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VOLUNTARY CORRECTIVE ACTION WORK PLAN ASSEMBLY F SOLID WASTE
MANAGEMENT UNIT 19 UNDERGROUND WASTE TANK 1648 FOR RESOURCE
CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION FOR MILLINGTON
SUPPACT TN
5/26/1999
ENSAFE INC

**VOLUNTARY CORRECTIVE ACTION WORK PLAN
ASSEMBLY F
SWMU 19 – UNDERGROUND WASTE TANK 1648
NAVAL SUPPORT ACTIVITY MID-SOUTH
MILLINGTON, TENNESSEE**



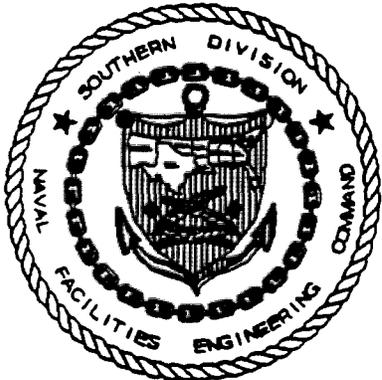
Revision: 1

CTO-106

Contract Number: 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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May 26, 1999

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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: May 26, 1999
Signature: [Signature]
Name: Robert Smith
Title: Task Order Manager

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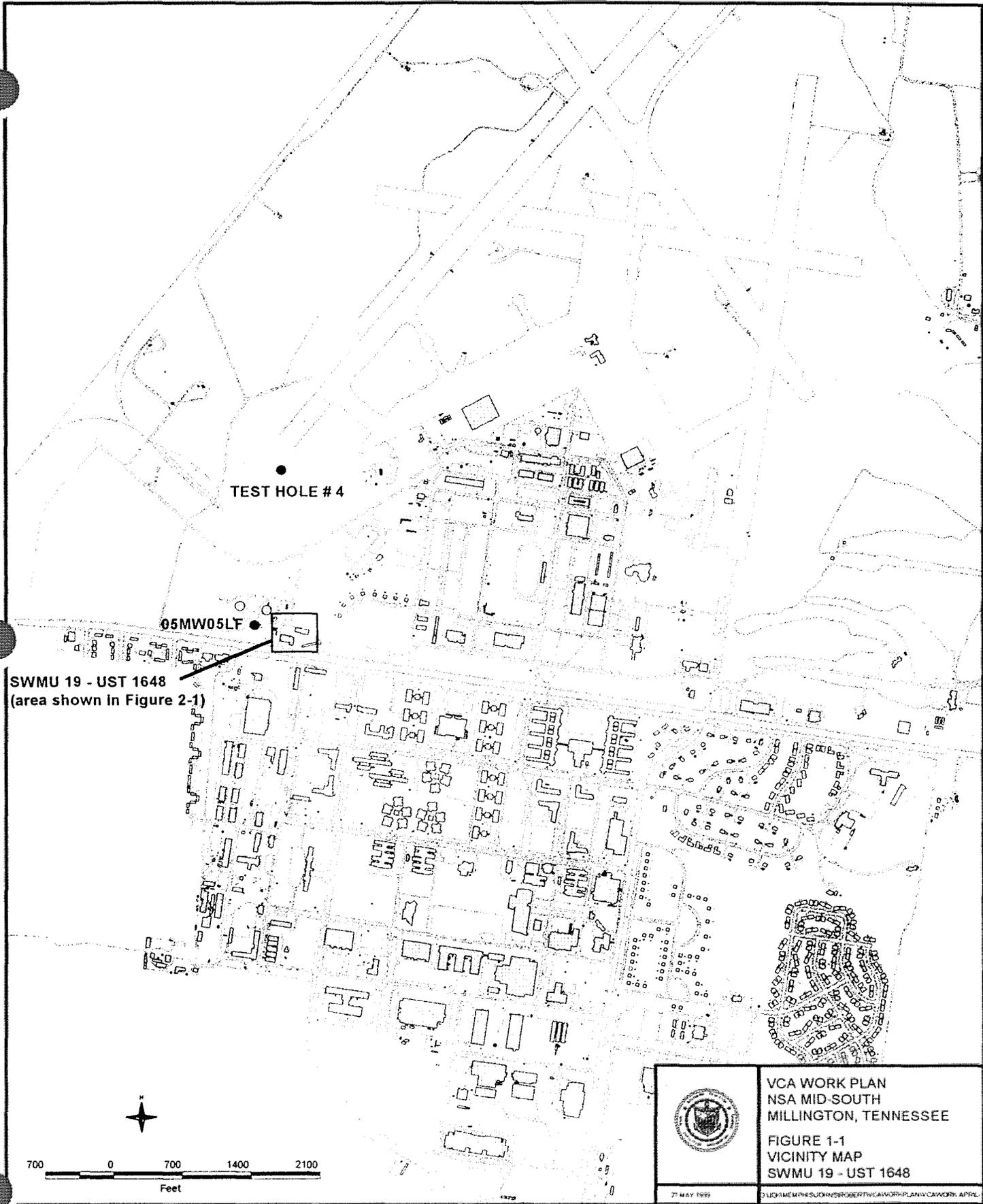
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Appendix B	Site-Specific Health and Safety Plan

1.0 INTRODUCTION

As part of the U.S. Navy Installation Restoration Program, the following Resource Conservation and Recovery Act (RCRA) Voluntary Corrective Action (VCA) Work Plan has been prepared for the removal of petroleum contaminated soil at Solid Waste Management Unit (SWMU) 19, the location of former underground storage tank (UST) 1648 (Figure 1-1), at Naval Support Activity Mid-South (NAVSUPPACT Mid-South or NSA Mid-South), Millington, Tennessee (formerly Naval Air Station Memphis until October 1996, then NSA Memphis until October 1, 1998). 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 *Assemblies G and H Site Investigation Plan — SWMUs 19 and 49* (EnSafe, 1997).

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SWMU 19 - UST 1648
 (area shown in Figure 2-1)

TEST HOLE # 4

05MW05LF



VCA WORK PLAN
 NSA MID-SOUTH
 MILLINGTON, TENNESSEE
 FIGURE 1-1
 VICINITY MAP
 SWMU 19 - UST 1648



2.0 ENVIRONMENTAL SETTING

SWMU 19 is approximately 150 feet north of Navy Road (Figure 2-1) on the NSA Mid-South Northside. SWMU 19 is bounded to the north by SWMU 49 (a former hazardous-waste accumulation point for Building N-757) and a wooded area and to the south by Navy Road and Building N-341 of the Navy Exchange Service Station. SWMU 19 is bordered to the east by Building N-757 of the Navy Exchange Service Station and to the northwest by the former Aircraft Fire Fighting Training Facility (SWMU 5).

According to various sources, UST 1648 was used from 1983 through 1996. Observations and data collected during the removal of UST 1648 indicated a release may have occurred prior to its removal.

Topography and Drainage

SWMU 19 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.

Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12 of the *Comprehensive RFI Work Plan* (E/A&H, 1994). Updated information is available in the *Hydrogeology and Groundwater Quality at the Naval Support Activity Memphis, Millington, Tennessee* (Carmichael, et al., 1997).

Stratigraphy

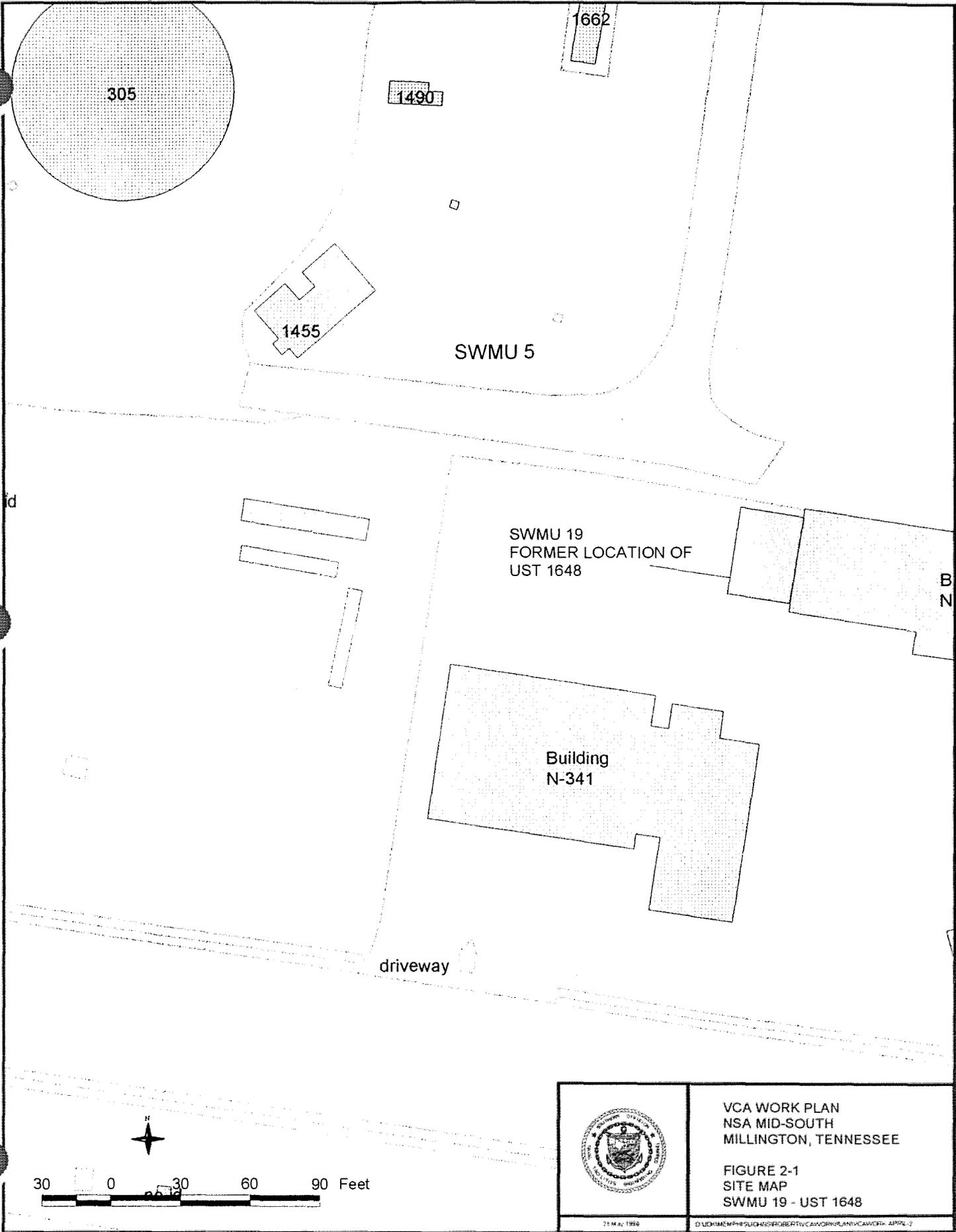
Site-specific stratigraphic data are not available for SWMU 19; however, lithologic information obtained from the SWMU 5 RFI (E/A&H, 1997a) indicates a shallow geology comprised of low

to very low-permeability silty clays and clays overlying a silt horizon. Laboratory-measured vertical hydraulic conductivities for the silty-clay unit were reported to be 1.4×10^{-7} centimeters per second (cm/sec); no conductivity data are available for the underlying silt unit. Based on a 65-foot deep 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 below land surface (bls) and continued as sand with some gravel until the Cockfield Formation was encountered at approximately 65 feet bls.

To obtain deeper geologic information that could be used to evaluate SWMUs in the area, the U.S. Geological Survey (USGS) drilled a stratigraphic test hole (Test Hole 4) to approximately 200 feet bls approximately 500 feet south of the main runway and about 750 feet north of SWMU 19. 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. Because of the unanticipated thinness of the Cockfield Formation, this borehole was advanced approximately 50 feet into the Memphis 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 Test Hole 4 are shown in Table 2-1.

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 this 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 locally appears to flow 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. Water in this ditch eventually drains into North Fork Creek. It is unknown if shallow groundwater flow at SWMU 19 is in a direction similar to that observed at SWMU 5.

**Table 2-1
 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 bis).	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 from monitoring wells screened in the fluvial deposits across the NSA Mid-South Northside indicate that groundwater in the fluvial deposits typically flows toward the west-northwest.

Climatological Data

Regional climatological data are provided in Section 2.8 of the *Comprehensive RFI Work Plan* (E/A&H, 1994).

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3.0 SOURCE CHARACTERIZATION

Two USTs were formerly located at Building N-757. UST 1648 had a capacity of 280 gallons and it stored used automotive oil and hydraulic fluid generated by automotive repair activities at the Navy Exchange Service Station for later recycling. UST 341, capacity unknown, stored used oil from automobile maintenance operations at Building N-341 of the Navy Exchange Service Station. Both USTs were installed in 1979. UST 341 was closed in place when it was filled with concrete; the date of closure is not known. UST 1648 (SWMU 19) was removed on March 19, 1996, by a Navy UST contractor and the UST was operational until the time it was removed. During the excavation and removal of UST 1648, the vent-pipe attachment to the fill-pipe was discovered to be disconnected and obviously waste oil had infiltrated into surrounding soil. Oil was visible in the soil beneath the foundation of Building N-757. After UST 1648 was removed, the pit was filled to grade with pea gravel and capped with concrete at the recommendation of the BRAC Cleanup Team (BCT).

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4.0 CHARACTERIZATION OF HAZARDOUS CONSTITUENT RELEASES

4.1 Previous Investigations

Following removal of UST 1648, confirmation samples were collected from the excavation floor. Samples 019S0001 and 019S0002 were collected from the north and south ends of the excavation floor, respectively, and analyzed by an offsite laboratory for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), Appendix IX metals, and pesticides/polychlorinated biphenyls (PCBs). The confirmation data are presented in Tables 4-1 and 4-2.

