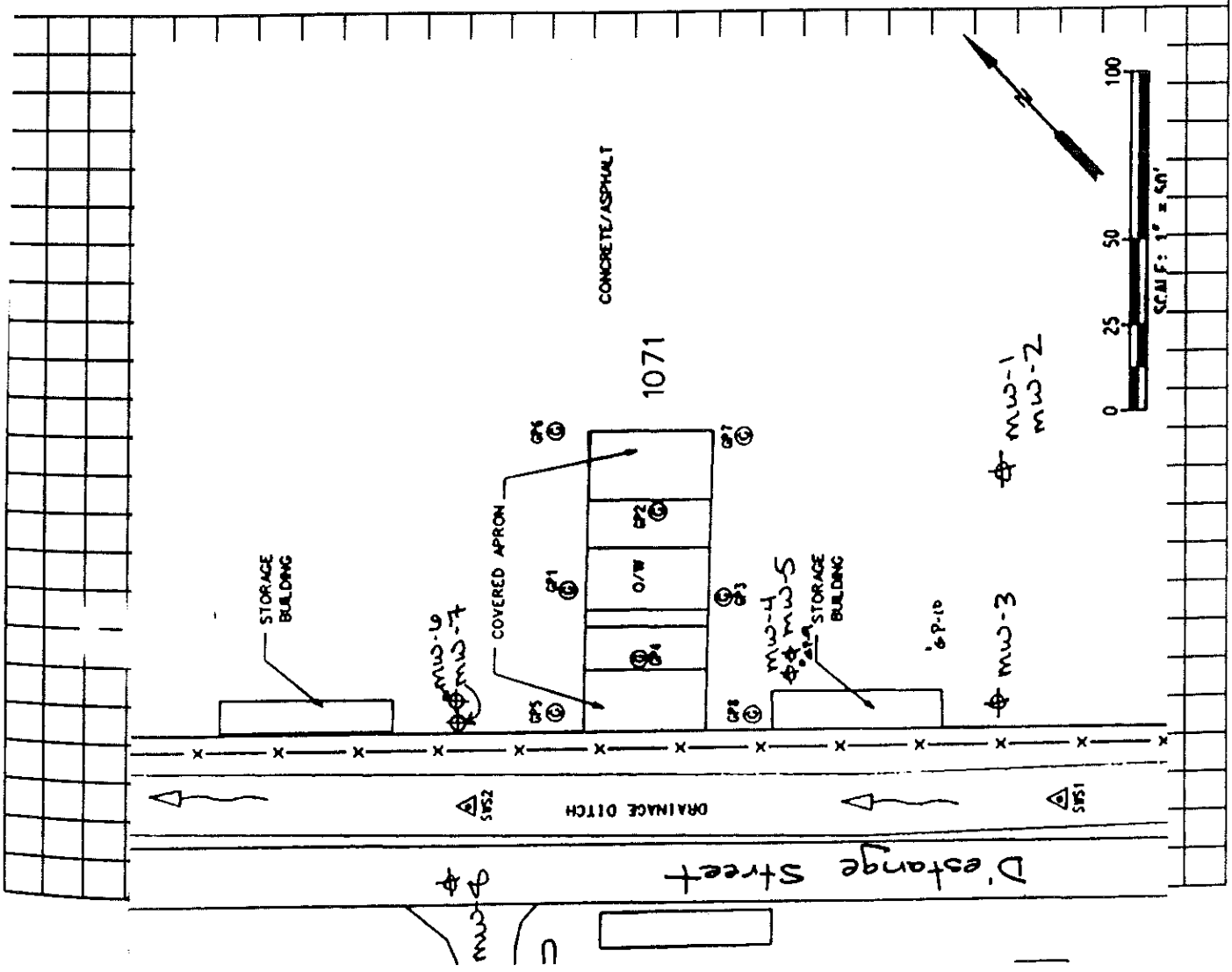
19. TOTAL NUMBER OF CORE BOXES: N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	X	≤VOC			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Timothy Coffey

LOCATION SKETCH/COMMENTS

SCALE: 1-in. = 50 ft



* NOTE TYPE OF MONITORING (i.e., borehole cuttings, monitoring well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: (Signature and Date)

