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VOLUNTARY CORRECTIVE ACTION WORK PLAN FOR RCRA FACILITY INVESTIGATION AT SOLID WASTE MANAGEMENT UNIT 16 ABOVE GROUND WASTE STORAGE TANK AND SOIL REMOVAL MILLINGTON SUPPACT TN
2/18/1998
ENSAFE

VOLUNTARY CORRECTIVE ACTION WORK PLAN
RCRA FACILITY INVESTIGATION
NAVAL SUPPORT ACTIVITY MEMPHIS
MILLINGTON, TENNESSEE

SWMU 16
N-94 ABOVEGROUND WASTE STORAGE TANKS
TANK AND SOIL REMOVAL

Revision: 01

CTO-094
Contract No. N62467-89-D-0318

Prepared for:

Department of the Navy
Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina

Prepared by:

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The Contractor, EnSafe Inc., 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: February 18, 1998
Signature: _____
Name: Lawson Anderson
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) Voluntary Corrective Action Work Plan has been prepared for the removal of tanks and soil at Solid Waste Management Unit (SWMU) 16, the N-94 Aboveground Waste Storage Tanks, at Naval Support Activity (NSA) Memphis, Millington, Tennessee (Figure 1). The primary references for this work plan are the *Comprehensive RCRA Facility Investigation [RFI] Work Plan* (E/A&H, 1994), the *RCRA Facility Assessment* (ERC/EDGe, 1990), and the *Assembly D Site Investigation Plan — SWMU 16, N-94 Aboveground Waste Storage Tanks*, Revision 2 (E/A&H, 1997).

2.0 ENVIRONMENTAL SETTING

SWMU 16 consists of two 8,000-gallon aboveground waste storage tanks (ASTs) located approximately 900 feet east of the main runway and 300 feet northwest of Building N-16 on the NSA Memphis Northside. Figure 1 is a vicinity map of SWMU 16.

The two waste tanks (Tanks 369 and 370) reportedly were installed in 1962 and are scheduled for removal in 1998. The tanks were used to store petroleum products, waste fuels, and/or waste lubricating oil. Currently, Tank 369 contains waste oil, while Tank 370 has not been used for several months and is thought to be empty. Neither the tanks nor fill pipe area have an immediate secondary containment system; however, SWMU 16 is part of a larger area surrounded by a concrete berm which drains to an oil-water separator approximately 350 feet northwest of SWMU 16 (Figure 1). The concrete berm directs any water runoff or free-flowing product spills within SWMU 16 to the oil-water separator. A concrete road is adjacent to the north side of SWMU 16, while the south and east sides are bordered by grass areas, and the west side is bordered by an area covered with gravel. Petroleum staining is presently visible in the adjacent grass and gravel areas. The *Visual Site Inspection* (ERC/EDGe, 1990a) report did not indicate a release at SWMU 16.

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Figure 1 Vicinity Map 1

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According to the *RCRA Facility Assessment* (RFA) (ERC/EDGe, 1990b), representatives of the U.S. Navy, Tennessee Department of Environment and Conservation (TDEC), and U.S. Environmental Protection Agency (USEPA) Region IV recommended no further action at this SWMU. Because SWMU 16 is located on property to be transferred from the Navy to the City of Millington, it was later recommended for a Confirmatory Sampling Investigation (CSI) by the BRAC Cleanup Team. On April 10, 1995, EnSafe/Allen & Hoshall (E/A&H) personnel noted a leaking pipe fitting that was causing petroleum stains on the gravel and on a small portion of unpaved ground under the fill pipe assembly. The leak was immediately repaired by Navy personnel.

2.1 Topography and Drainage

The topography at SWMU 16 generally is level. Surface water drains into an oil-water separator approximately 350 feet northwest of SWMU 16. Water from the oil-water separator discharges into the NSA Memphis sanitary sewer system.

2.2 Geologic and Hydrogeologic Information

The regional hydrogeology of the Memphis area is detailed in Section 2.11; a conceptual model of the hydrogeology at NSA Memphis is presented in Section 2.12 of the *Comprehensive RFI Work Plan* (E/A&H, 1994). Updated information is available in the *Hydrogeology and Groundwater Quality at Naval Support Activity Memphis, Millington, Tennessee* (Carmichael and others, 1997).

2.2.1 Site-Specific Geology

No previous geologic investigations have been conducted at SWMU 16. However, site-specific geology has been characterized using data from RFI work at SWMU 15 to the west of SWMU 16 (see Figure 1), including lithologic descriptions and geophysical logging during RFI soil-boring activities. Lithologic information to the north and east of SWMU 15 was also obtained from

multiple borings in the SWMU 7 area. The following describes the stratigraphy identified beneath the SWMUs 7 and 15 areas.