Samples were also collected from the excavated soil for disposal characterization. The excavated soil was field screened using a photoionization detector (PID) and segregated into "clean" soil (PID readings equal to or less than background levels) and "dirty" soil (PID readings exceeding background). Since the oil contamination was so obvious, visual inspection and PID screening was used to delineate "clean" versus "dirty" and samples were not collected for total petroleum hydrocarbon (TPH) analysis. Disposal samples 019V0001 and 019V0002 were collected from the "clean" and "dirty" soil, respectively, and analyzed at an offsite laboratory for F001-F005 solvent scan, PCBs, toxicity characteristic leaching procedure (TCLP)-TPH, TCLP-metals, TCLP-herbicides, TCLP-VOCs, and TCLP-SVOCs. All parameters analyzed for were detected at concentrations less than the method detection limits. All soil generated during the removal of UST 1648 was arranged for disposal by the Navy's UST contractor.

**Table 4-1
 UST 1648 Tank Pit Soil Confirmation Sample Results
 Inorganic Data (mg/kg)**

Constituent	019S0001	019S0002
Arsenic	5.5	6.2
Barium	141	172
Beryllium	0.44 J	0.53 J
Cadmium	0.86 J	0.88 J
Chromium	9.2	12.6

Table 4-1
 UST 1648 Tank Pit Soil Confirmation Sample Results
 Inorganic Data (mg/kg)

Constituent	019S0001	019S0002
Cobalt	8 J	8.6 J
Copper	10.6	14.4
Lead	96.6	75.3
Nickel	15.6	19.9
Selenium	0.37 J	ND
Vanadium	17 J	20.8
Zinc	166 J	83.6 J
Tin	21.3 J	37.6 J

Notes:

- ND — Not Detected above the practical quantitation limit.
 J — Compound was detected at a concentration less than the method reporting limit
 mg/kg — Milligrams per kilogram

Table 4-2
 UST 1648 Tank Pit Soil Confirmation Sample Results
 Organic Data ($\mu\text{g}/\text{kg}$)

Constituent	019S0001	019S0002
Heptachlor	3	ND
Heptachlor epoxide	1.9 J	ND
Endosulfan II	8	4 J
4,4'-DDE	ND	5.6 J
4,4'-DDT	5	ND
Acetone	ND	330
2-Butanone (MEK)	ND	56 J
Naphthalene	4,400 J	3,600 J
2-Methylnaphthalene	9400	7,600 J
bis(2-Ethylhexyl)phthalate	1,800 J	1,600 J
4-Methyl-2-Pentanone	ND	20 J
Benzene	250 J	63 J
Ethylbenzene	1800	280

Table 4-2
UST 1648 Tank Pit Soil Confirmation Sample Results
Organic Data ($\mu\text{g}/\text{kg}$)

Constituent	019S0001	019S0002
Styrene	ND	15 J
Toluene	3000	190
Xylene (Total)	12000	1600

Notes:

- ND — Not detected above practical quantitation limit.
- J — Compound was detected at a concentration less than the method reporting limit.
- $\mu\text{g}/\text{kg}$ — Micrograms per kilogram

4.2 SWMU 19 Confirmatory Sampling Investigation 1

In January of 1998, EnSafe conducted a Confirmatory Sampling Investigation (CSI) at SWMU 19. 2
 In all, seven direct push technology (DPT) locations were sampled around former UST 1648. Of 3
 the seven locations, subsurface soil samples were collected at four locations and fluvial deposits 4
 groundwater samples were collected at three locations. 5

4.2.1 CSI Objectives 6

The SWMU 19 CSI was conducted as part of the Assemblies G and H investigation. The purpose 7
 of this investigation was to better define the vertical and horizontal extent of the soil contamination 8
 identified during removal of UST 1648, and to assess the potential for groundwater contamination 9
 associated with former UST 1648. Although SWMU 19 was originally part of Assembly F, it 10
 was originally investigated concurrently with the CSI at SWMU 49 (an Assemblies G and H 11
 SWMU). However, full RFI characterization was deemed to be necessary at SWMU 19, so it has 12
 been regrouped in its original Assembly F status. 13

4.2.2 Sampling 14

The CSI consisted of collecting soil and groundwater samples at seven locations (Figure 4-1) using 15
 a DPT rig. Soil samples were collected from four locations around the former tank pit at a depth 16

interval of 12- to 15-foot bls. Groundwater samples were collected from the upper part of the
 fluvial deposits from the remaining three locations from depths of approximately 50 feet bls.

4.2.3 Analytical Procedures and Requirements

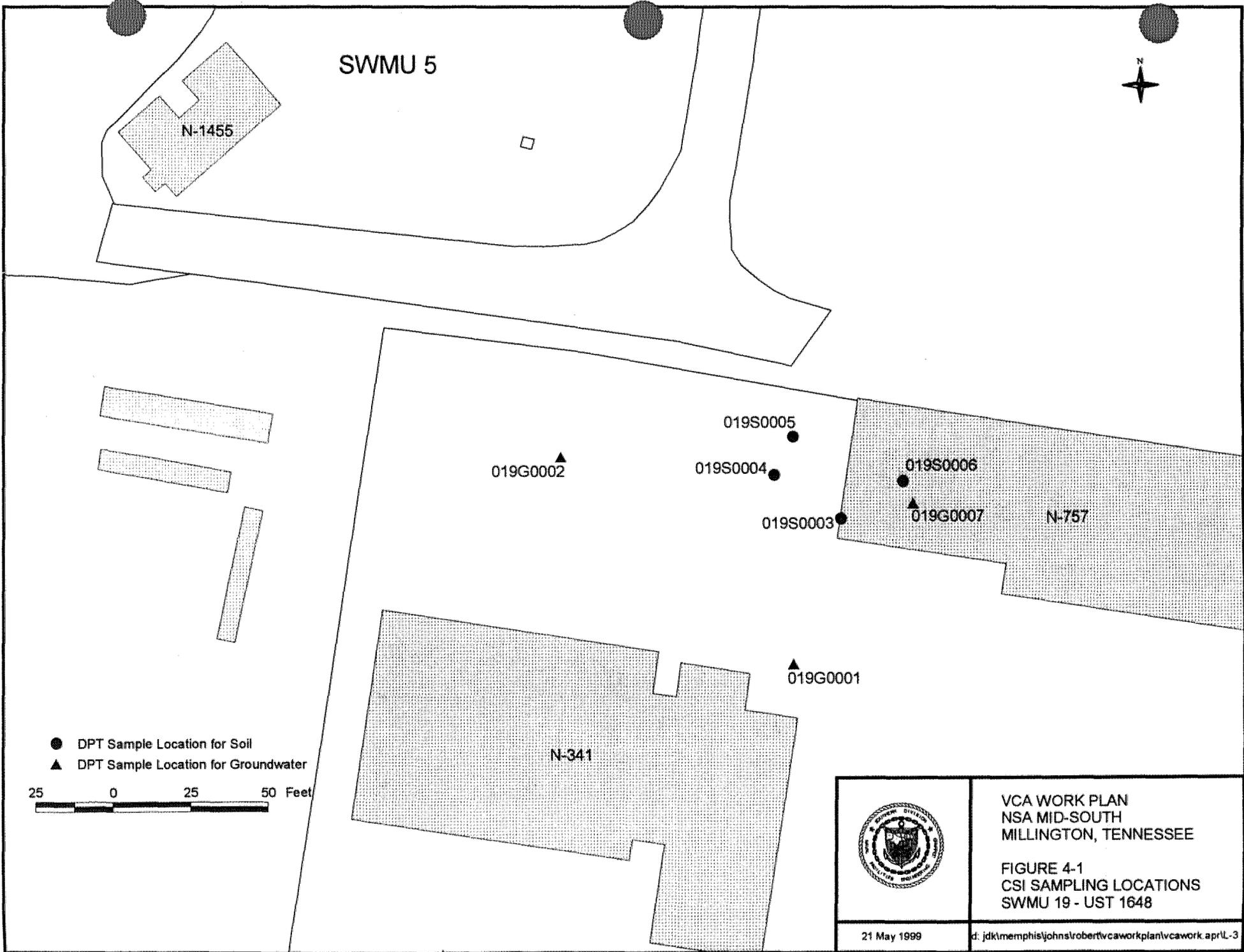
All CSI soil samples collected at SWMU 19 were analyzed at an offsite laboratory using the
 following methods:

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

All groundwater samples were analyzed at an offsite laboratory for VOCs using USEPA
 Method 8240. Table 4-3 lists the samples collected during the CSI and the analyses performed.

Table 4-3
CSI Sample Analytical Parameters — SWMU 19

Sample Location	Sample Depth	Analyses	Rationale
019S0003, 019S0004, 019S0005, 019S0006	Subsurface Soil 12 to 15 feet bls	VOCs, SVOCs, TPH, pesticides/PCBs, and Appendix IX metals	To assess the extent of contamination in soil and to estimate the volume of soil for possible removal.
019G0001, 019G0007, 019G0002	Fluvial Deposits 50 or 51 feet bls	VOCs	To determine if fluvial deposits groundwater had been impacted by SWMU 19 operations.



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 NSA MID-SOUTH
 MILLINGTON, TENNESSEE

FIGURE 4-1
 CSI SAMPLING LOCATIONS
 SWMU 19 - UST 1648



4.3 SWMU 19 CSI Results

VOCs, SVOCs, pesticides, TPH, and inorganics were identified in subsurface soil samples collected at SWMU 19. VOCs were also identified in fluvial deposits groundwater samples. Inorganics identified in soil at SWMU 19 were compared with background reference concentrations (RCs) to determine whether measured concentrations occur naturally or are indicative of contamination. The procedures used to determine the background RCs for inorganics are documented in the Technical Memorandum — *Reference Concentrations* (E/A&H, 1997). Concentrations of organics detected in soil were compared to soil-screening levels (SSLs) (USEPA, 1996a), except for TPH which has no established SSL. Organics detected in fluvial deposits groundwater were compared to tap water risk-based concentrations (RBCs) (USEPA, 1998) and maximum contaminant levels (MCLs) (USEPA, 1996b).

Table 4-4 presents the TPH analyses results in soil samples, while Tables 4-5 through 4-7 summarize analytical data for soil and groundwater samples collected during the CSI and present SSLs, RBCs, and/or RCs for comparison.

**Table 4-4
 SWMU 19 CSI
 Total Petroleum Hydrocarbon Detections in Soil (mg/kg)**

Location	Organic Compound	Result
019S0004	TPH	4,600
019S0005	TPH	740
019S0006	TPH	120

Table 4-5
 SWMU 19 CSI
 Organic Detections in Soil by Location ($\mu\text{g}/\text{kg}$)

Location	Organic Compound	SSL ^a	Result
019S0003	Acetone	8,000	74
019S0004	Acetone	8,000	220
	Chrysene	1,000	30 J
	Phenanthrene	1,400,000	56 J
	Pyrene	1,400,000	87 J
	Toluene	5,000	1.7 J
	bis(2-Ethylhexyl)phthalate (BEHP)	11,000	190 J
019S0005	Acetone	8,000	45 J
	Pyrene	1,400,000	28 J
	bis(2-Ethylhexyl)phthalate (BEHP)	11,000	78 J
019S0006	2-Butanone (MEK)	NA	15 J
	4-Methyl-2-Pentanone (MIBK)	NA	13 J
	Acetone	8,000	170
	Carbon disulfide	14,000	1.7 J
	Heptachlor	60	0.2 J
	bis(2-Ethylhexyl)phthalate (BEHP)	11,000	84 J

Notes:

- a — SSL considered protective of contaminant transfer from soil to groundwater (USEPA, 1996a).
- J — Compound was detected at a concentration less than the method reporting limit.
- NA — Not available.

Table 4-6
 SWMU 19 CSI
 Organic Detections in Groundwater ($\mu\text{g/L}$)

Location	Organic Compound	RBC ^a	MCL ^b	Result
019G0001	2-Butanone (MEK)	1,900	NA	6.2 J
	4-Methyl-2-Pentanone (MIBK)	2,900	NA	1.1 J
	Methylene chloride	4	NA	2.6 J
	Toluene	750	1,000	1.5 J
019G0002	2-Butanone (MEK)	1,900	NA	7.2 JB
	Toluene	750	1,000	0.65 J
019G0007	2-Butanone (MEK)	1,900	NA	4.8 J
	Methylene chloride	4	NA	2.6 J
	Toluene	750	1,000	0.95 J

Notes:

- a — Tap water RBCs are from the Risk-Based Concentration Table (USEPA, 1998).
- b — MCL values are from the *Drinking Water Regulations and Health Advisories* (USEPA, 1996b).
- J — Compound was detected at a concentration less than the method reporting limit.
- B — Compound was also detected in the corresponding method blank.
- NA — Not available.