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | HOLE NUMBER 27H-MW-002/MW | SHEET 2 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete pavement	N/A	N/A	N/A	
	1	V. DK gray (10YR 3/1) silty sand; dry, loosly-packed to strongly packed (2.2 Ft BGS), F-grnd,	0.7 ppm		7N1671	Drill: 4.2 Ft Recover: 3.7 Ft
	2					
	3		1.2 ppm	N/A	N/A	Gravel layer
	4	V. pale brn (10YR 8/3) sand				
		No Recovery	N/A		N/A	
	5	V. pale brn sand; moist, massive, F-grnd, mod-packed, mod-cohesive.				Drill: 5.0 Ft Recover: 4.5
	6	Black (10YR 2/1) silty sand: moist to wet, F-grnd, generally mass, but w/ mnr strat.	9.1 ppm		7N1672	
	7			7N1673		
	8					water @ 8 Ft.
	9		N/A		N/A	
	10					

HTRW DRILLING LOG

HOLE NUMBER 27H-MW-06 (7D)

PROJECT: Fort Stewart USTs

INSPECTOR Timothy Colley

SHEET 3 OF 3

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Black silty sand (as above)				
	12		N/A	TN1673	N/A	
	13					
	14					
	15					TD = 15.0 ft
	16					
	17					
	18					
	19					
	20					

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HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 27H-MW-07(7N)

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 6

3. PROJECT: Fort Stewart

4. LOCATION: DOL Motor Pool

5. NAME OF DRILLER: Doug Bishop

6. MANUFACTURERS DESIGNATION OF DRILL: CME-75

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME Model 75 drill rig; 4¼-in. ID Hollow-stem augers w/ 9-in. diam. bit; 3½-in. IS x 5-Ft split-spoon samplers.

8. HOLE LOCATION: North of washrack

9. SURFACE ELEVATION: TOC 83.41 ft N 677619.50 E 826419.72

10. DATE STARTED: 10-8-99

11. DATE COMPLETED: 10-8-99

12. OVERBURDEN THICKNESS: N/A

15. DEPTH GROUNDWATER ENCOUNTERED: 8 Ft BGS.

13. DEPTH DRILLED INTO ROCK: N/A

16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:

14. TOTAL DEPTH OF HOLE: 45.0 Ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

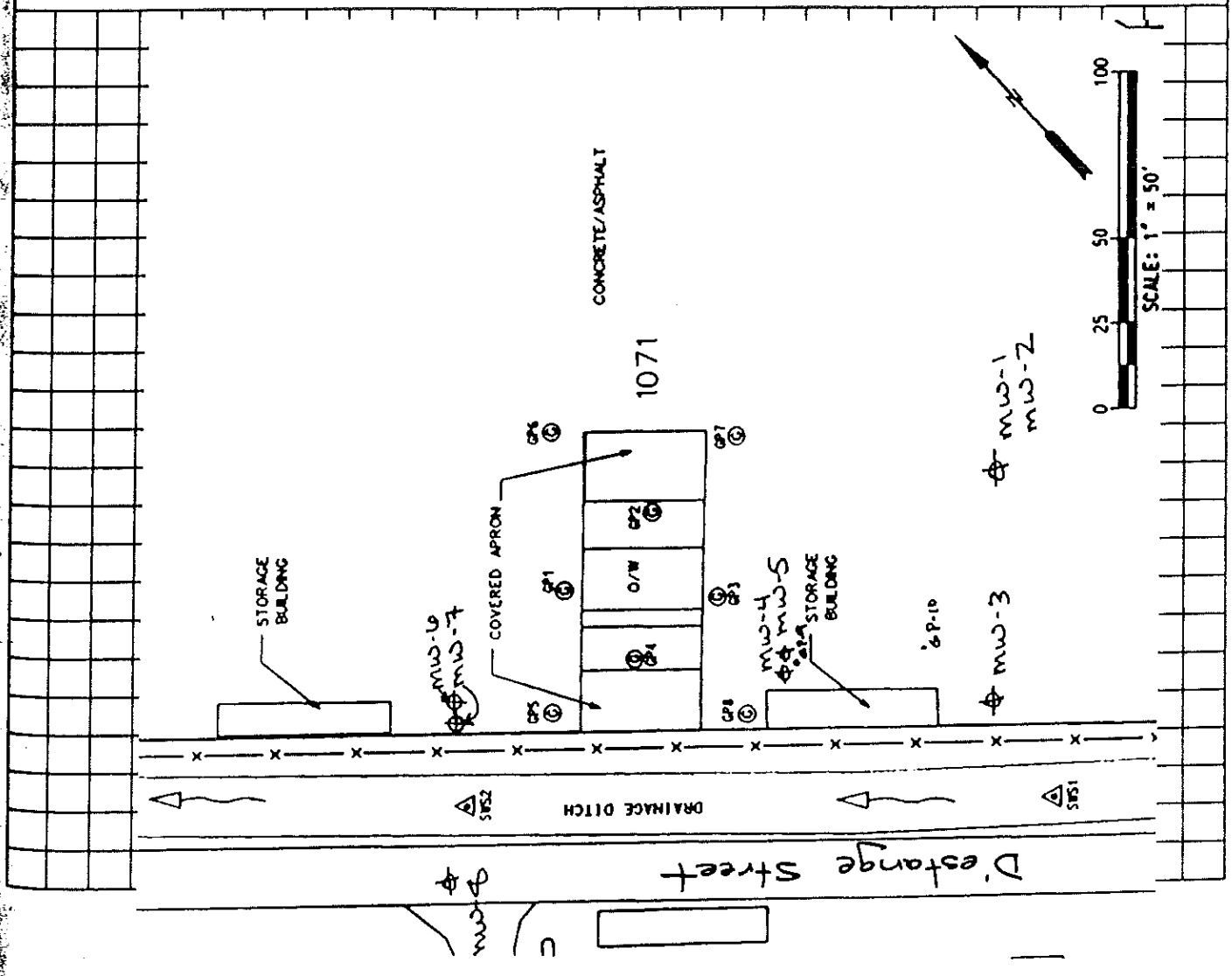
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES
			N/A

