ASSEMBLIES G AND H
SITE INVESTIGATION PLANS
RCRA FACILITY INVESTIGATION
NAVAL SUPPORT ACTIVITY MEMPHIS
MILLINGTON, TENNESSEE

CONFIRMATORY SAMPLING INVESTIGATION
SWMUs 23, 24, 41, 43, 47, 17/48, and 19/49

Revision: 3

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North Charleston, South Carolina

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The Contractor, EnSafe/Allen & Hoshall, hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0318 is complete, accurate, and complies with all requirements of the contract.

Date	December 9, 1997
Signature	
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Title:	Task Order Manager

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1.0 INTRODUCTION

As part of the U.S. Navy Installation Restoration Program, the following Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site Investigation Plan has been prepared for a Confirmatory Sampling Investigation (CSI) by EnSafe/Allen & Hoshall (E/A&H) at Solid Waste Management Units (SWMUs):

- SWMU 23 — Underground storage tank on the south end of Building S-8.
- SWMU 24 — Waste oil aboveground storage tank between Buildings N-114 (Auto Hobby Shop) and N-349.
- SWMU 41 — Nonhazardous waste storage yard (Salvage Yard No. 2)
- SWMU 43 — Former hazardous waste accumulation point along the west side of former Building S-176.
- SWMU 47 — Former hazardous waste accumulation point on the south side of Building S-344.
- SWMU 17/48 — Underground waste tank in the Building S-9 complex (SWMU 17), and various inactive hazardous waste accumulation points on the west side of Building S-9 (SWMU 48).
- SWMU 19/49 — An underground waste tank (SWMU 19), and a hazardous waste accumulation point (SWMU 49). Both located near Building N-757.

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One report will be generated for all SWMUs, except SWMU 17 and SWMU 19. Data from the investigation from these two SWMUs will be included in a separate document following RFI guidelines.

The primary references for the CSI are the *Comprehensive RFI Work Plan, Naval Air Station Memphis, Millington, Tennessee* (E/A&H, 1994) and the RCRA Facility Assessment (RFA) (ERC/EDGe, 1990).

Eight SWMU assemblies (i.e., groups) have been defined for the NSA Memphis RCRA Corrective Action Program. Four (A, B, C, and D) are on closing portions of the activity and have been categorized and listed according to their Base Closure and Realignment Act (BRAC) priority. The remaining four (E, F, G, and H) are on portions that will remain open.

Assembly G, inactive aboveground hazardous waste accumulation points, and Assembly H, active operational areas with waste stored aboveground, have been combined into this CSI work plan. When Assembly G was first established, it included SWMUs 43, 45, 46, 47, 48, 49, and 61.

SWMU 45 has since received a no-further-action status based on findings of an interim measures investigation (E/A&H, 1995a) and SWMU 46 was investigated during the SWMU 14 RFI (Assembly E) because of its proximity to SWMU 14.

SWMU 61, on the east side of Building N-26, is not included in this CSI because samples were collected and soil excavated prior to the recent demolition of N-26. Detailed information regarding the soil sampling and excavation will be included in the Assemblies G and H CSI report.

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Because releases have already been confirmed during voluntary corrective action removals at Assembly F SWMUs 17 and 19, followup investigations for these SWMUs have been incorporated into the Assembly G CSIs at SWMUs 48 and 49, respectively.

When it was first established, Assembly H included SWMUs 23, 24, 39, and 41. SWMU 39 (site of former Building S-74) was moved into Assembly F when it was determined that Building S-74 had housed dry cleaning operations and thus had a greater potential for contaminating groundwater.

Each SWMU is addressed in a self-contained section of this work plan.

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2.0 SWMU 23

SWMU 23 is an underground storage tank (UST) on the south end of Building S-8, Fire Station No. 1, on the NSA Memphis Southside. The UST stored No. 2 fuel oil and/or diesel fuel from 1944 through 1987. During a 1990 inspection, no visual evidence of a release was identified (ERC/EDGe, 1990). The information compiled on SWMU 23 from the 1990 RFA report is provided in Attachment A. In 1992, a UST removal was attempted in the Building S-8 vicinity. The excavation was backfilled and compacted when the UST was not found. On January 23, 1997, a geophysical investigation was performed at SWMU 23 to try and locate the UST. A small, rectangular area was searched south of Building S-8 offset from the position of the 1992 excavation. Anomolies were identified, however, the data do not suggest an in-place, metal UST within the area surveyed (E/A&H, 1997b). Figure 2-1 depicts results of the geophysical investigation. Figure 2-2 shows the location of SWMU 23.

Topography and Drainage

SWMU 23 and the surrounding area are characterized by relatively level, low-relief topography. Surrounding areas have concrete or grass cover. Surface drainage is toward the south and west to a north-south drainage ditch (SWMU 38) which flows into Big Creek Drainage Canal. A topographic map showing land surface elevations is provided in Attachment B.

Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12 of the *Comprehensive RFI Work Plan*. Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee* (Kingsbury and Carmichael, 1995).

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Stratigraphy

Site-specific stratigraphic data were not available for SWMU 23. However, lithological information was obtained while installing background monitoring well cluster BG-04 approximately 500 feet northeast of SWMU 23. Based on the lithologies encountered at BG-04, this area consists of a complex shallow geology of low to very low-permeability silty clays and clays (loess), overlying a sand and gravel horizon.

Table 2-1 lists stratigraphic units encountered.

Table 2-1
Stratigraphic Data

Stratigraphic Unit	BG-04
Alluvium	Not present
Loess	Silt and clayey silt 0 to 38 feet bls (38')
Fluvial Deposits	Sand, gravel, and silt 38 feet bls to 71 feet bls (33')
Cockfield Formation	Sand and clay from 71 feet bls to termination depth of the boring at 76 feet bls.
Cook Mountain Formation	Not sampled

Notes:
bls — below land surface
(38') — depth of stratigraphic unit

Shallow Groundwater

Three background monitoring wells were installed at location BG-04 on the NSA Memphis Southside in January 1995 in conjunction with the RFIs at Assembly A SWMUs. The wells were completed in the loess (BG04L), upper part of the fluvial deposits (BG04UF), and the lower part of the fluvial deposits (BG04LF). Data collected from these wells, approximately 500 feet to the northeast of SWMU 23, indicate that groundwater is typically first encountered at the interface

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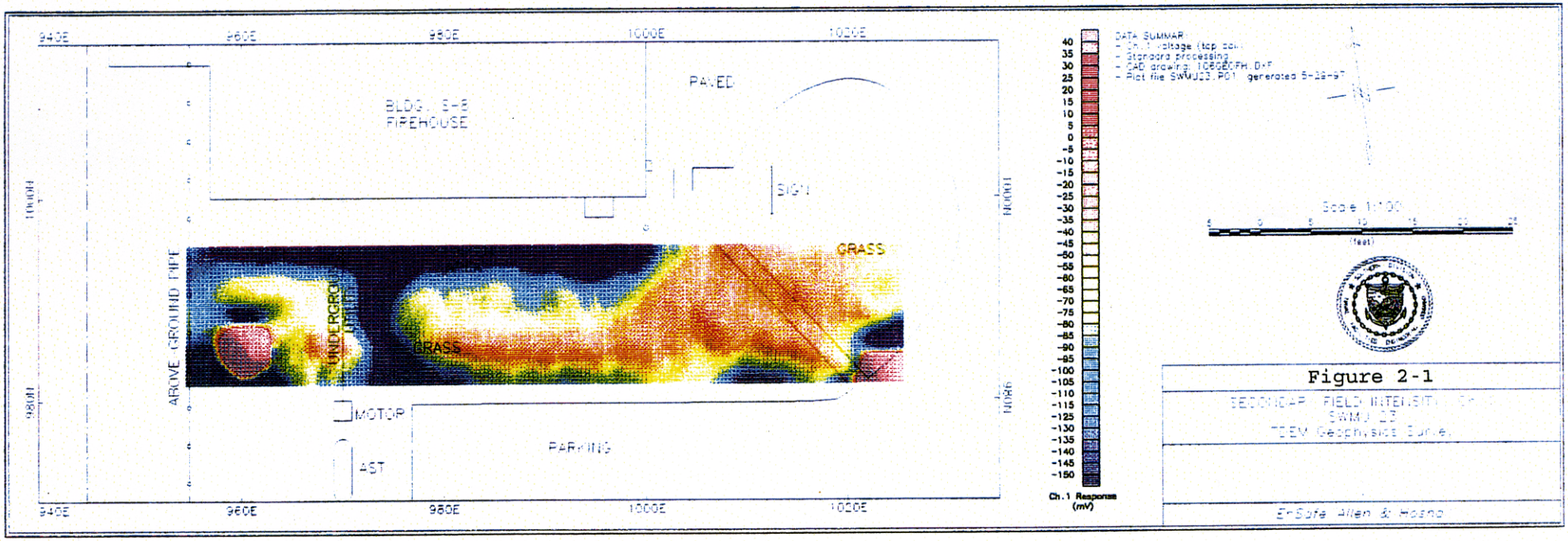
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BLDG. S-8
FIREHOUSE
PAVED
SIGN
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ABOVE GROUND PIPE
MOTOR
AST
PARKING
40
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-140
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Ch.1 Response (mV)
DATA SUMMARY:
- Ch.1 voltage (top coil)
- Standard processing
- CAD drawing: 1060E0FH.DXF
- Plot file SWMU23.PO1 generated 5-28-97
Scale 1:100
(feet)
Figure 2-1
SECONDARY FIELD INTENSITY
SWMU 23
TDEM Geophysical Survey
EnSafe Allen & Hoshall

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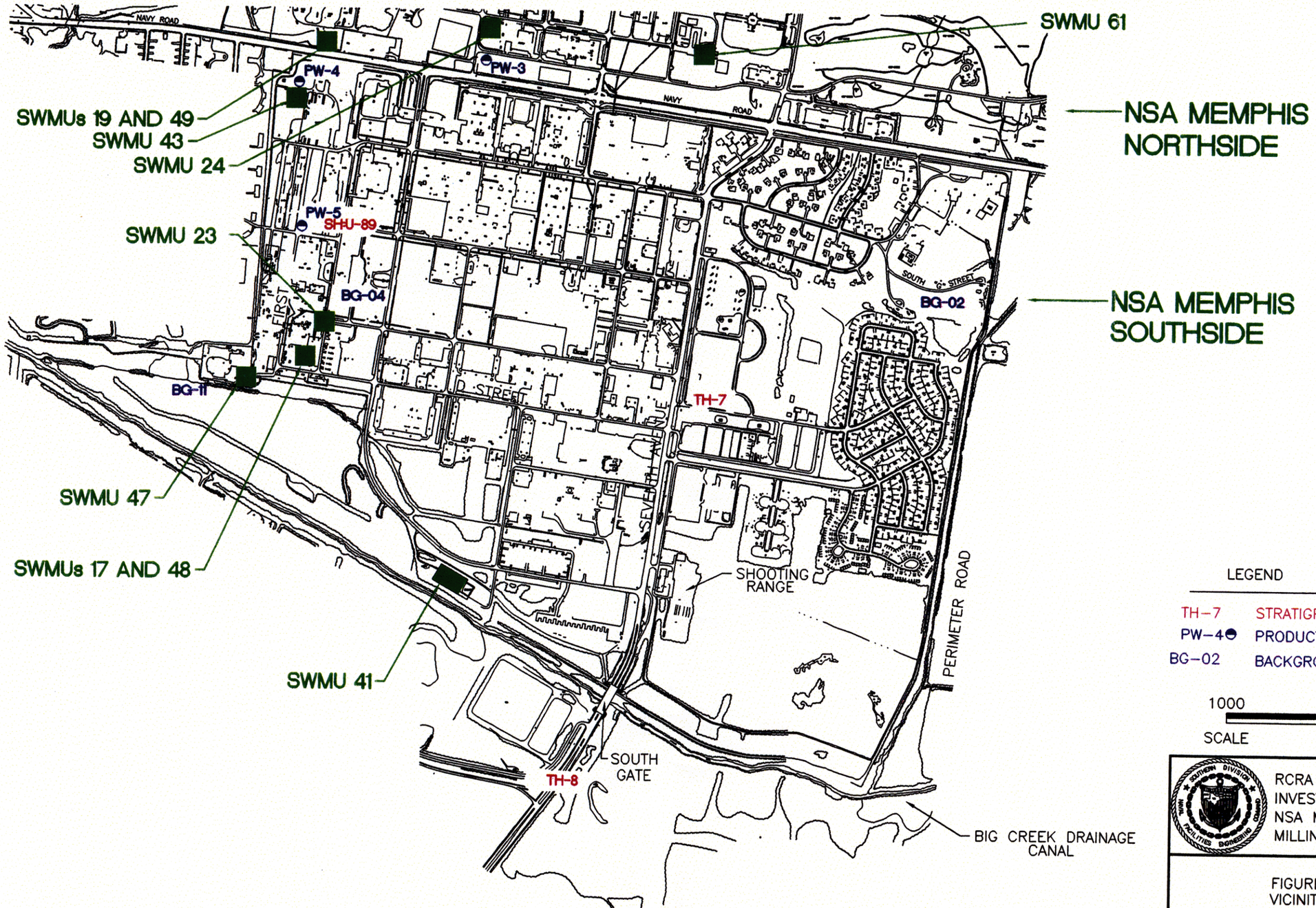
SWMU 61
NSA MEMPHIS NORTHSIDE
NSA MEMPHIS SOUTHSIDE
SWMUs 19 AND 49
SWMU 43
SWMU 24
SWMU 23
SWMU 47
SWMUs 17 AND 48
SWMU 41
PW-4
PW-3
PW-5
SHU-89
BG-04
BG-11
BG-02
TH-7
TH-8
NAVY ROAD
FIRST
D STREET
SEVENTH AVENUE
SOUTH STREET
PERIMETER ROAD
SHOOTING RANGE
SOUTH GATE
BIG CREEK DRAINAGE CANAL
N
LEGEND
TH-7 STRATIGRAPHIC TEST HOLE
PW-4 PRODUCTION WELL
BG-02 BACKGROUND WELL
1000 0 1000
SCALE FEET
RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 2-2
VICINITY MAP
ASSEMBLY G AND H SWMUs
DWG DATE: 10/21/97
DWG NAME: 106VMA1

between the silt-clay and clay units in the loess. Groundwater measurements from March 30, 1995, indicate static groundwater levels in the wells are approximately 5 feet below land surface (bls) in the loess, and 10 to 11 feet bls in the upper and lower fluvial deposits. Based on the topography and the information contained in the conceptual model of the NSA Memphis hydrogeology (Section 2.12 of the *Comprehensive RFI Work Plan*), groundwater is presumed to flow southwesterly in the fluvial deposits. Within the NSA Memphis Southside, groundwater in the loess/shallow alluvium most likely moves primarily downward to recharge the deeper fluvial deposits or alluvium. In the immediate vicinity of SWMU 23, some water in the loess may move laterally and discharge to the SWMU 38 drainage ditch.

Climatological Data

Regional climatological data are provided in Section 2.8 of the *Comprehensive RFI Work Plan.*

2.1 Source Characterization

Analytical data were not available from the July 2, 1992, UST Closure Report, in which the attempt to locate the UST was described.

Field sampling will be performed as outlined in Section 2.2 of this CSI to determine if a release has occurred at SWMU 23. If contamination is verified, and the degree of contamination warrants, the scope of the investigation may be expanded to meet RFI requirements. Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of any contaminants exceeding appropriate action levels. If a contaminants action level is exceeded, fate and transport mechanisms, as well as risk, will be evaluated for the contaminant. The procedures and references used to determine these characteristics will be documented in an RFI report.

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2.2 Characterization of Hazardous Constituent Releases

Previous Investigations

The 1992 UST Closure Report discussed an attempt to locate the UST in the Building S-8 vicinity. Contractors dug 11 feet deep to locate the UST. Excavated soil appeared to be disturbed and no contamination was visible. A disconnected pipe was discovered and thought to be an abandoned vent line. The excavation was backfilled and compacted when the UST was not identified. No certification to confirm UST removal or plans showing UST locations have been identified from available information.

Data Gaps

The following data gaps will be the focus of this CSI:

- The surface soil contamination, if any, associated with the UST.
- The subsurface soil contamination, if any, associated with the UST.
- The potential for loess and/or fluvial deposits groundwater contamination associated with the UST.

Inorganic constituents identified in SWMU 23 soil will be compared to background concentrations, risk-based concentrations (RBCs) (USEPA, 1996), and soil screening levels (SSLs) (USEPA, 1996). Organics will be compared to RBCs and SSLs. A Preliminary Risk Evaluation (PRE) will be performed on organic and inorganic constituents.

Surface soil and groundwater samples from the background monitoring wells installed in 1995 and 1996 were analyzed for Appendix IX metals. The procedures used to determine the inorganics background reference concentrations (RCs) are documented in the *Reference Concentrations Technical Memorandum* (E/A&H, 1996a).

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Objective of the Proposed Field Investigation

The primary objective of the proposed field investigation is to determine whether a release has occurred at SWMU 23. All samples will be collected and processed per Section 4 of the *Comprehensive RFI Work Plan*. If contamination is identified at SWMU 23, the BRAC Cleanup Team (BCT) will review the sampling results to determine whether a second round of investigation and/or full RFI characterization will be necessary.

Field personnel may deviate from the strategy outlined below if field conditions or data (i.e., visual observations or field screening results) suggest additional or different intervals may be successfully sampled or yield more useful information. Any deviations will be documented in the field logbook and the CSI report. The investigatory area may then be enlarged or reduced, based on initial data results.

Soil

The proposed soil investigation will consist of hand-auger and Geoprobe sampling (using methods outlined in Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) for offsite laboratory analysis. Five proposed sampling locations, as shown in Figure 2-3, have been selected in the area of the UST. Soil samples will be collected from the surface to 1 foot deep (upper interval) using a hand auger at two locations, while subsurface samples will be collected at a depth interval of 12- to 15-feet (lower interval) using Geoprobe equipment at three locations. Since the depth of the UST is unknown, the sampling interval was estimated based on the 500-gallon UST described in the 1990 RFA.

The two upper interval samples collected will be analyzed for full scan analysis (FSA) for risk assessment purposes. The three lower interval samples will be analyzed for volatile organic compounds (VOCs), total petroleum hydrocarbons-gasoline range organics (TPH-GRO), and TPH-diesel range organics (DRO). All soil samples will be analyzed at an offsite laboratory.

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Groundwater

The proposed groundwater investigation will consist of Geoprobe sampling to collect groundwater samples from the fluvial deposits for offsite laboratory analysis for VOCs since VOCs are an indicator for petroleum and solvent contamination. Based on previous work at other SWMUs, the Geoprobe should be able to penetrate through the loess and into the fluvial deposits to a refusal depth of about 50 feet. Groundwater samples will be collected from two Geoprobe locations.

The samples will collected from the southwest side of the former UST as this is the assumed direction of groundwater flow in the fluvial deposits.

Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the first phase of the investigation, a second phase, consisting of advancing and sampling soil borings and/or installing and sampling monitoring wells, may be implemented. The number, locations, and depths of soil borings and/or monitoring wells will be determined using data from the first phase of this investigation. An addendum to this CSI, describing the proposed drilling, sampling, and analytical strategies for an expanded investigation, will be prepared and submitted to the BCT for review and comment if a second phase is required.

Analytical Requirements

Hand-auger soil samples from the upper interval will be analyzed at an offsite laboratory using the following methods:

- VOCs, U.S. Environmental Protection Agency (USEPA) Method 8240
- Semivolatile organic compounds (SVOCs), USEPA Method 8270
- TPH, USEPA Method 418.1
- TPH-GRO, Tennessee (TN) Modified 8015/GRO
- TPH-DRO, TN Modified 8015/DRO

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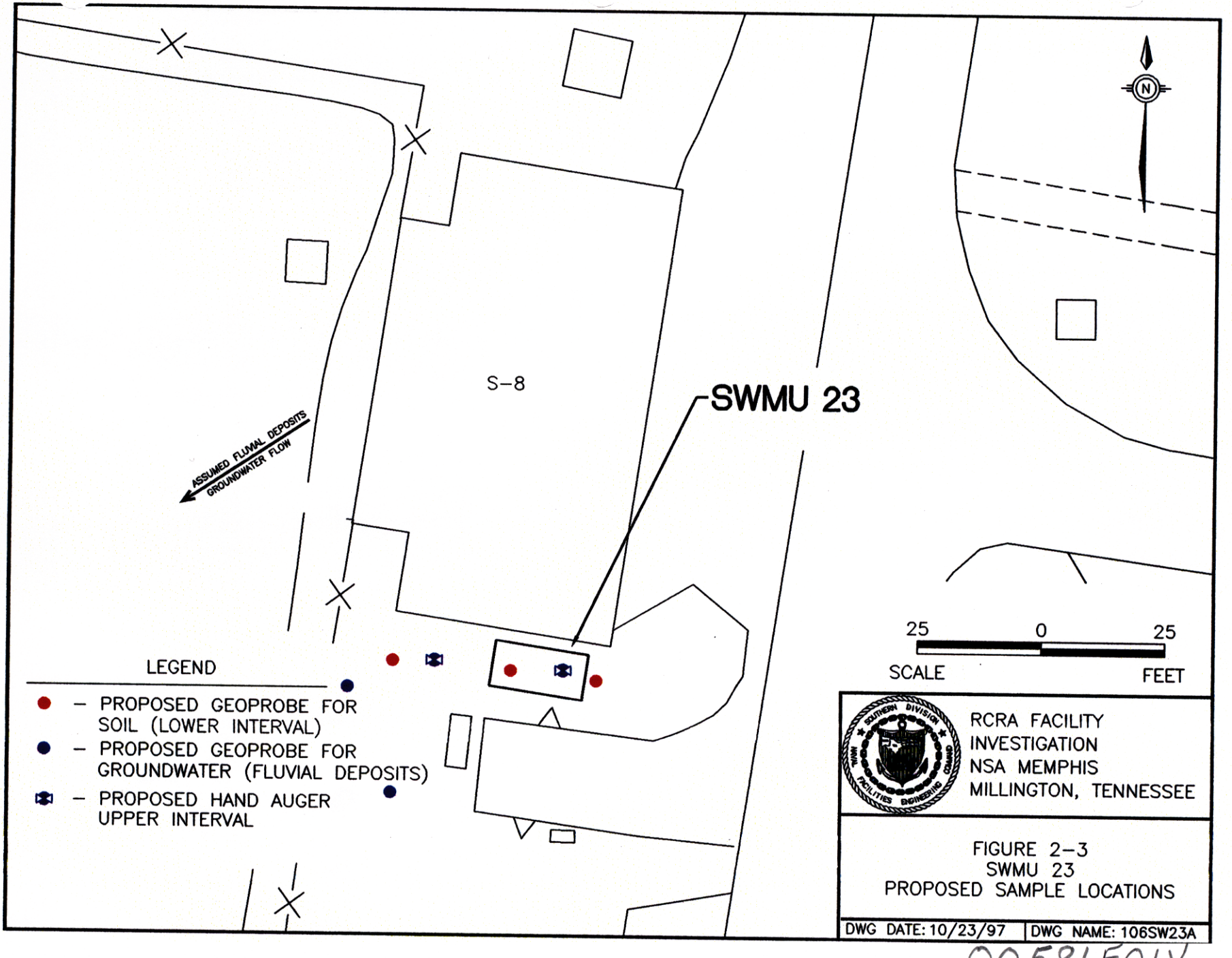

FIGURE 2-3
SWMU 23
PROPOSED SAMPLE LOCATIONS

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- Chlorinated pesticides/polychlorinated biphenyls (PCBs), USEPA Method 8080
- Organophosphorus pesticides, USEPA Method 8140
- Chlorinated herbicides, USEPA Method 8150
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series
- Total cyanide, USEPA Method 9010

Geoprobe soil samples from the lower interval will be analyzed at an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- TPH-GRO, TN Modified 8015/GRO
- TPH-DRO, TN Modified 8015/DRO
- TPH, USEPA Method 418.1

Groundwater samples will be analyzed at an offsite laboratory using the following method:

- VOCs, USEPA Method 8240

Table 2-2 summarizes the proposed number of samples to be collected and the analyses to be performed.

Sample Management

Sample management procedures will adhere to Sections 4.12 and 5 of the *Comprehensive RFI Work Plan*.

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Table 2-2
Proposed Sampling and Analytical Requirements — SWMU 23

Method	Sample Matrix/Type	Number of Samples	Analysis
Hand Auger	Soil (0- to 1-foot depth interval)	2	FSA[a]
Geoprobe	Soil (12- to 15-foot depth interval)	3	VOCs, TPH by 418.1, TPH-GRO, and TPH-DRO
Geoprobe	Fluvial Deposits	2	VOCs

Note:
[a] — FSA includes VOCs, SVOCs, TPH, TPH-GRO, TPH-DRO, chlorinated pesticides/PCBs, organophosphorus pesticides, chlorinated herbicides, total metals (Appendix IX), and cyanide.

Sample Custody

Sample custody procedures will adhere to Section 4.12.5 of the *Comprehensive RFI Work Plan*.

Quality Assurance/Quality Control

Quality assurance/quality control (QA/QC) procedures will adhere to Section 4.14 of the *Comprehensive RFI Work Plan*.

Decontamination Procedures

Decontamination procedures will adhere to Section 4.11 of the *Comprehensive RFI Work Plan*.

Investigation-Derived Waste

Investigation-derived waste (IDW) will be handled as specified in the *NSA Memphis IDW Management Plan* (E/A&H, 1995b).

2.3 Potential Receptors

SWMU 23 is approximately 1,500 feet east of the nearest offsite residence. The nearest NSA Memphis personnel are 30 feet north of the area at Building S-8. Storm water from

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SWMU 23 discharges into SWMU 38, in turn discharging into Big Creek Drainage Canal, which may serve as a food and water source for wildlife. SWMU 38 comprises drainage ways in populated areas of NSA Memphis; therefore, the potential exists for contact with surface water and sediment by NSA Memphis personnel. Offsite, the potential exists for contact with surface water and sediment by the general public due to unrestricted access to the drainage ways. According to NSA Memphis personnel, no fishing or swimming occurs in Big Creek Drainage Canal, but children may play near it.

Five production wells at NSA Memphis supply drinking water. The nearest production wells are PW-4 and PW-5, as shown in Figure 2-1. PW-4 is approximately 2,500 feet north of SWMU 23 and PW-5 is approximately 1,000 feet north. Both production wells are screened in the Fort Pillow aquifer (PW-4 is screened at 1,450 feet bls and PW-5 is screened at a depth of 1,435 feet) with the Flour Island confining unit separating the overlying Memphis Sand aquifer from the Fort Pillow aquifer. The potential for ecological and human health effects will be analyzed in more detail and presented in an RFI report, if contamination warranting full RFI characterization is identified at SWMU 23.

2.4 Quality Assurance Plan

The quality assurance plan presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout this CSI at SWMU 23.

2.5 Data Management Plan

The data management plan presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during this CSI.

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2.6 Health and Safety Plan

The site-specific health and safety plan for SWMU 23 is included in Attachment C. The E/A&H Comprehensive Health and Safety Plan for work conducted at NSA Memphis is included in Section 7 of the *Comprehensive RFI Work Plan*.

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3.0 SWMU 24

SWMU 24 consisted of two aboveground waste oil tanks located between Buildings N-114 (Auto Hobby Shop) and N-349 at First Avenue and Bougainville Street on the NSA Memphis Northside (Figure 3-1). The AST located next to Building N-349 has been removed leaving one 500-gallon AST. They were used by NSA Memphis personnel for changing lubricants and other fluids in their private vehicles. The year the tanks began operating is not known. During a 1990 inspection, the open ditch on the north end of the site appeared stained from oil discharge in surface runoff. Two additional sample locations are proposed in the DERA workplan for the area northwest of N-114 and southeast of Building 397. Surficial soil will be sampled to determine if run off and overflow from a catch basin has adversely affected soil. The catch basin was part of a caustic dip tank used for degreasing of engine blocks. Discoloration of soil surrounding the tanks was also noted (ERC/EDGe, 1990). The information compiled on SWMU 24 from the 1990 RFA is included in Attachment A.

Topography and Drainage

SWMU 24 and the surrounding area are characterized by relatively level, low-relief topography. The immediate area is covered with asphalt and concrete. Surface water drains into a tributary of North Fork Creek. A topographic map showing land surface elevations is included in Attachment B to this document.

Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12 of the *Comprehensive RFI Work Plan*. Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee.*

Stratigraphy

Site-specific stratigraphic data for SWMU 24 are not available, but information was available from the SWMU 5 RFI, conducted by E/A&H and U.S. Geological Survey (USGS) (report pending). Stratigraphic data collected at SWMU 5, approximately 1,600 feet west of SWMU 24, indicate a complex shallow geology of low to very low-permeability silty clays and clays overlying a silt horizon (loess). Laboratory-measured hydraulic conductivities for the silty-clay unit were reported to be 1.4×10^{-7} centimeters per second (cm/sec) (E/A&H, 1996b); no conductivity data were available for the underlying silt unit. Based on the 65-foot boring for monitoring well 05MW05LF at SWMU 5, the silty clays changed to a yellowish to pinkish gray sand (fluvial deposits) at about 40 feet bls and continued as sand until the Cockfield Formation was encountered at about 65 feet bls.

To obtain deeper geologic information that could be related to SWMUs in the area, the USGS drilled stratigraphic Test Hole 4 to a depth of about 200 feet bls, 500 feet south of the main runway and about 1,800 feet northwest of SWMU 24. The test hole was originally to be advanced approximately 15 feet into the Cook Mountain Formation, the confining unit separating the Memphis sand aquifer from the overlying Cockfield Formation and shallower units. Due to the unanticipated thinness of the Cockfield Formation, this borehole was advanced approximately 50 feet into the Memphis sand aquifer. The test hole was visually logged by a field geologist during drilling and geophysically logged following completion. Lithologies encountered in the monitoring well 05MW05LF boring and the test hole are shown in Table 3-1.

Water level data in the area indicates that groundwater in the fluvial deposits flows toward the west-northwest. These data were collected from monitoring wells screened in the fluvial deposits across the NSA Memphis Northside during other RFIs.

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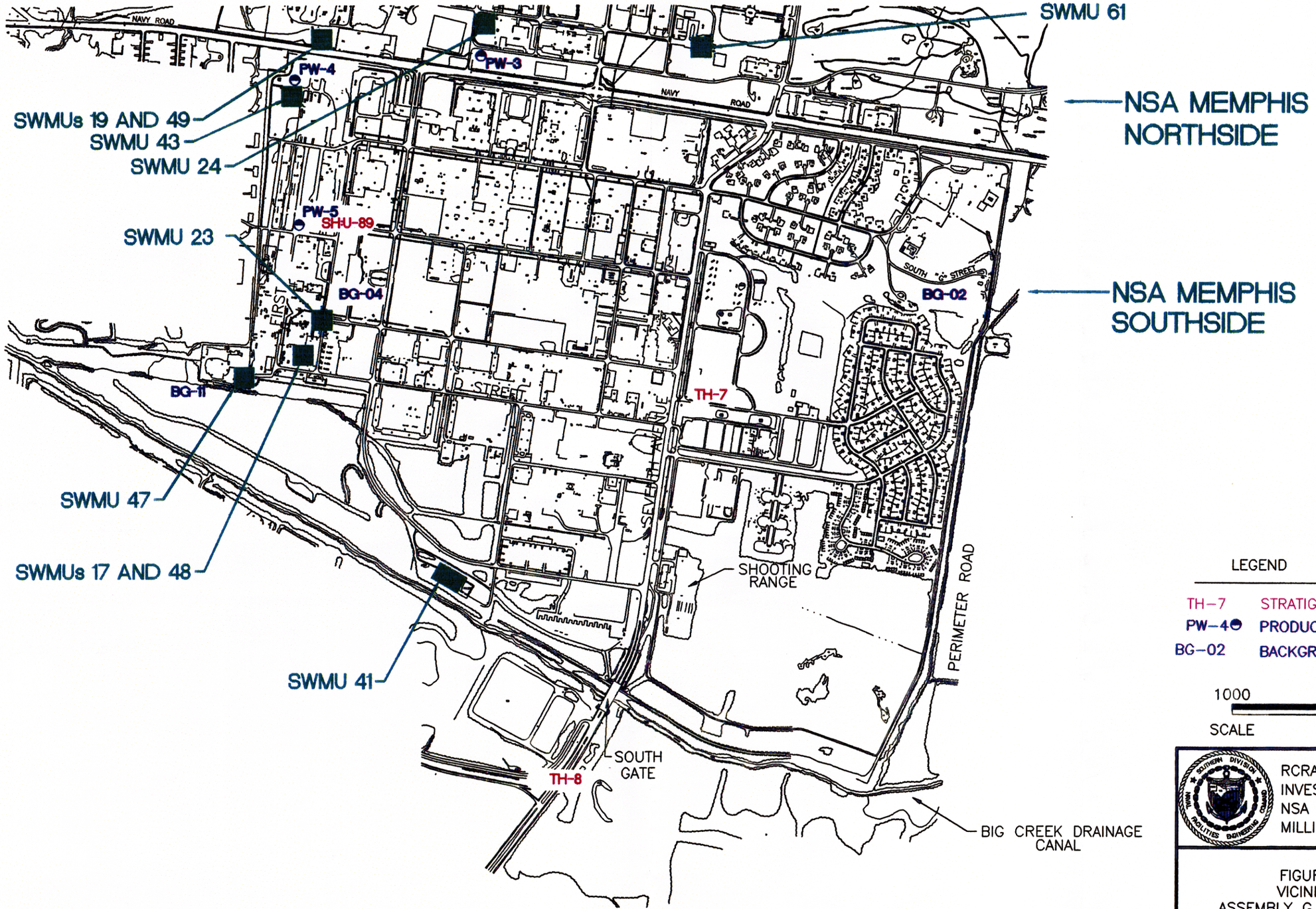

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Table 3-1
Stratigraphic Data

Stratigraphic Unit	05MW05LF	Test Hole 4
Loess	Approximately 40 feet of loess. These materials were described as silt and clay.	Approximately 40 feet of loess. These materials were described as silt and clay.
Fluvial Deposits	Approximately 25 feet of sand with some gravel deposits.	Approximately 25 feet of fluvial deposits. These materials were described as sand and gravel.
Cockfield Formation	Boring terminated at the top of Cockfield Formation (approximately 66 feet bls).	Approximately 30 feet of alternating sand, clay, and some lignite.
Cook Mountain Formation	Not sampled.	Characterized as a gray to blue-gray dense clay. Defined as the upper confining unit between the surficial aquifer(s) and the Memphis sand aquifer. The borehole for Test Hole 4 was advanced 44 feet into the Cook Mountain Formation.

Climatological Data

Regional climatological data are provided in Section 2.8 of the *Comprehensive RFI Work Plan*.

Shallow Groundwater

Information from a previous UST investigation at SWMU 5 (E/A&H, 1992) indicates that groundwater is typically encountered at the interface between the silt-clay and silt units in the loess. Potentiometric data indicate that shallow groundwater at SWMU 5 is held under confining pressures; water levels in monitoring wells screened in the loess equilibrated several feet higher than the silty clay/silt interface where saturated conditions were generally first encountered during drilling. As seen at other NSA Memphis locations, loess groundwater at SWMU 5 appears to flow with topography toward the drainage ditch (SWMU 4) that flows east-west across the north side of SWMU 5, although the primary direction of flow probably is vertically downward. It is unknown if shallow groundwater at SWMU 24 flows in a similar direction.

3.1 Source Characterization

The SWMU received waste oils and other lubricating fluids from private vehicles.

Field sampling will be performed as outlined in Section 3.2 of this CSI to better define the nature and extent of contamination that was visually identified. If the degree of contamination warrants, the scope of the investigation may be expanded to meet RFI requirements. Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of contaminants exceeding appropriate action levels. If a contaminants action level is exceeded, fate and transport mechanisms, as well as risk, will be evaluated for the contaminant. The procedures and references used to determine these characteristics will be documented in an RFI report.

3.2 Characterization of Hazardous Constituent Releases

Previous Investigations

No previous investigations are known to have been conducted at SWMU 24.

Data Gaps

The following data gaps will be the focus of this CSI:

- The presence of surface soil contamination, if any, associated with the waste oil tanks.
- The presence of subsurface soil contamination, if any, associated with the waste oil tanks.

Inorganic constituents identified in soil at SWMU 24 will be compared to background soil concentrations, RBCs, and SSLs (USEPA, 1996) to determine whether measured values occur naturally or indicate contamination. Organics will be compared to RBCs and SSLs. A Preliminary Risk Evaluation (PRE) will be performed on organic and inorganic constituents.

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Surface soil and groundwater samples from the background monitoring wells installed in 1995 and 1996 were analyzed for Appendix IX metals. The procedures used to determine the inorganics background RCs are documented in the *Reference Concentrations Technical Memorandum*.

Objective of the Proposed Field Investigation

The primary objective of the proposed field investigation is to determine whether a release has occurred at SWMU 24. All samples will be collected and processed as per Section 4 of the *Comprehensive RFI Work Plan*. If contamination is identified at SWMU 24, the BCT will review the sampling results to determine whether a second round of investigation and/or full RFI characterization will be necessary.

Field personnel may deviate from the strategy outlined below if field conditions or data (i.e., visual observations) suggest additional or different intervals may be successfully sampled or yield more useful information. Any deviations will be documented in the field logbook and the CSI report. The investigatory area may then be enlarged or reduced, based on initial data results.

Soil

The proposed soil investigation will consist of hand-auger sampling (using methods outlined in Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) for offsite laboratory analysis. Six sample locations, as shown in Figure 3-2, have been proposed for SWMU 24. Soil samples will be collected from the 0- to 1-foot and 3- to 4-foot intervals using a hand auger. Sample locations were based on discoloration of soil surrounding the remaining tank and the area underneath the tank which was removed. The surface soil samples are for risk assessment purposes and to inspect for surface releases. The subsurface samples will indicate the extent of contamination, if a release has occurred.

Two of the surface soil samples will be submitted for FSA, while the remaining surface and all of the subsurface soil samples will be analyzed for VOCs, SVOCs, Appendix IX metals, TPH, GRO, and DRO. All soil samples will be analyzed at an offsite laboratory.

Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the first phase of the investigation, a second phase, consisting of advancing and sampling soil borings and/or installing and sampling monitoring wells, may be implemented. The number, locations, and depths of soil borings and/or monitoring wells will be determined using data from the first phase of this investigation. An addendum to this plan describing the proposed drilling, sampling, and analytical strategies for an expanded investigation will be prepared and submitted to the BCT for review and comment if a second phase is required.

Analytical Requirements

Soil samples will be submitted to an offsite laboratory using the following methods:

- VOCs, U.S. Environmental Protection Agency (USEPA) Method 8240
- SVOCs, USEPA Method 8270
- TPH, USEPA Method 418.1
- TPH-GRO, TN Modified 8015/GRO
- TPH-DRO, TN Modified 8015/DRO
- Chlorinated pesticides/PCBs, USEPA Method 8080
- Organophosphorus pesticides, USEPA Method 8140
- Chlorinated herbicides, USEPA Method 8150
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series
- Total cyanide, USEPA Method 9010

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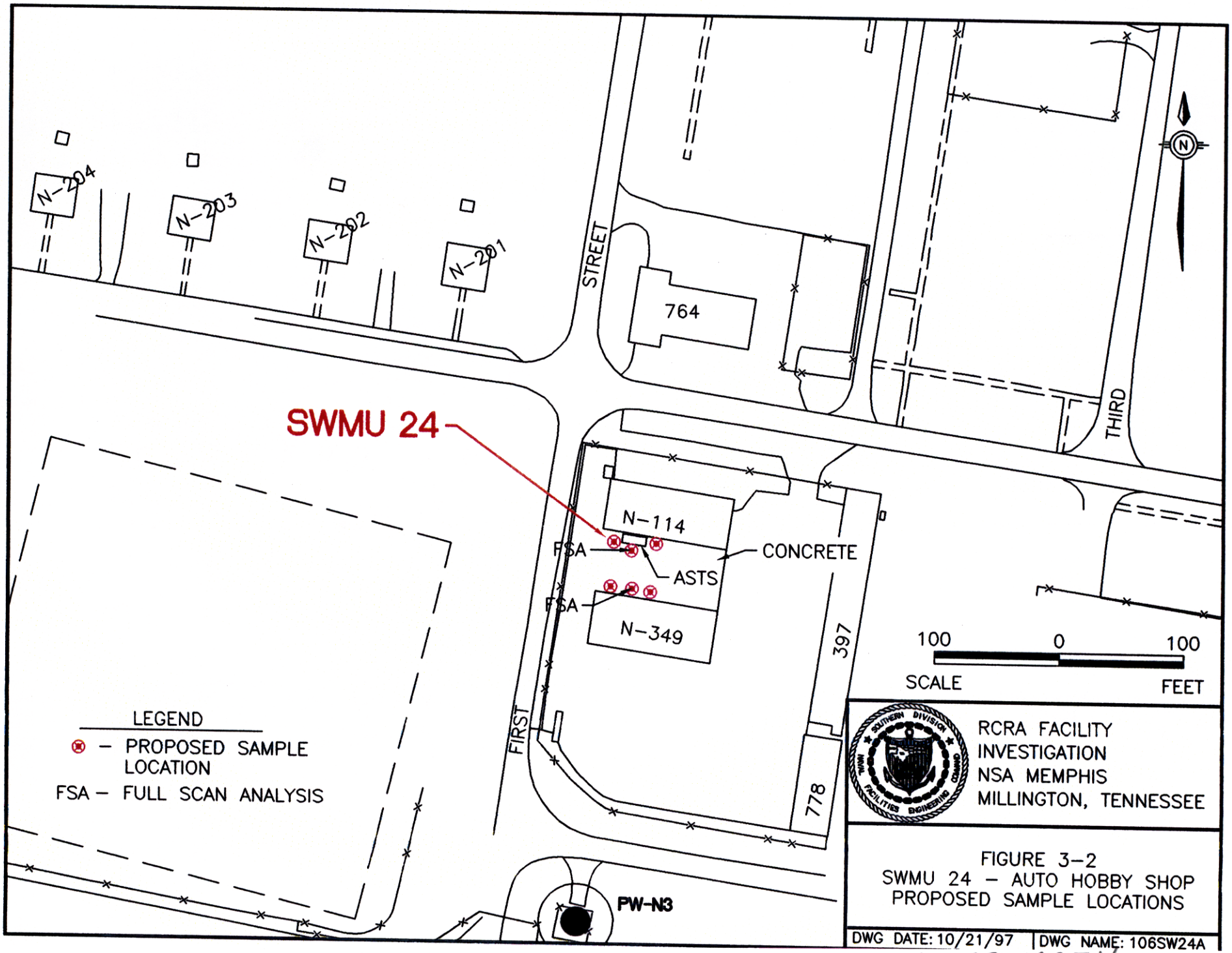

FIGURE 3-2
SWMU 24 – AUTO HOBBY SHOP
PROPOSED SAMPLE LOCATIONS

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Table 3-2 shows the proposed number of samples to be collected and the analyses to be performed.

Table 3-2
Proposed Sampling and Analytical Requirements — SWMU 24

Method	Sample Matrix/Type	Number of Samples	Analysis
Hand Auger	Soil (0 - 1')	2	FSA[a]
Hand Auger	Soil (0 - 1')	4	VOCs, SVOCs, TPH, GRO, DRO, and Appendix IX metals
Hand Auger	Soil (3' - 4')	6	VOCs, SVOCs, TPH, GRO, DRO, and Appendix IX metals

Note:
[a] — FSA includes VOCs, SVOCs, TPH (418.1), TPH-GRO, TPH-DRO, chlorinated pesticides/PCBs, organophosphorus pesticides, chlorinated herbicides, total metals (Appendix IX), and cyanide.

Sample Management

Sample management procedures will adhere to Sections 4.12 and 5 of the *Comprehensive RFI Work Plan*.

Sample Custody

Sample custody will adhere to Section 4.12.5 of the *Comprehensive RFI Work Plan*.

Quality Assurance/Quality Control

QA/QC procedures will adhere to Section 4.14 of the *Comprehensive RFI Work Plan*.

Decontamination Procedures

Decontamination procedures will adhere to Section 4.11 of the *Comprehensive RFI Work Plan*.

Investigation-Derived Waste

IDW will be handled as specified in the *NSA Memphis IDW Management Plan*.

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3.3 Potential Receptors

SWMU 24 is approximately one-half mile northeast of the nearest offsite residence. The nearest NSA Memphis personnel are in Buildings N-114 and N-349, adjacent to SWMU 24.

Surface-water drainage from SWMU 24 enters North Fork Creek via one of two storm water drains north and south of SWMU 24. North Fork Creek, a water and food source for various animals, could expose humans to potential contaminants being transported in the creek through infrequent uses such as wading.

Five production wells at NSA Memphis supply drinking water. The nearest production well, PW-3, is approximately 300 feet south of SWMU 24 and is screened in the Fort Pillow aquifer at 1,450 feet bls. The potential for ecological and human health effects will be analyzed in more detail and presented in an RFI report, if contamination warranting full RFI characterization is identified at SWMU 24.

3.4 Quality Assurance Plan

The QA plan presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout this CSI at SWMU 24.

3.5 Data Management Plan

The data management plan presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during this CSI for SWMU 24.

3.6 Health and Safety Plan

The site-specific health and safety plan for SWMU 24 is included as Attachment C. The E/A&H Comprehensive Health and Safety Plan for work conducted at NSA Memphis is included in Section 7 of the *Comprehensive RFI Work Plan*.

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4.0 SWMU 41

SWMU 41 is an approximately 5,700-square-yard, asphalt-covered storage yard (Salvage Yard No. 2), designated as a nonhazardous storage area, near the southwest corner of the NSA Memphis Southside (Figure 4-1). SWMU 41 is reported to have been in operation since 1944, and may have received hazardous material. During a 1990 inspection, no visual evidence of a release was found (ERC/EDGe, 1990). A copy of the 1990 RFA information compiled for SWMU 41 is included in Attachment A.

Topography and Drainage

SWMU 41 and the surrounding area are characterized by relatively level, low-relief topography. Because it is south of the flood berm, flooding in Big Creek Drainage Canal would affect SWMU 41 before it would impact areas north of the berm. The immediate area was covered with gravel until the early 1980s and has since been capped with asphalt. Surface water flows toward the south and drains into Big Creek Drainage Canal. A topographic map showing land surface elevations is provided in Attachment B to this document.

Geologic and Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12 of the *Comprehensive RFI Work Plan*. Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee*.

Stratigraphy

Site-specific stratigraphic data for SWMU 41 are not available; however, information was obtained from the SWMU 65 RFI report. SWMU 65 is approximately 1,000 feet southeast of SWMU 41. Alluvium is assumed to be present from land surface to the top of the Cockfield Formation near the Big Creek Drainage Canal. The upper alluvium consists of clay, silty clay,

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clayey silt, and silt. In general, the clay content decreases while the sand content increases with depth. The upper alluvium's thickness ranges from 20 feet in soil boring 065S05UA to 29 feet in soil boring 065S06UA. The deeper alluvium consists of sand and gravel. In general, its uppermost portion is a silty or clayey fine- to medium-grained sand with sparse to frequent gravel. The deep alluvium is 29 feet thick in soil boring 065S06DA. Table 4-1 lists the stratigraphic units encountered.

Table 4-1
Stratigraphic Data

Stratigraphic Unit	065S06UA/065G06UA[a,b]	065S06DA/065G06DA[a,b]
Loess or Upper Alluvium	0-29 feet bls (29')	0-29 feet bls (29')
Fluvial Deposits or Deeper Alluvium	29-42 feet bls (13')	29-42 feet bls (13')
Cockfield Formation	42 - >46 feet bls (> 4')	42 - >46 feet bls (> 4')

Notes:
[a] — Lithologic descriptions for 065S06UA/065G06US and 065S06DA/065G06DA are taken from *Draft RCRA Facility Investigation Report, Assembly E - SWMUs 2, 9, 14, 38, 59, and 65, NSA Memphis, Millington, Tennessee*, June 13, 1997. EnSafe/Allen & Hoshall.
[b] — S = soil boring, G = monitoring well, UA = upper alluvium, DA = deeper alluvium
(29') — indicates thickness of formation

Based on water level measurements taken during the SWMU 65 RFI, groundwater near SWMU 41 flows southerly in the upper alluvium. Within the NSA Memphis Southside, groundwater in the loess/shallow alluvium typically moves downward to recharge the deeper fluvial deposits. In the immediate vicinity of SWMU 41, some water in the loess may move laterally and discharge to the south into Big Creek Drainage Canal.

Climatological Data

Regional climatological data are provided in Section 2.8 of the *Comprehensive RFI Work Plan*.

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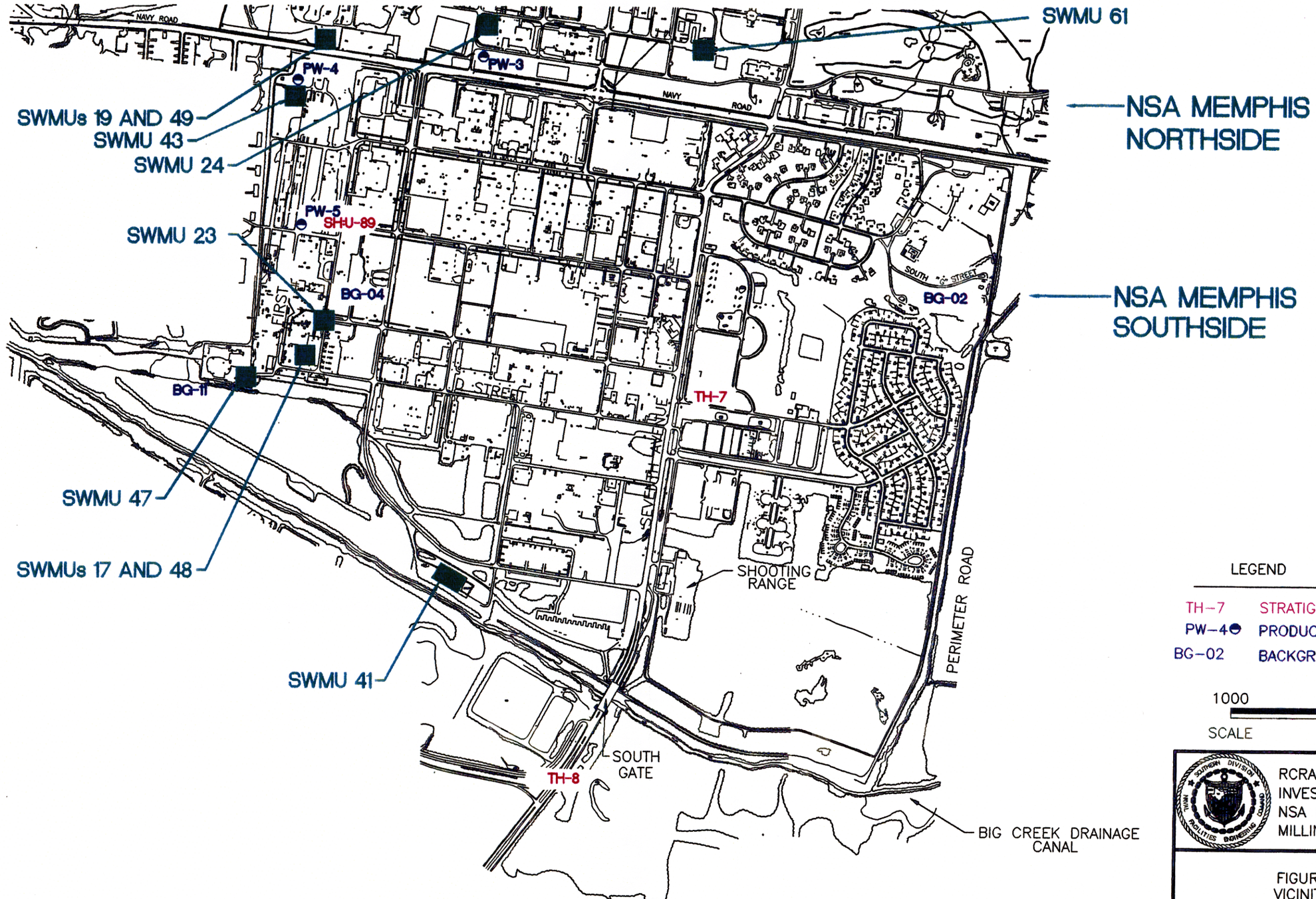

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4.1 Source Characterization

This SWMU is reported to have been used to store scrap metal, derelict equipment (planes, helicopters, etc.), tires, furniture, and batteries.

Field sampling will be performed to determine whether a release has occurred at SWMU 41. If contamination is verified, and the degree of contamination warrants, the scope of the investigation may be expanded to meet RFI requirements. Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of contaminants identified as exceeding appropriate action levels. If a contaminants action level is exceeded, fate and transport mechanisms, as well as risk, will be evaluated for the contaminant. The procedures and references used to determine these characteristics will be documented in an RFI report.

4.2 Characterization of Hazardous Constituent Releases

Previous Investigations

No previous investigations are known to have been conducted at SWMU 41.

Data Gaps

The following data gaps will be the focus of this investigation:

- The presence of surface soil contamination, if any, associated with the salvage yard.
- The presence of subsurface soil contamination, if any, associated with the salvage yard.
- The potential for alluvial (both upper and deep) groundwater contamination associated with the salvage yard.

Inorganic constituents identified in SWMU 41 soil will be compared to background reference concentrations, RBCs, and SSLs (USEPA, 1996) to determine whether measured values occur

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naturally or indicate contamination. Organics will be compared to RBCs and SSLs. A Preliminary Risk Evaluation (PRE) will be performed on organic and inorganic constituents.

Surface soil and groundwater samples from the background monitoring wells installed in 1995 and 1996 were analyzed for Appendix IX metals. The procedures used to determine the inorganics background RCs are documented in the *Reference Concentrations Technical Memorandum*.

Objective of the Proposed Field Investigation

The primary objective of the proposed field investigation is to determine whether a release has occurred at SWMU 41. All samples will be collected and processed as per Section 4 of the *Comprehensive RFI Work Plan*. If contamination is identified at SWMU 41, the BCT will review the sampling results to determine whether a second round of investigation, to include soil borings and/or monitoring wells, will be necessary.

Field personnel may deviate from the strategy outlined below if field conditions or data (i.e., visual observations) suggest additional or different intervals may be successfully sampled or yield more useful information. Any deviations will be documented in the field logbook and the CSI report. The investigatory area may then be enlarged or reduced, based on initial data results.

Soil

The proposed soil investigation will consist of Geoprobe sampling (as outlined in Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) for offsite laboratory analysis. Four proposed sample locations, as shown in Figure 4-2, have been selected. Soil samples will be collected and submitted for laboratory analysis from the surface to about 1 foot deep. The samples are to assess risk associated with any surface contaminants, and to inspect for any surface spills.

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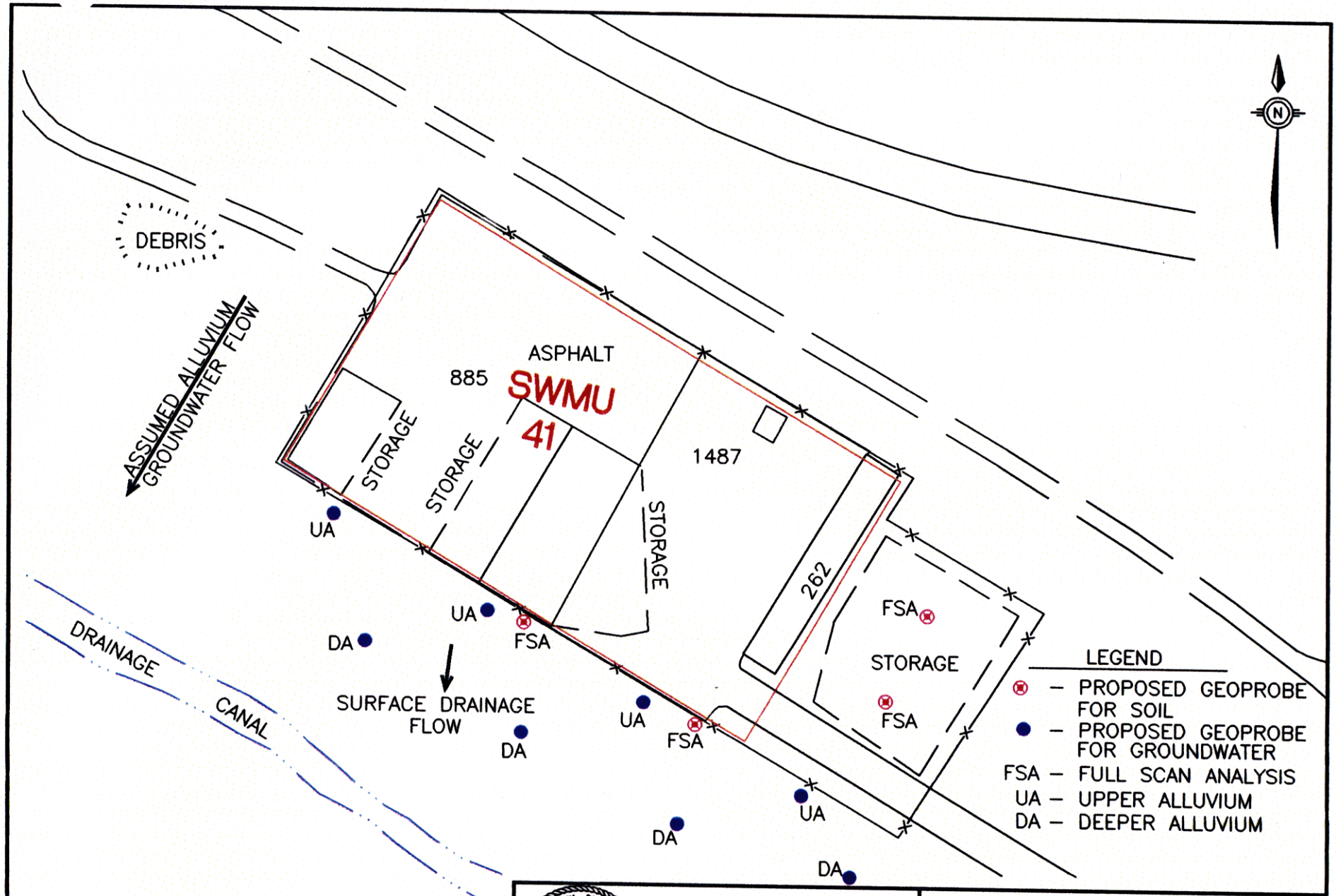

RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 4–2
SWMU 41
PROPOSED SAMPLE LOCATIONS

DWG DATE: 10/23/97 | DWG NAME: 106SW41A

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The four soil samples will be analyzed for FSA for risk assessment purposes, and locations may be changed based on soil discoloration. All soil samples will be analyzed at an offsite laboratory.

Groundwater

Groundwater samples will be collected because of material which was stored in the past on the gravel prior to it being covered with asphalt. Groundwater samples will be collected from the deeper alluvium at four sample locations. In addition to the deeper alluvium sample locations, four additional samples will be collected from the upper alluvium at different sample locations.

