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FINAL ENVIRONMENTAL ASSESSMENT REPORT UNDERGROUND STORAGE TANKS 304
AND 1239 (UST304) (UST1239)MILLINGTON SUPPACT TN
10/27/1994
ENSAFE/ALLEN & HOSHALL

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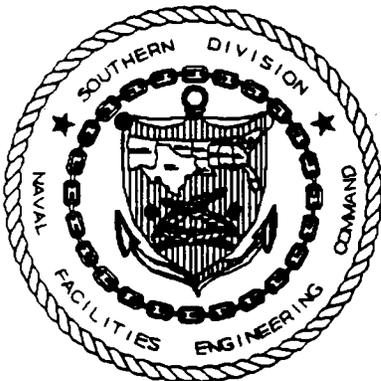


**FINAL
ENVIRONMENTAL ASSESSMENT REPORT
USTs 304 AND 1239
NAVAL AIR STATION MEMPHIS
MILLINGTON, TENNESSEE
FACILITY I.D. # 0-791709
PROJECT CODE: CTO-0080**

Prepared for:

**DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA**

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**Release of this document requires the prior notification of the Commanding Officer of
Naval Air Station Memphis, Millington, Tennessee**

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EXECUTIVE SUMMARY

EnSafe/Allen & Hoshall was retained by the Department of the Navy to conduct an environmental assessment of two 100,000-gallon underground storage tanks (USTs) located in the North Fuel Farm near Building N-94 at the Naval Air Station in Millington, Tennessee. These tanks (identified as tanks 304 and 1239) were field-constructed of concrete and steel and used for storage of No. 2 heating oil for consumptive use on the premises. Water intrusion into the tanks indicated that the tanks may have leaked in the past. Both tanks have been taken out of service and the fuel oil removed. The tanks currently contain an unknown quantity of water and residual amounts of heating oil. The quantity of fuel released is unknown. The following items summarize the key findings of this investigation.

- Groundwater at the site has been previously classified as "non-drinking" water.
- The site soil action level is 500 milligrams per kilogram (mg/kg), and the site groundwater action level is 1,000 micrograms per liter ($\mu\text{g/L}$) for TPH-DRO.
- One or more petroleum releases have occurred at the site impacting both soil and groundwater. Based on the varying depths of contamination, releases may have occurred as spills at the surface and/or leaks from the tanks.
- Soil TPH-DRO concentrations were above the action level of 500 mg/kg in portions of the soil intervals sampled in 5 of 15 borings (at concentrations up to 2,300 mg/kg).
- TPH-DRO concentrations in groundwater were above action levels in 7 of 11 monitoring and leak detection wells which were sampled (at concentrations up to 170,000 $\mu\text{g/L}$).
- The site ranking was completed and the score was calculated at 593. A score greater than 500 indicates a corrective action is required.

An Environmental Assessment Report (EAR) was conducted on Building N-126 (tanks 7, 303, and 1241), located immediately west of the facility, and submitted to the TDEC on November 17, 1994. Based on TPH-DRO concentrations in shallow groundwater above the "non-drinking" water cleanup levels at this neighboring facility, a *Site Specific Standard Request* was submitted to the TDEC on January 21, 1994, in lieu of a Corrective Action Plan (CAP). A TPH-DRO concentration of 100 ppm followed with quarterly monitoring for a one-year period was requested. As found in this investigation, TPH-DRO concentrations above the "non-drinking" water cleanup level were also found at tanks 304 and 1239, which are located hydrologically upgradient and possibly contributing to Building N-126 contamination. Seeing both of these sites have been slated to be transferred to the city of Millington under the Base Realignment and Closure (BRAC) program, the NAVY wishes to expedite the remedy of these properties. Therefore, following review of this report by the TDEC, a single CAP will be submitted for both facilities (Building N-126 and Tanks 304 and 1239) addressing the best course of action to remediate the soil and groundwater contamination.

1.0 INTRODUCTION

EnSafe/Allen & Hoshall was retained by the Department of the Navy to conduct an environmental assessment of two 100,000-gallon underground storage tanks (USTs) in the North Fuel Farm at the Naval Air Station (NAS) Memphis, in Millington, Tennessee, Facility identification number 0-791709 (Figure 1). These tanks (identified as tanks 304 and 1239) were field constructed of concrete and steel and were used for storage of No. 2 heating oil for consumptive use on the premises. Water intrusion into the tanks indicated that the tanks may have leaked in the past. Both tanks have been taken out of service and the fuel oil removed. The tanks currently contain an unknown quantity of water and residual amounts of heating oil. The quantity of fuel released is unknown.

1.1 Objectives and Scope

The objectives and scope of the Environmental Assessment are in accordance with the Tennessee Department of Environment and Conservation's (TDEC's) UST Division Reference Handbook, *Environmental Assessment Guidelines*, January 1, 1994. The objectives were:

- To determine whether soil and/or groundwater were contaminated as a result of leakage from tanks 304 and/or 1239.
- To determine the nature and extent of contamination (if any), including the possible presence of free product.
- To characterize the geology and hydrogeology beneath the site and its relationship to contamination.
- To collect sufficient information for corrective measures to be developed (if necessary).

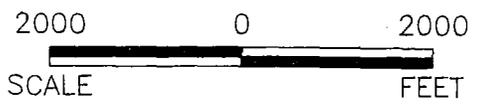
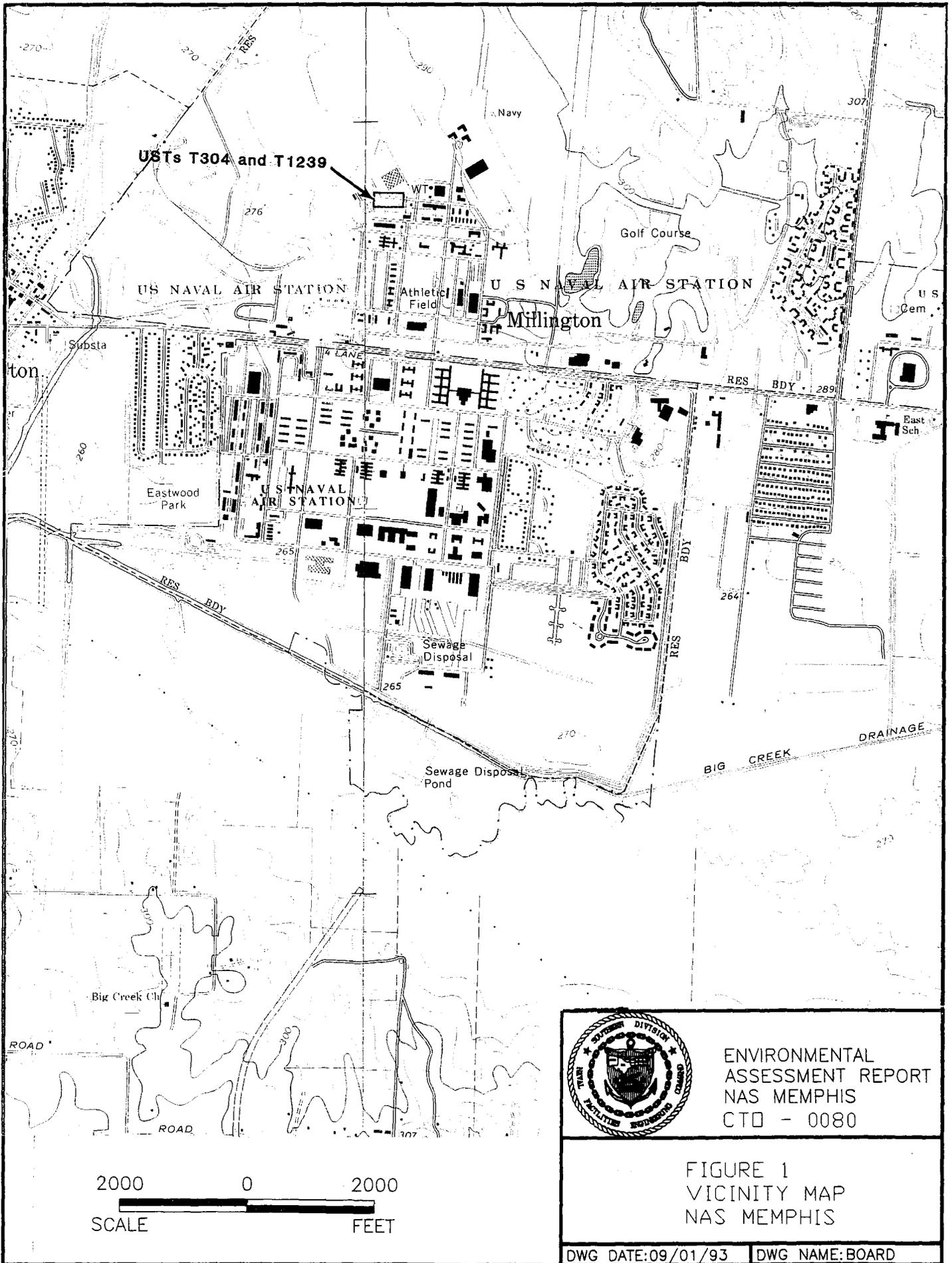
The scope of work developed to fulfill these objectives included:

- Completion of 15 soil borings (with field organic vapor analyzer [OVA] screening and laboratory analysis) to determine TPH-DRO soil concentrations.
- Installation and sampling of three new monitoring wells and sampling of eight existing wells to determine TPH-DRO groundwater concentrations.
- Analysis of soil and groundwater for engineering design parameters in the event that corrective measures are warranted.

1.2 Previous Studies

E/A&H conducted an environmental assessment of USTs 7/303/1241 in 1993 under the TDEC, UST *Environmental Assessment Guidelines*, dated January 1992. These USTs are located directly west of USTs 304/1239. USTs 7/303/1241 contained Jet A fuel while in service. These tanks were removed April 1992. Analysis of soil samples from the tank pit indicated total petroleum hydrocarbon-diesel range organics (TPH-DRO).

Six monitoring wells were installed and sampled for the investigation of USTs 7/303/1241. TPH and benzene, toluene and xylenes (BTX) compounds were detected in samples from monitoring wells N-MW-5 and N-MW-6 at concentration above the established groundwater cleanup levels (per TDEC UST guidelines of January 1992) of 1.0 ppm for TPH and 0.070 ppm for benzene. Analyses of soil samples resulted in no detections of TPH or BTX above the site soil cleanup action levels of 1,000 mg/kg and 500 mg/kg, respectively. The results of this investigation were reported under cover of *Final Environmental Assessment Report, Building N-126, Facility I.D. #0-791709*, EnSafe/Allen & Hoshall, November 1993.



ENVIRONMENTAL
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 NAS MEMPHIS
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FIGURE 1
 VICINITY MAP
 NAS MEMPHIS

2.0 SITE LOCATION

Tanks 304 and 1239 are in the North Fuel Farm, south of Funafuti Street and approximately 200 feet south of Building N-126 (Figure 2). The site is in a grassy area bordered on three sides by concrete and asphalt drives. Approximately 2 feet of relief exists at the site with surface elevations ranging from approximately 284 feet mean sea level (msl) to the east of the tank site to approximately 282 feet msl west of the site. Surface water runoff in the immediate tank area appears to drain west-northwest.

Base utility maps were provided to E/A&H in September 1994 by the activity. These maps were reviewed to locate all known underground utilities in the area of USTs 304 and 1239. A storm sewer line trending east west is 200 to 250 feet north of the site. A water supply line (connected to production well N-1) trends northwest-southeast and is 150 to 200 feet west of the site. A sanitary sewer line connects to Building N-12, 150 to 250 feet east of the North Fuel Farm, but does not cross the site. Electric lines cross the site overhead through the center of the site.

3.0 SOIL INVESTIGATION

3.1 Regional and Site Geology

NAS Memphis is located within the central Mississippi Embayment, a 200-mile wide trough or syncline that plunges southward along an axis which approximates the Mississippi River. The embayment is filled with several thousand feet of sediments which range from Cretaceous to Quaternary in age (0 to 140 million years ago). The Naval Base is underlain by Pleistocene age loess deposits which are in turn underlain (in descending order) by the Terrace Deposits (Pleistocene and Pliocene age) and the Claiborne and Wilcox Groups (Tertiary age).

The surficial loess deposits are unconsolidated windblown sediments consisting of silt, silty clay, clay, and minor amounts of sand. These deposits typically range from 0 to 65 feet in thickness in the Memphis/Millington area. The underlying Terrace Deposits are unconsolidated alluvial sediments consisting of sand, gravel, and some clay with thin layers of a ferruginous sands and conglomerates at the base. This unit ranges from 0 to 100 feet in thickness in the Memphis/Millington area.

Soils encountered during this investigation consisted primarily of clayey silts and silty clays which are part of the surficial loess deposits. Although no classification testing was conducted on the soil samples collected, visual descriptions indicate Unified Soil Classifications of CL (lean clays), ML (silts), and MH (elastic silts).