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	X	SVOC			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		Timothy Coffey

LOCATION SKETCH/COMMENTS

SCALE: 1-in. = 50 Ft



HTRW DRILLING LOG

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 2 OF 6 | 64

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Concrete pavement	N/A	N/A	N/A	
	1	Very dk gray (10YR 3/1) to gray (10YR 6/1) silty sand: Dry, F-grnd, gravelly, stratified.	1.7 ppm		7N1771	Drill: 4.1 ft Recover: 3.2 ft
	2					
	3		2.1 ppm	N/A	7N1772	gravel bed
	4					
		No recovery	N/A		N/A	
	5					
		Gray (10YR 5/1) sand: moist, massive, F-grnd w/ large wood fragments.	No sample		No sample	Drill: 5.0 ft Recover: 4.2 ft
	6					Unsampleable: Too much wood
		Wood				
	7			N/A		wood fragments.
			N/A		N/A	water @ 8 ft
	8	Black (10YR 2/1) silty sand: wet, saturated, F-grnd, massive, "dirty"				
	9					
		No Recovery				
	10					

HTRW DRILLING LOG

HOLE NUMBER 2TH-MW-076 (NE)

PROJECT: Fort Stewart USTs

INSPECTOR Timothy Coffey

SHEET 3 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Black silty sand (as above)				
	12					
	13					
	14		N/A	N/A	N/A	
	15					
	16					
	17					
	18					
	19					
	20					

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs	INSPECTOR Timothy Coffey	HOLE NUMBER 27H-MW-07
		SHEET 4 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Black silty sand (as above).				
	21	↓				
	22					
	23					
	24		N/A	N/A	N/A	
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

HOLE NUMBER 27H-MW01 61

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 5 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	31	DK red-brn (5YR 3/2) sand: wet, F to M-grind, returned in clumps.				
	32			N/A		
	33					
	34		N/A		N/A	
	35					Augers binding on wood frags in hole: did not went to advance briefly.
	36					
	37			7N1773		
	38					
	39					
	40					

HTRW DRILLING LOG

HOLE NUMBER ZH-MW-04-08

PROJECT: Fort Stewart USTs

INSPECTOR Timothy Coffey

SHEET 6 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	41	DK red-brn sand (as above).				
	42			7N1773		
	43		N/A		N/A	
	44					
	45					TD = 45.0 Ft.
	46					
	47					
	48					
	49					
	50					

HTRW DRILLING LOG

DISTRICT: USACE - Savannah

HOLE NUMBER: 2TH-MW-8(TW) 48

1. COMPANY NAME: SAIC

2. DRILL SUBCONTRACTOR: Miller Drilling Company

SHEET 1 OF 4

3. PROJECT: Fort Stewart

4. LOCATION: DOL Motor pool

5. NAME OF DRILLER: Doug Bishop

6. MANUFACTURERS DESIGNATION OF DRILL: CME 75

7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: CME Model 75 drill rig; 4¼-in. ID, Hollow-stem augers w/ 9-in. diam 6.1; 3½-in. IDX 5-Ft split-spoon samplers.