The proposed groundwater investigation will consist of Geoprobe sampling for offsite laboratory VOC analysis. VOCs will be used as an indicator parameter because they include constituents of petroleum and solvents (common contaminants at NSA Memphis) and because of the small sample volume required. Based on previous work at other SWMUs, the Geoprobe should be able to penetrate through the upper alluvium and into sand and gravel in the lower alluvium to a refusal depth of about 50 feet. Groundwater samples will be collected as dictated by field conditions (i.e., buried utilities could cause some sampling locations to be moved).

Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the first phase of the investigation, a second phase, consisting of advancing and sampling soil borings and/or installing and sampling monitoring wells, may be implemented. The number, locations, and depths of soil borings and/or monitoring wells will be determined using data from the first phase of this investigation. An addendum to this plan describing the proposed drilling, sampling, and analytical strategies for an expanded investigation will be prepared and submitted to the BCT for review and comment if a second phase is required.

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Analytical Requirements

Two upper interval soil samples will be analyzed at an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- SVOCs, USEPA Method 8270
- TPH, USEPA Method 418.1
- TPH-GRO, TN Modified 8015/GRO
- TPH-DRO, TN Modified 8015/DRO
- Chlorinated pesticides/PCBs, USEPA Method 8080
- Organophosphorus pesticides, USEPA Method 8140
- Chlorinated herbicides, USEPA Method 8150
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series
- Total cyanide, USEPA Method 9010

The remaining soil samples will be analyzed at an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series
- TPH-GRO, TN Modified 8015/GRO
- TPH-DRO, TN Modified 8015/DRO
- TPH, USEPA Method 418.1

All groundwater samples will be analyzed at an offsite laboratory for VOCs by USEPA Method 8240.

Table 4-2 shows the proposed number of samples to be collected and the analyses to be performed.

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Table 4-2
Proposed Sampling and Analytical Requirements — SWMU 41

Method	Sample Matrix/Interval	Number of Samples	Analysis
Geoprobe	Soil- (0-1')	4	FSA[a]
Geoprobe	Groundwater- upper alluvium	4	VOCs
	deeper alluvium	4	VOCs

Note:
[a] — FSA includes VOCs, SVOCs, TPH, TPH-GRO, TPH-DRO, chlorinated pesticides/PCBs, organophosphorus pesticides, chlorinated herbicides, total metals (Appendix IX), and cyanide.

Sample Management

Sample management procedures will adhere to Sections 4.12 and 5 of the *Comprehensive RFI Work Plan*.

Sample Custody

Sample custody will adhere to Section 4.12.5 of the *Comprehensive RFI Work Plan*.

Quality Assurance/Quality Control

QA/QC procedures will adhere to Section 4.14 of the *Comprehensive RFI Work Plan*.

Decontamination Procedures

Decontamination procedures will adhere to Section 4.11 of the *Comprehensive RFI Work Plan*.

Investigation-Derived Waste

IDW will be handled as specified in the *NSA Memphis IDW Management Plan* (E/A&H, 1995b).

4.3 Potential Receptors

SWMU 41 is approximately 4,000 feet southeast of the nearest offsite residence. NSA Memphis personnel work in the salvage yard during normal working hours.

Storm water runoff from SWUM 41 discharges into Big Creek Drainage Canal, which may serve as a food and water source for various animals. Off NSA Memphis property, infrequent contact with surface water and sediment by the general public is possible due to unrestricted access to the drainage way. According to NSA Memphis personnel, no fishing or swimming occurs in Big Creek Drainage Canal, but children may play near it.

Five production wells at NSA Memphis supply drinking water. The nearest production wells to SWMU 41 are PW-4 and PW-5, as shown in Figure 4-1. PW-4 is approximately 5,200 feet northwest of SWMU 41, and PW-5 is approximately 3,800 feet northwest. Both production wells are screened in the Fort Pillow aquifer (PW-4 is screened at 1,450 feet bls, and PW-5 is screened at 1,435 feet bls), with the Flour Island confining unit separating the overlying Memphis sand aquifer from the Fort Pillow aquifer. The potential for ecological and human health effects will be analyzed in more detail and presented in an RFI report, if contamination warranting full RFI characterization is identified at SWMU 41.

4.4 Quality Assurance Plan

The QA plan presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout this CSI at SWMU 41.

4.5 Data Management Plan

The data management plan presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during this CSI for SWMU 41.

4.6 Health and Safety Plan

The site-specific health and safety plan for SWMU 41 is included in Attachment C. The E/A&H Comprehensive Health and Safety Plan for work conducted at NSA Memphis is included in Section 7 of the *Comprehensive RFI Work Plan.*

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5.0 SWMU 43

SWMU 43 is a former hazardous waste accumulation point along the west side of former Building S-176 on the NSA Memphis Southside (Figure 5-1). Building S-176 was demolished on January 28, 1986. Currently, the area where Building S-176 stood is covered with gravel and used as parking or for storage. The hazardous waste accumulation point at Building S-176 is reported to have operated from an unknown date until 1986. During a 1990 inspection, Building S-176 had been demolished and the accumulation point was no longer in use (ERC/EDGe, 1990). In a 1951 drawing, Building S-176 was listed as a cement shed, while in a 1970s drawing, it was listed as family housing storage. The information compiled on SWMU 43 from the 1990 RFA is included in Attachment A.

Topography and Drainage

SWMU 43 and the surrounding area are characterized by relatively level, low-relief topography. The building foundation appears to have been removed or to have been covered with gravel. Surrounding areas have gravel or grass cover. Surface water drains toward a catch basin to the south and then flows west to a north-south drainage ditch (SWMU 38) which flows into Big Creek Drainage Canal. A topographic map showing land surface elevations is provided in Attachment B.

Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12 of the *Comprehensive RFI Work Plan*. Updated information is available in the *Hydrogeology of Post Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee*.

Stratigraphy

Site-specific stratigraphic data for SWMU 43 are not available; however, information was obtained from the SWMU 5 RFI report (pending) conducted by EnSafe/Allen & Hoshall SWMU 5 is 1,000 feet north of SWMU 43 and the stratigraphic data indicate a complex shallow geology of

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low to very low-permeability silty clays and clays overlying a silt horizon (loess). Laboratory-measured hydraulic conductivities for the silty-clay unit were reported to be 1.4×10^{-7} cm/sec (E/A&H, 1996b); no conductivity data are available for the underlying silt unit. Based on the 65-foot boring for monitoring well 05MW05LF at SWMU 5, the silty clays changed to a yellowish to pinkish gray sand at about 40 feet bls and continued as sand until the Cockfield Formation was encountered at about 65 feet bls.

To obtain deeper geologic information that could be related to SWMUs in the area, the USGS drilled stratigraphic Test Hole 4 to approximately 200 feet bls at a location approximately 500 feet south of the main runway and about 2,500 feet north of SWMU 43. The test hole was originally to be advanced approximately 15 feet into the Cook Mountain Formation, the confining unit separating the Memphis aquifer from the overlying Cockfield Formation and shallower units. Due to the unanticipated thinness of the Cockfield Formation, this borehole was advanced approximately 50 feet into the Memphis sand aquifer. The test hole was visually logged by a field geologist during drilling and geophysically logged following completion. Lithologies encountered in the 05MW05LF boring and the test hole were as follows:

Table 5-1
Stratigraphic Data

Stratigraphic Unit	05MW05LF	Test Hole 4
Loess	Approximately 40 feet of loess. These materials were described as silt and clay.	Approximately 40 feet of loess. These materials were described as silt and clay.
Fluvial Deposits	Approximately 25 feet of sand with some gravel deposits.	Approximately 25 feet of fluvial deposits. These materials were described as sand and gravel.
Cockfield Formation	Boring terminated at the top of Cockfield Formation (approximately 66 feet bls).	Approximately 30 feet of alternating sand, clay and some lignite.
Cook Mountain Formation	Not sampled.	Characterized as a gray to blue-gray dense clay. Defined as the upper confining unit between the surficial aquifer(s) and the Memphis aquifer. The boring for Test Hole 4 was advanced 44 feet into the Cook Mountain Formation.

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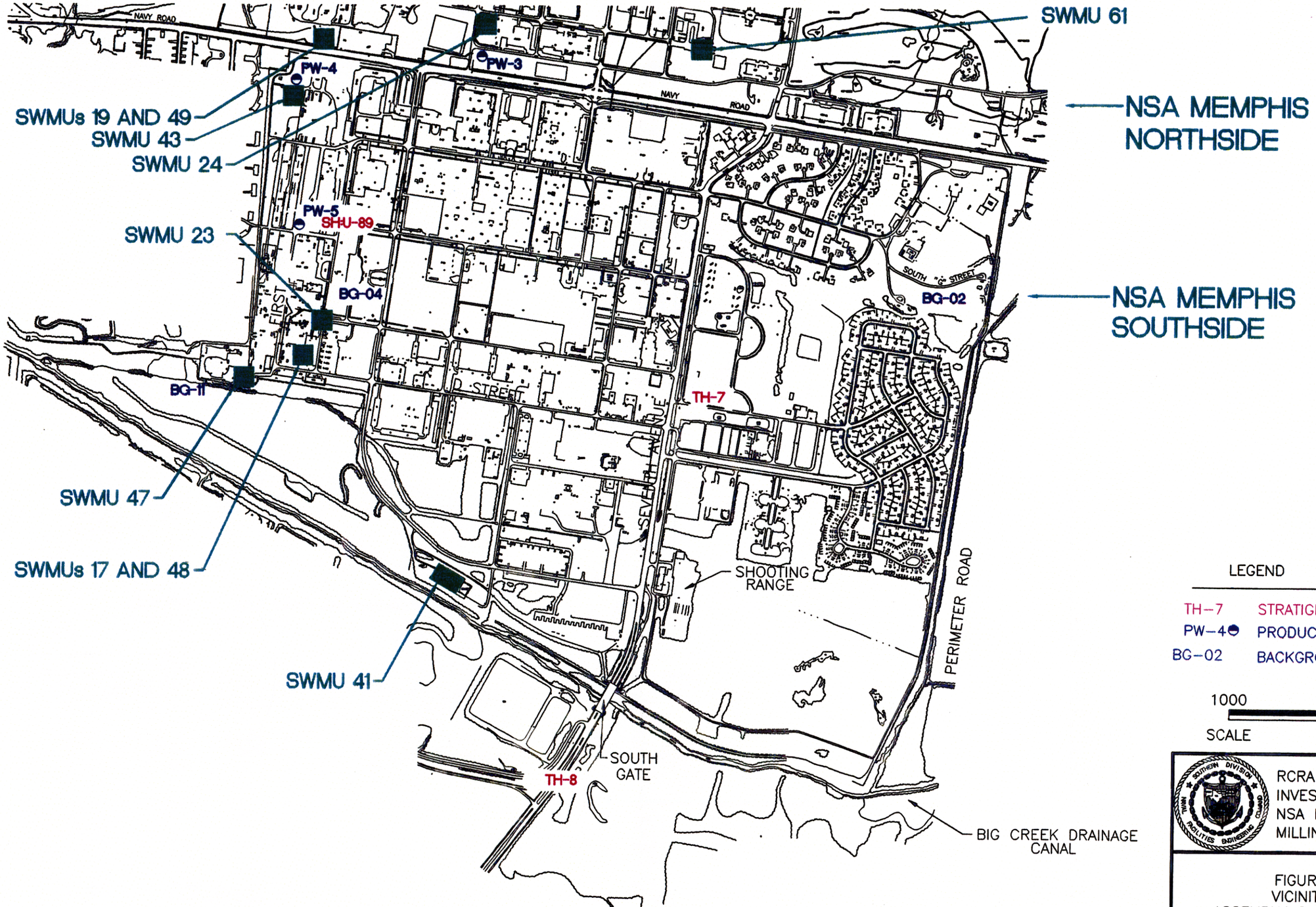

LEGEND

TH-7	STRATIGRAPHIC TEST HOLE
PW-4	PRODUCTION WELL
BG-02	BACKGROUND WELL

1000 0 1000

SCALE FEET

RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 5-1
VICINITY MAP
ASSEMBLY G AND H SWMUs

DWG DATE: 06/20/97 | DWG NAME: 106VMA4

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Shallow Groundwater

Information from a previous UST investigation at SWMU 5 (E/A&H, 1992) indicates that groundwater is typically encountered at the interface between the silt-clay and silt units in the loess. Potentiometric data indicate that shallow groundwater at SWMU 5 is held under confining pressures; water levels in monitoring wells screened in the loess were equilibrated several feet higher than the silty clay/silt interface where water was generally encountered during drilling. As seen at other NSA Memphis locations, loess groundwater at SWMU 5 appears to flow with topography toward the drainage ditch (SWMU 4) that flows east-west across the north side of SWMU 5, although the primary direction of flow probably is vertically downward. It is assumed that shallow groundwater flow at SWMU 43 also flows with topography towards the west and the SWMU 38 ditch.

Water level data in the area indicate that groundwater in the fluvial deposits flows toward the west-southwest. These data were collected from monitoring wells screened in the fluvial deposits across NSA Memphis during other RFIs.

Climatological Data

Regional climatological data are provided in Section 2.8 of the *Comprehensive RFI Work Plan*.

5.1 Source Characterization

Limited information is available on SWMU 43's past use as a hazardous waste accumulation point. SWMU 43 is reported to have been used to store drummed waste paint and solvents.

Field sampling will be performed to determine whether a release has occurred at SWMU 43. If contamination is verified, and the degree of contamination warrants, the scope of the investigation may be expanded to meet RFI requirements. Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of contaminants exceeding appropriate

action levels. If a contaminants action level is exceeded, fate and transport mechanisms, as well as risk, will be evaluated for the contaminant. The procedures and references used to determine these characteristics will be documented in an RFI report.

5.2 Characterization of Hazardous Constituent Releases

Previous Investigations

No previous investigations are known to have been conducted at SWMU 43.

Data Gaps

The following data gaps will be the focus of this CSI:

- The presence of surface soil contamination, if any, associated with the hazardous waste accumulation point.

- The presence of subsurface soil contamination, if any, associated with the hazardous waste accumulation point.

Inorganic constituents identified in soil at SWMU 43 will be compared to background soil concentrations, RBCs, and SSLs. Organics will be compared to RBCs and SSLs. A Preliminary Risk Evaluation (PRE) will be performed on organic and inorganic constituents.

Surface soil and groundwater samples from the background monitoring wells installed in 1995 and 1996 were analyzed for Appendix IX metals. The procedures used to determine the inorganics background RCs are documented in the *Reference Concentrations Technical Memorandum*.

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Objective of the Proposed Field Investigation

The primary objective of the proposed field investigation is to determine whether a release has occurred at SWMU 43. All samples will be collected and processed as per Section 4 of the *Comprehensive RFI Work Plan*. If contamination is identified at SWMU 43, the BCT will review the sampling results to determine whether a second round of investigation, to include soil borings and/or monitoring wells, will be necessary.

Field personnel may deviate from the strategy outlined below if field conditions or data (i.e., visual observations or field screening results) suggest additional or different intervals may be successfully sampled or yield more useful information. Any deviations will be documented in the field logbook and the CSI report. The investigatory area may then be enlarged or reduced, based on initial data results.

Soil

The proposed soil investigation will consist of hand-auger sampling (using methods outlined in Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) for offsite laboratory analysis. Three proposed sampling locations have been selected in and around the hazardous waste accumulation area, as shown in Figure 5-2. One of the three sample locations will be in a nearby drainage ditch to determine whether surface contaminants have migrated via surface runoff. Soil samples will be collected from beneath the gravel surface to 1 foot deep and from the 3 to 4 feet depth interval. The upper interval soil samples are to assess risk associated with any surface contaminants, while the lower interval soil samples are to inspect for contaminant migration, if a release has occurred.

Two of the surface soil samples from the most visibly stained areas and/or with the highest PID readings will be submitted for FSA for risk assessment purposes, while the remaining upper interval sample and the three lower interval samples will be analyzed for VOCs, SVOCs, and

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Appendix IX metal as these are indicators of solvents and some are found in paint as well. All soil samples will be analyzed at an offsite laboratory.

Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the first phase of the investigation, a second phase, consisting of advancing and sampling soil borings and/or installing and sampling monitoring wells, may be implemented. The number, locations, and depths of soil borings and/or monitoring wells will be determined using data from the first phase of this investigation. An addendum to this plan describing the proposed drilling, sampling, and analytical strategies for an expanded investigation will be prepared and submitted to the BCT for review and comment if a second phase is required.

Analytical Requirements

Two of the three upper interval soil samples will be analyzed at an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- SVOCs, USEPA Method 8270
- TPH, USEPA Method 418.1
- TPH-GRO, TN Modified 8015/GRO
- TPH-DRO, TN Modified 8015/DRO
- Chlorinated pesticides/PCBs, USEPA Method 8080
- Organophosphorus pesticides, USEPA Method 8140
- Chlorinated herbicides, USEPA Method 8150
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series
- Total cyanide, USEPA Method 9010

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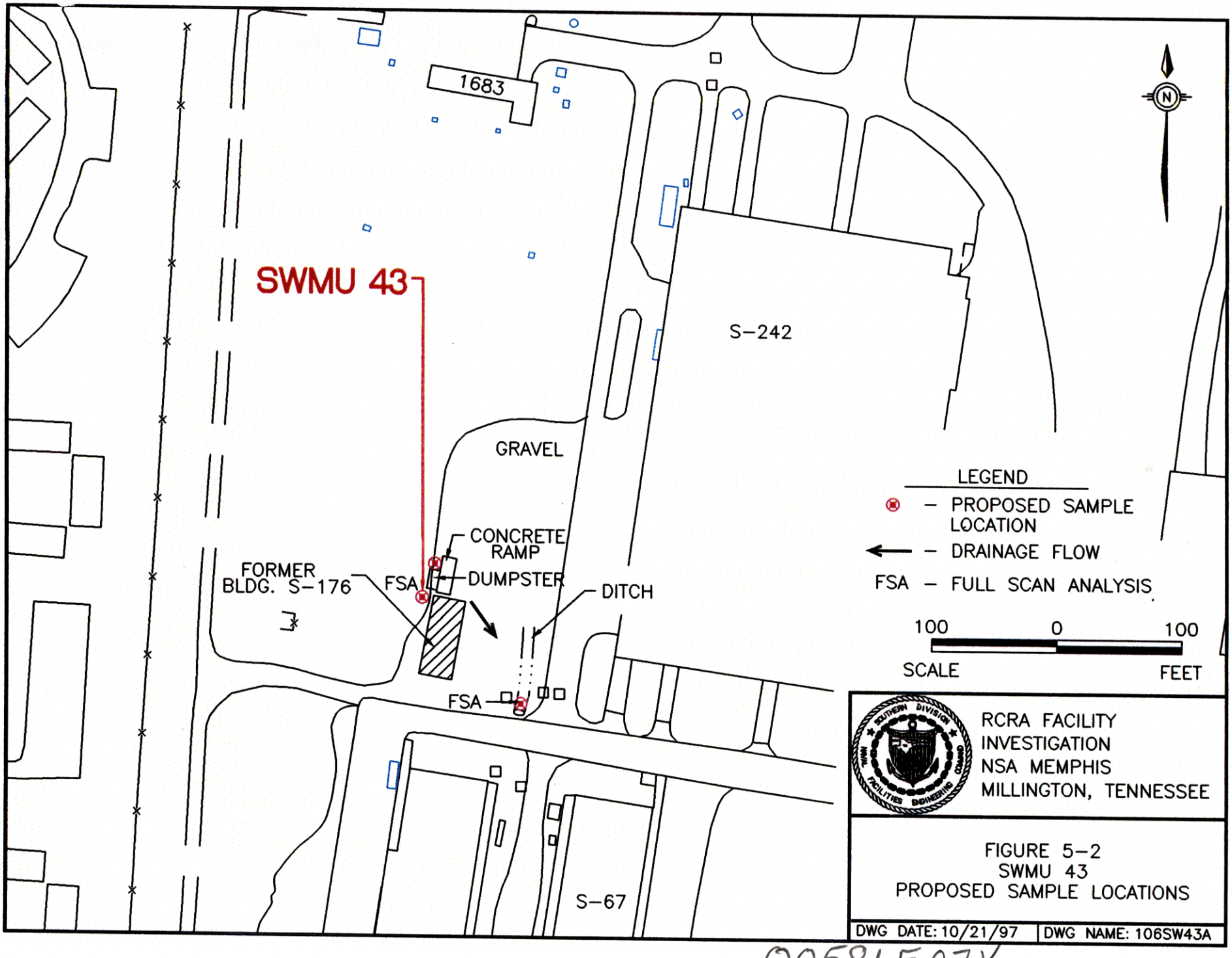

FIGURE 5-2
SWMU 43
PROPOSED SAMPLE LOCATIONS

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The remaining upper interval soil sample and three subsurface soil samples will be analyzed at an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- SVOCs, USEPA Method 8270
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series

Table 5-2 shows the proposed number of samples to be collected and the analyses to be performed.

Table 5-2
Proposed Sampling and Analytical Requirements — SWMU 43

Method	Sample Matrix/Interval	Number of Samples	Analysis
Hand Auger	Soil (0-1')	2	FSA[a]
Hand Auger	Soil (0 - 1')	1	VOCs, SVOCs, and Appendix IX metals
Hand Auger	Soil (3'- 4')	3	VOCs, SVOCs, and Appendix IX metals

Note:
[a] — FSA includes VOCs, SVOCs, TPH (418.1), TPH-GRO, TPH-DRO chlorinated pesticides/PCBs, organophosphorus pesticides, chlorinated herbicides, total metals (Appendix IX), and cyanide.

Sample Management

Sample management procedures will adhere to Sections 4.12 and 5 of the *Comprehensive RFI Work Plan*.

Sample Custody

Sample custody will adhere to Section 4.12.5 of the *Comprehensive RFI Work Plan*.

Quality Assurance/Quality Control

QA/QC procedures will adhere to Section 4.14 of the *Comprehensive RFI Work Plan*.

Decontamination Procedures

Decontamination procedures will adhere to Section 4.11 of the *Comprehensive RFI Work Plan*.

Investigation-Derived Waste

IDW will be handled as specified in the *NSA Memphis IDW Management Plan*.

5.3 Potential Receptors

SWMU 43 is approximately 500 feet east of the nearest offsite residence. The closest NSA Memphis personnel are 100 feet east of SWMU 43 in Building S-242.

Storm water runoff from SWMU 43 discharges into SWMU 38, in turn discharging into Big Creek Drainage Canal, which may serve as a food and water source for various animals. SWMU 38 comprises drainage ways in populated areas of NSA Memphis; therefore, infrequent contact with surface water and sediment by NSA Memphis personnel is possible. Off NSA Memphis property, infrequent contact with surface water and sediment by the general public is possible due to unrestricted access to the drainage way. According to NSA Memphis personnel, no fishing or swimming occurs in Big Creek Drainage Canal, but children may play near it.

Five production wells at NSA Memphis supply drinking water. Two production wells, PW-4 and PW-5, are near SWMU 43. PW-4 is approximately 350 feet north of SWMU 43, and PW-5 is approximately 1,200 feet south. Both production wells are screened in the Fort Pillow aquifer (PW-4 is screened at 1,450 feet bls, and PW-5 is screened at 1,435 feet bls) with the Flour Island confining unit separating the overlying Memphis sand aquifer from the Fort Pillow aquifer. The

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potential for ecological and human health effects will be analyzed in more detail and presented in an RFI report, if contamination warranting full RFI characterization is identified at SWMU 43.

5.4 Quality Assurance Plan

The QA plan presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout this CSI at SWMU 43.

5.5 Data Management Plan

The data management plan presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during this CSI for SWMU 43.

5.6 Health and Safety Plan

The site-specific health and safety plan for SWMU 43 is included in Attachment C of this document. The E/A&H Comprehensive Health and Safety Plan for work at NSA Memphis is included in Section 7 of the *Comprehensive RFI Work Plan*.

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6.0 SWMU 47

SWMU 47 is a former hazardous waste accumulation point on the south side of Building S-344 which is in the southwest corner of the NSA Memphis Southside at the west end of D Street (former Seabees Compound) (Figure 6-1). The SWMU is a concrete pad area which abuts Building S-344 and joins a concrete wash rack. The area south of the concrete is a grass field extending approximately 50 feet to the north bank of a tributary (SWMU 38) of Big Creek Drainage Canal. SWMU 47 reportedly stored mineral spirits, waste oil, and hydraulic fluid from 1983 to 1992. No visual evidence of a release was identified during a 1990 inspection (ERC/EDGe, 1990). The information compiled on SWMU 47 during the 1990 RFA is included in Attachment A.

Topography and Drainage

SWMU 47 and the surrounding area are characterized by relatively level, low-relief topography. Surrounding areas are covered with concrete or grass. Surface drainage is toward the south to a drainage ditch (SWMU 38) which flows into Big Creek Drainage Canal. A topographic map showing land surface elevations is provided in Attachment B.

Geologic and Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12 of the *Comprehensive RFI Work Plan*. Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee*.

Stratigraphy

Site-specific data were not available for SWMU 47. However, lithological information was obtained while installing background monitoring well 0BGG11MA (BG11) approximately 300 feet west of SWMU 47 (Figure 6-1). Table 6-1 lists stratigraphic units encountered.

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Table 6-1
Stratigraphic Data

Stratigraphic Unit	BG11
Alluvium	Loess or upper alluvium interval, 0-36 feet bls (36') and consists of clay, silty clay, clayey silt, and silt.
Loess	Loess or upper alluvium interval, 0-36 feet bls (36') and consists of silt and clay deposits.
Fluvial Deposits	Sand and gravel, 37-69 feet bls (32')
Cockfield Formation	Sand, silt, and clay, 67 feet bls to termination depth of the boring at 76 feet bls
Cook Mountain Formation	Not Sampled

Notes:
bls — below land surface
(32') — depth of stratigraphic unit

Within the NSA Memphis Southside, groundwater in the loess/shallow alluvium typically moves downward to recharge the deeper fluvial deposits or alluvium. In the immediate vicinity of SWMU 47, some water in the upper alluvium may move laterally and discharge to the south to the SWMU 38 drainage ditch.

Climatological Data

Regional climatological data are provided in Section 2.8 of the *Comprehensive RFI Work Plan.*

6.1 Source Characterization

No previous investigations are known to have been conducted at SWMU 47. This SWMU reportedly stored mineral spirits, waste oil, and hydraulic fluid.

Field sampling will be performed to determine if a release has occurred at SWMU 47. If contamination is verified, and the degree of contamination warrants, the scope of the investigation may be expanded to meet RFI requirements. Reference materials will be used to determine the

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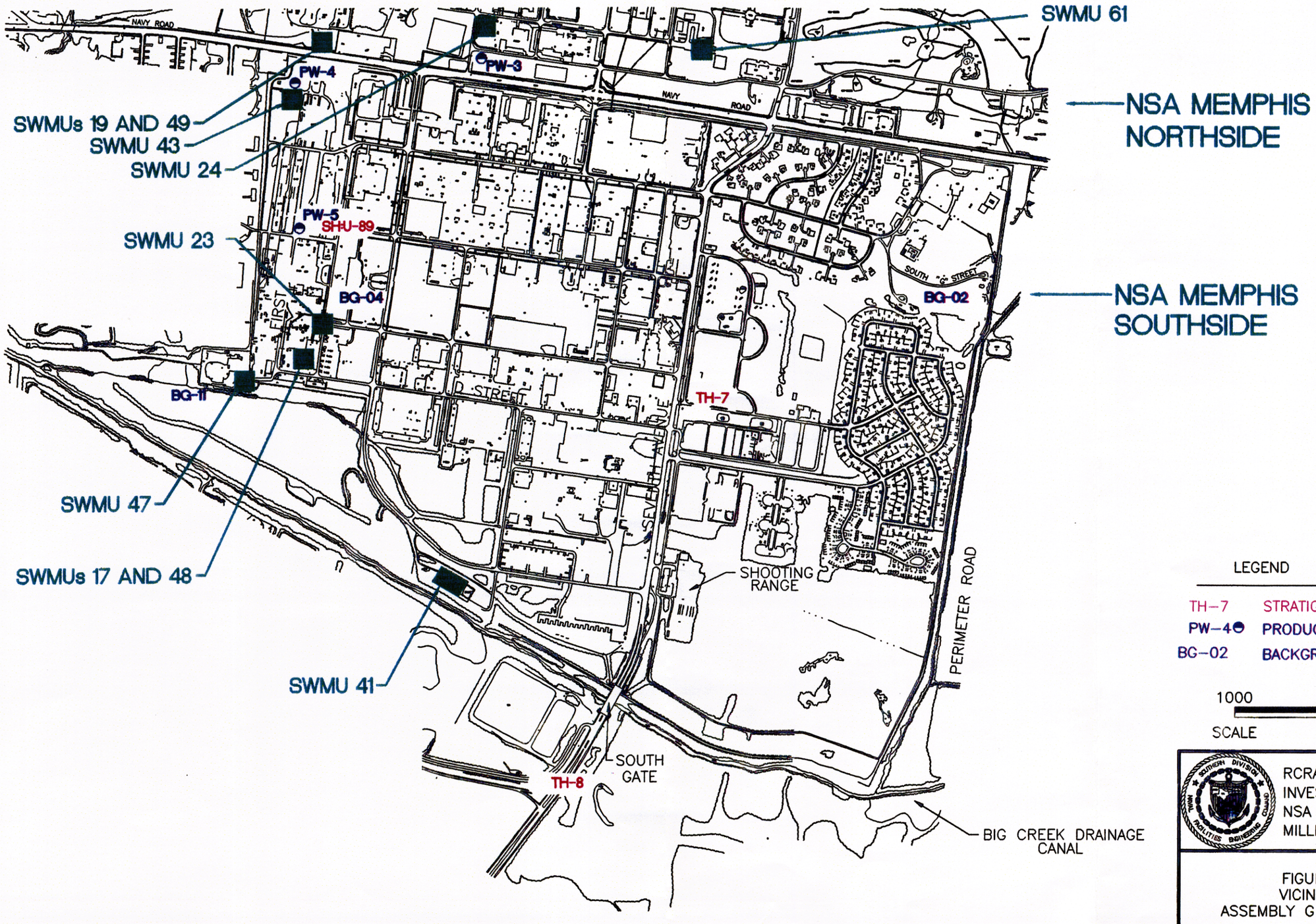

LEGEND

TH–7	STRATIGRAPHIC TEST HOLE
PW–4	PRODUCTION WELL
BG–02	BACKGROUND WELL

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SCALE FEET

RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 6–1
VICINITY MAP
ASSEMBLY G AND H SWMUs

DWG DATE: 06/20/97 | DWG NAME: 106VMA5

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physical, chemical, and migration/dispersal characteristics of contaminants identified as exceeding appropriate action levels. If a contaminants action level is exceeded, fate and transport mechanisms, as well as risk, will be evaluated for the contaminant. The procedures and references used to determine these characteristics will be documented in an RFI report.

6.2 Characterization of Hazardous Constituent Releases

Previous Investigations

No previous investigations are known to have been conducted at SWMU 47.

Data Gaps

The following data gaps will be the focus of this investigation:

- The extent of surface soil contamination, if any, associated with the hazardous waste accumulation point.

- The extent of subsurface soil contamination, if any, associated with the hazardous waste accumulation point.

Inorganic constituents identified in SWMU 47 soil will be compared to background soil concentrations, RCBs, and SSLs. Organics will be compared to RBCs and SSLs. A Preliminary Risk Evaluation (PRE) will be performed on organic and inorganic constituents.

Surface soil and groundwater samples from the background monitoring wells installed in 1995 and 1996 were analyzed for Appendix IX metals. The procedures used to determine the inorganics background reference concentrations (RCs) are documented in the *Reference Concentrations Technical Memorandum*.

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Objective of the Proposed Field Investigation

The primary objective of the proposed field investigation is to determine whether a release has occurred at SWMU 47. All samples will be collected and processed as per Section 4 of the *Comprehensive RFI Work Plan*. If contamination is identified at SWMU 47, the BCT will review the sampling results to determine whether a second round of investigation, to include soil borings and/or monitoring wells, will be necessary.

Field personnel may deviate from the strategy outlined below if field conditions or data (i.e., visual observations or field screening results) suggest additional or different intervals may be successfully sampled or yield more useful information. Any deviations will be documented in the field logbook and the CSI report. The investigatory area may then be enlarged or reduced, based on the initial data results.

Soil

The proposed soil investigation will consist of hand-auger sampling (as outlined in Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) at five proposed sample locations, shown in Figure 6-2. The proposed sample locations were selected in and outside the perimeter of the concrete pad and wash rack along the southeast end of Building S-344. Soil samples will be collected from below the concrete/grass (0 to 1 foot deep) and the subsurface (3 to 4 feet deep). The surface soil samples are for assessing risk and inspecting for surface releases. The subsurface samples will indicate the extent of contamination, if a release has occurred.

The two surface soil samples from the most visibly stained area and/or with the highest PID readings will be analyzed for FSA for risk assessment purposes, while the other three surface and five subsurface soil samples will be analyzed for VOCs, SVOCs, Appendix IX metals, TPH, TPH-GRO, and TPH-DRO. These sample parameters include indicators of the types of materials once stored at SWMU 47. All soil samples will be analyzed at an offsite laboratory.

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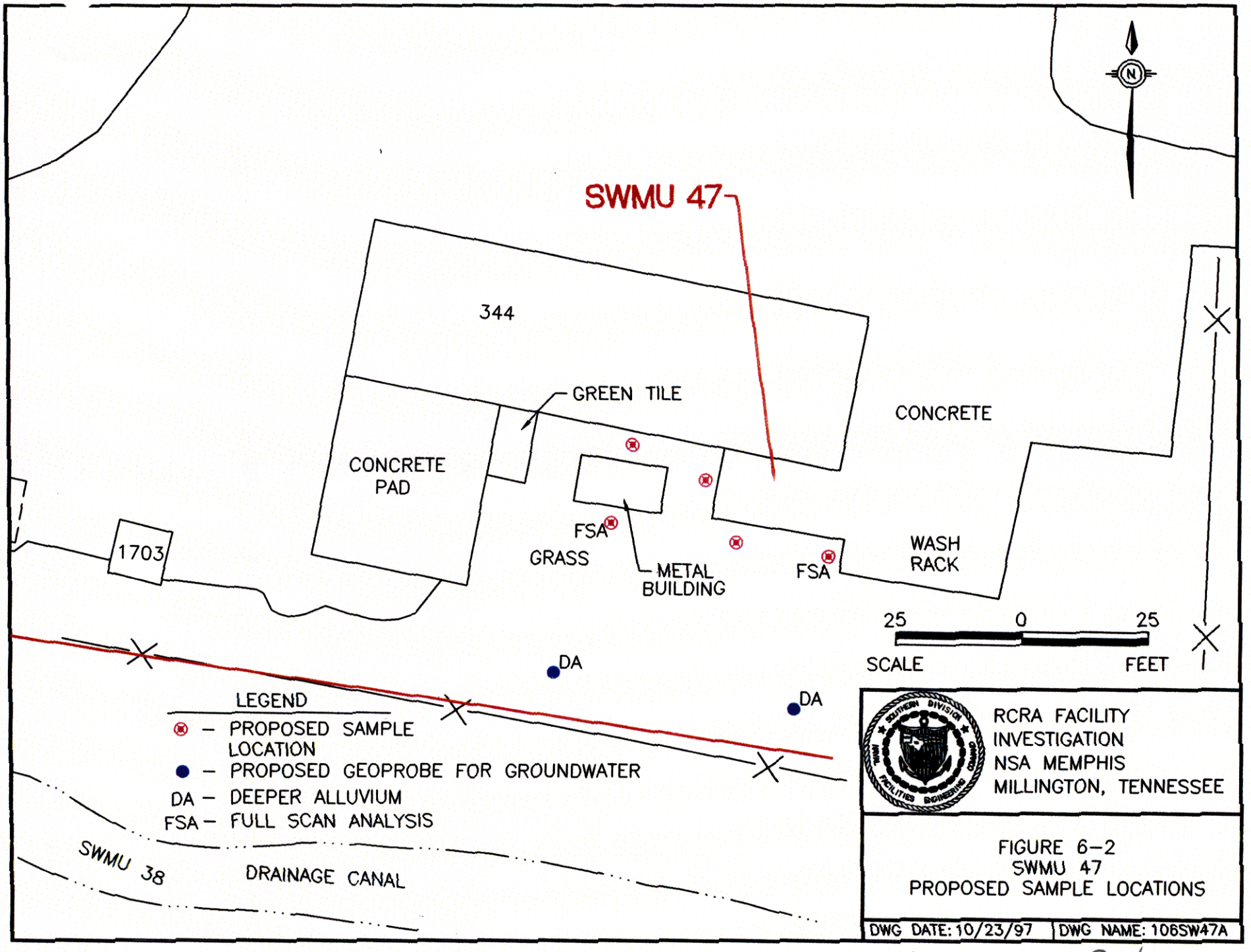

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Groundwater

Groundwater samples will be collected from the deeper alluvium at two sample locations. The proposed groundwater investigation will consist of Geoprobe sampling for offsite laboratory VOC analysis. VOCs will be used as an indicator parameter because they include constituents of petroleum and solvents (common contaminants at NSA Memphis) and because of the small sample volume required. Based on previous work at other SWMUs, the Geoprobe should be able to penetrate through the upper alluvium and into sand and gravel in the lower alluvium to a refusal depth of about 50 feet. Groundwater samples will be collected as dictated by field conditions (i.e., buried utilities could cause some sampling locations to be moved).

Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the first phase of the investigation, a second phase, consisting of advancing and sampling soil borings and/or installing and sampling monitoring wells, may be implemented. The number, locations, and depths of soil borings and/or monitoring wells will be determined using data from the first phase of this investigation. An addendum to this CSI describing the proposed drilling, sampling, and analytical strategies for an expanded investigation will be prepared and submitted to the BCT for review and comment if a second phase is required.

Analytical Requirements

Two of the surface soil samples will be analyzed at an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- SVOCs, USEPA Method 8270
- TPH, USEPA Method 418.1
- TPH-GRO, TN Modified 8015/GRO

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- TPH-DRO, TN Modified 8015/DRO
- Chlorinated pesticides/PCBs, USEPA Method 8080
- Organophosphorus pesticides, USEPA Method 8140
- Chlorinated herbicides, USEPA Method 8150
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series
- Total cyanide, USEPA Method 9010

The remaining soil samples will be analyzed at an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- SVOCs, USEPA Method 8270
- TPH, USEPA Method 418.1
- TPH-GRO, TN Modified 8015/GRO
- TPH-DRO, TN Modified 8015/DRO
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series

Sample Custody

Sample custody will adhere to Section 4.12.5 of the *Comprehensive RFI Work Plan*.

Quality Assurance/Quality Control

QA/QC procedures will adhere to Section 4.14 of the *Comprehensive RFI Work Plan*.

Decontamination Procedures

Decontamination procedures will adhere to Section 4.11 of the *Comprehensive RFI Work Plan*.

Table 6-2 shows the proposed number of samples to be collected and the analyses to be performed.

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Table 6-2
Proposed Sampling and Analytical Requirements — SWMU 47

Method	Sample Matrix/Interval	Number of Samples	Analysis
Hand Auger	Soil (0 - 1')	2	FSA[a]
Hand Auger	Soil (0 - 1')	3	VOCs, SVOCs, TPH, DRO, GRO, and Appendix IX metals
Hand Auger	Soil (3' - 4')	5	VOCs, SVOCs, TPH, DRO, GRO, and Appendix IX metals
Geoprobe	Groundwater-deeper alluvium	2	VOCs

Note:
[a] — FSA includes VOCs, SVOCs, TPH (418.1), TPH-GRO, TPH-DRO, chlorinated pesticides/PCBs, organophosphorus pesticides, chlorinated herbicides, total metals (Appendix IX), and cyanide.

Investigation-Derived Waste

IDW will be handled as specified in the *NSA Memphis IDW Management Plan*.

6.3 Potential Receptors

SWMU 47 is approximately 1,500 feet southeast of the nearest offsite residence. The closest NSA Memphis personnel are at the Resident Officer in Charge of Construction office, adjacent to SWMU 47.

Storm water runoff from SWMU 47 discharges into SWMU 38, in turn discharging into Big Creek Drainage Canal, which may serve as a food and water source for various animals. SWMU 38 comprises drainage ways which are in populated areas of NSA Memphis; therefore, infrequent contact with surface water and sediment by NSA Memphis personnel is possible. Off NSA Memphis property, infrequent contact with surface water and sediment by the general public is possible due to unrestricted access to the drainage way. According to NSA Memphis personnel, no fishing or swimming occurs in Big Creek Drainage Canal, but children may play near it.

Five production wells at NSA Memphis supply drinking water. The nearest production wells to SWMU 47 are PW-4 and PW-5, as shown in Figure 6-1. PW-4 is approximately 3,000 feet north of SWMU 47, and PW-5 is approximately 1,800 feet north. Both production wells are screened in the Fort Pillow aquifer (PW-4 is screened at 1,450 feet bls, and PW-5 is screened at 1,435 feet bls) with the Flour Island confining unit separating the overlying Memphis sand aquifer from the Fort Pillow aquifer. The potential for ecological and human health effects will be analyzed in more detail and presented in an RFI report, if contamination warranting full RFI characterization is identified at SWMU 47.

6.4 Quality Assurance Plan

The quality assurance plan presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout this CSI at SWMU 47.

6.5 Data Management Plan

The data management plan presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during this CSI for SWMU 47.

6.6 Health and Safety Plan

The site-specific health and safety plan for SWMU 47 is included in Attachment C. The E/A&H Comprehensive Health and Safety Plan for work conducted at NSA Memphis is included in Section 7 of the *Comprehensive RFI Work Plan*.

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7.0 SWMUs 17 and 48

SWMU 17, an underground waste tank (UWT) removed in 1996, is approximately 100 feet east of First Avenue on the NSA Memphis Southside in the Building S-9 complex (Figure 7-1). No evidence of a release was visible at SWMUs 17 and 48 during the RFA (ERC/EDGe, 1990), however data from the voluntary corrective action (VCA) removal in June of 1996 of the UWT at SWMU 17, which are presented in Section 7.1 of this CSI work plan, indicate that a release had occurred before the UWT was removed. The period of operation for SWMU 17 is unknown.

SWMU 48 consists of various inactive hazardous waste accumulation points for containerized paint thinner and degreasing agents on the service side (west side) of the Building S-9 complex, just outside overhead doors to work bays. SWMU 48 is reported to have been operated since 1950.

The information compiled on SWMUs 17 and 48 from the 1990 RFA report is included in Attachment A of this document.

Topography and Drainage

SWMUs 17 and 48 and the surrounding area are characterized by relatively level, low-relief topography. The immediate area is covered by gravel or asphalt and descends slightly to the south and west toward a north-south drainage ditch (SWMU 38) which flows southward into Big Creek Drainage Canal. A topographic map showing land surface elevations is included in Attachment B.

Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12 of the *Comprehensive RFI Work Plan*. Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee*.

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Stratigraphy

Site-specific stratigraphic data are not currently available for SWMUs 17 and 48. However, lithological information was obtained from data collected while installing background monitoring well cluster BG-04, approximately 750 feet northeast of SWMUs 17 and 48, and background well 0BG11MA, approximately 900 feet southwest of those SWMUs. Based on the lithologies encountered at BG-04, this area consists of a complex shallow geology of low to very low-permeability silty clays and clays (loess) overlying a sand and gravel horizon (fluvial deposits). SWMUs 17 and 48 are believed to be in a transitional zone of alluvium deposits associated with the Big Creek area (300 feet to the south). Table 7-1 lists stratigraphic units encountered in well cluster BG-04 and background well 0BG11MA (BG11).

Table 7-1
Stratigraphic Data

Stratigraphic Unit	BG-04	BG11
Alluvium	Not present	Loess or upper alluvium interval is 0-36 feet bls (36') and consists of clay, silty clay, clayey silt, and silt.
Loess	Silt and clayey silt 0 to 38 feet bls (38')	Loess or upper alluvium interval is 0-36 feet bls (36') and consists of silt and clay deposits.)
Fluvial Deposits	Sand, gravel, and silt 38 feet bls to 71 feet bls (33')	Sand and gravel, 37-69 feet bls (32')
Cockfield Formation	Sand and clay from 71 feet bls to termination depth of the boring at 76 feet bls.	Sand, silt, and clay, 67 feet bls to termination depth of the boring at 76 feet bls
Cook Mountain Formation	Not sampled	Not sampled

Notes:
bls — below land surface
(38') — depth of stratigraphic unit

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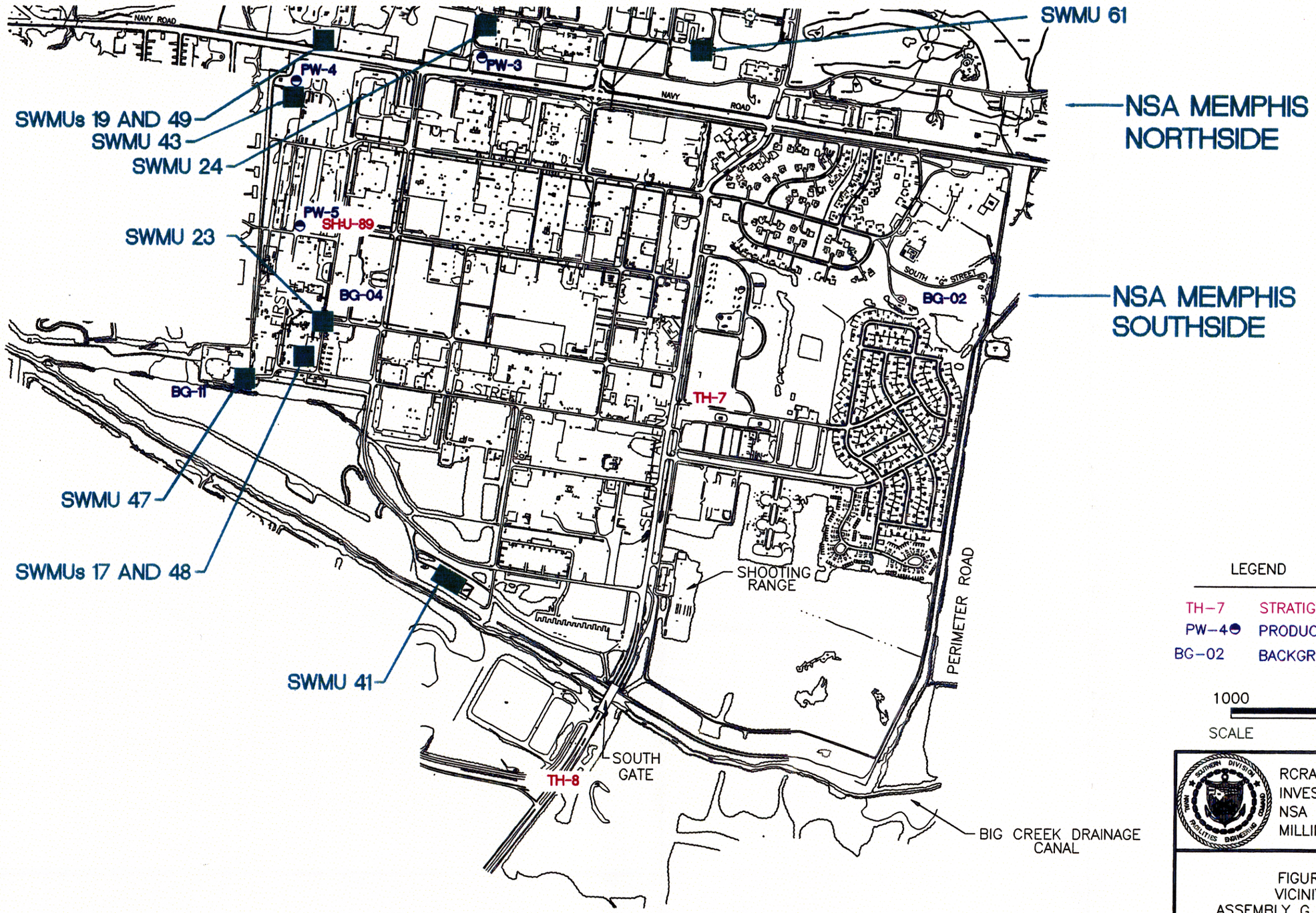

LEGEND

TH-7	STRATIGRAPHIC TEST HOLE
PW-4	PRODUCTION WELL
BG-02	BACKGROUND WELL

1000 0 1000

SCALE FEET

RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 7-1
VICINITY MAP
ASSEMBLY G AND H SWMUs

DWG DATE: 06/20/97 | DWG NAME: 106VMA6

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Shallow Groundwater

Three wells were installed at location BG-04 on the NSA Memphis Southside in January 1995 for the RFIs at Assembly A SWMUs. The wells were completed in the loess (BG04L), upper part of the fluvial deposits (BG04UF), and lower part of the fluvial deposits (BG04LF). Data collected from these wells, located 750 feet to the northeast of SWMUs 17 and 48, indicate that groundwater is typically first encountered at the interface between the silt-clay and clay units in the loess. Groundwater measured on March 30, 1995, indicate static groundwater levels in the wells are approximately 5 feet bls in the loess, and 10 to 11 feet bls in the upper and lower fluvial deposits. Based on the topography and conceptual model of the NSA Memphis hydrogeology (Section 2.12 of the *Comprehensive RFI Work Plan*), groundwater flows southwesterly in the fluvial deposits. Within the NSA Memphis Southside, groundwater in the loess/shallow alluvium most likely moves primarily downward to recharge the deeper fluvial deposits. In the immediate vicinity of SWMUs 17 and 48, some water in the loess/upper alluvium may move laterally and discharge to the south to the SWMU 38 drainage ditch.

Climatological Data

Regional climatological data are provided in Section 2.8 of the *Comprehensive RFI Work Plan*.

7.1 Source Characterization

The *Voluntary Corrective Action Report for SWMU 17* (E/A&H, pending) will detail the removal of UWT 1657. Tables 7-2 and 7-3 present inorganic and organic data from the removal of UWT 1657 which indicate a release may have occurred before the UWT was removed. The removal report for UWT 1657 is included in Attachment D. The RFA references UWT 1657 as a waste oil tank, but is an oil-water separator. The tank removed is Tank S-9 as documented in the removal report in Attachment D.

Table 7-2
Hits-Only for Confirmation Soil Samples from Bottom of Tank Pit
Inorganic Analytical Results from Tank 1657 Removal — SWMU 17

Sample ID	Parameter	Result	Units
017S000101	Antimony	9	mg/kg
	Arsenic	2.5	mg/kg
	Barium	108	mg/kg
	Beryllium	0.45B	mg/kg
	Cadmium	2.8	mg/kg
	Chromium	10.9	mg/kg
	Cobalt	8B	mg/kg
	Copper	19.5	mg/kg
017S000101	Lead	14.4N*	mg/kg
	Nickel	18.8	mg/kg
	Tin	25.4B	mg/kg
	Vanadium	21.6	mg/kg
	Zinc	55.7	mg/kg
017V000101	Barium	1,880	mg/L
017V000201	Barium	1,380	mg/L

Notes:
B — Result is less than the reporting limit but greater than the instrument detection limit.
N* — Spike recovery was not within the method-specified control limits. Laboratory duplicate was not within the method-specified control limits.
mg/kg — Milligrams per kilogram
mg/L — Milligrams per liter

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Table 7-3
Hits Only for Confirmation Soil Samples from Bottom of Tank Pit
Organic Analytical Results from Tank 1657 Removal — SWMU 17 (μg/kg)

Sample ID	Parameter	Result
017S000101	2 methylnaphthalene	15,000
	4,4'-DDD	3.8
	4,4'-DDE	4.8
	4,4'-DDT	2.4
	Endosulfan II	4.4 P
	Endrin	5.6
	Endrin aldehyde	2.3 JP
	Ethylbenzene	370
	Heptachlor epoxide	2.3 P
017S000101	Naphthalene	8,700 J
	Phenanthrene	1,100 J
	Styrene	31 J
	Tetrachloroethene	17 J
	Toluene	140
	Xylene	1,400
	alpha-Chlordane	2.6 P
	bis(2-Ethylhexyl)phthalate	2,400 JB
	o-Xylene	660

Notes:

P — Pesticides/PCBs are analyzed using two gas chromatograph (GC) columns. This flag is applied when the difference between the values of the two columns differs by more than 25%.

JP — Compound was detected at a concentration less than the method reporting limit. Pesticides/PCBs are analyzed using two GC columns. This flag is applied when the difference between the values of the two columns differs by more than 25%.

JB — Compound was detected at a concentration less than the method reporting limit. The analyte was found in the associated lab blank as well as the sample.

J — Compound was detected at a concentration less than the method reporting limit.

μg/kg — Micrograms per kilogram.

SWMU 17 is reported to have received waste automotive oil and hydraulic fluid generated during automobile maintenance at Building S-9. Neither the installation date nor the date when the tank was initially used for waste oil storage is known.

SWMU 48 is reported to have stored waste thinners, degreasers, and batteries, and is an open storage area with no containment and an unprotected ground surface. The SWMU is no longer used as an accumulation point.

Field sampling will be performed to better define the extent of contamination at SWMUs 17 and 48. Since a release from SWMU 17 has been previously identified *(VCA Report: SWMU 3,7, 17, 18, 19, and the Gas Pits*, EnSafe, 1997), the scope of the investigation has been expanded to meet RFI requirements. Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of contaminants identified as exceeding appropriate action levels. Excessive human health risk, ecological risk, and the chemical fate and transport characteristics will be evaluated. The procedures and references used to determine these characteristics will be documented in an RFI report.

7.2 Characterization of Hazardous Constituent Releases

Previous Investigations

The data collected during the removal of UWT 1657 indicated a release may have occurred before the tank was removed in June 1996. Staining was visible around the fill pipe and in subsurface soil above and below the UWT. The *Voluntary Corrective Action Report for SWMU 17* (E/A&H, pending) details the removal of UWT 1657. No other reports of investigations are known to be available concerning SWMUs 17 and 48.

Data Gaps

The following data gaps will be the focus of this investigation:

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- The extent of surface soil contamination associated with the UWT and/or hazardous waste accumulation point.

- The extent of subsurface soil contamination associated with the UWT and/or hazardous waste accumulation point.

- The potential for alluvium and/or fluvial deposits groundwater contamination associated with the UWT and/or the hazardous waste accumulation point.

Inorganic constituents identified in soil at SWMUs 17 and 48 will be compared to background soil concentrations, RBCs, and SSL. Organics will be compared to RBCs and SSLs. A Preliminary Risk Evaluation (PRE) will be performed on organic and inorganic constituents.

Surface soil and groundwater samples from the background monitoring wells installed in 1995 and 1996 were analyzed for Appendix IX metals. The procedures used to determine the inorganics background RCs are documented in the *Reference Concentrations Technical Memorandum*.

Objective of the Proposed Field Investigation

The primary objectives of the proposed field investigation are to better define the extent of contamination identified at SWMU 17 during the tank closure and to determine whether a release has occurred at SWMU 48. All samples will be collected and processed as per Section 4 of the *Comprehensive RFI Work Plan*. The BCT will review the sampling results to determine whether a second round of investigation, to include soil borings and/or monitoring wells, will be necessary.

Field personnel may deviate from the strategy outlined below if field conditions or data (i.e., visual observations or field screening results) suggest additional or different intervals may be successfully sampled or yield more useful information. Any deviations will be documented in the

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field logbook and the CSI report. The investigatory area may then be enlarged or reduced, based on the initial data results.

Soil

The proposed soil investigation will consist of hand auger and Geoprobe sampling (as outlined in Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) for offsite laboratory analysis. Eight soil samples will be collected from four proposed locations, as shown in Figure 7-2, four, outside each bay on the western side of Building S-9 in the area of the hazardous waste accumulation points (SWMU 48). The soil samples will be collected from below the asphalt/concrete (to approximately 1 foot deep) and from 3 to 4 feet deep using a hand auger. The surface soil samples are for inspection of surface releases. The subsurface samples will better define the vertical extent of contamination, if a release has occurred. The soil samples will be analyzed for VOCs, DRO, GRO, TPH, and Appendix IX metals.

Four soil samples will be collected at SWMU 17 from four proposed locations using a Geoprobe. The samples will be collected 5 feet away from each corner of the tank pit-four from the 12 to 15-foot interval (soil-water interface). SWMU 17 soil samples will be analyzed for VOCs, SVOCs, chlorinated pesticides/PCBs, TPH, and Appendix IX metals.

Sample parameters include constituents which are indicators of the types of materials once stored at SWMU 48 and materials received by the UWT at SWMU 17. All of the soil samples will be sent to an offsite laboratory.