Loess, the surficial material in the area, is characterized as a silt varying in clay content and color from ground surface to depths of 28 to 42 feet. Color ranges from brown, yellowish brown, and reddish brown to olive-gray and greenish gray. At SWMU 15, a saturated zone was encountered in the loess between 11 and 23 feet below ground surface (bgs) at several soil-sampling locations. However, a water-bearing zone was absent at other locations in the SWMU 7 and 15 areas, particularly in those areas covered by concrete or asphalt.

The first presence of sand marks the contact between the loess and the underlying fluvial deposits. This contact was visually identified during RFI soil-boring activities at SWMU 15 and confirmed through geophysical logging at monitoring well location 015G03LF (Figure 2). The fluvial deposits, which are between 43 and 68 feet thick in the SWMU 15 area, terminate between 85 to 96 feet bgs. The uppermost part of the fluvial deposits consists of silty and clayey, very fine- to medium-grained sand which generally coarsens with depth to a medium- to coarse-grained sand with pea-sized gravel between 55 and 63 feet bgs. A sequence of gravelly sand or sandy gravel then extends to the base of the fluvial deposits. The gravel is rounded to subangular, and generally coarsens with depth, with some pieces collected in samples from near the base of the fluvial deposits exhibiting a maximum longitudinal diameter of 2 inches. The fluvial deposits are saturated. Sediments in this unit are brown, yellowish brown, dusky yellow, yellowish orange, yellowish gray, reddish brown, light gray, and olive gray.

The contact between the fluvial deposits and the underlying Cockfield Formation is erosional and ranges from about 85 to 96 feet bgs in the SWMU 15 area. This contact was noted by a change from sand and gravel to fine sand with clay, either interstitial, or in thin laminations. Sediment color in the Cockfield Formation varied between soil borings, from light gray, to yellowish gray,

Figure 2 Monitoring Well Locations 1

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olive-gray, yellowish orange, and reddish brown. The contact between the fluvial deposits and the Cockfield Formation generally was encountered at shallower depths at SWMU 7, east of SWMU 15, except in the boring for well 007G18LF, located north of SWMU 15 (Figure 2), where the contact was identified at approximately 100 feet bgs. Appendix A includes copies of selected boring logs, geophysical logs, and geotechnical information from SWMUs 7 and 15.

2.2.2 Site-Specific Hydrogeology

Groundwater in the fluvial deposits flows locally toward the northwest, based on data collected during investigations at Assembly A SWMUs, communication with U.S. Geological Survey (USGS) representatives, and data obtained during the SWMU 15 CSI and RFI. Groundwater flows primarily downward in the loess, although some loess groundwater may discharge locally to nearby streams, drainage ditches, and other surface-water bodies. Specific information from a direct push technology (DPT) investigation conducted during the SWMU 15 CSI and from monitoring-well installations conducted during the SWMU 15 and SWMU 7 RFIs is presented below.

Hydrocone Investigation

During the DPT investigation conducted as part of the SWMU 15 CSI, a Hydrocone groundwater sampler was used. Electronic equipment in the tool and uphole recorded the tool fill rate and hydrostatic pressure at specific depths in the loess and upper fluvial deposits. Horizontal hydraulic conductivity of the sample zones was estimated by applying the fill rate data to the Bouwer and Rice rate-of-rise permeability model (Bouwer and Rice, 1976). Horizontal hydraulic conductivity measurements for the loess ranged from 1.09×10^{-5} to 2.27×10^{-4} centimeters per second (cm/sec). Measurements for the fluvial deposits ranged from 1.05×10^{-5} to 3.92×10^{-4} cm/sec.

Monitoring Well Investigation

During the SWMU 15 RFI, four monitoring well pairs were installed. Each cluster consisted of one well each in the upper and lower parts of the fluvial deposits. Groundwater elevations were measured in each well on April 8, 1996, to determine flow directions and gradients in the upper and lower fluvial deposits at SWMU 15. Potentiometric maps of the two zones indicate a northwest flow for groundwater in the upper fluvial deposits and a northwest to west-northwest flow in the lower fluvial deposits. Based on these measurements, little head difference exists between groundwater levels in the upper and lower fluvial deposits monitoring wells, indicating little vertical flow between the upper and lower parts of the formation. Based on these measurements, horizontal groundwater gradients in the respective zones range from 0.0032 feet/foot for the upper fluvial deposits to 0.0042 feet/foot in the lower fluvial deposits.