Table 4-7
 SWMU 19 CSI
 Inorganic Detections in Subsurface Soil (mg/kg)

Location	Constituent	RC ^a	SSL ^b	Result
019S0003	Arsenic (As)	20.2	15	7.1
	Barium (Ba)	265	32	93.5
	Beryllium (Be)	1	180	0.37 J
	Cadmium (Cd)	3.24	6	0.09 J
	Chromium (Cr)	28.2	19	10.8 J
	Cobalt (Co)	14.4	NA	6.2
	Copper (Cu)	32.5	NA	15.1 J
	Lead (Pb)	19.8	NA	8.7 J
	Mercury (Hg)	0.18	3	0.02
	Nickel (Ni)	NA	21	16.4
	Vanadium (V)	43.7	NA	19.8
	Zinc (Zn)	109	42,000	48.5 J
019S0004	Arsenic (As)	20.2	15	9.5
	Barium (Ba)	265	32	127
	Beryllium (Be)	1	180	0.48 J
	Cadmium (Cd)	3.24	6	0.14 J
	Chromium (Cr)	28.2	19	12.6 J
	Cobalt (Co)	14.4	NA	7.4
	Copper (Cu)	32.5	NA	14.9 J
	Lead (Pb)	19.8	NA	15.8 J
	Mercury (Hg)	0.18	3	0.03
	Nickel (Ni)	NA	21	15.4
	Vanadium (V)	43.7	NA	23.5
	Zinc (Zn)	109	42,000	49.2 J

Table 4-7
 SWMU 19 CSI
 Inorganic Detections in Subsurface Soil (mg/kg)

Location	Constituent	RC ^a	SSL ^b	Result
019S0005	Arsenic (As)	20.2	15	7.7
	Barium (Ba)	265	32	172
	Beryllium (Be)	1	180	0.5 J
	Cadmium (Cd)	3.24	6	0.05 J
	Chromium (Cr)	28.2	19	14 J
	Cobalt (Co)	14.4	NA	10.5
	Copper (Cu)	32.5	NA	17.6 J
	Lead (Pb)	19.8	NA	20.7 J
	Mercury (Hg)	0.18	3	0.03
	Nickel (Ni)	NA	21	20.3
	Silver (Ag)	NA	NA	0.21 J
	Vanadium (V)	43.7	NA	23.5
	Zinc (Zn)	109	42,000	59.9 J
019S0006	Arsenic (As)	20.2	15	11.1
	Barium (Ba)	265	32	98.8
	Beryllium (Be)	1	180	0.5 J
	Chromium (Cr)	28.2	19	14.2 J
	Cobalt (Co)	14.4	NA	5.9
	Copper (Cu)	32.5	NA	18.3 J
	Lead (Pb)	19.8	NA	14.4 J
	Mercury (Hg)	0.18	3	0.02
	Nickel (Ni)	NA	21	16.3
	Vanadium (V)	43.7	NA	26.4
	Zinc (Zn)	109	42,000	59.5 J

Notes:

- a — SSL considered protective of contaminant transfer from soil to groundwater (USEPA, 1996a).
- b — RC from Technical Memorandum — *Reference Concentrations* (E/A&H, 1997).
- NL — Not Listed.
- J — Reported concentration is below the practical quantitation limit

No metals were identified in the soil samples exceeding both their background RC and SSL, and organic compound concentrations in soil were less than SSLs. According to these soil sample analytical results a soil removal at SWMU 19 would be unnecessary. However, TPH concentrations in soil need to be compared to regulatory guidance and action levels provided by the Tennessee Department of Environment and Conservation (TDEC).

4.4 Regulatory Action Levels

The TDEC, Division of Underground Storage Tanks (DUST) has 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 *Environmental Assessment Guidelines* (TDEC, 1996), have established cleanup levels for TPH in soil based on groundwater classification and soil permeability. Additionally, the NSA Mid-South, Public Works Department-Environmental Division (PWD-ED) requested an action level of 100 mg/kg in soil at depths shallower than five feet regardless of soil permeabilities and groundwater classification due to potential future construction activities.

Table 4-8 presents the criteria used to determine the site-specific cleanup standards for soil at depths greater than five feet under these guidelines.

Table 4-8
 TDEC Division of USTs
 TPH Cleanup Level Concentrations (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. Soil samples collected for permeability analysis at SWMU 19 indicate a vertical permeability from the 10 to 12 foot depth of the loess of 4.7×10^{-6} cm/sec. Groundwater is classified as a drinking water or a non-drinking water supply based partly on whether it exceeds USEPA drinking water standards. Based on samples collected from the loess at background wells throughout NSA Mid-South, groundwater in this unit exceeds certain national primary and secondary drinking water standards (USEPA, 1996b), as indicated in Table 4-9. Exceedances of either primary or secondary standards for loess groundwater probably are the result of relatively large amounts of suspended solids in the samples and analyses of total (non-filtered) water samples.

Table 4-9
Comparison of Background Loess Groundwater Data to
USEPA Drinking-Water Standards ($\mu\text{g/L}$)

Sample ID	Date	Constituent	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

The vertical permeability of the loess at SWMU 19 is between 10^{-4} cm/sec and 10^{-6} cm/sec and several background loess wells at NSA Mid-South have constituents exceeding drinking-water standards; therefore, the applicable TDEC cleanup level for TPH concentrations in SWMU 19 soil would be 500 mg/kg. As previously discussed, the NSA Mid-South, PWD-ED has requested that the TPH concentration cleanup level for soil from the surface to a depth of five feet bls be 100 mg/kg.

Based on a site-specific cleanup level for TPH of 500 mg/kg, data from Table 4-4 indicate that the subsurface samples from locations 019S0004 and 019S0005 exceed the cleanup level with concentrations of 4,600 mg/kg and 740 mg/kg, respectively. Based on these data, a soil removal is required at the former UST 1648 location.

5.0 REMOVAL ACTION

A remedial contractor under the direction of EnSafe will provide the necessary equipment and personnel to excavate, stockpile, and dispose of contaminated soil at SWMU 19. EnSafe will assist the contractor as necessary, collect confirmation and disposal samples, and compile the removal activities in a VCA report. If the excavated soil is not a hazardous waste, EnSafe will be responsible to complete and file a TDEC Special Waste Permit Application for disposal of the soil generated during the removal. The following activities will be performed by the designated staff; they are further described in subsequent sections.

- EnSafe will plan field activities 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 A, and the Site-Specific Health and Safety Plan (SSHASP) which is included as Appendix B.
- The Navy will designate an area to stockpile contaminated soil and the contractor will place plastic on the ground surface before stockpiling soil onsite.
- The contractor will excavate and stockpile 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 (yd³) of stockpiled soil.

- The contractor will backfill the excavated area with clean crushed limestone gravel and restore the surface to its original condition. 1
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- The contractor will cover the stockpile with plastic and maintain this cover until the soil is transported offsite for disposal. 3
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- EnSafe will coordinate disposal of soil and decontamination fluids resulting from field activities. 5
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- The contractor will remove all construction materials. 7
- The contractor will prepare an after action removal report. 8
- EnSafe will prepare a VCA report. 9

5.1 Pre-Removal Activities 10

Activities to be conducted before the soil removal are discussed in the following sections. 11

Orientation Meeting 12

Before performing any field activities at SWMU 19, 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, QA/QC sampling requirements, and sample packaging. Documentation requirements to be discussed will include the use of field forms, field logbooks, and photographic documentation. 13
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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

TDEC will be given at least two weeks notice by the Navy before any removal activities start. Soil excavation will commence with the removal of asphalt and gravel fill within a 20-foot by 30-foot area around locations 019S0004 and 019S0005 (Figure 5-1). The soil excavation will be conducted in 1-foot lifts, since there is limited subsurface soil data and the condition of the soil above 12 feet in depth is unknown. Soil samples will be collected from the bottom of each lift for field screening with an infrared (IR) TPH Plus Field Analyzer, which performs analyses based on USEPA Method 418.1 (IR method). If the TPH concentrations in samples above the depth known to be TPH-contaminated are less than the action level, then that soil will be staged separately from the soil that exceeds the action level and used as backfill material. Therefore, excavated soil will be staged in two separate stockpiles — one for soil with TPH concentration less than the action level and one for soil with TPH concentrations exceeding the action level. Removal of 1-foot lifts will continue until field screening indicates that soil remaining on the sides and bottom of the excavation (if the depth is greater than 5 feet) contain TPH concentrations less than the action level of 500 mg/kg.

If TPH concentrations in soil do not exceed action levels until 12 feet bls (top of the 12 to 15-foot bls sample interval), the amount of overburden soil to be removed is estimated at 270 yd³. If TPH concentrations above action levels are limited to the sample interval (12 to 15-foot bls), then an estimated 70 yd³ of TPH-contaminated soil will be generated.

The contractor is expected to excavate with a backhoe or trackhoe excavator. 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. All stockpiled soil will be placed on plastic and covered with plastic to prevent cross-contamination and/or erosion. The contractor 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 non-contaminated overburden will be used for backfill.

EnSafe personnel will collect soil samples with disposable spoons or decontaminated stainless-steel spoons and bowls from the excavation walls and base as each 1 foot lift is removed. Soil samples will be collected from the center of the excavator bucket, if necessary, to avoid entering the excavation and to avoid sample contamination from the bucket wall. Personnel will not enter the excavation once it is greater than 4 feet deep. Soil samples will be collected in accordance with the procedures described in Section 4.4.2 of the *Comprehensive RFI Work Plan*.

5.3 Post-Removal Activities

Several activities will be conducted after the field screening indicates TPH concentrations are below action levels, including collecting confirmation soil samples, backfilling the excavation, disposal of used personal protective equipment (PPE) and disposable sampling equipment, and disposal of the excavated soil.



SWMU 5

Building
N-757

Building
N-341



EXCAVATION AREA

20 0 20 40 60 Feet



VCA WORK PLAN
NSA MID-SOUTH
MILLINGTON, TENNESSEE

FIGURE 5-1
SWMU 19 - UST 1648
EXCAVATION AREA

21 May 1999

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Confirmation Soil Sampling

Once field screening demonstrates TPH concentrations in soil from the base and walls of the pit are less than the site-specific cleanup level, EnSafe will collect a 5-part composite sample from each of the excavation walls and one grab sample from each of the four corners of the excavation base. These confirmation soil samples will be analyzed onsite using the TPH Plus Field Analyzer for TPH and at an offsite laboratory for Appendix IX 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 contractor. EnSafe will collect samples of the water for offsite laboratory 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 contractor. 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 water disposal.

Backfill of the Excavation

The excavation will remain open until receipt of confirmation samples indicating soil exceeding site-specific cleanup levels have been removed and the BCT has approved backfilling of the excavation. The contractor will place a temporary fence or barricade around the excavation during and following excavation activities. Any overburden with TPH concentrations less than the action level will be used by the contractor for backfill along with pea gravel from an offsite source. After backfilling has been completed, the area will be resurfaced to match pre-removal conditions.

Disposal of Soil

Contaminated soil will be properly disposed of in accordance with current USEPA and TDEC regulations. Disposal of special waste soil will be arranged by EnSafe, while disposal of hazardous waste soil will be arranged by the Navy.

Removal of Construction Materials

After stockpiled soil has been removed and/or used as backfill, any debris or trash associated with field activities will be removed by the contractor. The contractor will be responsible for leaving the area as close as possible to its original condition.

Disposal of PPE and Disposable Sampling Equipment

Any used PPE or disposable sampling equipment, such as plastic sheeting, will be stockpiled along with the excavated soil for load out and disposal after the disposal profile is approved. Section 5.9, Investigation-Derived Waste, has additional information on waste disposal.

The Voluntary Corrective Action Report

Following the soil removal, the contractor will submit a report describing its activities. Additionally, EnSafe will prepare a VCA report after field activities are complete 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.

- Manifests for soil disposal (if available at the time of report) and a description of water removal during the project, if any.

5.4 Analytical Requirements

Analytical requirements for the samples to be collected at SWMU 19 are summarized in Table 5-1. Confirmation samples will be analyzed for TPH (Field IR) and Appendix IX metals (U.S. EPA Method 6010/7000 series). One characterization sample for disposal of every 100 yd³ of soil will be collected and analyzed for TCLP lead and TCLP benzene. EnSafe will collect any additional samples required by the disposal facility and submit them for the required analyses.

Table 5-1
Sample Summary and Analytical Requirements

Sample Type	Matrix	Analytical Parameters	Rationale	Turnaround Time	Laboratory
Extent Verification	Soil	TPH based on USEPA Method 418.1	Waste oil and hydraulic fluid in the tank leaked into the surrounding soil	Field Analysis	N/A
Confirmation	Soil	TPH Method 418.1	TPH - Due to waste oil contamination.	Field Analysis	N/A
		Appendix IX Metals	Metals - Waste oil often contains various metals.	5 days	Offsite laboratory
Soil Disposal	Soil (Excavated Material)	TCLP lead TCLP benzene*	Required by TDEC Division of Solid Waste	5 days	Offsite laboratory

Notes:

- NA — Not applicable.
- * — Additional analyses may be required by the disposal facility.

Field measurements at SWMU 19 will be conducted in accordance with Section 4.10.1 of the *Comprehensive RFI Work Plan*. Field IR 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 procedures 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). EnSafe and/or the NSA Mid-South, PWD-ED will handle disposal of IDW.

6.0 QUALITY ASSURANCE PLAN

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The quality assurance procedures presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed for sampling activities at SWMU 19.

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7.0 DATA MANAGEMENT PLAN

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The data management procedures presented in Section 5 of the *Comprehensive RFI Work Plan* will
be followed for sampling activities at SWMU 19.

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8.0 HEALTH AND SAFETY PLAN

EnSafe will not have responsibility for the soil removal; therefore, the contractor shall provide to the Navy 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 site-specific information concerning types of activities and site contaminants. The contractor's health and safety plan must be submitted to TDEC for review prior to its implementation. During confirmation sampling, EnSafe personnel will comply with the CHASP (Appendix A) and the SSHASP (Appendix B).

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Appendix A
Comprehensive Health and Safety Plan

7.0 COMPREHENSIVE HEALTH AND SAFETY PLAN (CHASP)

A Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) is being conducted at the Naval Air Station (NAS) Memphis, Tennessee. The purpose of this program is to assess the nature and extent of contamination at the site and to determine if follow-up action is required to maintain compliance with environmental regulations.

This Comprehensive Health and Safety Plan (CHASP) is applicable to field operations to be conducted during the RFI at NAS Memphis. The Navy project contract number with EnSafe/Allen & Hoshall (E/A&H) is N62467-89-D-0318. A Site-Specific Health and Safety Plan (SSHSP) will be developed and implemented to address site-specific activities and hazards.