3.2 Soil Boring Results

In all, 15 soil borings were completed using 3.25-inch inside diameter (ID) hollow stem augers powered by a Central Mine Equipment (CME) Model 55 drill rig. Boring locations are shown in Figure 2. Soil samples were collected using continuous samplers 5 feet in length and approximately 3 inches in inside diameter.

Headspace field screening for organic vapors was conducted on each sample collected. Each sample was split vertically and a portion placed in a self-sealing plastic bag and allowed to volatilize for at least 15 minutes. A second portion of the sample was placed in a glass container for possible analytical testing. A photoionization organic vapor detector was used to qualitatively determine the presence of contamination in the volatilized samples.

Soil samples for analytical testing were then selected based on the results of organic vapor detector readings. Although samples were collected continuously at 5-foot intervals, headspace samples and subsequent analytical samples were collected at intervals determined in the field. Sample intervals were selected based on the amount of sample recovered, soil type(s) within the sample, and the apparent presence or absence of contamination based on visual observations and/or unusual odors. Sample intervals and headspace screening results are shown on the boring logs (Appendix A) and cross sections on Figures 3 and 4. Three soil samples also were collected and analyzed for microbial plate count to provide design input for any remedial effort which may be required. The results of these analyses are shown in Appendix B.

3.3 Analytical Results

A total of 42 soil samples for analytical testing for TPH-DRO concentrations were selected based on organic vapor detector readings in accordance with TDEC guidance. Samples selected generally represent the sample with the highest detector reading, the deepest sample which the detector indicated was contaminated, and the sample immediately above the water table. Table 1 summarizes the results of analytical testing of soil samples for TPH-DRO; individual analytical results are in Appendix C. As indicated in Table 1, 18 of the soil samples contained a TPH-GRO constituent. Data assessment of the analytical results is included in Section 4.5.

Table 1 Summary of TPH-DRO Analysis for Soil Samples Facility I.D. # 0-791709					
Boring Number	Date	Sample Identification	Sample Depth (ft)	OVM Reading (ppm)	TPH-DRO Concentration (mg/kg)
B-1	7/11/94	MEMSB00108	3.0-8.0	400	2,300*
		MEMSB00118	15.5-18.0	328	44
		MEMSB00123	20.5-23.0	13	<5.3
B-2	7/11/94	MEMSB0025.8	3.4-5.8	421	2,300*
		MEMSB00220.5	18.0-20.5	234	2,300*
		MEMSB00223	20.5-23.0	136	960*
B-3	7/12/94	MEMSB00308	3.0-8.0	56	790*
		MEMSB00318	13.0-18.0	81	1,300*
		MEMSB00323	20.5-23.0	112	160*
B-4	7/12/94	MEMSB00410.5	8.0-10.5	238	82*
		MEMSB00413	10.5-13.0	121	290*
		MEMSB00418	15.5-18.0	48	86*
B-5	7/13/94	MEMSB00518	15.5-18.0	214	<5.1
		MEMSB00520.5	18.0-20.5	229	<5.1
		MEMSB0528	23.0-28.0	10	<4.1
B-6	7/12/94	MEMSB00608	5.5-8.0	27	53
		MEMSB00610.5	8.0-10.5	324	890
		MEMSB00618	15.5-18.0	304	<5.0
B-7	7/14/94	MEMSB00708	4.0-8.0	49	<5.1
		MEMSB00715.5	13.0-15.5	94	61
		MEMSB00723	20.5-23.0	7	<5.3
B-8	7/12/94	MEMSB00808	5.5-8.0	27	32*
		MEMSB00818	13.0-18.0	306	18*
B-9	7/12/94	MEMSB00908	4.6-8.0	32	54
		MEMSB0918	14.7-18.0	67	130
B-10	7/12/94	MEMSB01008	5.5-8.0	21	230
		MEMSB01018	15.5-18.0	13	<4.9
B-11	7/12/94	MEMSB01108	3.0-8.0	31	<4.8
		MEMSB01115.5	13.0-15.5	32	<4.9
		MEMSB01118	15.5-18.0	16	9.8*

Table 1 Summary of TPH-DRO Analysis for Soil Samples Facility I.D. # 0-791709					
Boring Number	Date	Sample Identification	Sample Depth (ft)	OVM Reading (ppm)	TPH-DRO Concentration (mg/kg)
B-12	7/13/94	MEMSB01208	3.8-8.0	234	800*
		MEMSB01216	14.9-16.0	132	26
		MEMSB01628	27.0-28.0	Not Measured	<4.1
B-13	7/12/94	MEMSB01318	14.0-18.0	77	490*
		MEMSB01325.5	23.0-25.5	327	690*
		MEMSB01328	25.5-28.0	18	<4.3
B-14	7/13/94	MEMSB01408	3.0-8.0	64	<4.2
		MEMSB01418	13.0-18.0	23	7.9
B-15	7/13/94	MEMSB01503	1.0-3.0	330	310*
		MEMSB01508	3.0-8.0	213	61*
		MEMSB01518	13.0-18.0	136	<4.2
		MEMSB01528	25.5-28.0	6	<4.2

Notes: Soil cleanup level is 500 mg/kg for TPH.
 Analytical results above cleanup level appear in bold type.
 Asterisk (*) indicates TPH-GRO constituent detected.

3.4 Soil Sample Nomenclature

Soil samples were identified by E/A&H with a 10 character alpha-numeric system as follows:

- Characters 1,2,3 indicate the facility — MEM indicates NAS MEM.
- Character 4 indicates the sample media — S for soil.
- Character 5 indicates the sample method — B for soil boring.
- Characters 6,7,8 indicate the sample location — 002 is soil boring number 2

- Characters 9,10 indicate the sample depth — 18 indicated the bottom of the soil sample was estimated at 18 feet below grade.

3.5 Soil Cleanup Levels

Soil cleanup levels established by TDEC are based on site soil permeability and the determination of whether a site is considered a "drinking water or non-drinking water" site. A previous Environmental Assessment Report for an adjacent site has determined the site to be a non-drinking water site (*Final Environmental Assessment Report — Building N-126 USTs, Facility I.D. #0-791709, EnSafe/Allen & Hoshall, November 1993*). Based on the results of this previous work, no further classification effort was performed. A copy of the data used for that classification is included as Appendix D.

To determine the hydraulic conductivity of site soils, undisturbed soil samples were collected from boring B-3A (drilled 5 feet west of boring B/MW-3) in accordance with *ASTM D1587*. Based on water levels from existing wells in the area, the water table was approximately 6 feet below ground surface. Therefore, in accordance with TDEC guidance, one undisturbed sample was collected from the 4- to 6-foot depth interval representing the interval just above the water table. A second sample was collected from the 9- to 11-foot depth interval and represents the soil which visually appeared to represent the zone of highest hydraulic conductivity. Laboratory hydraulic conductivity testing was conducted by Tri-State Testing in accordance with Method 9100 of *Test Methods for Evaluating Solid Waste, Third Edition (SW-846)* and in general accordance with *ASTM D-5084-90*.

Laboratory test results indicate that the hydraulic conductivity of site soil in the interval immediately above the water table is 1.8E-07 cm/sec and 8.4E-07 cm/sec for the interval representing the zone of highest hydraulic conductivity. Laboratory hydraulic conductivity data sheets are included as Appendix E. These results are similar to the results of previous tests conducted for the adjacent site (EnSafe/Allen & Hoshall, November 1993).

Soil permeability

Based on the results of hydraulic conductivity testing and the previously established "non-drinking water" status of the site, TDEC regulations indicate that the TPH soil cleanup level is 500 mg/kg. Any remedial soil efforts will likely be limited to the 304/1239 UST pit areas since no soil contamination was identified during the investigation of USTs 7/303/1241.

3.6 Contaminant Plume

Soil contamination at tanks 304 and 1239 appears to be limited to a relatively small area in the immediate vicinity of the tanks (Figure 5). Analytical data indicate that soil contamination above the cleanup level of 500 mg/kg extends laterally over an area of approximately 9,800 square feet. While it was not possible to distinguish fill from in situ soils, it is likely that the majority of the most significant contamination is present in the immediate tank fill area.

There is a strong possibility the soil contamination plume from USTs 304/1239 could be influencing soil conditions at USTs 7/303/1241; however, data are insufficient from this and previous studies to form a definitive opinion of this relationship. Furthermore, there is no benefit in determining the degree of mixing given the relative location of each site and since the remedial action should be very similar for both sites. All remedial alternatives should be addressed in the Corrective Action Plan including the alternative of combining remedial efforts for UST Sites 7/303/1241 and 304/1239. If these sites are combined for corrective action, cleanup standards will be established under the January 1994 *Environmental Assessment Guidelines*.

Cross-sections A-A' and B-B' (Figures 3 and 4) indicate contamination at various depths and at various concentrations. At some locations, the higher contamination concentrations are near the ground surface while at other locations the higher levels are at depth. There are not enough analytical data to map different zones of contamination but the available data suggest the possibility of both surface releases and leaks from one or both tanks. A large percentage of the contamination occurs within a soft very moist grayish brown zone of clayey silt. Analytical

results for samples collected from borings which were continued to a depth of 28 feet below ground surface indicate the maximum depth of soil contamination is about 25 feet.

3.7 Estimated Contaminant Mass in Soil

The following contaminant mass calculations are considered as rough approximations and are based on several assumptions, the largest being the average plume concentrations used in the mass balance calculations are representative of the DRO present at the site. The calculations below are based on the assumption that the contaminants in the soil are distributed homogeneously throughout the soil column, therefore the determined values should be considered as very conservative estimates.

The DRO plume in soil is estimated from Figure 5 to roughly measure 170 feet by 105 feet by 18 feet in depth. The heterogeneity in soil and the variable concentrations with depth complicate mass balance calculations. As shown in Figure 3, concentration with depth profiles of DRO values ranges between 2,300 mg/kg to non-detect across the site. Therefore, two contaminant plumes, 100 ppm and 500 ppm from Figure 5, have been used to represent the average DRO mass in soil. Sixty-three percent (202,000 ft³) of the plume consists of the 500 ppm while the remaining 37 percent (119,000 ft³) represents the 100 ppm plume. The following mass balance calculation was used to approximate the mass of DRO present in each respective plume:

DRO Mass = (Total volume) (percent of plume) (DRO concentration (mg/L)) (3.785 liters/gallon) (1 lb/454,000 mg)
(202,000 ft³) (500 mg/kg) (1kg/2.2 lbs) (1lb/454,000 mg) (96 lbs/ft³) = 9,708 pounds DRO
(119,000 ft³) (100 mg/kg) (1kg/2.2 lbs) (1lb/454,000 mg) (96 lbs/ft³) = 1,144 pounds DRO

Total DRO = 10,852 pounds

*included 100 ppm
= 17850 ft³*

4.0 GROUNDWATER INVESTIGATION

4.1 Hydrogeology

4.1.1 Regional and Site Hydrogeology

Shallow groundwater at the site occurs as a perched zone within the surficial loess deposits. These deposits are primarily made up of silt, silty clay, and clay, and exhibit low water yields and poor water quality.

Beneath this surficial water-bearing zone, lie two major aquifers known as the Memphis Sand (lower Claiborne Group) and the Fort Pillow Formation (Wilcox Group) which provide 95 percent of the municipal and industrial water supply for the Memphis and Shelby County areas. The surficial aquifer is separated from these aquifers by the Jackson-Upper Claiborne confining unit which consists of the Cockfield and Cook Mountain Formations. These confining units act as an aquitard impeding the downward migration of shallow groundwater to the Memphis Sand and Fort Pillow aquifers below.

4.1.2 Potentiometric Surface

Water level data were collected on July 19, 1994, from the three newly installed groundwater monitoring wells (MW-1 through MW-3), five existing leak detection wells (T304-1, T304-2, and T1239-1, -2, and -3), and six existing monitoring wells (N-MW-1 through N-MW-6). Water level measurements varied more than would typically be expected for the horizontal spacing of the wells and the relatively flat topography, ranging from 6.79 to 13.59 feet below ground surface. Table 2 summarizes groundwater level data collected on July 19, 1994.

Interpretation of this water level data is not straightforward due to apparent water level differences of several feet over relatively short horizontal distances. A potentiometric map has been developed, however, using the data from all wells. It should be noted that the leak detection wells are screened from 2.5 feet to 15 feet while the monitoring wells were screened from either 5 feet to 20 feet or 5 feet to 25 feet; this variation in screening depths may affect

Table 2 Water Level Data July 19, 1994 Facility I.D. # 0-791709				
Monitoring Well	Top of Casing (TOC) Elevation (ft msl)	Depth to Water (ft below TOC)	Potentiometric Surface Elevations (ft msl)	Total Depth of Well (ft below grade)
MW-1	284.66	9.76 7.76	274.90	20
MW-2	284.94	12.75 10.75	272.19	20
MW-3	285.93	11.59 1.59	274.34	20
T304-1	284.34	6.86	277.48	15
T304-2	283.83	10.77	273.06	15
T1239-1	284.08	10.58	273.50	15
T1239-2	283.28	11.29	271.99	15
T1239-3	283.64	6.79	276.85	15
N-MW-1	285.95	10.71 8.71	275.24	20
N-MW-2	284.76	11.90 9.90	272.86	20
N-MW-3	285.90	14.49 12.49	271.41	20
N-MW-4	286.53	9.23 7.23	277.30	25
N-MW-5	285.19	16.14 14.14	269.05	25
N-MW-6	281.95	9.61	272.34	20

Notes: Free product was measured 2 millimeters thick in monitoring well MW-2 before well development.

the water levels in the wells. In addition, the impact of cultural features such as the adjacent paved areas and the large paved runway to the north are unclear. As shown in Figure 6 the potentiometric surface indicates two groundwater "highs" separated by a narrow trough or groundwater "low." Based on this interpretation, groundwater at the site flows essentially both north to northwest and south to southeast toward the groundwater low which bisects the site.