8. HOLE LOCATION: D'estange St. N 677543.67 E 826486.54

9. SURFACE ELEVATION: TOC 81.52ft

10. DATE STARTED: 10-8-99

11. DATE COMPLETED: 10-8-99

12. OVERBURDEN THICKNESS: N/A

15. DEPTH GROUNDWATER ENCOUNTERED: 9 FtBGS

13. DEPTH DRILLED INTO ROCK: N/A

16. DEPTH TO WATER AND ELAPSED TIME AFTER ORILLING COMPLETED: 8.0 Ft / 2 min.

14. TOTAL DEPTH OF HOLE: 45.0 Ft

17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):

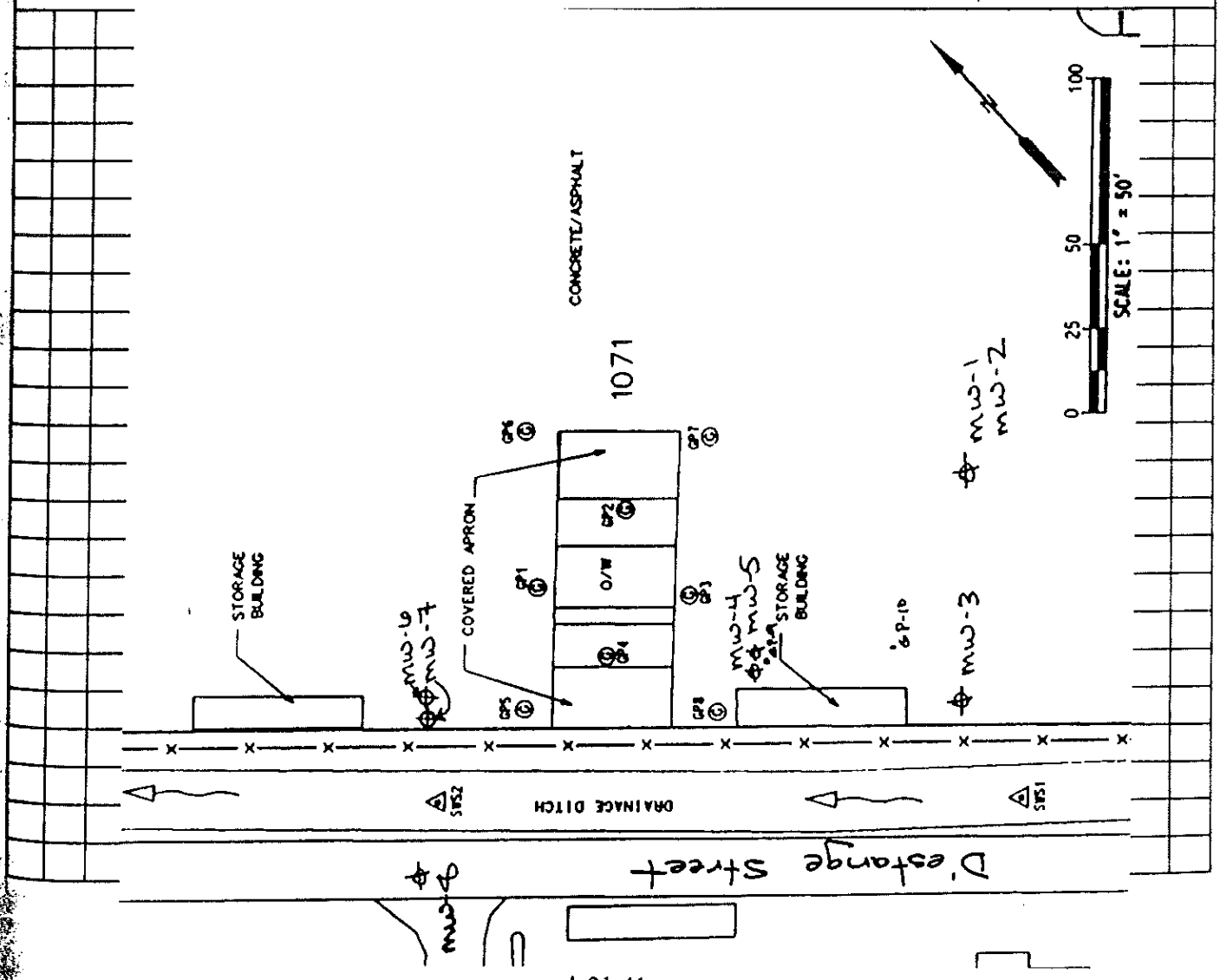
18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES			
	(DISTURBED)		N/A			