Estimations of the vertical hydraulic conductivity in the loess and fluvial deposits were obtained from Shelby tube samples collected during the Assembly A RFI for SWMU 7. Falling head permeability tests were conducted on a sample from the lower part of the fluvial deposits collected from the boring for monitoring well 007001LF and a sample of loess from the boring for well 007G09LS (Figure 2). The sample from the lower fluvial deposits had a vertical hydraulic conductivity of 6.8×10^{-5} cm/sec and the value for the loess sample was 9.5×10^{7} cm/sec.

2.3 Climatological Data

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

3.0 SOURCE CHARACTERIZATION

The two waste tanks at SWMU 16 have been used to store a variety of liquids including petroleum products, waste fuels, and/or waste lubricating oil. Spent solvents also may have been mixed with the waste fuels or oils. The potential contaminants of concern at SWMU 15 are jet fuel

constituents (benzene, toluene, ethylbenzene, xylene, and naphthalene), chlorinated solvents, semivolatile hydrocarbon constituents of oils, and metals.

A CSI was conducted at SWMU 16 in July 1997 to assess the nature of surface and subsurface soil contamination, determine the contaminants of concern, and estimate the extent of shallow soil contamination, in the event that a soil removal is warranted. The CSI work plan and sampling results are presented in Sections 4.2 and 4.3.

4.0 CHARACTERIZATION OF HAZARDOUS CONSTITUENT RELEASES

4.1 Previous Investigations

A 1990 visual inspection of SWMU 16 did not indicate surface releases. According to the 1990 RFA, the tanks were equipped with secondary containment systems. On April 10, 1995, an E/A&H representative inspected SWMU 16 and no secondary containment system was observed immediately around the tanks; however, a concrete berm surrounded the larger area which included SWMU 16. Also on this date, a leak of hydrocarbons from a fitting in the piping assembly was discovered that had stained the gravel and a small unpaved area under the piping assembly. The leak was immediately repaired by Navy personnel. No other previous investigations are known to have been conducted at SWMU 16.

4.2 SWMU 16 CSI

In all, 14 shallow soil samples were collected from seven locations around SWMU 16 and analyzed during the July 1997 CSI.

4.2.1 CSI Objectives

The SWMU 16 investigation focused on the following objectives:

- Investigate the nature of surface and subsurface soil contamination associated with the two waste tanks.

- Estimate the extent of shallow contaminated soil that might have to be excavated when tanks 369 and 370 were removed.

- Investigate potential health risks associated with any identified surface-soil contamination.

4.2.2 Sampling

The CSI consisted of hand-auger sampling (as outlined in Section 4.4.4.3 of the Comprehensive RFI Work Plan) for laboratory analysis. Fourteen shallow soil samples were collected from seven locations (Figure 3) around the tanks. At each location, an upper-interval surface sample was collected from 0 to 1 feet bgs and a lower-interval subsurface sample was collected from 3 to 4 feet bgs. Field selection of the final sample locations was biased toward areas of any visibly stained soil.

4.2.3 Analytical Procedures and Parameters

Field measurements at SWMU 16, which were made in accordance with Section 4.10 of the Comprehensive RFI Work Plan, consisted of headspace analysis (organic vapor detection) for all soil samples using a photoionization detector (PID). The PID readings in the 3- to 4-foot interval were used to determine if deeper samples were needed. Based on the PID readings and visual observations of these samples, no samples deeper than 4 feet were collected.

Figure 3 SWMU 16 Sample Locations

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All soil samples were submitted to an offsite laboratory for analysis. Upper-interval samples from the southwest end of each tank (sample locations 016S0006 and 016S0007), near the tank piping, had full scan analyses (FSA) performed to determine the nature of SWMU 16 soil contamination and provide data for a preliminary risk evaluation (FSA methods are listed below). Lower-interval samples from locations 016S0001 and 016S0002 had FSA, minus pesticide, herbicide, PCB, and cyanide analyses (see Table 1 for specific methods to be performed). The remaining sample locations adjacent to and between the tanks were selected to estimate the extent of shallow subsurface contamination using total petroleum hydrocarbons (TPH) as an indicator parameter, and to determine whether a soil removal would be necessary.

The following methods were used for the FSA samples:

- Volatile organic compounds (VOCs), USEPA Method 8240
- Semivolatile organic compounds (SVOCs), USEPA Method 8270
- TPH, USEPA Method 418.1
- TPH-gasoline range organics (TPH-GRO), Tennessee (TN) Modified 8015/GRO
- TPH-diesel range organics (TPH-DRO), TN Modified 8015/DRO
- 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

Table 1 lists the soil samples collected and the analyses performed.