From this low point the groundwater then flows west-southwest away from the site corresponding to the regional groundwater flow direction for the perched zone.

It should be stressed that the potentiometric surface shown is one interpretation of the available data for one event only. Although other interpretations could possibly be made, the existing limits of contamination at the site generally agree with the interpretation presented. The one exception is the presence of groundwater contamination at N-MW-6 (1,500 $\mu\text{g/L}$), if groundwater is flowing southeast in this area, the contamination detected would likely be from a separate unknown source.

4.1.3 Free Product

A small amount of free product was detected in newly installed monitoring well MW-2. Approximately 2 millimeters of product was observed in the bailer at the start of development. Analytical results indicate a TPH-DRO concentration of 170,000 $\mu\text{g/L}$ in the groundwater at this location. Nearby boring B-11 reflected only minor soil contamination (9.8 mg/kg was the highest value measured) and nearby leak detection well T1239-3 indicated a TPH concentration of only 1,900 $\mu\text{g/L}$ in the groundwater. TPH was detected in seven other wells in concentrations ranging from 660 $\mu\text{g/L}$ to 1,400 $\mu\text{g/L}$. These relatively low concentrations compared to MW-2 indicate that the free product encountered in MW-2 is limited in areal extent.

4.1.4 Hydraulic Gradient

Based on water level data collected on July 19, 1994, the highest hydraulic gradient occurs between wells MW-2 and T1239-3. Water levels from these wells indicate a head drop of 3.66 feet across a horizontal distance of approximately 12 feet or a hydraulic gradient of 0.305. The lowest gradient occurs between wells T304-1 and T1239-3. Water levels from these wells indicate a head drop of 0.63 feet across a horizontal distance of approximately 48 feet or a

hydraulic gradient of 0.013. Gradient calculations between the respective wells are provided below:

MW-2 and 1239-3

$$\frac{dy}{dx} = \frac{276.85 \text{ ft} - 273.19 \text{ ft}}{12 \text{ ft}} = 0.305$$

T1239-1 and T1239-3

$$\frac{dy}{dx} = \frac{277.48 \text{ ft} - 276.85 \text{ ft}}{48 \text{ ft}} = 0.013$$

4.1.5 Slug Testing

Rising and falling head slug tests were conducted on the three newly installed wells to provide additional estimates of aquifer characteristics. Prior to conducting a slug test, the static water level was measured using an electronic water level indicator. An In-Situ pressure transducer was then placed in the water column near the bottom of the well. A two-channel Hermit 1000C data logger was used to measure and record water levels in the well. After allowing the water column to stabilize after insertion of the transducer, a 5-foot long, 1.5-inch diameter Teflon slug was rapidly inserted into the water column. The data logger was programmed to continuously record water levels from the initial insertion of the slug until the test was terminated. To facilitate subsequent graphing of the data, the data logger recorded water levels logarithmically. Rising head slug tests were conducted similarly, with water levels recorded as the slug was rapidly withdrawn from the water column.

Data from the slug tests were evaluated using AQTESOLV (Aquifer Test Solver) by Geraghty and Miller Modelling Group (1989). Rising and falling head slug test data were plotted using the unconfined aquifer solution. Elapsed time versus displacement was plotted on semi-logarithmic graphs. Hydraulic conductivity values were computed using an equation developed by Bouwer and Rice (1976) for unconfined aquifers. Individual slug test graphs and results generated by AQTESOLV are included in Appendix F. Table 3 summarizes slug test results for the three newly installed wells. The average k value calculated from the six tests is 4.47617E-03 feet per day (ft/day).

Table 3				
Slug Test Results				
Facility I.D. # 0-791709				
Monitoring Well	k - Falling Head (ft/min)	k - Rising Head (ft/min)	k - Falling Head (ft/day)	k - Rising Head (ft/day)
MEM-80-MW-1	2.3195E-06	4.981E-06	3.340E-03	7.1726E-03
MEM-80-MW-2	2.7201E-06	2.2905E-06	3.9169E-03	3.2983E-03
MEM-80-MW-3	2.9706E-06	3.3691E-06	4.2777E-03	4.8515E-03
Average Hydraulic Conductivity (k) = 4.47617E-03 ft/day				

4.1.6 Groundwater Flow Rates

Groundwater flow velocities were estimated using the following expression:

$$V = ki/n_e$$

Where:

- V = groundwater velocity
- k = horizontal hydraulic conductivity
- i = hydraulic gradient
- n_e = estimated effective porosity

Groundwater velocity calculations were made using an average hydraulic conductivity (k) value of $4.47617\text{E-}03$ ft/day based on an average of the k values obtained from slug test results. A range of velocities was determined using the observed high and low hydraulic gradients of 0.305 and 0.013, respectively. For this calculation, the effective porosity is assumed to be the average total porosity. The average total porosity value was taken from the investigation performed for the adjacent tank and is 0.394. The lowest and highest estimated groundwater velocities (V_l and V_h) are calculated as shown below.

Hydraulic Conductivity
Hydraulic Gradient
Porosity
From W-126 test

$$V_l = (4.47617\text{E-}03 \text{ ft/day})(0.013)/(0.394) = 1.48\text{E-}04 \text{ ft/day}$$
$$V_h = (4.47617\text{E-}03 \text{ ft/day})(0.305)/(0.394) = 5.38\text{E-}04 \text{ ft/day}$$

Thickness 20

4.2 Monitoring Well Construction

Three groundwater monitoring wells were installed during this investigation. Monitoring wells MW-1 and MW-2 were installed downgradient of tanks 304 and 1239 respectively, while MW-3 was installed at a point nearest the suspected leak from tank 304.

Each well was installed using 3.25-inch hollow stem augers which were advanced to a depth of 23 feet below ground surface. A 15-foot section of 0.010 slot, Schedule 40 PVC screen was installed in each well from 5 to 20 feet below ground surface. Well completion data are provided in Table 4. The open borehole below the screen and the annulus around the screen was backfilled to an approximate depth of 4 feet below ground surface (1 foot above the top of the screen) using 10-20 size silica sand. An approximate 2-foot seal was installed above the sandpack using bentonite pellets. The wells were completed as above grade installations and included a concrete pad with lockable protective casing and concrete filled protective guard posts. Well construction materials used are provided in Table 5. Well construction diagrams are in Appendix G.

Table 4 Well Completion Data Facility I.D. #0-791709					
Monitoring Well Identification	Installation Date	Total Depth (ft btoc) ^a	Well Diameter (inches)	Screened Interval (ft bls) ^b	Measuring Point Elevation
MW-1	7-11-94	22.8	2	5.0-20.0	284.66
MW-2	7-11-94	22.8	2	5.0-20.0	284.94
MW-3	7-12-94	22.9	2	5.0-20.0	285.93

Notes: ^a - feet below top of casing
 ^b - feet below land surface
 ^c - feet above mean sea level

Table 5 Well Construction Materials Facility I.D. #0-791709				
Monitoring Well Identification	Calculated Materials Used		Actual Material Used	
	Sand ¹ (100 bag)	Bentonite ² (5-gallon bucket)	Sand (100 bag)	Bentonite (5-gallon bucket)
MW-1	3.8	0.7	3.5	0.5
MW-2	3.8	0.5	4.1	0.5
MW-3	3.8	0.6	3.8	0.5

Notes: ¹ - 10/20 Silica Sand Used
 ² - 1/4 inch Bentonite Pellets
 Bags of Portland cement not measured

4.3 Well Development

Prior to sampling newly installed wells MW-1, MW-2, and MW-3, each well was developed using a combination of surging and bailing. A total of 4.5 well volumes were removed from MW-1, 6.0 well volumes were removed from MW-2, and 5.3 well volumes were removed from MW-3. Each well was bailed until essentially dry during development. Development water was collected and drummed onsite for proper disposal.

4.4 Monitoring Well Sampling

In all, 11 wells were sampled during this investigation (eight existing wells and three newly installed wells). All wells were purged of three well volumes or to dryness prior to sampling. Groundwater temperature, pH, and conductivity measurements during purging is presented in Table 6. Samples were collected using previously decontaminated and dedicated PVC or Teflon bailers. The sample was then transferred to clean, 1-liter amber glass bottles pre-preserved with HCL. Groundwater samples were also collected for additional engineering design parameters if corrective actions are necessary. All samples were kept on ice and maintained under chain-of-custody until delivered overnight to National Environmental Testing (NET Cambridge Division in Bedford, Massachusetts).

4.5 Analytical Results

Groundwater analytical results indicate that newly installed wells MW-1, MW-2, and MW-3 as well as existing wells N-MW-6, T304-1, T1239-2, and T1239-3 contain TPH-DRO concentrations above the action level of 1.0 ppm (or 1,000 $\mu\text{g/L}$) for a "non-drinking water" site. These results are summarized in the Table 7 below; individual analytical results are in Appendix H. Groundwater samples were also collected for analysis for selected parameters to provide design input for any remedial effort which may be required. A copy of the complete analytical laboratory reports is included with the soil design parameters in Appendix B.

4.6 Groundwater Sample Nomenclature

Groundwater samples were identified by E/A&H with a eight character alpha-numeric system as follows:

- Characters 1,2,3 indicate the facility — MEM indicates NAS MEM.
- Character 4 indicates the sample media — G for groundwater.
- Characters 5,6 indicate the sample method — MW for monitoring well.
- Characters 7,8 indicate the sample location — 02 is monitoring well number 3

Final EAR, Tanks 304 and 1239
 Facility I.D. #0-791709
 NAS Memphis, Millington, Tennessee
 October 27, 1994

Table 6 Well Purging Data							
Monitoring Well	Total Depth (ft. btoc)	Depth to Water (ft. btoc)	Well Volume (gallons)	Purge Volume (gallons)	pH	Conductivity (mhos)	Temperature (°F)
MW-1	22.8	12.35	2.0	6.0	7.95	381	68.0
					7.91	399	66.8
					10.3	354	66.9
MW-2	22.45	16.41	1.3	3.9	ND	ND	ND
					11.3	543	66.5
					10.64	515	66.4
MW-3	22.6	15.18	1.7	3.4	10.2	416	68.3
					9.69	433	66.6
					DRY	DRY	DRY
T304-1	15	6.56	1.4	4.2	6.28	380	71.2
					6.35	370	69.4
					6.37	369	68.6
T304-2	15	7.88	1.2	2.4	6.73	159	67.8
					7.09	164	66.6
					DRY	DRY	DRY
T1239-1	15	6.44	1.4	4.2	7.27	335	70.5
					7.54	325	70.0
					7.83	309	69.7
T1239-2	15	6.67	1.4	4.2	6.37	240	71.5
					6.35	236	70.4
					6.42	228	70.0

Table 6 Well Purging Data							
Monitoring Well	Total Depth (ft. btoc)	Depth to Water (ft. btoc)	Well Volume (gallons)	Purge Volume (gallons)	pH	Conductivity (mhos)	Temperature (°F)
T1239-3	15	6.41	1.4	2.8	6.76	469	69.5
					6.85	463	68.1
					DRY	DRY	DRY
N-MW-1	22.5	11.74	1.8	7.2	10.25	482	68.3
					10.13	518	68.8
					11.27	457	68.5
					11.60	458	68.9
N-MW-4	27.5	9.41	2.9	8.7	7.41	79	67.2
					6.96	78	66.7
					6.94	79	65.7
N-MW-6	20.0	10.9	1.5	4.5	7.30	373	70.5
					7.07	381	69.3
					7.52	376	70.6

Notes: btoc = below top of casing
 ND = not determined

Table 7		
Groundwater Analytical Results (July 15, 1994)		
Well Number	Sample Number	TPH-DRO Concentration ($\mu\text{g/L}$)
MW-1	MEMGMW0100	14,000
MW-1 (duplicate)	MEMHMW0100	12,000
MW-2	MEMGMW0200	170,000
MW-3	MEMGMW0300	19,000
N-MW-1	MEMGNMW100	< 110
N-MW-4	MEMGNMW200	< 110
M-MW-6	MEMGNMW300	1,500
T304-1	MEMGT30401	11,000
T304-2	MEMGT30402	< 100
T1239-1	MEMG123901	660
T1239-2	MEMG123902	6,800
T1239-3	MEMG123903	1,900

Notes: Cleanup level for groundwater is 1.0 ppm (or 1,000 $\mu\text{g/L}$), (non-drinking water). Results above cleanup level are shown in bold. Traces of free product were detected in MW-2.