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	X	X	SVOC			

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
		X		

LOCATION SKETCH/COMMENTS

SCALE: 1-in. = 50 Ft



HTRW DRILLING LOG

PROJECT: Fort Stewart USTs	INSPECTOR Timothy Colley	SHEET 2 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		Asphalt pavement	N/A	N/A	N/A	
	1	Yellow (10YR 8/6) silty sand: Dry, indurated, F to c grnd. weakly cemented; Discs.	1.4 ppm	N/A	7N1871	Drill: 4.7 Ft Recover: 3.8 Ft
	2	Grey (10YR 5/1) sand: dry, loose, friable, F-grnd. incr. silt/moisture w/depth: moist, mod packed			7N1872	
	3	becoming stratified at bottom.	0.8 ppm			
	4	Weak red (10R 5/2) silty sand: moist, massive, F grnd.				
	5	No recovery	N/A		N/A	Bottom of shoe is set
	6	Black (10YR 2/1) silty sand: moist to wet, generally massive, w/ minr lt stratifications, F-grnd, "dirty"	0.6 ppm	N/A	N/A	Drill: 5.0 Ft Recover: 4.6 Ft
	7					
	8					
	9	Weak red (10R 5/2) sand: wet, massive, med-packed, F-grnd.	N/A		N/A	water @ 9 Ft BGS.
	10	No recovery	N/A	N/A	N/A	

HTRW DRILLING LOG

HOLE NUMBER 27H-MW-03(N)

PROJECT: Fort Stewart USTs

INSPECTOR Timothy Coffey

SHEET 3 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	11	Black silty sand: wet, F-grnd, "dirty".	N/A	N/A	N/A	
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					

HTRW DRILLING LOG

HOLE NUMBER 27H-MW-BC(N) 51

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Collar | SHEET 4 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	21	DRood-brn (5YR 3/2) Sand: wet, F to M-grnd, returned in clumps.	N/A	N/A	N/A	
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					

HTRW DRILLING LOG

HOLE NUMBER 27H-440-B(7N) 52

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 5 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSAPCE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	31	DK red-brn sand (as above).				
	32			N/A		
	33					
	34					
	35		N/A		N/A	
	36					
	37			7N1873		
	38					
	39					
	40					

HTRW DRILLING LOG

HOLE NUMBER 27A-MW-67(N) 53

PROJECT: Fort Stewart USTs | INSPECTOR Timothy Coffey | SHEET 6 OF 6

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	HEADSPACE SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
	41	DR red-brn sand (as above).				
	42		N/A	7N1BT3	N/A	
	43					
	44					
	45					TD = 45.0 Bgs
	46					
	47					
	48					
	49					
	50					

SWMU 27H

DOL MAINTENANCE MOTORPOOL AND ASSOCIATED TWO OIL/WATER SEPARATORS (BUILDING 1056)

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HTRW DRILLING LOG

1. COMPANY NAME: SAIC	DISTRICT: Savannah COE	HOLE NUMBER: 7P-GP-01
	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 of 2 SHEETS
3. PROJECT: Fort Stewart 16 SWMU's	4. LOCATION: Hinesville GA SWMU-27H	
5. NAME OF DRILLER: Haz	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-41	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4'x2" Sampler; 4'x1" Rods; 3/4 PVC Piezometer; Acetate Sleeve	8. HOLE LOCATION: SWMU 27H	
	9. SURFACE ELEVATION: NAVD-88 86.56' E-827207.23' N-677627.68' NAD-83	
	10. DATE STARTED: 1-21-98	11. DATE COMPLETED: 1-21-98
12. OVERBURDEN THICKNESS: 12'	15. DEPTH GROUNDWATER ENCOUNTERED: ~5' BGS	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED:	
14. TOTAL DEPTH OF HOLE: 12'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY):	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES		
NA			NA		

20. SAMPLES FOR CHEMICAL ANALYSIS	VOC	METALS	OTHER (SPECIFY)	OTHER (SPECIFY)	OTHER (SPECIFY)	21. TOTAL CORE RECOVERY %
	✓	✓	SVOC			NA

22. DISPOSITION OF HOLE	BACKFILLED	MONITORING WELL	OTHER (SPECIFY)	23. SIGNATURE OF INSPECTOR
			Piezometer	[signature]

LOCATION SKETCH/COMMENTS

SCALE:

See location Maps

PROJECT	HOLE NO.
Fort STEWART 16 SWMU's	7P-GP-01

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

QA CHECK BY: ______ (Signature and Date)

well atmosphere, soil core, breathing zone, venting compressor, etc.)