Table 1
Sample Analytical Parameters — SWMU 16

Sample Number	Sample Depth	Analyses	Rationale
016S000601, 016S000701	Upper interval 0 to 1 foot	FSA[a]	Risk assessment purposes, nature of contaminants, and estimate volume of soil for possible removal.
016S000101, 016S000201, 016S000301, 016S000401, 016S000501, 016C000501[b]	Upper interval 0 to 1 foot	TPH, TPH-GRO, and TPH-DRO	Estimate volume of soil for possible removal.
016S000104, 016S000204	Lower interval 3 to 4 feet	VOC, SVOC, TPH, TPH-GRO, TPH-DRO, and Appendix IX Metals	Nature of contaminants and estimate volume of soil for possible removal.
016S000304, 016S000404, 016S000504, 016S000604, 016C000604[b], 016S000704	Lower interval 3 to 4 feet	TPH, TPH-GRO, and TPH-DRO	Estimate volume of soil for possible removal.

Notes:
[a] = FSA includes analysis for VOC, SVOC, TPH, TPH-DRO, TPH-GRO, chlorinated pesticides/PCBs, organophosphorus pesticides, chlorinated herbicides, total metals (Appendix IX), and cyanide.
[b] = 016C000501 and 016C000604 are duplicates of 016S000501 and 016S000604, respectively.

4.2.4 Sample Management

Samples were managed as specified in Sections 4.12 and 5 of the Comprehensive RFI Work Plan.

4.2.5 Sample Custody

Sample custody procedures outlined in Section 4.12.5 of the Comprehensive RFI Work Plan were followed during the CSI.

4.2.6 Quality Assurance/Quality Control

Quality assurance/quality control procedures outlined in Section 4.14 of the Comprehensive RFI Work Plan were followed during the CSI.

4.2.7 Decontamination Procedures

Decontamination procedures outlined in Section 4.11 of the Comprehensive RFI Work Plan were followed during the CSI.

4.2.8 Investigation-Derived Waste

Investigation-derived waste (IDW) was handled as specified in Section 4.13 of the Comprehensive RFI Work Plan and in the *NSA Memphis IDW Management Plan* (E/A&H, 1995).

4.3 SWMU 16 CSI Results

Appendix IX metals, herbicides, pesticides, SVOCs, and TPH were identified during the CSI in surface and subsurface soil at SWMU 16. Inorganic constituents identified in soil at SWMU 16 were compared to background soil concentrations to determine whether measured values occur naturally or indicate contamination. The procedures used to determine the background reference concentrations for inorganics are documented in the technical memorandum *Reference Concentrations* (E/A&H, 1997). Except for TPH, concentrations of organic contaminants were compared to USEPA industrial risk-based concentration (RBC) values (USEPA, 1989).

Tables 2 through 5 summarize the analytical data collected during the CSI and present RBC and background reference concentrations for comparison. Table 6 presents TPH data for which there are no RBC values or background reference concentrations. For SWMU 16 data, the tables present concentrations that exceed detection limits only. A complete copy of the laboratory data is presented in Appendix B.

Table 2
Appendix 9 Metals in Soil (Hits Only) (mg/kg)

Parameter	Subsurface Samples 016S000104	Subsurface Samples 016S000204	Subsurface Background Reference Concentration	Surface Samples 016S000601	Surface Samples 016S000701	Surface Background Reference Concentration
Arsenic	12.1	11	20.3	11.8	62.1	14.6
Barium	187	233	265	182	139	223
Beryllium	1.3	0.32 J	1.00	0.56 J	0.5 J	1
Chromium	16.5	12.2	28.3	17.1	12.5	23.9
Cobalt	19.1	10	14.4	9	8.4	16.0
Copper	23.4	16	32.5	19	17.3	24.2
Lead	16.9	14.3	19.8	26.8	20.2	26.0
Mercury	0.05	ND	0.18	0.03	0.03	0.46
Nickel	36.3	13.3	NA	16	16	20.6
Thallium	0.26 J	0.18 J	NA	0.31 J	0.16 J	NA
Vanadium	33.8	21.9	43.7	32.2	24.4	45.1
Zinc	75.6 J	49.7 J	109	58 J	61.4 J	98.0

Notes:
J = Estimated concentration
NA = Not available
ND = Not detected

Table 3
Herbicides in Soil (Hits Only) (μg/kg)