Data Assessment

All analytical data collected during the investigation were reviewed to verify that the quality objectives of the investigation were met. In all, 42 soil samples, 11 groundwater samples, and one duplicate groundwater sample were collected as part of this investigation. Sample analysis was performed and reported under three separate sample delivery groups: 94.02155, 94.02186, and 94.02217. Samples were analyzed for total high-boiling point petroleum hydrocarbons known as total petroleum hydrocarbon-diesel range organics (TPH-DRO).

All samples were received by the laboratory in good condition, with the proper custody documents intact (copies of chain-of-custody forms are in Appendix I). The technical holding times, from the time of sample collection until the time of sample extraction and/or analysis, were within method requirements. All surrogate spike recoveries were within quality control

criteria. Method blanks were analyzed in compliance with quality control requirements. No contamination was detected within the method blanks. A duplicate groundwater sample was also collected from monitoring well MW-1 and submitted "blind" to the laboratory for analysis. The results for the original groundwater sample and the duplicate groundwater sample from MW-1 showed similar results with TPH-DRO levels of 14,000 $\mu\text{g/L}$ and 12,000 $\mu\text{g/L}$ respectively.

4.7 Groundwater Classification

Groundwater at the site has been previously classified as "non-drinking water." Please refer to *Final Environmental Assessment Report — Building N-126 USTs, Facility I.D. #0-791709*, EnSafe/Allen & Hoshall, November 1993 for additional information. The data collected for this classification are presented in Appendix D. The groundwater cleanup level for this site is 1,000 $\mu\text{g/L}$ (or 1.0 ppm) for TPH.

4.8 Groundwater Contamination Plume

Figure 7 shows the estimated extent of the TPH-DRO groundwater contamination plume at the site. Monitoring wells N-MW-5 and N-MW-6 are therefore included in this investigation and contamination detected in these wells shown as one plume. The TPH-DRO concentration shown for well N-MW-5 was from a sample collected in May 1993, since this well was not sampled as a part of this investigation. Well N-MW-6 was resampled during this investigation and showed concentrations of contamination similar to those detected in July 1993 when it was originally sampled (1,500 $\mu\text{g/L}$ in July 1994 and 2,000 $\mu\text{g/L}$ in July 1993).

Figures 8 and 9 show the estimated extent of the groundwater contamination in cross-sections C — C' and D — D'. The extent of contamination is indicated by the shaded area bound by an isopleth valued at the cleanup level of 1.0 ppm.

Given the groundwater flow directions indicated on the potentiometric map, the groundwater contamination at N-MW-6 may be from a third unknown source. A second possible explanation for the presence of contamination in N-MW-6 is seasonal changes in groundwater flow directions.

Groundwater contamination concentrations in the leak detection wells are somewhat anomalous and were not included in the construction of the groundwater contamination plume map. It is unclear why groundwater contamination concentrations in the leak detection wells vary significantly from those in nearby monitoring wells. Two plausible explanations for the variation in contamination levels are: (1) the leak detection wells have been evacuated regularly during leak detection monitoring and concentration of contamination may have been reduced by the removal of contaminated groundwater from the wells; and (2) the monitoring wells are screened 5 feet deeper than the leak detection wells and the monitoring wells may have encountered contamination at depth below the leak detection wells.

There is a strong possibility the plume from USTs 7/303/1241 and 304/1239 are interrelated; however, data are insufficient from this and previous studies to form a definitive opinion of this relationship. Furthermore, there is no benefit in determining the degree of interaction given the relative location of each site and since any remedial action should be very similar for both sites. All remedial alternatives should be addressed in the Corrective Action Plan including the alternative of combining remedial efforts for UST Sites 7/303/1241 and 304/1239. If these sites are combined, cleanup standards will be established under the January 1994 assessment guidelines.

4.9 Estimated Contaminant Mass in Groundwater

The following contaminant mass calculations are considered as rough approximations and are based on several assumptions, the largest being the average plume concentrations used in the mass balance calculations are representative of the DRO present at the site. This assumption

generally holds true for groundwater; however, the determined values should be considered as conservative estimates.

The contaminant mass in groundwater was approximated by taking the area of the contaminant plume shown in Figure 7 and an estimate of the average water column thickness to determine the volume of impacted groundwater. The following formula was used to calculate the volume of water:

$$V = A*d*n$$

where: V = volume of impacted groundwater (gallons)

A = area of impacted groundwater

d = depth of impacted groundwater

n = porosity value

The total area and depth of groundwater affected with DRO are approximated at 28,000 ft² and 15 feet. Using a literature porosity value of 40 percent for the silts and clays encountered at the site (Fetter, C.W. 1980), a total affected volume of 168,000 ft³ (or 1,400,000 gallons) was determined. The respective dimensions of the 100 ppm, 10 ppm, and 1 ppm plumes were determined to comprise 3 percent, 33 percent, and 64 percent of the total plume. The contaminant plume was assumed to extend vertically through the entire saturated zone. The following mass balance calculation was used to approximate the mass of DRO present in each respective plume:

$$\text{Mass of DRO} = (\text{Total volume}) (\text{percent of plume}) (\text{DRO concentration (mg/L)}) (3.785 \text{ liters/gallon}) (1 \text{ lb}/454,000 \text{ mg})$$

The mass determined in each plume was then summed for a total mass determination.

(1,400,000 gallons) (0.64) (1 mg/L) (3.785 liters/gallon) (1 lb/454,000 mg) = 7.5 lbs DRO

(1,400,000 gallons) (0.33) (10 mg/L) (3.785 liters/gallon) (1 lb/454,000 mg) = 38.5 lbs DRO

(1,400,000 gallons) (0.03) (100 mg/L) (3.785 liters/gallon) (1 lb/454,000 mg) = 35 lbs DRO

Total DRO = 81 lbs

4.10 Site Ranking

A site ranking was completed as requested in Technical Guidance Document — 014 of the *Environmental Assessment Report Guidelines*, from the Tennessee Department of the Environment and Conservation, UST Reference Handbook, January 1994. The calculated site score was 593. A score greater than 500 indicates a corrective action is required. The site ranking form is provided in Appendix J.

NAS Memphis production well N-1 is located about 150 feet west of monitoring well N-MW-3. The total depth of this well is 523 feet and it is screened in the Memphis Sand Formation. N-1 provides potable water to the base. The Jackson-upper Claiborne Formation (a regional confining unit) has been documented by E/A&H (unpublished data) in the vicinity of the north fuel farm. This formation is between the Memphis Sand Aquifer and the impacted surficial aquifer and should act as a barrier to contaminants in the surficial zone, if the production wells are properly cased and do not leak.

5.0 SUMMARY

The following items summarize the findings of this investigation.

- Groundwater at the site has been classified as "non-drinking" water
- The average soil hydraulic conductivity at the site is 4.48E-03 ft/day based on slug test results and 5.10E-04 ft/day based on laboratory test results. *Soil permeability*
1.8 x 10⁻⁷ cm/sec
- The hydraulic gradient across the site (as interpreted from water level data) ranges from 0.013 to 0.388.
- Groundwater flows northwest across the site at calculated groundwater velocities ranging from 1.48E-04 ft/day to 4.41E-03 ft/day.
- Based on the "non-drinking water" classification for the site and the low hydraulic conductivity values of site soils, action levels for soil and groundwater are 500 mg/kg and 1,000 µg/L, respectively for TPH-DRO.
- One or more release at the site has impacted both soil and groundwater. Based on the varying depths of contamination, releases may have occurred as spills at the surface and/or leaks from the tanks.
- Soil TPH-DRO concentrations were above the action level of 500 mg/kg in portions of the soil intervals sampled in 5 of 15 borings (at levels up to 2,300 mg/kg).
- The contaminant mass estimate for soil indicated 10,868 pounds of TPH-DRO.

- TPH-DRO concentrations in groundwater were above the action level of 1,000 $\mu\text{g/L}$ in 7 of 11 monitoring and leak detection wells sampled (at levels ranging from 1,500 $\mu\text{g/L}$ to 170,000 $\mu\text{g/L}$).
- The contaminant mass estimate for groundwater indicated 81 lbs of TPH-DRO.
- A site ranking was completed and the calculated score was 593. A score greater than 500 indicates a corrective action is required.

Based on this data and the site ranking score, EnSafe/Allen and Hoshall recommends the development of a Corrective Action Plan to determine the best course of action to remediate the soil and groundwater contamination detected at this site and the neighboring site containing tanks 7/303/1241.

6.0 REFERENCES

EnSafe/Allen & Hoshall (November 17, 1993). *Final EAR - Building N-126 USTs; Facility I.D. 0-791709, NAS Memphis.* Memphis, Tennessee.

EnSafe/Allen & Hoshall (January 21, 1994). *Final Site Specific Standard Request; Building N-126, Facility I.D. 0791709, NAS Memphis.* Memphis, Tennessee.

Fetter, C. W., 1980. *Applied Hydrogeology.* Merrill Publishing Company, p. 64-68.

7.0 SIGNATURE PAGE

We, the undersigned, certify under penalty of law, including but not limited to penalties for perjury, that the information contained in this report and on any attachments is true, accurate and complete to the best of our knowledge, information, and belief. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for intentional violations.

_____ Owner/Operator (Print)	_____ Signature	_____ Date
<i>Benjamin J. Bawtley</i> P.E. or P.G. (Print)	<i>Benjamin J. Bawtley</i> Signature	<i>10-27-94</i> Date
	<i>TN #1602</i> _____ TN Lic./Reg.#	

If a P.E. signs the report, indicate the area of expertise.

Stamp/Seal

STATE OF _____

Sworn to and subscribed before me by _____ on this date

My commission expires _____

Notary Public-Print Name

Signature

APPENDIX A

BORING LOGS

FACILITY I.D. # 0-791709

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Gross

0	0	0.0-3.0' CLAYEY SILT, TAN TO TAN AND LIGHT BROWN, FIRM TO STIFF.
3	400	3.0-8.0' CLAYEY SILT, GREYISH BROWN, MOIST, FIRM (WITH STRONG HYDROCARBON ODOR).
8	297	8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
13	126	13.0-14.0' CLAYEY SILT, GREYISH BROWN, SOFT.
14.8	328	14.0-14.5' CLAYEY SILT, BROWN, STIFF. 14.5-15.4' CLAYEY SILT, GRAYISH BROWN, SOFT. 15.4-16.4' SILTY CLAY, DARK BROWN, FIRM.
18	35	18.0-20.5' CLAYEY SILT TO SILTY CLAY, BROWN, MOIST, FIRM.
20.5	13	20.5-23.0' SILTY CLAY, TAN MOTTLED YELLOW TAN, FIRM TO STIFF.

Boring Number	B/MW-1
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1325/071194
Time/Date Finish	1425/071194

DISCONTINUED BORING AT 23.0 FEET.

25
30



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B/MW-1
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/11/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSBB-1

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Cross

0	4	0.0-1.0' CLAYEY SILT, TAN WITH CONCRETE FRAGMENTS (FILL). 1.0-3.4' CLAYEY SILT, TAN MOTTLED GREY AND BLACK, STIFF.
3.4	421	3.4-5.8' CLAYEY SILT, GRAYISH BROWN, MOIST, FIRM (WITH HYDROCARBON ODOR).
5.8	102	5.8-8.0' SILTY CLAY, GRAYISH BROWN, MOIST, SOFT (WITH SLIGHT HYDROCARBON ODOR).
8	275	8.0-10.5' CLAYEY SILT, GREYISH BROWN, MOIST, SOFT.
10.5	92	10.5-15.2' SILTY CLAY, GREYISH BROWN TO TAN MOTTLED GREY, MOIST, SOFT.
13	27	
15.5	120	15.2-16.0' SILTY CLAY, GREYISH BROWN, VERY MOIST, SOFT.
18	234	16.0-18.0' SILTY CLAY, DARK BROWN, MOIST, FIRM. 18.0-20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM (WITH STRONG HYDROCARBON ODOR).
20.5	136	20.5-23.0' SILTY CLAY, BROWN, MOIST, FIRM (WITH HYDROCARBON ODOR).

Boring Number	B/MW-2
Facility Name	North Fuel Farm (Building N-94) Near Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1520/071194
Time/Date Finish	1815/071194

DISCONTINUED BORING AT 23.0 FEET.



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B/MW-2
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/11/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSBB-2

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS / 5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

5	0	30	0.0-3.0' CLAYEY SILT, TAN GRADING TO TAN MOTTLED GREY, SLIGHTLY MOIST, STIFF.
	3	56	3.0-8.0' CLAYEY SILT, GREYISH BROWN, WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
10	8	48	8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
	13	81	13.0-18.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
15			
	18	86	18.0-20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM TO STIFF (WITH HYDROCARBON ODOR).
20	20.5	112	20.5-23.0' SILTY CLAY, BROWN GRADING TO TAN, MOIST, FIRM TO STIFF (WITH SLIGHT HYDROCARBON ODOR).