The provisions of this plan are mandatory for E/A&H personnel and those personnel under contract to E/A&H or the Navy e.g., the United States Geological Survey (USGS) whose work responsibilities call for them to enter a work zone (See 7.3 Work Areas). Such personnel must read this plan and sign the plan acceptance form (See Attachment C) before starting site activities. In addition, such personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, *Standards for Hazardous Waste Workers and Emergency Responders* (HAZWOPER). These regulations include the following provisions for employees exposed to hazardous substances, health hazards, or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment (PPE) described in 120(g).

All non-E/A&H personnel present in E/A&H work areas shall either adopt and abide by this CHASP and the corresponding SSHSP or shall have their own safety plan which, at a minimum, meets the requirements of the E/A&H CHASP and SSHSP.

At least one person certified in CPR and First Aid will be present during field activities. In addition, the E/A&H employees that are onsite will be certified in CPR and First Aid.

7.1 Site Characterization

Upon review of available information, the following chemicals are representative of the types of chemical hazards (contamination) known or suspected to be present on NAS Memphis: benzene, toluene, ethylbenzene, xylene, polychlorinated biphenyls (PCBs), naphtha, waste oils, and cleaning solutions. SSHSPs shall be designed to protect workers from chemical hazards known or suspected to be present at a specific location. The following information will be included in the SSHSP:

- A site map displaying the location of planned work areas within the site
- The expected site-specific contaminants of concern and the (suspected) magnitude and scope of the situation
- Decontamination procedures
- A material safety data sheet (MSDS) for each contaminant known or expected of being present

7.1.1 Work Areas

Site control for all work areas will be established and maintained according to the recommendations in the EPA's *Interim Standard Operating Safety Guides*, Revised September, 1982. Three general zones of operation, each described below, will be established to reduce the potential for contaminant migration and risk of personnel exposure:

- The exclusion zone (EZ) or "hot zone"

- contamination reduction zone (CRZ), and the
- support zone (SZ)

Field personnel shall enter the SZ and don their PPE, then they will move through the CRZ and into the EZ. After completing their work or when taking a break they will leave the EZ through the CRZ, decontaminate themselves and their equipment, and leave the area through the SZ.

The exclusion zone is the area being investigated, sampled, or otherwise of interest. It is where chemical contamination is known or suspected to exist. The EZ includes the work area except for areas set aside as either the CRZ or SZ. The EZ will be defined and demarcated in the field; in the case of drilling, the EZ is typically about 50 feet in diameter with the borehole located in the middle.

Only authorized personnel that meet the training requirements of OSHA 29 CFR 1910.120 (40 hour HAZWOPER course/8-hour annual refresher course/24-hour supervised onsite training or equivalent) are permitted within the exclusion and contamination reduction zones. Documentation of these certifications will be maintained on site, as well as in the site trailer, at all times. Prior to entering the EZ, and at all times when in the EZ, all personnel shall be outfitted in and properly use all required PPE. A checkpoint may be established at the edge of the EZ to regulate the flow of personnel and equipment in and out of the area.

When using Level A, B, or C PPE, all personnel entering the EZ must use the "buddy system". All persons entering the EZ must be able to:

- Provide his or her partner with assistance
- Observe his or her partner for signs of chemical or heat exposure
- Periodically check the integrity of his or her partner's protective clothing
- Notify the shift supervisor, his representative, or others if emergency help is needed

Additionally, at least one person shall remain outside the EZ and have available at least the same level of PPE as those who entered the EZ. The person outside the EZ will provide logistical and safety support as needed.

The contamination reduction zone serves as a buffer between the EZ and the SZ and is intended to prevent the spread of contaminants from the work areas. All decontamination procedures will be conducted in this area. The CRZ shall be adjacent to and upwind of the EZ and include all decontamination stations. When leaving the SZ and entering the CRZ, personnel must be wearing the prescribed PPE. Exiting the CRZ requires the removal of all contaminants through compliance with established decontamination procedures as contained herein and in the corresponding SSHSP.

The support zone is the outermost area and is considered a non-contaminated or clean area. The support area will be equipped with an appropriate first-aid station and equipment to perform gross decontamination of health and safety equipment (e.g., air monitoring equipment). The SZ is adjacent to and upwind of the CRZ.

The actual location and boundary of work zones will be determined and demarcated in the field. Existing site conditions such as prevailing wind direction, location of utilities, roads, security, etc., shall be considered when determining zone locations.

Changes in meteorologic conditions or site conditions may necessitate relocating the CRZ or SZ. These conditions (e.g., wind direction, surface water run-off patterns, etc.) will be monitored at all times. A wind sock or similar device will be placed in a location visible to all site workers.

7.1.2 Work Area Access

A file will be maintained onsite that includes a current OSHA initial HAZWOPER training certificate (or copy) and an up-to-date refresher certificate for all employees involved in field activities. Employees that are unsure that a copy of their certificate is onsite shall bring a copy of their certificate with them and present it to the Site Health and Safety Officer before beginning field work. Personnel that fail to meet or abide by the criteria established in the CHASP or SSHSP shall be restricted from entering work areas.

Subcontractors, DOD oversight personnel, and other site visitors must provide the Site Health and Safety Officer with documentation showing that their HAZWOPER training is current and must agree to comply with this CHASP and the corresponding SSHSP or equivalent health and safety requirements prior to site entry. Personnel that fail to meet or abide by the criteria established in the CHASP or SSHSP shall be restricted from entering work areas.

The Site Health and Safety Officer may suspend site work and may instruct personnel to evacuate the area. Examples of situations when this may happen are:

- Site conditions have changed, for whatever reason, such that the SSHSP does not adequately address the current situation,
- Safety precautions being used are inadequate for the situation, or
- Personnel including E/A&H, subcontractors, visitors, or DOD are or may be exposed to an immediate health hazard.

7.1.3 Site History and Description

A review of the existing site data will be conducted to assess the potential hazards to be encountered by E/A&H and contractor personnel and addressed in the SSHSP. The location of NAS Memphis is shown on Figure 2-1, Vicinity Map.

7.2 Site Activities

Field activities to be conducted as part of this RFI (e.g., soil borings, well installations, and well development) are described in the E/A&H Comprehensive Sampling and Analysis Plan (CSAP). Specific health and safety procedures associated with specific activities, hazards, and/or sites are addressed in the appropriate SSHSP.

The Site Supervisor will manage the day-to-day field operations which includes assigning field staff to specific work tasks and coordinating any required logistical support. The Site Supervisor has the authority to suspend or postpone specific field operations if he or she believes that worker health and safety concerns have not been adequately addressed.

Certain activities present a level of hazard that must be dealt with on a case by case basis. These activities are neither covered by this CHASP nor by a SSHSP. Examples of such activities are: confined space entry; moving or sampling of unknown drums or containers; and entering excavations, trenches, or test pits that are more than three feet deep. Should the Project Manager or Site Supervisor deem it necessary to perform an activity such as those listed above, it is that person's responsibility to contact the Project Health and Safety Officer and request an addendum to the SSHSP specifying the health and safety procedures, training, and conditions necessary for undertaking that task. These activities are prohibited until the SSHSP addendum is reviewed, accepted, and implemented.

7.3 Chemical Hazards

Information about specific site chemical hazards will be provided in each SSHSP. Such information will include National Fire Protection Association (NFPA) ratings, symptoms of acute and chronic exposure, carcinogenicity, and OSHA permissible exposure limits (PELs). A table of exposure guidelines for expected site chemicals will be provided. Information in this table will include odor thresholds, OSHA PELs, American Conference of Governmental Industrial Hygienists threshold limit values (ACGIH TLVs), National Institute for Occupational Safety and

Health recommended exposure limits (NIOSH RELs), auto-ignition temperatures, and flammability ranges. Material Safety Data Sheets for these materials will be included in Attachment A of each SIP.

7.4 Operations and Physical Hazards

Field personnel should be aware of and act in a manner to minimize the dangers associated with physical hazards typically encountered during environmental investigations. These hazards include heat-related illnesses, uneven terrain, slippery surfaces, lifting, and use of heavy equipment. Electrical lines may be present either above or below ground, and underground gas lines may be present. Prior to the initiation of drilling activities, drilling locations must be cleared by the Naval Public Works Center (PWC).

Heavy equipment and drill rig operations will be conducted in accordance with the procedures outlined in Attachment A — *Drilling Safety Guide*, provided in this plan. Personnel conducting drill rig operations shall keep clear of all moving parts. To prevent entanglement with the drill rig, loose clothing shall not be worn. The Site Supervisor and Site Health and Safety Officer shall be aware of the potential for heat stress and other weather-related illnesses, and shall implement appropriate work regimens to minimize the likelihood of field personnel becoming ill. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. When working in areas that support habitat for poisonous snakes, personnel shall wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

7.5 Employee protection

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

7.5.1 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, unless authorized by the Site Health and Safety Officer.**
- **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 on 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.**
- **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 touch or pass close to any overhead lines.**

- Due to the possible presence of underground utilities (including electric, natural gas, water, sewer, telephone, etc.), the activity 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 all subsurface investigations.
- Due to the flammable properties of some 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.

7.5.2 NAS 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 altering of any government records is forbidden.
- 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 verbal, 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 or slacks or coverall-type garments will be worn at all times on government property.**
- **All persons operating motor vehicles will obey all NAS Memphis traffic regulations.**

7.5.3 Selection of Personal Protective Equipment

It is important that PPE be appropriate to protect against the potential or known hazards at each cleanup or 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 past experiences and sound safety practices.

Table 7-1
Level of Protection and Criteria

Level of Protection	Criteria for Use	Equipment
Level A	<ul style="list-style-type: none"> • 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 potential 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. • When the type(s) and/or potential concentration of toxic substances are not known. 	<ul style="list-style-type: none"> • Positive-pressure full facepiece self-contained breathing apparatus (SCBA) or positive-pressure supplied air respirator with escape SCBA. • Fully-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. • Optional: coveralls, long cotton underwear, disposable protective suit, gloves and boots, over fully encapsulating suit.
Level B	<ul style="list-style-type: none"> • When respiratory protection is warranted and cartridge respirators are not appropriate. Examples of these conditions are: When work areas contain less than 19.5 percent oxygen, When expected contaminants do not have appropriate warning properties e.g. vinyl chloride, or When cartridges are not available to protect against all contaminants of concern. 	<ul style="list-style-type: none"> • Chemical resistant clothes, long sleeves, hooded, one or two pieces. • Positive-pressure full facepiece 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. • Optional: coveralls and disposable outer boots.
Level C	<ul style="list-style-type: none"> • When respiratory protection is warranted and cartridge respirators are appropriate. • When work areas contain at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> • Chemical resistant clothes, long sleeves, hood optional, one or two pieces. • Full-facepiece, 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.

Table 7-1 Level of Protection and Criteria		
Level of Protection	Criteria for Use	Equipment
Level D	<ul style="list-style-type: none"> • When level B or C is not indicated. • When airborne particulates do not warrant respiratory protection. • When work areas contain at least 19.5 percent oxygen. 	<ul style="list-style-type: none"> • 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. • Optional: coveralls and disposable outer boots.

Notes:

Level A protection will be selected when the highest available level of respiratory, skin, and eye protection is needed.

Contraindications for use of Level A:

- Environmental measures 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 effect 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 mg/m³ or the total concentrations exceed the PEL of 15 mg/m³.

Level D protection will be chosen when measurements of atmospheric concentrations are less than 2 ppm above background levels and work functions preclude splashes, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemicals.

The Project Health and Safety Officer will determine the appropriate level of PPE prior to the initial entry based on the best available information. 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 Project Health and Safety Officer.

Field activities which disturb soils will be initiated in Modified Level D protection except when stated otherwise in the SSHSP or site conditions (e.g., sampling results from previous studies) indicate that modified Level D is inappropriate. Modified Level D protection consists of a hard hat, appropriate chemical-resistant gloves (vinyl or nitrile), eye protection, and chemical-resistant, steel-toed and shank 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 levels of contamination detected in previous studies were low and free product was not detected.

PPE upgrades to Level C will be initiated if airborne concentrations exceeds 2 ppm above the background concentration in the breathing zone or if concentrations of any contaminant exceeds 50 percent of the OSHA PEL. See Table 7-1 for the specific criteria for use and the equipment required for each level of protection.

7.5.4 Air Monitoring

Previous site work indicates that workers may potentially be exposed to low concentrations of numerous chemicals including volatile organic compounds (VOCs), halogenated compounds, and combustible gases/vapors. Based on site history and existing sampling data, "worst case" contaminated areas will be identified prior to initiation of field activities.

Air monitoring using a photoionization detector (PID) and/or other appropriate sampling equipment will be conducted prior to beginning field activities at a new EZ and during ground disturbing activities. The PID will be field calibrated to measure VOCs relative to a 100 ppm

isobutylene standard. If 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.

A combustible gas indicator (CGI) will be used during all soil borings and well installations. The CGI will be field calibrated to measure flammable gases relative to a 23 percent lower explosive limit (LEL) methane standard. Downhole CGI readings will be collected continuously during all soil disturbing operations. Field activities will immediately cease if downhole readings exceed 10 percent LEL. If CGI readings do not subside, a careful investigation and mapping of the area will be made. Operations may not proceed until readings are below 10 percent LEL. The area will be immediately evacuated and the situation re-evaluated to determine how to proceed.

If breathing zone levels exceed 2 ppm 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 both the Project Manager and the Project Health and Safety Officer. The Project Health and Safety Officer 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. (Typically, PPE will be upgraded to Level C assuming that cartridge respirators are appropriate, otherwise Level B.) See Table 7-1 for specific criteria for each protection level. Work shall not proceed until breathing zone levels return to background levels, and it is reasonably anticipated that breathing zone samples will stay approximately at background levels; or the chemical constituent(s) are identified and appropriate PPE is donned.