Parameter	016S000701	RBCs
Dicamba	5.3 J	61,000,000
MCPP	6000	2,000,000

Note:
J = Estimated concentration
RBC = Risk-based concentrations

Table 4
Pesticides in Soil (Hits Only) (μg/kg)

Parameter	016S000601	016S000701	RBCs
Endosulfan I	0.97 J	1.2 J	12,000,000
Dieldrin	8.2	7.1	360
Methoxychlor	1.2 J	ND	10,000
Chlordane	4.5 J	6.2 J	4,400

Notes:
ND = Not detected
J = Estimated concentration
RBC = Risk-based concentration

Table 5
SVOCs in Soil (Hits Only) (μg/kg)

Parameter	016S000104	016S000204	016S000701	RBCs
Di-n-butylphthalate	51 J	ND	ND	200,000,000
Fluoranthene	ND	ND	26 J	82,000,000
Pyrene	ND	8.6 J	19 J	61,000,000

Notes:
ND = Not detected
J = Estimated concentration
RBC = Risk-based concentration

Table 6
TPH in Soil (mg/kg)

Sample Number	TPH	TPH-DRO	TPH-GRO
Upper-Interval Samples (0 to 1 foot bgs)			
016S000101	ND	5.4	ND
016S000201	990	510	ND
016S000301	26	5.3	ND
016S000401	140	ND	ND
016S000501	20	ND	ND
016S000601	44	5	ND
016S000701	18	5.4	ND
Lower-Interval Samples (3 to 4 feet bgs)			
016S000104	ND	ND	ND
016S000204	300	39	ND
016S000304	11	ND	ND
016S000404	150	5.2	ND
016S000504	15	ND	ND
016S000604	15	ND	ND
016S000704	1500	1100	2.4

Note:
ND = Not detected

Because several of the Appendix IX metals concentrations identified at SWMU 16 were less than background reference concentrations or Risk Based Concentrations (RBCs), and the detected herbicide, pesticide, and SVOC concentrations were less than RBCs, soil removal based on these constituents is unnecessary. For TPH and other petroleum-related constituents, regulatory guidance and action levels are provided by the Tennessee Department of Environment and Conservation (TDEC).

4.4 Regulatory Action Levels

The TDEC Division of Underground Storage Tanks (USTs) recently established uniform soil cleanup standards for petroleum releases that *apply to both regulated and non-regulated UST sites, as well as non-tank-related sites* (Tennessee Senate Bill 2720 [Public Chapter 864], May 3, 1996). These regulations, presented in the TDEC Division of USTs *Environmental Assessment Guidelines* (TDEC, 1996), have established cleanup levels for TPH in soil based on groundwater classification and soil permeability.

Table 7 presents the criteria used to determine the site-specific cleanup standards under these regulations.

Table 7
TDEC Division of USTs
TPH Cleanup Levels (mg/kg)

	Soil Permeability		
	$>10^{-4}$ cm/sec	**10^{-4} to 10^{-6} cm/sec**	**$<10^{-6}$ cm/sec**
Drinking Water	100	250	500
Non-Drinking Water	250	500	1,000

The cleanup levels are based on two variables: soil permeability and groundwater classification. Data collected during the nearby SWMU 7 RFI indicate a vertical permeability in the loess of 9.5×10^{-7} cm/sec from the 20 to 22 foot depth. Boring logs at SWMU 7 and SWMU 15 indicate that the lithology of the loess near SWMU 16 is homogeneous, with no known sand stringers or major lithologic variations. In the event that sand stringers or any significant lithology changes in the loess are discovered, the cleanup level will be adjusted accordingly.

Groundwater is classified as a drinking water or a non-drinking water supply based partly on whether it exceeds U.S. Environmental Protection Agency (USEPA) drinking water standards. Based on samples collected from the loess at background wells throughout NSA Memphis, groundwater in this unit exceeds certain national primary and secondary drinking water standards (*Drinking Water Regulations and Health Advisories*, USEPA, 1996), as indicated in Table 8. Exceedances of either Primary or Secondary Standards for loess groundwater probably is the result of relatively large amounts of suspended solids in the samples and analyses of total (non-filtered) water samples.