Boring Number	B/MW-3
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	0830/071294
Time/Date Finish	0915/071294

DISCONTINUED BORING AT 23.0 FEET.



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B/MW-3
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSBB-3

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/.5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

5
 10
 15
 20
 25
 30

4

4.0-6.0' CLAYEY SILT, GREYISH BROWN, MOIST, VERY FIRM TO STIFF (WITH HYDROCARBON ODOR).

9

9.0-11.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM TO SOFT (WITH HYDROCARBON ODOR).

DISCONTINUED BORING AT 11.0 FEET.

Boring Number	B-3A
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	0930/071294
Time/Date Finish	1000/071294



ENVIRONMENTAL
 ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-3A

UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSB-3A

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/.5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

0	9	0.0-1.5' CRUSHED LIMESTONE (FILL)
3	2	1.5-3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, STIFF.
5.5	9	3.0-6.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM (WITH HYDROCARBON ODOR).
8	238	6.0-7.0' CLAYEY SILT, BROWN MOTTLED BEIGE, MOIST, STIFF.
10.5	121	7.0-8.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
13	11	8.0-13.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH HYDROCARBON ODOR).
15.5	4.8	13.0-18.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).

Boring Number	B-4
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1310/071294
Time/Date Finish	1355/071294

DISCONTINUED BORING AT 18.0 FEET.



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-4
 UST's 304 & 1239
 MILLINGTON, TN
 DATE INSTALLED: 7/12/1994 PROJ. #: CTO0080

DATE: 8/4/1994	DWG NAME: CTOSBB-4
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DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS / .5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION
SURFACE - Grass					
0		15			0.0-2.0' CLAYEY SILT, TAN MOTTLED BROWN, SLIGHTLY MOIST, STIFF (FILL?) 2.0-3.0' SILT, SLIGHTLY CLAYEY, DARK BROWN,, FIRM.
3		15			3.0-5.0' CLAYEY SILT, DARK BROWN, MOIST, FIRM.
5		4			5.0-8.0' CLAYEY SILT, TAN MOTTLED GREY AND DARK BROWN, SLIGHTLY MOIST, STIFF (IN SITU SOIL).
8		1			8.0-13.0' CLAYEY SILT, TAN MOTTLED GREY AND DARK BROWN, MOIST, STIFF.
13		4			13.0-15.5' CLAYEY SILT, TAN MOTTLED GREY GRADING TO BROWN MOTTLED GREY, VERY MOIST, FIRM.
15.5		214			15.5-18.0' SAME AS ABOVE (WITH SLIGHT HYDROCARBON ODOR).
18		229			18.0- 20.5' SAME AS ABOVE (WITH SLIGHT HYDROCARBON ODOR).
20.5		0			20.5-23.0' CLAYEY SILT TO SILTY CLAY, DARK GREYISH BROWN GRADING TO DARK REDDISH BROWN, MOIST, STIFF.
23		10			23.0-28.0' SILTY CLAY GRADING TO CLAYEY SILT, DARK BROWN GRADING TO BROWN MOTTLED TAN, MOIST TO VERY MOIST, STIFF TO FIRM.
30					DISCONTINUED BORING AT 28.0 FEET.

Boring Number	B-5
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1630/071394
Time/Date Finish	Not recorded



ENVIRONMENTAL ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-5
UST's 304 & 1239
MILLINGTON, TN

DATE INSTALLED: 7/13/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSBB-5

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS / 5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Crushed Limestone

	0	15	0.0-2.5' CLAYEY SILT, BROWN, STIFF.
			2.5-3.0' CLAYEY SILT, DARK GREY, MOIST, SOFT.
5	3	4	3.0-6.0' CLAYEY SILT, GREYISH BROWN, MOIST, SOFT.
	5.5	27	6.0-8.0' CLAYEY SILT, MOTTLED BROWN, TAN, AND GREY, MOIST, STIFF.
	8	324	8.0-13.0' CLAYEY SILT, BROWN MOTTLED GREY AT TOP 1' GRADING TO GREYISH BROWN MOTTLED GREY, MOIST, SOFT (WITH HYDROCARBON ODOR).
10	10.5	303	
	13	288	13.0-18.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY WITH SOME BLACK STAINING?, WET, SOFT (WITH SLIGHT HYDROCARBON ODOR).
15	15.5	304	

Boring Number	B-6
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Bucklee Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1405/071294
Time/Date Finish	1450/071294

DISCONTINUED BORING AT 18.0 FEET.



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-6
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSBB-6

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/.5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

5	0	41	0.0-4.0' CLAYEY SILT, TAN TO BROWN, DRY TO SLIGHTLY MOIST, STIFF.
5	4	49	4.0-8.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM.
10	8	14	8.0-8.5' CLAYEY SILT, TAN TO BROWN, SLIGHTLY MOIST, FIRM, FRIABLE.
10	10.5	86	8.5-13.0' CLAYEY SILT, GREYISH BROWN, MOTTLED GREY AND TAN, MOIST, FIRM (WITH HYDROCARBON ODOR).
15	13	94	13.0-18.0' SAME AS ABOVE (WITH HYDROCARBON ODOR).
15	15.5	81	
20	18	7	18.0-20.5' CLAYEY SILT, GREYISH BROWN, MOTTLED TAN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
20	20.5	7	20.5-22.0' CLAYEY SILT, GREY, VERY MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR). 22.0-23.0' SILTY CLAY, DARK BROWN, MOIST, STIFF (OIL SHEEN ON SAMPLER).
25	23	0	23.0-28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM (WITH TRACE OF STAINING).
25	25.5	1	

Boring Number	B-7
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	0845/071494
Time/Date Finish	Not recorded

DISCONTINUED BORING AT 28.0 FEET.

30



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-7
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/14/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSBB-7

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/.5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Crushed Limestone

0	51	0.0-0.5' CLAYEY SILT, BROWN, SLIGHTLY MOIST, FIRM.
3	29	0.5-3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM.
5.5	27	3.0-8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT GRADING TO CLAYEY SILT, GREY MOTTLED BROWN, STIFF. (WITH SLIGHT HYDRO-CARBON ODOR).
8	185	8.0-13.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
10.5	239	
13	306	13.0-18.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
DISCONTINUED BORING AT 18.0 FEET.		

Boring Number	B-8
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1500/071294
Time/Date Finish	1545/071294



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-8

UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSBB-8

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

0	60	0.0-3.0' CLAYEY SILT, TAN TO BROWN, SLIGHTLY MOIST, STIFF, (WITH TRACES OF SUBROUNDED GRAVEL) (FILL).
3	16	3.0-4.6' CLAYEY SILT TO SILTY CLAY, TAN AND BROWN, VERY MOIST, (WITH TRACES OF GRAVEL) (FILL?).
4.6	32	4.6-8.0' CLAYEY SILT, GREYISH BROWN WITH SOME BLACK STAINING, MOIST, SOFT (WITH SLIGHT HYDROCARBON ODOR).
8	3	8.0-10.1' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT.
10.1	3	10.1-14.7' CLAYEY SILT TO SILTY CLAY, TAN TO BROWN MOTTLED GREY, MOIST, FIRM.
13	2	
14.7	67	14.7-18.0' CLAYEY SILT, DARK BROWN, MOIST, STIFF (WITH TRACES OF FINE WET VERTICAL SEAMS OF GREY SILT)(WITH SLIGHT HYDROCARBON ODOR).

Boring Number	B-9
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1030/071294
Time/Date Finish	1100/071294

DISCONTINUED BORING AT 18.0 FEET.

20
25
30



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-9

UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTO5BB-9

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS / 5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

5
10
15
20
25
30

0	20	0.0-3.0' CLAYEY SILT, BROWN MOTTLED TAN, SLIGHTLY MOIST, STIFF (IN SITU SOIL).
3	14	3.0-8.0' CLAYEY SILT, BROWN GRADING TO BROWN MOTTLED GREY, SLIGHTLY MOIST, STIFF, (GREY MOTTLING IS SILT IN BOTTOM 1.5 FEET) (WITH SLIGHT HYDROCARBON ODOR).
5.5	21	
8	9	8.0-13.0' CLAYEY SILT, BROWN MOTTLED BEIGE, GRADING TO SILT, BROWN MOTTLED GREY, STIFF, MOIST (WITH SLIGHT HYDROCARBON ODOR).
10.5	19	
13	9	13.0-18.0' CLAYEY SILT, BROWN MOTTLED BEIGE AND LIGHT GREY, FIRM, VERY MOIST.
15.5	13	

Boring Number	B-10
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1220/071294
Time/Date Finish	1250/071294

DISCONTINUED BORING AT 18.0 FEET.



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-10

UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTO SB-10

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS / 5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

	0	40	0.0-3.0' CLAYEY SILT, TAN, SLIGHTLY MOIST, STIFF (IN SITU SOIL?).
	3	31	3.0-8.0' CLAYEY SILT, BROWN, SLIGHTLY MOIST, STIFF.
	8	25	8.0-10.5' CLAYEY SILT, BROWN MOTTLED GREY, VERY MOIST, FIRM.
	10.5	15	10.5-13.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY (WITH SOME BLACK IN LOWER PORTION), VERY MOIST, FIRM.
	13	32	13.0-15.5' CLAYEY SILT, TAN MOTTLED GREY, MOIST, FIRM.
	15.5	16	15.5-18.0' SILTY CLAY BROWNISH GREY GRADING TO BROWN AND GREY TO DARK BROWN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).

DISCONTINUED BORING AT 18.0 FEET.

Boring Number	B-11
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1540/071294
Time/Date Finish	1645/071294



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-11
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSB-11

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

0	40	0.0-3.8' CLAYEY SILT, BROWN MOTTLED BEIGE AND DARK BROWN, SLIGHTLY MOIST, STIFF (FILL?).
3.8	234	3.8-5.8' CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
8	150	8.0-14.5' CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
13.0	137	14.5-14.7' SILT, BROWN, STIFF, DRY.
14.9	132	14.7-14.9' CLAYEY SILT, BROWN WITH BLACK STAINING, WITH TRACES OF ROUNDED GRAVEL, VERY MOIST (WITH TRACES OF OIL AND STRONG HYDROCARBON ODOR). 14.9-16.0' CLAYEY SILT TO SILTY CLAY, SLIGHTLY MOIST, VERY STIFF.
18	242	18.0-23.0' CLAYEY SILT, DARK GREYISH BROWN, MOIST, STIFF (WITH STRONG HYDROCARBON ODOR).
23	261	23.0-25.0' CLAYEY SILT, DARK BROWN, SLIGHTLY MOIST, FRIABLE (WITH HYDROCARBON ODOR).
25	257	25.0-28.0' CLAYEY SILT, TAN MOTTLED BEIGE, SLIGHTLY MOIST, STIFF (UPPER PORTION OF SAMPLE MAY HAVE SLIGHT HYDROCARBON ODOR) (COLLECTED ANALYTICAL SAMPLE FROM 27-28').

DISCONTINUED BORING AT 28.0 FEET.

Boring Number	B-12
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1110/071294
Time/Date Finish	Not recorded



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-12
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/13/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTO5B-12

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

5	1	330	0.0-1.0' CLAYEY SILT, TAN MOTTLED BROWN, SLIGHTLY MOIST, STIFF.
	3	213	1.0-3.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR). HIT TANK AT APPROXIMATE DEPTH OF 6 FEET, OFFSET BORING 3 FEET EAST. SAMPLES BELOW 3 FEET IN DEPTH ARE FROM OFFSET BORING.
	8	202	3.0-8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR). 8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
10	13	136	13.0-18.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT TO FIRM (WITH TRACES OF CARBONIZED WOOD AND SLIGHT HYDROCARBON ODOR).
15	18	8	18.0-20.5' CLAYEY SILT, LIGHT GREYISH BROWN GRADING TO GREY, MOIST, FIRM.
20	20.5	3	20.5-23.0' SILTY CLAY, DARK GREYISH BROWN GRADING TO DARK BROWN, MOIST, STIFF.
25	23	2	23.0-27.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO STIFF.
	25.5	6	27.0-28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM.
30			DISCONTINUED BORING AT 28.0 FEET.

Boring Number	B-15
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	Not recorded/071394
Time/Date Finish	



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-15
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/13/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSB-15

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS/.5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

0	70	0.0-3.0' CLAYEY SILT, BROWN MOTTLED BEIGE, SLIGHTLY MOIST, STIFF.
3	64	3.0-8.0' CLAYEY SILT, BROWN WITH DARK BROWN STREAKS, MOIST, FIRM.
8	96	8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR).
13	23	13.0-18.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO SOFT (WITH SLIGHT HYDROCARBON ODOR).

Boring Number	B-14
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1015/071394
Time/Date Finish	1050/071394

DISCONTINUED BORING AT 18.0 FEET.