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

On a daily basis, PIDs, CGIs, and other monitoring equipment shall be calibrated 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 work day at which time each instrument will be checked to ensure that it is free from surface contamination. Field staff shall record in their field notebooks the fact that they conducted these calibrations and checks and note whether the equipment was or was not functioning properly. When equipment is not functioning properly, it should be brought to the attention of the Site Supervisor or Site Health and Safety Officer who will arrange for repairs and/or replacement of that equipment as needed.

7.5.5 Procedures and Equipment for Extreme Weather Conditions

The seasonal climate in Memphis can be expected to be hot with high relative humidity in the summer months and moderately cold to extremely cold in the winter months. Therefore, heat-and-cold stress will be of concern for all personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot and cold weather can cause physical discomfort, loss of efficiency, and personal injury.

7.5.5.1 Exposure to Hot Weather

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Various levels of personal protection may require wearing low permeability disposable suits, gloves, and boots which will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site.

Heat stress is the metabolic and environmental heat to which an individual is exposed. The manifestations of heat strain are the adjustments made by an individual in response to the stress. The three most important categories of heat-induced illness are: heat exhaustion, heat cramps, and heat stroke. These disorders can occur when the normal responses to increased sweat

production are not adequate to meet the needs for body heat loss or when the temperature regulating mechanisms fail to function properly.

Heat exhaustion is a state of collapse brought about by an insufficient blood supply to the cerebral cortex portion of the brain. The crucial event is low blood pressure caused by inadequate heart output and widespread dilation of blood vessels.

Heat Exhaustion Factors — Factors which can lead to heat exhaustion are as follows:

- Increased dilation of blood vessels causing a decreased capacity of circulation to meet the demands for heat loss to the environment from exercise and from digestive activities.
- Decreased blood volume due to dehydration.
- Reduced blood volume due to lack of physical training, infection, intoxication (from industrial contaminants as well as from drinking alcohol), or heart failure.

Heat Exhaustion Symptoms — The symptoms include extreme weakness or fatigue, dizziness, nausea, or headache. More severe cases may also involve vomiting and possible unconsciousness. The skin becomes clammy and moist, the complexion pale, and the oral temperature stays normal or low, yet the rectal temperature is usually elevated (99.5°F - 101.3°F). Workers who are unacclimated run the highest risk.

Heat Exhaustion Treatment — In most cases, treatment of heat exhaustion is fairly simple. The victim will be moved to a cool place. If the victim is unconscious, medical assistance must be sought. Mild cases may experience immediate recovery; however, more severe cases may require several days care. No permanent effects have ever been reported.

Heat cramps result when the working muscles go into painful spasms. This may occur in people who perspire profusely in heat and who drink large quantities of water, but who fail to replace their bodies' salt. It is the low salt content in the blood that causes the cramping. The abdominal muscles as well as the muscles in the arms and legs may be affected. The cramps may appear during or even after work hours. Persons on a low sodium diet should not be given salt. A physician must be consulted for care of people with this condition.

Heat stroke is the most serious of the health problems that can arise while working in hot environments. It is caused by the breakdown of the thermo-regulatory system under conditions of stress. When this happens, perspiration stops, and the body can no longer regulate its own temperature.

Heat Stroke Symptoms — A heat stroke victim may be identified by hot, dry, and unusually red or spotted skin. The body core temperature can exceed 105°F. Mental confusion, irritability, and chills are common. These are all early warning signs of heat stroke; if the sufferer is not removed from the hot environment at once, more severe symptoms can follow, including unconsciousness, delirium, and convulsions, possibly ending in death.

Heat Stroke Treatment — Heat stroke must be treated as a major medical emergency; medical assistance must be summoned immediately.

Additional treatment:

- First aid must be administered.
- Individual must be moved to a cool location.
- Individual must be cooled through wetting, fanning, or immersion.

Care should be taken to avoid over-cooling and to begin treatment for shock by raising the legs. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

To reduce the potential for heat strokes:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

• **Additional Measures for Extremely Warm Weather:**

- Wear cooling devices to aid in ventilation. (NOTE: the additional weight may affect efficiency.)
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing protective clothing (if required).

7.5.5.2 Exposure to Cold Weather

Persons working outdoors in temperatures at or below freezing may experience frostbite or hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface-area-to volume ratio, such as fingers, toes, and ears, are the most susceptible.

Two factors influence the development of cold injury: ambient temperature and wind velocity. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air, thus, on a cold day the body can cool quickly when PPE is removed and if a person has wet clothing underneath.

Frostbite is a condition in which the cold temperature forms ice crystals in the cells and tissues, dehydrating protoplasm and killing tissues. At the same time, circulation of the blood is blocked. Frostbite could lead to gangrene and amputation.

Frostbite damage occurs in several degrees:

- **Frost nip, or incipient frostbite is characterized by sudden whitening of the skin.**
- **When superficial frostbite occurs, the skin has a waxy or whitish look and is firm to the touch; however, the tissue underneath has retained its resiliency.**
- **In deep frostbite, the tissues are cold, pale, and solid. The injury is severe. In addition to frostbite, other physiological reactions to cold may be experienced as well. Trench foot, for example, may result from prolonged exposure to low temperatures near, though possibly above, freezing. Walking on the foot is very painful. In very severe cases, the flesh dies and the foot may have to be amputated. Immersion foot is very similar although it is less severe. Although amputation is unusual, some mobility of the limb is lost. Blisters may occur around the lips, nostrils, and eyelids.**

Chilblain (pernio), which is an inflammation of the hands and feet caused by exposure to cold and moisture, is characterized by a recurrent localized itching, swelling, and painful inflammation on the fingers, toes, or ears, produced by mild frostbite. Such a sequence produces severe spasms and is accompanied by pain.

Hypothermia occurs when the body loses heat faster than it can produce it. The initial reaction involves the constriction of blood vessels in the hands and feet in an attempt to conserve the heat. After the initial reaction, involuntary shivering begins in an attempt to produce more heat.

Temperature is only a relative factor in cases of hyperthermia. Cases of exposure have occurred in temperatures well above freezing. Humidity is another important factor. Moisture on the skin and clothing will allow body heat to escape many times faster than when the skin and clothing are dry.

Hypothermia occurs when the body's core temperature drops below 96°F. When this happens, the affected person becomes exhausted. He may begin to behave irrationally, move more slowly, stumble, and fall. The speech becomes weak and slurred. If these preliminary symptoms are allowed to pass untreated, stupor, collapse, and unconsciousness occur, possibly ending in death.

To reduce effects of cold exposure:

- **Stay dry.** When the temperature drops below 40°F, change perspiration soaked clothes frequently. When clothes get wet, they lose about 90 percent of their insulating value.
- **Beware of the wind.** A slight breeze carries heat away from bare skin much faster than still air. Wind drives cold air under and through clothing. Wind refrigerates wet clothes. Wind multiplies the problems of staying dry.
- **Understand cold.** Most hypothermia cases develop in temperatures between 30°F and 50°F. Cold water running down the neck and legs or cold water held against the body by wet clothes causes hypothermia.
- **Have shelter available.** Make adequate dry, warm shelter available.
- **Provide warm drinks.**

- **Never ignore shivering.** Persistent shivering is a clear warning that a person is on the verge of hypothermia. Allow for the fact that exposure greatly reduces normal endurance. Warmth generated by physical activity may be the only factor preventing hypothermia.

7.5.6 Personal Decontamination

A CRZ will be established immediate to each sampling/boring site and will include a station for decontaminating equipment and personnel. The CRZ will be covered with sheets of 6-mil polyethylene (typically an area 20-feet by 20-feet is sufficient) with specific stations that will accommodate the removal and disposal of the protective clothing, boot covers, gloves, and respiratory protection if required.

As a general rule, equipment will be decontaminated using a soap and clean water wash solution. Equipment decontamination will be completed by personnel in Level D PPE. In the event of inclement weather (e.g., lightning) or an emergency requiring immediate evacuation, all contaminated equipment will be wrapped and taped in 6-mil polyethylene sheeting and tagged as "contaminated" for later decontamination.

Personnel working in the CRZ will be in one Level of PPE lower than personnel in the EZ. For example, if personnel in the EZ are in Level B, decon workers will be in Level C.

7.5.6.1 Personal Decontamination Procedures

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

- **Brushing heavily soiled boots and rinsing outer gloves and boots with soap and water.**
- **Removing outer gloves and depositing them in a plastic-lined container.**
- **Removing outer chemical protective clothing.**

- **Washing and rinsing inner gloves.**
- **Hard hats and eye protection should be washed thoroughly at the end of each work day with a soap and water solution.**
- **Disposable gloves and any disposable clothing will be disposed of in sealable bags and placed in a clearly labeled 55-gallon drum for disposal by the Navy.**
- **All field personnel are to be instructed to shower as soon as possible after leaving the site.**

Decontamination procedures will be conducted at the lunch break and at the end of each work day. If higher levels of PPE are needed, adjustments will be made to these procedures and an amendment will be made to this CHASP.

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

7.5.6.2 Closure of the Personal Decontamination Station

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

7.5.7 Work Limitations

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as

specified in 29 CFR 1910.120(e). All supervisors must complete an additional 8 hours of training in site management. All personnel must complete an 8-hour refresher training course on an annual basis in order to continue working at the site.

7.5.8 Exposure Evaluation

All personnel scheduled for site activities will have had a baseline physical examination which includes a stressing exam of the neurologic, cardiopulmonary, musculoskeletal and dermatological systems, pulmonary function testing, multi-chemistry panel and urinalysis, and will have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. An examination and updated occupational history will be repeated on an annual basis and upon termination of employment, as required by 29 CFR 1910.120(f). The content of the annual or termination examination will be the same as the baseline physical. A qualified physician will review the results of the annual examination and exposure data and request further tests or issue medical clearances as appropriate.

After any job-related injury or illness, there will be a medical examination to determine fitness for duty or any job restrictions. The Site Health and Safety Manager will review the results with the examining physician before releasing the employee for work. A similar examination will be performed 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 maintained by the employer or the physician for at least 30 years following the termination of employment.

7.6 Medical Monitoring Program

All E/A&H or USGS personnel who enter hazardous-waste/spill sites or have the potential for exposure to hazardous materials from these sites must participate in the E/A&H Medical Monitoring Program or an equivalent program. The program is conducted by E/A&H's company doctor with the company Health and Safety Officer. The purpose of the program is to identify any pre-existing illnesses or problems that would put an employee at unusual risk

from certain exposures or respirators, and to monitor and evaluate exposure-related events where workers are involved in handling hazardous materials. Project managers should consult with the Health and Safety Officer and/or the company doctor concerning the scope of work and known or anticipated chemical hazards associated with each project.

- E/A&H maintains the right to exclude certain individuals from particular jobs based on reports from the company doctor. The program will be reviewed on an annual basis to determine its effectiveness. The company doctor has been employed as an independent contractor to provide medical monitoring for E/A&H.

The doctor is responsible for the following aspects of the Medical Monitoring Program:

- Selection and quality assurance of medical and laboratory services involved in carrying out the monitoring program.
- Development of a uniform medical record.
- Record retention.
- Employee notification of examination results.
- Determination of content of the medical and biological monitoring programs.
- Record review and correlation between potential exposure and effect.
- Monitoring job-related illness and injury for each employee.

7.6.1 Preplacement Examinations

Each E/A&H employee will be given a preplacement examination: to identify any preexisting illness or problem that would put the employee at an unusual risk from certain exposures; to assure that each employee can safely use negative-pressure respirators; and to develop a database to assess any exposure-related events detected during periodic medical monitoring. Data accumulation will include variables such as age, sex, race, smoking history, prior employment history, and other conditions that might bear upon the occurrence of subsequent events once employment begins.

The preplacement examination includes:

- Occupational history including previous chemical and carcinogenic exposures.
- Medical history including demographic data, family history, personal habits, past medical history, and a review of current systems.
- Fertility history.
- Physical examination stressing the neurologic, cardiopulmonary, musculoskeletal, and dermatological systems.
- Physiological parameters including blood pressure and visual acuity testing.
- Pulmonary function testing including FVC, FEVI, and FEV 25-75.
- Electrocardiogram.
- PA and lateral chest X-ray.

- A multi-chemistry panel including tests of kidney and liver function.
- Red blood cell cholinesterase.
- Audiogram.

The history, physiological parameters, X-ray, screening tests, and laboratory studies will be conducted before the physical examination. After the physical examination, the medical examiner will review the results of the examination and special studies with each employee and facilitate referral for further evaluation of abnormalities detected during this examination. The Site Health and Safety Officer will provide each employee with a written summary and detailed results of the examination along with identification of any job restrictions. Additional medical testing procedures (e.g., ophthalmology/optometric assessment, specialized audiometric testing, etc.) may be required at the discretion of E/A&H's attending physician.

7.6.2 Periodic and Exit Examinations

An examination and updated occupational history will be repeated annually and include:

- Updated occupational and medical history.
- Physical examination stressing the neurologic, cardiopulmonary, musculoskeletal, and dermatological systems.
- Pulmonary function testing including FVC, FEVI, and FEV 25-75.
- Multi-chemistry panel including tests of kidney and liver function.
- Urinalysis.

The company doctor will review the results of annual examination and exposure data and request further tests or issue medical clearances as appropriate. An examination will also be administered when an employee leaves the company. The company doctor will be consulted for the contents of the exam except when the employee has had an exam within 6 months, or when there has been no site work since the last examination.

7.6.3 Return-to-Work Examinations

After any job-related injury or illness, a medical examination is required to determine fitness for duty or to identify any job restrictions. The medical examiner will review the results of this back-to-work examination with the company doctor before releasing the employee for work. A similar examination will be performed if an employee has missed at least three days of work due to a non-job-related injury requiring medical attention.