Table 8
Background Loess Groundwater Data vs. USEPA Drinking Water Standards
(μg/L)

Sample ID	Date	Parameter	Result	USEPA Drinking Water Standard	Standard
0BGG01LS01	21-Mar-95	Antimony	20	6	Primary
0BGG01LS02	10-Nov-95	Antimony	25	6	Primary
		Thallium	3	2	Primary
0BGG02LS01	17-Mar-95	Antimony	20	6	Primary
		Chromium	167	100	Primary
		Lead	33.6	15	Primary
		Nickel	143	100	Primary
0BGG02LS02	9-Nov-95	Antimony	25	6	Primary
		Thallium	3	2	Primary
0BGG04LS01	16-Mar-95	Antimony	20	6	Primary
		Chromium	213	100	Primary
		Nickel	165	100	Primary
0BGG04LS02	9-Nov-95	Antimony	25	6	Primary
		Cadmium	5.4	5	Primary
		Chromium	222	100	Primary
		Nickel	157	100	Primary
		Thallium	3	2	Primary
0BGG05LS01	17-Mar-95	Antimony	40.5	6	Primary
		Chromium	160	100	Primary
		Nickel	114	100	Primary
0BGG05LS02	9-Nov-95	Antimony	25	6	Primary
		Thallium	3	2	Primary

Because the vertical permeability of the loess obtained during the SWMU 7 RFI is less than 10^{-6} cm/sec and background wells screened in the loess throughout NSA Memphis have concentrations of several inorganic constituents exceeding drinking water standards, the applicable TDEC cleanup level for TPH in SWMU 16 soil is 1,000 mg/kg.

Based on a site-specific cleanup level of 1,000 mg/kg for TPH, data from Table 6 indicate that only the 1,500 mg/kg TPH concentration in sample 016S000704 exceeds the cleanup level. Therefore, it appears that soil removal is only required around the 3- to 4-foot depth (from the lower-interval sample) at location 016S0007.

5.0 REMOVAL ACTION

The U.S. Army Corps of Engineers will provide the equipment and personnel to remove the ASTs and excavate, stockpile, and dispose of the contaminated soil. EnSafe will assist the Corps as necessary, collect confirmation and soil-disposal samples, and report on the removal activities in a Voluntary Corrective Action report. The following activities will be performed by the designated staff; they are further described in subsequent sections.

- EnSafe will plan field activities, review historical data, and schedule EnSafe personnel and equipment.

- EnSafe will review with the necessary personnel the applicable portions of the Comprehensive RFI Work Plan, the Comprehensive Health and Safety Plan (CHASP) which is included as Appendix C, and the Site-Specific Health and Safety Plan (SSHASP) which is included as Appendix D.

- The Corps will empty, disconnect, remove, and clean the ASTs which will then be taken (by the Corps) to a metal recycler.

- The Corps will designate an area to stockpile contaminated soil and place plastic on the ground surface before stockpiling soil onsite.

- The Corps will excavate and stockpile surface and subsurface soil.

- EnSafe will collect composite soil samples during excavation for field-screening analysis.

- EnSafe will collect one composite disposal profile soil sample from each 100 cubic yards (yd^3) of stockpiled soil.

- The Corps will backfill the excavated area with clean soil and reseed it.

- The Corps will cover the stockpile with plastic and maintain this cover until the soil is properly disposed of. The Corps will coordinate disposal of soil and decontamination fluids resulting from field activities.

- The Corps will remove all construction materials.

- EnSafe will prepare a Voluntary Corrective Action report.

- The Corps will prepare a removal report.

5.1 Preremoval Activities

Activities to be conducted before removing the soil are discussed in the following sections.

Orientation Meeting

Before performing any field activities at SWMU 16, EnSafe personnel will hold an orientation meeting to review general and site-specific requirements for sampling and documentation. General discussion will include the locations of the site field office, subject site, and designated decontamination areas. Sampling requirements to be discussed will include general sampling protocol, the sample-numbering system, quality assurance/quality control (QA/QC) sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation.

The EnSafe Site Safety Officer (SSO) will review the CHASP and SSHASP (Appendices C and D, respectively) with EnSafe personnel before any field activities. All EnSafe employees working onsite will be required to sign a form acknowledging that they are familiar with the plan and agree to abide by its guidelines. The SSHASP contains a copy of the compliance agreement form.

5.2 Removal Activities

Several activities will be conducted before and during soil removal. Specific tasks include air monitoring, tank removal, soil excavation, and soil screening. Tank and piping removal procedures are detailed in the *Final Tank Closure Plan* (E/A&H, 1995). TDEC will be given at least two weeks notice by the Navy before any removal activities start.

Air Monitoring

If needed, air monitoring will be conducted by the Corps before and in conjunction with any field screening or confirmation sampling. Air monitors to be used include a photoionization detector

and a combustible-gas indicator. All air sample readings and locations will be recorded in the field logbook. Specific air-monitoring procedures are discussed in Section 6.4 of the SSHASP (Appendix D).