Groundwater

The groundwater investigation will focus on the fluvial deposits or deeper alluvium underlying the loess/shallow alluvium at SWMU 17 because it is the preferential zone of groundwater flow and

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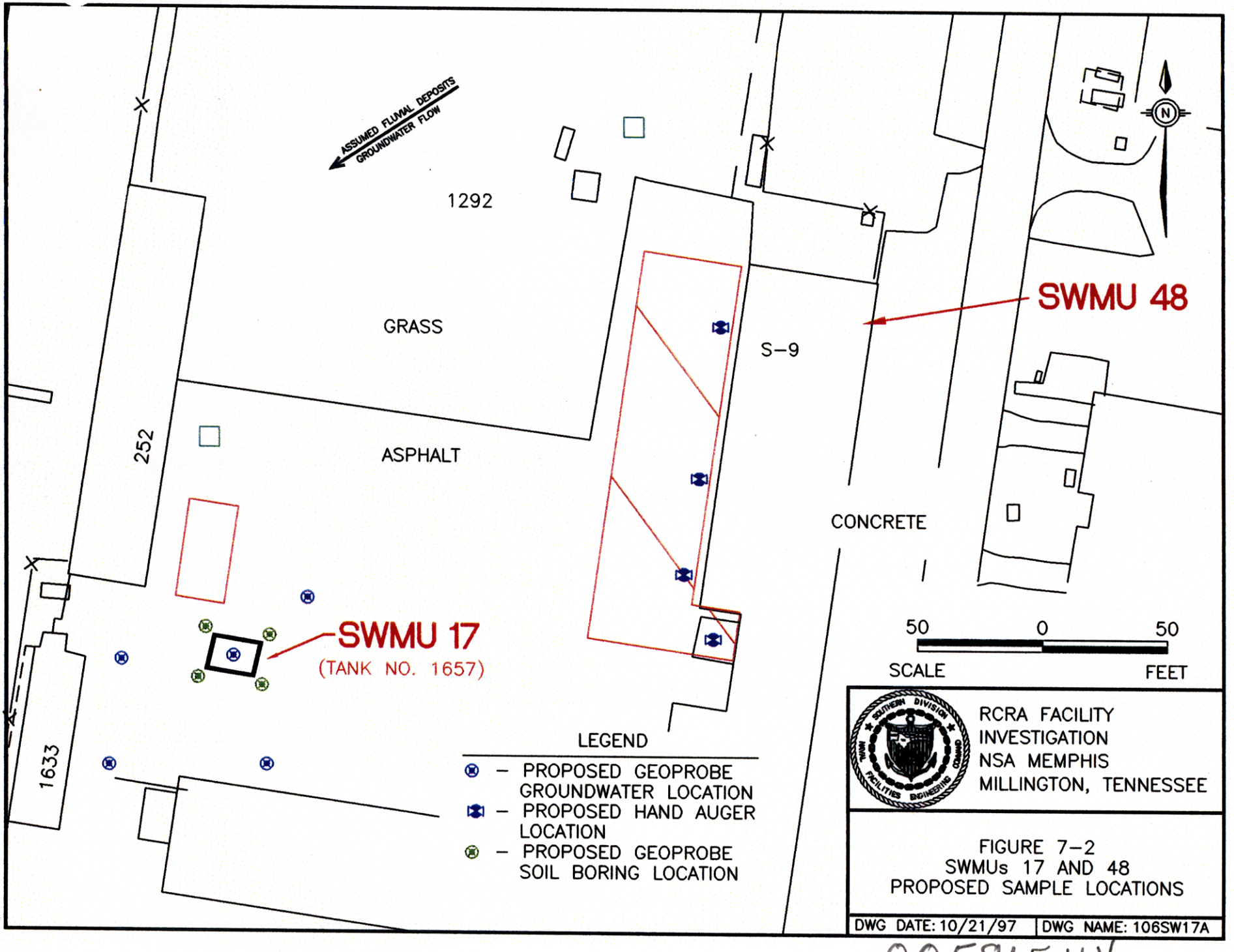
ASSUMED FLUVIAL DEPOSITS GROUNDWATER FLOW
1292
GRASS
ASPHALT
252
1633
S-9
CONCRETE
SWMU 48
SWMU 17
(TANK NO. 1657)
N
50 0 50
SCALE FEET
LEGEND
– PROPOSED GEOPROBE GROUNDWATER LOCATION
– PROPOSED HAND AUGER LOCATION
– PROPOSED GEOPROBE SOIL BORING LOCATION
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 7-2
SWMUs 17 AND 48
PROPOSED SAMPLE LOCATIONS
DWG DATE: 10/21/97
DWG NAME: 106SW17A

00581EUY

Shallow Groundwater

Three wells were installed at location BG-04 on the NSA Memphis Southside in January 1995 for the RFIs at Assembly A SWMUs. The wells were completed in the loess (BG04L), upper part of the fluvial deposits (BG04UF), and lower part of the fluvial deposits (BG04LF). Data collected from these wells, located 750 feet to the northeast of SWMUs 17 and 48, indicate that groundwater is typically first encountered at the interface between the silt-clay and clay units in the loess. Groundwater measured on March 30, 1995, indicate static groundwater levels in the wells are approximately 5 feet bls in the loess, and 10 to 11 feet bls in the upper and lower fluvial deposits. Based on the topography and conceptual model of the NSA Memphis hydrogeology (Section 2.12 of the *Comprehensive RFI Work Plan*), groundwater flows southwesterly in the fluvial deposits. Within the NSA Memphis Southside, groundwater in the loess/shallow alluvium most likely moves primarily downward to recharge the deeper fluvial deposits. In the immediate vicinity of SWMUs 17 and 48, some water in the loess/upper alluvium may move laterally and discharge to the south to the SWMU 38 drainage ditch.

Climatological Data

Regional climatological data are provided in Section 2.8 of the *Comprehensive RFI Work Plan*.

7.1 Source Characterization

The *Voluntary Corrective Action Report for SWMU 17* (E/A&H, pending) will detail the removal of UWT 1657. Tables 7-2 and 7-3 present inorganic and organic data from the removal of UWT 1657 which indicate a release may have occurred before the UWT was removed. The removal report for UWT 1657 is included in Attachment D. The RFA references UWT 1657 as a waste oil tank, but is an oil-water separator. The tank removed is Tank S-9 as documented in the removal report in Attachment D.

Table 7-2
Hits-Only for Confirmation Soil Samples from Bottom of Tank Pit
Inorganic Analytical Results from Tank 1657 Removal — SWMU 17

Sample ID	Parameter	Result	Units
017S000101	Antimony	9	mg/kg
	Arsenic	2.5	mg/kg
	Barium	108	mg/kg
	Beryllium	0.45B	mg/kg
	Cadmium	2.8	mg/kg
	Chromium	10.9	mg/kg
	Cobalt	8B	mg/kg
	Copper	19.5	mg/kg
017S000101	Lead	14.4N*	mg/kg
	Nickel	18.8	mg/kg
	Tin	25.4B	mg/kg
	Vanadium	21.6	mg/kg
	Zinc	55.7	mg/kg
017V000101	Barium	1,880	mg/L
017V000201	Barium	1,380	mg/L

Notes:
B — Result is less than the reporting limit but greater than the instrument detection limit.
N* — Spike recovery was not within the method-specified control limits. Laboratory duplicate was not within the method-specified control limits.
mg/kg — Milligrams per kilogram
mg/L — Milligrams per liter

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Table 7-3
Hits Only for Confirmation Soil Samples from Bottom of Tank Pit
Organic Analytical Results from Tank 1657 Removal — SWMU 17 (μg/kg)

Sample ID	Parameter	Result
017S000101	2 methylnaphthalene	15,000
	4,4'-DDD	3.8
	4,4'-DDE	4.8
	4,4'-DDT	2.4
	Endosulfan II	4.4 P
	Endrin	5.6
	Endrin aldehyde	2.3 JP
	Ethylbenzene	370
	Heptachlor epoxide	2.3 P
017S000101	Naphthalene	8,700 J
	Phenanthrene	1,100 J
	Styrene	31 J
	Tetrachloroethene	17 J
	Toluene	140
	Xylene	1,400
	alpha-Chlordane	2.6 P
	bis(2-Ethylhexyl)phthalate	2,400 JB
	o-Xylene	660

Notes:

P — Pesticides/PCBs are analyzed using two gas chromatograph (GC) columns. This flag is applied when the difference between the values of the two columns differs by more than 25%.

JP — Compound was detected at a concentration less than the method reporting limit. Pesticides/PCBs are analyzed using two GC columns. This flag is applied when the difference between the values of the two columns differs by more than 25%.

JB — Compound was detected at a concentration less than the method reporting limit. The analyte was found in the associated lab blank as well as the sample.

J — Compound was detected at a concentration less than the method reporting limit.

μg/kg — Micrograms per kilogram.

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SWMU 17 is reported to have received waste automotive oil and hydraulic fluid generated during automobile maintenance at Building S-9. Neither the installation date nor the date when the tank was initially used for waste oil storage is known.

SWMU 48 is reported to have stored waste thinners, degreasers, and batteries, and is an open storage area with no containment and an unprotected ground surface. The SWMU is no longer used as an accumulation point.

Field sampling will be performed to better define the extent of contamination at SWMUs 17 and 48. Since a release from SWMU 17 has been previously identified *(VCA Report: SWMU 3,7, 17, 18, 19, and the Gas Pits*, EnSafe, 1997), the scope of the investigation has been expanded to meet RFI requirements. Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of contaminants identified as exceeding appropriate action levels. Excessive human health risk, ecological risk, and the chemical fate and transport characteristics will be evaluated. The procedures and references used to determine these characteristics will be documented in an RFI report.

7.2 Characterization of Hazardous Constituent Releases

Previous Investigations

The data collected during the removal of UWT 1657 indicated a release may have occurred before the tank was removed in June 1996. Staining was visible around the fill pipe and in subsurface soil above and below the UWT. The *Voluntary Corrective Action Report for SWMU 17* (E/A&H, pending) details the removal of UWT 1657. No other reports of investigations are known to be available concerning SWMUs 17 and 48.

Data Gaps

The following data gaps will be the focus of this investigation:

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- The extent of surface soil contamination associated with the UWT and/or hazardous waste accumulation point.

- The extent of subsurface soil contamination associated with the UWT and/or hazardous waste accumulation point.

- The potential for alluvium and/or fluvial deposits groundwater contamination associated with the UWT and/or the hazardous waste accumulation point.

Inorganic constituents identified in soil at SWMUs 17 and 48 will be compared to background soil concentrations, RBCs, and SSL. Organics will be compared to RBCs and SSLs. A Preliminary Risk Evaluation (PRE) will be performed on organic and inorganic constituents.

Surface soil and groundwater samples from the background monitoring wells installed in 1995 and 1996 were analyzed for Appendix IX metals. The procedures used to determine the inorganics background RCs are documented in the *Reference Concentrations Technical Memorandum*.

Objective of the Proposed Field Investigation

The primary objectives of the proposed field investigation are to better define the extent of contamination identified at SWMU 17 during the tank closure and to determine whether a release has occurred at SWMU 48. All samples will be collected and processed as per Section 4 of the *Comprehensive RFI Work Plan*. The BCT will review the sampling results to determine whether a second round of investigation, to include soil borings and/or monitoring wells, will be necessary.

Field personnel may deviate from the strategy outlined below if field conditions or data (i.e., visual observations or field screening results) suggest additional or different intervals may be successfully sampled or yield more useful information. Any deviations will be documented in the

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field logbook and the CSI report. The investigatory area may then be enlarged or reduced, based on the initial data results.

Soil

The proposed soil investigation will consist of hand auger and Geoprobe sampling (as outlined in Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) for offsite laboratory analysis. Eight soil samples will be collected from four proposed locations, as shown in Figure 7-2, four, outside each bay on the western side of Building S-9 in the area of the hazardous waste accumulation points (SWMU 48). The soil samples will be collected from below the asphalt/concrete (to approximately 1 foot deep) and from 3 to 4 feet deep using a hand auger. The surface soil samples are for inspection of surface releases. The subsurface samples will better define the vertical extent of contamination, if a release has occurred. The soil samples will be analyzed for VOCs, DRO, GRO, TPH, and Appendix IX metals.

Four soil samples will be collected at SWMU 17 from four proposed locations using a Geoprobe. The samples will be collected 5 feet away from each corner of the tank pit-four from the 12 to 15-foot interval (soil-water interface). SWMU 17 soil samples will be analyzed for VOCs, SVOCs, chlorinated pesticides/PCBs, TPH, and Appendix IX metals.

Sample parameters include constituents which are indicators of the types of materials once stored at SWMU 48 and materials received by the UWT at SWMU 17. All of the soil samples will be sent to an offsite laboratory.

Groundwater

The groundwater investigation will focus on the fluvial deposits or deeper alluvium underlying the loess/shallow alluvium at SWMU 17 because it is the preferential zone of groundwater flow and

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a potential route for contaminant transport, particularly for chlorinated solvents at NSA Memphis. The proposed groundwater investigation will consist of Geoprobe sampling and offsite laboratory analysis. Based on work conducted at other SWMUs, the Geoprobe should be able to penetrate through the loess/shallow alluvium and into the fluvial deposits/deeper alluvium to a refusal depth of about 50 feet. Groundwater samples will be collected from the five Geoprobe locations, as dictated by field conditions (i.e., buried utilities could cause sample locations to be moved). Data from the geoprobe location closest to SWMU 48 (northeast of SWMU 17) will also be used to assess contamination which may have migrated downgradient from SWMU 48. An attempt will be made to obtain shallow (loess) groundwater samples as well as deeper (fluvial) groundwater samples. If shallow groundwater samples cannot be collected, a saturated soil sample will be collected instead. All groundwater samples will be sent to an offsite laboratory for VOCs analysis.

Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the first phase of the investigation, a second phase, consisting of advancing and sampling soil borings and/or installing and sampling monitoring wells, may be implemented. The number, locations, and depths of soil borings and/or monitoring wells will be determined using data from the first phase of this investigation. An addendum to this plan describing the proposed drilling, sampling, and analytical strategies for an expanded investigation will be prepared and submitted to the BCT for review and comment, if a second phase is required.

Analytical Requirements

Soil and groundwater samples will be submitted to an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- SVOCs, USEPA Method 8270

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- TPH, USEPA Method 418.1
- TPH-GRO, TN Modified 8015/GRO
- TPH-DRO, TN Modified 8015/DRO
- Chlorinated pesticides/PCBs, USEPA Method 8080
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series

Tables 7-4 and 7-5 show the proposed number of samples to be collected and the analyses to be performed.

Table 7-4
Proposed Sampling and Analytical Requirements — SWMU 48

Method	Sample Matrix/Interval	Number of Samples	Analysis
Hand Auger	Soil (0-1')	4	VOCs, TPH, TPH-DRO, TPH-GRO, and Appendix IX metals
	Soil (3-4')	4	

Table 7-5
Proposed Sampling and Analytical Requirements — SWMU 17

Method	Sample Matrix/Interval	Number of Samples	Analysis
Geoprobe	Soil (12-15')	4	VOCs, SVOCs, chlorinated pesticides/ PCBs, TPH, and Appendix IX metals
Geoprobe	Groundwater — loess (saturated soil)	5	VOCs
	Groundwater — fluvial deposits	5	VOCs

Sample Management

Sample management procedures will adhere to Sections 4.12 and 5 of the *Comprehensive RFI Work Plan*.

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Sample Custody

Sample custody procedures will adhere to Section 4.12.5 of the *Comprehensive RFI Work Plan*.

Quality Assurance/Quality Control

QA/QC procedures will adhere to Section 4.14 of the *Comprehensive RFI Work Plan*.

Decontamination Procedures

Decontamination procedures will adhere to Section 4.11 of the *Comprehensive RFI Work Plan*.

Investigation-Derived Waste

IDW will be handled as specified in the *NSA Memphis IDW Management Plan*.

7.3 Potential Receptors

SWMUs 17 and 48 are approximately 750 feet southeast of the nearest offsite residence, which is in the Millington Heights residential area. However, houses in this area were recently demolished. The Building S-9 area is currently occupied by Navy personnel.

Storm water runoff from SWMUs 17 and 48 discharges into SWMU 38, in turn discharging into Big Creek Drainage Canal, which may serve as a food and water source for wildlife. SWUM 38 comprises drainage ways which are in populated areas of NSA Memphis; therefore, the potential exists for infrequent contact with surface water and sediment by NSA Memphis personnel is possible. Offsite, contact with surface water and sediment by the general public is possible due to unrestricted access to the drainage way. According to NSA Memphis personnel, no fishing or swimming occurs in Big Creek Drainage Canal, but children may play near it.

Five production wells at NSA Memphis supply drinking water. The nearest production wells to SWMUs 17 and 48 are PW-4 and PW-5, as shown in Figure 7-1. PW-4 is approximately

2,800 feet north of SWMUs 17 and 48 and PW-5 is approximately 1,400 feet north. Both production wells are screened in the Fort Pillow aquifer (PW-4 is screened at 1,450 feet bls and PW-5 is screened at 1,435 feet bls) with the Flour Island confining unit separating the overlying Memphis sand aquifer from the Fort Pillow aquifer. The potential for ecological and human health effects will be analyzed in more detail and presented in an RFI report, if contamination warranting full RFI characterization is found at SWMUs 17 and 48.

7.4 Quality Assurance Plan

The quality assurance plan presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout this CSI at SWMUs 17 and 48.

7.5 Data Management Plan

The data management plan presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during this CSI at SWMUs 17 and 48.

7.6 Health and Safety Plan

The site-specific health and safety plan for SWMUs 17 and 48 is included in Attachment C. The E/A&H Comprehensive Health and Safety Plan for work conducted at NSA Memphis is included in Section 7 of the *Comprehensive RFI Work Plan*.

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8.0 SWMUs 19 and 49

SWMUs 19 and 49 are approximately 150 feet north of Navy Road (Figure 8-1) on the NSA Memphis Northside. SWMU 19 is bounded to the north by SWMU 49 and a wooded area and to the south by Navy Road and Building 341 of the Navy Exchange Service Station. SWMU 19 is bordered to the east by Building 757 of the Navy Exchange Service Station and to the northwest by the Aircraft Fire Fighting Training Facility (SWMU 5).

SWMU 19 reported to have operated as a UWT from 1983 through 1992. Data collected during the removal of UWT 1648 (SWMU 19) indicate a release may have occurred before removal.

SWMU 49 is reportedly operated as a hazardous waste accumulation point for Building N-757 from 1969 through 1986. During a 1990 inspection, oil stains were observed on the asphalt around SWMU 49 (ERC/EDGe, 1990).

The information compiled on SWMUs 19 and 49 from the 1990 RFA is included in Attachment A.

Topography and Drainage

SWMUs 19 and 49 and the surrounding area are characterized by relatively level, low-relief topography. The immediate area is asphalt and descends slightly to the west and northwest toward two storm drains and a wooded area to the north. Both storm drains discharge into a ditch that drains SWMU 5 and leads into a tributary of North Fork Creek. A topographic map showing land surface elevations is included in Attachment B.

Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12 of the *Comprehensive RFI Work Plan*. Updated information is available in the *Hydrogeology of Post-Wilcox Group Stratigraphic Units in the Area of the Naval Air Station Memphis, Near Millington, Tennessee*.

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Stratigraphy

Site-specific stratigraphic data are currently not available for SWMUs 19 and 49. However, lithologic information obtained from the E/A&H and USGS RFI at SWMU 5 (E/A&H, 1997a), indicates a complex shallow geology of low to very low-permeability silty clays and clays overlying a silt horizon (loess). Laboratory-measured hydraulic conductivities for the silty-clay unit were reported to be 1.4 x 10^{-7} cm/sec; no conductivity data are available for the underlying silt unit. Based on the 65-foot boring for monitoring well 05MW05LF at SWMU 5, the silty clays changed to a yellowish to pinkish gray sand at about 40 feet bls and continued as sand until the Cockfield Formation was encountered at approximately 65 feet bls.

To obtain deeper geologic information that could be related to SWMUs in the area, the USGS drilled stratigraphic Test Hole 4 to approximately 200 feet bls approximately 500 feet south of the main runway and about 750 feet north of SWMUs 19 and 49. The test hole was originally to be advanced approximately 15 feet into the Cook Mountain Formation, the confining unit separating the Memphis aquifer from the overlying Cockfield Formation and shallower units. Due to the unanticipated thinness of the Cockfield Formation, this borehole was advanced approximately 50 feet into the Memphis Sand aquifer. The test hole was visually logged by a field geologist during drilling and geophysically logged following completion. Lithologies encountered in the 05MW05LF boring and the test hole are shown in Table 8-1.

Shallow Groundwater

Information from a previous UST investigation at SWMU 5 (E/A&H, 1992) indicates that groundwater is typically encountered at the interface between the silt-clay and silt units in the loess. Potentiometric data indicate that shallow groundwater at SWMU 5 is held under confining pressures; water levels in monitoring wells screened in the loess equilibrated several feet higher than the silty clay/silt interface where water was generally encountered during drilling. At SWMU 5, some groundwater in the loess appears to flow toward the drainage ditch (SWMU 4)

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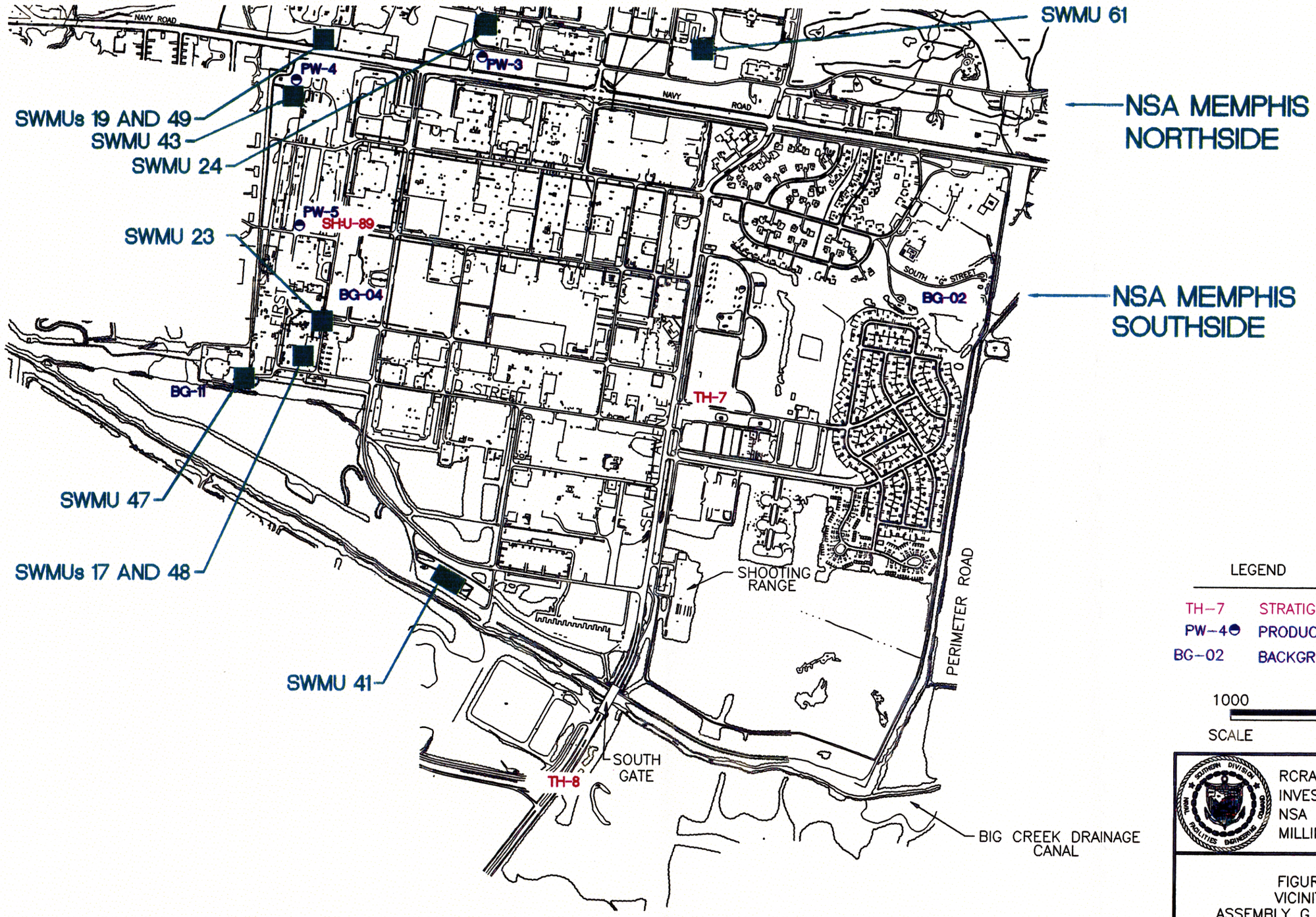

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that flows east-west across the north side of SWMU 5, although the primary direction of flow probably is vertically downward. Water in this ditch eventually drains into North Fork Creek. It is unknown if shallow groundwater flow at SWMUs 19 and 49 is in a similar direction to that observed at SWMU 5.

Table 8-1
Stratigraphic Data

Stratigraphic Unit	05MW05LF	Test Hole 4
Loess	Approximately 40 feet of loess. These materials were described as silt and clay.	Approximately 40 feet of loess. These materials were described as silt and clay.
Fluvial Deposits	Approximately 25 feet of sand with some gravel deposits.	Approximately 25 feet of fluvial deposits. These materials were described as sand and gravel.
Cockfield Formation	Boring terminated at the top of Cockfield Formation (approximately 66 feet bls).	Approximately 30 feet of alternating sand, clay, and some lignite.
Cook Mountain Formation	Not sampled.	Characterized as a gray to blue-gray dense clay. Defined as the upper confining unit between the surficial aquifer(s) and the Memphis sand aquifer. The boring for Test Hole 4 was advanced approximately 44 feet into the Cook Mountain Formation.

Water level data in the area indicate that groundwater in the fluvial deposits flows toward the west-northwest. These data were collected from monitoring wells screened in the fluvial deposits across the NSA Memphis Northside during other RFIs.

Climatological Data

Regional climatological data are provided in Section 2.8 of the *Comprehensive RFI Work Plan.*

8.1 Source Characterization

Tank 1648 (SWMU 19) was removed on March 19, 1996, by the Navy's UST contractor. During the excavation and removal of the 280-gallon UWT the fill-pipe and vent-pipe joints were discovered to be disconnected from each other, allowing waste oil to infiltrate into the surrounding soil. Noticeable amounts of oil were seeping from beneath Building N-757. In accordance with the *Interim Measures Work Plan — SWMU 19* (E/A&H, 1995c), confirmation samples were collected from the floor of the excavation after the UWT was removed. Samples 019S000101 and 019S000201 were collected from the north and south ends of the excavation floor, respectively, and analyzed by an offsite laboratory for VOCs, SVOCs, Appendix IX metals, and PCBs. The confirmation data are presented in Tables 8-2 and 8-3. The closure report for Tank 1568 is included in Attachment D.

Samples were also collected from the excavated soil for disposal characterization. The excavated soil was field screened using a PID and segregated into "clean" soil (PID readings at or less than background levels) and "dirty" soil (PID readings exceeding background). Samples 019V000101 and 019V000201 were collected from the "clean" and "dirty" soil, respectively. Disposal samples were analyzed at an offsite laboratory for: F001-F005 solvent scan, PCBs, toxicity characteristic leaching procedure (TCLP)-TPH, and a full TCLP analysis (less pesticides). All concentrations for the parameters analyzed were below the method detection limits. All soil generated during the UWT removal activities was disposed of by the UST contractor.

One of the UWTs at Building 757, Tank 1648, held 280 gallons and received waste automotive oil and hydraulic fluid generated by automotive repair activities at the Navy Exchange Service Station. The other UWT at Building N-757 (Tank 341) collected waste oil from automobile maintenance operations at Building 341 of the Navy Exchange Service Station. Tank 341 was closed in place when it was filled with concrete, but the date of closure is not known. Both UWTs were installed in 1979.

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Table 8-2
SWMU 19 Voluntary Corrective Action — Confirmation Sampling Results
Inorganic Data (mg/kg)

Sample ID	Parameter	Concentration
019S000101	Arsenic	5.5
	Barium	141
	Beryllium	0.44 J
	Cadmium	0.86 J
	Chromium	9.2
	Cobalt	8 J
	Copper	10.6
	Lead	96.6
	Nickel	15.6
	Selenium	0.37 J
	Vanadium	17 J
	Zinc	166 J
	Tin	21.3 J
019S000201	Arsenic	6.2
	Barium	172
	Beryllium	0.53 J
	Cadmium	0.88 J
	Chromium	12.6
	Cobalt	8.6 J
	Copper	14.4
	Lead	75.3
	Nickel	19.9
	Vanadium	20.8
	Zinc	83.6 J
	Tin	37.6 J

Notes:
J — Compound was detected at a concentration less than the method reporting limit
mg/kg — Milligrams per kilogram

Table 8-3
SWMU 19 Voluntary Corrective Action
Confirmation Sampling Results — Organic Data (μg/kg)

Sample ID	Parameter	Concentration
019S000101	Heptachlor	3
	Heptachlor epoxide	1.9 J
	Endosulfan II	8
	4,4'-DDT	5
	Naphthalene	4,400 J
	2-Methylnaphthalene	9400
	bis(2-Ethylhexyl)phthalate (BEHP)	1,800 J
	Benzene	250 J
	Toluene	3000
	Ethylbenzene	1800
	Xylene (Total)	12000
019S000201	4,4'-DDE	5.60 J
	Endosulfan II	4 J
	Naphthalene	3,600 J
	2-Methylnaphthalene	7,600 J
	bis(2-Ethylhexyl)phthalate (BEHP)	1,600 J
	Acetone	330
	2-Butanone (MEK)	56J
	Benzene	63 J
	4-Methyl-2-Pentanone (MIBK)	20 J
	Toluene	190
	Ethylbenzene	280
	Styrene	15 J
	Xylene (Total)	1600

Notes:
J — Compound was detected at a concentration less than the method reporting limit.
μg/kg — Micrograms per kilogram

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SWMU 49 is adjacent to SWMU 19 and may have impacted the area. This SWMU was an accumulation point for used automobile batteries, waste paints, containerized waste mineral spirits, and tires. During past inspections of SWMU 49, surface staining was visible.

Field sampling will be performed to better define the nature and extent of contamination at SWMUs 19 and 49. Since a release from SWMU 19 has been previously identified *(VCA Report: SWMU 3,7, 17, 18, 19, and the Gas Pits*, EnSafe, 1997), the scope of the investigation has been expanded to meet RFI requirements. Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of contaminants identified as exceeding appropriate action levels. The procedures and references used to determine these characteristics will be documented in an RFI report.

8.2 Characterization of Hazardous Constituent Releases

Previous Investigations

Visual and analytical data collected during the removal of UWT 1648 indicated a release may have occurred before its removal. The *Voluntary Corrective Action Report for SWMU 19* (pending), will detail information on the removal of UWT 1648. No other reports or investigations are known to be available for SWMUs 19 and 49.

Data Gaps

The following data gaps will be the focus of this CSI:

- The extent of surface soil contamination associated with the UWT and hazardous waste accumulation point.

- The extent of subsurface soil contamination associated with the UWTs and hazardous waste accumulation point.

- The potential for groundwater contamination associated with the UWTs and the hazardous waste accumulation point.

Inorganic constituents identified in SWMUs 19 and 49 soil will be compared to background soil concentrations, RBCs, and SSLs. Organics will be compared to RBCs and SSLs. A Preliminary Risk Evaluation (PRE) will be performed on organic and inorganic constituents.

Surface soil and groundwater samples from the background monitoring wells installed in 1995 and 1996 were analyzed for Appendix IX metals. The procedures used to determine the inorganics background RCs are documented in the *Reference Concentrations Technical Memorandum*.

Objective of the Proposed Field Investigation

The objective of the proposed field investigation is to better define the extent of contamination at SWMUs 19 and 49. All samples will be collected and processed as per Section 4 of the *Comprehensive RFI Work Plan*. The BCT will review the sampling results to determine whether a second round of investigation, to include soil borings and/or monitoring wells, will be necessary.

Field personnel may deviate from the strategy outlined below if field conditions or data (i.e., visual observations or field screening results) suggest additional or different intervals may be successfully sampled or yield more useful information. Any deviations will be documented in the field logbook and the CSI report. The investigatory area may then be enlarged or reduced, based on the results of the initial data.

Soil

The proposed soil investigation will consist of hand-auger and Geoprobe sampling (using methods outlined in Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) for offsite laboratory analysis. Five sample locations, as shown in Figure 8-2, have been proposed — one within the hazardous

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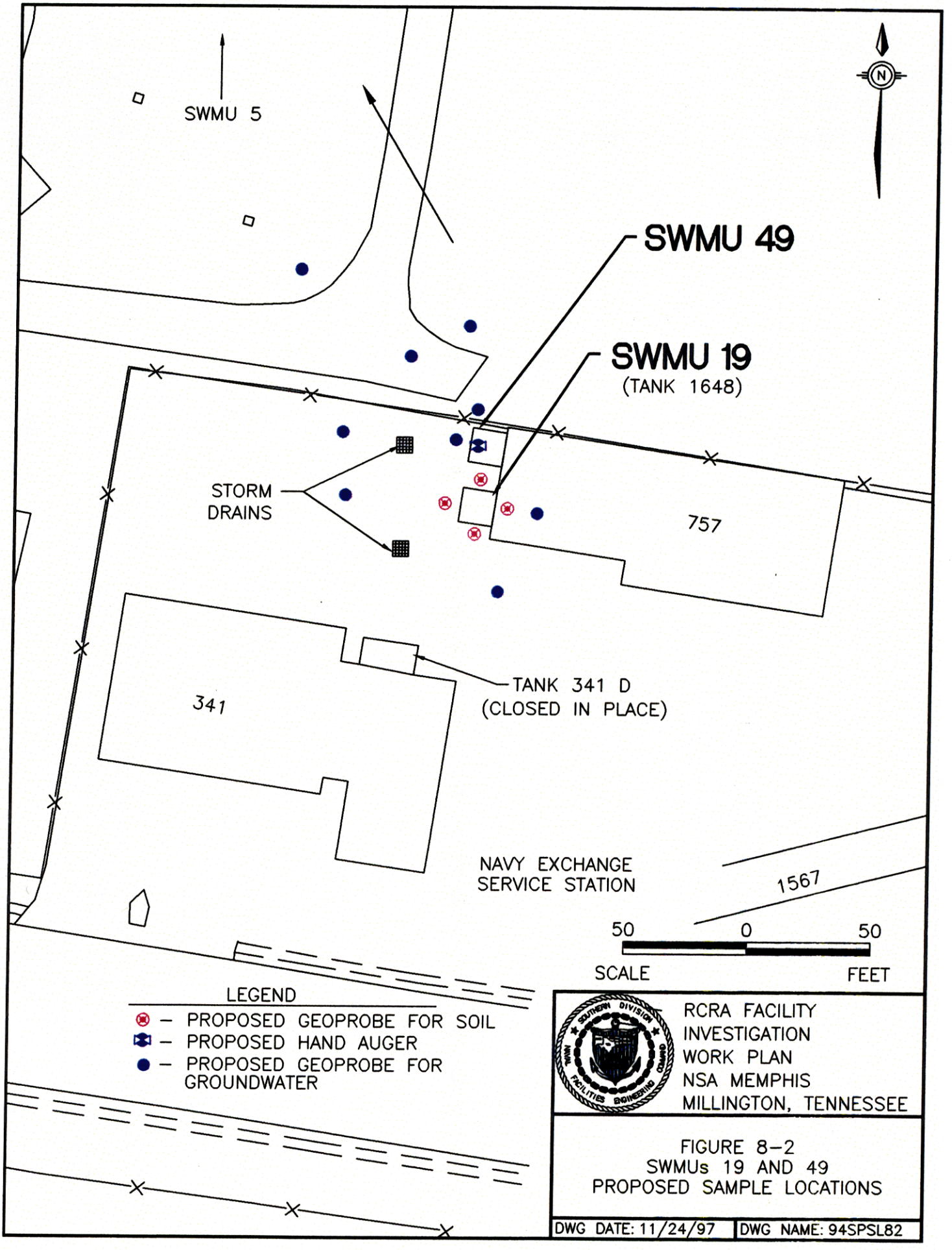
SWMU 5
SWMU 49
SWMU 19
(TANK 1648)
STORM DRAINS
757
341
TANK 341 D
(CLOSED IN PLACE)
NAVY EXCHANGE
SERVICE STATION
1567
50 0 50
SCALE FEET
LEGEND
– PROPOSED GEOPROBE FOR SOIL
– PROPOSED HAND AUGER
– PROPOSED GEOPROBE FOR GROUNDWATER
RCRA FACILITY
INVESTIGATION
WORK PLAN
NSA MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 8-2
SWMUs 19 AND 49
PROPOSED SAMPLE LOCATIONS
DWG DATE: 11/24/97
DWG NAME: 94SPSL82

waste accumulation area from the 0 to 1 foot deep and 3 to 4 feet deep intervals using a hand auger; and four from the UWT (Tank 1648) area from the 12 to 15-foot interval. Proposed sample locations were selected on the northwest end of Building N-757 and within the areas of concern. The surface soil sample is for assessing risk and inspecting for surface spills, while the subsurface samples are to inspect the area where a release would presumably occur from the UWT and to better define the vertical extent of contamination, if a release has occurred. The surface soil sample will be analyzed for FSA for risk assessment purposes, while the other 5 soil samples will be analyzed for VOCs, SVOCs, TPH, chlorinated pesticides/PCBs, and Appendix IX metals.

Groundwater

The groundwater investigation will focus on the fluvial deposits underlying the loess because it is the preferential zone of groundwater flow and a potential route for contaminant transport, particularly for chlorinated solvents at NSA Memphis. The proposed groundwater investigation will consist of Geoprobe sampling for laboratory analysis. Based on work at other SWMUs, the Geoprobe should be able to penetrate through the loess and into the fluvial deposits to depth of about 50 feet bls. Groundwater samples will be collected from 8 Geoprobe locations on the northwest end of Building N-757 and in the direction of SWMU 5 to see if migration has occurred, as dictated by field conditions (i.e., buried utilities could cause some sampling locations to be moved). Groundwater samples will also be obtained from the loess, if possible. If a groundwater sample cannot be obtained, a soil sample will be collected and analyzed for VOCs instead. All groundwater samples will be analyzed at an offsite laboratory for VOCs.

Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the first phase of the investigation, a second phase, consisting of drilling and sampling soil borings and monitoring wells, may be implemented. The number, locations, and depths of soil borings and/or monitoring wells will be determined using data from the first phase of this investigation. An addendum to this plan describing the proposed

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drilling, sampling, and analytical strategies for an expanded investigation will be prepared and submitted to the BCT for review and comment, if a second phase is required.

Analytical Requirements

Surface soil samples will be analyzed at an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- SVOCs, USEPA Method 8270
- TPH, USEPA Method 418.1
- TPH-GRO, TN Modified 8015/GRO
- TPH-DRO, TN Modified 8015/DRO
- Chlorinated pesticides/PCBs, USEPA Method 8080
- Organophosphorus pesticides, USEPA Method 8140
- Chlorinated herbicides, USEPA Method 8150
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series
- Total cyanide, USEPA Method 9010

Subsurface soil samples will be analyzed at an offsite laboratory using the following methods:

- VOCs, USEPA Method 8240
- SVOCs, USEPA Method 8270
- Chlorinated pesticides/PCBs, USEPA Method 8080
- TPH, USEPA Method 418.1
- RCRA Part 264, Appendix IX Total Metals, USEPA Method 6010/7000 series

All groundwater samples will be analyzed at an offsite laboratory for VOCs by USEPA Method 8240.

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Tables 8-4 and 8-5 show the proposed number of samples to be collected and the analyses to performed.

Table 8-4
Proposed Sampling and Analytical Requirements — SWMU 49

Method	Sample Matrix/Interval	Number of Samples	Analysis
Hand Auger	Soil (0-1')	1	FSA[a]
	Soil (3-4')	1	VOCs, SVOCs, pesticides/PCBs, TPH, and Appendix IX metals

Note:
[a] — FSA includes VOCs, SVOCs, TPH, TPH-GRO, TPH-DRO, chlorinated pesticides/PCBs, organophosphorus pesticides, chlorinated herbicides, total metals (Appendix IX), and cyanide.

Table 8-5
Proposed Sampling and Analytical Requirements — SWMU 19

Method	Sample Matrix/Interval	Number of Samples	Analysis
Geoprobe	Soil (12-15')	4	VOCs, SVOCs, pesticides/PCBs, TPH, and Appendix IX metals
Geoprobe	Groundwater-loess (saturated soil)	8	VOCs
	Groundwater-fluvial deposits	8	VOCs

Sample Management

Sample management procedures will adhere to Sections 4.12 and 5 of the *Comprehensive RFI Work Plan*.

Sample Custody

Sample custody will adhere to Section 4.12.5 of the *Comprehensive RFI Work Plan*.

Quality Assurance/Quality Control

QA/QC procedures will adhere to Section 4.14 of the *Comprehensive RFI Work Plan.*

Decontamination Procedures

Decontamination procedures will adhere to Section 4.11 of the *Comprehensive RFI Work Plan.*

Investigation-Derived Waste

IDW will be handled as specified in the *NSA Memphis IDW Management Plan.*

8.3 Potential Receptors

SWMUs 19 and 49 are approximately 500 feet northeast of the nearest offsite residence, which is on Navy Road. The nearest NSA Memphis office personnel are the employees of the Building N-757 Navy Exchange Service Station, immediately adjacent to SWMUs 19 and 49.

Surface water runoff drains from SWMUs 19 and 49 into North Fork Creek via one of two storm water drains west of the SWMUs. North Fork Creek serves as a water and food source for various animals and could expose humans to potential contaminants being transported in the stream through infrequent uses such as wading.

Five production wells at NSA Memphis are used for drinking water supply. The nearest production well, PW-3, is approximately 1,600 feet east of SWMUs 19 and 49 and is screened in the Fort Pillow aquifer at a depth of 1,450 feet. The potential for ecological and human health effects will be analyzed in more detail in an RFI report, if contamination warranting full RFI characterization is identified at SWMUs 19 and 49.

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8.4 Quality Assurance Plan

The quality assurance plan presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout this CSI at SWMUs 19 and 49.

8.5 Data Management Plan

The data management plan presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during the CSI for SWMUs 19 and 49.

8.6 Health and Safety Plan

The site-specific health and safety plan for SWMUs 19 and 49 is included in Attachment C. The E/A&H Comprehensive Health and Safety Plan for work conducted at NSA Memphis is included in Section 7 of the *Comprehensive RFI Work Plan*.

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Attachment A

RCRA Facility Assessment

7.17 SWMU NO. 17: BUILDING S-9 UNDERGROUND WASTE TANKS

7.17.1 UNIT CHARACTERISTICS

7.17.1.1 TYPE OF UNIT

Active underground storage tanks.

7.17.1.2 DESIGN FEATURES

Tank 1657 is a 550 gallon tank. The other tank located inside S-9 is presumed to be approximately the same size.

7.17.1.3 OPERATING PRACTICE (PAST AND PRESENT)

Waste oil storage.

7.17.1.4 PERIOD OF OPERATION

Currently in use. The date the tanks were converted to waste oil usage is not known.

7.17.1.5 AGE OF UNIT

Unknown.

7.17.1.6 LOCATION OF UNIT

Building S-9. See Figure 7-17.

7.17.1.7 GENERAL PHYSICAL CONDITIONS

Not determined.

7.17.1.8 CLOSURE METHOD

Not applicable.

7.17.2 WASTE CHARACTERISTICS

7.17.2.1 TYPE OF WASTE

Primarily waste oil, including waste hydraulic fluid.

7.17.2.2 MIGRATION CHARACTERISTICS

Wastes such as those previously characterized are reasonably mobile in the environment. Preliminary investigation of this SWMU indicates the most likely release mechanism to be leaking underground tanks or product lines. Therefore, the release point is likely to be low grade. Surface infiltration of rain water can transport these wastes into the soil and groundwater.

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7.17.2.3 TOXICOLOGICAL CHARACTERISTICS

Used engine oil and hydraulic fluid toxic constituents include toxic volatile and semivolatile organics, toxic polynuclear aromatic hydrocarbons, and heavy metals (lead, cadmium). Organic constituents include known and suspected carcinogens, and toxic liquids and vapors. Acute effects of exposure may include nausea, vomiting, dizziness, drowsiness, central nervous system, depression, or damage to nerves, liver, or kidney.

7.17.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Substances remaining in the tanks would be in the form of liquids or semiliquids/sludges. Substances that may have leaked from the tanks could exist as waste-saturated soils or soil moisture/groundwater contaminants.

7.17.3 MIGRATION PATHWAYS

7.17.3.1 GEOLOGIC SETTING

See Section 3.2.

7.17.3.2 HYDROGEOLOGIC SETTING

See Sections 3.3 and 3.4.

7.17.3.3 ATMOSPHERIC CONDITIONS

See Sections 3.3 and 3.4.

7.17.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general information. Except for buildings, the topography in the immediate area is flat, with paved and unpaved areas.

7.17.3.5 PATHWAYS

AIR

Not applicable to this unit.

SOIL

Not applicable.

SURFACE WATER/SEDIMENT

Not applicable.

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GROUNDWATER

Not applicable.

SUBSURFACE GAS

Not applicable.

7.17.4 CONTAMINANT RELEASE IDENTIFICATION

7.17.4.1 PRIOR INSPECTION REPORTS

None available.

7.17.4.2 PUBLIC COMPLAINTS

None.

7.17.4.3 MONITORING/SAMPLING DATA

Waste oil is tested for PCBs prior to disposal.

7.17.4.4 EVIDENCE OF RELEASE

None available.

7.17.5 EXPOSURE POTENTIAL

7.17.5.1 PROXIMITY TO AFFECTED POPULATION

None expected based on available information.

7.17.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

No known sensitive environments are located in the vicinity of the site.

7.17.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

Migration to potential receptors is unlikely due to limited waste volume, limited waste mobility and distance to nearest receptors.

7.16.6 DOCUMENTS REVIEWED

See PRD.

7.17.7 SUMMARIZED DATA GAP

7.17.7.1 SOIL

No data.

7.17.7.2 **GROUNDWATER**

No data.

7.17.7.3 **SURFACE WATER/SEDIMENT**

Not applicable.

7.17.7.4 **AIR**

Not applicable.

7.17.7.5 **SUBSURFACE GAS**

Not applicable.

7.17.8 **RECOMMEND ACTIONS**

This site has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM, EPA Region IV, and the Tennessee Department of Health and Environment.

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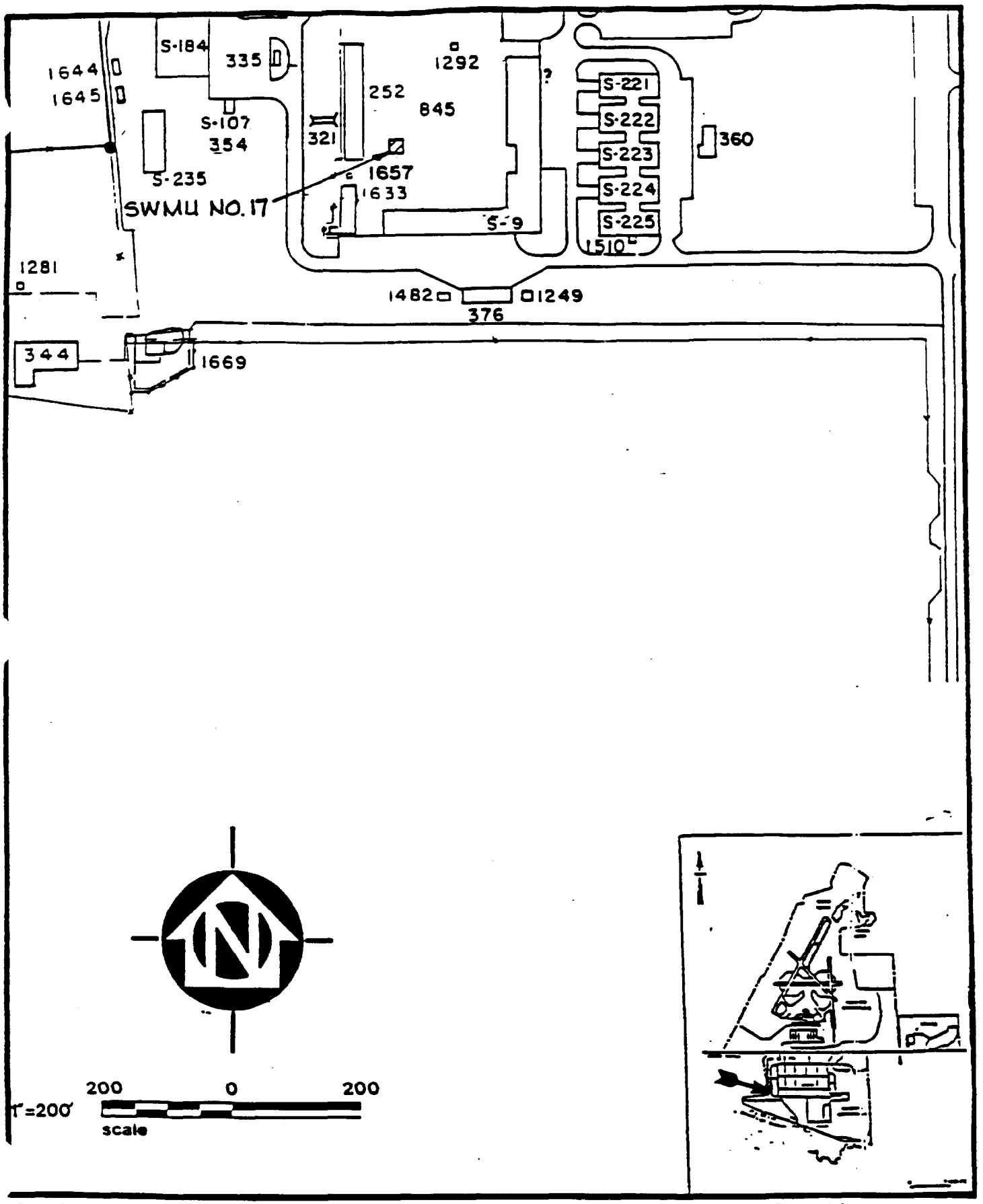

SWMU NO. 17 S-9 UNDERGROUND WASTE TANK
FIGURE 7-17 LOCATION MAP

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7.19 SWMU NO. 19: BUILDING 341 UNDERGROUND WASTE TANK AND TANK 1648

7.19.1 UNIT CHARACTERISTICS

7.19.1.1 TYPE OF UNIT

Active Underground Tanks.

7.19.1.2 DESIGN FEATURES

The Building 341 UST is 280 gallons in capacity and holds waste automotive oil and hydraulic fluid. Piping connected to the tank include feed lines which run from Building 341 and a vent line which runs to the north side of Building 341.

Tank No. 1648 is a UST used to collect waste oil from Building 757. It consists of the UST and associated feed and vent lines.

7.19.1.3 OPERATING PRACTICE (PAST AND PRESENT)

According to Department of the Navy information, the Building 341 UST system is used to temporarily store waste oil and hydraulic fluid generated by the Navy Exchange Service Station as automobile maintenance wastes.

Tank No. 1648 is similarly used for storage of waste oil from Building 757 automobile maintenance operations.

7.19.1.4 PERIOD OF OPERATION

Period of operation is from approximately 1979 to the present.

7.19.1.5 AGE OF UNIT

The tank was installed within the last 11 years.

7.19.1.6 LOCATION OF UNIT

The Building 341 UST and Tank No. 1648 are located on the north side of Building 341 and the west side of Building 757, respectively. See Figure 7-19.

7.19.1.7 GENERAL PHYSICAL CONDITIONS

Unknown.

7.19.1.8 CLOSURE METHOD

Not applicable at the present time (active tank).

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7.19.2 WASTE CHARACTERISTICS

7.19.2.1 TYPE OF WASTE

In addition to heavier hydrocarbons, waste material may include volatile petroleum constituents such as benzene, xylene, and toluene, and heavy metals. PCBs are possible but unlikely.

7.19.2.2 MIGRATION CHARACTERISTICS

Wastes such as those previously characterized in this description are reasonably mobile in the environment. Preliminary investigation of this SWMU indicates the most likely release mechanism to be leaking underground tanks or product lines. Therefore, the release point is likely to be below grade. Surface infiltration of rain water can transport these wastes into the soil and groundwater.

7.19.2.3 TOXICOLOGICAL CHARACTERISTICS

Used engine oil and hydraulic fluid include toxic volatile and semivolatile organics, toxic polynuclear aromatic hydrocarbons, and heavy metals (lead, cadmium). Organic constituents include known and suspected carcinogens, and toxic liquids and vapors. Acute effects of exposure may include nausea, vomiting, dizziness, drowsiness, central nervous system, depression, damage to nerves, liver, or kidney.

7.19.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Substances remaining in the tanks would be in the form of liquids or semiliquids/sludges. Substances that may have leaked from the tanks could exist as waste-saturated soils or soil moisture/groundwater contaminants.

7.19.3 MIGRATION PATHWAYS

7.19.3.1 GEOLOGIC SETTING

See Section 3.2.

7.19.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.19.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

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7.19.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general information. The area has been disturbed by past activities, but is generally level. Surface drainage is toward the south and west.

7.19.3.5 PATHWAYS

AIR

Because no surface releases of waste oil are evident at this location, it is felt that air is not a transport mechanism.

SOIL

Should a leak exist, hazardous constituents of the waste oils and fluids at this location would likely be released into the soil mass around and beneath the tank. Soil particle bonding, which naturally exists in the silt and clay type soils typical to this area, provide strong attenuation for these potential contaminants. Minor releases from this system would be trapped in the vadose soil zone until natural driving forces are exerted (surface water infiltration) to transport these substances to the groundwater surface.

SURFACE WATER/SEDIMENT

Preliminary evaluation of the UST system at SWMU No. 19 indicates no obvious points of surface contamination attributable to these units. Therefore, the likelihood of surface water transport is remote.

GROUNDWATER

Contaminants contained in the UST at this SWMU are generally heavier than water and slightly soluble in water. They would be transported generally down gradient with the flow of groundwater.

SUBSURFACE GAS

There is a limited potential for migration of VOCs from the waste oil tanks. VOC source is limited by size of tanks.

7.19.4 CONTAMINANT RELEASE IDENTIFICATION

7.19.4.1 PRIOR INSPECTION REPORTS

None available.

7.19.4.2 PUBLIC COMPLAINTS

None.

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7.19.4.3 MONITORING/SAMPLING DATA

None available.

7.19.4.4 EVIDENCE OF RELEASE

None.

7.19.5 EXPOSURE POTENTIAL

7.19.5.1 PROXIMITY TO AFFECTED POPULATION

SWMU No. 19 is located in the NAS North Side industrial area, which is distant from the permanent NAS population but near off-Station residences along Navy Road.

7.19.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The unit is distant from sensitive environments.

7.19.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

It has not been previously determined whether a release of hazardous material has occurred from this tank system.

7.19.6 DOCUMENTS REVIEWED

See PR .

7.19.7 SUMMARIZED DATA GAP

7.19.7.1 SOIL

No available data.

7.19.7.2 GROUNDWATER

No available data.

7.19.7.3 SURFACE WATER/SEDIMENT

No surface water/sediment sampling is needed.

7.19.7.4 AIR

No air sampling is needed.

7.19.7.5 SUBSURFACE GAS

No data available in 1989.

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7.19.8 RECOMMENDED ACTIONS

This site has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM, EPA Region IV, and the Tennessee Department of Health and Environment.

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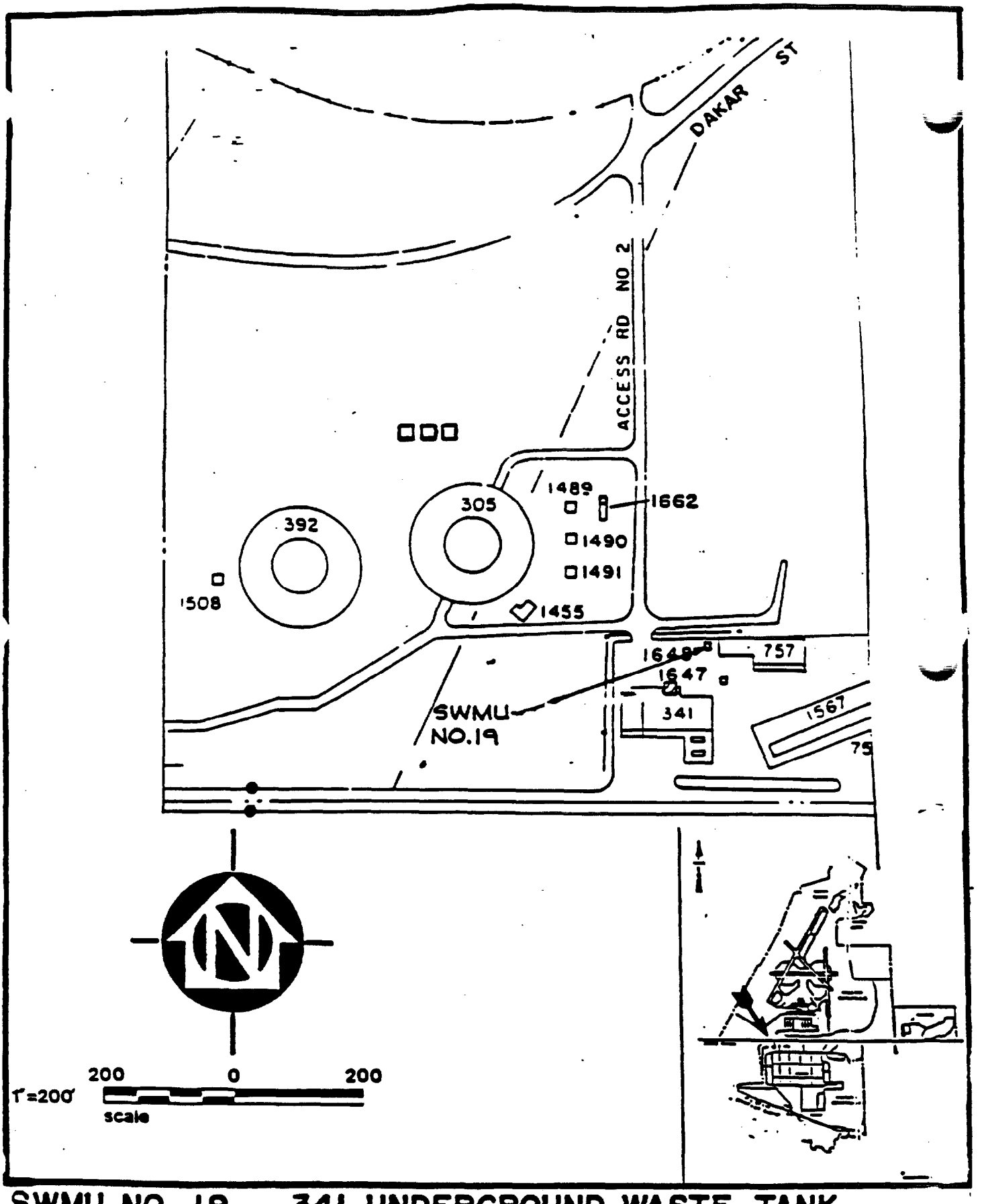

SWMU NO. 19 341 UNDERGROUND WASTE TANK
FIGURE 7-19 LOCATION MAP

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7.23 SWMU NO. 23: UNDERGROUND FUEL TANK AT BUILDING S-8

7.23.1 UNIT CHARACTERISTICS

7.23.1.1 TYPE OF UNIT

Inactive underground storage tank.

7.23.1.2 DESIGN FEATURES

The tank capacity is 500 gallons; tank and piping are steel.

7.23.1.3 OPERATING PRACTICE (PAST AND PRESENT)

Storage of fuel prior to use. Fuel is no longer needed.

7.23.1.4 PERIOD OF OPERATION

No longer in use. The tank is no longer required and the Station intends to declare the contents to be surplus. The tank was installed in 1944.

7.23.1.5 AGE OF UNIT

Forty-six years.

7.23.1.6 LOCATION OF UNIT

Building S-8; See Figure 7-23.

7.23.1.7 GENERAL PHYSICAL CONDITIONS

Unknown.

7.23.1.8 CLOSURE METHOD

Not applicable.

7.23.2 WASTE CHARACTERISTICS

7.23.2.1 TYPE OF WASTE

Diesel fuel.

7.23.2.2 MIGRATION CHARACTERISTICS

Wastes such as those previously characterized in this description are reasonably mobile in the environment. Preliminary investigation of this SWMU indicates the most likely release mechanism to be leaking underground tanks or feed line. Therefore, the release point is likely to be below grade. Surface infiltration of rain water can transport these wastes into the soil and ground water.

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7.23.2.3 TOXICOLOGICAL CHARACTERISTICS

Diesel fuel (No. 2 fuel oil) is a light oil consisting primarily of long-chain hydrocarbons (unbranched paraffins); it may contain sodium dichromate (corrosion inhibitor). It is generally regarded as being low in toxicity.

7.23.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Diesel fuel could be present in the tank as a liquid and/or sludge. Fluid that had leaked to the underlying soil could be present as saturated soil.

7.23.3 MIGRATION PATHWAYS

7.23.3.1 GEOLOGIC SETTING

See Section 3.2.

7.23.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.23.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

7.23.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general information. The area has been disturbed by past activities, but is generally level. Surface drainage is toward the south and west.

7.23.3.5 PATHWAYS

AIR

Because no surface releases of waste oil are evident at this location, it is felt that air is not a transport mechanism.