7.6.4 Confidentiality

Medical records will be maintained in a confidential manner so that only authorized persons will have access to the records. The authorized personnel will include medical staff of the joint venture or contract medical personnel, the individual, the individual's personal physician, or the individual's designated representative. Upon written request, the individual may obtain a copy of the medical file which will be provided within 15 days of the receipt of the written request. Information used for research, testing, statistical, or epidemiologic purposes will have all identifying data removed including the identity of the individual. Any medical information or findings obtained which do not affect the individual's job performance will not be made available to E/A&H in order to maintain the patient-physician confidentiality. Upon death, retirement, resignation, or other termination of services, the records will be retained by E/A&H or contracting physician.

7.7 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 – Lawson Anderson/Robert Smith (E/A&H)
- Project Manager – Robert Smith (E/A&H)
- Project Health & Safety Officer – Mr. Doug Petty (E/A&H)
- Field Environmental Scientist – Ms. Carol Davis (E/A&H)
- Field Geologist – Mr. Ben Brantley (E/A&H)
- Site Supervisor – To Be Determined
- Site Health & Safety Officer – To Be Determined
- Engineer-in-Charge – Mr. Mark Taylor (SOUTHDIV)
- Naval Air Station Memphis, Tennessee Site Contact – Ms. Tonya Barker

7.7.1 Responsibilities of Site Supervisor

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

- Field staff follow the CHASP, SSHSP, and other safety and health standard operating procedures (SOPs). Personnel that do not comply are retrained and/or instructed to leave the site and not allowed to return.
- Field staff have current HAZWOPER training.
- Field staff know who the Site Health and Safety Officer is.
- Field staff know the site-specific safety and health concerns.
- There is an adequate onsite supply of health and safety equipment.

- Field staff participate in the E/A&H Medical surveillance program (or in the case of 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 assuring that field staff who may be exposed to unique or special hazards have the training or experience necessary to safely conduct their work.

7.7.2 Responsibilities of Site Health and Safety Officer

The responsibilities of the Site Health and Safety Officer include:

- Providing the Site Supervisor with 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 observing whether field staff are utilizing proper work practices and decontamination procedures.
- Reporting significant safety violations to the Project Manager and/or Project Health and Safety Officer.
- Conducting safety briefings during field activities.
- Assuring that a copy of the Health and Safety Plan is maintained onsite during all field activities.
- Maintaining a file of HAZWOPER training certificates and appropriate refresher training certificates for onsite personnel.

The Site Health and Safety Officer will have the following qualifications: (1) 40 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 work tasks being conducted, and (4) shall be trained to use the air monitoring equipment; be able to interpret the data collected with the instruments; be familiar with symptoms of chemical exposure, heat stress, and cold exposure; and know the location and proper use of onsite safety equipment. He will also be familiar with this CHASP.

The position of Site Health and Safety Officer 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 Site Health and Safety Officer during a particular task. When that task is completed and/or field staff change, the Site Health and Safety Officer may change as well.

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. The SAP calls for one work shift per day. If circumstances arise that require multiple work shifts, an alternate Site Health and Safety Officer will be designated.

7.7.3 Responsibilities of Onsite Field Staff

The health and safety responsibilities of field staff include:

- Being familiar with and complying with the CHASP and SSHSP.

- Attending site health and safety briefings and being aware of anticipated chemical, physical, and biological hazards and knowing what to do when these hazards are encountered.

- Being properly trained on PPE use, safe work practices, decontamination procedures to be followed, and emergency procedures and communications.

- Properly utilizing required PPE, including respiratory protective equipment.
- Having up to date HAZWOPER training and then providing the Site Supervisor with documentation that their training is current.
- Being an up to date participant in an acceptable medical surveillance program.
- 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.
- Being fit-tested and physically capable of using a respirator. Should the use of respiratory protection be required, then field workers shall not have facial hair which interferes with achieving a proper fit.

In addition, field staff should always be alert and use their senses (sight, smell, etc.) to identify and react to potentially dangerous situations. When working in the EZ, visual contact should be maintained between personnel and 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 SSHSP.

The number of personnel and equipment in the contaminated area should be kept to a minimum in order to achieve effective site operations. All visitors to the job site must comply with the SSHSP procedures. PPE may be modified for visitors depending on the situation. Modifications must be approved by the Project Health and Safety Officer.

7.8 Emergency Information

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

If any situation or unplanned occurrence requires outside or support service, Ms. Tonya Barker, NAS Memphis Site Contact, will be informed and the appropriate contact from the following list will be made:

Contact	Agency or Organization	Telephone
Tonya Barker	Naval Support Activity, Mid-South	(901) 873-5461
Mark Taylor	SOUTHDIV Engineer-in-Charge	(843) 743-0573
Law Enforcement	NSA Mid-South Base Security	9-911
Fire Department	NSA Mid-South	9-911
Ambulance Service	Naval Hospital, Millington Navy Road	(901) 873-5801/5802 o r 9 - 9 1 1
Hospital	Methodist North Hospital 3960 Covington Pike	(901) 372-5211 or 9-911
Southern Poison Control Center	—	(901) 528-6048
Lawson Anderson	EnSafe Inc. Memphis, Tennessee	(901) 372-7962
Doug Petty	EnSafe Inc.	(901) 372-7962

Mark Taylor, SOUTHDIV Engineer-in-Charge will be contacted after appropriate emergency measures have been initiated onsite.

7.8.1 Site Resources

Cellular telephones will be used for emergency use and communication/coordination with NAS Memphis. First aid and eye wash equipment will be available at the work area.

7.8.2 Emergency Procedures

Conditions which 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 discovered that suggests the existence of a situation 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 Site Health and Safety Officer.
- If any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the Site Health and Safety Officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the Site Health and Safety Officer that indicate possible routes for upwind escape.

- **The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the Site Health and Safety Officer has evaluated the situation and provided the appropriate instructions to the field team.**

- **If an accident occurs, the Project Manager is to complete an Accident Report Form (See Attachment C) for submittal to the managing principal-in-charge of the project.**

- **If a member of the field crew suffers a personal injury, the Site Health and Safety Officer 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 body areas should be flushed immediately with copious amounts of clean water, and if the situation dictates, the Site Health and Safety Officer 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 Attachment B for directions to the emergency medical facility.) An Accident Report Form will be completed for any such incident.**

Additional information on appropriate chemical exposure treatment methods will be provided through MSDS in Attachment A of each SIP. Directions to the nearest emergency medical facility capable of providing general emergency medical assistance and treating chemical burns

are provided in Attachment B of this CHASP. Directions from individual sites to the NAS Memphis South Gate will be provided as Attachment B of each SIP.

7.9 Forms

The following forms will be used in implementing this CHASP:

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

A SSHSP Plan Acceptance Form will be filled out by all employees working on the site before site activities begin. The Plan Feedback Form will be filled out by the Site Health and Safety Officer and any other onsite employee who wishes to fill one out. The Exposure History Form will be completed by both the Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in Attachment C of this plan.

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

ATTACHMENT A

ENSAFE CORPORATE *HEALTH AND SAFETY MANUAL*

DRILLING SAFETY GUIDE

Appendix B

Drilling Safety Guide

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Drilling Safety Guide

EnSafe is concerned about employee safety while working on or around drill rigs as well as when traveling to and from a drilling site, moving the drill rig and tools from location to location on a site, and during maintenance of the drill rig. Every drill crew will have a designated safety supervisor. The safety supervisor will have the responsibility for ensuring that all drilling operations are conducted in a safe manner. All personnel working on, with, or around a drill rig will be under the jurisdiction of the rig safety supervisor.

Drill Rig Safety Supervisor

The safety supervisor for the drill crew will be the drill rig operator. However, the EnSafe safety officer still maintains the overall safety responsibility for the site. The drill crew safety supervisor is a direct representative of the site health and safety supervisor and will report any safety problems directly to the site health and safety officer. The drill rig safety supervisor will:

- Be the leader in using proper personal protective equipment. He/she will set an example for other personnel to follow.
- Enforce the requirements of the health and safety plan and take appropriate actions when other personnel are not following the requirements of the health and safety plan.
- Ensure that all drill rig and associated drill rig equipment is properly maintained.
- Ensure that all drill rig operating personnel are thoroughly familiar with the drill operations.
- Inspect the drill rig and associated drill rig equipment for damage before starting drilling operations. Check for structural damage, loose bolts or nuts, correct tension in chains and cables, loose or missing guards or protective covers, fluid leaks, damaged hoses and/or damaged pressure gauges and pressure relief valves.
- Test all emergency and warning devices such as emergency shut-down switches at least daily (prior to starting drilling operations). Drilling will not be permitted until all emergency and warning devices are functioning.
- Conduct a safety briefing daily before starting drilling operations. Any new employee will receive a copy of the drilling operations safety manual, and the drill rig manufacturer's operating and maintenance manual.
- Ensure that each employee reads and understands the drill rig manufacturer's operating and maintenance manual.
- Observe the mental, emotional, and physical capabilities of each worker.
- Ensure that each drill rig has a first aid kit and fire extinguisher.
- Maintain a list of emergency contact telephone numbers. This list will be posted in a prominent location and each drill rig employee will be informed of the list's location.

Drill Rig Personnel Protective Equipment

For most geotechnical, mineral, and/or groundwater drilling, drill rig personal protective equipment will include the following:

- Hard hat
- Safety shoes with steel toe and steel shank (or equivalent)
- Gloves
- Safety glasses with side shields
- Close-fitting but comfortable clothes
- Hearing protection

It is important that clothing does not have loose ends, straps, drawstrings or belts, or other unfastened parts that might become caught in or on a rotating or translating part of the drill rig.

Rings, necklaces, or other jewelry will not be worn during drilling operations.

Additional protective equipment may be required by the Site-Specific Health and Safety Plan.

Drill Rig Housekeeping

The following housekeeping measures must be taken for all drilling operations.

- Suitable storage locations will be provided for all tools, materials, and supplies. The storage should be conveniently located and will provide for safe handling of all supplies.
- Drill tools, supplies, and materials will not be transported on the drill rig unless the drill rig is designed and equipped to carry drill tools, supplies, and materials.
- Pipe, drill rods, casing, augers, and similar drilling tools when stored will be stacked in a manner that will prevent spreading, rolling, or sliding.
- Penetration or other driving hammers will be secured to prevent movement when not in use.
- Work areas, platforms, walkways, scaffolding, and other access ways will be kept free of materials, debris and obstructions and substances such as ice, grease, or oil that could cause a surface to become slick or otherwise hazardous.
- Never store gasoline in a nonapproved container. Red, nonsparking, vented containers marked with the word gasoline will be used. The fill spout will have a flame arrester.
- Prior to drilling, adequate site clearing and leveling will be performed to accommodate the drill rig and supplies and to provide a safe working area. Drilling will not be started when tree limbs, unstable ground or site obstructions cause unsafe tool handling conditions.

Maintenance Safety

Well maintained drilling equipment makes drilling operations safer. When performing equipment/tool maintenance, the follow safety precautions will be followed:

- Safety glasses will be worn when maintenance is performed on drill rigs or drilling tools.
- Shut down the drill rig engine to make repairs or adjustments to the rig or to lubricate fittings (except to make repairs or adjustments that can only be made while the engine is running).
- Always block the wheels or lower the leveling jacks or both. Set the hand brake before working under a drill rig.
- Release all pressure on hydraulic systems, the drilling fluid system, and the air operating system of the drill rig prior to performing maintenance.
- Use extreme caution when opening drain plugs and radiator caps and other pressurized plugs and caps.
- Allow time for the engine and exhaust to cool before performing maintenance on these systems.
- Never weld or cut on or near the fuel tank.
- Do not use gasoline or other volatile or flammable liquids as a cleaning agent.
- Follow the manufacturer's recommendations for quantity and type of lubricants, hydraulic fluids and coolants.
- Replace all caps, filler plugs, protective guards or panels, and high pressure hose clamps and chains or cables that have been removed during maintenance.
- Perform a safety inspection prior to starting drilling equipment after maintenance is performed.

Safe Use of Hand Tools

There are a large number of hand tools that can be used on or around a drill rig. The most important rule of hand tools is to use a tool for its intended purpose. The following are a few general and specific safety rules to follow when using hand tools.

- When using a hammer, wear safety glasses and require all others around you to wear safety glasses.
- When using a chisel, wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and stored in an orderly manner.
- Use wrenches on nuts, not pliers.
- Use screwdrivers with blades that fit the screw slot.
- When using a wrench on a tight nut, use some penetrating oil, use the largest wrench available that fits the nut, when possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands when possible and with both feet firmly placed. Do not push or pull with one or both feet on the drill rig or the side of a mud pit or some other blocking-

off device. Always assume that you may lose your footing. To avoid serious injury if you fall, remove sharp objects from the area near you.

- Keep all pipe wrenches clean and in good repair. The jaws of pipe wrenches will be wire brushed frequently to prevent accumulation of dirt and grease which cause wrenches to slip.
- Never use pipe wrenches in place of a rod holding device.
- Replace hock and heel jaws when visibly worn.
- When breaking tool joints on the ground or on a drilling platform, position hands so that fingers will not be smashed between the wrench handle and the ground or the platform if the wrench were to slip or the joint suddenly to let go.