Tank Content Removal and Disposal. Removal of all liquids and sludges from the tanks will be in accordance with National Fire Protection Association (NFPA) 30, *Flammable and Combustible Liquids*. In the event of a fire or explosion hazard resulting from an underground release of flammable or combustible liquid, the procedures outlined in NFPA 329, *Recommended Practice for Handling Underground Releases of Flammable and Combustible Liquids*, will be followed. All usable product will be stored in appropriate containers for later delivery to or pickup by Defense Reutilization and Marketing Office (DRMO) Memphis. For waste tanks, liquids will be pumped into a tank truck for disposal at an appropriate facility.

Tank and Piping Removal and Disposal. This element includes decontamination, demolition, and disposal of the tanks. Before closing the tanks, the supply and fill lines, and any other piping leading to or from the tanks will be drained, disconnected and capped. Access equipment such as ladders and guard rails will be removed before tank removal. Water from triple-rinsing of the tanks will be contained and discharged to an oil-water separator. The concrete tank supports will be crushed, removed, and placed in a temporary stockpile for later reuse. These ASTs are not regulated under the *Tennessee Underground Storage Tank Act* and therefore have no associated UST regulations. The tanks will be turned in to a metal recycler by the Corps.

Surface and Subsurface Soil Excavation

Soil excavation will start with removal of 3 feet of overburden within a 10-foot radius of location 016S0007. The overburden will be stockpiled near the excavation for use as backfill. Removal of 1-foot thick, 20-foot diameter lifts will continue until field screening indicates that soil

↑ sample here

remaining on the sides and bottom of the excavation contains concentrations of TPH that are less than the action level of 1,000 mg/kg. The amount of overburden soil to be removed is estimated at 35 yds^3. Assuming that only one lift of contaminated soil from 3 to 4 feet deep is removed, then an additional 11.6 yds^3 of contaminated soil will be generated.

The Corps is expected to excavate with a large backhoe or trackhoe. As the soil is excavated, it will be segregated and stockpiled onsite into an overburden pile and a potentially contaminated soil pile. Both piles will be sampled by EnSafe for confirmation and disposal characterization. The stockpiled soil will be placed on plastic and covered with plastic to prevent cross-contamination and erosion. The Corps will be responsible for maintaining the plastic cover on the stockpiled soil. A five-day turnaround time will be requested for the disposal profile samples. Upon receipt, EnSafe will attach a summary of detections to the data package, and forward two copies to the Navy within five days of receipt of the data. The overburden will be used for backfill if it is not contaminated. Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. Any special waste soil will be disposed of by the Corps, while any hazardous waste soil will be disposed of by the Navy.

Soil Screening

Using disposable spoons or decontaminated stainless-steel spoons and bowls, EnSafe personnel will collect soil samples from the excavation walls and base as each 20-foot diameter lift is removed. These samples will be collected from the backhoe bucket, if necessary. Soil samples will be collected from the center of the bucket to avoid sample contamination from the bucket wall. Personnel will not enter the excavation if it is greater than 4 feet deep. The samples will be collected in accordance with the procedures described in Section 4.4.3 of the Comprehensive RFI Work Plan.

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Samples will be screened using an infrared (IR) TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). The excavation will continue until field screening demonstrates that the contaminated soil has been removed to concentrations less than the site-specific remediation level of 1,000 mg/kg.

5.3 Postremoval Activities

Several activities will be conducted after soil is removed, including confirmation soil sampling, backfilling the excavation, and disposing of used personal protective equipment (PPE) and disposable sampling equipment.

Confirmation Soil Sampling — III Level 14-day turnaround

When field screening demonstrates that the contaminated soil has been removed to less than the site-specific remediation level of 1,000 mg/kg TPH, EnSafe will collect a 5-part composite sample from each of the excavation walls and four grab samples from the excavation floor (one from each corner). These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH (Method 418.1) and at an offsite laboratory for Appendix IX metals (USEPA Method 6010/7000 series). 8 total Metals

Any water encountered in the excavation will be containerized in properly labeled U.S. Department of Transportation (DOT)-approved 55-gallon drums by the Corps. EnSafe will collect samples of the water for analyses of VOCs, and oil and grease. The drums will remain onsite. Upon approval from the City of Millington publicly owned treatment works, the water will be discharged via an oil-water separator to the sewer by the Corps. If any water is not approved for discharge to the sewer, then the Navy will arrange for proper disposal of the water. EnSafe will be responsible for collecting any water samples required by the disposal facility and to obtain any additional analyses to determine the appropriate means for disposal of water.