SOIL

Should a leak exist, hazardous constituents of the waste oils and fluids at this location would likely be released into the soil mass around and beneath the tank. Soil particle bonding, which naturally exists in the silt and clay type soils typical to this area, provide strong attenuation for these potential contaminants. Minor releases from this system would be trapped in the vadose soil zone until natural driving forces are exerted (surface water infiltration) to transport these substances to the ground water surface.

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SURFACE WATER/SEDIMENT

Preliminary evaluation of the UST system at SWMU No. 23 indicates no obvious points of surface contamination attributable to this unit. Therefore, the likelihood of surface water transport is remote.

GROUNDWATER

Contaminants contained in the UST at this SWMU are lighter than water and slightly soluble in water. They would be transported generally down gradient with the flow of ground water.

SUBSURFACE GAS

VOCs from POL could migrate if released in sufficient quantity.

7.23.4 CONTAMINANT RELEASE IDENTIFICATION

7.23.4.1 PRIOR INSPECTION REPORTS

Information is shown in Appendix L of the Station's Underground Tank Survey Report.

7.23.4.2 PUBLIC COMPLAINTS

None.

7.23.4.3 MONITORING/SAMPLING DATA

Information is shown in Appendix L of the Station's Underground Tank Survey Report.

7.23.4.4 EVIDENCE

None.

7.23.5 EXPOSURE POTENTIAL

7.23.5.1 PROXIMITY TO AFFECTED POPULATION

This SWMU is located in the NAS South Side industrial area, which is far away from the permanent NAS population.

7.23.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The unit is distant from sensitive environments.

7.23.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

It has not been previously determined whether a release of hazardous material has occurred from this tank system.

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7.23.6 DOCUMENTS REVIEWED

See PRD.

7.23.7 SUMMARIZED DATA GAP

7.23.7.1 SOIL

None available.

7.23.7.2 GROUNDWATER

No available data.

7.23.7.3 SURFACE WATER/SEDIMENT

No previous data. Surface water/sediment sampling is not needed for this SWMU.

7.23.7.4 AIR

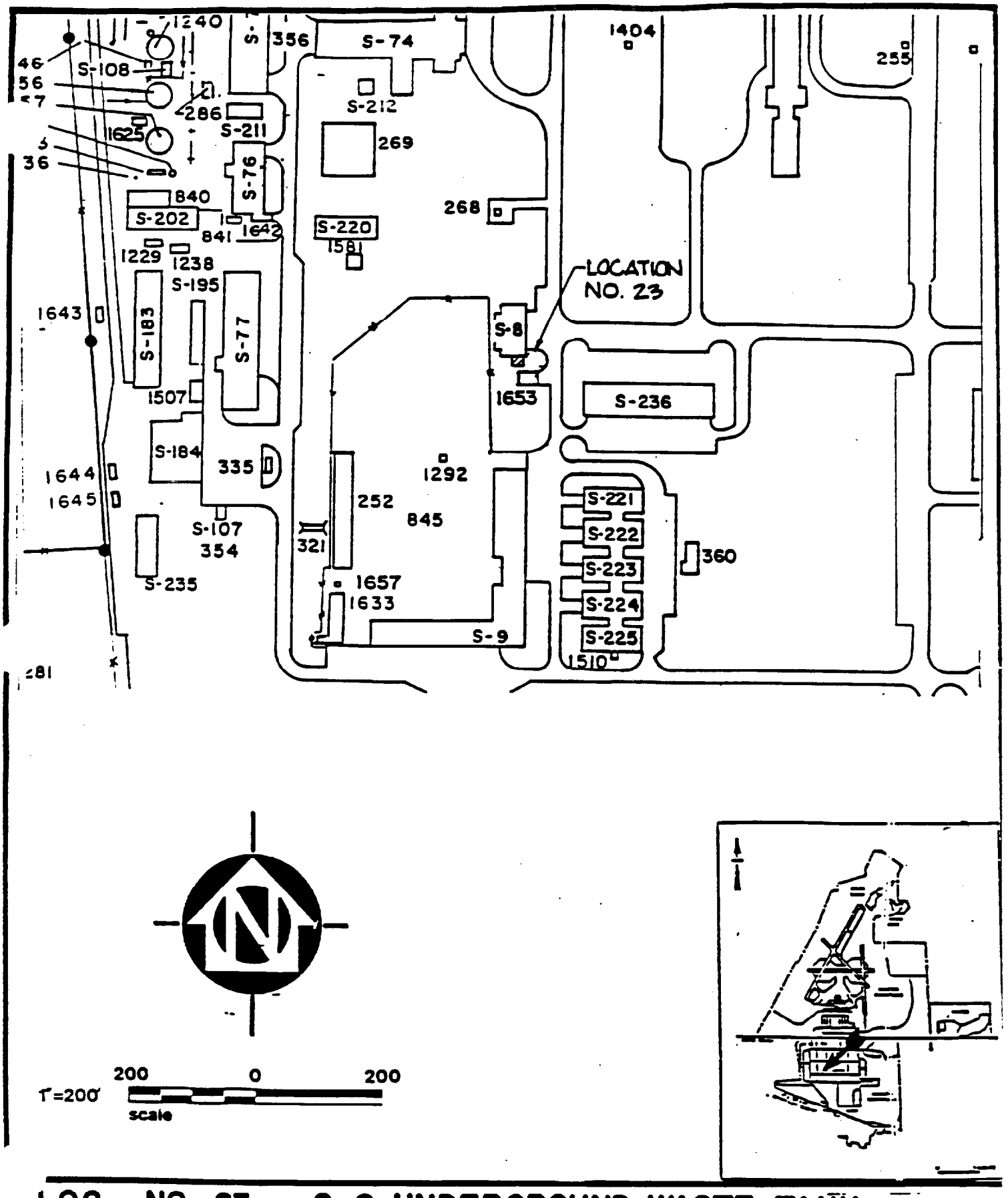
No previous data.

7.23.7.5 SUBSURFACE GAS

No previous data. Air Monitoring is not needed for this SWMU.

7.23.8 RECOMMENDED ACTIONS

Site No. 23 has been determined to be an "area of concern" by SOUTHDIV NAVFACENGCOM, EPA Region IV, and Tennessee Department of Health and Environment. Therefore, it will be included for investigation under the Navy's UST program.



LOC. NO. 23 S-8 UNDERGROUND WASTE TANK
FIGURE 7-23 LOCATION MAP

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7.24 SWMU NO. 24: AUTO HOBBY SHOP WASTE OIL TANKS-BUILDING N-114

7.24.1 UNIT CHARACTERISTICS

7.24.1.1 TYPE OF UNIT

Inactive waste oil tanks.

7.24.1.2 DESIGN FEATURES

Two, 500-gallon above-ground tanks.

7.24.1.3 OPERATING PRACTICE (PAST AND PRESENT)

Building N-114 is the Station Auto Hobby Shop which is utilized by base personnel to repair their vehicles. Work performed at this location is "do it yourself" (DIY), and waste oils and fluids are deposited in the two previously mentioned tanks.

7.24.1.4 PERIOD OF OPERATION

Unknown.

7.24.1.5 AGE OF UNIT

Unknown.

7.24.1.6 LOCATION OF UNIT

The N-114 waste oil tanks consist of two, 500-gallon above-ground tanks located near Building N-114. See Figure 7-24.

7.24.1.7 GENERAL PHYSICAL CONDITIONS

Unknown.

7.24.1.8 CLOSURE METHOD

Not applicable.

7.24.2 WASTE CHARACTERISTICS

7.24.2.1 TYPE OF WASTE

According to Department of the Navy information, various waste oils and fluids are stored in these tanks. These wastes would include automotive non-lubricating oils, lubricating oils, grease and hydraulic fluids.

7.24.2.2 MIGRATION CHARACTERISTICS

Wastes such as those previously characterized in this description are reasonably mobile in the environment. Preliminary investigation of this SWMU indicates the most

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likely release mechanism to be leaking tanks or product lines. Therefore, the release point is likely to be above grade. Rain water runoff can transport these wastes along the ground surface for dispersion/redeposition downgradient.

7.24.2.3 TOXICOLOGICAL CHARACTERISTICS

Used engine oil and hydraulic fluid include toxic volatile and semivolatile organics, toxic polynuclear aromatic hydrocarbons, and heavy metals (lead, cadmium). Organic constituents include known and suspected carcinogens, and toxic liquids and vapors. Acute effects of exposure may include nausea, vomiting, dizziness, drowsiness, central nervous system, depression, or damage to nerves, liver, or kidney.

7.24.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Substances remaining in the tanks would be in the form of liquids or semiliquids/sludges. Substances that may have leaked from the tanks could exist as waste-saturated soils or soil moisture/groundwater contaminants.

7.24.3 MIGRATION PATHWAYS

7.24.3.1 GEOLOGIC SETTING

See Section 3.2.

7.24.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.24.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

7.24.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general information. The area has been disturbed by past activities, but is generally level. General surface drainage is toward the south and west, with local variations.

7.24.3.5 PATHWAYS

AIR

Because no surface releases of waste oil are evident at this location, it is felt that air is not a transport mechanism.

SOIL

Should a leak exist, hazardous constituents of the waste oils

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and fluids at this location would likely be released into the pavement beneath the tank. Any leak would be readily apparent and limited to maximum volume of the tank(s) involved. Soil is not an applicable migration pathway for this unit.

SURFACE WATER/SEDIMENT

Preliminary evaluation of the tanks at SWMU No. 24 indicates no points of appreciable surface contamination. Therefore, the likelihood of surface water transport is remote.

GROUNDWATER

Contaminants contained in the tank at this SWMU are slightly soluble in water and would be transported generally down gradient with the flow of surface water.

SUBSURFACE GAS

Not applicable. Source is relatively small and located above-ground over pavement.

7.24.4 CONTAMINANT RELEASE IDENTIFICATION

7.24.4.1 PRIOR INSPECTION REPORTS

None available.

7.24.4.2 PUBLIC COMPLAINTS

None.

7.24.4.3 MONITORING/SAMPLING DATA

None available.

7.24.4.4 EVIDENCE OF RELEASE

This facility is utilized by NAS employees on an unsupervised basis. Surface oil stains were visible around the subject tanks. An investigation plan would include one sample point located at the point of most significant staining.

7.24.5 EXPOSURE POTENTIAL

7.24.5.1 PROXIMITY TO AFFECTED POPULATION

This SWMU is located in the NAS North Side industrial area, distant from the permanent NAS population.

7.24.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The unit is distant from sensitive environments.

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7.24.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

It has not been previously determined whether a significant release of hazardous material has occurred from this tank system.

7.24.6 DOCUMENTS REVIEWED

See PRD.

7.24.7 SUMMARIZED DATA GAP

7.24.7.1 SOIL

None available.

7.24.7.2 GROUNDWATER

No available data.

7.24.7.3 SURFACE WATER/SEDIMENT

No previous data. Surface water/sediment sampling is not needed for this SWMU.

7.24.7.4 AIR

No previous data.

7.24.7.5 SUBSURFACE GAS

No previous data. Gas sampling is not needed for this SWMU.

7.24.8 RECOMMENDED ACTIONS

This site has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM, EPA Region IV, and the Tennessee Department of Health and Environment.

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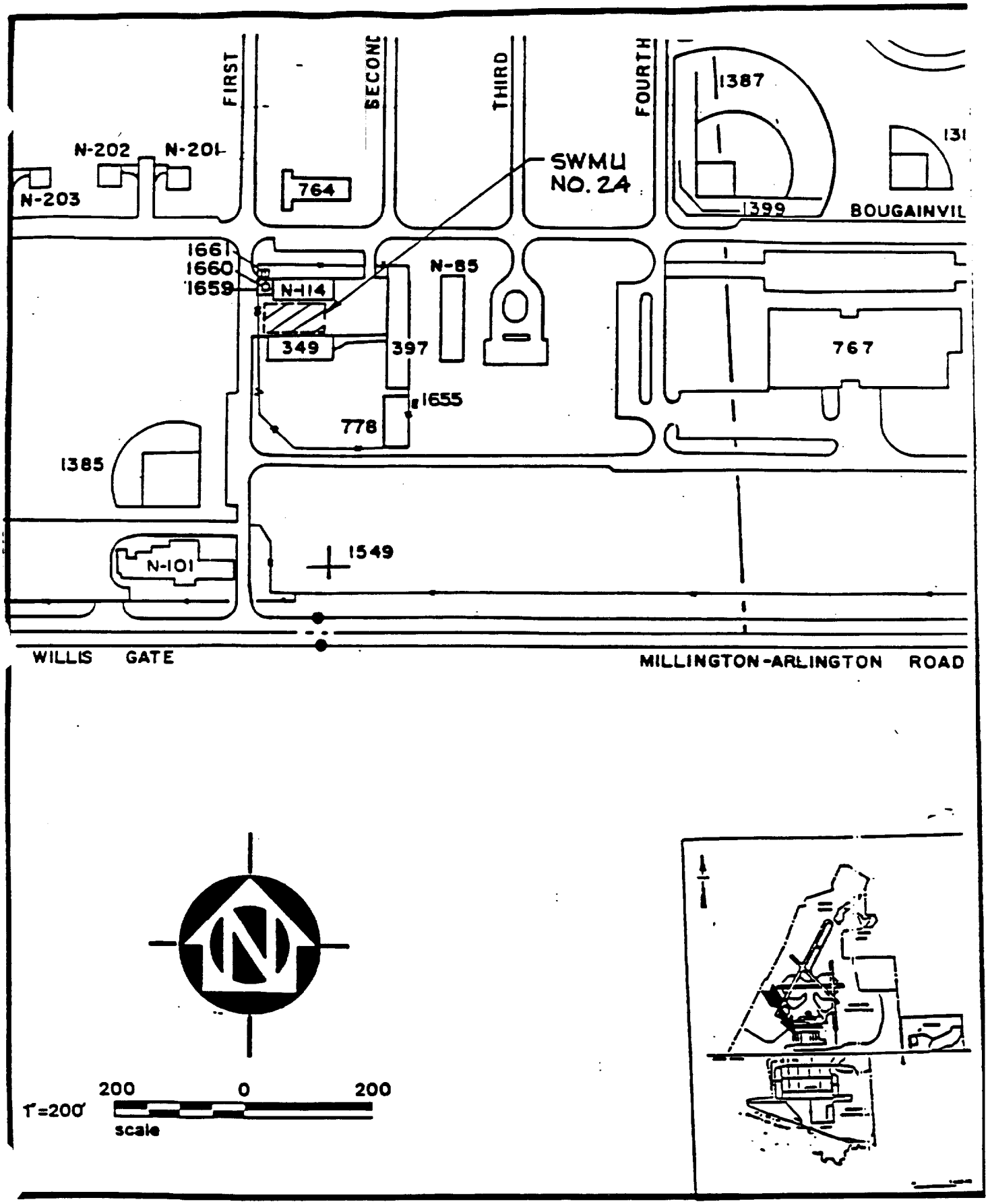

SWMU NO. 24 AUTO SHOP WASTE OIL TANK
FIGURE 7-24 LOCATION MAP

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7.41 SWMU NO. 41: SALVAGE YARD NO. 2

7.41.1 UNIT CHARACTERISTICS

7.41.1.1 TYPE OF UNIT

Waste storage area.

7.41.1.2 DESIGN FEATURES

The approximate salvage yard area was 5,700 square yards.

7.41.1.3 OPERATING PRACTICE (PAST AND PRESENT)

All storage was above ground with no evidence of buried wastes.

7.41.1.4 PERIOD OF OPERATION

The yard has been operated by DRMO since 1944.

7.41.1.5 AGE OF UNIT

Forty-six years old.

7.41.1.6 LOCATION OF UNIT

Salvage Yard No. 2 was a fenced-in open storage area, designated as Area No. 885 in Figure 7-41.

7.41.1.7 GENERAL PHYSICAL CONDITIONS

Not applicable.

7.41.1.8 CLOSURE METHOD

Unknown.

7.41.2 WASTE CHARACTERISTICS

7.41.2.1 TYPE OF WASTE

Salvage Yard No. 2 is used to store scrap metal, tire, batteries, used furniture, etc. There is no evidence of any liquid wastes or chemical drums within the area. In addition, DRMO operated the salvage yard under a contract with the Navy which prohibited the admittance of any hazardous substance into the yard. However, as in Salvage Yard No. 1, the previous presence of scrap vehicles and batteries introduces the possibility of low-level contamination through leakage of gasoline, lubricating oil, or battery acid.

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7.41.2.2 MIGRATION CHARACTERISTICS

Presumed contamination from batteries and vehicles would be in the form of a liquid. Contamination, therefore, would have been downward through the soil if leaks have actually occurred.

7.41.2.3 TOXICOLOGICAL CHARACTERISTICS

Unknown. No toxic substances have been identified. Refer to SWMUs No. 1, 5, and 6 for information on potential contaminants.

7.41.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Contaminants, if present, would necessarily be present as soil contaminants.

7.41.3 MIGRATION PATHWAYS

7.41.3.1 GEOLOGIC SETTING

See Section 3.2.

7.41.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.41.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

7.41.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general information. The area is generally level. Surface drainage is toward the south and west.

7.41.3.5 PATHWAYS

AIR

Although the vapors produced by the potential contaminants can be harmful, they also produce strong odors which would negate the need for testing. Furthermore, since these vapors are known to dissipate quickly, testing would not be meaningful unless a spill had very recently occurred.

SOIL

Due to the nature of the presumed leaks, a portion of the contaminants would complex with the soil particles, thereby leaving traces of their pathway downward.

900122

SURFACE WATER/SEDIMENT

Salvage Yard No. 2 is located adjacent to the Big Creek Drain as shown on Figure 7-41. It is possible that contamination of the creek could occur from either overland flow or the groundwater movement. However, contamination could only occur by overland flow on a continuous basis, which would be visually apparent, or from storm water runoff, which would quickly be carried down stream.

GROUNDWATER

Although there is a possibility of groundwater contamination of large leaks have occurred, no evidence exists to indicate that they have.

SUBSURFACE GAS

Since there is no visual evidence of buried waste, the presence of subsurface gas appears unlikely.

7.41.4 CONTAMINANT RELEASE IDENTIFICATION

7.41.4.1 PRIOR INSPECTION REPORTS

None available.

7.41.4.2 PUBLIC COMPLAINTS

None.

7.41.4.3 MONITORING/SAMPLING DATA

None available.

7.41.4.4 EVIDENCE OF RELEASE

None observed.

7.41.5 EXPOSURE POTENTIAL

7.41.5.1 PROXIMITY TO AFFECTED POPULATION

This SWMU is located in the remote location distant from the permanent NAS population.

7.41.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The unit is distant from sensitive environments.

7.41.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

It has not been previously determined whether a release of hazardous material has occurred from this unit.

000123

7.41.6 DOCUMENTS REVIEWED

See PRD.

7.41.7 SUMMARIZED DATA GAP

7.41.7.1 SOIL

None available.

7.41.7.2 GROUNDWATER

No available data.

7.41.7.3 SURFACE WATER/SEDIMENT

No previous data.

7.41.7.4 AIR

No previous data.

7.41.7.5 SUBSURFACE GAS

No previous data.

7.41.8 RECOMMENDED ACTIONS

This site has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM, EPA Region IV, and the Tennessee Department of Health and Environment.

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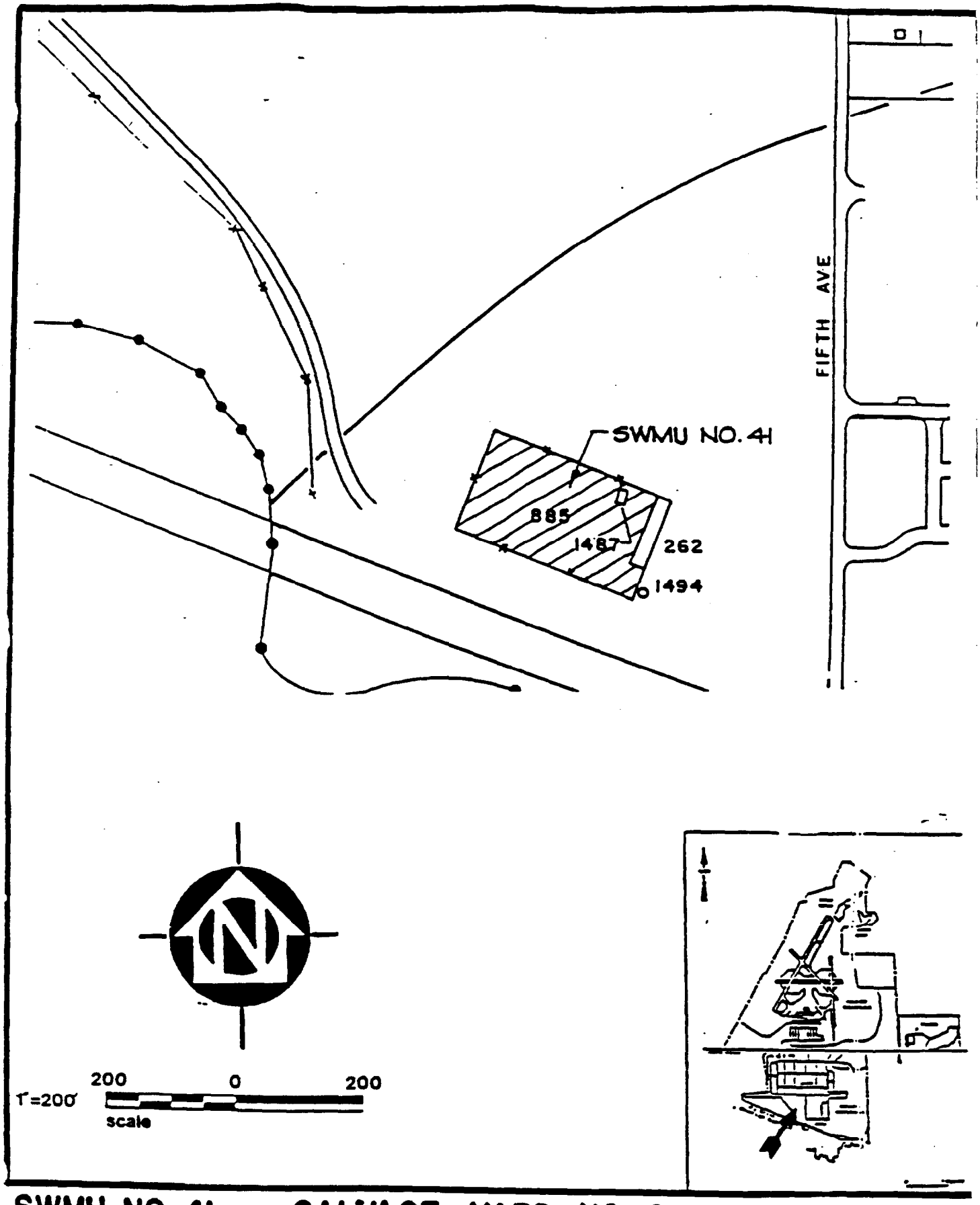

SWMU NO. 41 SALVAGE YARD NO. 2
FIGURE 7-41 LOCATION MAP

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7.43 SWMU NO. 43: S-176 HAZARDOUS WASTE ACCUMULATION POINT

7.43.1 UNIT CHARACTERISTICS

7.43.1.1 TYPE OF UNIT

Inactive waste storage area.

7.43.1.2 DESIGN FEATURES

Open, unpaved storage yard.

7.43.1.3 OPERATING PRACTICE (PAST AND PRESENT)

This SWMU served as an accumulation point for drummed paint solvents. From this accumulation point, the drummed wastes were conveyed off-site for disposal. The area was unprotected ground surface with no containment.

7.43.1.4 PERIOD OF OPERATION

The area was inspected in 1983 with no visual evidence of any release. The area is no longer used as an accumulation point, and Building S-176 no longer exists.

7.43.1.5 AGE OF UNIT

Unknown.

7.43.1.6 LOCATION OF UNIT

SWMU No. 43 was located adjacent to Building S-176. See Figure 7-43.

7.43.1.7 GENERAL PHYSICAL CONDITIONS

Not applicable.

7.43.1.8 CLOSURE METHOD

Not applicable.

7.43.2 WASTE CHARACTERISTICS

7.43.2.1 TYPE OF WASTE

According to Department of the Navy information, drummed paint solvents were placed in the accumulation area; however, it would be reasonable to assume that waste paint and perhaps paint strippers may have also been involved.

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7.43.2.2 MIGRATION CHARACTERISTICS

Any released solvents would be mobile in the soil and if in sufficient volume, could reach ground water. Transport via surface waters is a possibility if any release coincided with a precipitation event. If paint sludges were released, they would be very immobile in soil and less likely to be transported by surface waters. Also, they would be very apparent visually and such were not detected.

7.43.2.3 TOXICOLOGICAL CHARACTERISTICS

Paint solvents would likely have included mineral spirits, turpentine and other terpenes, phenols, kerosene, and possibly various alcohols. Gasoline-type substances (e.g., BTEX) are also possible.

Depending on substances present, symptoms of exposure could be headache; eye, skin, and mucous membrane irritation; drowsiness; agitation; and damage to nerve tissue, liver, or kidneys.

7.43.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Residual contamination would exist as adsorbate on soil particles, as soil-pore vapors, and possibly as groundwater contaminants.

7.43.3 MIGRATION PATHWAYS

7.43.3.1 GEOLOGIC SETTING

See Section 3.2.

7.43.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.43.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

7.43.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general information. The area has been disturbed by past activities, but is generally level. Surface drainage is toward the south and west.

000128

7.43.3.5 PATHWAYS

AIR

Any release of volatile constituents during SWMU operation would have volatilized promptly upon release. The SWMU has not been used as an accumulation point for many months. Therefore, there would be no residual volatile constituents in the ambient air in the vicinity of the SWMU.

SOIL

Any release would impact initially the upper or surficial soils with the potential for transport to the deeper soils only if the release was in a significant amount. There was no visual evidence of a release in 1983, and such would have been apparent had a release of a significant amount occurred. Minor releases would be trapped in the vadose zone and attenuated by the surficial soils. Thus, for this SWMU, transport into the soil below a depth of three feet is not expected if in fact a release did occur.

SURFACE WATER/SEDIMENT

Visual observations have revealed no apparent release of hazardous constituents to surface water. If such a release had occurred, the time lapse would prevent detection at this time. Evidence of a past surface release may exist in ditch sediment.

GROUNDWATER

If there had been a significant release from this SWMU, solvents could have reached the ground water.

7.43.4 CONTAMINANT RELEASE IDENTIFICATION

7.43.5 SUBSURFACE GAS

Not applicable.

7.43.4.1 PRIOR INSPECTION REPORTS

Visual inspections in 1987 and 1989 revealed no evidence of releases. Site is scheduled for closure when the planned hazardous waste storage building becomes operational.

7.43.4.2 PUBLIC COMPLAINTS

None.

7.43.4.3 MONITORING/SAMPLING DATA

None.

7.43.4.4 EVIDENCE OF RELEASE

None observed.

7.43.5 EXPOSURE POTENTIAL

7.43.5.1 PROXIMITY TO AFFECTED POPULATION

This SWMU is located in the NAS industrial area, which is far away from the permanent NAS population.

7.43.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The unit is distant from sensitive environments.

7.43.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

It has not been previously determined whether a release of hazardous material has occurred from this Unit. It is reasonable to assume that a release would be characterized by the organic volatile priority pollutants, xylene, heavy metals, and phenols.

7.43.6 DOCUMENTS REVIEWED

See PRD.

7.43.7 SUMMARIZED DATA GAP

7.43.7.1 SOIL

None available.

7.43.7.2 GROUNDWATER

No available data.

7.43.7.3 SURFACE WATER/SEDIMENT

No previous data.

7.43.7.4 AIR

No previous data.

7.43.7.5 SUBSURFACE GAS

No previous data. Subsurface gas monitoring is not needed for this SWMU.

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7.43.8 RECOMMENDED ACTIONS

This site has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM, EPA Region IV, and the Tennessee Department of Health and Environment.

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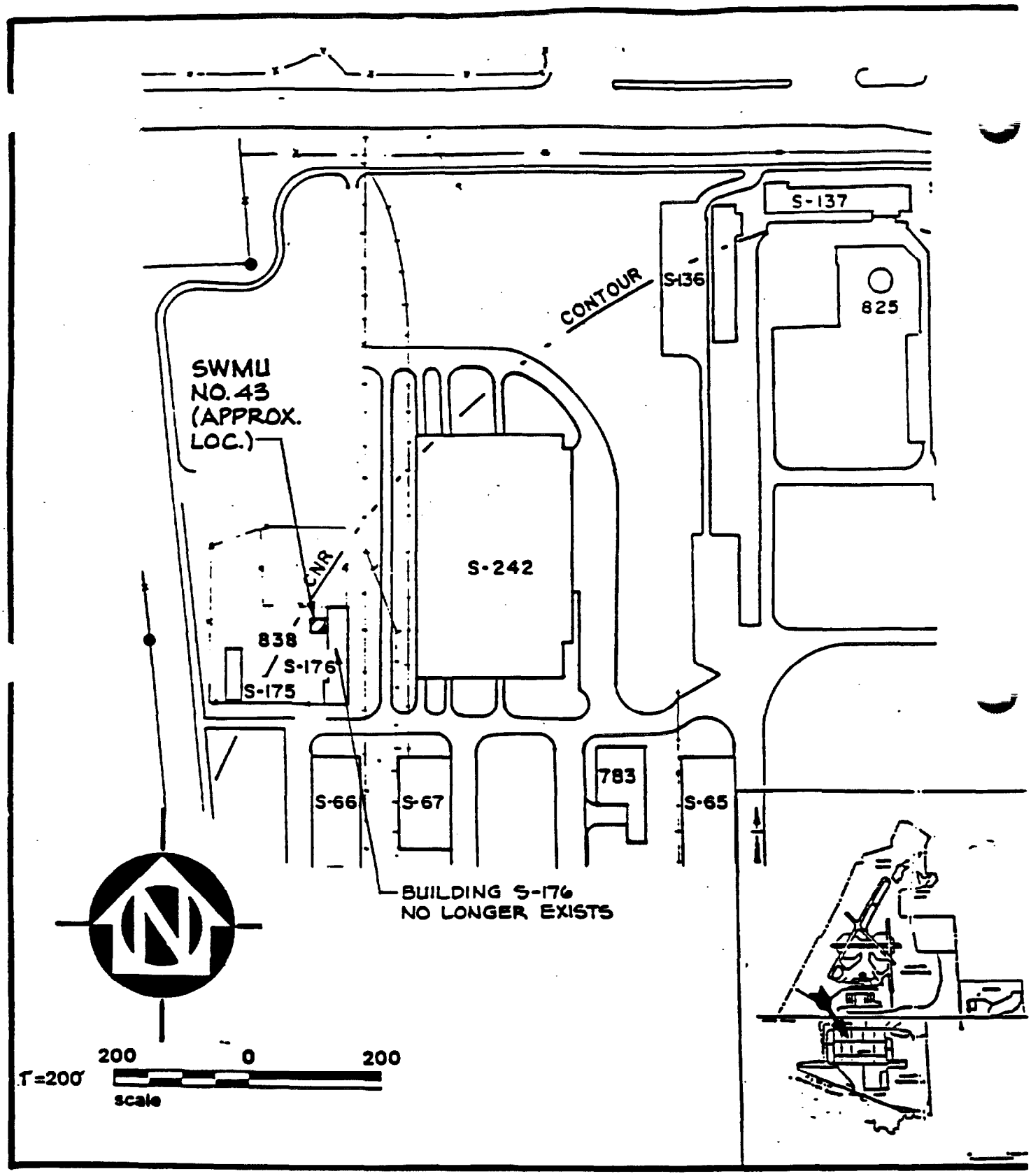

SWMU NO. 43 HZ WASTE ACCUMULATION PTS AT S-17
FIGURE 7-43 LOCATION MAP

7.47 SWMU NO. 47: BUILDING 344 HAZARDOUS ACCUMULATION POINT

7.47.1 UNIT CHARACTERISTICS

7.47.1.1 TYPE OF UNIT

Inactive waste storage area.

7.47.1.2 DESIGN FEATURES

The containers accumulated at this point ranged in size from one quart to five gallons; the accumulated wastes were ultimately conveyed off-site for disposal. The area was unprotected ground surface with no containment.

7.47.1.3 OPERATING PRACTICE (PAST AND PRESENT)

This SWMU served as accumulated point for containerized mineral spirits.

7.47.1.4 PERIOD OF OPERATION

The area is no longer used as an accumulation point.

7.47.1.5 AGE OF UNIT

Unknown.

7.47.1.6 LOCATION OF UNIT

SWMU No. 47 is located adjacent to Building 344. See Figure 7-47.

7.47.1.7 GENERAL PHYSICAL CONDITIONS

Physical condition was good at the time of the July 1989 site inspection.

7.47.1.8 CLOSURE METHOD

Not applicable.

7.47.2 WASTE CHARACTERISTICS

7.47.2.1 TYPE OF WASTE

Containerized mineral spirits.

7.47.2.2 MIGRATION CHARACTERISTICS

Any released solvents would be mobile in the soil and, if in sufficient volume, could reach ground water. Transport via

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surface waters is a possibility if any previous release coincided with a precipitation event.

7.47.2.3 TOXICOLOGICAL CHARACTERISTICS

Mineral spirits are petroleum distillates similar to kerosene which are used as paint and varnish solvents and metal cleaner/degreaser. Prolonged dermal contact can lead to tissue damage. Prolonged inhalation of vapors can lead to liver and kidney damage.

7.47.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Any residual contamination would exist as adsorbate on soil particles, as soil-pore vapor, and possibly as groundwater contamination.

7.47.3 MIGRATION PATHWAYS

7.47.3.1 GEOLOGIC SETTING

See Section 3.2.

7.47.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.47.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

7.47.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general information. The area has been disturbed by past activities, but is generally level. Surface drainage is toward the south and west.

7.47.3.5 PATHWAYS

AIR

Any release of volatile constituents would have volatilized promptly upon release. The SWMU has not been as an accumulation point for many months; therefore, there would be no residual volatile constituents in the ambient air in the vicinity of the SWMU.

SOIL

Any releases would initially impact the upper or surficial soils with the potential for transport to the deeper soils

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only if the release were a significant amount. There was no visual evidence of a release in 1983 and such would have been apparent had a release of a significant amount occurred prior to the 1983 inspection. Minor releases would be trapped in the vadose zone and attenuated by the surficial soils. Thus, for this SWMU, transport into the soil below a depth of three feet is not expected if in fact a release did occur.

SURFACE WATER/SEDIMENT

Visual observations have revealed no apparent release of hazardous constituents to surface water courses. If such a release had occurred, the time lapse would prevent detection at this time.

GROUNDWATER

If there had been a significant release from this SWMU, solvents could have reached the ground water.

SUBSURFACE GAS

Not applicable.

7.47.4 CONTAMINANT RELEASE IDENTIFICATION

7.47.4 1 PRIOR INSPECTION REPORTS

The unit has been inspected in 1983, 1987, and 1989. No visual evidence of release was found.

7.47.4.2 PUBLIC COMPLAINTS

None.

7.47.4.3 MONITORING/SAMPLING DATA

None.

7.47.4.4 EVIDENCE OF RELEASE

None observed.

7.47.5 EXPOSURE POTENTIAL

7.47.5.1 PROXIMITY TO AFFECTED POPULATION

This SWMU is located in the NAS South Side industrial area, at a distance from the permanent NAS population.

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7.47.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The site is not in or near environmentally sensitive areas.

7.47.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

The area was inspected in 1983, and there was no visual evidence of any releases. Inspections were conducted on 1983, 1987, and 1989. In absence of a release, migration is unlikely.

7.47.6 DOCUMENT REVIEWED

See PRD.

7.47.7 SUMMARIZED DATA GAP

7.47.7.1 SOIL

None available.

7.47.7.2 ROUNDWATER

No available data.

7.47.7.3 SURFACE WATER/SEDIMENT

No previous data.

7.47.7.4 AIR

No previous data.

7.47.7.5 UBSURFACE GAS

No previous data.

7.47.8 RECOMMENDED ACTIONS

This site has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM, EPA Region IV, and the Tennessee Department of Health and Environment.

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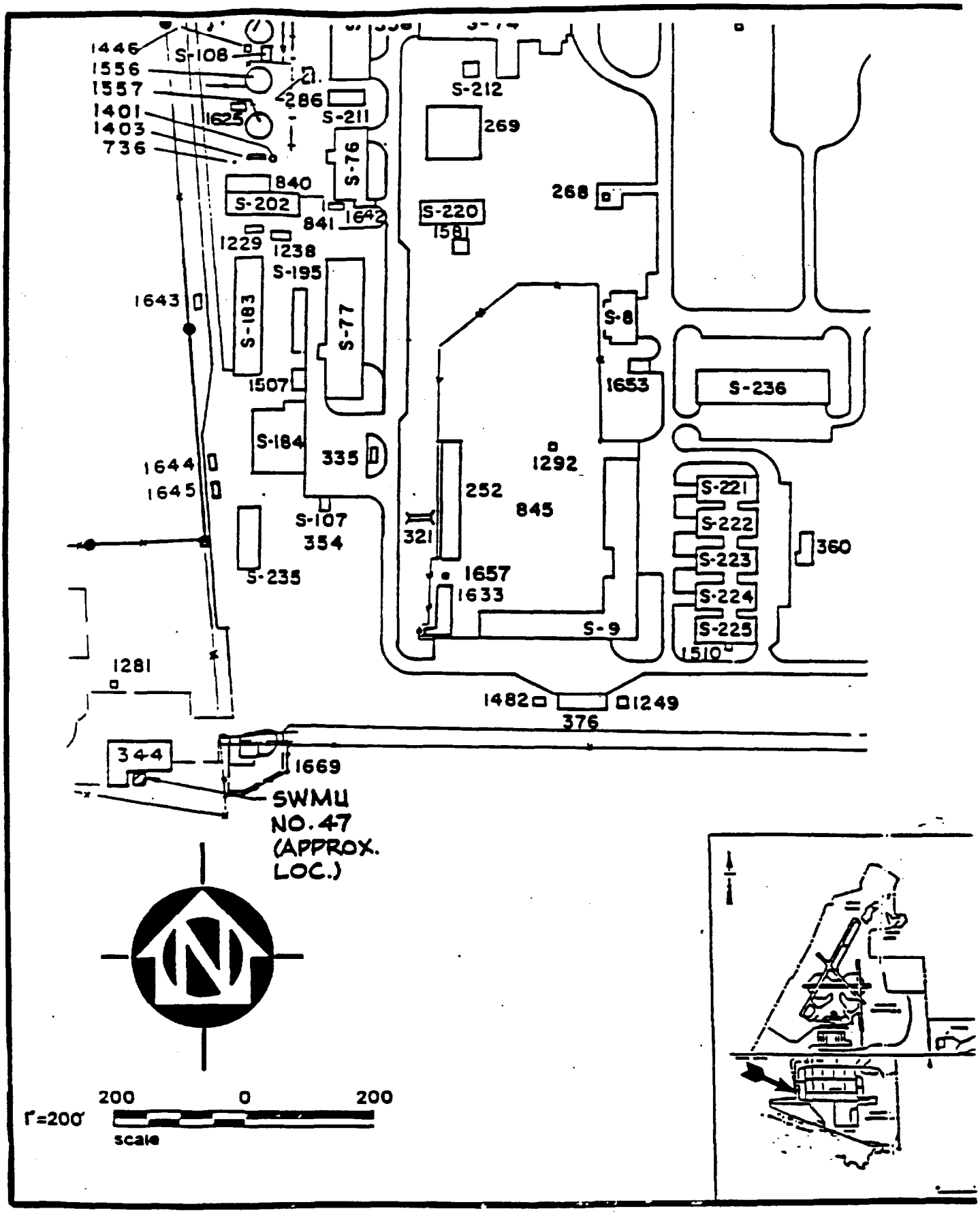

SWMU NO. 47 HZ WASTE ACCUMULATION PTS AT 344
FIGURE 7-47 LOCATION MAP

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7.48 SWMU NO. 48: S-9 HAZARDOUS WASTE ACCUMULATION POINT

7.48.1 UNIT CHARACTERISTICS

7.48.1.1 TYPE OF UNIT

Inactive waste storage area for Public Works maintenance.

7.48.1.2 DESIGN FEATURES

Open storage area; unprotected surface ground with no containment.

7.48.1.3 OPERATING PRACTICE (PAST AND PRESENT)

This SWMU served as accumulated point for containerized paint thinner and degreasing agents.

7.48.1.4 PERIOD OF OPERATION

The area is no longer used as an accumulation point.

7 8.1.5 AGE OF UNIT

Unknown.

7. 8.1.6 LOCATION OF UNIT

SWMU No. 48 is located adjacent to Building S-9. See Figure 7-48.

7. 8.1.7 GENERAL PHYSICAL CONDITIONS

As of the last inspection (7 February 1990), the site was clean. However, a used automobile battery staging area had been set up on a graveled section of the parking area near Building 1292 a short distance to the north.

7.48.1.8 CLOSURE METHOD

Removal of containers.

7.48.2 WASTE CHARACTERISTICS

7.48.2.1 TYPE OF WASTE

Paint thinners and degreasers.

7.48.2.2 MIGRATION CHARACTERISTICS

Any released solvents would be mobile in the soil and, if in sufficient volume, could reach ground water. Transport via

surface waters is a possibility if any release coincided with a precipitation event. If paint sludges were released, they would be very immobile in soil and less likely to be transported via surface waters. Also, paint sludges would be very apparent visually and such were not detected during the 1983 survey.

7.48.2.3 TOXICOLOGICAL CHARACTERISTICS

Paint solvents would likely have included mineral spirits, turpentine and other turpenes, phenols, kerosenes, and possibly various alcohols. Gasoline-type substances (e.g., BTEX) are also possible.

Depending on substances present, symptoms of exposure could be headache; eye, skin, and mucous membrane irritation; drowsiness; agitation; and damage to nerve tissue, liver, or kidneys.

7.48.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Residual contamination would exist as adsorbate on soil particles, as soil pore-vapors, and possibly as groundwater contaminants.

7.48.3 MIGRATION PATHWAYS

7.4.3.1 GEOLOGIC SETTING

See Section 3.2.

7.4.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.4.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

7.4.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general information. The area has been disturbed by past activities, but is generally level. Surface drainage is toward the south and west.

7.4.3.5 PATHWAYS

AIR

Any release of volatile constituents would have volatilized promptly upon release. The SWMU has not been an accumulation

000140

point for many months; therefore, there would be no residual volatile constituents in the ambient air in the vicinity of the SWMU.

SOIL

Any releases would initially impact the upper or surficial soils with the potential for transport to the deeper soils only if the release were a significant amount. There was no visual evidence of a release in 1983 and such would have been apparent had a release of a significant amount occurred prior to the 1983 inspection. Minor releases would be trapped in the vadose zone and attenuated by the surficial soils. Thus, for this SWMU, transport into the soil below a depth of three feet is not expected, if a release did in fact occur.

SURFACE WATER/SEDIMENT

Visual observations have revealed no apparent release of hazardous constituents to surface water courses.

GROUNDWATER

If there had been a significant release from this SWMU, solvents could have reached the groundwater.

SUBSURFACE GAS

Not applicable.

7.48.4 CONTAMINANT RELEASE IDENTIFICATION

7.48.4 1 PRIOR INSPECTION REPORTS

None available.

7.48.4.2 PUBLIC COMPLAINTS

None.

7.48.4.3 MONITORING/SAMPLING DATA

None.

7.48.4.4 EVIDENCE OF RELEASE

None observed.

000141

7.48.5 EXPOSURE POTENTIAL

7.48.5.1 PROXIMITY TO AFFECTED POPULATION

The affected population would be workers in the immediate area.

7.48.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The site is not in or near environmentally sensitive areas.

7.48.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

Because of the site location and small container sizes, migration to potential receptors is unlikely.

7.48.6 DOCUMENTS REVIEWED

See PRD.

7.48.7 SUMMARIZED DATA GAP

7.48.7.1 SOIL

No data.

7.48.7.2 GROUNDWATER

No data.

7.48.7.3 SURFACE WATER/SEDIMENT

No data.

7.48.7.4 AIR

Not applicable.

7.48.7.5 SUBSURFACE GAS

Not applicable.

7.48.8 RECOMMENDED ACTIONS

This site has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM, EPA Region IV, and the Tennessee Department of Health and Environment.

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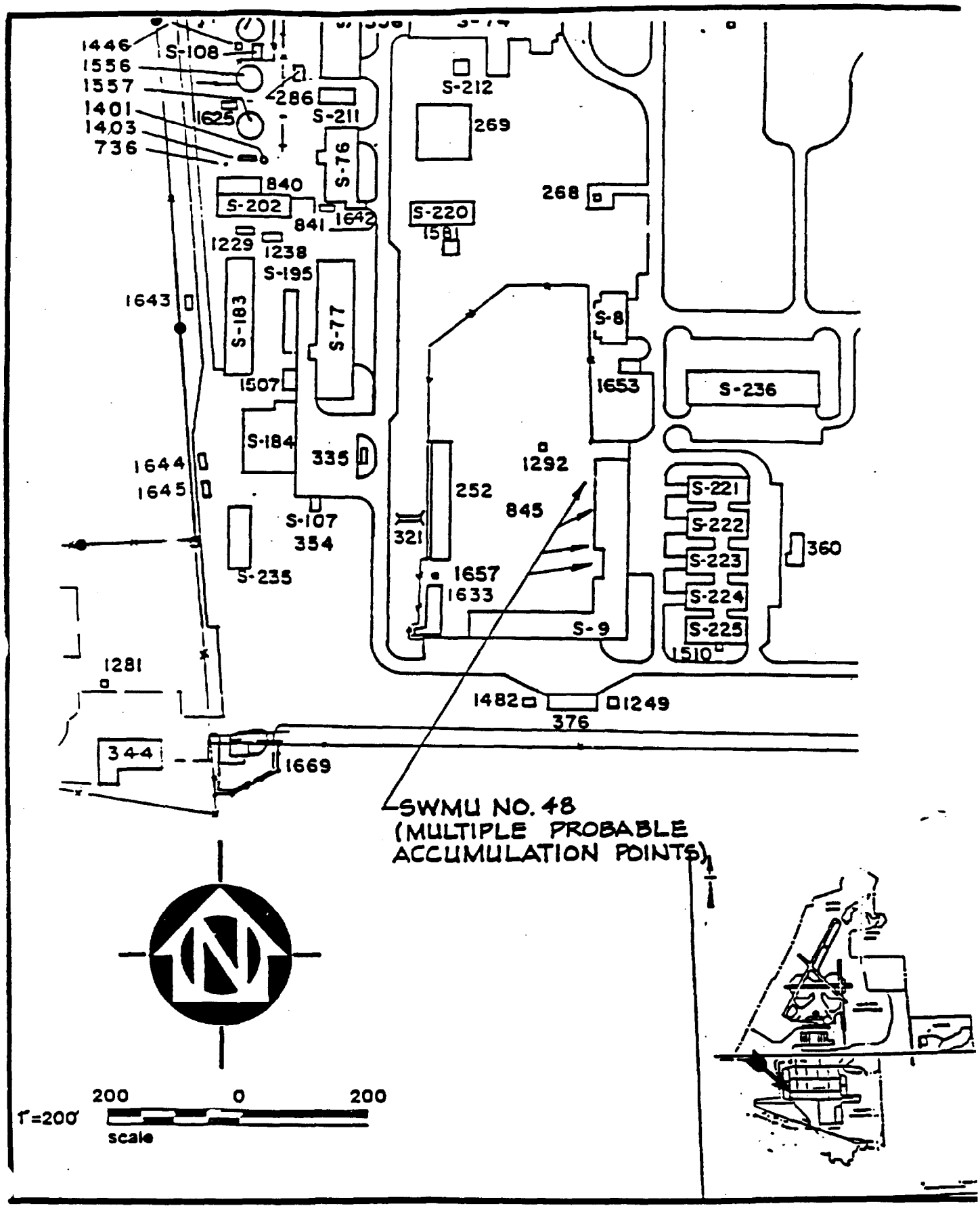

SWMU NO. 48 HZ. WASTE ACCUMULATION PTS AT S-9
FIGURE 7-48 LOCATION MAP

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7.49 SWMU NO. 49: BUILDING 757 HAZARDOUS WASTE ACCUMULATION POINTS

7.49.1 UNIT CHARACTERISTICS

7.49.1.1 TYPE OF UNIT

Inactive waste storage area.

7.49.1.2 DESIGN FEATURES

The area was open storage with unprotected ground surface and no containment.

7.49.1.3 OPERATING PRACTICE (PAST AND PRESENT)

This SWMU served as accumulated point for used automobile batteries and containerized waste mineral spirits.

7.49.1.4 PERIOD OF OPERATION

The area is no longer used as an accumulation point.

7.49.1.5 AGE OF UNIT

Unknown.

7.49.1.6 LOCATION OF UNIT

SWMU No. 49 is located adjacent to Building 757. See Figure 7-49.

7.49.1.7 GENERAL PHYSICAL CONDITIONS

The SWMU was unused and appeared clean at the time of the last inspection (7 February 1990). SWMU usage and exact location have apparently changed several times over the past several years.

7.49.1.8 CLOSURE METHOD

To be determined.

7.49.2 WASTE CHARACTERISTICS

7.49.2.1 TYPE OF WASTE

Mineral spirits, waste paints, and used batteries.

00145

7.49.2.2 MIGRATION CHARACTERISTICS

Any released solvents would be mobile in the soil and, if in sufficient volume, could reach ground water. Transport via surface waters is a possibility if any release coincided with a precipitation event. If mineral spirits were released, they would be very immobile in soil and less likely to be transported via surface waters. Also, mineral spirits would be very apparent visually and such were not detected during the 1983 survey or later site visits.

7.49.2.3 TOXICOLOGICAL CHARACTERISTICS

Contaminants of concern are sulfuric acid, and the heavy metals cadmium, lead, and zinc. Sulfuric acid, at sufficient strength, is corrosive to tissue and can produce chemical burns. One neutralized, the constituents are relatively innocuous. Heavy metals produce toxic effects in sufficient dosages, primarily by interfering with cellular enzymes and/or nerve function. Heavy metal poisoning usually results from chronic exposure to low concentrations in food and water.

During the period of operation, paints likely contained lead and various metallic pigments in a hydrocarbon (e.g., acrylic) matrix. Liquid paints probably included both oil-based and water-based (e.g., latex) types. Paint solvents probably included turpentine and/or other terpenes and mineral spirits. Lead, which is probably the most important toxic metal of concern at this SWMU, can result in systemic poisoning as a result of chronic exposure. Paint organic solvents can produce a number of acute and chronic effects, including headaches, nausea, dizziness, disorientation, liver or kidney damage, or nerve tissue damage.

7.49.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Sulfuric acid in likely no longer associated with this SWMU, given the time since operations ceased and the local meteorological conditions. Heavy metals would likely be present as adsorbate in soil particles.

At this SWMU, residuals would likely exist as solids or liquids adsorbed onto soil particles or as soil moisture/groundwater contaminants.

7.49.3 MIGRATION PATHWAYS

7.49.3.1 GEOLOGIC SETTING

See Section 3.2.

000146

7.49.3.2 **HYDROGEOLOGIC SETTING**

See Section 3.3.

7.49.3.3 **ATMOSPHERIC CONDITIONS**

See Section 4.0.

7.49.3.4 **TOPOGRAPHIC CHARACTERISTICS**

See Section 3.1 for general information. The area has been disturbed by past activities, but is generally level. Surface drainage is toward the south and west.

7.49.3.5 **PATHWAYS**

AIR

Any release of volatile constituents would have volatilized promptly upon release. The SWMU has not been as an accumulation point for many months; therefore, there would be no residual volatile constituents in the ambient air in the vicinity of the SWMU.

SOIL

Any releases would initially impact the upper or surficial soils with the potential for transport to the deeper soils only if the release were a significant amount. There was no visual evidence of a release in 1983 and such would have been apparent had a release of a significant amount occurred prior to the 1983 inspection. Minor releases would be trapped in the vadose zone and attenuated by the surficial soils. Thus, for this SWMU, transport into the soil below a depth of three feet is not expected if in fact a release did occur.

SURFACE WATER/SEDIMENT

Visual observations have revealed no apparent release of hazardous constituents to surface water courses. If such a release had occurred, the time lapse would prevent detection at this time.

GROUNDWATER

If there had been a significant release from this SWMU, solvents could have reached the groundwater. There is no indication that this ever occurred.

000147

SUBSURFACE GAS

Not applicable.

7.49.4 CONTAMINANT RELEASE IDENTIFICATION

7.49.4.1 PRIOR INSPECTION REPORTS

None available.

7.49.4.2 PUBLIC COMPLAINTS

None.

7.49.4.3 MONITORING/SAMPLING DATA

None available.

7.49.4.4 EVIDENCE OF RELEASE

None observed.

7.49.5 EXPOSURE POTENTIAL

7.49.5.1 PROXIMITY TO AFFECTED POPULATION

The SWMU is located on Navy Road. While it is distant from the NAS residential area it is near residences on Navy Road.

7.49.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The site is not in or near environmentally sensitive areas.

7.49.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

Migration to potential receptors is unlikely considering the locations and potential volumes involved.

7.49.6 DOCUMENTS REVIEWED

None available.

7.49.7 SUMMARIZED DATA GAP

7.49.7.1 SOIL

No data.

7.49.7.2 GROUNDWATER

No data.

000148

7.49.7.3 SURFACE WATER/SEDIMENT

No data.

7.49.7.4 AIR

Not applicable.

7.49.7.5 SUBSURFACE GAS

Not applicable.

7.49.8 RECOMMENDED ACTIONS

This site has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM, EPA Region IV, and the Tennessee Department of Health and Environment.

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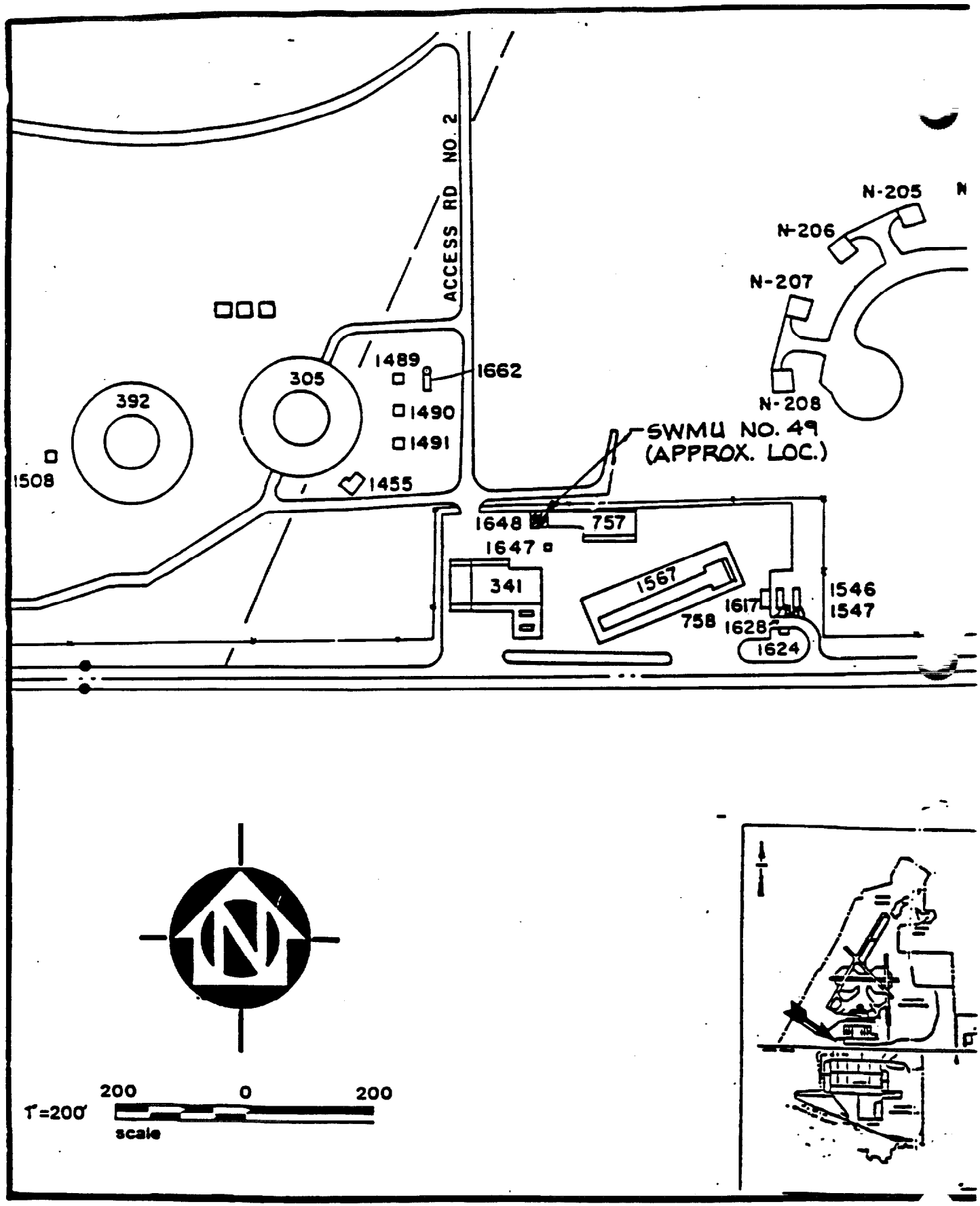

SWMU NO. 49 HZ WASTE ACCUMULATION PTS AT 757
FIGURE 7-49 LOCATION MAP

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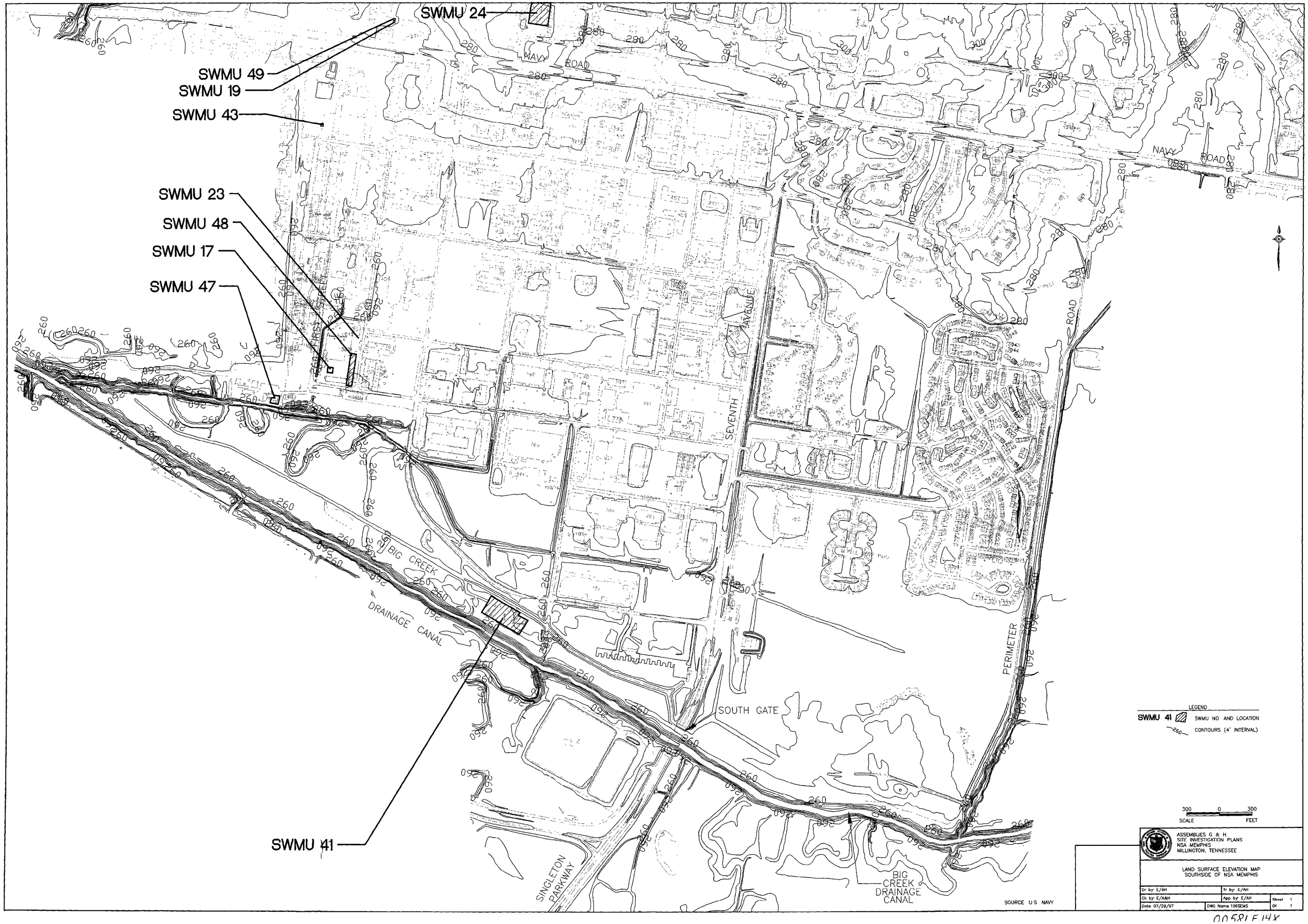
Attachment B

Topographic Map


SWMU 24
SWMU 49
SWMU 19
SWMU 43
SWMU 23
SWMU 48
SWMU 17
SWMU 47
SWMU 41
NAVY ROAD
SEVENTH AVENUE
PERIMETER ROAD
BIG CREEK DRAINAGE CANAL
SOUTH GATE
SINGLETON PARKWAY
BIG CREEK DRAINAGE CANAL
LEGEND
SWMU 41 SWMU NO AND LOCATION
260 CONTOURS (4' INTERVAL)
300 0 300
SCALE FEET
SOURCE U S NAVY
ASSEMBLIES G & H
SITE INVESTIGATION PLANS
NSA MEMPHIS
MILLINGTON, TENNESSEE
LAND SURFACE ELEVATION MAP
SOUTHSIDE OF NSA MEMPHIS
Dr by E/AH
Tr by E/AH
Ck by E/A&H
App by E/AH
Date 07/29/97
DWG Name 106SEMS
Sheet 1
Of 1

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Attachment C

Site-Specific Health and Safety Plan

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1.0 INTRODUCTION

As part of the U.S. Navy Installation Restoration Program, at the Naval Support Activity (NSA) Memphis, Millington, Tennessee, a Confirmatory Sampling Investigation (CSI) will be conducted at Assemblies G and H. Assemblies G and H include the following Solid Waste Management Units (SWMUs): 17, 19, 43, 47, 48, 49 in Assembly G; and 23, 24, and 41 in Assembly H. The objectives of the CSI are to assess the nature and extent of contamination onsite and to determine if additional action is required to maintain compliance with environmental regulations.