Safety During Drilling Operations

- Do not drive a drill rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast, look up to check for overhead obstructions.
- Before raising the mast, all drill rig personnel (except the person raising the mast) and visitors will be cleared from the area immediately to the rear and sides of the mast. All drill rig personnel and visitors will be informed that the mast is being raised prior to raising the mast.
- All drill rig personnel and visitors will be instructed to stand clear of the drill rig immediately prior to and during starting of the engine.
- All gear boxes will be in the neutral position, all hoist levers will be disengaged, all hydraulic levers will be in the nonactuating positions, and the cathead rope will not be on the cathead before starting the drill rig engine.
- The drill rig must be leveled and stabilized with leveling jacks and/or solid cribbing before the mast is raised. The drill rig will be leveled if settling occurs after initial setup.
- The mast will be lowered only when the leveling jacks are down. The leveling jacks must be in the down position until the mast is completely lowered.
- Secure and/or lock the mast according to the drill rig manufacturer's recommendations before starting drilling operations.
- The drill rig must only be operated from the control position. If the operator must leave the control position, the rotary drive and the feed control must be placed in the neutral position. The drill engine will be shut down when the operator leaves the vicinity of the drill rig.
- Throwing or dropping of tools is not permitted. All tools will be carefully passed by hand between personnel or a hoist line will be used.
- When drilling within an enclosed area, ensure that fumes are exhausted out of the area. Exhaust fumes can be toxic and may not be detected by smell.
- Clean mud and grease from boots before mounting the drill platform. Use hand holds and railings. Watch for slippery ground when dismounting from the drill platform.
- Do not touch any metal parts of the drill rig with exposed flesh during freezing weather. Freezing of moist skin to metal can occur almost instantaneously.
- All unattended boreholes must be covered or otherwise protected to prevent drill rig personnel, site visitors, or animals from stepping or falling into the hole.

- Do not attempt to use one or both hands to carry tools when climbing ladders.

Working on Derrick Platforms

- When working on a derrick platform, use a safety belt and a lifeline. The safety belt will be at least 4 inches wide and will fit snugly but comfortably. The lifeline, will be less than 6 feet long and attached to the derrick.
- The safety belt and lifeline will be strong enough to withstand the dynamic force of a 250-pound weight falling 6 feet.
- A safety climbing device will be used when climbing to a derrick platform that is higher than 20 feet.
- The lifeline will be fastened to the derrick just above the derrick platform to a structural member that is not attached to the platform or to other lines or cables supporting the platform.
- Tools will be securely attached to the platform with safety lines. Do not attach a tool to a line attached to the wrist or other body part.
- When working on a derrick platform, do not guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or a traveling block.
- Derrick platforms over 4 feet above the ground will have toe boards and safety railings.

Working on the Ground

- Workers on the ground must avoid going under elevated platforms.
- Terminate drilling operations and, if possible, lower the mast during an electrical storm.
- Overhead and buried utilities must be located and marked on all boring location plans and boring assignment sheets.
- When there are overhead electrical power lines at or near a drilling site or project, consider all wire to be charged and dangerous.
- Watch for sagging power lines before entering a site. Do not lift power lines to gain entry. Call the utility to have them lift the power lines or to deenergize the power.
- Operations adjacent to overhead lines are prohibited unless one of the following conditions is satisfied:

- Power has been shut off and positive means taken to prevent the lines from being energized.
- Equipment, or any part, does not have the capability of coming within the following minimum clearance from energized overhead lines, or the equipment has been positioned and blocked to assure no part, including cables, can come within the minimum clearances listed in the adjacent table.

Power lines nominal system kv	Minimum required clearance
0-50	10 feet
51-100	12 feet
101-200	15 feet
201-300	20 feet
301-500	25 feet
501-750	35 feet
751-1000	45 feet

- While in transit with boom lowered and no load, the equipment clearance will be a minimum of 4 feet for voltages less than 50kv, 10 feet for voltages 51kv to 345kv, and 16 feet for voltages over 345kv.
- Before working near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter will be de-energized. The following precautions will be taken to dissipate induced voltages:
 - The equipment will be provided with an electrical ground to the upper rotating structure supporting the boom.
 - Ground jumper cables will be attached to materials being handled by boom equipment when electrical charge may be induced while working near energized transmitters. Crews will be provided nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load. Insulating gloves will be used.
- Continue to watch overhead power lines. Both hoist lines and overhead power lines can be moved toward each other by the wind.
- If there are any questions concerning drill rig operations on a site in the vicinity of overhead power lines, call the power company. The power company will provide expert advice as a public service.
- Look for warning signs indicating underground utilities. Underground utilities may be located a considerable distance away from the warning sign. Call the utility and jointly determine the precise location of all underground utility lines, mark and flag the locations, and determine the specific precautions to be taken to ensure safe drilling operations.

Wire Rope Safety

- All wire ropes and fittings will be visually inspected at least once a week for abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper reeving, jamming, crushing, bird caging, kinking, core protrusion, and damage to lifting hardware.
- Wire ropes must be replaced when inspection indicates excessive damage. The *Wire Rope User's Manual* may be used as a guide for determining excessive damage.
- Wire ropes that have not been used for a period of a month or more will be thoroughly inspected before being returned to service.
- All manufactured and end fittings and connections must be installed according to the manufacturer's specifications.
- Swivel bearings on ball-bearing type hoisting swivels must be inspected and lubricated daily to ensure that the swivel rotates freely under load.
- Do not drill through or rotate drill through a slipping device, do not hoist more than 10 feet of the drill rod column above the top of the last (mast), do not hoist a rod column with loose tool joints, and do not make up, tighten, or loosen tool hoists while the rod column is being supported by a rod slipping device.

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- Do not attempt to brake the fall of a drill rod column with your hands or by increasing tension on the rod slipping device.
 - Wire ropes must be properly matched with each sheave. The sheave will pinch wire rope that is too large. Wire rope that is too small will groove the sheave. Once a sheave is grooved, it will severely pinch and damage larger sized wire rope.
 - Use tool handling hoists only for vertical lifting of tools. Do not use tool handling hoists to pull on objects away from the drill rig.
 - All hoisting hooks will be equipped with safety latches.
 - When tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull for the hoist line or the feed mechanism of the drill.
 - Minimize shock loading of a wire rope; apply loads smoothly and steadily.
 - Avoid sudden loading in cold weather.
 - Never use frozen ropes.
 - Protect wire rope from sharp corners or edges.
 - Replace faulty guides and rollers.
 - Replace worn sheaves or worn sheave bearings.
 - Know the safe working load of the equipment and tackle. Never exceed safe working limits.
 - Periodically inspect clutches and brakes of hoists.
 - Always wear gloves when handling wire ropes.
 - Do not guide wire rope onto hoist drums with your hands.
 - After installation of a new wire rope, the first lift must be a light load to allow the wire rope to adjust.
 - Never leave a load suspended when the hoist is unattended.
 - Never use a hoist line to ride up the mast.

Cathead and Rope Hoist Safety

- Keep the cathead clean and free of rust and oil and/or grease. The cathead must be cleaned with a wire brush when it becomes rusty.
- Check the cathead for rope-wear grooves. If a rope groove forms that is deeper than 1/8-inch, the cathead must be replaced.
- Always start work with a clean, dry, sound rope. A wet or oily rope may grab the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast. If the rope grabs the cathead or otherwise becomes tangled in the drum, release the rope and sound the alarm for all personnel to clear the area rapidly.
- The rope must not be permitted to contact chemicals.
- Never wrap the rope from a cathead around a hand, wrist, arm, foot, ankle, leg, or any other body part.
- Attach the hammer to the rope using a knot that will not slip, such as a bowline.

- A minimum of 18 inches must be maintained between the operating hand and the cathead drum when driving samplers, casing, or other tools. Be aware that the rope advances toward the cathead with each hammer blow as the sampler or other drilling tool advances into the ground. Loosen grip on the rope as the hammer falls. Maintaining a tight grip on the rope increases the chances of being pulled into the cathead.
- Do not use a rope that is longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not leave a cathead unattended with the rope wrapped on the drum.
- Position all other hoist lines to prevent contact with the operating cathead rope.
- The cathead operator must be on a level surface with good, firm footing conditions.

Auger Safety

- The drill rig must be level, the clutch or hydraulic rotation control disengaged, the transmission in low gear and the engine running at low RPM when starting an auger boring.
- Seat the auger head below the ground surface with an adequate amount of downward pressure prior to rotation.
- Observe the auger head while slowly engaging the clutch or rotation control and start rotation. Stay clear of the auger.
- Slowly rotate the auger and auger head while continuing to apply downward pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about one foot or more below the surface.
- Follow manufacturer's recommended methods for securing the auger to the power coupling.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never place feet under the auger section that is being hoisted.
- Stay clear of rotating augers and other rotating components of the drill rig.
- Never reach behind or around a rotating auger.
- Use a long-handle shovel to move auger cuttings away from the auger.
- Augers will be cleaned only when the drill rig is in neutral and the augers have stopped rotating.

Rotary and Core Drilling Safety

- Water swivels and hoist plugs must be lubricated and checked for frozen bearings before use.
- Drill rod chuck jaws must be checked periodically and replaced as necessary.
- The weight of the drill rod string and other expected hoist loads must not exceed the hoist and sheave capacities.
- Only the operator of the drill rig will brake or set a manual chuck to ensure that rotation of the chuck will not occur prior to removing the wrench from the chuck.

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- The drill rod chuck jaws will not be used to brake drill rods during lowering into the hole.
 - Drill rods will not be held or lowered into the hole with pipe wrenches.
 - Do not attempt to grab falling drill rods with hands or wrenches.
 - In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction must be relieved or bled down prior to breaking the first tool joint.
 - Use a rubber or other suitable rod wiper to clean rods during removal from the hole. Do not use hands to clean drilling fluids from the drill rods.
 - Do not lean unsecured drill rods against the mast.

ATTACHMENT B

DIRECTIONS TO EMERGENCY MEDICAL FACILITIES

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

The nearest hospital and the nearest facility capable of treating chemical burns are the same facility, which is located at Methodist North Hospital. 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 NAS Memphis Main Gate:

1. Exit base through South Gate (Singleton Parkway).
2. Continue on Singleton Parkway through the stop signs.
- 4 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.

Also, refer to the Route to Hospital Map on the following page.

Appendix B
Site-Specific Health and Safety Plan

SITE-SPECIFIC HEALTH AND SAFETY PLAN

This Site Specific Health and Safety Plan (SSHSP) has been written to complement the Comprehensive Health and Safety Plan (CHSP). Site-specific details presented in this SSHSP include: potential site contaminants, proposed site activities, action levels (ALs), and initial level of personal protective equipment (PPE). Copies of this plan and the CHSP must be onsite during all field operations.

Applicability

The provisions of this plan are mandatory for EnSafe personnel, who shall read the plan and sign the plan acceptance form before starting site activities. In addition, personnel will operate in accordance with the most current requirements of Title 29 Code of Federal Regulations (CFR) 1910.120, Standards for Hazardous Waste Operators and Emergency Response (HAZWOPER). These regulations include the following provisions for employees: training 1910.120(e), medical surveillance 1910.120(f), and PPE 1910.120(g).

All non-EnSafe personnel present at the work areas shall either adopt and abide by this SSHSP and the corresponding CHSP or shall have their own safety plans which, at minimum, meet the requirements of this SSHSP and the CHSP.

This SSHSP applies to standard field procedures and tasks such as collecting soil and water samples and the nonroutine task of trenching. Other non-routine procedures and tasks involving non-routine risks are not covered in this plan. Examples of **procedures that are not covered** in this plan are:

- Confined space entry
- Locating and/or recovering UXO
- Sampling, handling, or removing unidentified drums

Should it be necessary to conduct these or other "high-risk" tasks, specific health and safety procedures must be developed, approved, and implemented before these tasks may proceed.

Authorized Personnel

- | | |
|--|------------------|
| • NSA Mid-South Contact | Tonya Barker |
| • TOM/Project Manager | Robert Smith |
| • Project Health and Safety Officer (PHSO) | Doug Petty, IHIT |
| • Site Supervisor | To Be Determined |
| • Site Health and Safety Officer (SHSO) | To Be Determined |

Responsibilities of Key Field Staff

It is the overall responsibility of the PHSO to develop and implement the SSHSP. The TOM and PHSO shall approve any changes or modifications to this SSHSP. The SHSO will implement the SSHSP under the PHSO's direction. Health- and safety-related duties may be delegated to qualified individuals by the PHSO or the TOM.

Responsibilities of Site Supervisor

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

- Field staff follow the CHSP, SSHSP, and other safety and health standard operating procedures (SOPs). Personnel who repeatedly do not comply shall be retrained and/or instructed to leave the site and not allowed to return.
- Field staff have current HAZWOPER training.
- Field staff know who the PHSO and SHSO are.
- Field staff know the site-specific health and safety concerns.
- The onsite supply of health and safety equipment is adequate.

- Field staff participate in the EnSafe medical surveillance program (or in the case of subcontractors, an equivalent program).
- Field staff attend health and safety "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.

Responsibilities of Site Health and Safety Officer

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 CHSP 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 as he/she deems appropriate, or when requested by the site supervisor.
- Ensuring that a copy of the appropriate health and safety plans 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 hours of Occupational Safety and Health Administration (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 work tasks being conducted, (4) training in the use of the air-monitoring equipment, (5) ability to interpret the data collected with the instruments, (6) familiarity with symptoms of chemical

exposure, heat stress, and cold exposure, and (7) knowledge of the location and proper use of onsite safety equipment. He/she will also be familiar with this health and safety plan.

Responsibilities of Onsite Field Staff

The health and safety responsibilities of field staff include:

- Being familiar with and complying with the CHSP and SSHSP.
- Attending site health and safety briefings and being aware of anticipated chemical, physical, and biological hazards and knowing what to do when these hazards are encountered.
- Being trained on PPE use, safe work practices, decontamination procedures to be followed, emergency procedures, and communications.
- Properly using required PPE, including respiratory protective equipment.
- Having up-to-date HAZWOPER training and providing the site supervisor with documentation of that training.
- Being an up-to-date participant in the EnSafe medical monitoring program.
- Using the buddy system when wearing respiratory protective equipment.
- Being fit-tested and physically capable of using a respirator (when one is required). Should respiratory protection be required, field workers shall not have facial hair that interferes with its proper fit.