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CT00080

SOIL BORING B-14
 UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/13/1994 PROJ. #: CT00080

DATE: 8/4/1994

DWG NAME: CTOSB-14

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)
 SAMPLE TYPE
 SAMPLE DEPTH
 BLOWS / 5 FT.
 ORGANIC VAPOR (ppm)

SURFACE - Grass

0	7	0.0-3.0' CLAYEY SILT, TAN TO BROWN, SLIGHTLY MOIST, FIRM TO STIFF (FILL?)
3	15	3.0-8.0' CLAYEY SILT, BROWN MOTTLED TAN, VERY MOIST, SOFT.
8	9	8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT.
13	6	13.0-14.0' CLAYEY SILT, BROWN, WET, SOFT.
14	77	14.0-14.5' CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, WET, SOFT (WITH HYDROCARBON ODOR). 14.5-18.0' CLAYEY SILT, GREYISH BROWN GRADING TO BROWN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
18	49	18.0-21.0' CLAYEY SILT, LIGHT BROWN GRADING TO DARK BROWN, MOIST, STIFF.
20.5	300	21.0-23.0' CLAYEY SILT, DARK BROWN, VERY MOIST, FRIABLE (WITH HYDROCARBON ODOR).
23	327	23.0-26.0' CLAYEY SILT, DARK GREYISH BROWN, VERY MOIST, FIRM (WITH TRACES OF OIL AND STRONG HYDROCARBON ODOR).
25.5	18	26.0-28.0' CLAYEY SILT, BROWN MOTTLED TAN, MOIST, FIRM TO STIFF (WITH SLIGHT HYDROCARBON ODOR).

DISCONTINUED BORING AT 28.0 FEET.

Boring Number	B-13
Facility Name	North Fuel Farm (Building N-94) Nas Memphis, Millington, TN
Facility I.D.	0-791709
E/H&H Geologist License #	Jeffery L. Albert TN 1083
Drilling Subcontractor	Tristate Testing Services, Inc. 6756 Buckles Cove Memphis, TN
Drilling Method	3.25-inch HSA
Sampler Type	CME 5-foot CS
Time/Date Start	1310/071294
Time/Date Finish	Not recorded



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 CTO-0080

SOIL BORING B-13

UST's 304 & 1239
 MILLINGTON, TN

DATE INSTALLED: 7/12/1994 PROJ. #: CTO0080

DATE: 8/4/1994

DWG NAME: CTOSB-13

APPENDIX B

REMEDIAL DESIGN PARAMETERS

FACILITY I.D. # 0-791709

Microbial Plate Count	
Sample Location	Results (CFU/ml)
B-12 (8-13')	346
B-14 (8-13')	<45
B-15 (8-13')	<45

Note: CFU/ml = Colony Forming Unit/milliliter

Remedial Design Parameters (Groundwater)				
Parameter	Results			units
	MW-1	MW-2	MW-3	
Alkalinity as CaCO ₃	220	320	360	ppm
Total Organic Carbon	27	230	63	mg/L
Total Phosphorus	0.12	0.32	0.068	mg/L
Nitrate	<0.020	0.29	0.033	mg/L
Nitrite-N	<0.020	<0.020	<0.020	mg/L
Turbidity	130	320	92	NTU
Total Suspended Solids	340	410	160	mg/L
Iron	8.3	7.5	3.0	mg/L
Manganese	4.3	6.6	5.7	mg/L

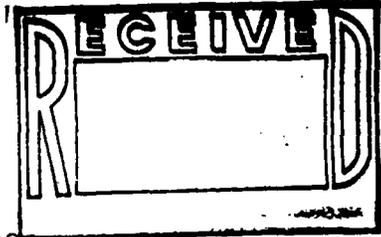


NATIONAL ENVIRONMENTAL TESTING, INC.

Dayton Division
3601 South Dixie Drive
Dayton, OH 45439
Tel: (513) 294-6856
Fax: (513) 294-7816

ANALYTICAL REPORT

Kerri Cattabriga
NET ATLANTIC - MA
12 Oak Park
Bedford, MA 01730



07/22/1994

NET Job Number: 94.09291

Client Project ID: EnSafe NAS-Memphis CTO-0080

Analyte	Result	Flag	Units	Reporting	Date	Analyst	Prep	Run	Method Reference	
				Limit	Analyzed	Initials	Batch	Batch		
SAMPLE NO.	SAMPLE DESCRIPTION						DATE-TIME TAKEN			
251881	Soil-B-14 (8-13) B.#87844						07/13/1994 10:30			
Dry Weight	77.1		%		07/15/1994	bjm		304	APHA-2540 G.	
Plate Count, Standard	<45		CFU/mL		07/21/1994	jmt		25		
SAMPLE NO.	SAMPLE DESCRIPTION						DATE-TIME TAKEN			
251882	Soil-B-15 (8-13) B.#87845						07/13/1994 15:00			
Dry Weight	77.2		%		07/15/1994	bjm		304	APHA-2540 G.	
Plate Count, Standard	<45		CFU/mL		07/21/1994	jmt		25		
SAMPLE NO.	SAMPLE DESCRIPTION						DATE-TIME TAKEN			
251883	Soil-B-12 (8-13) B.#87846						07/13/1994 11:25			
Dry Weight	76.8		%		07/15/1994	bjm		304	APHA-2540 G.	
Plate Count, Standard	346		CFU/mL		07/21/1994	jmt		25		

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709



NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMGMW0100

NET Sample No: 106502

Parameter	Method	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
Alkalinity	AQ EPA 310.1	220	ppmCaCO3	07/21/1994		204	djc
Nitrate-calc	AQ EPA 353.2	<0.020	mg/L N	07/20/1994		6	lmz
Nitrite-N -IC	AQ EPA 300.0	<0.020	mg/L N	07/20/1994		188	lmz
Phosphorus-Total	AQ EPA 365.3	0.12	mg/L P	07/26/1994		88	djc
Solids, suspended (TSS)	AQ EPA 160.2	340	mg/L	07/19/1994		342	djc
Total Organic Carbon, TOC	AQ EPA 415.2	27	mg/L	07/20/1994		154	lmz
Turbidity	AQ EPA 180.1	130	NTU	07/16/1994		148	lmz
Aq. Dig. SW846, 3010 mod	AQ SW846,3010 mod	07/20/1994	date	07/20/1994	5138CW		drm
Iron (Fe) 846 ICP	AQ SW846 ICP, 6010	8.3	mg/L	07/25/1994		342	pac
Manganese (Mn) 846 ICP	AQ SW846 ICP, 6010	4.3	mg/L	07/25/1994		303	pac
EX TPH (Extractable) DRO	AQ SW-846, 3500	07/19/1994	date	07/19/1994	exdro_		hpm

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MENGMW0200

NET Sample No: 106503

Parameter	Method	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
Alkalinity	AQ EPA 310.1	320	ppmCaCO3	07/21/1994		204	djc
Nitrate-calc	AQ EPA 353.2	0.29	mg/L N	07/20/1994		6	lmz
Nitrite-N -IC	AQ EPA 300.0	<0.020	mg/L N	07/20/1994		188	lmz
Phosphorus-Total	AQ EPA 365.3	0.32	mg/L P	07/26/1994		88	djc
Solids, suspended (TSS)	AQ EPA 160.2	410	mg/L	07/19/1994		342	djc
Total Organic Carbon, TOC	AQ EPA 415.2	230	mg/L	07/20/1994		154	lmz
Turbidity	AQ EPA 180.1	320	NTU	07/16/1994		148	lmz
Aq. Dig. SW846, 3010 mod	AQ SW846,3010 mod	07/20/1994	date	07/20/1994	5138CW		drm
Iron (Fe) 846 ICP	AQ SW846 ICP, 6010	7.5	mg/L	07/25/1994		342	pac
Manganese (Mn) 846 ICP	AQ SW846 ICP, 6010	6.6	mg/L	07/25/1994		303	pac
EX TPH (Extractable) DRO	AQ SW-846, 3500	07/19/1994	date	07/19/1994	exdro_		hpm

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMGHW0300

NET Sample No: 106504

Parameter	Method	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
Alkalinity	AQ EPA 310.1	360	ppmCaCO3	07/21/1994		204	djc
Nitrate-calc	AQ EPA 353.2	0.033	mg/L N	07/20/1994		6	lmz
Nitrite-N -IC	AQ EPA 300.0	<0.020	mg/L N	07/20/1994		188	lmz
Phosphorus-Total	AQ EPA 365.3	0.068	mg/L P	07/26/1994		88	djc
Solids, suspended (TSS)	AQ EPA 160.2	160	mg/L	07/19/1994		342	djc
Total Organic Carbon, TOC	AQ EPA 415.2	63	mg/L	07/20/1994		154	lmz
Turbidity	AQ EPA 180.1	92	NTU	07/16/1994		148	lmz
Aq. Dig. SW846, 3010 mod	AQ SW846,3010 mod	07/20/1994	date	07/20/1994	5138CW		drm
Iron (Fe) 846 ICP	AQ SW846 ICP, 6010	3.0	mg/L	07/25/1994		342	pac
Manganese (Mn) 846 ICP	AQ SW846 ICP, 6010	5.7	mg/L	07/25/1994		303	pac
EX TPH (Extractable) DRO	AQ SW-846, 3500	07/19/1994	date	07/19/1994	exdro_		hpm

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

APPENDIX C

**SOIL ANALYTICAL RESULTS
FACILITY I.D. # 0-791709**

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB0025.8

NET Sample No: 106305

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) B100 DRO S Diesel Range Organics	2300000	ug/Kg	07/16/1994	1	2	puh

Only DRO reported C10-C24
Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMS800108

NET Sample No: 106302

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S						
Diesel Range Organics	2300000	ug/Kg	07/18/1994	1	2	pwh

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USIs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEHSB00118

NET Sample No: 106303

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) B100 DRO S Diesel Range Organics	44000	ug/Kg	07/16/1994	1	2	puh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB00123

NET Sample No: 106304

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<5300	ug/Kg	07/16/1994	1	2	puh

USTs T304 and T1239 W.
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMS800220.5

NET Sample No: 106306

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	2300000	ug/Kg	07/16/1994	1	2	pmh

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMS800223

NET Sample No: 106307

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	960000	ug/Kg	07/19/1994	1	2	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB00308

NET Sample No: 106308

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) B100 DRO S Diesel Range Organics	790000	ug/Kg	07/19/1994	1	2	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMS00318

NET Sample No: 106309

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	1300000	ug/Kg	07/19/1994	1	2	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB00323

NET Sample No: 106310

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	160000	ug/Kg	07/19/1994	1	2	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

UST:s T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB00410.5

NET Sample No: 106311

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	82000	ug/Kg	07/16/1994	1	2	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB00413

NET Sample No: 106312

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	290000	ug/Kg	07/16/1994	1	2	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB00418

NET Sample No: 106313

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	86000	ug/Kg	07/16/1994	1	2	ner

Only DRO reported C10-C24.
Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMS800518

NET Sample No: 106415

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<5100	ug/Kg	07/17/1994	2	3	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMSB00520

NET Sample No: 106416

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<5100	ug/Kg	07/17/1994	2	3	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division

ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB00608

NET Sample No: 106314

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S						
Diesel Range Organics	53000	ug/Kg	07/16/1994	1	2	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMS00610.5

NET Sample No: 106315

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	890000	ug/Kg	07/16/1994	1	2	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB00618

NET Sample No: 106316

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<5000	ug/Kg	07/16/1994	1	2	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMS00708

NET Sample No: 106515

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<5100	ug/Kg	07/23/1994	2	4	pmh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMS800715

NET Sample No: 106516

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	61000	ug/Kg	07/28/1994	2	5	puh

NOTE: This sample was reextracted on 07/27/94(within holding times). The result reported is from 07/28/94.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Noshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMS800723

NET Sample No: 106517

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<5300	ug/Kg	07/23/1994	2	4	pmh

NOTE: This sample was reextracted outside holding times on 07/27/94 due to low surrogate recovery. This was reanalyzed and confirmed to have no DRO- the surrogate recovery for the reextraction was 53% (recovery range of 50-150%).

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB00808

NET Sample No: 106317

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	32000	ug/Kg	07/16/1994	1	2	ner

Only DRO reported C10-C24.
Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMS800818

NET Sample No: 106318

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	18000	ug/Kg	07/16/1994	1	2	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

UST-s T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMS800908

NET Sample No: 106319

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	54000	ug/Kg	07/17/1994	1	2	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMS800918

NET Sample No: 106320

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) B100 DRO S Diesel Range Organics	130000	ug/Kg	07/17/1994	1	2	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MENS801008

NET Sample No: 106321

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	230000	ug/Kg	07/17/1994	1	2	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB01018

NET Sample No: 106322

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<4900	ug/Kg	07/17/1994	1	2	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMS801108

NET Sample No: 106323

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<4800	ug/Kg	07/17/1994	1	2	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: HEMSB01115.5

NET Sample No: 106324

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<4900	ug/Kg	07/17/1994	1	2	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02155

Project: Naval Air Station, Memphis

Date Rec'd: 07/13/1994

Sample ID: MEMSB01118

NET Sample No: 106325

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S						
Diesel Range Organics	9800	ug/Kg	07/17/1994	1	2	ner

Only DRO reported C10-C24.
Sample did contain GRO analyte C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMSB01208

NET Sample No: 106418

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S						
Diesel Range Organics	800000	ug/Kg	07/17/1994	2	3	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMS801228

NET Sample No: 106420

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<4100	ug/Kg	07/17/1994	2	3	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMS801318

NET Sample No: 106421

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	490000	ug/Kg	07/17/1994	2	3	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMSB01325

NET Sample No: 106422

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S						
Diesel Range Organics	690000	ug/Kg	07/18/1994	2	3	ner

Only DRO reported C10-C24.
Sample did have a GRO analyte C6-14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMSB01328

NET Sample No: 106423

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<4300	ug/Kg	07/18/1994	2	3	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMS801408

NET Sample No: 106424

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<4200	ug/Kg	07/18/1994	2	3	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

**NET Cambridge Division
ANALYTICAL REPORT**

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMS801418

NET Sample No: 106425

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	7900	ug/Kg	07/18/1994	2	3	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division

ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMSB01503

NET Sample No: 106426

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	310000	ug/Kg	07/18/1994	2	3	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMSB01508

NET Sample No: 106427

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	61000	ug/Kg	07/18/1994	2	3	ner

Only DRO reported C10-C24.