This Site-Specific Health and Safety Plan (SSHSP) is written for field operations to be conducted at the Assemblies G and H SWMUs (Figure 1). This plan is to be used in conjunction with the approved NSA Memphis Comprehensive Health and Safety Plan (CHASP) in the *Comprehensive RFI Work Plan, Naval Air Station Memphis, Millington, Tennessee* (EnSafe/Allen & Hoshall, 1994). Copies of both this plan and the CHASP must be onsite during field operations.

Applicability

See CHASP Section 7.

Current Hazardous Waste Operations and Emergency Response (HAZWOPER) training certificates for EnSafe/Allen & Hoshall (E/A&H) personnel and all subcontractors anticipated to be conducting fieldwork will be filed onsite and available for review. Individuals whose certificates are not on file shall provide the Site Supervisor with documentation verifying their completion of HAZWOPER training, and that their refresher training is current, before being allowed to enter a work area. Personnel who complete a refresher training course during the course of this project shall provide the Site Supervisor copies of their new training certificates. The Site Supervisor will have received training commensurate with Title 29 Code of Federal Regulations (CFR) Part 1910.120 Section (e)(4), Manager and Supervisor Training. E/A&H

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personnel, excluding interns, will have received training in first aid, and cardiopulmonary resuscitation before performing fieldwork.

All subcontractors, Navy oversight personnel, and any other site visitors must provide health and safety certification with appropriate refresher course documentation prior to entering the site.

2.0 SITE CHARACTERIZATION

2.1 Work Areas

See Section 7.1.1 of the CHASP for a description of the following work zones:

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ)
- Support Zone (SZ)

Field activities to be conducted onsite and within each work area are described in the Site Investigation Plan for each site. Figure 2 shows a typical site work zone setup.

2.2 Work Area Access

Authorized personnel will be allowed access to work areas as long as they have presented documentation of 40-hour Occupational Safety and Health Administration (OSHA) training under 29 CFR 1910.120, have signed CHASP and SSHSP plan acceptance forms, and have received a hazard communication briefing from the site health and safety officer or site supervisor. See also Work Area Access, Section 7.1.2 of the CHASP.

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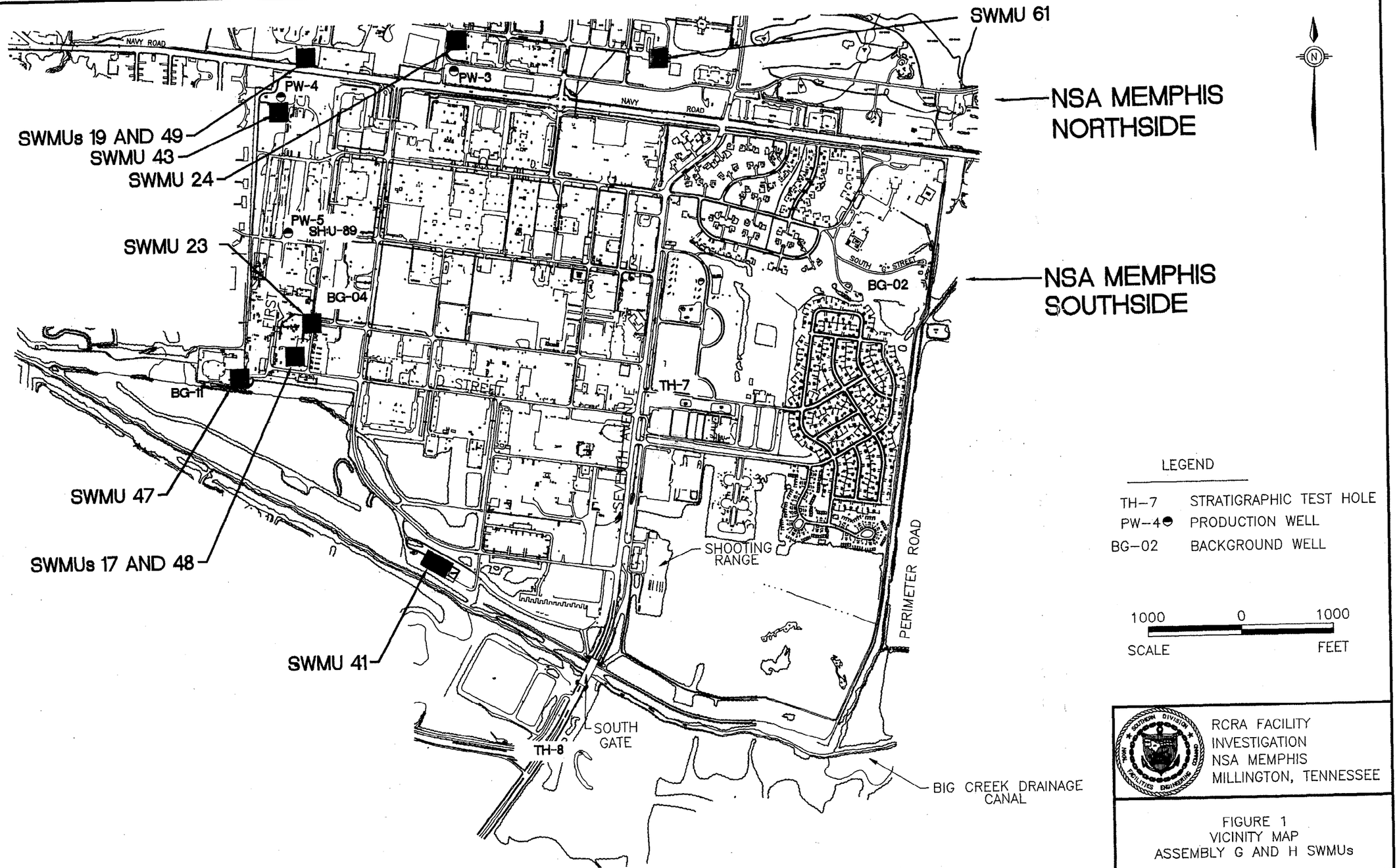
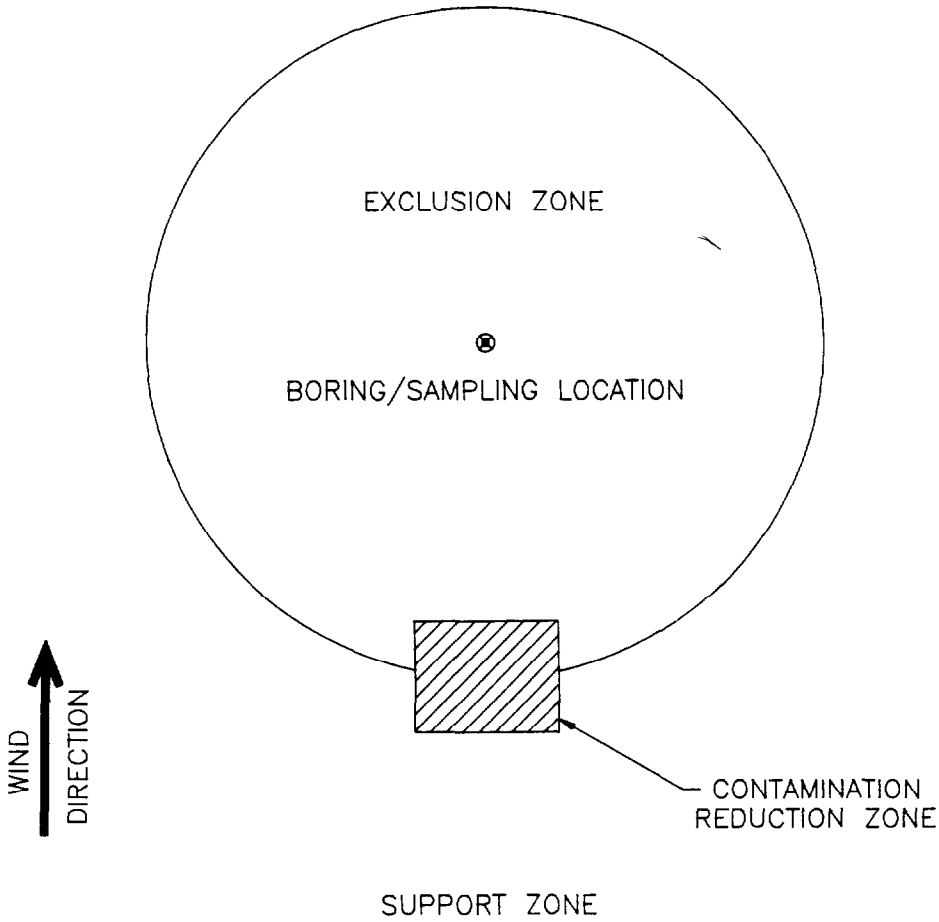

SWMU 61
NSA MEMPHIS NORTHSIDE
NSA MEMPHIS SOUTHSIDE
NAVY ROAD
PW-3
PW-4
SWMUs 19 AND 49
SWMU 43
SWMU 24
PW-5
SHU-89
SWMU 23
BG-04
BG-11
SWMU 47
SWMUs 17 AND 48
SWMU 41
TH-8
SOUTH GATE
SHOOTING RANGE
TH-7
D STREET
SEVENTH AVENUE
FIRST
SOUTH G STREET
BG-02
PERIMETER ROAD
BIG CREEK DRAINAGE CANAL
LEGEND
TH-7 STRATIGRAPHIC TEST HOLE
PW-4 PRODUCTION WELL
BG-02 BACKGROUND WELL
1000 0 1000
SCALE FEET
RCRA FACILITY INVESTIGATION
NSA MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 1
VICINITY MAP
ASSEMBLY G AND H SWMUs
DWG DATE: 11/20/96
DWG NAME: 106SGHVM

00581E15Z



SCALE: NOT TO SCALE

RCRA FACILITY
INVESTIGATION
NSA MEMPHIS
MILLINGTON, TN

FIGURE 2
SITE WORK ZONES

DWG DATE: 11/20/96 | DWG NAME: 106SWZRF

2.3 Site Descriptions

2.3.1 SWMU 43

SWMU 43 is a hazardous waste accumulation point along the west side of former Building S-176 on the NSA Memphis Southside (Figure 1). Building S-176 was demolished on January 28, 1986. Currently, the area where Building S-176 stood is covered with gravel and is used as a parking or storage area. SWMU 43 reportedly operated from an unknown date until 1986. During a 1990 inspection, Building S-176 no longer existed and the accumulation point was no longer in use (ERC/EDGe, 1990). In a 1951 drawing, Building S-176 was listed as a cement shed, while in a 1970s drawing it was listed as family housing storage.

Site Activities

Site activities will include hand auger soil sampling. If contamination is verified, the scope of the investigation may be expanded to meet RCRA Facility Investigation (RFI) requirements. Field methods are described in the *Comprehensive RFI Work Plan.*

The EZ, CRZ, and SZ locations will be determined in the field based on physical layout of the site, work task requirements, and weather conditions. The CRZ and SZ may move from day to day or during the day as appropriate (e.g., should weather conditions change). When noninvestigation personnel are in the vicinity, the EZ will be established using yellow caution tape.

Chemical Hazards

No previous investigations have been performed at SWMU 43. This unit reportedly stored drummed waste paint and waste solvents. The site history suggests a potential for toxic chemicals having been released at this site. Representative chemicals (i.e., within a class of chemicals such as "solvents"), the most toxic chemicals, and/or those most likely to be present onsite are listed in Table 2-1. Exposure levels, odor thresholds, and site action levels for each chemical also are

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Table 2-1
SWMU 43
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Toluene	40	Colorless liquid with sweet, pungent, benzene-like odor	Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest	200 300 Ceiling	50	25	1.3 to 7.1
Cadmium	NA	Soft blue-white, malleable, lustrous metal; grayish-white powder	Pulmonary edema, dyspnea, coughing, tight chest, substernal pain; headache, chills, muscle ache; nausea, vomiting, diarrhea, anosmia, emphysema; proteinuria, mild anemia	0.05 mg/m^3	0.002 mg/m^3 — Respirable Fraction 0.01 mg/m^3 — Total Dust	0.01 mg/m^3	NA
Chromium	NA	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid	Irritates eyes, skin; histologic fibrosis of lungs	1 mg/m^3	0.5 mg/m^3	0.25 mg/m^3	NA
Lead	NA	Bluish-gray, soft metal; heavy ductile, soft, gray solid	Encephalopathy; kidney disease; irritate eyes; hypotension, weakness, facial pallor, lassitude, insomnia, PAL, eye grounds, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic; anemia, gingival lead line; tremors, paralysis of wrist, ankles. Metallic taste, increased salivation, pyorrhea	0.05 mg/m^3	0.15 mg/m^3	0.025 mg/m^3	NA

Table 2-1
SWMU 43
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Benzene	4.68	Colorless to pale yellow watery liquid with a gasoline-like odor	Dizziness, excitation, pallor, followed by flushing, weakness, headache, dyspnea, chest constriction. Coma and possibly death	1 5 STEL	0.1 Suspected Human Carcinogen	0.05	1.3 to 7.1
Xylene	0.05	Colorless liquid with aromatic odor	Dizziness, excitement, drowsiness, staggering gait, irritate eyes, nose throat, corneal vacuolization, anorexia, nausca, vomiting, abdominal pain, dermatitis	100 150 STEL	100 150 STEL	50	1.0 to 7.0

Notes:

a — Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values.
b — Information referenced directly from CHEMTOX material safety data sheet (MSDS) chemical database
c — 29 CFR 1910.1000, Table Z-1-A. Limits for Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)
d — 1990-1991 Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienists (ACGIH). (STEL = Short-Term Exposure Limit)
e — Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50% of the PEL or TLV, whichever is lower.
f — Flammable range is defined as the range between the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL)
NA — Substance information not available, or substance unlisted.
mg/m^3 — milligrams per cubic meter
ppm — parts per million

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presented in Table 2-1. Material Safety Data Sheets (MSDSs) for those chemicals are included in Appendix A.

2.3.2 SWMU 47

SWMU 47 consists of a hazardous waste accumulation point on the south side of Building S-344 which is in the southwest corner of the NSA Memphis Southside at the end of D Street (Figure 1). The SWMU is a concrete sidewalk area which abuts Building S-344 and is connected to a concrete wash rack. The area south of the concrete is a grass field which extends approximately fifty feet to the north branch of Big Creek Drainage Canal. SWMU 47 reportedly operated from 1983 through 1992 and stored mineral spirits, waste oil, and hydraulic fluid.

Site Activities

Site activities will include hand auger sampling. If contamination is verified, the scope of the investigation may be expanded to meet RFI requirements. Field methods are described in the *Comprehensive RFI Work Plan*).

The EZ, CRZ, and SZ locations will be determined in the field based on physical layout of the site, work task requirements, and weather conditions. The CRZ and SZ may be moved as appropriate (e.g., should weather conditions change). When noninvestigation personnel are in the vicinity, the EZ will be established using yellow caution tape.

Chemical Hazards

SWMU 47 reportedly was used to store mineral spirits, waste oil, and hydraulic fluid from 1983 through 1992. No evidence of a release was visible during an inspection conducted in 1990 (ERC\EDGe, 1990). The site history suggests a potential for toxic chemicals having been released onsite. Representative chemicals are listed in Table 2-2, along with exposure levels, odor thresholds, and site action levels for each chemical. MSDSs for those chemicals are included in Appendix A.

Table 2-2
SWMU 47
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Toluene	40	Colorless liquid with sweet, pungent, benzene-like odor	Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest	200 300 Ceiling	50	25	1.3 to 7.1
Hydraulic Fluid	NA	Colorless, oily liquid with odor like burned lubricating oil	Irritates eyes, skin, and respiratory system	5 mg/m^3	5 mg/m^3 10 mg/m^3 STEL	2.5 mg/m^3	NA
PCBs	NA	Light yellow oily liquid or white solid powder with a weak odor	Acne from skin contact	0.5 mg/m^3	0.5 mg/m^3 Skin	0.25 mg/m^3	NA
Cadmium	NA	Soft blue-white, malleable, lustrous metal; grayish-white powder	Pulmonary edema, dyspnea, coughing, tight chest, substernal pain; headache, chills, muscle ache; nausea, vomiting, diarrhea, anosmia, emphysema; proteinuria, mild anemia	0.05 mg/m^3	0.002 mg/m^3 — Respirable Fraction 0.01 mg/m^3 — Total Dust	0.001 mg/m^3	NA
Chromium	NA	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid	Irritates eyes, skin; histologic fibrosis of lungs	1 mg/m^3	0.5 mg/m^3	0.25 mg/m^3	NA

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Table 2-2
SWMU 47
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Lead	NA	Bluish-gray, soft metal; heavy ductile, soft, gray solid	Encephalopathy; kidney disease; irritate eyes; hypotension, weakness, facial pallor, lassitude, insomnia, PAL, eye grounds, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic; anemia, gingival lead line; tremors, paralysis of wrist, ankles. Metallic taste, increased salivation, pyorrhea	0.05 mg/m^3	0.15 mg/m^3	0.025 mg/m^3	NA
Diesel Fuel	NA	Clear liquid	Produces dizziness, headache, nausea, and possibly irritation of the eyes, nose, and throat	NA	NA	NA	0.7 to 7.5
Ethylbenzene	140	Colorless liquid with a sweet gasoline-like odor	Irritation of nose, dizziness, depression. Moderate irritation of the eye with corneal injury possible. Irritates skin and may cause blisters	100 125 STEL	100 125 STEL	50	1.0 to 6.7
Benzene	4.68	Colorless to pale yellow watery liquid with a gasoline-like odor	Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possibly death	1 5 STEL	0.1 Confirmed Human Carcinogen	0.05	1.3 to 7.1

Table 2-2
SWMU 47
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Xylene	0.05	Colorless liquid with aromatic odor	Dizziness, excitement, drowsiness, staggering gait, irritate eyes, nose throat, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis	100 150 STEL	100 150 STEL	50	1.0 to 7.0

Notes:

[a] — Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values.
[b] — Information referenced directly from CHEMTOX material safety data sheet (MSDS) chemical database
[c] — 29 CFR 1910.1000, Table Z-1-A. Limits for Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)
[d] — 1990-1991 Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienists (ACGIH). (STEL = Short-Term Exposure Limit)
[e] — Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50% of the PEL or TLV, whichever is lower.
[f] — Flammable range is defined as the range between the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL)
NA — Substance information not available, or substance unlisted.
mg/m^3 — milligrams per cubic meter
ppm — parts per million

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2.3.3 SWMUs 17 and 48

SWMU 17, an Under Ground Waste Tank (UWT) removed in 1996, is approximately 100 feet east of First Avenue on the NSA Memphis Southside in the Building S-9 complex (Figure 1). Confirmation samples collected from the excavation pit indicate a release may have occurred before removal of the UWT. Reportedly this SWMU received waste motor oil, lubricants, and hydraulic fluids generated during automotive maintenance activities at Building S-9.

SWMU 48, approximately 200 feet to the east-northeast of SWMU 17, consists of various inactive hazardous waste accumulation points on the service side (west side) of the Building S-9 complex, just outside the work bay doors. SWMU 48 reportedly stored waste thinners, degreasers, and batteries. SWMU 48 reportedly has operated since 1950. The period of operation for SWMU 17 is unknown. No visual evidence of a release was found at SWMUs 17 and 48 (ERC/EDGe, 1990).

Site Activities

Site activities will include Geoprobe and hand auger soil and groundwater sampling. If contamination is verified, the scope of the investigation may be expanded to meet RFI requirements. Field methods are described in the *Comprehensive RFI Work Plan*.

The EZ, CRZ, and SZ locations will be determined in the field based on physical layout of the site, work task requirements, and weather conditions. The CRZ and SZ may move from day to day or during the day as appropriate (e.g., should weather conditions change). When noninvestigation personnel are in the vicinity, the EZ will be established using yellow caution tape.

Chemical Hazards

The site history suggests a potential for toxic chemicals having been released at either SWMU 17 and/or 48. Representative chemicals are listed in Table 2-3, along with exposure levels, odor thresholds, and site action levels for each chemical. MSDSs for those chemicals are included in Appendix A.

2.3.4 SWMUs 19 and 49

SWMUs 19 and 49, are approximately 150 feet north of Navy Road on the NSA Memphis Northside. SWMU 19 is bounded to the north by SWMU 49 and a wooded area and to the south by Navy Road and Building 341 of the Navy Exchange Service Station. SWMU 19 is bordered to the east by Building 757 of the Navy Exchange Service Station and to the northwest by the Aircraft Fire Fighting Training Facility (SWMU 5).

SWMU 19 reportedly operated from 1983 through 1992 and SWMU 49 reportedly operated from 1969 through 1986. Data collected during the removal of UWT 1648 (SWMU 19), indicates a release may have occurred before removal. During a 1990 inspection, oil staining was observed on the asphalt around SWMU 49 (ERC/EDGe, 1990).

Tank 1648, at Building 757, holds 280 gallons of waste automotive oil and hydraulic fluid generated by automotive repair activities at Building 757 of the Navy Exchange Service Station. Tank 341 collected waste oil from automobile maintenance operations at Building 341 of the Navy Exchange Service Station. Tank 341 was closed in place by filling with concrete, on an unknown date. Both tanks were installed in 1979. SWMU 49 is adjacent to SWMU 19 and may have impacted the area. This SWMU served as an accumulation point for used automobile batteries, waste paints, containerized waste mineral spirits, and tires.

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Table 2-3
SWMUs 17 and 48
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Toluene	40	Colorless liquid with sweet, pungent, benzene-like odor	Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest	200 150 STEL	50	25	1.3 to 7.1
Hydraulic Fluid	NA	Colorless, oily liquid with odor like burned lubricating oil	Irritates eyes, skin, and respiratory system	5 mg/m^3	5 mg/m^3 10 mg/m^3 STEL	2.5 mg/m^3	NA
PCBs	NA	Light yellow oily liquid or white solid powder with a weak odor	Acne from skin contact	0.5 mg/m^3	0.5 mg/m^3 Skin	0.25 mg/m^3	NA
Cadmium	NA	Soft blue-white, malleable, lustrous metal; grayish-white powder	Pulmonary edema, dyspnea, coughing, tight chest, substernal pain; headache, chills, muscle ache; nausea, vomiting, diarrhea, anosmia, emphysema; proteinuria, mild anemia	0.05 mg/m^3	0.002 mg/m^3 — Respirable Fraction 0.01 mg/m^3 — Total Dust	0.001 mg/m^3	NA
Chromium	NA	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid	Irritates eyes, skin; histologic fibrosis of lungs	1 mg/m^3	0.5 mg/m^3	0.25 mg/m^3	NA

Table 2-3
SWMUs 17 and 48
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Lead	NA	Bluish-gray, soft metal; heavy ductile, soft, gray solid	Encephalopathy; kidney disease; irritate eyes; hypotension, weakness, facial pallor, lassitude, insomnia, PAL, eye grounds, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic; anemia, gingival lead line; tremors, paralysis of wrist, ankles. Metallic taste, increased salivation, pyorrhea	0.05 mg/m^3	0.15 mg/m^3	0.025 mg/m^3	NA
Diesel Fuel	NA	Clear liquid	Produces dizziness, headache, nausea, and possibly irritation of the eyes, nose, and throat	NA	NA	NA	0.7 to 7.5
Ethylbenzene	140	Colorless liquid with a sweet gasoline-like odor	Irritation of nose, dizziness, depression. Moderate irritation of the eye with corneal injury possible. Irritates skin and may cause blisters	100 125 STEL	100 125 STEL	50	1.0 to 6.7
Benzene	4.68	Colorless to pale yellow watery liquid with a gasoline-like odor	Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possibly death	1 5 STEL	10 Suspected Human Carcinogen	0.05	1.3 to 7.1

Table 2-3
SWMUs 17 and 48
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Xylene	0.05	Colorless liquid with aromatic odor	Dizziness, excitement, drowsiness, staggering gait, irritate eyes, nose throat, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis	100 150 STEL	100 150 STEL	50	1.0 to 7.0

Notes:

a — Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values.
b — Information referenced directly from CHEMTOX material safety data sheet (MSDS) chemical database
c — 29 CFR 1910.1000, Table Z-1-A. Limits for Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)
d — 1990-1991 Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienists (ACGIH). (STEL = Short-Term Exposure Limit)
e — Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50% of the PEL or TLV, whichever is lower.
f — Flammable range is defined as the range between the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL)
NA — Substance information not available, or substance unlisted.
mg/m^3 — milligrams per cubic meter
ppm — parts per million

Site Activities

Site activities will include hand auger and Geoprobe soil and groundwater sampling. If contamination is verified, the scope of the investigation may be expanded to meet RFI requirements. Field methods are described in the *Comprehensive RFI Work Plan.*

The EZ, CRZ, and SZ locations will be determined in the field based on physical layout of the site, work task requirements, and weather conditions. The CRZ and SZ may move from day to day or during the day as appropriate (e.g., should weather conditions change). When noninvestigation personnel are in the vicinity, the EZ will be established using yellow caution tape.

Chemical Hazards

The data collected during the removal of UWT 1648, indicated a release may have occurred before removal of UWT 1648. The Voluntary Corrective Action Report for SWMU 19 (E/A&H pending), will contain information concerning the removal of UWT 1648. No other reports or investigations were available concerning SWMUs 19 and 49.

The site history for SWMUs 19 and 49 suggests a potential for toxic chemicals having been released at SWMU 19 and/or 49. Representative chemicals, are listed in Table 2-4, along with exposure levels, odor thresholds, and site action levels for each chemical. MSDSs for those chemicals are included in Appendix A.

2.3.5 SWMU 23

SWMU 23 consists of an underground storage tank on the south end of Building S-8, on the of NSA Memphis Southside. The tank stored either No. 2 fuel oil or diesel fuel and reportedly operated from 1944 through 1987. During a 1990 inspection, no evidence of a release was visible (ERC/EDGe, 1990).

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Table 2-4
SWMUs 19 and 49
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Toluene	40	Colorless liquid with sweet, pungent, benzene-like odor	Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest	200 300 Ceiling	50	25	1.3 to 7.1
Hydraulic Fluid	NA	Colorless, oily liquid with odor like burned lubricating oil	Irritates eyes, skin, and respiratory system	5 mg/m^3	5 mg/m^3 10 mg/m^3 STEL	2.5 mg/m^3	NA
PCBs	NA	Light yellow oily liquid or white solid powder with a weak odor	Acne from skin contact	0.5 mg/m^3	0.5 mg/m^3 Skin	0.25 mg/m^3	NA
Cadmium	NA	Soft blue-white, malleable, lustrous metal; grayish-white powder	Pulmonary edema, dyspnea, coughing, tight chest, substernal pain; headache, chills, muscle ache; nausea, vomiting, diarrhea, anosmia, emphysema; proteinuria, mild anemia	0.05 mg/m^3	0.002 mg/m^3 — Respirable Fraction 0.01 mg/m^3 — Total Dust	0.001 mg/m^3	NA
Chromium	NA	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid	Irritates eyes, skin; histologic fibrosis of lungs	1 mg/m^3	0.5 mg/m^3	0.25 mg/m^3	NA

Table 2-4
SWMUs 19 and 49
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Lead	NA	Bluish-gray, soft metal; heavy ductile, soft, gray solid	Encephalopathy; kidney disease; irritate eyes; hypotension, weakness, facial pallor, lassitude, insomnia, PAL, eye grounds, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic; anemia, gingival lead line; tremors, paralysis of wrist, ankles. Metallic taste, increased salivation, pyorrhea	0.05 mg/m^3	0.15 mg/m^3	0.025 mg/m^3	NA
Diesel Fuel	NA	Clear liquid	Produces dizziness, headache, nausea, and possibly irritation of the eyes, nose, and throat	NA	NA	NA	0.7 to 7.5
Ethylbenzene	140	Colorless liquid with a sweet gasoline-like odor	Irritation of nose, dizziness, depression. Moderate irritation of the eye with corneal injury possible. Irritates skin and may cause blisters	100 125 STEL	100 125 STEL	50	1.0 to 6.7
Benzene	4.68	Colorless to pale yellow watery liquid with a gasoline-like odor	Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possibly death	1 5 STEL	10 Suspected Human Carcinogen	0.5	1.3 to 7.1

Table 2-4
SWMUs 19 and 49
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Xylene	0.05	Colorless liquid with aromatic odor	Dizziness, excitement, drowsiness, staggering gait, irritate eyes, nose throat, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis	100 150 STEL	100 150 STEL	50	1.0 to 7.0

Notes:

a — Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values.
b — Information referenced directly from CHEMTOX material safety data sheet (MSDS) chemical database
c — 29 CFR 1910.1000, Table Z-1-A. Limits for Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)
d — 1990-1991 Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienists (ACGIH). (STEL = Short-Term Exposure Limit)
e — Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50% of the PEL or TLV, whichever is lower.
f — Flammable range is defined as the range between the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL)
NA — Substance information not available, or substance unlisted.
mg/m^3 — milligrams per cubic meter
ppm — parts per million

SWMU 23 and the surrounding area are characterized by relatively level, low-relief topography. Surrounding areas have concrete or grass cover. Surface drainage is toward the south and west leading to a drainage ditch (SWMU 38) which flows into Big Creek Drainage Canal.

Site Activities

Site activities will include hand auger and Geoprobe soil and groundwater sampling. If contamination is verified, the scope of the investigation may be expanded to meet RFI requirements. Field methods are described in the *Comprehensive RFI Work Plan*.

The EZ, CRZ, and SZ locations will be determined in the field based on physical layout of the site, work task requirements, and weather conditions. The CRZ and SZ may move from day to day or during the day as appropriate (e.g., should weather conditions change). When noninvestigation personnel are in the vicinity, the EZ will be established using yellow caution tape.

Chemical Hazards

The site history for SWMU 23 suggests a potential for toxic chemicals having been released at this site. Representative chemicals are listed in Table 2-5, along with exposure levels, odor thresholds, and site action levels for each chemical. MSDSs for those chemicals are included in Appendix A.

2.3.6 SWMU 24

SWMU 24 consists of two aboveground waste oil tanks at the Auto Hobby Shop between Buildings N-114 and N-349 at First Avenue and Bougainville Street, on the NSA Memphis Northside. These tanks collect used motor oil and other spent lubricants when military personnel change the oil in their personal vehicles. The exact year that these tanks began operating is not

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Table 2-5
SWMU 23
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Diesel Fuel	NA	Clear liquid	Produces dizziness, headache, nausea, and possibly irritation of the eyes, nose, and throat	NA	NA	NA	0.7 to 7.5
Ethylbenzene	140	Colorless liquid with a sweet gasoline-like odor	Irritation of nose, dizziness, depression. Moderate irritation of the eye with corneal injury possible. Irritates skin and may cause blisters	100 125 STEL	100 125 STEL	50	1.0 to 6.7
Benzene	4.68	Colorless to pale yellow watery liquid with a gasoline-like odor	Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possibly death	1	10 Suspected Human Carcinogen	0.5	1.3 to 7.1

Table 2-5
SWMU 23
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Xylene	0.05	Colorless liquid with aromatic odor	Dizziness, excitement, drowsiness, staggering gait, irritate eyes, nose throat, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis	100 150 STEL	100 150 STEL	50	1.0 to 7.0

Notes:

[a] — Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values.
[b] — Information referenced directly from CHEMTOX material safety data sheet (MSDS) chemical database
[c] — 29 CFR 1910.1000, Table Z-1-A. Limits for Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)
[d] — 1990-1991 Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienists (ACGIH). (STEL = Short-Term Exposure Limit)
[e] — Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50% of the PEL or TLV, whichever is lower.
[f] — Flammable range is defined as the range between the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL)
NA — Substance information not available, or substance unlisted.
mg/m^3 — milligrams per cubic meter
ppm — parts per million. During a 1990 inspection oil was present in surface water runoff and in the open ditch located on the north end of the site and the soil appeared discolored (ERC/EDGe, 1990).

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Site Activities

Site activities will include hand auger soil sampling. If contamination is verified, the scope of the investigation may be expanded to meet RFI requirements. Field methods are described in the *Comprehensive RFI Work Plan.*

The EZ, CRZ, and SZ locations will be determined in the field based on physical layout of the site, work task requirements, and weather conditions. The CRZ and SZ may move from day to day or during the day as appropriate (e.g., should weather conditions change). When noninvestigation personnel are in the vicinity, the EZ will be established using yellow caution tape.

Chemical Hazards

The site history for SWMU 24 suggests a potential for toxic chemicals having been released at this site. Representative chemicals are listed in Table 2-6, along with exposure levels, odor thresholds, and site action levels for each chemical. MSDSs for those chemicals are included in Appendix A.

2.3.7 SWMU 41

SWMU 41 consists of a nonhazardous waste storage yard, Salvage Yard No. 2, in the southwest corner of NSA Memphis Southside. The SWMU covers approximately 5,700 square yards and is capped with asphalt. SWMU 41 has reportedly operated since 1944. During a 1990 inspection, no evidence of a release was visible (ERC/EDGe, 1990).

Site Activities

Site activities will include Geoprobe soil and groundwater sampling. If contamination is verified, the scope of the investigation may be expanded to meet RFI requirements. Field methods are described in the *Comprehensive RFI Work Plan.*

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Table 2-6
SWMU 24
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Diesel Fuel	NA	Clear liquid	Produces dizziness, headache, nausea, and possibly irritation of the eyes, nose, and throat	NA	NA	NA	0.7 to 7.5
Ethylbenzene	140	Colorless liquid with a sweet gasoline-like odor	Irritation of nose, dizziness, depression. Moderate irritation of the eye with corneal injury possible. Irritates skin and may cause blisters	100 125 STEL	100 125 STEL	50	1.0 to 6.7
Benzene	4.68	Colorless to pale yellow, watery liquid with a gasoline-like odor	Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possibly death	1 5 STEL	10 Suspected Human Carcinogen	0.5	1.3 to 7.1

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Table 2-6
SWMU 24
Exposure Guidelines for Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	Physical Characteristics[b]	Symptoms of Exposure[b]	OSHA PEL[c] (ppm)	ACGIH TLV[d] (ppm)	Action Level[e] (ppm)	Flammable range[f] (% by volume)
Xylene	0.05	Colorless liquid with aromatic odor	Dizziness, excitement, drowsiness, staggering gait, irritate eyes, nose throat, corneal vacuolization, anorexia, nausea, vomiting, abdominal pain, dermatitis	100 150 STEL	100 150 STEL	50	1.0 to 7.0

Notes:
a — Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values.
b — Information referenced directly from CHEMTOX material safety data sheet (MSDS) chemical database
c — 29 CFR 1910.1000, Table Z-1-A. Limits for Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)
d — 1990-1991 Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienists (ACGIH). (STEL = Short-Term Exposure Limit)
e — Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50% of the PEL or TLV, whichever is lower.
f — Flammable range is defined as the range between the Lower Explosive Limit (LEL) and Upper Explosive Limit (UEL)
NA — Substance information not available, or substance unlisted.
mg/m^3 — milligrams per cubic meter
ppm — parts per million

The EZ, CRZ, and SZ locations will be determined in the field based on physical layout of the site, work task requirements, and weather conditions. The CRZ and SZ may move from day to day or during the day as appropriate (e.g., should weather conditions change). When noninvestigation personnel are in the vicinity, the EZ will be established using yellow caution tape.

Chemical Hazards

No site-specific chemical hazards have been identified for SWMU 41.

3.0 OPERATIONS AND PHYSICAL HAZARDS

Physical hazards typically encountered during environmental investigations should be anticipated. These hazards include cold or heat-related illnesses, uneven terrain, slippery surfaces, lifting, and use of heavy equipment. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. If working in areas supporting habitat for poisonous snakes, personnel should wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

The site supervisor and the Site Health and Safety Officer (SHSO) shall be aware of the potential for heat and/or cold stress and other weather-related illnesses. As appropriate, the SHSO shall implement appropriate work regimens to minimize the likelihood of field personnel becoming ill or injured. For details on working in extreme weather conditions, see Section 6.5 of the CHASP; for details on working in hot or cold environments, see Section 7.5.5 of the CHASP. The project health and safety officer (PHSO) also can provide guidance on safe work practices that may be helpful under these conditions. Heavy equipment operations will be conducted in accordance with the procedures outlined in the *Drilling Safety Guide*, Attachment A of the CHASP.

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4.0 EMPLOYEE PROTECTION

Employee protection for this project includes standard safe work practices, NSA Memphis rules of conduct, personal protective equipment (PPE), personal decontamination procedures, and equipment for extreme weather conditions, work limitations, and exposure evaluation.

4.1 Standard Safe Work Practices

- Eating, drinking, chewing gum or tobacco, smoking, or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.

- Hands and face must be thoroughly washed upon leaving the work area.

- No contact lenses will be worn in work areas while invasive actions are conducted.

- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, or discolored surfaces, or lean, sit, or place equipment on drums, containers, or soil suspected of being contaminated.

- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Consumption of alcoholic beverages is prohibited.

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- Due to the possible presence of overhead power lines, adequate side and overhead clearance should be maintained to ensure that the drill rig boom does not come within 15 feet of any overhead lines.

- Due to the possible presence of underground utilities (including electric, natural gas, water, sewer, telephone, etc.), NSA Memphis personnel and local utility representatives should be contacted and requested to identify all lines at the ground surface using characteristic spray paint or labeled stakes. A 3-yard buffer zone should be maintained during subsurface investigations.

- Due to the flammable properties of the potential chemical hazards, all spark or ignition sources should be bonded and/or grounded or mitigated before soil boring advancement or other site activities begin.

4.2 NSA Memphis General Rules of Conduct

- Liquor, firearms, narcotics, tape recorders, and other contraband items are not permitted on the premises.

- Any violation of local, state, or federal laws, or conduct which is outside the generally accepted moral standards of the community is prohibited.

- Violation of the Espionage Act, willfully hindering or limiting production, or sabotage is not permitted.

- Willfully damaging or destroying property, or removing government records is forbidden.

- Misappropriation or unauthorized alteration of any government records is forbidden.

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- Securing government tools in a personal or contractor's tool box is forbidden.

- Gambling in any form, selling tickets or articles, taking orders, soliciting subscriptions, taking up collections, etc., is forbidden.

- Doing personal work in government shop or office, using government property or material for unauthorized purposes, or using government telephones for unnecessary or unauthorized local or long-distance telephone calls is forbidden.

- Compliance with posted signs and notices is required.

- Boisterousness and noisy or offensive work habits, abusive language, or any oral, written, symbolic, or other communicative expression which tends to disrupt the work or morale of others is forbidden.

- Fighting or threatening bodily harm to another is forbidden.

- Defacing any government property is forbidden.

- Wearing shorts of any type and/or offensive logos, pictures, or phrases on clothing is forbidden. Shirts, shoes, and pants, slacks, or coverall-type garments will be worn at all times on government property.

- Persons operating motor vehicles will obey NSA Memphis traffic regulations.

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4.3 Selection of Personal Protective Equipment

It is important that PPE be appropriate to protect against the potential or known hazards at each investigation site. Protective equipment will be selected based on the types, concentrations, and routes of personal exposure that may be encountered. In situations where the types of materials and possibilities of contact are unknown or the hazards are not clearly identifiable, a more subjective determination must be made of the PPE required, based on experience and sound safety practices.

The PHSO will determine the appropriate level of PPE prior to the initial entry based on: site history, chemical(s) of concern, air monitoring levels (i.e., photoionization detector [PID] readings, combustible gas indicator [CGI] readings, or colorimetric tube results), physical site conditions (i.e., heat stress or cold exposure), additional available information, and professional judgment. PPE requirements are subject to change as site information is updated or changes. **The decision to upgrade or downgrade levels of PPE shall be made by the PHSO.**

Field activities which disturb soil will be initiated in modified Level D protection except when stated otherwise in this SSHSP, or when site conditions indicate that modified Level D is inappropriate (for example, elevated PID readings in the EZ prior to starting work). Modified Level D protection consists of a hard hat, appropriate chemical-resistant gloves (vinyl or nitrile), eye protection, and steel toed and steel shanked work boots. Work coveralls (full-length sleeves and pants) will be worn if free product or contaminants identified as skin irritants are encountered. This level of protection was selected because the contaminant concentrations detected in previous studies were low and free product was not detected.

PPE upgrades to Level C will be initiated if airborne concentrations exceed 2 parts per million (ppm) above the background concentration in the breathing zone or if the concentration

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of any contaminant exceeds 50% of the OSHA Permissible Exposure Limit (PEL). See Table 4-1 for the specific criteria for use and equipment for each level of protection.

4.4 Air Monitoring

The PHSO reserves the right to require personal exposure monitoring or other types of air sample collection and analysis. These samples may be required for a variety of reasons including: PID or flame ionization detector (FID) readings exceed or approach the action level (AL), to determine if personal exposures are below OSHA PELs, or to identify a chemical odor. Personal exposure monitoring will be conducted when site activities are conducted in PPE Level B or C. Sampling strategies will be designed to represent worst-case exposures. Samples typically are collected and analyzed using methods from the National Institute for Occupational Safety and Health (NIOSH) *Manual of Analytical Methods*.

Air will be monitored using a PID and/or other appropriate sampling equipment prior to beginning field activities at a new EZ and during ground-disturbing activities. The PID will be field calibrated (typically PIDs are calibrated using a 100 ppm isobutylene standard). If volatile organic compounds (VOCs) are detected downhole, colorimetric detector tubes and/or other sampling media may be used to determine the identification and approximate concentration of these compounds.

Action Level and Ceiling Concentration

For this project, the AL is defined as the PID or FID reading in the breathing zone above which respiratory protection must be upgraded; chemical protective clothing may also be upgraded. The AL is determined on a site-by-site basis. To exceed the AL, PID or FID readings should be sustainable. Readings should remain above the AL for at least one or two minutes at a time. Readings that are elevated for only a few seconds every 15 or 20 minutes do not exceed the AL and do not require workers to upgrade their level of PPE.

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Table 4-1
Level Of Protection And Criteria

Level A	• When atmospheres are "immediately dangerous to life and health" (IDLH in the NIOSH/OSHA Pocket Guide to Chemical Hazards or other guides). • When known atmospheres or situations exist that would affect the skin or eyes or be absorbed into the body through these surfaces. Consult standard references to obtain concentrations hazardous to skin, eyes, or mucous membranes. • Potential situations include those where immersion may occur, vapors may be generated, or splashing may occur through site activities. • Where atmospheres are oxygen-deficient with the conditions above. • When the type(s) and or potential concentration of toxic substances are not known.	• Positive pressure-demand full facepiece, self-contained breathing apparatus (SCBA) or positive pressure-demand supplied air respirator with escape SCBA • Totally encapsulating chemical protective suit • Chemical-resistant inner and outer gloves • Steel toe and shank chemical-resistant boots • Hard hat under suit • Two-way radios worn inside suit • Coveralls, long cotton underwear, disposable protective suit, gloves and boots, worn over fully encapsulating suit
Level B	• When work areas contain less than 19.5% oxygen. • When vinyl chloride is detected in the breathing zone.	• Chemical-resistant clothes, long sleeves, hooded, one or two pieces • Full-faced positive-pressure demand supplied air breathing apparatus or airline system with a 30-minute escape bottle • Hard hat • Inner gloves and chemical-resistant gloves • Steel toe and shank boots • Coveralls and disposable outer boots
Level C	• When airborne dust particles warrant respiratory protection. • When work areas contain at least 19.5% oxygen.	• Chemical-resistant clothes, long sleeves, hood optional, one or two pieces • Full-face piece, air-purifying respirator equipped with cartridges suitable for the hazard • Hard hat • Inner gloves and chemical-resistant gloves • Steel toe and shank boots • Coveralls and disposable outer boots

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Table 4-1
Level Of Protection And Criteria

Level D	• When level B or C is not indicated. • When airborne particles do not warrant respiratory protection. • When work areas contain at least 19.5% oxygen.	• Inner gloves and chemical-resistant gloves needed to handle soil or water samples • Steel toe and shank boots • Hard hat (ANSI Z891-1969 standard) • Eye protection (ANSI Z87.1-1968) standard • Sunscreen (SPF 15 or greater) • Coveralls and disposable outer boots

Notes:
ANSI — American National Standards Institute
SPF — Sun Protection Factor

Level A protection will be selected when the highest available level of respiratory, skin, and eye protection is needed. Level A protection will be required in Area A of the exclusion zone when appropriate.

When use of Level A is not required:
- Environmental measurements contiguous to the site indicate that air contaminants do not represent a serious dermal hazard.
- Reliable, accurate historical data do not indicate the presence of severe dermal hazards.
- Open, unconfined areas.
- Minimal probability of vapors or liquids (splash hazards) present which could affect or be absorbed through the skin.
- Total vapor readings indicate 500 ppm to 1,000 ppm.

Level B protection will be selected when the highest level of respiratory protection is needed, but cutaneous exposure to the small unprotected areas of the body (neck and back of head) is unlikely, or where concentrations are not known to be within acceptable standards. Additionally, the permissible limit for exposure to mixtures of all site gases will be checked using the requirements of 1910.1000(d)(2)(I) to ensure that PEL is not exceeded. If the value calculated using this method exceeds 1.0, Level B PPE is required.

Level C protection will be selected when the types and concentrations of inseparable material are known, or reasonably assumed to be no greater than the protection factors associated with air-purifying respirators, and exposure to the unprotected areas of the body is unlikely to cause harm. Dust concentrations require Level C PPE, where the respirable fractions exceed the PEL of 5 milligrams per cubic meter (mg/m^3) or the total concentrations exceed the PEL of 15 mg/m^3.

Level D protection will be chosen when measurements of atmospheric concentrations are at background levels and work functions preclude splashes, immersion, or the potential for unexpected inhalation or contact with hazardous concentrations of any chemicals.

For this project the AL, as determined on a properly calibrated PID or FID, is 5 PID or FID units above background. PPE shall be upgraded to Level C (assuming that cartridge respirators are appropriate, otherwise Level B) if airborne VOC concentrations in the breathing zone exceed the AL, or if the concentration of any contaminant exceeds 50% of the OSHA PEL.

If breathing zone levels exceed the AL, or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact the Task Order Manager, Project Manager, and/or the PHSO. The PHSO will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. See Table 4-1 for specific criteria for each protection level.

If PID or FID readings exceed 10 units, the SHSO shall contact the PHSO and discuss the need to identify and quantify airborne contaminants. Work shall not proceed until breathing zone concentrations return to background levels and it is reasonably anticipated that they will stay approximately at background levels, or the chemical constituent(s) are identified and appropriate PPE is donned.

The ceiling concentration is defined as the maximum allowable PID or FID reading in the breathing zone regardless of PPE. A ceiling concentration of 50 PID or FID units has been established. Should VOC concentrations exceed 50 ppm in the breathing zone, field workers should secure their equipment and back off the site. Work shall not resume until the Site Supervisor understands why VOC concentrations became elevated, knows the major constituents of the VOCs being generated, and the VOCs in the breathing zone are less than 5 ppm or workers have upgraded to Level C or B. The proper PPE upgrade shall be determined by the

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PHSO based on site-specific chemical information (i.e., is there enough information to determine that air-purifying respirators will provide sufficient protection).

Field monitoring values will be recorded in a field logbook and copies must be posted for field personnel review.

Combustible Gas Indicator

A CGI may be used during soil boring advancement and well installations. The CGI will be field-calibrated to measure flammable gases relative to a methane standard. Downhole CGI readings will be collected periodically during soil-disturbing operations. Field activities will immediately cease if downhole readings exceed 20% of the lower explosive limit (LEL). If CGI readings do not subside, the area will be immediately evacuated and the situation re-evaluated to determine how to proceed. Operations may not proceed until downhole readings are below 20% LEL.

Field monitoring values will be recorded in a field logbook and copies must be posted for field personnel review.

PIDs, CGIs, and other monitoring equipment shall be calibrated daily or their proper function verified before being used. Throughout the day this equipment shall be periodically checked to ensure that it is working properly. A final calibration shall be conducted at the end of the workday, at which time each instrument will be checked to ensure that it is free from surface contamination. Field staff shall note in their field notebooks that they conducted these calibrations and checks and note whether the equipment functioned properly. Malfunctioning equipment should be brought to the attention of the site supervisor or SHSO, who will arrange to repair and/or replace that equipment as needed.

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4.5 Severe Weather Conditions

Fieldwork shall not be conducted when lightning can be seen or thunder heard from the work area. When lightning and/or thunder occur, cease work, perform emergency personal and equipment decontamination (see Section 6.6) as needed, then seek shelter.

During extreme weather conditions, the Site Supervisor shall use his/her best judgment and has the authority to stop fieldwork or dismiss workers for the day. Examples of conditions that (may) warrant work stoppage include: tornado warnings, hurricane warnings, high winds, hail, flooding, and ice storms.

For details on working in hot or cold environments, see Section 7.5.5 of the CHASP.

4.6 Personal Decontamination

A CRZ will be established immediately at each sampling/boring site and will include a station for decontaminating equipment and personnel. When Level B or C PPE is used the CRZ will be formally established using sheets of 6-millimeter polyethylene (typically an area 20 feet x 20 feet is sufficient) with specific stations that will accommodate the removal and decontamination or disposal of protective clothing, boot covers, gloves, and respiratory protection. CRZs may be established using alternative, yet equivalent, designs.

Generally, personnel working in the CRZ will use one level of PPE lower than personnel in the EZ. For example, if personnel in the EZ are in Level B, decontamination workers will be in Level C. As a general rule, equipment will be decontaminated using a soap and clean water wash solution and will be conducted by personnel in Level D PPE – gloves and safety glasses are required, face shields (splash and spray protection) and Tyvek suites are recommended.

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In severe weather (e.g., lightning, hail, and tornado warnings) or an emergency requiring immediate evacuation, contaminated equipment can be wrapped in 6-millimeter polyethylene sheeting, sealed, and tagged as "contaminated." The equipment can be decontaminated later under less hectic circumstances.

4.6.1 Personal Decontamination Procedures

The decontamination procedures, based on Level D protection, will consist of:

- Brush debris from heavily soiled boots then rinse outer gloves and boots with soap and water.
- Remove outer gloves and deposit them in a labeled plastic-lined container.
- Remove outer chemical-protective clothing and deposit them in a labeled plastic-lined container.
- Remove inner gloves and deposit them in a labeled plastic-lined container.
- Periodically wash hard hats and eye protection with a soap and water solution.
- Discard containers of disposable PPE in a labeled 55-gallon drum.
- Field personnel should shower as soon as practical after leaving the site.

Decontamination procedures will be conducted at the lunch break and at the end of each workday. If higher levels of PPE are needed, these procedures will be adjusted and this SSHSP will be amended.

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All wastes (soil and water) generated during personal decontamination will be collected in 55-gallon drums. The drums will be labeled by E/A&H personnel for final disposal by the Navy.

4.6.2 Closure of the Personal Decontamination Station

Disposable clothing and plastic sheeting used during site activities will be double-bagged and discarded in a refuse container. Decontamination and rinse solutions will be placed in 55-gallon drums and labeled for later analysis and disposal. Washtubs, pails, buckets, etc. will be washed, rinsed, and dried at the end of each workday.

4.7 Work Limitations

Site activities will be conducted during daylight hours. Personnel conducting fieldwork shall complete the initial health and safety training and actual field training requirements specified in 29 CFR 1910.120(e). Supervisors must complete an additional eight hours of training in site management. All personnel must complete an eight hour refresher training course annually to continue working onsite.

After a job-related injury or illness, a medical examination may be necessary in order to determine fitness for duty or if job restrictions are needed. Regardless of whether E/A&H requires such an exam, a employee may request an exam before returning to work. Should an employee have a question about his/her ability to work, prior to completing that task, he or she are encouraged to seek their doctors' opinion as to their fitness to work. In the meantime, the employee needs to notify the project manager so activities can be completed on schedule. The Corporate Health and Safety Officer will review the results with the examining physician before releasing the employee for work.

A medical examination may be required if an employee has missed at least three days of work due to a non-job-related injury or illness requiring medical attention. Medical records shall be

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maintained by the employer or the physician for at least 30 years following the termination of employment.

5.0 MEDICAL MONITORING PROGRAM

See CHASP Section 7.6.

6.0 AUTHORIZED PERSONNEL

Personnel anticipated to be onsite at various times during site activities include:

• Principal-in-Charge	Dr. James Speakman (E/A&H)
• Task Order Manager/Project Manager	Mr. Lawson Anderson (E/A&H)
• Project Health and Safety Officer	Mr. Doug Petty (E/A&H)
• Site Supervisor	Ms. Alisa Bennett (E/A&H)
• Site Health and Safety Officer	Ms. Alisa Bennett (E/A&H)
• Engineer-in-Charge (EIC)	Mr. Mark Taylor (SOUTHDIV)
• NSA Memphis Site Contact	Mr. Rob Williamson

6.1 Responsibilities of Site Supervisor

The Site Supervisor will direct the site operations and, relative to health and safety, is responsible for ensuring that:

- Field staff follow the CHASP, SSHSP, and other safety and health standard operating procedures. Personnel who do not comply are retrained and/or instructed to leave the site and not allowed to return.

- Field staff have current HAZWOPER training.

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- Field staff know who is the acting SHSO.
- Field staff know the site-specific safety and health concerns.
- The onsite supply of health and safety equipment is adequate.
- Field staff participate in the E/A&H medical surveillance program (or subcontractors, an equivalent program).
- Field staff attend safety and health "kick-off" orientation and other site safety briefings.

The Site Supervisor is also responsible for ensuring that field staff who may be exposed to unique or special hazards have the training or experience necessary to safely conduct their work.

6.2 Responsibilities of SSHO

The responsibilities of the SHSO include:

- Providing the Site Supervisor technical input on site health and safety issues.
- Observing field personnel and reporting to the Site Supervisor on the effectiveness of the CHASP and SSHSP and whether field staff are using proper work practices and decontamination procedures.
- Reporting significant safety violations to the Project Manager and/or PHSO.
- Conducting safety briefings during field activities.

000196

- Ensuring that copies of the CHASP and SSHSP are maintained onsite during field activities.

- Maintaining a file of HAZWOPER training certificates and appropriate refresher training certificates for onsite personnel.

The SHSO will have the following qualifications: (1) 40 of hours OSHA training or equivalent experience, (2) 24 hours of supervisory training or equivalent experience, (3) knowledge of the health and safety concerns for the specific tasks being conducted, and (4) trained to use the air monitoring equipment; able to interpret the data collected with the instruments; familiar with symptoms of chemical exposure, heat stress, and cold exposure; and knows the location and proper use of onsite safety equipment. They will also be familiar with the CHASP and SSHSP.

The position of SHSO may rotate. Often, particularly on small projects, this function is not a full-time responsibility, rather a member of the field team is selected to serve as the alternate SHSO. Then when that task is completed and/or field staff change, the alternate SHSO may change as well. The alternate Health and Safety Officer must meet the criteria for the SHSO listed above.

The following criteria outline when the Site Health and Safety Officer will be replaced: (1) termination of employment, (2) end of work task, (3) end of shift, (4) sickness, (5) injury, or (6) death. It should be noted that under site work schedules only one shift will be working. As a result, the Site Health and Safety Officer will be responsible for the day shift. If circumstances arise that require work during other periods, an alternate Site Health and Safety Officer will be designated.

900197

6.3 Responsibilities of Onsite Field Staff

The health and safety responsibilities of field staff include:

- Being familiar with and complying with this CHASP and SSHSP.
- Attending site health and safety briefings and being aware of anticipated chemical, physical, and biological hazards and what to do when these hazards are encountered.
- Being properly trained on PPE to be used, safe work practices, decontamination procedures to be followed, and emergency procedures and communications.
- Using required PPE including respiratory protection.
- Having up-to-date HAZWOPER training and providing the Site Supervisor with documentation that training is current.
- Being an up-to-date participant in an acceptable medical surveillance program.
- Being fit-tested and physically capable of using a respirator when using a respirator may be a requirement. Should the use of respiratory protection be required, field workers shall not have facial hair which intrudes into the respirator's sealing surface.
- Using the buddy system when wearing respiratory protective equipment. When working in Level C or higher, a third person shall be at the work area. This person shall be suitably equipped to provide logistical and safety support to the entry team.