In addition, field staff should always be alert and use their senses (sight, smell, taste, etc.), to identify and react to potentially dangerous situations. When working in the exclusion zone (EZ), visual contact should be maintained with other personnel in the area; field personnel should be close enough to assist each other in an emergency. Procedures for leaving the EZ must be planned and all necessary equipment present before entering the EZ.

To maintain effective site operations, minimize the number of personnel and equipment in the contaminated area. Site visitors shall comply with the CHSP and this SSHSP, and have the same responsibilities as field staff. PPE requirements may be modified for visitors, depending on the situation. Modifications must be approved by the PHSO.

Work Zones

Section 3.1 of the CHSP describes the function and interrelation the three work zones at a sampling site or location:

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

When determined appropriate by the TOM with input from the RPM, these work zones will be established and used during fieldwork covered under this SSHSP. Each work zone will be clearly marked with cones, barricades, or caution tape, as appropriate, and access to them will be controlled. As a minimum, the area where samples are handled and sampling equipment is decontaminated will be delineated. If needed, a large-equipment decontamination area will be constructed near the EZ.

Authorized personnel will be allowed access to work areas as long as they follow the requirements of this SSHSP and the CHSP, in particular Section 3.2 of the CHSP.

Site Investigations

This work plan includes a subsection that briefly describes the site, including known or suspected site-specific physical and chemical hazards. Additional site-specific information and an individual site map can be found in Section 3 of this work plan. The EZ, CRZ, and SZ for each site will be

established in the field as determined necessary. The use and locations of these zones depend on the work task, layout of the site, meteorological conditions, and logistical factors.

SWMU 19

SWMU 19 is approximately 150 feet north of Navy Road on the NSA Mid-South Northside. SWMU 19 is bounded to the north by SWMU 49 (a former hazardous-waste accumulation point for Building N-757) and a wooded area and to the south by Navy Road and Building N-341 of the Navy Exchange Service Station. SWMU 19 is bordered to the east by Building N-757 of the Navy Exchange Service Station and to the northwest by the former Aircraft Fire Fighting Training Facility (SWMU 5).

Two USTs were formerly located at Building N-757. UST 1648 had a capacity of 280 gallons and it stored used automotive oil and hydraulic fluid generated by automotive repair activities at the Navy Exchange Service Station for later recycling. UST 341, capacity unknown, stored used oil from automobile maintenance operations at Building N-341 of the Navy Exchange Service Station. Both USTs were installed in 1979. UST 341 was closed in place when it was filled with concrete; the date of closure is not known. UST 1648 (SWMU 19) was removed on March 19, 1996, by a Navy UST contractor and the UST was operational until the time it was removed. During the excavation and removal of UST 1648, the vent-pipe attachment to the fill-pipe was discovered to be disconnected and obviously waste oil had infiltrated into surrounding soil. Oil was visible in the soil beneath the foundation of Building N-757. After UST 1648 was removed, the pit was filled to grade with pea gravel and capped with concrete at the recommendation of the BRAC Cleanup Team (BCT).

Site Activities

Field activities include confirmatory soil sampling using disposable spoons or decontaminated stainless-steel spoons. Fieldwork is detailed in Sections 2 and 3 of the attached work plan.

Chemical Hazards and PPE Requirements

The potential contaminants for the Voluntary Corrective Action are petroleum products, metals (e.g., cadmium and lead), and pesticides. Table 4-1 lists exposure guidelines for these contaminants.

It is important that the PPE specified for the project protect against known and suspected site hazards. Protective equipment is 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, and a greater emphasis is placed on experience and sound safety practices.

Voluntary Corrective Action Work Plan-Contaminated Soil Removal
 Site Specific Health and Safety Plan — SWMU 19
 Naval Support Activity Mid-South
 Revision: 1; May 25, 1999

Table 4-1
Exposure Limits for Expected Site Chemical Hazards

Name	Odor ^a Threshold	OSHA PEL ^b	ACGIH TLV ^c	NIOSH REL ^d	Auto- Ignition (°F)	Flammable Range
Arsenic	N.A.	0.5 mg/m ³	0.01 mg/m ³	0.02 mg/m ³ C	N.A.	N.A.
Beryllium	N.A.	0.002 mg/m ³	0.002 mg/m ³	0.005 mg/m ³ C	N.A.	N.A.
Cadmium	N.A.	0.06 mg/m ³ ceiling	0.05 mg/m ³	Potential Occupational Carcinogen	N.A.	N.A.
Lead	N.A.	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	N.A.	N.A.
Diesel	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Fog Oil	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Gasoline	N.A.	N.A.	890 mg/m ³	N.A.	N.A.	N.A.
Motor Oil	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Dieldrin	N.A.	0.25 mg/m ³	N.A.	0.25 mg/m ³	N.A.	N.A.

Notes:

- ^a = Odor Threshold for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
 - ^b = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in CFR 1910.1000.
 - ^c = Threshold Limit Values, and Short-Term Exposure Limits (TLVs and STELs) are recommended guidelines developed by the American Conference for Governmental Industrial Hygienist (ACGIH).
 - ^d = Recommended Exposure Limits (RELs) are non-enforceable guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA.
- N.A. = Not Applicable
 ppm = parts per million
 mg/m³ = milligrams per cubic meter

PPE for Confirmatory Sampling:

The initial level of PPE for confirmatory sampling is Level D, which includes:

- Chemical-resistant coveralls (optional)
- Chemical-resistant outer gloves; inner gloves or glove liners (optional)
- Steel toe and steel shank boots
- Hard hat
- Safety glasses with side shields or safety goggles
- Chemical-resistant outer boots (optional)

PPE requirements are subject to change as site information changes or is updated. A decision to deviate from specified levels of PPE as contained in the SSHSP must be made or reviewed by the PHSO.

General Operational and Physical Hazards

Field personnel should be aware of and act in a manner to minimize the dangers associated with physical hazards typically encountered during environmental investigations as discussed in Section 7.1 of the CHSP. At NSA Mid-South, these hazards include heat-related illnesses, snakes, insects, poisonous plants, uneven terrain, slippery surfaces, lifting, and using heavy equipment. Electrical lines may be present either above or below ground, and underground gas, fuel, water, steam, sanitary, and storm water drainage lines may be present.

The Site Supervisor shall be aware of the potential for heat stress (discussed in Appendix C of the CHSP). When necessary, work regimens should be implemented to minimize the potential for employee illness.

Employee Protection

Employee protection for this project is addressed in several ways including the use of: work limitations, specified PPE, air monitoring, decontamination procedures, standard safe work practices, general rules of conduct, procedures for extreme weather conditions, and medical surveillance.

Work Limitations

All site activities will be conducted during daylight only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional eight hours of HAZWOPER Site Supervisor Training. All personnel must complete an eight-hour refresher training course annually to continue working onsite.

Personnel and Equipment Decontamination

As needed, a CRZ will be established next to the EZs established for invasive activities and will include stations for decontaminating personnel, PPE, and equipment. Decontamination procedures are discussed in Section 3.3 and 7.8 of the CHSP.

Standard Safe Work Practices

Standard safe work practices include:

- Eating, drinking, chewing gum or tobacco, smoking, or any other activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the SHSO.
- Hands and face must be thoroughly washed when a person leaves the work area.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as practical after leaving the CRZ.

- 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 be 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.
- Adequate side and overhead clearance must be maintained to ensure that the drill rig boom does not touch or pass close to any overhead power lines or other overhead obstacles or obstructions.
- Local utility representatives shall be requested to identify all underground utilities. Utility lines should be marked using characteristic spray paint or labeled stakes. A buffer zone, 3 yards to either side of a utility line, should be maintained during all 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.

General Rules of Conduct

The following general rules of conduct are required for anyone working on this project:

- Liquor, firearms, narcotics, 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 record is forbidden.
- 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 any 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 that tends to disrupt work or morale of others is forbidden.
- Fighting or threatening bodily harm to another is forbidden.
- Defacing any government property is forbidden.
- Wearing offensive logos, pictures, or phrases on clothing is forbidden. Shirts, shoes, and pants or slacks, or cover-all type garments will be worn at all times on government property.

Medical Monitoring Program

This topic is discussed Section 4.5 of the CHSP.

Emergency Information and Procedures

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. Emergency contacts to be used during fieldwork at NSA Mid-South are listed in Table 4-2.

Table 4-2
Emergency Contacts¹

Contact	Agency or Organization	Telephone
Tonya Barker	NSA Mid-South	901/874-5461
Ambulance		911
Emergency Room	Methodist North Hospital	901/384-5211
		911
Southern Poison Control		800/942-5969
Center		901/528-6048
Fire Department		911
Police		911
Robert Smith	Task Order Manager	901/372-7962
Doug Petty	Project Health and Safety Officer	901/372-7962

¹ = Emergency Contact Number have been updated from the *NAS Memphis Comprehensive Health and Safety Plan* (EnSafe 1994).

Site Resources

A cellular telephone will be available in the SZ for routine and emergency communications/coordination with NSA Mid-South personnel. First-aid and eyewash equipment will be available at the work area and in each field office. All field team members have been certified in first-aid and cardiopulmonary resuscitation.

Emergency Procedures

Examples of an emergency include:

- A fire, explosion, or similar event at or near the site whether related to this project or not.
- When a member of the field crew sustains a significant injury, or experiences symptoms of chemical exposure, or other health problem.

- When a condition is discovered which suggests that site conditions are immediately more dangerous or hazardous than anticipated.

In an emergency, the following procedures should be followed:

- If it is necessary to evacuate the area, immediately proceed to a rally point and remain there until instructed otherwise.
- Use planned escape routes. Emergency exit routes and proper use of emergency equipment will be defined for all personnel during an initial safety meeting.
- If a member of the field crew experiences effects or symptoms of exposure while on the scene, the field crew will immediately halt work and act according to the instructions provided by the Site Supervisor or, in his/her absence, the SHSO.
- For applicable site activities, including all Level B activities, use wind indicators to continuously indicate upwind, preferred escape routes, from downwind routes.
- Investigate conditions(s) suggesting that site conditions may be more hazardous than anticipated. Record the condition observed and the decisions made in the safety logbook, or in the field logbook if no safety logbook is being maintained. If there are doubts about how to proceed, suspend work and leave the area until the PHSO has evaluated the situation and provided the appropriate instructions to the field team.
- If an accident occurs, the Site Supervisor is to complete an Accident Report Form for submittal to the TOM and NSA Mid-South.
- If a member of the field crew suffers a personal injury, the SHSO will call 911 for ambulance emergency response, if needed. Ambulance service will be used to transport any injured persons. Next alert appropriate response agencies as the situation dictates. Complete an Accident Response Form for any such incident.
- If a member of the field crew suffers a chemical exposure, flush the affected areas 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 Attachment A for directions to the emergency medical facilities.) If a patient is contaminated, the ambulance and/or hospital will be notified prior to receiving the patient. An Accident Report Form will be completed for any such incident. Additional information on appropriate chemical exposure treatment methods will be provided through Material Safety Data Sheets (MSDS) in Appendix C.

Forms

The following forms will be used in implementing this health and safety plan:

- Plan Acceptance Form
- Plan Feedback Form
- Accident Report Form

An SSHSP Plan Acceptance Form will be filled out by all employees onsite before activities begin. The Plan Feedback Form will be filled out by the SHSO and any other onsite employee who wishes to do so. Examples of all forms are included in this plan. All completed forms must be returned to the TOM at EnSafe, Memphis, Tennessee.

Directions to the Nearest Medical Facility

The nearest hospital and the nearest facility capable of treating chemical burns are the same facility, which is Methodist North Hospital, 3960 New Covington Pike, Memphis, Tennessee 38128. Therefore, there is only one set of directions (see map on following page).

Directions to Methodist North Hospital from NSA Mid-South:

- 1) Exit base through south gate (Singleton Parkway).

- 2) Continue on Singleton Parkway through stop signs.
- 3) Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).
- 4) Entrance to the emergency room is 700 feet past this light on the left.

*Voluntary Corrective Action Work Plan-Contaminated Soil Removal
Site Specific Health and Safety Plan — SWMU 19
Naval Support Activity Mid-South
Revision: 1; May 25, 1999*

Map to Hospital

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, Memphis, Tennessee.

Job No: CTO 0106

Contract No: N62467-89-0318

Project: NSA Mid-South Voluntary Corrective Action Field Activities

I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

Signed

Print Name

Company

Date

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions:

ACCIDENT REPORT FORM

SUPERVISOR'S REPORT OF ACCIDENT		DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS	
TO		FROM	
		TELEPHONE (Include area code)	
NAME OF INJURED OR ILL WORKER AND COMPANY			
WORKER'S SOCIAL SECURITY NUMBER			
DATE OF ACCIDENT	TIME OF ACCIDENT	EXACT LOCATION OF ACCIDENT	
NARRATIVE DESCRIPTION OF ACCIDENT			
NATURE OF ILLNESS OR INJURY AND PART OF BODY INVOLVED		LOST TIME YES <input type="checkbox"/> NO <input type="checkbox"/>	
PROBABLE DISABILITY (Check one)			
FATAL <input type="checkbox"/>	LOST WORK DAY WITH ___ DAYS AWAY FROM WORK	LOST WORK DAY WITH ___ DAYS OF RESTRICTED FIRST-AID ONLY ACTIVITY	NO LOST WORK DAY <input type="checkbox"/>
CORRECTIVE ACTION RECOMMENDED (By whom and by when)			
NAME OF SUPERVISOR (Print)		TITLE	
		DATE	

**Attachment A
Map to the Hospital**