Backfill of the Excavation

The excavation will remain open until confirmation samples document that soil exceeding the TPH action level of 1,000 mg/kg has been removed and the BCT has approved backfilling based on a review of the TPH and metals concentrations. A temporary fence or barricade will be placed around the excavation. Any clean overburden from the excavation will be combined with soil from an offsite source and will be used by the Corps for backfill. The area will then be seeded by the Corps.

Removal of Construction Materials

After stockpiled soil has been removed or backfilled, any debris or trash associated with field activities will be removed by the Corps. The area will be left as close as possible to its natural state.

Disposal of PPE and Disposable Sampling Equipment

Used PPE and disposable sampling equipment such as plastic sheeting will be profiled for disposal, along with the excavated soil. Any used PPE or disposable sampling equipment will be stockpiled, along with the excavated soil for loading and disposal, after the disposal profile is approved. Corps personnel will be responsible for the proper disposal of all PPE and disposable equipment. Section 5.9, Investigation-Derived Waste, has additional information on waste disposal.

The Voluntary Corrective Action Report

EnSafe will prepare a report after field activities are complete and analytical results have been received to address the following:

- Field activities, including a description of the field screening and sampling activities.
- Analytical test results for confirmation samples collected following the soil removal.

- A diagram showing the features of the site during the removal action. The diagram will include the location of the excavation, soil sample locations, and detected concentrations.

- Disposal manifests (if available at the time of report) and a description of the fate of water generated during the removal action, if any.

The Corps will submit a report describing its activities during the soil removal.

5.4 Analytical Requirements

Analytical requirements for the samples scheduled to be collected at SWMU 16 are summarized in Table 9. Confirmation samples will be analyzed for TPH (418.1) and Appendix IX metals (USEPA Method 6010/7000 series). One characterization sample for soil disposal, which will be collected using a decontaminated stainless-steel hand auger or spoon and bowl for every 100 yd^3 of soil, will be analyzed for toxicity characteristic leaching procedure (TCLP) lead, and TCLP benzene. EnSafe will collect any additional samples required by the disposal facility and submit them for the required analyses.

Table 9
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Turnaround Time	Laboratory
Extent Verification	Soil	TPH based on USEPA Method 418.1	Field Analysis	N/A
Confirmation	Soil	TPH Method 418.1 Appendix IX Metals	Field Analysis 5 days	N/A ETC
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene	5 days	ETC

Note:
ETC = Environmental Testing & Consulting, Memphis, Tennessee

Field measurements at SWMU 16 will be conducted in accordance with Section 4.10.1 of the Comprehensive RFI Work Plan. IR method screening of soil samples will be performed in accordance with the manufacturer's instructions.

5.5 Sample Management

Samples will be managed in accordance with Sections 4.12 and 5 of the Comprehensive RFI Work Plan.

5.6 Sample Custody

Sample custody will be maintained in accordance with Section 4.12.5 of the Comprehensive RFI Work Plan.

5.7 Quality Assurance/Quality Control

QA/QC procedures to be followed during sampling activities will be in accordance with Section 4.14.2 of the Comprehensive RFI Work Plan.

5.8 Decontamination Procedures

Decontamination will be performed in accordance with Section 4.11 of the Comprehensive RFI Work Pan.

5.9 Investigation-Derived Waste

Investigation-derived waste (IDW) will be handled in accordance with Section 4.13 of the Comprehensive RFI Work Plan and the *Investigation-Derived Waste Management Plan* (EnSafe, 1995). The Corps and/or the NSA Memphis Public Works Office will properly dispose of all IDW.

6.0 QUALITY ASSURANCE PLAN

The quality assurance procedures presented in Section 4.14 of the Comprehensive RFI Work Plan will be followed for sampling activities at SWMU 16.

7.0 DATA MANAGEMENT PLAN

The data management procedures presented in Section 5 of the Comprehensive RFI Work Plan will be followed for sampling activities at SWMU 16.

8.0 HEALTH AND SAFETY PLAN

Since EnSafe does not have responsibility for the soil removal, the Corps shall provide a written health and safety plan for removal activities for its employees which shall meet, at a minimum, the requirements specified in the EnSafe CHASP and include all site-specific information concerning types of activities, site contaminants, etc. The Corps's health and safety plan will be submitted to TDEC for review prior to its implementation. During confirmation sampling, EnSafe personnel will comply with the CHASP (Appendix C) and the SSHASP (Appendix D).

9.0 REFERENCES

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