000108

In addition, field staff should always be alert and use their senses (sight, smell, etc.) to identify and react to potentially hazardous situations. When working in the EZ, visual contact should be maintained between personnel; field personnel should be close enough to assist each other during an emergency. Procedures for leaving a contaminated area must be planned and implemented before going onsite, in accordance with the CHASP and SSHSP.

The number of personnel and the amount of equipment in the contaminated area should be minimized, consistent with effective site operations. All visitors to the job site must comply with the CHASP and SSHSP procedures. PPE may be modified for visitors depending on the situation. Modifications must be approved by the PHSO.

7.0 EMERGENCY INFORMATION

Hazardous waste site activities, by definition, present a risk to onsite personnel. During routine operations risk is minimized by establishing good work practices, staying alert, and using proper PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

All hazardous waste site activities present a risk to onsite personnel. During routine operations risk is minimized by establishing good work practices, staying alert, and using proper PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated. In an emergency summon the required help first, then contact project personnel as appropriate.

000199

If any situation or unplanned occurrence requires outside or support service, Rob Williamson, NSA Memphis site contact, will be informed and the appropriate contact from the following list will be made:

Contact	Agency or Organization	Telephone
Rob Williamson	NSA Memphis	(901) 874-5461/5462
Mark Taylor	SOUTHDIV EIC	(803) 820-5573
Law Enforcement	Millington Police NSA Memphis Base Security	911 (Cellular Phone) 9-911 (Base phone)
Fire Department	Millington Fire NSA Memphis	911 (Cellular phone) 9-911 (Base phone)
Ambulance Service	Millington Fire NSA Response	911 (Cellular phone) 9-911 (Base phone)
Hospital	Methodist North Hospital 3960 Covington Pike	(901) 372-5211
Southern Poison Control Center	–	(901) 528-6048
Lawson Anderson	EnSafe/Allen & Hoshall	(901) 372-7962
Doug Petty	EnSafe/Allen & Hoshall	(901) 372-7962 (901) 362-0252

* In an emergency, dialing 911 on a cellular phone will reach the local, nonmilitary response center. If a NSA Memphis base phone is used 9-911 will reach Naval security. In an emergency it is important to contact emergency personnel using the closest available phone, let the operator know where you are, what the situation is, and provide additional information as requested based on your knowledge. Stay on the phone until they hang up or tell you to hang up.

Mark Taylor, SOUTHDIV EIC, will be contacted after appropriate emergency measures have been initiated onsite.

7.1 Site Resources

Cellular telephones or telephones throughout NSA Memphis are available for emergency use and communication/coordination with NSA Memphis. First-aid and eye wash equipment will be available at the work area.

7.2 Emergency Procedures

Conditions that may constitute an emergency include any member of the field crew being involved in an accident or experiencing any adverse effects or symptoms of exposure while onsite, or if a condition is identified that suggests a situation is more hazardous than anticipated.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the SHSO. Copies of emergency contacts and routes will be posted onsite.

- If any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately stop work and act according to the instructions of the SHSO.

- For applicable site activities, wind indicators visible to field personnel will be provided by the SHSO to indicate possible routes for upwind escape.

000201

- The discovery of any conditions that suggest a situation is more hazardous than anticipated will result in the suspension of work until the SHSO has evaluated the situation and provides the appropriate instructions to the field team.

- If an accident occurs, the site supervisor is to complete an Accident Report Form (see Appendix B) for submittal to the managing principal-in-charge of the project.

- If a member of the field crew suffers a personal injury, the SHSO will call **(901) 372-5211 or 9-911** (serious injury) to alert appropriate emergency response agencies or administer onsite first aid (minor injury) as the situation dictates. An Accident Report Form will be completed for any such incident.

- If a member of the field crew suffers chemical exposure, the affected areas should be flushed immediately with copious amounts of clean water, and if the situation dictates, the SHSO should alert appropriate emergency response agencies, or personally ensure that the exposed individual is transported to the nearest medical treatment facility for prompt treatment. See Appendix C for directions. An Accident Report Form will be completed for any such incident.

Additional information on appropriate chemical exposure treatment methods are provided on MSDSs in Appendix A.

8.0 FORMS

The following forms will be used to implement this SSHSP:

- Plan Acceptance Form
- Plan Feedback Form
- Exposure History Form
- Accident Report Form

900292

The Plan Acceptance Form will be filled out by all field personnel prior to their working onsite. The Plan Feedback Form will be filled out by the SHSO and any other onsite employee who wishes to fill one out. The Exposure History Form will be completed by both the site supervisor and the individual(s) for whom the form is intended. Examples of each form are provided in Appendix B of this plan.

All completed forms must be returned to the Task Order Manager at EnSafe/Allen & Hoshall, Memphis, Tennessee.

000203

Appendix A

Material Safety Data Sheets

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: TOLUENE
FORMULA: C6H5CH3
FORMULA WT: 92.14
CAS NO.: 108-88-3
NIOSH/RTECS NO.: XS5250000
COMMON SYNONYMS: METHYLBENZENE; PHENYLMETHANE; TOLUOL
PRODUCT CODES: 9472,9456,9466,9462,V963,9351,9460,9457,9459,9336,5375,9461
EFFECTIVE: 09/08/86
REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 2 MODERATE
FLAMMABILITY - 3 SEVERE (FLAMMABLE)
REACTIVITY - 0 NONE
CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

WARNING
FLAMMABLE
CAUSES IRRITATION
MAY BE FATAL IF SWALLOWED OR INHALED

KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING. AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE. FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
TOLUENE	90-100	108-88-3

3 - PHYSICAL DATA

BOILING POINT: 111 C (232 F) VAPOR PRESSURE(MM HG): 22

MELTING POINT: -95 C (-139 F) VAPOR DENSITY(AIR=1): 3.2

SPECIFIC GRAVITY: 0.87 (H2O=1)

EVAPORATION RATE: 2.24 (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: CLEAR, COLORLESS LIQUID WITH BENZENE-LIKE ODOR.

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4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP 4 C (40 F) NFPA 704M RATING: 2-3-0

FLAMMABLE LIMITS: UPPER - 7.1 % LOWER - 1.2 %

FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK. CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE.

TOXIC GASES PRODUCED
CARBON MONOXIDE, CARBON DIOXIDE

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5 - HEALTH HAZARD DATA

ACCEPTABLE MAXIMUM PEAK ABOVE THE ACCEPTANCE CEILING CONCENTRATION FOR AN EIGHT-HOUR SHIFT = 500 PPM FOR 10 MINUTES. (PEL) CEILING = 300 PPM.

THRESHOLD LIMIT VALUE (TLV/TWA): 375 MG/M3 (100 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 560 MG/M3 (150 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): MG/M3 (200 PPM)

TOXICITY:		
	LD50 (ORAL-RAT)(MG/KG)	- 5000
	LD50 (IPR-MOUSE)(MG/KG)	- 1.12
	LD50 (SKN-RABBIT) (G/KG)	- 14
	LC50 (INHL-MOUSE-8H) (PPM)	- 5320

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE
INHALATION AND INGESTION ARE HARMFUL AND MAY BE FATAL.
INHALATION MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS, NARCOSIS, SUFFOCATION, LOWER BLOOD PRESSURE, CENTRAL NERVOUS SYSTEM DEPRESSION.
INHALATION OF VAPORS MAY CAUSE COUGHING, CHEST PAINS, DIFFICULTY BREATHING, OR UNCONSCIOUSNESS.

900206

LIQUID MAY BE IRRITATING TO SKIN AND EYES. PROLONGED SKIN CONTACT MAY RESULT IN DERMATITIS. EYE CONTACT MAY RESULT IN TEMPORARY CORNEAL DAMAGE. INGESTION MAY CAUSE HEADACHE, NAUSEA, VOMITING, GASTROINTESTINAL IRRITATION, UNCONSCIOUSNESS, CONVULSIONS.
CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.

TARGET ORGANS
CENTRAL NERVOUS SYSTEM, LIVER, KIDNEYS, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INHALATION, ABSORPTION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
WASH CLOTHING BEFORE RE-USE.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS, NITRIC ACID, SULFURIC ACID, CHLORINE

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: U220 (TOXIC WASTE)

8 - PROTECTIVE EQUIPMENT

VENTILATION:	USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.
RESPIRATORY PROTECTION:	RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.
EYE/SKIN PROTECTION:	SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, POLYVINYL ALCOHOL GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS
BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	TOLUENE
HAZARD CLASS	FLAMMABLE LIQUID
UN/NA	UN1294
LABELS	FLAMMABLE LIQUID
REPORTABLE QUANTITY	1000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	TOLUENE
HAZARD CLASS	3.2
UN/NA	UN1294
LABELS	FLAMMABLE LIQUID

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: CADMIUM
FORMULA: CD
FORMULA WT: 112.40
CAS NO.: 07440-43-9
NIOSH/RTECS NO.: EU9800000
PRODUCT CODES: 1184,1182
EFFECTIVE: 09/10/86
REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	3	SEVERE (CANCER CAUSING)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	0	NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

WARNING
HARMFUL IF SWALLOWED OR INHALED
NOTE: REPORTED AS CAUSING CANCER IN LABORATORY ANIMALS. EXERCISE DUE CARE.
AVOID CONTACT WITH EYES, SKIN, CLOTHING.
AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

SAF-T-DATA(TM) STORAGE COLOR CODE: BLUE (HEALTH)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
CADMIUM	90-100	07440-43-9

3 - PHYSICAL DATA

BOILING POINT: 767 C (1413 F)
MELTING POINT: 321 C (610 F)
SPECIFIC GRAVITY: 8.64 (H2O=1)
VAPOR PRESSURE(MM HG): N/A
VAPOR DENSITY(AIR=1): 3.9
EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: SOFT, BLUE-WHITE SOLID.

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4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

UNUSUAL FIRE & EXPLOSION HAZARDS
CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE OR EXPLOSION.

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5 - HEALTH HAZARD DATA

THIS SUBSTANCE IS LISTED AS NTP ANTICIPATED HUMAN CARCINOGEN, IARC PROBABLE HUMAN CARCINOGEN (GROUPS 2A AND 2B). THE ACCEPTABLE CEILING CONCENTRATION (PEL) IS 0.6 MG/M3.

THRESHOLD LIMIT VALUE (TLV/TWA): 0.05 MG/M3 (PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.2 MG/M3 (PPM)

TOXICITY:	LD50 (ORAL-RAT) (MG/KG)	-	225
	LD50 (IPR-RAT) (MG/KG)	-	4
	LD50 (SCU-RAT) (MG/KG)	-	9

CARCINOGENICITY: NTP: YES IARC: YES Z LIST: NO OSHA REG: YES

EFFECTS OF OVEREXPOSURE
OVEREXPOSURE TO VAPORS MAY CAUSE IRRITATION OF MUCOUS MEMBRANES, DRYNESS OF MOUTH AND THROAT, HEADACHE, NAUSEA AND DIZZINESS.
INHALATION MAY BE HARMFUL OR FATAL.
CHRONIC EFFECTS OF CADMIUM COMPOUNDS FROM LOW LEVEL EXPOSURE IN THE AIR MAY CAUSE IRREVERSIBLE LUNG INJURY, KIDNEY DISEASE, AND OTHER ADVERSE EFFECTS.
DUST MAY IRRITATE EYES.

TARGET ORGANS
RESPIRATORY SYSTEM, KIDNEYS, BLOOD, PROSTATE

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INGESTION, INHALATION

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.

IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

INCOMPATIBLES: STRONG OXIDIZING AGENTS, NITRATES, NITRIC ACID

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D006 (EP TOXIC WASTE)

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1 PPM, A HIGH-EFFICIENCY PARTICULATE RESPIRATOR IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, RUBBER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: BLUE (HEALTH)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. STORE IN SECURE POISON AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	CADMIUM
HAZARD CLASS	ORM-E
LABELS	NONE
REPORTABLE QUANTITY	1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	POISONOUS SOLIDS, N.O.S. (CADMIUM)
HAZARD CLASS	6.1
UN/NA	UN2811
LABELS	POISON

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: CHROMIUM
FORMULA: CR
FORMULA WT: 52.00
CAS NO.: 7440-47-3
NIOSH/RTECS NO.: CB4200000
PRODUCT CODES: 4961
EFFECTIVE: 09/10/86
REVISION #03

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	0	NONE
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	0	NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
CHROMIUM	90-100	7440-47-3

3 - PHYSICAL DATA

BOILING POINT: 2200 C (3992 F)
VAPOR PRESSURE(MM HG): N/A

MELTING POINT: 1900 C (3452 F)
VAPOR DENSITY(AIR=1): N/A

SPECIFIC GRAVITY: 7.14 (H2O=1)
EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: STEEL GRAY TO SILVER PELLETS.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE WATER SPRAY, ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
CAN BE AN EXPLOSION HAZARD, ESPECIALLY WHEN HEATED.

5 - HEALTH HAZARD DATA

NOTE: WHILE THE SPECIFIC COMPOUNDS CANNOT BE IDENTIFIED, THERE IS EVIDENCE THAT CERTAIN CHROMIUM COMPOUNDS CAUSE CANCER IN HUMANS AND EXPERIMENTAL ANIMALS. CHROMIUM IS WIDELY DISTRIBUTED IN AIR, WATER, SOIL AND FOOD. TRIVALENT CHROMIUM MAY BE AN ESSENTIAL TRACE INGREDIENT IN THE HUMAN DIET. ALL CHROMIUM COMPOUNDS ARE REGULATED BY THE EPA, BUT NO SPECIFIC DATA IS AVAILABLE TO LINK TRIVALENT CHROMIUM TO CANCER. PRUDENT JUDGEMENT DICTATES THAT EXPOSURE SHOULD BE MINIMIZED AS MUCH AS POSSIBLE. (SEE IARC MONOGRAPH ON EVALUATION OF CARCINOGENIC RISK OF CHEMICALS TO HUMANS, VOLUME 23 LYON, FRANCE IARC, 1980, PP. 205-323).

THRESHOLD LIMIT VALUE (TLV/TWA): 0.5 MG/M3 (PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 1 MG/M3 (PPM)

CARCINOGENICITY: NTP: YES IARC: YES Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE
CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS.
DUST MAY ULCERATE MUCOUS MEMBRANES.
EXCESSIVE INHALATION OF DUST IS IRRITATING AND MAY BE SEVERELY DAMAGING TO RESPIRATORY PASSAGES AND/OR LUNGS.
INGESTION MAY RESULT IN SEVERE INTESTINAL IRRITATION WITH BURNS TO MOUTH.
NOTE: PRODUCT IS A SOLID MASS; HOWEVER, WARNINGS ARE BASED ON INHALATION DUST, MIST OR FUME EMISSIONS THAT ARE POSSIBLE DURING MANUFACTURING OR CHEMICAL REACTIONS.

TARGET ORGANS
RESPIRATORY SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INGESTION, INHALATION

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.

INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED PERSON TO FRESH AIR. GET MEDICAL ATTENTION.

EYE CONTACT: IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ATTENTION.

SKIN CONTACT: IMMEDIATELY WASH WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES.

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6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: FLAME

INCOMPATIBLES: CARBONATES, STRONG BASES, MINERAL ACIDS

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7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND REMOVE.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D007 (EP TOXIC WASTE)

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8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO KEEP FUME OR DUST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: A RESPIRATOR WITH DUST/MIST FILTER IS RECOMMENDED. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, PROPER GLOVES ARE RECOMMENDED.

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9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

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10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	CHROMIUM
HAZARD CLASS	ORM-E
LABELS	NONE
REPORTABLE QUANTITY	1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	CHEMICALS, N.O.S. (NON-REGULATED)

000216

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: BENZENE
FORMULA: C6H6
FORMULA WT: 78.10
CAS NO.: 71-43-2
NIOSH/RTECS NO.: CY1400000
COMMON SYNONYMS: BENZOL; PHENYL HYDRIDE; COAL NAPHTHA
PRODUCT CODES: 9156,9256,9153,9154,9155,B717,9149
EFFECTIVE: 01/22/87
REVISION #04

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	4	EXTREME (CANCER CAUSING)
FLAMMABILITY	-	3	SEVERE (FLAMMABLE)
REACTIVITY	-	0	NONE
CONTACT	-	1	SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER
EXTREMELY FLAMMABLE
CAUTION: CONTAINS BENZENE, CANCER HAZARD
HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN
EXCEPTIONAL HEALTH HAZARD - READ MATERIAL SAFETY DATA SHEET
KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING. AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE. FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED STRIPE (STORE SEPARATELY)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
BENZENE	90-100	71-43-2

3 - PHYSICAL DATA

BOILING POINT: 80 C (176 F) VAPOR PRESSURE(MM HG): 74.6

MELTING POINT: 6 C (43 F) VAPOR DENSITY(AIR=1): 2.77

SPECIFIC GRAVITY: 0.88 (H2O=1) EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: CLEAR COLORLESS LIQUID HAVING CHARACTERISTIC AROMATIC ODOR.

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4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: -11 C (12 F) NFPA 704M RATING: 2-3-0

FLAMMABLE LIMITS: UPPER - 8.0 % LOWER - 1.3 %

FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK. CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE.

TOXIC GASES PRODUCED
CARBON MONOXIDE, CARBON DIOXIDE

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5 - HEALTH HAZARD DATA

THIS SUBSTANCE IS LISTED AS ACGIH SUSPECT HUMAN CARCINOGEN, NTP HUMAN CARCINOGEN, IARC HUMAN CARCINOGEN (GROUP 1). ACCEPTABLE MAXIMUM PEAK ABOVE THE ACCEPTANCE CEILING CONCENTRATION FOR AN EIGHT-HOUR SHIFT = 50 PPM FOR 10 MINUTES; (PEL) CEILING = 25 PPM.

THRESHOLD LIMIT VALUE (TLV/TWA): 30 MG/M3 (10 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 75 MG/M3 (25 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 30 MG/M3 (10 PPM)

TOXICITY:
LD50 (ORAL-RAT)(MG/KG) - 4894
LD50 (ORAL-MOUSE)(MG/KG) - 4700
LD50 (IPR-RAT)(MG/KG) - 2.9
LC50 (INHL-MOUSE-7H) (PPM) - 9980

CARCINOGENICITY: NTP: YES IARC: YES Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE
INHALATION MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS, NARCOSIS, SUFFOCATION, LOWER BLOOD PRESSURE, CENTRAL NERVOUS SYSTEM DEPRESSION. INHALATION OF VAPORS MAY CAUSE SEVERE IRRITATION OR BURNS OF THE

RESPIRATORY SYSTEM, PULMONARY EDEMA, OR LUNG INFLAMMATION.
LIQUID MAY BE IRRITATING TO SKIN AND EYES. PROLONGED SKIN CONTACT MAY RESULT IN DERMATITIS. EYE CONTACT MAY RESULT IN TEMPORARY CORNEAL DAMAGE. INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS, GASTRO-INTESTINAL IRRITATION, BLURRED VISION, LOWERING OF BLOOD PRESSURE. IRREVERSIBLE INJURY TO BLOOD FORMING TISSUE MAY RESULT FROM CHRONIC LOW LEVEL EXPOSURE.

TARGET ORGANS
BLOOD, CENTRAL NERVOUS SYSTEM, EYES, SKIN, BONE MARROW, RESPIRATORY SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INGESTION, INHALATION, EYE CONTACT, SKIN CONTACT, ABSORPTION

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS, SULFURIC ACID, NITRIC ACID

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO

CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: U019 (TOXIC WASTE)

8 - PROTECTIVE EQUIPMENT

VENTILATION:	USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.
RESPIRATORY PROTECTION:	RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS ABOVE 10 PPM, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.
EYE/SKIN PROTECTION:	SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, POLYVINYL ALCOHOL GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED STRIPE (STORE SEPARATELY)

SPECIAL PRECAUTIONS

BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	BENZENE (BENZOL)
HAZARD CLASS	FLAMMABLE LIQUID
UN/NA	UN1114
LABELS	FLAMMABLE LIQUID
REPORTABLE QUANTITY	1000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	BENZENE
HAZARD CLASS	3.2
UN/NA	UN1114
LABELS	FLAMMABLE LIQUID

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: LEAD, GRANULAR OR SHOT
FORMULA: PB
FORMULA WT: 207.19
CAS NO.: 7439-92-1
NIOSH/RTECS NO.: OF7525000
COMMON SYNONYMS: C.I. 77575
PRODUCT CODES: 4996,2256,2266
EFFECTIVE: 11/25/86
REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	0	NONE
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	0	NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

WARNING
MAY BE FATAL IF SWALLOWED
DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
INORGANIC LEAD	87-99	7439-92-1
ANTIMONY	0.5-5	7440-36-0
INORGANIC ARSENIC	.01-.5	7440-38-2

3 - PHYSICAL DATA

BOILING POINT: 1744 C (3171 F)
MELTING POINT: 327 C (621 F)
SPECIFIC GRAVITY: 11.34

VAPOR PRESSURE(MM HG): N/A
VAPOR DENSITY(AIR=1): N/A
EVAPORATION RATE: N/A

(H2O=1) (BUTYL ACETATE=1)

000221

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: GRAYISH-WHITE, SILVERY METAL, WITH NO ODOR.

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4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

TOXIC GASES PRODUCED
LEAD FUMES

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5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 0.15 MG/M3 (PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.05 MG/M3 (PPM)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: YES OSHA REG: YES

EFFECTS OF OVEREXPOSURE
INGESTION MAY CAUSE LASSITUDE, WEIGHT LOSS, CONSTIPATION, AND ANEMIA.
INGESTION MAY CAUSE NAUSEA, VOMITING, PARALYSIS, AND CENTRAL NERVOUS SYSTEM
INGESTION IS HARMFUL AND MAY BE FATAL.
CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.
IRREVERSIBLE INJURY TO BLOOD FORMING TISSUE MAY RESULT FROM CHRONIC LOW LEVEL EXPOSURE.
NOTE: PRODUCT IS A SOLID MASS; HOWEVER, WARNINGS ARE BASED ON INHALATION DUST, MIST OR FUME EMISSIONS THAT ARE POSSIBLE DURING MANUFACTURING OR CHEMICAL REACTIONS.

TARGET ORGANS
GI TRACT, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD, GINGIVAL TISSUE

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INGESTION, INHALATION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED IN LARGE AMOUNTS, MOVE EXPOSED PERSON TO FRESH AIR.
GET MEDICAL ATTENTION.

IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ATTENTION.
IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

INCOMPATIBLES: STRONG OXIDIZING AGENTS, POTASSIUM METAL, SODIUM METAL

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D008 (EP TOXIC WASTE)

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, UNIFORM, PROPER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	LEAD
HAZARD CLASS	ORM-E
LABELS	NONE
REPORTABLE QUANTITY	1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	CHEMICALS, N.O.S. (NON-REGULATED)

000224

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: XYLENES
FORMULA: C6H4(CH3)2
FORMULA WT: 106.17
CAS NO.: 1330-20-7
NIOSH/RTECS NO.: ZE2100000
COMMON SYNONYMS: DIMETHYLBENZENE; XYLOL
PRODUCT CODES: 9489,9499,5377,9491,9493,9490,X516,9492,9516
EFFECTIVE: 09/11/86
REVISION #03

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	2	MODERATE
FLAMMABILITY	-	3	SEVERE (FLAMMABLE)
REACTIVITY	-	0	NONE
CONTACT	-	2	MODERATE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

WARNING
FLAMMABLE
CAUSES IRRITATION
HARMFUL IF SWALLOWED OR INHALED

KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING. AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE. FLUSH SPILL AREA WITH WATER SPRAY.

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
M-XYLENE	40-65	108-38-3
O-XYLENE	15-20	95-47-6
P-XYLENE	0-20	106-42-3
ETHYL BENZENE	15-25	100-41-4

3 - PHYSICAL DATA

BOILING POINT: 137 C (279 F) VAPOR PRESSURE(MM HG): 5.1

MELTING POINT: -48 C (-54 F) VAPOR DENSITY(AIR=1): 3.7

SPECIFIC GRAVITY: 0.87 (H2O=1) EVAPORATION RATE: 0.7 (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: COLORLESS LIQUID WITH SWEET PLEASANT ODOR.

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4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP 27 C (80 F) NFPA 704M RATING: 2-3-0

FLAMMABLE LIMITS: UPPER - 7.0 % LOWER - 1.1 %

FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK. CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE.

TOXIC GASES PRODUCED
CARBON MONOXIDE, CARBON DIOXIDE

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5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 435 MG/M3 (100 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 655 MG/M3 (150 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 435 MG/M3 (100 PPM)

TOXICITY: LD50 (ORAL-RAT)(MG/KG) - 4300
LD50 (IPR-MOUSE)(MG/KG) - 1.6
LD50 (SCU-RAT)(MG/KG) - 1700

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE

INHALATION AND INGESTION ARE HARMFUL AND MAY BE FATAL.
INHALATION OF VAPORS MAY CAUSE HEADACHE, NAUSEA, VOMITING, DIZZINESS, DROWSINESS, IRRITATION OF RESPIRATORY TRACT, AND LOSS OF CONSCIOUSNESS.
INHALATION OF VAPORS MAY CAUSE NARCOSIS.
CONTACT WITH SKIN OR EYES MAY CAUSE IRRITATION.
INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS, GASTRO-

INTESTINAL IRRITATION, BLURRED VISION, LOWERING OF BLOOD PRESSURE.
CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.

TARGET ORGANS
CENTRAL NERVOUS SYSTEM, EYES, SKIN, GI TRACT, BLOOD, LIVER AND KIDNEYS

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INGESTION, INHALATION, SKIN CONTACT, EYE CONTACT, ABSORPTION

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.
J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: U239 (TOXIC WASTE)

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH

ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, NITRILE GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS
BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	XYLENE
HAZARD CLASS	FLAMMABLE LIQUID
UN/NA	UN1307
LABELS	FLAMMABLE LIQUID
REPORTABLE QUANTITY	1000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	XYLENES
HAZARD CLASS	3.3
UN/NA	UN1307
LABELS	FLAMMABLE LIQUID

000223

MALLINCKRODT SCIENCE PRODUCTS DIV -- LEAD METAL
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 00N010366
Manufacturer's CAGE: 62910
Part No. Indicator: A
Part Number/Trade Name: LEAD METAL

General Information

Company's Name: MALLINCKRODT INC,SCIENCE PRODUCTS DIVISION
Company's P. O. Box: M
Company's City: PARIS
Company's State: KY
Company's Zip Code: 40361
Company's Emerg Ph #: 314-982-5000
Company's Info Ph #: 314-982-5000
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Date MSDS Prepared: 08AUG85
Safety Data Review Date: 31OCT88
MSDS Serial Number: BGVPB
Unit Of Issue: NK

Ingredients/Identity Information

Proprietary: NO
Ingredient: LEAD (SARA III)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: OF7525000
CAS Number: 7439-92-1
OSHA PEL: 0.05 MG/M3;1910.1025
ACGIH TLV: 0.15 MG/M3;DUST 9192
Other Recommended Limit: N/K (FP N/ORNL)

Physical/Chemical Characteristics

Appearance And Odor: SMALL,BLUE-GRAY,ODORLESS GRANULES.
Boiling Point: 1740C
Melting Point: 327.5C
Vapor Pressure (MM Hg/70 F): SEE SUPP
Specific Gravity: 11.34 (WATER=1)
Decomposition Temperature: N/K (FP N)
Solubility In Water: INSOLUBLE

Fire and Explosion Hazard Data

Flash Point: N/K (FP N/ORNL)
Lower Explosive Limit: N/K (FP N)
Upper Explosive Limit: N/K (FP N)
Extinguishing Media: USE ANY MEANS SUITABLE FOR EXTINGUISHING SURROUNDING FIRE.
Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: NOT CONSIDERED TO BE A FIRE OR EXPLOSION HAZARD.HAZ DECOMP PROD:CAN PRODUCE TOXIC LEAD FUMES AND LEAD OXIDE FUMES AT ELEVATED TEMPERATURES.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): STABLE UNDER ORDINARY CONDITIONS OF USE AND STORAGE.
Materials To Avoid: AMMONIUM NITRATE,CHLORINE TRIFLUORIDE,HYDROGEN PEROXIDE.

Hazardous Decomp Products: DOES NOT DECOMPOSE BUT TOXIC LEAD OR LEAD OXIDE FUMES MAY FORM AT ELEVATED TEMPERATURES.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): WILL NOT OCCUR.

Health Hazard Data

Health Haz Acute And Chronic: LEAD IS A CUMULATIVE POISON & EXPOSURE EVEN TO SMALL AMOUNTS CAN RAISE THE BODY'S CONTENT TO TOXIC LEVELS.SYMPTOMS OF CHRONIC EXPOSURE ARE LIKE THOSE OF INGESTION POISONING;RESTLESSNESS AND IRRITABILITY MAY ALSO BE NOTED.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: INORGANIC LEAD & LEAD COMPOUNDS:INAD EVID FOR CARCIN IN HUM;SUFF EVID FOR CARCIN IN ANIM (IARC 1987).
Signs/Symptoms Of Overexp: EYES:IRRIT & ABRASION.ABSORPTION THROUGH EYE IS POSS.SKIN:IRRIT & REDNESS.MAY BE ABSORBED ON PROLONGED EXPOS CAUSING SYMP LIKE INGEST.INGEST:ABDOM PAIN & SPASMS,NAUSEA,VOM,HEADACHE.ACUTE POISONING-MUSCLE WEAK,"LEAD LINE" ON GUMS,METALLIC TASTE,LOSS OF APPETITE, INSOMNIA,DIZZ,HIGH LEAD LEVELS IN BLOOD & URINE, (SEE SUPP)
Med Cond Aggravated By Exp: PERSONS WITH PRE-EXISTING NERVE OR CIRCULATORY DISORDERS OR WITH SKIN OR EYE PROBLEMS MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF THIS DISEASE.
Emergency/First Aid Proc: EYES:WASH WITH PLENTY OF WATER FOR AT LEAST 15 MIN.CALL MD.SKIN:WASH EXPOSED AREA WITH SOAP AND WATER. GET MEDICAL ADVICE IF IRRIT DEVELOPS.INGEST:INDUCE VOMITING IMMEDIATELY BY GIVING 2 GLASSES OF WATER AND STICKING FINGER DOWN THROAT.CALL MD IMMEDIATELY.NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.INHALATION:REMOVE TO FRESH AIR.GET MEDICAL ATTENTION FOR ANY BREATHING DIFFICULTY.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: CLEAN-UP PERSONNEL NEED PROT CLOTHING AND RESP EQUIP FOR DUSTS.SWEEP,SCOOP,OR PICK UP MATL.VACUUMING/WET SWEEPING MAY AVOID DUST DISPERSAL.PACKAGE FOR RECLAMATION OR RECOVERY.PACKAGE UNRECLAIMABLE MATL FOR DISPOSAL IN RCRA APPROVED WASTE FACILITY.
Neutralizing Agent: N/K (FP N/ORNL)
Waste Disposal Method: DISPOSAL MUST BE IN ACCORDANCE WITH FEDERAL,STATE AND LOCAL REGULATIONS (FP N).
Precautions-Handling/Storing: KEEP CONTR TIGHTLY CLOSED.STORE IN COOL,DRY VENT AREA.PROTECT FROM PHYSICAL DMG.ISOLATE FROM INCOMPATIBLE SUBSTANCES. AVOID BREATHING DUST.
Other Precautions: MAINTAIN EYEWASH & QUICK-DRENCH FACILITY.EATING, DRINKING,& SMOKING SHOULD NOT BE PERMITTED WHERE EXPOS TO SOLIDS OR LIQUIDS CONTAINING SOL LEAD CMPDS ARE HANDLED,PROCESSED OR STORED.AREAS OF POSS EXP SHOULD BE MARKED & ACCESS (SEE SUPP)

Control Measures

Respiratory Protection: NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation: LOCAL AND GENERAL VENTILATION NECESSARY TO KEEP AIR CONCENTRATION BELOW TLV (FP N/ORNL).
Protective Gloves: WEAR IMPERVIOUS GLOVES.
Eye Protection: CHEMICAL WORKERS GOGGLES (FP N).
Other Protective Equipment: WEAR IMPERVIOUS PROTECTIVE CLOTHING,INCLUDING BOOTS,LAB COAT,APRON OR COVERALLS TO PREVENT SKIN CONTACT.
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.
WITH SHOCK,COMA,& DEATH IN EXTREME CASES.INHAL:IRRIT OF BRONCHI & LUNGS. ACUTE EXPOS-METALLIC TASTE,CHEST & ABDOMINAL PAIN,& INCREASED LEAD BLOOD LEVELS.ABSORPTION THROUGH RESPIRATORY SYSTEM IS POSSIBLE.OTHER PREC:TO SUCH AREAS SHOULD BE LIMITED TO AUTHORIZED PERSONS.

Transportation Data

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Trans Data Review Date: 89241
DOT PSN Code: ZZZ
DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZZ
IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI PSN Code: ZZZ
AFI Prop. Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
Additional Trans Data: NOT REGULATED FOR SHIPMENT.
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Disposal Data

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Label Data

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Label Required: YES
Label Status: G
Common Name: LEAD METAL
Special Hazard Precautions: LEAD IS A CUMULATIVE POISON & EXPOSURE EVEN TO SMALL AMOUNTS CAN RAISE THE BODY'S CONTENT TO TOXIC LEVELS.SYMPTOMS OF CHRONIC EXPOSURE ARE LIKE THOSE OF INGESTION POISONING;RESTLESSNESS AND IRRITABILITY MAY ALSO BE NOTED. EYES:IRRIT & ABRASION.ABSORPTION THROUGH EYE IS POSS.SKIN:IRRIT & REDNESS.MAY BE ABSORBED ON PROLONGED EXPOS CAUSING SYMP LIKE INGEST.INGEST:ABDOM PAIN & SPASMS,NAUSEA,VOM,HEADACHE.ACUTE POISONING-MUSCLE WEAK,"LEAD LINE" ON GUMS, METALLIC TASTE,LOSS OF APPETITE,INSOMNIA,DIZZ,HIGH LEAD LEVELS IN BLOOD & URINE, (SEE SUPP)
Label Name: MALLINCKRODT INC,SCIENCE PRODUCTS DIVISION
Label P.O. Box: M
Label City: PARIS
Label State: KY
Label Zip Code: 40361
Label Emergency Number: 314-982-5000
==========
URL for this msds http://hazard.com. If you wish to change, add to, or delete information in this archive please sent updates to dan@hazard.com.

NORTH STRONG -- ETHYL BENZENE, REAGENT - ETHYL BENZENE REAGENT
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 008257436
Manufacturer's CAGE: 9A714
Part No. Indicator: A
Part Number/Trade Name: ETHYL BENZENE, REAGENT

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General Information

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Item Name: ETHYL BENZENE REAGENT
Company's Name: NORTH STRONG, INC.
Company's Street: 7322 WESTMORE RD
Company's City: ROCKVILLE
Company's State: MD
Company's Country: US
Company's Zip Code: 20850-1260
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Date MSDS Prepared: 01JAN85
Safety Data Review Date: 26NOV79
MSDS Serial Number: BFRJJ
Hazard Characteristic Code: F3
Unit Of Issue: BT
Unit Of Issue Container Qty: 1 KG

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: ETHYL BENZENE (SARA III)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: DA0700000
CAS Number: 100-41-4
OSHA PEL: 100 PPM/125 STEL
ACGIH TLV: 100 PPM/125STEL 9192

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Physical/Chemical Characteristics

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Fire and Explosion Hazard Data

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Reactivity Data

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Health Hazard Data

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Precautions for Safe Handling and Use

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Control Measures

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Transportation Data

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Trans Data Review Date: 79330
DOT Proper Shipping Name: UNDER REVIEW
IMO Proper Shipping Name: FLAMMABLE LIQUIDS, NON-TOXIC, N.O.S./ ETHYL BENZENE
IMO UN Number: 1993
IMO UN Class: 3.2
IATA UN ID Number: 701
IATA Proper Shipping Name: ETHYL BENZENE
IATA Label: FLAMMABLE LIQUID

AFI Prop. Shipping Name: UNDER REVIEW

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Disposal Data

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Disposal Data Review Date: 89045
Rec # For This Disp Entry: 01
Tot Disp Entries Per NSN: 001
Landfill Ban Item: YES
Disposal Supplemental Data: IN CASE OF ACCIDENTAL EXPOSURE OR DISCHARGE, CONSULT MANUFACTURER FOR HEALTH AND SAFETY INFORMATION.
1st EPA Haz Wst Code New: D001
1st EPA Haz Wst Name New: IGNITIBLE
1st EPA Haz Wst Char New: IGNITABILITY
1st EPA Acute Hazard New: NO

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Label Data

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Label Required: YES
Label Status: F
Special Hazard Precautions: MAY BE POISONOUS IF INHALED OR ABSORBED THROUGH SKIN. VAPORS MAY CAUSE DIZZINESS OR SUFFOCATION. CONTACT MAY IRRITATE OR BURN SKIN AND EYES. FIRE MAY PRODUCE IRRITATING OR POISONOUS GASES. RUNOFF FROM FIRE CONTROL OR DILUTION WATER MAY CAUSE POLLUTION.
Label Name: BIOCLINICAL LABORATORIES INC NORTH STRONG DIV
Label Street: 7322 WESTMORE RD
Label City: ROCKVILLE
Label State: MD
Label Zip Code: 20850-1260
Label Country: US

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CHEM SERVICE -- F112S AROCHLOR 1260 100 UG-ML IN METHANOL
MATERIAL SAFETY DATA SHEET
FSC: 6550
NIIN: 00F038146
Manufacturer's CAGE: 8Y898
Part No. Indicator: A
Part Number/Trade Name: F112S AROCHLOR 1260 100 UG/ML IN METHANOL

General Information

Company's Name: CHEM SERVICE INC
Company's Street: 660 TOWER LN
Company's P. O. Box: 3108
Company's City: WEST CHESTER
Company's State: PA
Company's Country: US
Company's Zip Code: 19381-3108
Company's Emerg Ph #: 610-386-2100/800-452-9994
Company's Info Ph #: 610-692-3026/800-452-9994
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 02AUG94
Safety Data Review Date: 25JAN95
Preparer's Company: CHEM SERVICE INC
Preparer's St Or P. O. Box: 660 TOWER LN
Preparer's City: WEST CHESTER
Preparer's State: PA
Preparer's Zip Code: 19381-3108
MSDS Serial Number: BWKRY

Ingredients/Identity Information

Proprietary: NO
Ingredient: POLYCHLORINATED BIPHENYL, PCB, AROCLOR 1260, (CL 60%) (SUSPECTED HUMAN CARCINOGEN BY IARC, NTP - GROUP 2A) *94-4*
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: TQ1362000
CAS Number: 11096-82-5
Other Recommended Limit: 0.001 MG/CUM NIOSH

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID
Boiling Point: 148.28F
Melting Point: -144.4F
Vapor Pressure (MM Hg/70 F): 97
Vapor Density (Air=1): 1.11
Solubility In Water: MISCIBLE

Fire and Explosion Hazard Data

Flash Point: 51.8F
Lower Explosive Limit: 6.7
Upper Explosive Limit: 36
Extinguishing Media: CO2, DRY CHEMICAL POWDER. DON'T USE WATER.
Unusual Fire And Expl Hazrds: FLAMMABLE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): MOISTURE
Materials To Avoid: STRONG ACIDS, ACID HALIDES, ANHYDRIDES, STRONG OXIDIZING/REDUCING AGENTS, ACTIVE METALS, SODIUM.
Hazardous Decomp Products: TOXIC FUMES.

Hazardous Poly Occur: NO

Health Hazard Data

LD50-LC50 Mixture: ORAL LD50 (RAT): 5628 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: METHYL ALCOHOL-SKIN: FATAL IF ABSORBED. INHALATION: FATAL. INGESTION: FATAL/BLINDNESS. EXPOSURE MAY CAUSE LIVER/ KIDNEY DAMAGE, CARDIOVASCULAR SYSTEM INJURY, EYE INJURY.
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: SEE INGREDIENTS
Signs/Symptoms Of Overexp: METHYL ALCOHOL-GI DISTURBANCES & CONVULSIONS.
Emergency/First Aid Proc: METHYL ALCOHOL- EYES: FLUSH CONTINUOUSLY W/ WATER FOR 15-20 MINS. SKIN: FLUSH W/WATER FOR 15-20 MINS. IF NO BURNS HAVE OCCURED USE SOAP & WATER. INHALATION: REMOVE TO FRESH AIR. GIVE CPR/OXYGEN IF NEEDED. CONTINUE LIFE SUPPORTING MEASURES UNTIL MEDICAL ASSISTANCE HAS ARRIVED.OBTAIN MEDICAL ATTENTION IN ALL CASES.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE AREA. WEAR APPROPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE/SIMILAR MATERIAL. SWEEP UP & PLACE IN AN APPROPRIATE CONTAINER. HOLD FOR DISPOSAL. WASH CONTAMINATED SURFACES TO REMOVE ANY RESIDUES.
Waste Disposal Method: BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER & SCRUBBER.
Precautions-Handling/Storing: STORE IN COOL DRY PLACE. STORE ONLY W/ COMPATIBLE CHEMICALS. EYE SHIELDS SHOULD BE WORN. KEEP TIGHTLY CLOSED. FOR LABORATORY USE ONLY||
Other Precautions: HYGROSCOPIC. AVOID CONTACT W/SKIN/EYES & CLOTHING, DON'T BREATHE VAPORS. CONTACT LENSES SHOULD NOT BE WORN IN THE LABORTORY. ALL CHEMICALS SHOULD BE CONSIDERED HAZARDOUS. AVOID DIRECT PHYSICAL CONTACT.

Control Measures

Respiratory Protection: USE APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.
Ventilation: THIS CHEMICAL SHOULD BE HANDLED ONLY IN A HOOD.
Eye Protection: EYE SHIELDS
Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.

Transportation Data

Disposal Data

Label Data

Label Required: YES
Label Status: G
Common Name: F112S AROCHLOR 1260 100 UG/ML IN METHANOL
Special Hazard Precautions: METHYL ALCOHOL-SKIN: FATAL IF ABSORBED. INHALATION: FATAL. INGESTION: FATAL/BLINDNESS. EXPOSURE MAY CAUSE LIVER/ KIDNEY DAMAGE, CARDIOVASCULAR SYSTEM INJURY, EYE INJURY. METHYL ALCOHOL-GI DISTURBANCES & CONVULSIONS.
Label Name: CHEM SERVICE INC
Label Street: 660 TOWER LN
Label P.O. Box: 3108

Label City: WEST CHESTER
Label State: PA
Label Zip Code: 19381-3108
Label Country: US
Label Emergency Number: 610-386-2100/800-452-9994
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BOUGHT ACCORDING TO SPECIFICATION -- DIESEL FUEL - DIESEL FUEL
MATERIAL SAFETY DATA SHEET
FSC: 9140
NIIN: 002865296
Manufacturer's CAGE: 81349
Part No. Indicator: A
Part Number/Trade Name: DIESEL FUEL

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General Information

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Item Name: DIESEL FUEL
Company's Name: BOUGHT ACCORDING TO SPECIFICATION
Record No. For Safety Entry: 086
Tot Safety Entries This Stk#: 092
Date MSDS Prepared: 01JAN85
Safety Data Review Date: 05DEC79
MSDS Serial Number: BDTVR
Hazard Characteristic Code: F4

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: DIESEL FUEL
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: 1002022DF

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Physical/Chemical Characteristics

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Fire and Explosion Hazard Data

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Flash Point: 125F

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Reactivity Data

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Health Hazard Data

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Precautions for Safe Handling and Use

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Control Measures

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Transportation Data

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Trans Data Review Date: 79339
DOT PSN Code: GTF
DOT Proper Shipping Name: GAS OIL OR DIESEL FUEL OR HEATING OIL, LIGHT *
DOT Class: 3
DOT ID Number: UN1202
DOT Pack Group: III
DOT Label: FLAMMABLE LIQUID
IMO PSN Code: HIA
IMO Proper Shipping Name: FLAMMABLE LIQUID, N.O.S. *
IMO Regulations Page Number: 3345
IMO UN Number: 1993
IMO UN Class: 3.3
IATA PSN Code: MTX
IATA UN ID Number: 1202
IATA Proper Shipping Name: GAS OIL
IATA UN Class: 3
IATA Label: FLAMMABLE LIQUID
AFI PSN Code: MTX

AFI Prop. Shipping Name: GAS OIL
AFI Class: 3
AFI ID Number: UN1202
AFI Pack Group: III
AFI Label: FLAMMABLE LIQUID
AFI Basic Pac Ref: 7-7

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Disposal Data

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Label Data

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Label Required: YES
Label Status: G
Common Name: DIESEL FUEL
Label Name: BOUGHT ACCORDING TO SPECIFICATION

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HENKEL CORPORATION -EMERY GROUP -- EMERY 2863 MIL-H-83282 HYDRAULIC FLUID - HYDRAULI
MATERIAL SAFETY DATA SHEET
FSC: 9150
NIIN: 012816191
Manufacturer's CAGE: 0JS01
Part No. Indicator: A
Part Number/Trade Name: EMERY 2863 MIL-H-83282 HYDRAULIC FLUID

General Information

Item Name: HYDRAULIC FLUID, FIRE RESISTANT
Company's Name: HENKEL CORPORATION -EMERY GROUP
Company's Street: 4900 ESTE AVENUE
Company's City: CINCINNATI
Company's State: OH
Company's Country: US
Company's Zip Code: 45232
Company's Emerg Ph #: 513-482-2297
Company's Info Ph #: 513-482-2297
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Status: SE
Date MSDS Prepared: 16JAN90
Safety Data Review Date: 21FEB95
Supply Item Manager: CX
MSDS Preparer's Name: ROBERT E. BORGERDING
MSDS Serial Number: BWMJQ
Specification Number: MIL-H-83282
Hazard Characteristic Code: N1

Ingredients/Identity Information

Physical/Chemical Characteristics

Appearance And Odor: TRANSPARENT RED LIQUID, SLIGHT ESTER ODOR.
Boiling Point: >540F,>282C
Melting Point: -85F,-65C
Vapor Pressure (MM Hg/70 F): <1
Specific Gravity: 0.85 @60F
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: UNKNOWN
Solubility In Water: NEGLIGIBLE
Corrosion Rate (IPY): UNKNOWN

Fire and Explosion Hazard Data

Flash Point: 440F,227C
Flash Point Method: COC
Extinguishing Media: USE WATER SPRAY, DRY CHEMICAL, FOAM OR CARBON DIOXIDE. WATER MAY BE INEFFECTIVE BUT SHOULD BE USED TO KEEP DRUMS COOL.
Special Fire Fighting Proc: FIREFIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS IN THE POSITIVE PRESSURE MODE WITH A FULL FACE PIECE WHEN THERE IS AN EXPOSURE TO SMOKE, FUMES.
Unusual Fire And Expl Hazrds: IF A SPILL OR LEAK HAS NOT IGNITED, USE WATER SPRAY TO DISPERSE THE VAPORS. WATER SPRAY MAY BE USED TO FLUSH SPILLS AWAY FROM FIRE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): AVOID HEATING TO DECOMPOSITION. THE USER IS ADVISED TO HAVE A SAFETY EXPERT EVALUATE THE SPECIFIC CONDITIONS OF USE.
Materials To Avoid: NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomp Products: DECOMPOSITION MAY PRODUCE CARBON MONOXIDE AND

CARBON DIOXIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NONE. WILL NOT OCCUR.

Health Hazard Data

LD50-LC50 Mixture: TLV: NO ACGIH TLV
Route Of Entry - Inhalation: NO
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: INHALATION: UNKNOWN. INGESTION: UNKNOWN. EYE NOT CLASSIFIED AS PRIMARY IRRITANTS OR AS CORROSIVE MATERIAL.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: PRODUCT CONTAINS NO MATERIALS CURRENTLY CLASSIFIED AS CARCINOGENIC BY NTP, IARC OR OSHA.
Signs/Symptoms Of Overexp: NONE SPECIFIED BY MANUFACTURER.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: INGESTION: DO NOT INDUCE VOMITING. IF VICTIM IS CONSCIOUS AND ABLE TO SWALLOW, PROMPTLY HAVE VICTIM DRINK WATER TO DILUTE. DO NOT GIVE SODIUM BICARBONATE, FRUIT JUICES OR VINEGAR. NEVER GIVE ANYTHING BY MOUTH IF VICTIM IS UNCONSCIOUS OR HAVING CONVULSIONS. CALL A IMMEDIATELY FLUSH WITH WATER. INHALATION: REMOVE VICTIM TO FRESH AIR

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR APPROPRIATE RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING. CONTAIN SPILLED MATERIAL. TRANSFER TO SECURE CONTAINERS. WHERE NECESSARY, COLLECT USING ABSORBENT MEDIA.
Waste Disposal Method: ALL RECOVERED MATERIAL SHOULD BE PACKAGED, LABELED, TRANSPORTED AND DISPOSED OR RECLAIMED IN CONFORMANCE WITH APPLICABLE LAWS AND REGULATIONS AND IN CONFORMANCE WITH GOOD ENGINEERING PRACTICES. AVOID LANDFILLING OF LIQUIDS. RECLAIM WHERE POSSIBLE.
Precautions-Handling/Storing: NO SPECIAL PRECAUTIONS NECESSARY.
Other Precautions: IN THE EVENT OF AN UNCONTROLLED RELEASE OF THIS MATERIAL, THE USER SHOULD DETERMINE IF THE RELEASE IS REPORTABLE UNDER APPLICABLE LAWS AND REGULATIONS.

Control Measures

Respiratory Protection: WHERE EXPOSURE IS LIKELY TO EXCEED ACCEPTABLE CRITERIA, USE NIOSH/OSHA APPROVED RESPIRATORY EQUIPMENT. RESPIRATORS SHOULD BE SELECTED BASED ON THE FORM AND CONCENTRATION OF CONTAMINANT IN AIR AND IN ACCORDANCE WITH OSHA (29 CRFR 1910.134).
Ventilation: HANDLE IN THE PRESENCE OF ADEQUATE VENTILATION.
Protective Gloves: WEAR IMPERVIOUS GLOVES
Eye Protection: SAFETY GLASSES, CHEMICAL SAFETY GOGGLES
Other Protective Equipment: PROTECTIVE CLOTHING IMPERVIOUS TO THE PRODUCT FOR THE DURATION OF THE ANTICIPATED EXPOSURE.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: AVOID UNCONTROLLED RELEASES OF THIS MATERIAL. WHERE SPILLS ARE POSSIBLE, A COMPREHENSIVE SPILL RESPONSE PLAN SHOULD BE DEVELOPED AND IMPLEMENTED.

Transportation Data

Disposal Data

Label Data

Label Required: YES
Label Status: G

Common Name: EMERY 2863 MIL-H-83282 HYDRAULIC FLUID
Special Hazard Precautions: INHALATION: UNKNOWN. INGESTION: UNKNOWN. EYE NOT CLASSIFIED AS PRIMARY IRRITANTS OR AS CORROSIVE MATERIAL. NONE SPECIFIED BY MANUFACTURER.
Label Name: HENKEL CORPORATION -EMERY GROUP
Label Street: 4900 ESTE AVENUE
Label City: CINCINNATI
Label State: OH
Label Zip Code: 45232
Label Country: US
Label Emergency Number: 513-482-2297
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Appendix B

Health and Safety Plan Forms

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project site and returned to: EnSafe/Allen & Hoshall, Memphis, Tennessee.

CTO:	106
Contract No:	N62467-89-D-0318
Project:	ASSEMBLIES G and H – NSA Memphis

I have read and understand the contents of the above plan and agree to perform my work in accordance with it. I certify I am in compliance with the applicable OSHA training requirements pertaining to the following:

Check all that apply

[ ] 40-hour HAZWOPER training per 29 CFR 1910.120 **(required)**

[ ] 8-hour HAZWOPER Refresher per 29 CFR 1910.120 (**required**; if applicable)

[ ] 8-hour HAZWOPER Site Supervisor per 29 CFR 1910.120 (**required**; if applicable)

[ ] First Aid (if applicable)

[ ] CPR (if applicable)

_____
Signed

_____
Print Name

_____
Company

_____
Date

EMPLOYEE EXPOSURE HISTORY FORM

Employee: _____

Job Name: _____

Date(s) From/To: _____

Hours Onsite: _____

Contaminants (Suspected/Reported):

_____

_____

_____

_____

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(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

_____

_____

_____

Unexpected situations encountered:

_____

_____

_____

Recommendations for revisions:

_____

_____

_____

ACCIDENT REPORT FORM

This form is required by Public Law 91-596 and must be kept in the establishments for 5 years. Failure to maintain can result in the issuance of citations and assessment of penalties.	Case of File No.

Location of Office:

1. Name

2. Mail address *(No. and street, city or town, State, and zip code)*

3. Location if different from mail address

Injured or Ill Employee

4. Name *(First, middle, and last)* — Social Security No.

5. Home address *(No. and street, city or town, State, and zip code)*

6. Age — 7. Sex *(Check one)* Male ☐ Female ☐

8. Occupation *(Enter regular job title, not the specific activity he was performing at time of injury.)*

9. Department *(Enter name of department of division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)*

The Accident or Exposure to Occupational Illness

If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.

10. Place of accident or exposure *(No. and street, city or town, State and zip code)*

11. Was place of accident or exposure on employer's premises? Yes ☐ No ☐

12. What was the employee doing when injured? *(Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)*

13. How did the accident occur? *(Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.*

Occupational Injury or Occupational Illness

14. Describe the injury or illness in detail and indicate the part of body affected. *(E.g. amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)*

15. Name the object or substance which directly injured the employee/. *(For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc, the thing he has lifting, pulling, etc.)*

16. Date of injury or initial diagnosis of occupational illness — 17. Did employee die? *(Check one)* Yes ☐ No ☐

Other

18. Name and address of physician

19. If hospitalized, name and address of hospital

Date of report	Prepared by *(Print)*	Official position

000246

Appendix C

Directions to Emergency Medical Facilities

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

Methodist North Hospital is the nearest hospital **and** the nearest facility capable of treating chemical burns. Therefore, there is only one set of directions.

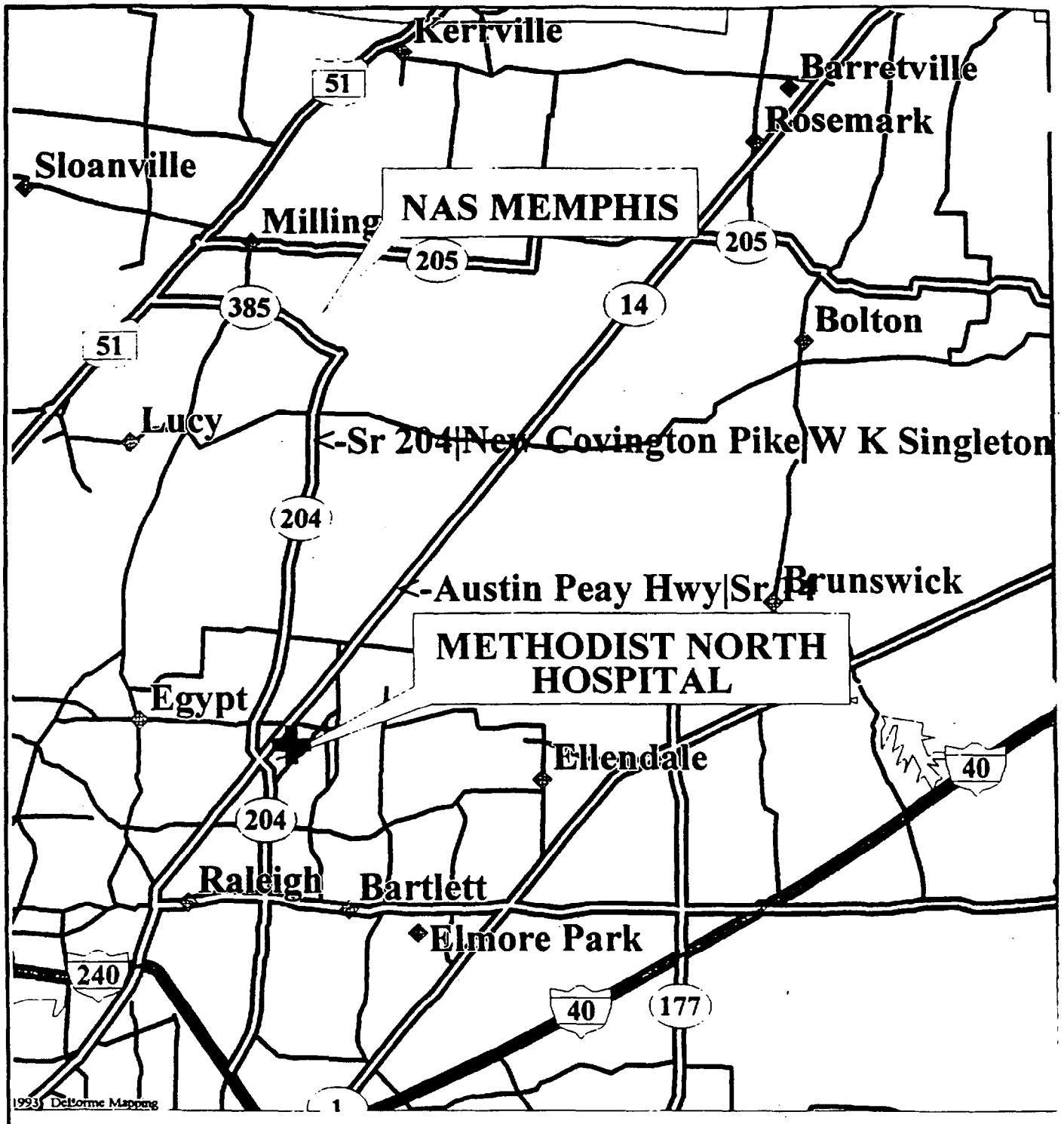
Nearest Hospital

Methodist North Hospital
3960 Covington Pike
Memphis, Tennessee

Emergency Room Telephone Number – (901) 372-5211

Directions to Methodist North Hospital from NSA Memphis Main Gate:

1) Exit site through South Gate (Singleton Parkway).
2) Continue on Singleton Parkway through the stop signs.
3) Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).
4) You will see the entrance to the emergency room 700 feet past this light on the left.



HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

DIRECTIONS TO THE HOSPITAL

DWG DATE: 10/04/94 | DWG NAME: BOARD

Attachment D

Closure Reports for Tank 1657 and Tank 1648

UNDERGROUND STORAGE TANK CLOSURE REPORT

PROVIDED TO

Officer in Charge of NAVFAC Contracts
P.O. Box 54306 - NAS Memphis
Millington, TN 38054-0306
Project No. 06-94-5218
Contract No. N62467-94--C-5218
Sub-Tech Job No. 5247A

FOR

UST S-9
November 25, 1996

Prepared By

Mr. Daniel D. Brown, Project Scientist

SUB-TECH, INC.®
A Koester Company - Environmental Services Division
7925 Burch Park Drive
Evansville, IN 47711-1787
Phone (812) 867-0100 / Fax (812) 867-4478

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EXECUTIVE SUMMARY

This underground storage tank (UST) removal project located at the Naval Air Station Memphis, Millington, Tennessee, involved the removal of one 550 gallon waste oil UST.