HTRW DRILLING LOG

PROJECT	INSPECTOR	HOLE NO.	SHEET
16 SWMU's		TP-GP-01	2 of 2

CLASS (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(SM) Silty SAND, FINE GRAINED SAND 2.5YR 2.5/1 black color (some clay mottling) AND SAND LENSES				
	2					
	3					
	4					
	5					▽ WT
	6					
	7	(SM) Silty SAND, FINE GRAINED 2.5Y, 6/3 light yellowish brown				
	8	(SM) Silty SAND, FINE GRAINED SAND 2.5YR 2.5/1 black color				
	9					
	10					
	11					
	12					Set Rezometer

PROJECT 16 SWMU's HOLE NO. TP-GP-01

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HTRW DRILLING LOG

1. COMPANY NAME: SAIL	DISTRICT: Savannah COE	HOLE NUMBER: 7P-GP-02
	2. DRILL SUBCONTRACTOR: Miller	SHEET 1 OF 2 SHEETS
3. PROJECT: Ft. Stewart 16 SWMU's	4. LOCATION: Hinesville, GA	
5. NAME OF DRILLER: Hez	6. MANUFACTURERS DESIGNATION OF DRILL: Mobile B-47	
7. SIZES AND TYPES OF DRILLING AND SAMPLING EQUIPMENT: 4' x 2" Sampler; 4' x 1" Rods; Acetate Sleeves + tubing; Alconox Soln	8. HOLE LOCATION: NAD-83 E-827813.33', N-677634.93'	
	9. SURFACE ELEVATION: NAVD-88 86.63'	
	10. DATE STARTED: 1/21/98	11. DATE COMPLETED: 1/21/98
12. OVERBURDEN THICKNESS: 10'	15. DEPTH GROUNDWATER ENCOUNTERED: ≈ 5.5' bgs	
13. DEPTH DRILLED INTO ROCK: 0'	16. DEPTH TO WATER AND ELAPSED TIME AFTER DRILLING COMPLETED	
14. TOTAL DEPTH OF HOLE: 10'	17. OTHER WATER LEVEL MEASUREMENTS (SPECIFY)	

18. GEOTECHNICAL SAMPLES	DISTURBED	UNDISTURBED	19. TOTAL NUMBER OF CORE BOXES		
NA			NA		
20. SAMPLES FOR CHEMICAL ANALYSIS	**VOC**	**METALS**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**	**OTHER (SPECIFY)**
	✓	✓	SVOC		
22. DISPOSITION OF HOLE	**BACKFILLED**	**MONITORING WELL**	**OTHER (SPECIFY)**	**23. SIGNATURE OF INSPECTOR**	**21. TOTAL CORE RECOVERY %**
			Piezometer	[signature]	NA

LOCATION SKETCH/COMMENTS

SCALE:

See location maps

PROJECT	HOLE NO.
Ft. Stewart 16 SWMU's	7P-GP-02

ENG FORM 5056-R, AUG 94

(Proponent CECW-EG)

well atmosphere, soil core, breathing zone, venting compressed air, etc.)

QA CHECK BY: ______ (Signature and Date)

HTRW DRILLING LOG

PROJECT: Ft Stewart | INSPECTOR: | HOLE NUMBER: TP-GP-02 | SHEET: 2 of 2

ELEV (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS (D)	GEOTECH SAMPLE OR CORE BOX NO (E)	ANALYTICAL SAMPLE NO (F)	REMARKS (G)
	1	(SM) silty sand fine grain sand 2.5 Y 2.5/1 black colour	HS: 0.0			
	2					
	3	- saturated from 5.5' to base	HS: 0.0			
	4	- few thin sand lenses (fine sand) grey color near base				
	5		HS: 0.0			
	6					▽
	7					
	8					
	9					
	10					

PROJECT: Ft. Stewart 16 SWMU's | HOLE NO: TP-GP-02

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