The UST was removed on June 27, 1996 by Sub-Tech personnel. Approximately 42 gallons of sludge were removed from the UST and placed in a properly labeled 55 gallon drum. This sludge was delivered to building N-1694 for disposal by the Government.

Approximately 140 tons of contaminated soil were removed from the UST excavation. Preliminary determination of soil contamination was achieved through the use of olfactory, visual, and instrument assisted field screening. Final determination of contamination was achieved by laboratory analysis for parameters set forth in applicable sections of NAVFAC Specifications No. 06-95-5218. HydroLogic Laboratories, Inc., a Tennessee Department of Environmental and Conservation (TDEC) Certified laboratory, provided analytical services throughout this project.

Removal of this UST, associated piping, and residual waste is complete. The following UST closure report describes preparations, methods, procedures, and details associated with the project.

1.0 INTRODUCTION

1.1 Responsible Party Information

This report was prepared for the following Responsible Party:

Contracting Officer
P.O. Box 54306 - Naval Air Station, Memphis
Millington, TN 38054-0306

The following individuals served as representatives of the Contracting Officer throughout this project:

Ms. Linda Boyd
Assistant Resident Engineer in Charge of Construction

Mr. Randy Wilson
Environmental Protection Specialist

Mr. Mike Jones
Navy Construction Representative

1.2 Underground Storage Tank Contractor

The UST closure contractor's company name, address, Site representatives, and phone numbers are as follows:

Company:	Sub-Tech, Inc.
Address:	7925 Burch Park Drive Evansville, IN 47711-1787
License #:	00030817
Telephone:	(812) 867-0100
Fax:	(812) 867-4478

Site Representatives:	Mr. Jett Thomas - Project Manager Mr. Dennis Jochem - Site Supervisor Mr. Kelly Spahn - Site Safety Officer Mr. Daniel Brown - Project Environmental Scientist

2.0 SITE DESCRIPTION

2.1 Site Location

The 550 gallon UST removed was located on the north side of Building S-9 (hereinafter referred to as the Site). The Site lies on the Naval Air Support Station - Memphis, at Millington, TN. A map showing the location of this Site is attached to the State of Tennessee Permanent Closure Report included with this closure report.

2.2 Site Surroundings

The UST Site is located in an asphalt parking lot immediately north of Building S-9. Building S-252 is located approximately 10 yards east of the Site. The Site is located in a portion of the naval station used for vehicle and general facility maintenance.

3.0 UST REMOVAL ACTIVITIES

3.1 UST Removal Preparations

Prior to UST removal, an Application for Permanent Closure of Underground Storage Tank Systems was submitted to Navy for review. The State Fire Marshall's office was informed of removal time and place. All known underground utilities were marked by Sub-Tech Personnel.

Safe work zones were identified by the Sub-Tech Safety Officer prior to UST removal, and clearly marked with yellow caution tape. Access to these zones was strictly controlled by the Sub-Tech Site Safety Officer. Seven roll-off boxes were delivered on Site by the Government for temporary containment of excavated soils. A staging area was prepared for cleaning and temporary storage of the excavated UST. Preparation of this area consisted of placing a minimum of 30 ml of polyethylene sheeting over soils present in the area. A map showing the location of these areas is attached to the State of Tennessee Permanent Closure Report included with this closure report.

Per NAVFAC Specifications No. 06-95-5218, Section 02082, page 9, 3.16.2 Fuel Removal, the Government removed fuel remaining in the UST prior to tank removal.

Underground piping associated with the UST was detached at its entry point into Buildings S-9 & S-252. The piping was drained with a pneumatic drum vac to ensure that no product remaining in the piping network would be released during UST removal. The piping entry point into Building S-9 & S-252 was sealed with concrete after piping was detached. Prior to UST removal, piping was uncovered with a concrete saw and backhoe, broken into sections, and removed.

3.2 UST Removal and Cleaning Procedures

Sub-Tech personnel removed UST S-9 on June 27, 1996. Personnel remained a safe distance from heavy equipment during this operation, and used pre-determined hand signals to maintain clear communications between workers and equipment operator. Upon removal from the excavation, the UST was visually inspected by Sub-Tech personnel. The fiberglass UST did not appear to have significant damage, however, some free product was observed to have leaked into the excavation. Approximately 350 gallons of trap water were removed from the excavation after UST removal.

The UST was staged on Site in a prearranged cleaning and storage area. Air inside the tank was monitored for hazardous conditions with an MSA Passport™ meter. After monitoring had ensured safe work conditions, the UST was cut open using pneumatic tools.

Tank cleaning was accomplished using several methods. First, a pneumatic drum vacuum was utilized to remove as much loose liquid sludge as possible. Second, Sub-Tech personnel entered the tank and used hand tools to remove sludge caked on interior walls. Finally, Sub-Tech personnel used absorbent pads to remove any remaining sludge and residue and power-washed the tank interior. Personnel performing cleaning operations were provided with chemical resistant coveralls, booties, and gloves, as well as full-face respirators with appropriate filter cartridges. A confined space entry permit was prepared by the Site Safety Officer prior to tank entry by Sub-Tech personnel.

Approximately 42 gallons of sludge were removed from the UST and placed in a 55 gallon drums The drum was labeled in accordance with all applicable State and Federal regulations. See Section 6.0 of this report, subpart 6.3 Disposal of Sludge for additional information concerning sludge disposal. Approximately 80 gallons of wash water were generated during tank cleaning and placed into 55 gallons drums. The drums were labeled in accordance with all applicable State and Federal regulations. See Section 6.0 of this report, subpart 6.5 Disposal of Trap Water and Rinsate for additional information concerning wash water disposal.

After cleaning, the UST was clearly marked in accordance with NAVFAC Specifications No. 06-95-5218, Section 02082, page 16, 3.22.4, Tank Removal.

3.3 Excavation and Backfilling of Soil and Other Materials

After removal of UST S-9, a 12" thick associated concrete slab, and two feet of surrounding backfill/soil, final excavation dimensions were 16' x 15' x 10'. Approximately 350 gallons of trap water were removed from the excavation after UST removal. See Section 6.0 of this report, subpart 6.5 Disposal of Trap Water and Rinsate for additional information concerning trap water disposal.

Excavated soils were stockpiled in roll-off boxes supplied by the Government. Soil which appeared to be contaminated due to visual, olfactory and photoionization detector (PID) screening was segregated from non-contaminated soils.

Approximately 95 cubic yards of soil were removed from the excavation. Based on visual examination, areas of contamination were prevalent on all sides and the bottom of the excavation. This contamination appeared to result from UST overfill. Laboratory analytical reports later confirmed that all soils which had appeared to be contaminated were contaminated with petroleum hydrocarbons.

3.4 Field Screening Procedures, Requirements, Results

As noted previously, field screening of excavated soils for petroleum contamination was conducted using visual and olfactory observations and PID instrumentation. Additionally, a Hanby ™ testing kit was used to provide more precise field screening results for certain screened samples. According to TDEC Technical Guidance Document 005, a minimum of 10 screen samples were required for an excavation of this size. Results of field screening are shown in Appendix A of this report.

4.0 SAMPLING ACTIVITIES

4.1 Soil Sample Procurement

A total of fourteen soil samples were taken and submitted for laboratory analysis during the removal of UST S-9. Two soil samples were taken from the bottom of the completed excavation, ten soil samples were taken along product piping lines, and a total of two composite soil sample were taken from roll-off boxes containing excavated soils. This sampling schematic was performed in accordance with specifications set forth in NAVFAC Specifications No. 06-95-5218, Section 02082, subsection 3.19 Soils Testing.

Location of sampling areas were determined using information provided in Figure I of TDEC UST System Closure Assessment Guidelines, as well as requirements set forth in NAVFAC Specifications No. 06-95-5218, Section 02082, subsection 3.19 Soils Testing.

4.2 Soil Sample Collection Procedures

Soil samples were obtained using disposable latex gloves. The gloves were discarded and replaced with new ones between each soil sample.

Soil samples collected were placed into clean glass jars provided by HydroLogic, Inc. The soil sample jars were packed full, leaving no headspace, and capped with a Teflon™ lined lid. No liquid preservatives were administered to the soil samples.

Each laboratory soil sample container was clearly labeled with non-smearing ink, to include at a minimum: job title, sample location, date, and required analysis. The label was covered with transparent tape to prevent deterioration of the label or writing. Soil sample containers were placed in sealable coolers and stored on ice for overnight delivery to HydroLogic, Inc.

4.3 Required Soil Sample Analysis

Soil samples were analyzed for the presence of contaminants in accordance with specifications set forth in NAVFAC Specifications No. 06-95-5218, Section 02082, subsection 3.19 Soils Testing.

Soil samples collected from the floor of the excavation were obtained from freshly exposed, undisturbed sections of soil. These samples were analyzed for the presence of benzene, toluene, ethylbenzene, and xylene (BTEX) utilizing EPA Method 8020,

total petroleum hydrocarbons (TPH) utilizing EPA Method 418.1, and Toxicity Characteristic Leaching Procedure (TCLP) for eight RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver).

Soil samples collected from stockpiles were also analyzed for the presence of BTEX and TPH, utilizing the same EPA methodology which was used for excavation samples. Stockpile soil samples with which were found to contain TPH 418.1 levels greater than or equal to 100 ppm, or benzene levels greater than or equal to 10 ppm, were further analyzed for TCLP benzene, TCLP lead, and TCLP TPH (utilizing EPA Methods 1311/8240, 1311/7420 and 1311/418.1, respectively).

Soil samples collected from product delivery piping trenches were analyzed for the presence of BTEX and TPH, utilizing the same EPA methodology which was used for excavation samples.

4.4 Liquid Waste (Sludge) Sample Collection

Petroleum sludge samples were collected using disposable latex gloves. The gloves were discarded and replaced with new ones between each sample. The sample was collected using a glass coliwasa sampling tube.

Sludge samples collected were placed into clean glass jars provided by HydroLogic, Inc., and capped with a Teflon™ lined lid. No liquid preservatives were administered to sludge samples.

Each laboratory sample container was clearly labeled with non-smearing ink, to include at a minimum: job title, sample location, date, and required analysis. The label was covered with transparent tape to prevent deterioration of the label or writing. Sludge sample containers were placed in sealable coolers and stored on ice for overnight delivery to HydroLogic, Inc.

4.5 Required Waste Analysis (Sludge)

Sludge samples were analyzed for the presence of hazardous characteristics in accordance with specifications set forth in NAVFAC Specifications No. 06-95-5218, Section 02082, subsection 3.16.4 Water, Waste Fuels, Sediment, and Sludge Analysis.
Analyses were performed for the following: flash point utilizing EPA Method 1020, TCLP benzene utilizing EPA Method 1311/8240, and TCLP for eight RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver).

4.6 Liquid Waste (Trap Water, Rinsate) Sample Collection

Trap water and rinsate samples were collected using disposable latex gloves. The gloves were discarded and replaced with new ones between each sample. The sample was collected using a glass coliwasa sampling tube.

Trap water and rinsate samples collected were placed into clean glass jars provided by HydroLogic, Inc., and capped with a Teflon™ lined lid. No liquid preservatives were administered to the samples.

Each laboratory sample container was clearly labeled with non-smearing ink, to include at a minimum: job title, sample location, date, and required analysis. The label was covered with transparent tape to prevent deterioration of the label or writing. Sludge sample containers were placed in sealable coolers and stored on ice for overnight delivery to HydroLogic, Inc.

4.7 Required Waste Analysis (Trap Water, Rinsate)

Trap water and rinsate samples were analyzed for the presence of contaminants and other characteristics in accordance with specifications set forth in NAVFAC Specifications No. 06-95-5218, Section 02082, subsection 3.16.7 Wash Water, Detergent Solution, and Sediment Removal, and subsection 3.18.2 Excavation Methods.

Analyses were performed for the following: BTEX, TPH, pH, surfactant (MBAS), and total lead, utilizing EPA methods 8020, 418.1, 150.1, 425.1, and 239.2, respectively.

4.8 Decontamination Procedures

Soil samples were taken by hand, using new disposable latex gloves for each sample. Sludge, trap water, and rinsate samples were taken using new disposable glass coliwasa tubes. For these reasons, decontamination procedures for sampling were not necessary during this UST removal.

4.9 Sample Custody

Laboratory samples were shipped overnight to HydroLogic, Inc. in Murfreesboro, TN via Federal Express. When necessary, samples were transported from the Murfreesboro office to the HydroLogic office located in Frankfort, KY to test certain analytical parameters (Flash Pt., TCLP Benzene). Proper chain of custody procedures were utilized while obtaining and transporting samples. The date and time of the transfer as well as required analysis were included on the chain of custody. A copy of the chain of custody may be found in Appendix B of this closure report.

5.0 LABORATORY ANALYSIS

5.1 Laboratory Analytical Results

Tables containing analytical results from soil samples collected at the Site may be found in Appendix A of this closure report.

6.0 WASTE DISPOSAL DATA

6.1 Disposal of Contaminated Soil

Per specifications set forth in NAVFAC Specifications No. 06-95-5218, Section 02082, subsection 3.18.1 Excavation Procedures, contaminated soil removed during excavation was disposed of by the Government.

6.2 Disposal of Residual Product

All residual product was removed by the Government prior to Sub-Tech UST removal activities.

6.3 Disposal of Sludge

Approximately 42 gallons of sludge were removed during UST cleaning. This sludge was delivered to Building N-1694 for disposal by the Government, per specifications set forth in NAVFAC Specifications No. 06-95-5218, Section 02082, subsection 3.16.6.2 Delivery of Sludge to the Government.

6.4 Disposal of UST

The cleaned UST was crushed and disposed of by the Government as construction debris.

6.5 Disposal of Trap Water and Rinsate

Approximately 350 gallons of trap water were removed from the excavation prior to backfilling, and approximately 42 gallons of rinsate were generated during power washing of the fiberglass UST. These wastes were placed into properly labeled 55 gallons drums and stored on Site pending laboratory analysis. At the date this report was completed, these wastes were still present on Site awaiting disposal.

August 1996

STATE OF TENNESSEE
DIVISION OF UNDERGROUND STORAGE TANKS

PERMANENT CLOSURE REPORT

The Responsible Party (RP) of the underground storage tank (UST) system shall complete and submit the **original** of this report within 45 days of collecting samples during the UST system closure assessment. Tennessee Code Annotated (T.C.A.) §68-215-103(16) defines Responsible Party as the owner and/or operator of a petroleum site or any person who at the time of the release which caused the contamination was an owner and/or operator of a petroleum underground storage tank.

Include the following appendices in the report. Attach extra sheets if necessary.

Appendix A: A table containing the field screening and analytical results. All results shall be reported in parts per million (ppm). The results shall be properly identified and correlated with the sampling locations on the site map. If water was encountered during closure-in-place, include the monitoring well information required in the Environmental Assessment Guidelines.

Appendix B: The original or carbon copy of the laboratory analysis sheets. Photocopies are not acceptable. All laboratory analysis sheets shall include the information specified in the *UST System Closure Assessment Guidelines*.

Appendix C: Documentation for treatment and/or disposal of soil, sludge, liquid, tanks and piping (i.e. Application to Treat Petroleum Contaminated Soil, Solid Waste Permits, Landfill Disposal Manifests, etc.).

Appendix D: **A copy of the Amended Notification form shall be submitted with this report. Send the original Amended Notification form to the UST Nashville Central Office.**

1. UST Facility ID 0 - 791713

2. Facility Name Naval Air Station - Memphis

3. Division personnel with the appropriate field office were notified at least one working day before collecting soil samples for the UST system closure assessment. Yes___ No___ If yes:
   Person contacted_____
   Field office_____
   Date_____
   Reported by_____

4. The tank atmosphere and work zone were regularly tested with a combustible gas indicator in accordance with UST regulations Appendix 6(2) and (3). Yes X No___

Facility ID Number 0-791713

5. Method of purging tank atmosphere:
Carbon dioxide gas___ Nitrogen___ Eductor-type air movers___
Diffused air blower___ Dry ice (1.5 lb/100 gal.) ___
Other N/A - Tank atmosphere was tested with an MSA Passport, and found to be below the LEL.

6. Product piping was drained into the tank. Yes___ No x

7. Product piping was: Capped___ Removed x

8. All liquid/sludge was removed from the UST system. Yes x No___
Not encountered___

9. Method of liquid/sludge storage: 55 gal. drum

10. Method of liquid/sludge disposal: Sludge was taken to Building N1694 by the Dept. of the Navy. Liquid to be delivered to Excel TSD, Inc.

Manifests included in Appendix C. Yes___ No___
Not applicable x

11. Tank was labeled in accordance with the UST Regulations Appendix 6(4)(f).
Yes x No___ Not applicable___

12. Method of UST system storage/disposal:
Cut up for disposal___ Stored on site___ Stored off site___
Other Crushed and Disposed of as construction debris

UST systems stored on site or off site are subject to Rules 1200-1-15-.07(2)(e), (f) and (g) and Appendix 7.

13. Location of UST system storage/disposal N/A

Certificate of disposal included in Appendix C. Yes___ No x
If no, explain Disposed of as construction debris

14. Amount of material excavated during UST system closure: 95 cubic yards.

Facility ID Number 0-791713

15. Total amount of contaminated material overexcavated after removal of the UST system:
0 cubic yards.
If more than 100 cubic yards of material was overexcavated, Division personnel in the appropriate field office should have been contacted.
Division personnel in the appropriate field office were contacted. Yes___ No___
Not applicable x
If yes:
Person contacted_____
Field Office_____
Date_____
Reported by_____

All excavated material remaining on the site of generation or on a site owned by the responsible party or subsidiary of the responsible party shall be placed on and covered with plastic and bermed. Sampling the excavated material in accordance with Technical Guidance Document - 005, must be completed prior to proper disposal.

If petroleum contaminated material is managed in accordance with Technical Guidance Document-009, the appropriate *Application to Treat Petroleum Contaminated Soil* shall be completed and submitted to the local field office for approval. If the contaminated material is to be treated on a site owned by a Third Party, contact the Tennessee Division of Solid Waste Management.

All excavations shall be backfilled with material containing levels at or below 5 ppm benzene and/or 100 ppm TPH.

16. Mark all that apply regarding the management of the excavated material:
Stockpiled on site___ Thermal treatment on site___ Thermal treatment off site___
Landfilled X Other_____

Documentation is included in Appendix C. Yes___ No x If no, explain why_____
_____

17. Explain why the method in #16 was chosen for management of the excavated material___
_____

18. All samples were placed directly into the appropriate containers, immediately after collection. Yes X No___

19. Immediately after collection all samples were placed on ice and maintained at 4°C until delivered to a Division approved laboratory. Yes X No___

Facility ID Number 0-791713

20. Laboratory confirmation of petroleum contamination or discovery of free product was reported to the Division within 72 hours. Yes___ No___ Not applicable X
If yes:
Person contacted_____
Field office_____
Date_____
Reported by_____

21. Water was encountered in the soil borings during closure-in-place.
Yes___ No___ Not applicable X
If encountered, was water sampled. Yes___ No___
Monitoring well information is in Appendix A. Yes___ No___
Analytical results are in Appendix B. Yes___ No___

22. Water was encountered during excavation of the UST system. Yes X No___
Amount of water removed: 400 gals.
Water recharged within 24 hours. Yes___ No X
Recharge water was sampled. Yes___ No X
Analytical results are in Appendix B. Yes___ No X
Method of water disposal:_____
Manifests included in Appendix C. Yes___ No X

23. If more than 500 gallons of water were removed, Division personnel in the appropriate field office should have been contacted.
Division personnel in the appropriate field office were contacted. Yes___ No___
Not applicable X
If yes:
Person contacted_____
Field Office_____
Date_____
Reported by_____

24. Bedrock was encountered during UST system removal/closure-in-place.
Yes___ No X
All contaminated material above the applicable cleanup level was excavated.
Yes___ No X Not applicable___
Soil was sampled from floor of excavation. Yes X No___
Analytical results are in Appendix B. Yes X No___

25. The original Notification Form reporting the closure of the tank system was submitted to the Nashville Central Office. Yes X No___

Facility ID Number 0-791713

26. **Failure to submit a Notification Form may result in the assessment of additional tank fees.**

THIS PERMANENT CLOSURE REPORT WILL NOT BE PROCESSED WITHOUT THE COMPLETION AND SUBMITTAL OF THE APPROPRIATE APPENDICES IN THEIR ENTIRETY.

27. An updated site map shall be provided in this space showing buildings, utilities, areas of overexcavation, borings, and sample points. The map shall also include soil stockpiles, their dimensions in feet, and properly labeled screening and sampling points. A measurement shall be included from one corner of the tank excavation to a permanent structure (i.e. building, power pole, fire hydrant, etc.). The site map shall include a north arrow.

See Attached Map.

APPENDIX A - TABLE I FIELD SCREENING* RESULTS OF MATERIAL EXCAVATED FROM UST S-9			
Screening Number	Method Used	Reading (ppm)	Notes
01	PID	3581	Pea gravel backfill - top 1' of excavation
02	PID	4411	Pea gravel backfill - top 2' of excavation
03	PID	3160	Pea gravel backfill - top 2' of excavation
04	PID	416	Pea gravel backfill - top 3' of excavation
05	PID	11.7	Pea gravel backfill - top 3' of excavation
06	PID	18.7	Gray clay backfill - top 5' of excavation
07	PID	47.8	Pea gravel backfill - top 5' of excavation
08	PID	72.9	Pea gravel backfill - top 6' of excavation
09	PID	90.2	Pea gravel backfill - top 6' of excavation
10	PID	43.2	Pea gravel backfill - top 7' of excavation
11	PID	19.4	Brownish clay from bottom side of excavation
12	PID	23.8	Brownish clay from bottom side of excavation
13	PID	50	Pea gravel backfill
14	PID	16.7	Pea gravel backfill
15	PID	79.6	Pea gravel backfill
16	PID	21.1	Trenching overburden
17	PID	39.4	Pea gravel backfill
18	PID	116.0	Pea gravel backfill
19	PID	82.2	Pea gravel backfill

* It should be noted that only field screening conducted with instrumentation are represented in this chart. A large number of field screenings using visual and olfactory determinations are also typically utilized by Sub-Tech personnel during tank removal activities.

APPENEDIX A - TABLE II LABORATORY ANALYTICAL RESULTS FROM MATERIAL EXCAVATED DURING REMOVAL OF UST S-9			
Sample ID	**Analyte**	**Results**	**Detection Limit**
Stockpile Cont.	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	2,080 mg/kg	10 mg/kg
	TCLP Lead	<0.1 mg/L	0.1 mg/L
	TCLP TPH 418.1	<1.0 mg/L	1.0 mg/L
	TCLP Benzene	BDL[a]	0.001 mg/L
Stockpile Clean	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	1,000 mg/kg	10 mg/kg
	TCLP Lead	<0.1 mg/L	0.1 mg/L
	TCLP TPH 418.1	<1.0 mg/L	1.0 mg/L
	TCLP Benzene	BDL	0.001 mg/L

[a] BDL - Below Detection Limit

APPENDIX A - TABLE III LABORATORY ANALYTICAL RESULTS FROM SLUDGE COLLECTED DURING CLEANING OF UST S-9			
Sample ID	**Analyte**	**Results**	**Detection Limit**
S-9 UST (sludge)	TCLP RCRA metals		
	• arsenic	0.007 mg/L	0.001 mg/L
	• barium	0.5 mg/L	0.01 mg/L
	• cadmium	0.088mg/L	0.005 mg/L
	• chromium	0.29 mg/L	0.05 mg/L
	• lead	<0.1mg/L	0.1 mg/L
	• mercury	<0.0020 mg/L	0.0020 mg/L
	• selenium	<0.002 mg/L	0.002 mg/L
	• silver	<0.010mg/L	0.010 mg/L
	TCLP Benzene	0.0376 mg/L	0.001 mg/L
	Flash Point	>200 °F	N/A

APPENDIX A - TABLE IV LABORATORY ANALYTICAL RESULTS FOR TRAP WATER AND TANK RINSATE AT UST S-9			
Sample ID	**Analyte**	**Results**	**Detection Limit**
S-9 Trap Water	Benzene (S)	<0.001	0.001 mg/L
	Toluene (S)	<0.001 mg/L	0.001 mg/L
	Ethylbenzene (S)	<0.001 mg/L	0.001 mg/L
	Xylene (S)	0.010 mg/L	0.005 mg/L
	TPH 418.1	3,414 mg/L	10.0 mg/L
	pH	6.0	N/A
	Surfactant (MBAS)	4.8 mg/L	0.25 mg/L
	Total Lead	mg/L	mg/L
S-9 Rinsate	Benzene (S)	BDL	0.001 mg/L
	Toluene (S)	8.30 mg/L	0.200 mg/L
	Ethylbenzene (S)	15.0 mg/L	0.200 mg/L
	Xylene (S)	10.4 mg/L	0.200 mg/L
	TPH 418.1	7,578 mg/L	25.0 mg/L
	pH	7.4	N/A
	Surfactant (MBAS)	5.0 mg/L	0.25 mg/L
	Total Lead	2.25 mg/L	0.001 mg/L

APPENDIX A - TABLE V LABORATORY ANALYTICAL RESULTS FROM EXCAVATED PIT AND PIPE TRENCHING AT UST S-9			
Sample ID	**Analyte**	**Results**	**Detection Limit**
S-9 Bottom East	TCLP RCRA metals		
	• arsenic	0.003 mg/L	0.001 mg/L
	• barium	0.9 mg/L	0.1 mg/L
	• cadmium	0.006 mg/L	0.005 mg/L
	• chromium	<0.05 mg/L	0.05 mg/L
	• lead	<0.1 mg/L	0.1 mg/L
	• mercury	<0.0002 mg/L	0.0002 mg/L
	• selenium	<0.002 mg/L	0.002 mg/L
	• silver	<0.010 mg/L	0.010 mg/L
	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	2,380 mg/kg	10 mg/kg
S-9 Bottom West	TCLP RCRA metals		
	• arsenic	<0.001 mg/L	0.001 mg/L
	• barium	0.3 mg/L	0.1 mg/L
	• cadmium	<0.005 mg/L	0.005 mg/L
	• chromium	<0.05 mg/L	0.05 mg/L
	• lead	<0.1 mg/L	0.1 mg/L
	• mercury	<0.0002 mg/L	0.0002 mg/L
	• selenium	<0.002 mg/L	0.002 mg/L
	• silver	0.012 mg/L	0.010 mg/L
	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	6,820 mg/kg	10 mg/kg
Piping Run A	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	5,140 mg/kg	10.0 mg/kg

APPENDIX A - TABLE V (CONTINUED) LABORATORY ANALYTICAL RESULTS FROM EXCAVATED PIT AND PIPE TRENCHING AT UST S-9			
Piping Run B	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	1,010 mg/kg	10.0 mg/kg
Piping Run C	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	3,390 mg/kg	10.0 mg/kg
Piping Run 0	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	2,240 mg/kg	10.0 mg/kg
Piping Run 1	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	3,620 mg/kg	10.0 mg/kg
Piping Run 2	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	860 mg/kg	10.0 mg/kg
Piping Run 3	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	560 mg/kg	10.0 mg/kg
Piping Run 4	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	1,320 mg/kg	10.0 mg/kg

APPENDIX A - TABLE V (CONTINUED) LABORATORY ANALYTICAL RESULTS FROM EXCAVATED PIT AND PIPE TRENCHING AT UST S-9			
Sample ID	**Analyte**	**Results**	**Detection Limit**
Piping Run 5	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	1,620 mg/kg	10.0 mg/kg
Piping Run 6	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	3.3 mg/kg	1.0 mg/kg
	TPH 418.1	92 mg/kg	10.0 mg/kg
Piping Run 7	Benzene (S)	<1.0 mg/kg	1.0 mg/kg
	Toluene (S)	<1.0 mg/kg	1.0 mg/kg
	Ethylbenzene (S)	<1.0 mg/kg	1.0 mg/kg
	Xylene (S)	<1.0 mg/kg	1.0 mg/kg
	TPH 418.1	3,000 mg/kg	10.0 mg/kg

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16825 SAMPLE ID- Stockpile Cont SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	2,080	mg/kg	10
Benzene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Toluene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
Ethylbenzene (S)	8020	07/03/96	MMS	< 1.0	mg/kg	1.
Xylene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Teresa W McClanahan

FINAL REPORT OF ANALYSES

-Tech, Inc
5 Burch Park Dr.
nsville, IN

REPORT DATE: 07/17/96

PLE NUMBER- 16825 SAMPLE ID- Stockpile Cont SAMPLE MATRIX- SO
E SAMPLED- 06/28/96
E RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
E RECEIVED- 1030 DELIVERED BY- Fed X

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LYSIS	METHOD	SAMPLE PREP DATE	BY	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
RARED TPH SOLID	418.1			07/02/96	KDS	2,080	mg/kg	10
zene, Solid	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
u , Solid	8020			07/03/96	MMS	< 1.0	mg/kg	1.0
y nzene (S)	8020			07/03/96	MMS	< 1.0	mg/kg	1.
e Solid	8020			07/03/96	MMS	< 1.0	mg/kg	1.0
P Lead	1311/7420	07/09/96	AKW	07/10/96	AKW	< 0.1	mg/L	0.1
P 418.1	1311/418.1			07/10/96	KDS	< 1.	mg/L	1.0

LABORATORY DIRECTOR Margaret Bulaw

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16824 SAMPLE ID- Stockpile Clena SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	1,000	mg/kg	10
Benzene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Toluene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Ethylbenzene (S)	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Xylene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Gerald W. McClanahan

FINAL REPORT OF ANALYSES

ıb-Tech, Inc
)25 Burch Park Dr.
/ansville, IN

REPORT DATE: 07/17/96

ıMPLE NUMBER- 16824 SAMPLE ID- Stockpile Clena SAMPLE MATRIX- SO
ıTE SAMPLED- 06/28/96
ıTE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
IME RECEIVED- 1030 DELIVERED BY- Fed X

ıge 1 of 1

ıALYSIS	METHOD	SAMPLE PREP DATE	BY	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
ıFRARED TPH SOLID	418.1			07/02/96	KDS	1,000	mg/kg	10
·nzene, Solid	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
ı ıe, Solid	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
t. ›enzene (S)	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
/l , Solid	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
CLP Lead	1311/7420	07/09/96	AKW	07/10/96	AKW	< 0.1	mg/L	0.1
CLP 418.1	1311/418.1			07/10/96	KDS	< 1.	mg/L	1.0

LABORATORY DIRECTOR Margaret Barlow

HYDROLOGIC, INC.

July 16, 1996

REPORTING:

HydroLogic, Inc.
410 New Salem Highway
Suite 106
Murfreesboro, TN 37129

Attention: Teresa McClanahan

INVOICING:

HydroLogic, Inc.
410 New Salem Highway
Suite 106
Murfreesboro, TN 37129

PROJECT NUMBER: FL9611258

DATE COMPLETED: July 16, 1996
DATE RECEIVED: July 9, 1996

PROJECT DESCRIPTION:

Sub. Tech. Inc./5247A— 2 soil samples analyzed for TCLP Benzene.

Enclosed is the laboratory report for the project described above. If you have any questions or if we can be of further assistance, please feel free to contact Jamie Fore at 1-800-728-2251. We appreciate your business and look forward to serving you again soon.

Respectfully,

Walter Hogg

Walter Hogg
QA/QC Officer

900273

1491 TWILIGHT TRAIL FRANKFORT, KY 40601
502-223-0251 FAX: 502-875-8016 / TOLL FREE 800-728-2251

HYDROLOGIC, INC.

COMPANY NAME: HydroLogic, Inc.
COMPANY PROJECT NUMBER: Sub. Tech. Inc./5247A

HYDROLOGIC PROJECT NUMBER: FL9611258
HYDROLOGIC SAMPLE NUMBER: 9611258
HYDROLOGIC LAB I.D.#: N/A
SAMPLE IDENTIFICATION: stockpile clean
DATE SAMPLED: 6/28/96

ANALYSIS	DATE/TIME EXTRACTED	DATE/TIME ANALYZED	METHOD	UNITS	SDL	RESULT
TCLP Benzene	7/14/96	7/15/96	1311/8240	mg/l	0.001	BDL

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

1491 TWILIGHT TRAIL FRANKFORT, KY 40601
502-223-0251 FAX: 502-875-8016 / TOLL FREE 800-728-2251

HYDROLOGIC, INC.

COMPANY NAME: HydroLogic, Inc.
COMPANY PROJECT NUMBER: Sub. Tech. Inc./5247A

HYDROLOGIC PROJECT NUMBER: FL9611258
HYDROLOGIC SAMPLE NUMBER: 9611259
HYDROLOGIC LAB I.D.#: N/A
SAMPLE IDENTIFICATION: stockpile cont
DATE SAMPLED: 6/28/96

ANALYSIS	DATE/TIME EXTRACTED	DATE/TIME ANALYZED	METHOD	UNITS	SDL	RESULT
TCLP Benzene	7/14/96	7/15/96	1311/8240	mg/l	0.001	BDL

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

000281

1491 TWILIGHT TRAIL FRANKFORT, KY 40601
502-223-0251 FAX: 502-875-8016 / TOLL FREE 800-728-2251

FINAL REPORT OF ANALYSES

b-Tech, Inc
25 Burch Park Dr.
ansville, IN

REPORT DATE: 07/11/96

MPLE NUMBER- 17009 SAMPLE ID- S-9 SLUDGE
TE SAMPLED- 07/01/96
TE RECEIVED- 07/02/96 SAMPLER- CLIENT
ME RECEIVED- DELIVERED BY- FedEx

SAMPLE MATRIX- SO
TIME SAMPLED- 1200
RECEIVED BY- KAB

ge 1 of 1

ALYSIS	METHOD	SAMPLE PREP DATE	BY	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
LP Arsenic	1311/7061	07/09/96	AKW	07/10/96	ATR	0.007	mg/L	0.001
LP Barium	1311/7080	07/09/96	AKW	07/11/96	ATR	0.5	mg/L	0.1
P Cadmium	1311/7130	07/09/96	AKW	07/11/96	AKW	0.088	mg/L	0.005
l hromium	1311/7190	07/09/96	AKW	07/10/96	AKW	0.29	mg/L	0.05
L ead	1311/7420	07/09/96	AKW	07/10/96	AKW	< 0.1	mg/L	0.1
LP Mercury	1311/7470	07/09/96	AKW	07/08/96	AKW	< 0.0020	mg/L	0.0020
LP Selenium	1311/7740	07/09/96	AKW	07/10/96	ATR	< 0.002	mg/L	0.002
LP Silver	1311/7760	07/09/96	AKW	07/10/96	AKW	< 0.010	mg/L	0.010

LABORATORY DIRECTOR Margaret Barlow

HYDROLOGIC, INC.

July 9, 1996

REPORTING:

HydroLogic, Inc.
410 New Salem Highway
Suite 106
Murfreesboro, TN 37129

Attention: Teresa McClanahan

INVOICING:

HydroLogic, Inc.
410 New Salem Highway
Suite 106
Murfreesboro, TN 37129

PROJECT NUMBER: FL9611070

DATE COMPLETED: July 9, 1996
DATE RECEIVED: July 3, 1996

PROJECT DESCRIPTION:

Sub-Tech, Inc./5247A—1 soil sample analyzed for TCLP(Benzene/Metals)/Flashpoint.

Enclosed is the laboratory report for the project described above. If you have any questions or if we can be of further assistance, please feel free to contact Jamie Fore at 1-800-728-2251. We appreciate your business and look forward to serving you again soon.

Respectfully,

Walter Hogg
QA/QC Officer

000283

1491 TWILIGHT TRAIL FRANKFORT, KY 40601
502-223-0251 FAX: 502-875-8016 / TOLL FREE 800-728-2251

HYDROLOGIC, INC.

COMPANY NAME: HydroLogic, Inc.
COMPANY PROJECT NUMBER: Sub-Tech, Inc./5247A

HYDROLOGIC PROJECT NUMBER: FL9611070
HYDROLOGIC SAMPLE NUMBER: 9611070
HYDROLOGIC LAB I.D.#: N/A
SAMPLE IDENTIFICATION: S-9 SLUDGE
DATE SAMPLED: 7/1/96

ANALYSIS	DATE/TIME ANALYZED	METHOD	UNITS	SDL	RESULT
Benzene	7/08/96	Tclp Benzene	mg/L	0.001	0.0376
Flashpoint	7/05/96	1020	Deg F		>200

BDL = Below Sample Detection Limit
SDL = Sample Detection Limit

COMMENTS: _____

1491 TWILIGHT TRAIL FRANKFORT, KY 40601
502-223-0251 FAX: 502-875-8016 / TOLL FREE 800-728-2251

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16819 SAMPLE ID- S-9 Trap Water SAMPLE MATRIX- WA
DATE SAMPLED- 06/28/96 TIME SAMPLED- 830
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
PH, LAB	EPA 150.1	07/03/96	KAB	6.0	std units	
MBAS	EPA 425.1	07/03/96	JTA	4.8	mg/l	0.25
INFRARED TPH LIQUID	418.1	07/03/96	KDS	3,414	mg/L	10
Method 8020 (L)	8020	07/02/96	MMS			
Benzene	8020			< 0.001	mg/L	0.001
Toluene	8020			< 0.001	mg/L	0.001
Ethylbenzene	8020			< 0.001	mg/L	0.001
Xylene	8020			0.010	mg/L	0.005

LABORATORY DIRECTOR Teresa W McClanahan

FINAL REPORT OF ANALYSES

-Tech, Inc
5 Burch Park Dr.
nsville, IN

REPORT DATE: 07/11/96

PLE NUMBER- 16875 SAMPLE ID- S-9 Rinsate
E SAMPLED- 07/01/96
E RECEIVED- 07/02/96 SAMPLER- Client
E RECEIVED- 900 DELIVERED BY- Fed X

SAMPLE MATRIX- WA
TIME SAMPLED- 1200
RECEIVED BY- KAB

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LYSIS	METHOD	SAMPLE PREP DATE	BY	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
LAB	EPA 150.1			07/03/96	KAB	7.4	std units	
S	EPA 425.1			07/03/96	JTA	5.0	mg/l	0.25
RA TPH LIQUID	418.1			07/03/96	KDS	7,578	mg/L	25
D TAL	239.2	07/05/96	ATR	07/11/96	ATR	2.25	mg/l	0.001
nod 8020 (L)	8020			07/09/96	MMS			
zene	8020					BDL	mg/L	0.001
uene	8020					8.30	mg/L	0.200
ylbenzene	8020					15.0	mg/L	0.200
ene	8020					10.4	mg/L	0.200

LABORATORY DIRECTOR Margaret Barlow

410 New Salem Hwy. • Suite 106 • Murfreesboro, TN 37129 • (615) 848-6810 • FAX (615) 848-6805

FINAL REPORT OF ANALYSES

)-Tech, Inc
25 Burch Park Dr.
ansville, IN

REPORT DATE: 07/04/96

MPLE NUMBER- 16821 SAMPLE ID- S-9 Bottom East SAMPLE MATRIX- SO
TE SAMPLED- 06/28/96 TIME SAMPLED- 940
TE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
ME RECEIVED- 1030 DELIVERED BY- Fed X

ge 1 of 1

ALYSIS	METHOD	SAMPLE PREP DATE	BY	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
FRARED TPH SOLID	418.1			07/02/96	KDS	2,380	mg/kg	10
nzene, Solid	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
uene, Solid	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
ylbenzene (S)	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
le Solid	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
LP Arsenic	1311/7061	07/01/96	ATR	07/02/96	ATR	0.003	mg/L	0.001
LP Barium	1311/7080	07/01/96	ATR	07/03/96	ATR	0.9	mg/L	0.1
LP Cadmium	1311/7130	07/01/96	ATR	07/03/96	ATR	0.006	mg/L	0.005
LP Chromium	1311/7190	07/01/96	ATR	07/03/96	ATR	< 0.05	mg/L	0.05
LP Lead	1311/7420	07/01/96	ATR	07/03/96	ATR	< 0.1	mg/L	0.1
LP Mercury	1311/7470	07/01/96	ATR	07/03/96	ATR	< 0.0002	mg/L	0.0002
LP Selenium	1311/7740	07/01/96	ATR	07/03/96	ATR	< 0.002	mg/L	0.002
LP Silver	1311/7760	07/01/96	ATR	07/03/96	ATR	< 0.010	mg/L	0.010

LABORATORY DIRECTOR Teresa W McClanahan

FINAL REPORT OF ANALYSES

-Tech, Inc
5 Burch Park Dr.
nsville, IN

REPORT DATE: 07/04/96

PLE NUMBER- 16820 SAMPLE ID- S-9 Bottom West
E SAMPLED- 06/28/96
E RECEIVED- 06/29/96 SAMPLER- D. Brown
E RECEIVED- 1030 DELIVERED BY- Fed X

SAMPLE MATRIX- SO
TIME SAMPLED- 945
RECEIVED BY- KDS

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LYSIS	METHOD	SAMPLE PREP DATE	BY	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
RARED TPH SOLID	418.1			07/02/96	KDS	6,820	mg/kg	10
zene, Solid	8020			07/02/96	MMS	< 1.0	mg/kg	1.0
ene, Solid	8020			07/03/96	MMS	< 1.0	mg/kg	1.0
nzene (S)	8020			07/03/96	MMS	< 1.0	mg/kg	1.0
Solid	8020			07/03/96	MMS	5.6	mg/kg	1.0
P Arsenic	1311/7061	07/01/96	ATR	07/02/96	ATR	< 0.001	mg/L	0.001
P Barium	1311/7080	07/01/96	ATR	07/03/96	ATR	0.3	mg/L	0.1
P Cadmium	1311/7130	07/01/96	ATR	07/03/96	ATR	< 0.005	mg/L	0.005
P Chromium	1311/7190	07/01/96	ATR	07/03/96	ATR	< 0.05	mg/L	0.05
P Lead	1311/7420	07/01/96	ATR	07/03/96	ATR	< 0.1	mg/L	0.1
P Mercury	1311/7470	07/01/96	ATR	07/03/96	ATR	< 0.0002	mg/L	0.0002
P Selenium	1311/7740	07/01/96	ATR	07/03/96	ATR	< 0.002	mg/L	0.002
P Silver	1311/7760	07/01/96	ATR	07/03/96	ATR	0.012	mg/L	0.010

LABORATORY DIRECTOR Margaret Barlow

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16823 SAMPLE ID- Piping Run A SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	5,140	mg/kg	10
Benzene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Toluene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Ethylbenzene (S)	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Xylene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Teresa W. McClanahan

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16862 SAMPLE ID- Piping Run B SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	1,010	mg/kg	10
Benzene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
T ne, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
E benzene (S)	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
ne, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Teresa W McClanahan

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16863 SAMPLE ID- Piping Run C SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	3,390	mg/kg	10
Benzene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
Toluene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
[illegible]ylbenzene (S)	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
[illegible]ene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Teresa W McClanahan

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16822 SAMPLE ID- Piping Run 0 SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	2,240	mg/kg	10
Benzene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
[illegible]uene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
[illegible]vlbenzene (S)	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
[illegible]ene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Teresa W McClanahan

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16855 SAMPLE ID- Piping Run 1 SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	3,620	mg/kg	10
Benzene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Toluene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
[illegible]ylbenzene (S)	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
[illegible]ene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Teresa (W) McClanahan

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16856 SAMPLE ID- Piping Run 2 SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	860	mg/kg	10
Benzene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
T[illegible]uene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
[illegible]lbenzene (S)	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
[illegible]ene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Theresa W McClanahan

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16857 SAMPLE ID- Piping Run 3 SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	560	mg/kg	10
Benzene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Toluene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
Ethylbenzene (S)	8020	07/02/96	MMS	< 1.0	mg/kg	1.0
[illegible]ene, Solid	8020	07/02/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Margaret Barlow

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16858 SAMPLE ID- Piping Run 4 SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	1,320	mg/kg	10
Benzene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
Toluene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
lbenzene (S)	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
ne, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Teresa W McClanahan

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16859 SAMPLE ID- Piping Run 5 SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	1,620	mg/kg	10
Benzene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
Toluene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
Ethylbenzene (S)	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
[illegible]ene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Teresa W McClanahan

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16860 SAMPLE ID- Piping Run 6 SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	92	mg/kg	10
Benzene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
T ene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
lbenzene (S)	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
ene, Solid	8020	07/03/96	MMS	3.3	mg/kg	1.0

LABORATORY DIRECTOR Teresa W McClanahan

FINAL REPORT OF ANALYSES

Sub-Tech, Inc
7925 Burch Park Dr.
Evansville, IN

REPORT DATE: 07/04/96

SAMPLE NUMBER- 16861 SAMPLE ID- Piping Run 7 SAMPLE MATRIX- SO
DATE SAMPLED- 06/28/96
DATE RECEIVED- 06/29/96 SAMPLER- D. Brown RECEIVED BY- KDS
TIME RECEIVED- 1030 DELIVERED BY- Fed X

Page 1 of 1

ANALYSIS	METHOD	ANALYSIS DATE	BY	RESULT	UNITS	DET. LIMIT
IRFRARED TPH SOLID	418.1	07/02/96	KDS	3,000	mg/kg	10
Benzene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
Toluene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
Ethylbenzene (S)	8020	07/03/96	MMS	< 1.0	mg/kg	1.0
Xylene, Solid	8020	07/03/96	MMS	< 1.0	mg/kg	1.0

LABORATORY DIRECTOR Teresa W McClanahan

000279

Chain of Custody Record

☐ 122 L, Asheville, NC 28801 (704)254-5169 FAX (704) 252-9711	☒ 410 New Salem Highway #106 Murfreesboro, TN 37129 (615) 848-6810 FAX (615) 848-6805	☐ 1491 Twilight Trail Frankfort, KY 40601 (502) 223-0251 FAX (502) 875-8016	☐ 2003 North Pine St Lumberton, NC 28358 (910) 738-6190 FAX (910) 671-8837	☐ 263 Branchview Drive SE Concord, NC 28025 (704) 786-3322 FAX (704) 786-2999	☐ 2500 Gateway Centre Morrisville, NC 27560 (919) 380-9699 FAX (919) 380-9717	☐ 4875 Riverside Drive Macon, GA 31210 (912) 757-0811 FAX (912) 757-0149

☐ 2082 Trade Ctr Way Naples, FL 33942 (813) 597-6059 FAX (813) 597-7056

Client: Sub. Tech. Inc.	Project No.: 5247 A
Report Address: 7925 Birch Pk.	Invoice Address: Same
Evansville, IN 47711	
Attn: Robert Fisher	Attn: Same
Phone No.: 812/867-0100	Sampled By: D. Brown
Fax No.: 812/867-4478	P.O. No: 5247 A

TURNAROUND TIME

☐ 24 Hours ☒ 48 Hours Date Needed: _____

☐ 5 Days ☐ 10 Days ☐ Other _____

REQUESTED PARAMETERS

LAB CODE I.D.
A = Asheville, NC
C = Concord, NC
D = Denver, CO
G = Macon, GA
K = Frankfort, KY
L = Lumberton, NC
M = Morrisville, NC
N = Naples, FL
S = Subcontracted
T = Murfreesboro,

Sample ID	Date	Time	Comp/ Grab	Matrix	Preserv.	Containers	BTEX 8020	TPH 418.1	PH	Surfactant (MBAS)	Lead	TCLP RCRA Metals (*)					REMARKS
S-9 Trap Water	6/28	830	Grab	H2O	None	2	X	X	X	X	X						16819
S-9 Bottom West	"	945	"	Soil	"	1	X	X				X					16820
S-9 Bottom East	"	940	"	"	"	1	X	X				X					16821
S-9 Piping Run 0-7	"	See Jars	"	"	"	8	X	X									16822
S-9 Piping Run A-C	"	"	"	"	"	3	X	X									16823
S-9 Stockpile Clean	"	"	"	"	"	1	X	X									16824
S-9 Stockpile Cont.	"	"	"	"	"	2	X	X									16825
Piping Run 1-7																	16355 - 16861
Piping Run B-C																	16862 - 16863

Lab Use Only Custody Seal: ☐ Yes ☐ No ☐ N/A Init Lab Temp. Rec. Lab T

COMMENTS: * Arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

Relinquished By:	Date	Time	Received By:	Date	Time	State Samples Collected:
			K. Smith	6/29	10:32	
Relinquished By:	Date	Time	Received By:	Date	Time	Lab Use Only
Relinquished By:	Date	Time	Received By:	Date	Time	
Relinquished By:	Date	Time	Received By:	Date	Time	

☐ 122 n Street, Asheville, NC 28801, (704)254-5169, FAX (704) 252-9711
☒ 410 New Salem Highway #106, Murfreesboro, TN 37129, (615) 848-6810, FAX (615) 848-6805
☐ 1491 Twilight Trail, Frankfort, KY 40601, (502) 223-0251, FAX (502) 875-8016
☐ 2003 North Pine, Lumberton, NC 28358, (910) 738-6190, FAX (910) 671-8837
☐ 263 Branchview Drive SE, Concord, NC 28025, (704) 786-3322, FAX (704) 786-2999
☐ 2500 Gateway Centre, Morrisville, NC 27560, (919) 380-9699, FAX (919) 380-9717
☐ 4875 Riverside Drive, Macon, GA 31210, (912) 757-0811, FAX (912) 757-0149
☐ 2082 Trade Ctr Way, Naples, FL 33942, (813) 597-6059, FAX (813) 597-7056

Client: Sub-Tech, Inc.
Project No.: 5247A
Report Address: 7925 Burch PK. Evansville, IN 47711
Invoice Address: Same
Attn: Robert Fisher
Attn: Same
Phone No.: 812/867-0100
Sampled By:
Fax No.: 812/867-4478
P.O. No: 5247 A

TURNAROUND TIME
☐ 24 Hours ☒ ~~48 Hours~~ Date Needed: due 7/9
☐ 5 Days ☐ 10 Days ☐ Other

REQUESTED PARAMETERS

LAB CODE LI
A = Asheville, NC
C = Concord, NC
D = Denver, CO
G = Macon, GA
K = Frankfort, KY
L = Lumberton, NC
M = Morrisville, NC
N = Naples, FL
S = Subcontracted
T = Murfreesboro, T

Sample ID	Date	Time	Comp/Grab	Matrix	Preserv.	Containers	BTEX 8020	TPH 418.1	PH	Surfactant (MBAS)	Lead	Flash Pt.	TCLP Benzene	TCLP RCRA Metals ⊛			REMARKS
S-9 Sludge	7-1-96	12:00PM	"	Sludge	N/A	2						X	X	X			
S-9 Rinsate	7-1-96	12:00PM	"	H_2O	"	"	X	X	X	X	X						16875
												K	K	T			

Lab Use Only — Custody Seal: ☐ Yes ☐ No ☐ N/A — Init Lab Temp. — Rec. Lab Temp

COMMENTS: ⊛ Arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

Relinquished By:	Date	Time	Received By:	Date	Time	State Samples Collected:
[signature]	7-1-96	6:00PM	Fed Ex			
Relinquished By:	Date	Time	Received By: Kim Beardex	7/2/96	9:00	Lab Use Only
Relinquished By:	Date	Time	Received By:	Date	Time	
Relinquished By:	Date	Time	Received By:	Date	Time	

☐ 122 [illegible] Asheville, NC [illegible] (704)254-5169 FAX (704) 252-97[illegible]
☒ 410 New Salem Highway #106 Murfreesboro, TN 37129 (615) [illegible] FAX (615) [illegible]
☐ 1491 Twilight Trail Frankfort, KY 40601 [illegible] FAX (502) [illegible]
☐ 2003 North Pine Lumberton, NC 28358 (910) 738-6190 FAX (910) 671-8837
☐ 263 Branchview Drive SE Concord, NC 28025 (704) 786-3322 FAX (704) 786-2999
☐ 2500 Gateway Centre Morrisville, NC 27560 (919) 380-9699 FAX (919) 380-9717
☐ 4875 Riverside Drive Macon, GA 31210 (912) 757-0811 FAX (912) 757-0149
2082 Trade Ctr Way Naples, FL 33942 (813) 597-6059 FAX (813) 597-7056

F19611070

Client: Sub-Tech, Inc.	Project No.: 5247A
Report Address: 7925 Burch Pk. Evansville, IN 47711	Invoice Address: Same
Attn: Robert Fisher	Attn: Same
Phone No.: 812/867-0100	Sampled By:
Fax No.: 812/867-4478	P.O. No: 5247 A

TURNAROUND TIME

☐ 24 Hours ☒ 48 Hours Date Needed: due 7/9
☐ 5 Days ☐ 10 Days ☐ Other

REQUESTED PARAMETERS

LAB CODE LI
A = Asheville, NC
C = Concord, NC
D = Denver, CO
G = Macon, GA
K = Frankfort, KY
L = Lumberton, NC
M = Morrisville, NC
N = Naples, FL
S = Subcontracted
T = Murfreesboro,

Sample ID	Date	Time	Comp/Grab	Matrix	Preserv.	Containers	BTEX 8020	TPH 418.1	pH	Surfactant (MBAS)	Lead	Flash Pt.	TCLP Benzene	TCLP RCRA Metals ⊛			REMARKS
S-9 Sludge	7-1-96	12:00PM	"	Sludge	N/A	2						X	X	X			1 broken, only 1 forwarde
S-9 Rinsate	7-1-96	12:00PM	"	H_2O	"	"	X	X	X	X	X						
												K	K	T			

Lab Use Only Custody Seal: ☐ Yes ☐ No ☐ N/A Init Lab Temp. Rec. Lab Tem

COMMENTS: ⊛ Arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver

Relinquished By:	Date	Time	Received By:	Date	Time	State Samples Collected:
[signature]	7-1-96	6:00PM	Fed Ex			
			Kim Bearden	7/2/96		Lab Use Only
Kim Bearden	7/2/96		[signature] Ramey	7-3-96	11:00	

Documentation for treatment and/or disposal of tanks and piping is not applicable.

These materials were cleaned, crushed and disposed of as construction debris.

Notification for Underground Storage Tanks

State Agency Name and Address

STATE USE ONLY
ID NUMBER
DATE RECEIVED
A. Date Entered Into Computer _____
B. Data Entry Clerk Initials _____
C. Owner Was Contacted to Clarify Responses. Comments

TYPE OF NOTIFICATION

☐ A. NEW FACILITY ☐ B. AMENDED ☒ C. CLOSURE

____ No. of tanks at facility ____ No. of continuation sheets attached

INSTRUCTIONS

Please type or print in ink all items except "signature" in section V. This form must be completed for each location containing underground storage tanks. If more than five (5) tanks are owned at this location, photocopy the following sheets, and staple continuation sheets to the form.

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—

a) In the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and

b) In the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

c) If the State agency so requires, any facility that has undergone any changes to facility information or tank system status (only amended tank information needs to be included).

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: 1. Gasoline, used oil, or diesel fuel, and 2. industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situate upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Send completed forms to:

Underground Storage Tank Division
200 Doctor's Building
708 Church Street
Tennessee Department of Health and Environment
Nashville, TN 37247-4101

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. 2. Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use. 3. If the State requires notification of any amendments to facility send information to State agency immediately.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)

Street Address
NAVSUPPACT Memphis (Formerly NAS Memphis)
7800 Third Avenue Code 0101

City: Millington State: Tennessee ZIP Code: 38054-0007

County: Shelby

Phone Number (Include Area Code): 901/873-5461

II. LOCATION OF TANK(S)

If required by State, give the geographic location of tanks by degrees, minutes, and seconds. Examples Lat. 42, 34, 12 N Long. 85, 24, 17W

Latitude 35°20'04" Longitude 89°52'44"

(If same as Section I, mark box here ☐)

Facility Name or Company Site Identifier, as applicable
Same

Street Address (P.O. Box not acceptable)
Same

City State ZIP code

County Municipality

PH-3197

Page

000304

☒ Federal Government ☐ State Government ☐ Local Government	☐ Commercial ☐ Private	Tanks are located on land within an Indian Reservation or on other trust lands. ☐ Tanks are owned by native American nation, tribe, or individual. ☐	Tribe or Nation:

V. TYPE OF FACILITY

Select the Appropriate Facility Description

____ Gas Station	____ Railroad	____ Trucking/Transport
____ Petroleum Distributor	____ Federal - Non-Military	____ Utilities
____ Air Taxi (Airline)	X Federal - Military	____ Residential
____ Aircraft Owner	____ Industrial	____ Farm
____ Auto Dealership	____ Contractor	____ Other (Explain) _____

VI. CONTACT PERSON IN CHARGE OF TANKS

Name	Job Title	Address	Phone Number (Include Area Code)
Randy Wilson	Env. Protection Specialist.	NAVSUPPACT Memphis 7800 3rd Ave., Code 0101 Millington, TN 38054-0007	901/873-5461

VII. FINANCIAL RESPONSIBILITY

I have met the financial responsibility requirements in accordance with 40 CFR Subpart H ☐

Check All that Apply

☐ Self Insurance	☐ Guarantee	☐ State Funds
☐ Commercial Insurance	☐ Surety Bond	☐ Trust Fund
☐ Risk Retention Group	☐ Letter of Credit	☐ Other Method Allowed Specify _____

VIII. CERTIFICATION (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative (Print)	Signature	Date Signed

EPA estimates public reporting burden for this form to average 30 minutes per response including time for reviewing instructions, gathering and maintaining the data needed and completing and reviewing the form. Send comments regarding this burden estimate to Chief, Information Policy Branch PM-223, U.S. Environmental Protection Agency, 401 M Street, Washington D.C. 20460, marked "Attention Desk Officer for EPA." This form amends the previous notification form as printed in 40 CFR Part 280, Appendix I. Previous editions of this notification form may be used while supplies last.

000305

STATE OF TENNESSEE
DIVISION OF UNDERGROUND STORAGE TANKS

APPLICATION FOR PERMANENT CLOSURE OF UNDERGROUND STORAGE TANK SYSTEMS

The UST system owner shall complete and submit the original of this application to the appropriate Division of Underground Storage Tanks field office for approval 30 days in advance of closing an UST system. Refer to the attached map for the address of the appropriate field office. A copy of the approved application shall be on the premises during closure of the UST system. All of the following items shall be addressed.

Once approved this application is valid for twelve months from the date of approval. The approved application is non-transferable. If ownership of the UST system changes, a new application shall be submitted for approval.

DIVISION OF UNDERGROUND STORAGE
BY [illegible] DATE 12-5-95

1. Facility I.D. Number: 0 - 7 9 1 7 1 8

2. Name of Facility: Exchange SVC Station, Bldg. 341

   Address: Navy Road

   Millington, TN

   Phone Number: (901) 873-5461 County: Shelby

   On-site Contact (Operator): Randy Wilson

3. Name of Tank Owner: NAVSUPPACT - Memphis (formerly NAS Memphis)

   Address: 7800 3rd Ave.

   Millington, TN 38054

   Phone Number: 901) 873-5461 Contact person: Randy Wilson

4. Number of tanks registered at this facility: 4

5. Number of regulated tanks to be closed: 4

6. List the tank number, size, contents, primary use and date last used for all tanks to be closed.

Tank Number	Size	Contents (past and present)	* Usage (all that apply)	Date Last Used
1546 - 4	20,000g	gasoline/unleaded	engine fuel sales	currently
1547 - 5	20,000g	gasoline/unleaded	engine fuel sales	currently
1617 - 6	10,000g	gasoline/unleaded	engine fuel sales	currently
1648 - 7	550g	used oil	used oil	5-4-95

* Heating oil, Emergency generator, Retail, Commercial, Farm, Residential, Other

7. A site map shall be attached showing the location of the underground storage tanks, associated lines, sampling points and any nearby underground utilities. A SITE MAP IS REQUIRED. THE APPLICATION WILL NOT BE PROCESSED WITHOUT ONE.

8. Type of closure: Removal X ** Closure in place ____

   ** Inert material selected ____

** Describe the reason for closing the UST system in-place. N/A
Refer to the document Procedure for Tank Closure-in-Place for selecting the inert solid fill material.

9. Soil and/or groundwater samples shall be collected. Laboratory analyses are based on the type of product stored. If the type of product stored is unknown, all samples shall be analyzed using BTX, TPH-GRO, TPH-DRO, and a waste oil method. Mark all the following that apply:

GASOLINE TANKS: (Boiling Point Range 70-180° F)

Benzene, Toluene, Xylene (BTX) AND
Total Petroleum Hydrocarbons-Gasoline Range Organics (TPH-GRO) X

DIESEL OR KEROSENE TANKS: (Boiling Point Range 180-450° F)

Total Petroleum Hydrocarbons-Diesel Range Organics (TPH-DRO) _____

WASTE OIL TANKS: (Boiling Point Range greater than 450° F)

418.1 OR 503E X

CHEMICAL TANKS:

Contact: David Arial with the Environmental Protection Agency in Atlanta at (404) 347-3866. N/A

10. All excavated material remaining on the site of generation or on a site owned by the generator or subsidiary of the generator shall be placed on and covered with plastic until sampled or managed in accordance with Technical Guidance Document-005. Sampling the excavated material can be done at the time of removal or after proper treatment of the contaminated material.

If petroleum contaminated material is managed in accordance with Technical Guidance Document-009, an Application to Treat Petroleum Contaminated Soil shall be completed and submitted to the appropriate field office for approval. If the contaminated material is to be treated on a site owned by a third party, contact the Tennessee Division of Solid Waste Management.

11. Name of Division approved laboratory selected Environmental Testing & Consulting

12. Name of Company/Person performing the UST system closure Enviro-Group, Inc.

13. Name of Company/Person obtaining soil/groundwater samples Environmental Testing & Consulting

14. Proposed date of UST system closure 12-1-95

A copy of the approved application shall be on the premises during closure of the UST system.

I, (print) Naval Support Activity Memphis, owner of the petroleum UST system(s) at this facility, agree to submit, within 45 days of collecting the samples, the analytical results for the UST system closure and will resolve all environmental problems resulting from a release from the UST system(s) at this site.

I certify under penalty of law, including but not limited to penalties for perjury, that the information contained in this form and on any attachments is true, accurate and complete to the best of my knowledge, information and belief. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for intentional violations.

L. W. Elkins By direction — 11-14-95

Signature of UST system owner or owner's authorized representative — Date

~~State of~~ With The U.S. Armed Forces at NSA Memphis ~~County of~~

Sworn to and subscribed before me by L. W. Elkins, LCDR, U. S. Navy on this date 14th Nov 95

My commission expires Indefinite

C. D. Connor
Notary Public
LT C. D. Connor, SJA, NSA Memphis
Authorized to perform notarial acts
pursuant to 10 U.S.C. 1044(a)
NO SEAL REQUIRED BY STATUTE

CN-0923 100307

APPENDIX D
Documentation

Owner ID: 9477 FACILITY NO. 0-791718

State of Tennessee

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

UNDERGROUND STORAGE TANK REGISTRATION CERTIFICATE

THIS CERTIFICATE MUST BE POSTED AT THE FACILITY

This certifies that the facility listed below has been duly registered with the State of Tennessee.

Facility Address:

EXCHANGE SVC STATION BLDG 741
NAVY RD
MILLINGTON, TN 38054

COMMISSIONER

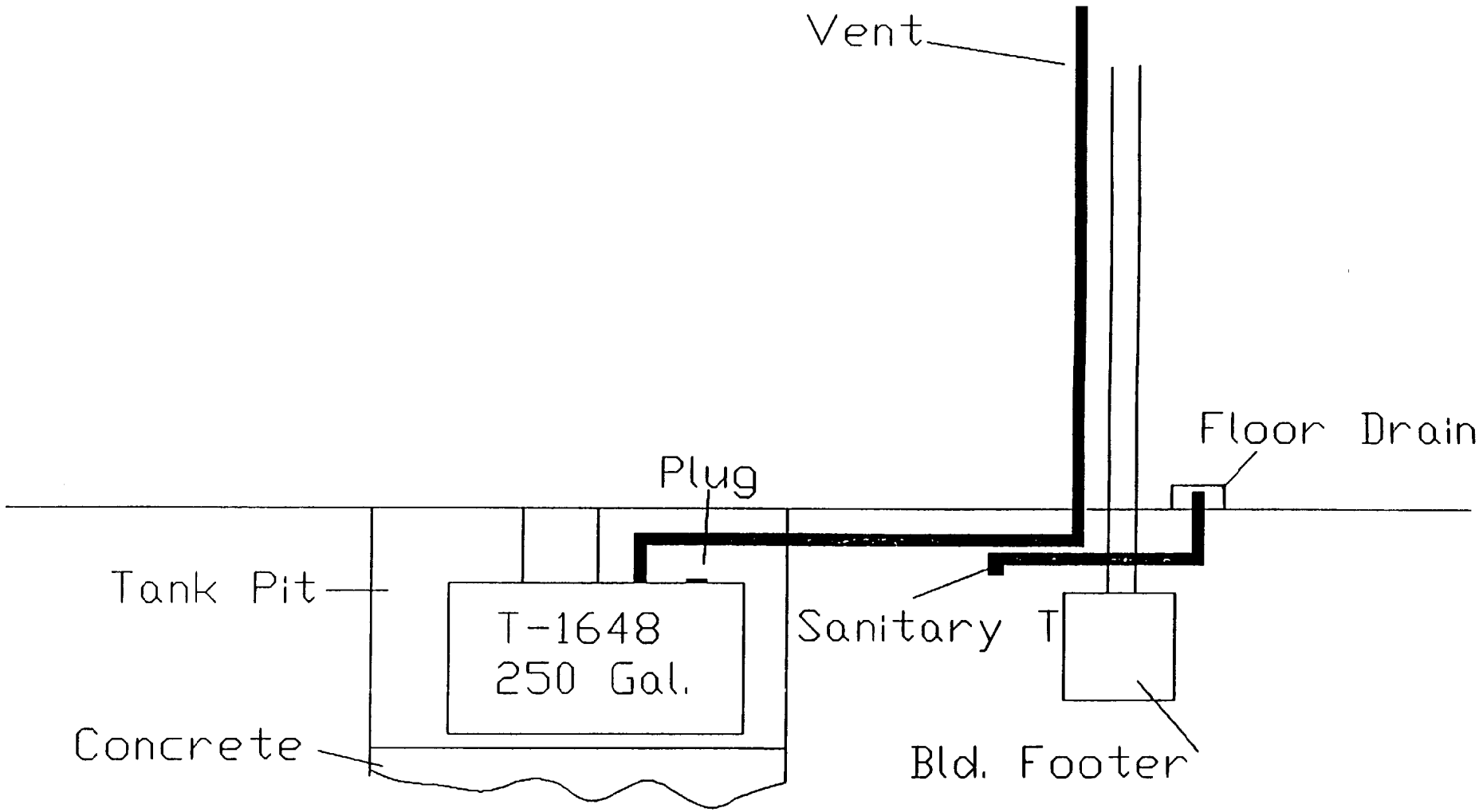
This certificate effective April 1, 1995 and expires March 31, 1996

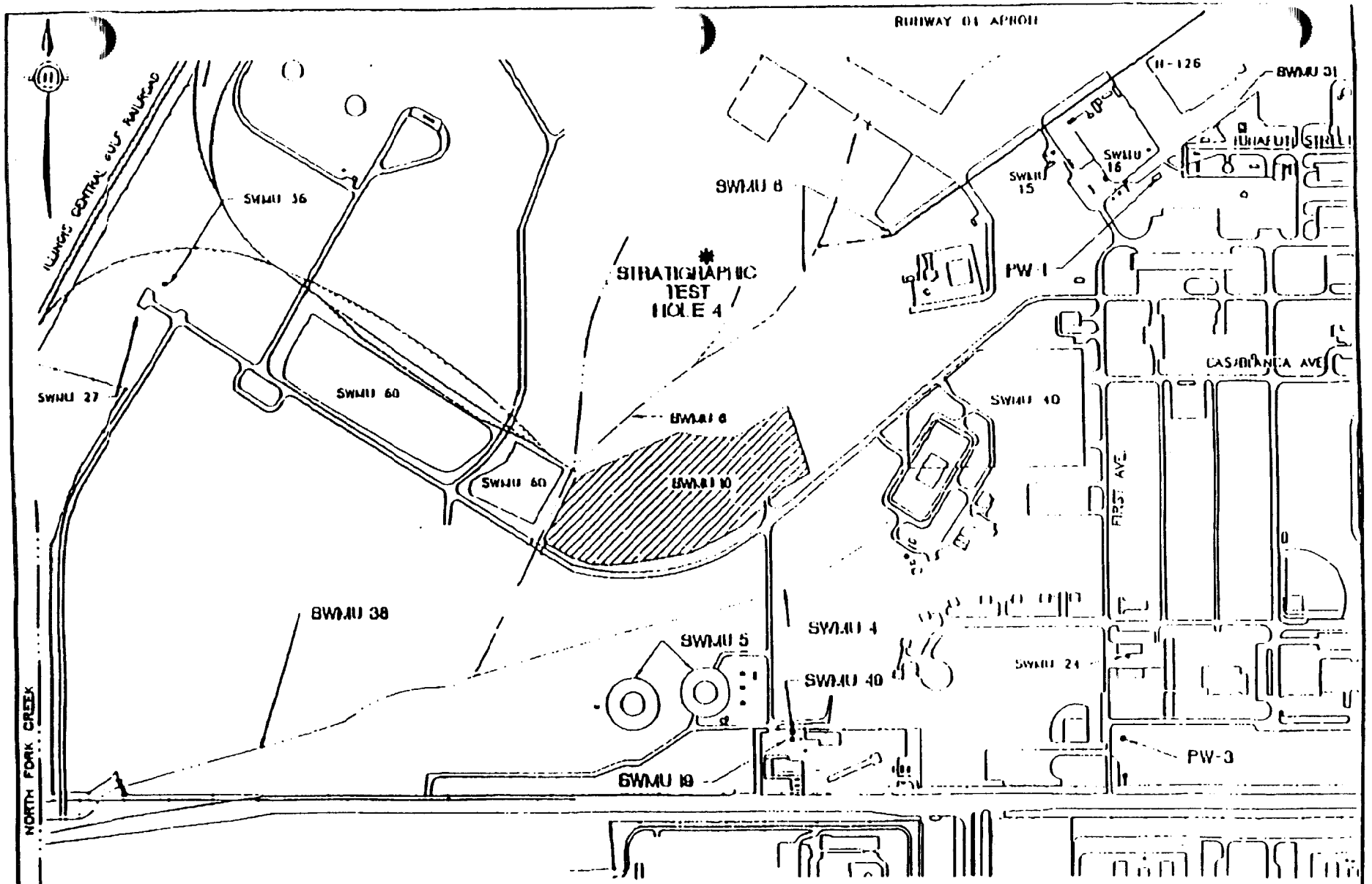
This certificate may be revoked if the Owner/Operator violates any of the lawful rules or regulations promulgated under Tennessee Code Annotated Section 68-215-101 et seq.

The following tanks have been duly registered at the above facility:

Tank Number	Description	Substance Stored
4	20,000 Gal	- Gasoline
5	20,000 Gal	- Gasoline
6	10,000 Gal	- Gasoline
7	~~230~~ 550 Gal	- Used Oil

0864 Rev 4/94) 000319 RCA PENDING


Vent
Floor Drain
Plug
Tank Pit
T-1648
250 Gal.
Sanitary T
Concrete
Bld. Footer



525 0 525

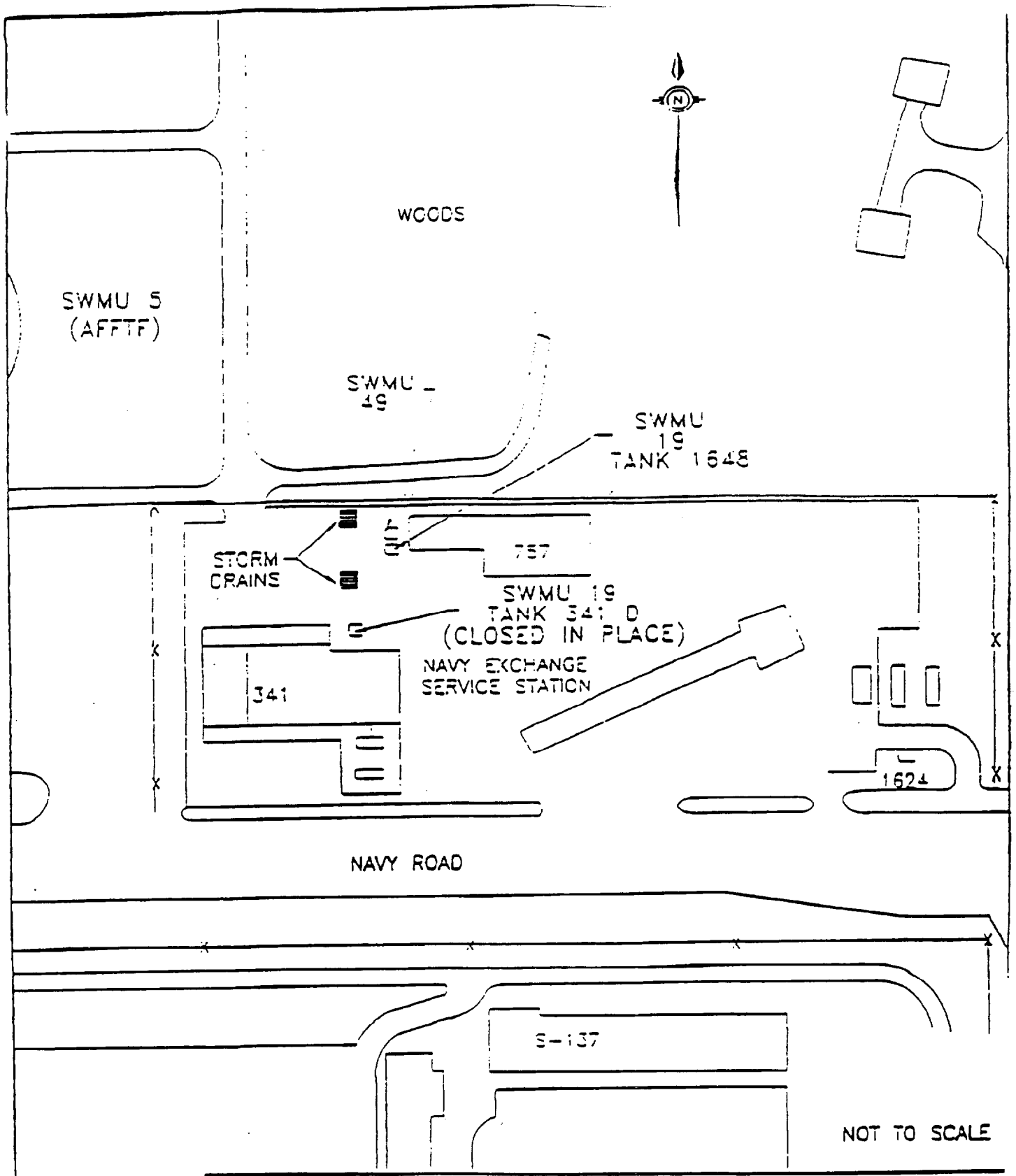
SCALE FEET

INTERIM MEASURES
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 1
VICINITY MAP
SWMU 19

DWG DATE: 04/10/95 | DWG NAME: 16MEM012

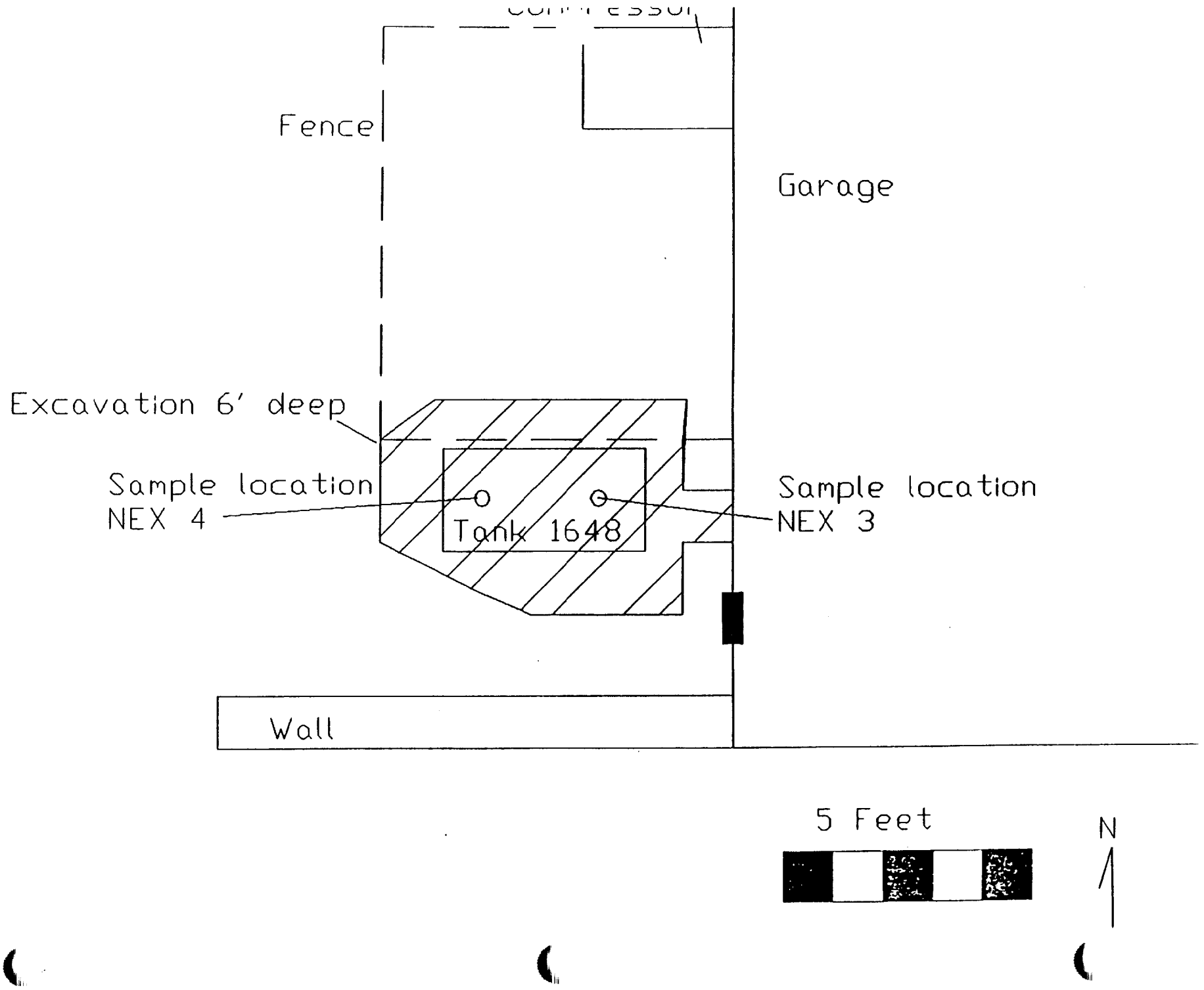
000311



INTERIM MEASURES
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 2
SITE MAP
UST 1648
SWMU 19

DWG DATE: 04/10/95 | DWG NAME: 161MWP19


Fence
Garage
Excavation 6' deep
Sample location
NEX 4
Tank 1648
Sample location
NEX 3
Wall
5 Feet
N

000313

TO ENSURE PROPER HANDLING OF SAMPLES PLEASE COMPLETE THIS ENTIRE FORM

Environmental Certification Labs, Inc.

P.O. Box 569 • Farmersburg, IN 47850-0569
(812) 696-5076 • 1-800-458-3489
Fax: (812) 696-2596

5881 41370 COC № 2553

Co. Name: ENVIRO-GROUP
Project Name: NEX - NAS MILLINGTON
PO No: 2-95-0039

Report To:
Company: ENVIRO GROUP
Address: 2626 KOTTER AVE
EVANSVILLE IN 47715

Attn: MIKE NEAC
Phone: 812 473 0278 Fax: 812 474 4731
Sampled by:

Accelerated Turnaround Requested 24hr (Subject to Additional Charge)
Result Request by: 3 / 25 / 96 (Mo Day Yr)
(Date must be Accepted and Approved by Lab.)

FIELD TEST PARAMETERS

SAMPLE ID	pH	TEMP	FLOW

FIELD TECH: DATE/TIME:

Analyses Requested (Note special detection limits or methods)

Sample ID	Date	Time	Comp	Grab	Sample Description/Location	Sample Type (Matrix): DW, GW, WW, ** Soil, Oil, Sludge, Other	No. Of Containers	Container Type: O = Other, G = Glass, AG = Amber Glass, HD = HDPE, VOA-Vial	BTEX 8240	TPH 418.1	pH	Surfactants MBAS	Total Lead				PRESERVATION	REMARKS	ECL Sample No.
NEX 7	3/20	10:00		✓	PIT WATER	GW	4	✓	✓	✓	✓	✓	✓				96-A016331		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	3/21 13:50	Courier		/	
Relinquished by: (Signature)	**Date/Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date/Time**	**Received for Lab by: (Signature)**
	/			3/25/96 1200	[signature]

Comments: WASTE OIL TANK PIT WATER

Distribution: White original and Yellow copy to accompany sample to laboratory.
Pink copy to be retained by client

** DW = Drinking Water, GW = Ground Water, WW = Wastewater

APPENDIX C
Site Maps

SPECIALIZED
ASSAYS, INC.
2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

Yes Heso

ANALYTICAL REPORT

ENVIRO GROUP 5881
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A016331

Sample ID: NEX-7

Date Collected: 3/20/96

Project:

Time Collected: 10:50

Project Name: NEX-NAS MILLINGTON

Date Received: 3/25/96

Sampler:

Time Received: 12:00

State Certification:

Sample Type: Ground water

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method	Batch
TRPH, IR	20.0	mg/l	11.8	0.10	1	3/25/96	12:37	A. Shelton	418.1	2597
Lead	0.052	mg/l	0.003	0.003	1	3/26/96	14:09	R.Street	6010A	2596
pH	6.9	pH Units			1	3/26/96	15:57	S.Sturm	9040	2598
Methylene Blue Act Sub	0.26	mg/l	0.05	0.05	1	3/26/96	15:57	S.Sturm	425.1	2599
Benzene	0.011	mg/l	0.005	0.005	1	3/25/96	21:18	G.Norton	8240B	2591
Ethylbenzene	0.009	mg/l	0.005	0.005	1	3/25/96	21:18	G.Norton	8240B	2591
Toluene	0.013	mg/l	0.005	0.005	1	3/25/96	21:18	G.Norton	8240B	2591
Xylenes	0.056	mg/l	0.005	0.005	1	3/25/96	21:18	G.Norton	8240B	2591

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range
VOA Surrogate, 1,2-Dichloroethane, d4	99.0	80 - 124
VOA Surrogate, Toluene d8	101.	86 - 108
VOA Surrogate, 4-Bromofluorobenzene	98.0	77 - 118

:
SAMPLE REC'D AT 18 DEG C.
MBAS REC'D OUT OF HOLDING

SPECIALIZED
ASSAYS, INC.
2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

ENVIRO GROUP 5881
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A016331

Sample ID: NEX-7

Date Collected: 3/20/96

Project:

Time Collected: 10:30

Project Name: NEX-NAS MILLINGTON

Date Received: 3/25/96

Sampler:

Time Received: 12:00

State Certification:

Sample Type: Ground water

Site I.D.:

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range

TIME. LEAD SAMPLE PRESER-
ED AT LAB.

Report Approved By: Danny B. Hale Report Date: 3/26/96

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

900317

ASSAYS, INC.
2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

ENVIRO GROUP 5881
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A015698

Sample ID: NEX-4

Date Collected: 3/19/96

Project:

Time Collected: 17:10

Project Name: NEX, NAS MILLINGTON

Date Received: 3/20/96

Sampler: J.M. HEAD

Time Received: 9:30

State Certification:

Sample Type: Solid waste

Site I.D.:

TCLP Results

Analyte	Result	Units	Reg Limit	Matrix Spike Recovery (%)	Date	Method
TCLP Extraction	COMPLETED				3/23/96	1311
Arsenic	< 0.10	mg/l	5.0	123	3/25/96	6010A
Barium	1.26	mg/l	100	81	3/25/96	6010A
Cadmium	< 0.10	mg/l	1.0	101	3/25/96	6010A
Chromium	< 0.50	mg/l	5.0	95	3/25/96	6010A
Lead	< 0.50	mg/l	5.0	119	3/25/96	6010A
Mercury	< 0.010	mg/l	0.20	86	3/23/96	7471
Selenium	< 0.10	mg/l	1.0	125	3/25/96	6010A
Silver	< 0.10	mg/l	5.0	112	3/25/96	6010A

ND = Not detected at the report limit.
TCLP preparation follows method 1311 SW-846 as revised November 24, 1992 (57 CFR 55114).

Report Approved By: Michael H. Dunn Report Date: 3/25/96

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

COPY 1

615726 3404

Environmental Certification Labs, Inc.

P.O. Box 569 - Farmersburg, IN 47850-0569
(812) 696-5076 - 1-800-458-3489
Fax: (812) 696-2596

COC № 4165

Accelerated Turnaround Requested 24 hr
(Subject to Additional Charge)

Result Request by: ___/___/___ Mo Day Yr
(Date must be Accepted and Approved by Lab.)

SPECIAL INSTRUCTIONS
RUSH · 24 Hr
FAX RESULTS TO
MIKE HEAD
901 872 3013

Name: ENVIRO-GROUP INC
Project Name: NEX, NAS MILLINGTON
ID No.: 2-95-0039
Report To:
Company: ENVIRO-GROUP
Address: 2626 KOTTER AVE
EVANSVILLE IN 47715
Attn: MIKE HEAD
Phone: 812 473 0276 Fax: 812 474 4791
Sampled by: J.M. HEAD

Analyses Requested (Note special detection limits or methods)

Sample ID	Date	Time	Comp	Grab	Sample Description/Location	Sample Type (Matrix): DW, GW, WW, SW, SO, SL, HW, O **	No. Of Containers	Container Type: CG = Clear Glass, AG = Amber Glass, HD = HDPE, VOA = Volatile Organic Analysis Vial, O = Other	BETX 8240	TPH IR	8 RCRA METALS	TCLP METALS						PRESERVATION	REMARKS	ECL Sample No.
NEX 1	3/19	4:30		✓	w/o SPOIL	SO	1	CG	✓	✓	✓									
NEX 2	3/19	4:40		✓	w/o SPOIL	SO	1	CG	✓	✓	✓									
NEX 3	3/19	5:01		✓	w/o Floor East	SO	1	CG	✓	✓	✓	✓							~~15385~~	15385
NEX 4	3/19	5:10		✓	w/o Floor West	SO	1	CG	✓	✓	✓	✓								15386
NEX 5	3/19	5:15		✓	Spoil waste oil	SO	1	CG	✓	✓	✓									
NEX 6	3/19	5:20		✓	w/o spoil	SO	1	CG	✓	✓	✓									

Rush Per
Mike Head
3/22/96 10:00

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
[signature]	3/19/96 5:45	Courier	/		/
Received by: (Signature)	**Date/Time**	**Relinquished by (Signature)**	**Date/Time**	**Received For Lab by: (Signature)**	**Date/Time**
	/		/		/

Comments: w/o WASTE OIL TANK PIT

Distribution: Wh... d Yellow copy to accompany sample to laboratory, Pink copy to be ... ent.

** DW = Drinking Water, GW = Ground W... SW = Solid Waste, SO = Soil, SL = Sludge, HW = Haza... Wastewater ...o, O = Other

TO ENSURE PROPER HANDLING OF SAM S PLEASE COMPLETE THIS ENTIRE FORM

5881

~~Environmental Certification Labs, Inc.~~

~~P.O. Box 569 Farmersburg, IN 47850-0569~~
~~(812) 696-5076 - 1-800-458-3189~~
~~Fax: (812) 696-2596~~

41105

COC № 4165

Co Name	ENVIRO-GROUP INC
Project Name	NEX, NAS MILLINGTON
PO No	2-95-0039
Report To:	
Company	ENVIRO-GROUP
Address	2626 KOTTER AVE EVANSVILLE IN 47715
Attn.	MIKE HEAD
Phone	812 473 0276 Fax: 812 474 4791
Sampled by	J.M. HEAD

Analyses Requested (Note special detection limits or methods)

Accelerated Turnaround Requested 24hr (Subject to Additional Charge)

Result Request by: / / Mo Day Yr (Date must be Accepted and Approved by Lab)

SPECIAL INSTRUCTIONS
RUSH: 24 Hr.
FAX RESULTS TO
MIKE HEAD
901 872 3013

Sample ID	Date	Time	Comp	Grab	Sample Description/Location	Sample Type (Matrix) DW, GW, WW, SW, SO, SL, HW, O**	No. Of Containers	Container Type: CG = Clear Glass, AG = Amber Glass, HD = HDPE, VOA = Volatile Organic Analyses Vial O = Other	BETX 8240	TPH IR	8 RCRA METALS							PRESERVATION	REMARKS	ECL Sample №
NEX 1	3/19	4:30		✓	w/o SPOIL	SO	1	CG	✓	✓	✓								15383	
NEX 2	3/19	4:40		✓	w/o SPOIL	SO	1	CG	✓	✓	✓								15384	
NEX 3	3/19	5:01		✓	w/o Floor East	SO	1	CG	✓	✓	✓								15385	
NEX 4	3/19	5:10		✓	w/o Floor WEST	SO	1	CG	✓	✓	✓								15386	
NEX 5	3/19	5:15		✓	Spoil waste oil	SO	1	CG	✓	✓	✓								15387	
NEX 6	3/19	5:20		✓	w/o spoil	SO	1	CG	✓	✓	✓								15388	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time	Relinquished by: (Signature)	Date/Time
[signature]	3/19/96 5:45	Courier	/		/
Relinquished by: (Signature)	**Date/Time**	**Relinquished by: (Signature)**	**Date/Time**	**Received For Lab by: (Signature)**	**Date/Time**
[signature]	3/20/96 0930		/		/

Comments: w/o: WASTE OIL TANK PIT

Distribution: White original and Yellow copy to accompany sample to laboratory.

** DW - Drinking Water, GW - Ground Water, WW - Waste Water, SW - Solid Waste, SO - Soil, SL - Sludge, HW - Hazardous Waste, O

100320

SPECIALIZED
ASSAYS, INC.
2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

ENVIRO GROUP 5581
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A015897

Sample ID: NEX-3

Date Collected: 3/19/96

Project:

Time Collected: 17:01

Project Name: NEX, NAS MILLINGTON

Date Received: 3/20/96

Sampler: J.M. HEAD

Time Received: 9:30

State Certification:

Sample Type: Solid waste

Site I.D.:

TCLP Results

Analyte	Result	Units	Reg Limit	Matrix Spike Recovery (%)	Date	Method
TCLP Extraction	COMPLETED				3/23/96	1311
Arsenic	< 0.10	mg/l	5.0	122	3/25/96	6010A
Barium	1.34	mg/l	100	81	3/25/96	6010A
Cadmium	< 0.10	mg/l	1.0	102	3/25/96	6010A
Chromium	< 0.50	mg/l	5.0	95	3/25/96	6010A
Lead	< 0.50	mg/l	5.0	120	3/25/96	6010A
Mercury	< 0.010	mg/l	0.20	84	3/23/96	7471
Selenium	< 0.10	mg/l	1.0	117	3/25/96	6010A
Silver	< 0.10	mg/l	5.0	112	3/25/96	6010A

ND = Not detected at the report limit.
TCLP preparation follows method 1311 SW-846 as revised November 24, 1992 (57 CFR 55114).

Report Approved By: Michael H. Dunn Report Date: 3/25/96

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

SPECIALIZED
ASSAYS, INC.
2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

ENVIRO GROUP 5881
ATT. MIKE LAMPERT
8686 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A015333

Sample ID: NEX-6

Date Collected: 3/19/96

Project:

Time Collected: 17:30

Project Name: NEX, NAS MILLINGTON

Date Received: 3/20/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Site I.D.:

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn

Report Date: 3/21/96

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

COPY 1

000322

SPECIALIZED
ASSAYS, INC.
2960 Foster Creighton Dr.
P.O. Box 40566
Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

ENVIRO GROUP 5331
ATT. MIKE LAMPERT
3686 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A015333

Sample ID: NEX-c

Date Collected: 3/19/96

Project:

Time Collected: 17:20

Project Name: NEX, NAS MILLINGTON

Date Received: 3/20/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Petroleum Hydrocarbons,IR	5030	mg/kg	10.0	1.0	10.0	3/20/96	17:48	M.Hinelick	418.1 MOD
Arsenic	4.6	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Barium	114.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Cadmium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Chromium	10.5	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Lead	195.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Mercury	ND	mg/kg	0.10	0.10	1.0	3/21/96	13:31	R.Street	7471
Selenium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Silver	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Benzene	0.016	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Ethylbenzene	0.108	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Toluene	0.152	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Xylenes	0.790	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range
VOA Surrogate, 1,2-Dichloroethane, d4	103.	62 - 147
VOA Surrogate, Toluene d8	100.	84 - 117
VOA Surrogate, 4-Bromofluorobenzene	113.	74 - 117

000323

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Nashville, TN 37204-0566
Phone 1-615-726-0177

ANALYTICAL REPORT

ENVIRO GROUP 5331
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A01533c

Sample ID: NEX-4

Date Collected: 3/15/96

Project:

Time Collected: 17:10

Project Name: NEX. NAS MILLINGTON

Date Received: 3/30/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Site I.D.:

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn

Report Date: 3/21/96

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

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ANALYTICAL REPORT

ENVIRO GROUP 5331
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A015337

Sample ID: NEX-5

Date Collected: 3/19/96

Project:

Time Collected: 17:15

Project Name: NEX, NAE MILLINGTON

Date Received: 3/21/96

Sampler: MIKE HEAD

Time Received: 8:30

State Certification:

Sample Type: Soil

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Petroleum Hydrocarbons,IR	8100	mg/kg	10.0	1.0	10.0	3/20/96	17:48	M.Hinelick	418.1 MOD
Arsenic	2.0	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Barium	31.9	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Cadmium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Chromium	10.3	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Lead	273.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Mercury	ND	mg/kg	0.10	0.10	1.0	3/21/96	13:31	R.Street	7471
Selenium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Silver	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Benzene	0.036	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Ethylbenzene	0.364	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Toluene	0.554	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Xylenes	2.80	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range
VOA Surrogate, 1,2-Dichloroethane, d4	105.	62 - 147
VOA Surrogate, Toluene d8	96.0	84 - 117
VOA Surrogate, 4-Bromofluorobenzene	93.0	74 - 117

000325

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ANALYTICAL REPORT

ENVIRO GROUP 5331
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A015333

Sample ID: NEX-3

Date Collected: 3/19/96

Project:

Time Collected: 17:01

Project Name: NEX, NAS MILLINGTON

Date Received: 3/30/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Site I.D.:

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn

Report Date: 3/21/96

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

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ANALYTICAL REPORT

ENVIRO GROUP 5381
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A01533c

Sample ID: NEX-4

Date Collected: 3/19/96

Project:

Time Collected: 17:10

Project Name: NEX, NAS MILLINGTON

Date Received: 3/21/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Petroleum Hydrocarbons,IR	3430	mg/kg	10.0	1.0	10.0	3/20/96	17:48	M.Hiaelick	418.1 MOD
Arsenic	4.6	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Barium	122.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Cadmium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Chromium	13.7	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Lead	199.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Mercury	ND	mg/kg	0.10	0.10	1.0	3/21/96	13:31	R.Street	7471
Selenium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Silver	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Benzene	0.066	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Ethylbenzene	0.212	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Toluene	0.372	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Xylenes	1.40	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range
VOA Surrogate, 1,2-Dichloroethane, d4	111.	62 - 147
VOA Surrogate, Toluene d8	91.0	84 - 117
VOA Surrogate, 4-Bromofluorobenzene	102.	74 - 117

000327

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ANALYTICAL REPORT

ENVIRO GROUP 5331
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A015334

Sample ID: NEK-3

Date Collected: 3/19/96

Project:

Time Collected: 16:40

Project Name: NEK, NAS MILLINGTON

Date Received: 3/20/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Site I.D.:

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn

Report Date: 3/21/96

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

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ANALYTICAL REPORT

ENVIRO GROUP 5331
ATT. MIKE LAMPERT
6666 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-4015333

Sample ID: NEX-3

Date Collected: 3/19/96

Project:

Time Collected: 17:01

Project Name: NEX. NAE MILLINGTON

Date Received: 3/20/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Petroleum Hydrocarbons,IR	1740	mg/kg	10.0	1.0	10.0	3/20/96	17:48	M.Himelick	418.1 MOD
Arsenic	9.7	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Barium	153.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Cadmium	1.4	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Chromium	18.0	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Lead	78.1	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Mercury	ND	mg/kg	0.10	0.10	1.0	3/21/96	13:31	R.Street	7471
Selenium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Silver	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Benzene	0.178	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Ethylbenzene	0.554	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Toluene	0.218	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Xylenes	1.35	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range
VOA Surrogate, 1,2-Dichloroethane, d4	106.	62 - 147
VOA Surrogate, Toluene d8	95.0	84 - 117
VOA Surrogate, 4-Bromofluorobenzene	105.	74 - 117

000319

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ANALYTICAL REPORT

ENVIRO GROUP 5581
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A015333

Sample ID: NEX-1

Date Collected: 3/19/96

Project:

Time Collected: 15:30

Project Name: NEX, NAS MILLINGTON

Date Received: 3/21/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Site I.D.:

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range

Report Approved By: Michael H. Dunn

Report Date: 3/21/96

Theodore J. Duello, Ph.D.
Michael H. Dunn, M.S.
Danny B. Hale, M.S.

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ANALYTICAL REPORT

ENVIRO GROUP 5331
ATT. MIKE LAMPERT
2626 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-A01533-

Sample ID: NEX-E

Date Collected: 3/19/96

Project:

Time Collected: 16:40

Project Name: NEX, NAE MILLINGTON

Date Received: 3/21/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Petroleum Hydrocarbons,IR	7460	mg/kg	10.0	1.0	10.0	3/20/96	17:48	M.Hiaelick	418.1 MOD
Arsenic	6.2	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Barium	182.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Cadmium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Chromium	14.2	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Lead	106.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Mercury	ND	mg/kg	0.10	0.10	1.0	3/21/96	13:31	R.Street	7471
Selenium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Silver	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Benzene	0.025	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Ethylbenzene	0.286	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Toluene	0.278	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Xylenes	1.59	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range
VOA Surrogate, 1,2-Dichloroethane, d4	103.	62 - 147
VOA Surrogate, Toluene d8	100.	84 - 117
VOA Surrogate, 4-Bromofluorobenzene	111.	74 - 117

000331

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APPENDIX B
Analytical Data

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ANALYTICAL REPORT

ENVIRO GROUP 5331
ATT. MIKE LAMPERT
8825 KOTTER AVENUE
EVANSVILLE, IN 47715

Lab Number: 96-401533

Sample ID: NEX-1

Date Collected: 3/19/96

Project:

Time Collected: 16:30

Project Name: NEX, NAS MILLINGTON

Date Received: 3/20/96

Sampler: MIKE HEAD

Time Received: 9:30

State Certification:

Sample Type: Soil

Analyte	Result	Units	Report Limit	Quan Limit	Dil Factor	Date	Time	Analyst	Method
Petroleum Hydrocarbons,IR	9260	mg/kg	10.0	1.0	10.0	3/20/96	17:48	M.Hiaelick	418.1 MOD
Arsenic	3.0	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Barium	121.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Cadmium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Chromium	12.1	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Lead	106.	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Mercury	ND	mg/kg	0.10	0.10	1.0	3/21/96	13:31	R.Street	7471
Selenium	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Silver	ND	mg/kg	1.0	1.0	1.0	3/21/96	11:50	R.Street	6010A
Benzene	0.048	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Ethylbenzene	0.274	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Toluene	0.216	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B
Xylenes	1.49	mg/kg	0.005	0.005	1.0	3/20/96	14:42	G.Norton	8240B

ND = Not detected at the report limit.

** QUALITY CONTROL DATA **

Surrogate Recoveries

Surrogate	% Recovery	Target Range
VOA Surrogate, 1,2-Dichloroethane, d4	106.	62 - 147
VOA Surrogate, Toluene d8	93.0	84 - 117
VOA Surrogate, 4-Bromofluorobenzene	95.0	74 - 117

000333

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APPENDIX A
Field Screening and Analytical Results

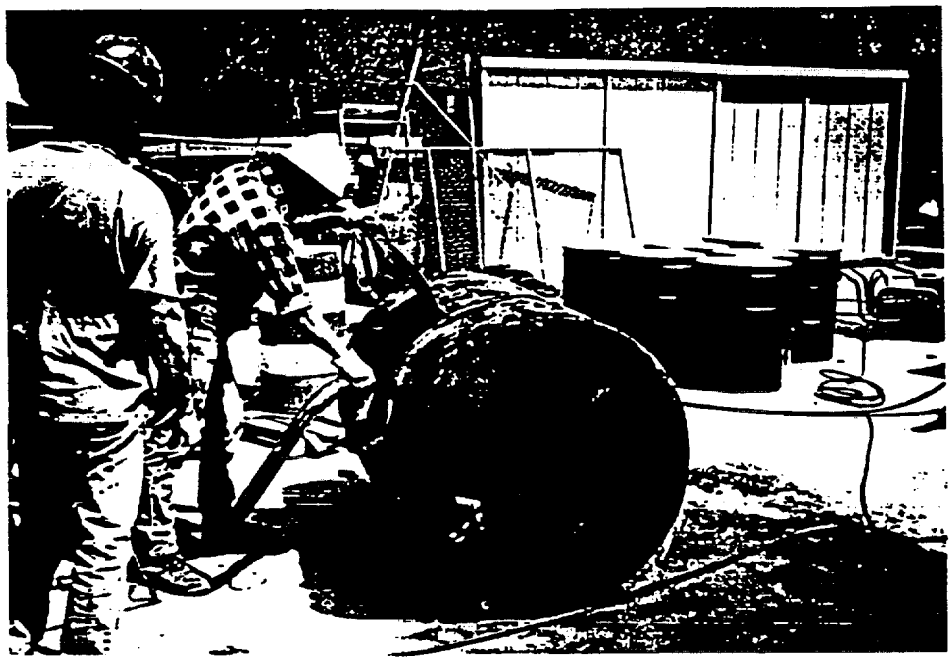
NAS- Memphis NEX Millington
Waste Oil Tank Pit Soil Samples
Tank T-1648

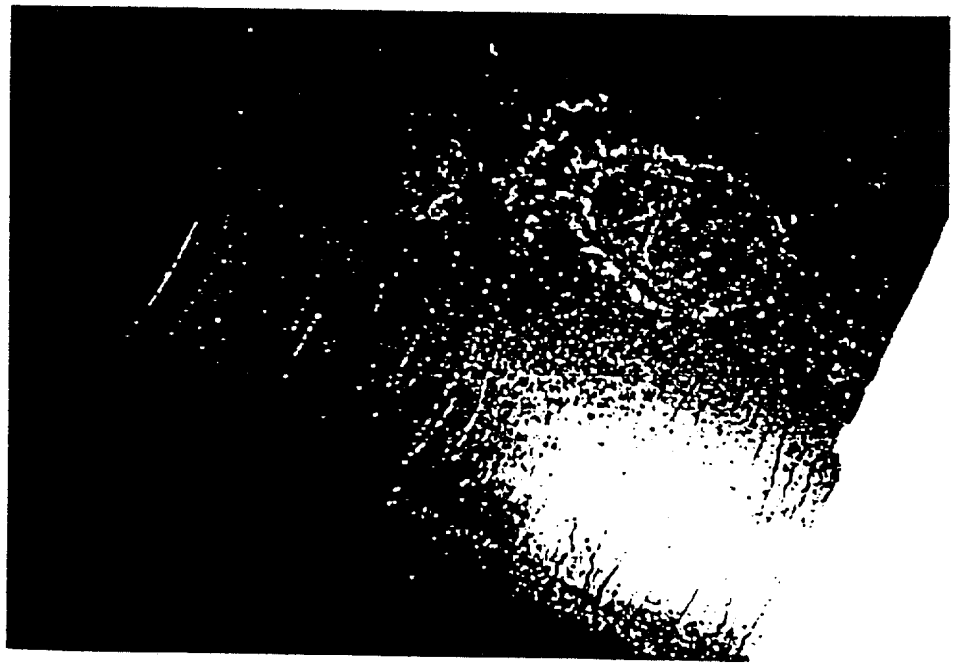
Parameter	Spoil	Spoil	Fl. East	Fl. West	Spoil	Spoil	
	NEX1	NEX2	NEX3	NEX4	NEX5	NEX6	Det. Limit
TPH -IR	9260.000	7660.000	1740.000	3430.000	3030.000	5030.000	10
Arsenic	3.000	6.200	9.700	4.500	4.600	4.600	1
Barium	121.000	182.000	153.000	122.000	114.000	114.000	1
Cadmium	nd	nd	1.400	nd	nd	nd	1
Chromium	12.100	14.200	18.000	13.700	10.500	10.500	1
Lead	106.000	106.000	78.100	199.000	195.000	195.000	1
Mercury	nd	nd	nd	nd	nd	nd	0.1
Selenium	nd	nd	nd	nd	nd	nd	1
Silver	nd	nd	nd	nd	nd	nd	1
Benzene	0.048	0.026	0.178	0.066	0.016	0.016	0.005
Ethylbenzene	0.274	0.286	0.554	0.212	0.108	0.108	0.005
Toluene	0.216	0.278	0.218	0.372	0.152	0.152	0.005
Xylene	1.490	1.590	1.350	1.400	0.795	0.790	0.005
TCLP Arsenic			0.100	0.100			
TCLP Barium			1.340	1.260			
TCLP Cadmium			0.100	0.100			
TCLP Chromium			0.500	0.500			
TCLP Lead			0.500	0.500			
TCLP Mercury			0.010	0.010			
TCLP Selenium			0.100	0.100			
TCLP Silver			0.100	0.100			
PID	0.3	0.4	0.3	0.3	0.4	0.3	

Ground Water Sample NEX 7

TRPH, IR	20.000
Lead	0.052
pH	6.900
MBAS	0.260
Benzene	0.011
Ethyl Benzene	0.009
Toluene	0.013
Xylene	0.056

All results are totals except the TCPL results
Results in mg/kg except for TCLP and NEX7 which are in mg/l
pH in pH units





April 19, 1996
Enviro-Group, Inc.

J. Michael Head
Environmental Geologist
Project Manager

ATTACHMENT 1
Site Photos

D. SAMPLE RESULTS

NAS- Memphis NEX Millington
Waste Oil Tank Pit Soil Samples
Tank T-1648

Parameter	Spoil	Spoil	Fl. East	Fl. West	Spoil	Spoil	
	NEX1	NEX2	NEX3	NEX4	NEX5	NEX6	Det. Limit
TPH -IR	9260.000	7660.000	1740.000	3430.000	3030.000	5030.000	10
Arsenic	3.000	6.200	9.700	4.500	4.600	4.600	1
Barium	121.000	182.000	153.000	122.000	114.000	114.000	1
Cadmium	nd	nd	1.400	nd	nd	nd	1
Chromium	12.100	14.200	18.000	13.700	10.500	10.500	1
Lead	106.000	106.000	78.100	199.000	195.000	195.000	1
Mercury	nd	nd	nd	nd	nd	nd	0.1
Selenium	nd	nd	nd	nd	nd	nd	1
Silver	nd	nd	nd	nd	nd	nd	1
Benzene	0.048	0.026	0.178	0.066	0.016	0.016	0.005
Ethylbenzene	0.274	0.286	0.554	0.212	0.108	0.108	0.005
Toluene	0.216	0.278	0.218	0.372	0.152	0.152	0.005
Xylene	1.490	1.590	1.350	1.400	0.795	0.790	0.005
TCLP Arsenic			0.100	0.100			
TCLP Barium			1.340	1.260			
TCLP Cadmium			0.100	0.100			
TCLP Chromium			0.500	0.500			
TCLP Lead			0.500	0.500			
TCLP Mercury			0.010	0.010			
TCLP Selenium			0.100	0.100			
TCLP Silver			0.100	0.100			

Ground Water Sample NEX 7

TRPH, IR	20.000
Lead	0.052
pH	6.900
MBAS	0.260
Benzene	0.011
Ethyl Benzene	0.009
Toluene	0.013
Xylene	0.056

All results are totals except the TCPL results
Results in mg/kg except for TCLP and NEX7 which are in mg/l
pH in pH units

INTRODUCTION

Enviro-Group, Inc., was contracted by Naval Air Station Memphis in Millington, Tennessee, to remove one (1) 280 gallon underground waste oil tank. This tank removal is part of a larger removal/ upgrade contract N62467-94-5225. The site is located on Navy Road at the Navy Exchange Service Station, in Millington, Tennessee. This site serves as a service station for military personnel.

Enviro-Group removed (1) one 280 gallon underground waste oil tank from the property on March 19, 1996. This tank was removed after approval from Tennessee Division of Underground Storage Tanks.

Sampling followed the TDEC guidelines. Contamination was detected in the tank pit, and additional analytical was performed. Two (2) confermatory samples for laboratory analysis were obtained from the bottom of the tank pit as outline by TDEC. The pit was backfilled with clean pea gravel to avoid a safety hazard.

A. UST CONTRACTOR

Enviro-Group Inc.
2626 Kotter Avenue
Evansville, IN 47715
(812) 473-0278
J. Michael Head, Project Manager

B. UST SITE

Exchange Service Station, BLDG 341
Facility ID # 0-791718
Navy Road
Millington, TN 38054
This is a service station for military personnel.

C. UNDERGROUND STORAGE TANK REMOVAL INFORMATION

On November 14, 1995, an Application for Permanent Closure was submitted to TDEC. Approval to remove the tank was given on December 5, 1995. Tank number 7, identified as tank number 1648 by the Navy, was the first tank to be removed and reported to be 550 gallons.

On March 19, 1996, at 4:00 PM, Enviro-Group, Inc. (EGI) mobilized equipment to the tank location. The level of product remaining in the waste oil tank was checked. Less than 6 inches of product remained. The explosive limit of the tank was check and found to be 3.0% of the LEL. The asphalt was removed and the piping was uncovered by hand.

EGI personnel found only a fill and vent line on top of the tank. Drawing submitted to EGI by the Navy indicated a floor drain in the adjacent building # 757 drained into the tank. This drain was found in the tank pit and lead back into the building, but did not connect to the tank. There was a sanitary T located on the end of the pipe. The top of the tank were the floor drain would have fit was plugged.

The tank was checked again with the explosion meter and read 3.0% of the LEL. The sides of the tank were excavated with a Case 580 backhoe. The excavated soil was field screened and placed on plastic. A total of approximately 20 cubic yards of soil were removed to facilitate tank removal. The tank was removed from the ground and secured above ground.

A concrete slab located beneath the tank was removed and the excavation floor and walls were squared up. Approximately 10 additional yards were field screened and removed from the excavation. The remaining product was drained from the tank and placed in a DOT 55 gallon drum. This drum was labeled and delivered to the government.

Water was found to be entering the excavation at about three feet below grade. The excavation remained open overnight. On March 20, 1996, the water from the pit was pumped into 55 gallon drums and the pit was backfilled. The soil was placed in 20 yard roll offs provided by the government. The tank was labeled per TDEC regulations.

On April 17, the tank was checked with an explosion meter and read 0.0% LEL. The tank was cut and cleaned using a pressure washer and non-phosphate detergent. The cleaning liquid was sampled then placed in a 55 gallon drum. The tank is currently secured on site pending disposal with the remaining tanks to be removed as part of the overall contract.

Enviro-Group, Inc.

Specialists For Today's Environmental Concerns

UNDERGROUND STORAGE TANK SYSTEM CLOSURE REPORT
EXCHANGE SERVICE STATION BLD 341
NAVY ROAD
MILLINGTON, TN 38054
OWNER ID # 9477
FACILITY ID # 0-791718
TANK # 7

PREPARED

BY

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4/18/96

RECEIVED
APR 22 1996
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APPENDICES

ATTACHMENT 1 Site Photographs

APPENDIX A Field Screening and Analytical Results

APPENDIX B Analytical Data

APPENDIX C Site Maps

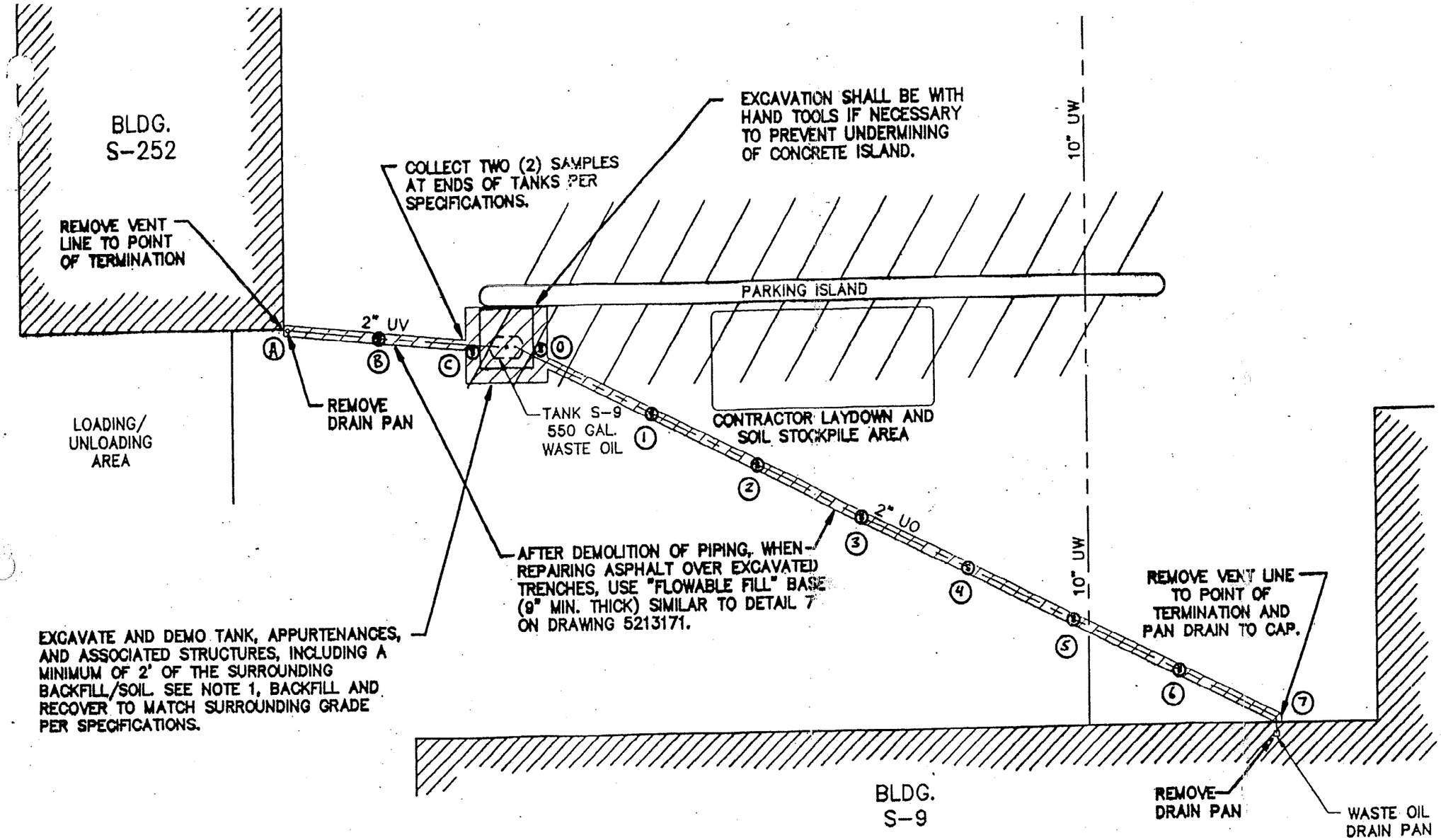
APPENDIX D Documentation

Tank Identification Number	Tank No. S-9	Tank No. ____	Tank No. ____	Tank No. ____	Tank No. ____
1. Status of Tank (mark only one)					
Currently In Use					
Temporarily Out of Use					
Permanently Out of Use	YES				
Amendment of Information					
2. Date of Installation (mo./year)					
3. Estimated Total Capacity (gallons)	550				
4. Material of Construction (Mark all that apply)					
Asphalt Coated or Bare Steel					
Cathodically Protected Steel					
Epoxy Coated Steel					
Composite (Steel with Fiberglass)					
Fiberglass Reinforced Plastic	YES				
Lined Interior					
Double Walled					
Polyethylene Tank Jacket					
Concrete					
Excavation Liner					
Unknown					
Other, Please specify					
Has tank been repaired?	N/A				
5. Piping (Material) (Mark all that apply)					
Bare Steel	YES				
Galvanized Steel					
Fiberglass Reinforced Plastic					
Copper					
Cathodically Protected					
Double Walled					
Secondary Containment					
Unknown					
Other, Please specify					
6. Piping (Type) (Mark all that apply)					
Suction: no valve at tank					
Suction: valve at tank					
Pressure					
Gravity Feed					
Has piping been repaired?	NO				

7. Substance Currently or Last Stored in Greatest Quantity by Volume					
Gasoline					
Diesel					
Gasohol					
Kerosene					
Heating Oil					
Used Oil	YES				
Other, Please specify					
Hazardous Substance CERCLA name and/or, CAS number	N/A				
Mixture of Substances Please specify					

X. TANKS OUT OF USE, OR CHANGE IN SERVICE

1. Closing of Tank					
A. Estimated date last used (mo./day/year)	05/01/96				
B. Estimate date tank closed (mo./day/year)	06/27/96				
C. Tank was removed from ground	YES				
D. Tank was closed in ground					
E. Tank filled with inert material Describe					
F. Change in service					
2. Site Assessment Completed	YES				
Evidence of a leak detected	YES				



PLAN VIEW

REF. THIS DRAWING

SCALE: 1" = 20'

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8/31/94

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