Sample did have a GRO analyte present C6-C14.

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMSB01518

NET Sample No: 106428

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<4200	ug/Kg	07/18/1994	2	3	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 07/22/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02186

Project: Naval Air Station, Memphis

Date Rec'd: 07/14/1994

Sample ID: MEMS801528

NET Sample No: 106429

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO S Diesel Range Organics	<4200	ug/Kg	07/18/1994	2	3	ner

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

APPENDIX D

**GROUNDWATER CLASSIFICATION DATA
FACILITY I.D. # 0-791709**

Groundwater Classification

A groundwater sample was collected from monitoring well N-MW-1 on August 26, 1993, and analyzed for Primary and Secondary Drinking Water Standards in accordance with the TDEC's Technical Guidance Document 002. Analytical results (included in Table 1) indicate iron, manganese, total dissolved solids (TDS), and turbidity in excess of the respective suggested levels for drinking water.

Table 1 N-MW-1 Drinking Water Quality (Facility I.D. 0-791673)		
Parameters	Result (mg/l)	Standard (mg/l)
Iron	4.38	0.3
Manganese	0.56	0.05
Total Dissolved Solids	513	500
Turbidity	9.5 NTU	1 NTU

Note:

Turbidity is a primary drinking water standard and expressed in Nephelometric Turbidity Units (NTU)

Because the shallow aquifer is not being utilized as a water source (drinking or otherwise) local to the site, and the elevated iron, manganese, TDS, and turbidity content fails to meet the drinking water standards, the aquifer can be characterized as a "non-drinking water" aquifer. Based upon this classification, the TDEC cleanup levels for non-drinking water are 70 $\mu\text{g/l}$ benzene and 1,000 $\mu\text{g/l}$ TPH.



MEMPHIS AND SHELBY COUNTY
HEALTH DEPARTMENT

RICHARD SWIGGART, M.P.A.
Director

SHERMAN KAHN, M.D.
Health Officer



DR. W. W. HERENTON
Mayor of Memphis

WILLIAM N. MORRIS, JR.
Mayor of Shelby County

August 6, 1992

EnSafe / Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134

Attn: Lawson M. Anderson

RE: Environmental Site Assessment
Water Well Search
Millington Naval Air Station-Willis Gate
Intersection Of Navy Road And Third Avenue
Millington, Tennessee

Dear Mr. Anderson:

Please find enclosed a list of quasi-public, commercial, and residential wells located within an approximate two (2) mile radius of the above location that are contained in our files. This list does not contain the location of any public water supply wells that are operated by the Public Utility Division, nor does it contain wells used for groundwater monitoring. Public water well information may be obtained from Memphis Light, Gas, and Water Division, 245 South Main St., Memphis, Tennessee (901)528-4011. Information regarding monitoring wells associated with leaking petroleum storage tanks may be obtained from the Tennessee Department of Environment and Conservation, Division of Water Management, 2500 Mt. Moriah Road, (901)543-6695.

Our records indicate five (5) wells on the Naval Air Station property, however, information regarding the exact location, use, and depth of these wells is not included in our files. You may contact Lt. Ron Gruzsky, NAS Memphis, 873-5230 for additional information about these wells.

Page 1 of 2

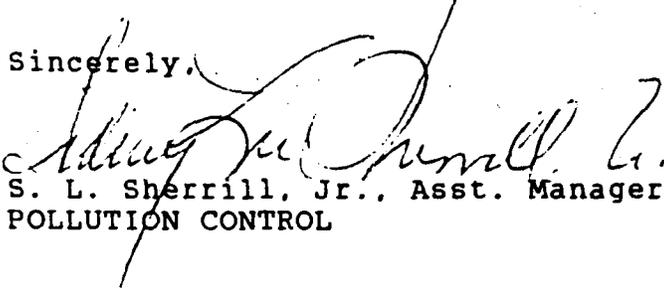
August 6, 1992

wp-0075I/115

August 6, 1992

I hope this clarifies the facts for which we have records on file in our office. If Pollution Control can be of further assistance, feel free to contact me at 576-7775.

Sincerely,



S. L. Sherrill, Jr., Asst. Manager
POLLUTION CONTROL

ENCLOSURE

wp-00751/116
WAS/SLS
HK-199

WATER WELL LIST

Page 1 of 2

August 6, 1992

Water Well Number: 1
Owner of Well: James E. Krosp
Location of Well: 7378 Krosp Road
Mailing Address: James E. Krosp
7378 Krosp Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: 150 Feet
Well Classification: Residential

Water Well Number: 2
Owner of Well: Clifford O. Longmire
Location of Well: 7431 Krosp Road
Mailing Address: Clifford O. Longmire
7431 Krosp Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: 120 Feet
Well Classification: Residential

Water Well Number: 3
Owner of Well: Terry Longmire
Location of Well: 7473 Krosp Road
Mailing Address: Terry Longmire
7473 Krosp Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: 130 Feet
Well Classification: Residential

Water Well Number: 4
Owner of Well: Phoenix Zinc
Location of Well: 4525/4599 Big Creek Church Road
Mailing Address: 4525/4599 Big Creek Church Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: Not Listed
Well Classification: Commercial

Water Well Number: 5
Owner of Well: Shelby County Conservation Board
Location of Well: Edmond Orgill Park
Mailing Address: Shelby County Conservation Board
2599 Avery
Memphis, TN 38053
Attn: Ed Price
Number of wells at this location: 1
Well Depth: Depth Not Listed
Well Classification: Irrigation And To Maintain Lake Level

wp0075I/117

WATER WELL LIST (Continued)

Page 2 of 2

August 6, 1992

Water Well Number: 6
Owner of Well: Harold Bradley
Location of Well: 5230 Bateman Road
Mailing Address: Harold Bradley
5230 Batman Road
Millington, TN 38053
Number of wells at this location: 1
Well Depth: 150 Feet
Well Classification: Residential

APPENDIX E

**LABORATORY HYDRAULIC CONDUCTIVITY RESULTS
FACILITY I.D. # 0-791709**



INTERSTATE TESTING SERVICES, INC.

Measurement of Hydraulic Conductivity

Client: EnSafe

Date of Report: 08/09/94

Project No.: E-2-629

Project Name: Naval Air Station Millington, Tennessee

Sample I.D.: Boring # 3A, Shelby tube # 1, Depth 4.0' - 6.0'

Soil Description: Gray Silty Clay

TN Facility I.D. No.: 0-791709

	<u>Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft ³)	121.5	126.0
Dry Density (Lbs/ft ³)	95.5	97.8
Moisture (% Dry Wt)	27.2	28.8

Permeability

Temperature Correction, $R_t = 1.086$

$$K_1 = 2.2 \times 10^{-7} \text{ cm/sec}$$

$$K_2 = 1.6 \times 10^{-7} \text{ cm/sec}$$

$$K_3 = 1.5 \times 10^{-7} \text{ cm/sec}$$

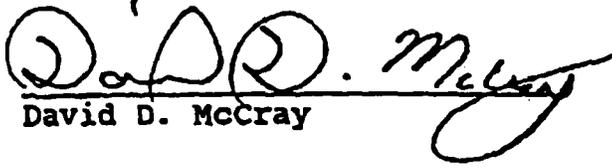
$$K_4 = 1.3 \times 10^{-7} \text{ cm/sec}$$

Coefficient of Permeability, $K_{20} = 1.8 \times 10^{-7} \text{ cm/sec}$

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-94-0034

Reviewed By:


David D. McCray



**STATE
TESTING SERVICES, INC.**

Measurement of Hydraulic Conductivity

Client: EnSafe

Date of Report: 08/03/94

Project No.: E-2-629

Project Name: Naval Air Station Millington, Tennessee

Sample I.D.: Boring # 3A, Shelby tube # 2, Depth 9.0'- 11.0"

Soil Description: Gray Silty Clay

TN Facility I.D. No.: 0-791709

	<u>Pre-Test</u>	<u>Post Test</u>
Wet Density (Lbs/ft ³)	116.4	122.6
Dry Density (Lbs/ft ³)	93.6	95.6
Moisture (% Dry Wt)	24.3	28.2

Permeability

Temperature Correction, $R_t = .949$

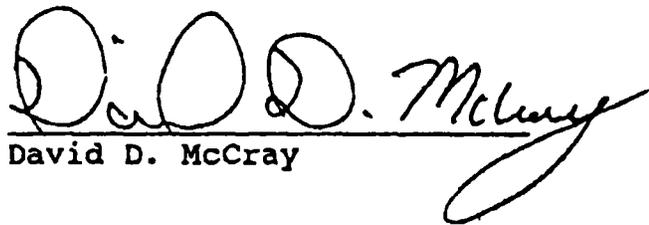
- $K_1 = 5.3 \times 10^{-7}$ cm/sec
- $K_2 = 1.5 \times 10^{-6}$ cm/sec
- $K_3 = 7.1 \times 10^{-7}$ cm/sec
- $K_4 = 7.9 \times 10^{-7}$ cm/sec

Coefficient of Permeability, $K_{20} = 8.4 \times 10^{-7}$ cm/sec

Tested in accordance with Method 9100 of Test Methods for evaluation Solid Waste, Third Addition (SW-846) and in general accordance with ASTM D-5084-90.

Lab No. P-94-0035

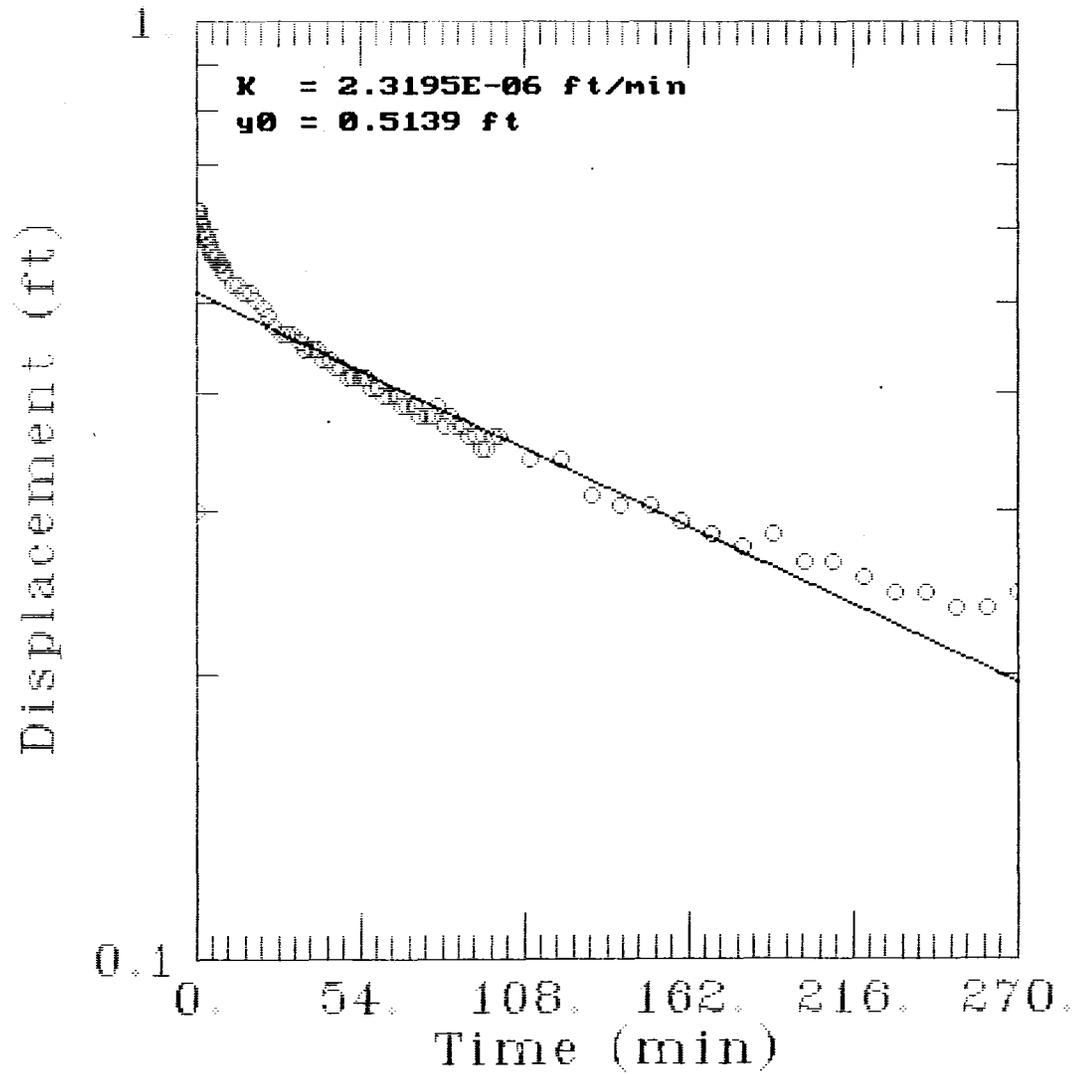
Reviewed By:


David D. McCray

APPENDIX F

**SLUG TEST RESULTS
FACILITY I.D. # 0-791709**

MW-1 Falling Head Test



AQTESOLV

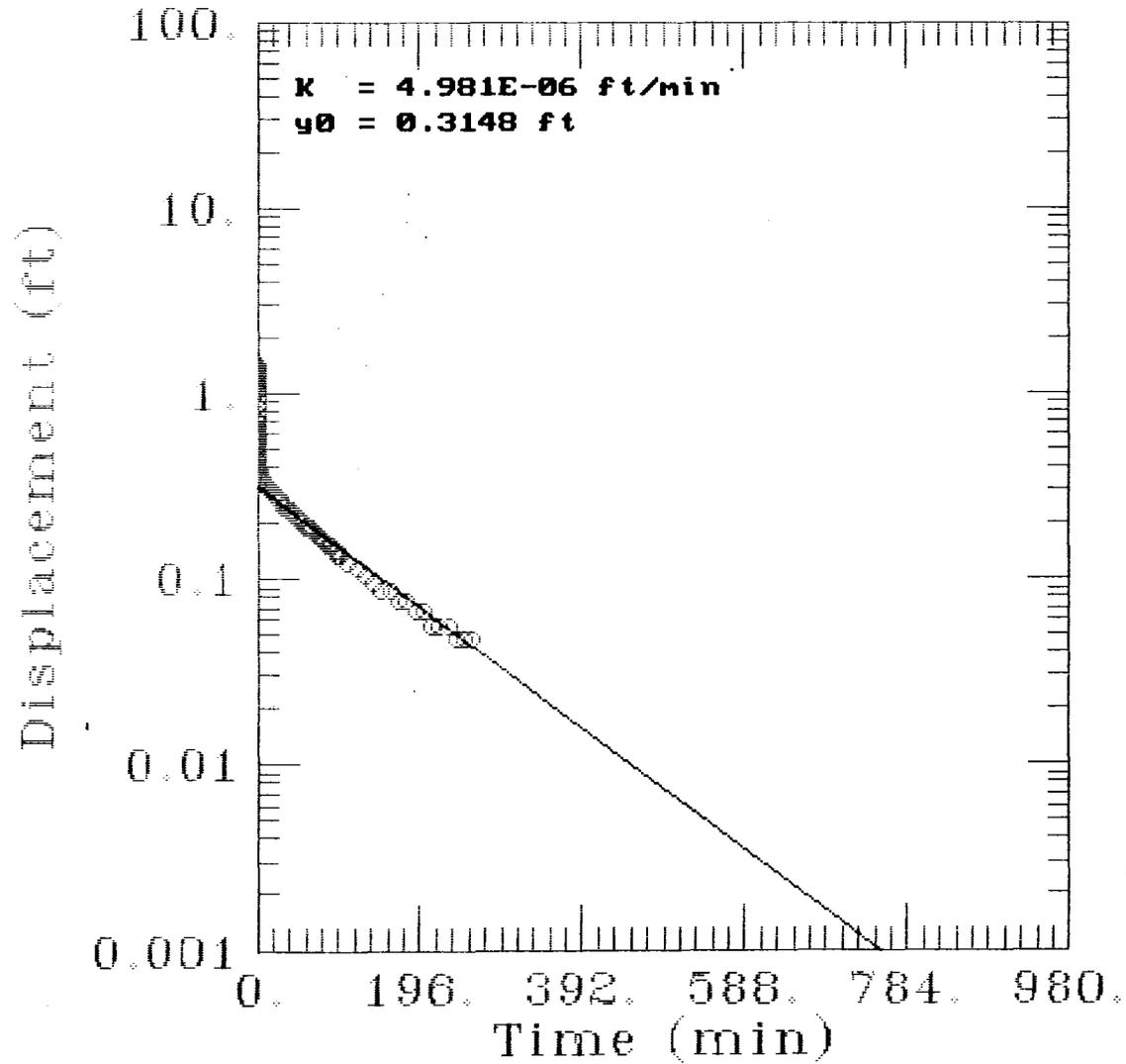


GERAGHTY
& MILLER, INC.



Modeling Group

MW-1 Rising Head Test

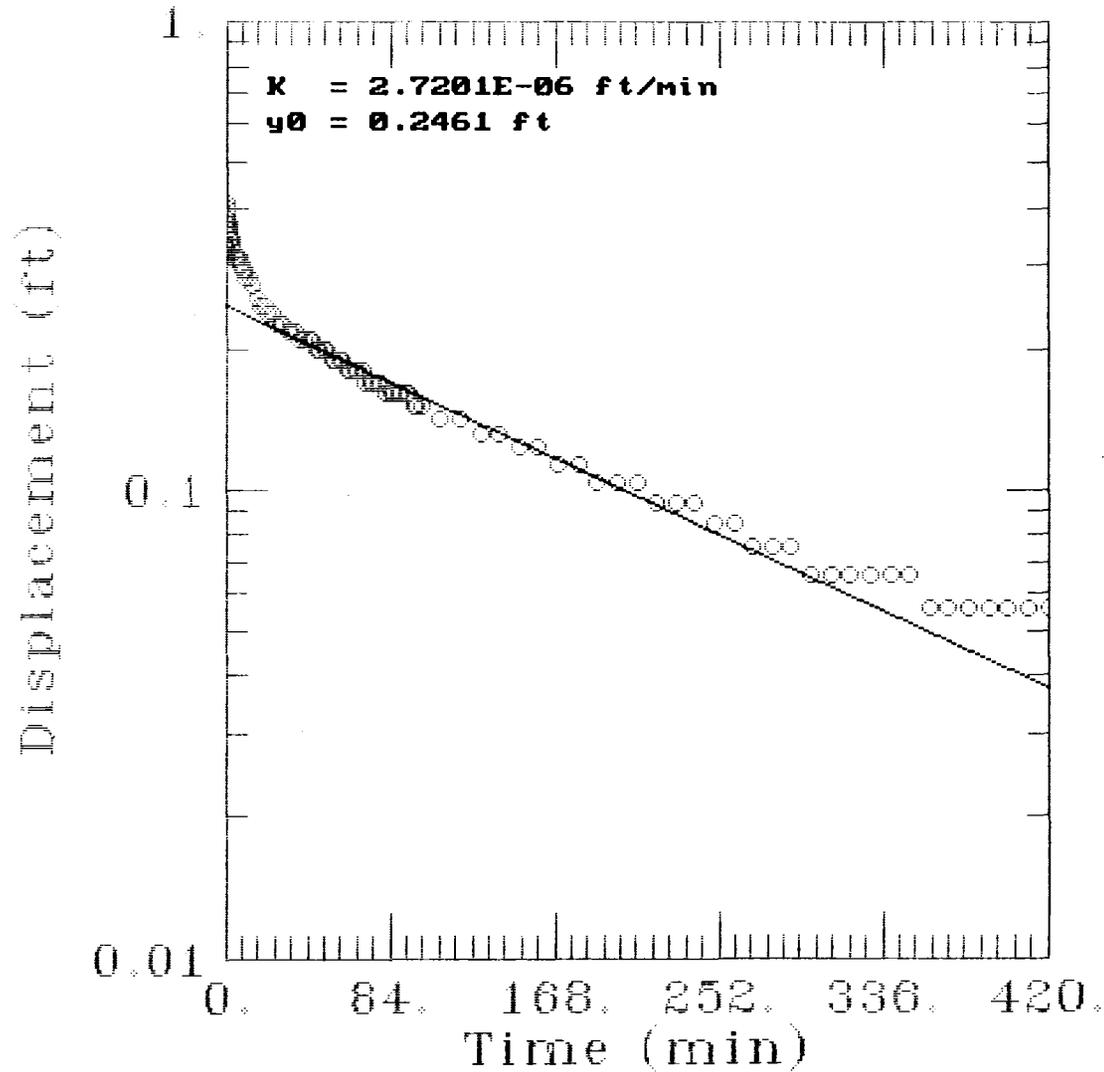


AQTESOLV

 GERAGHTY
& MILLER, INC.

 Modeling Group

MW-2 Falling Head Test



AQTESOLV

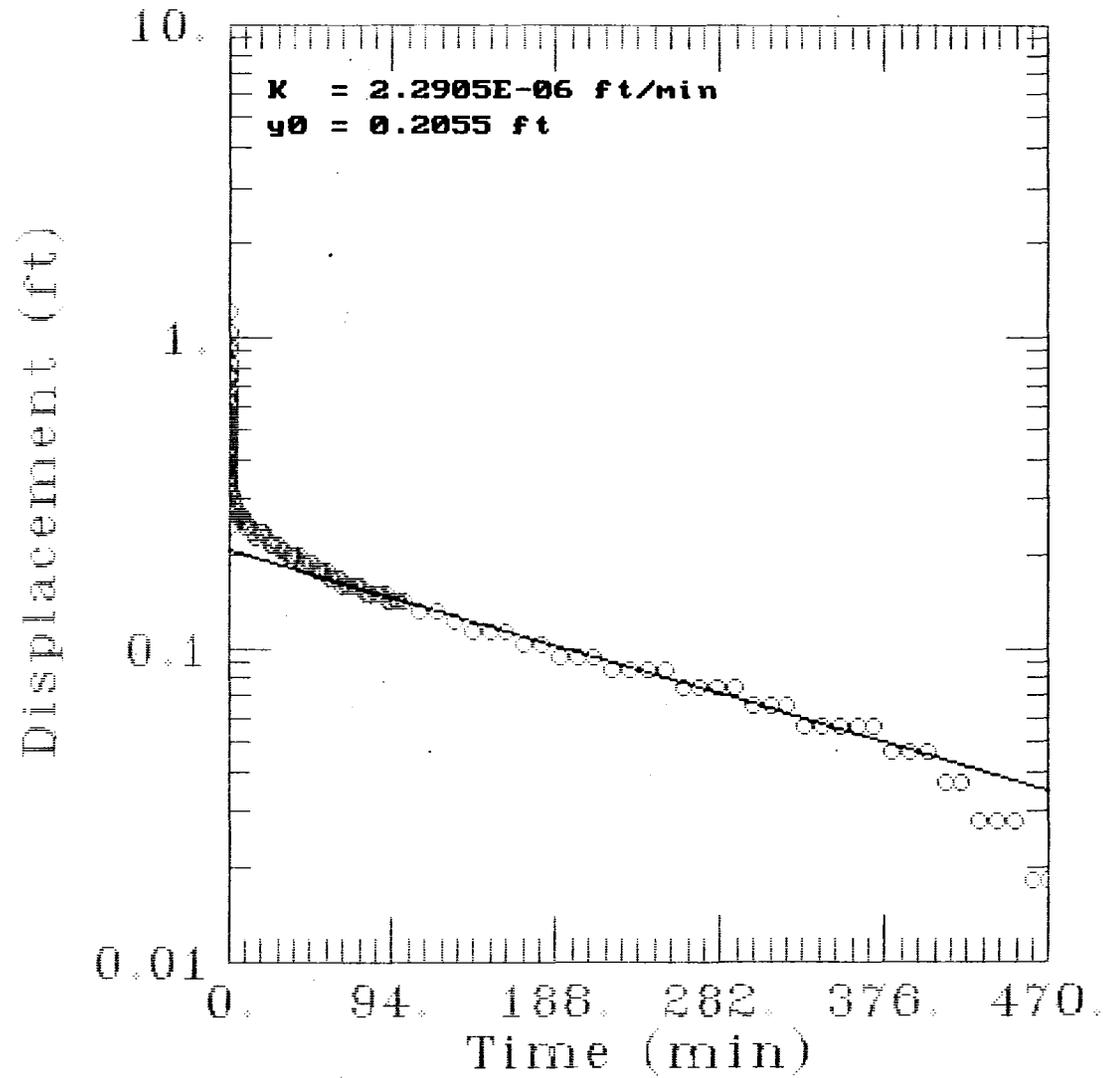


GERAGHTY
& MILLER, INC.



Modeling Group

MW-2 Rising Head Test

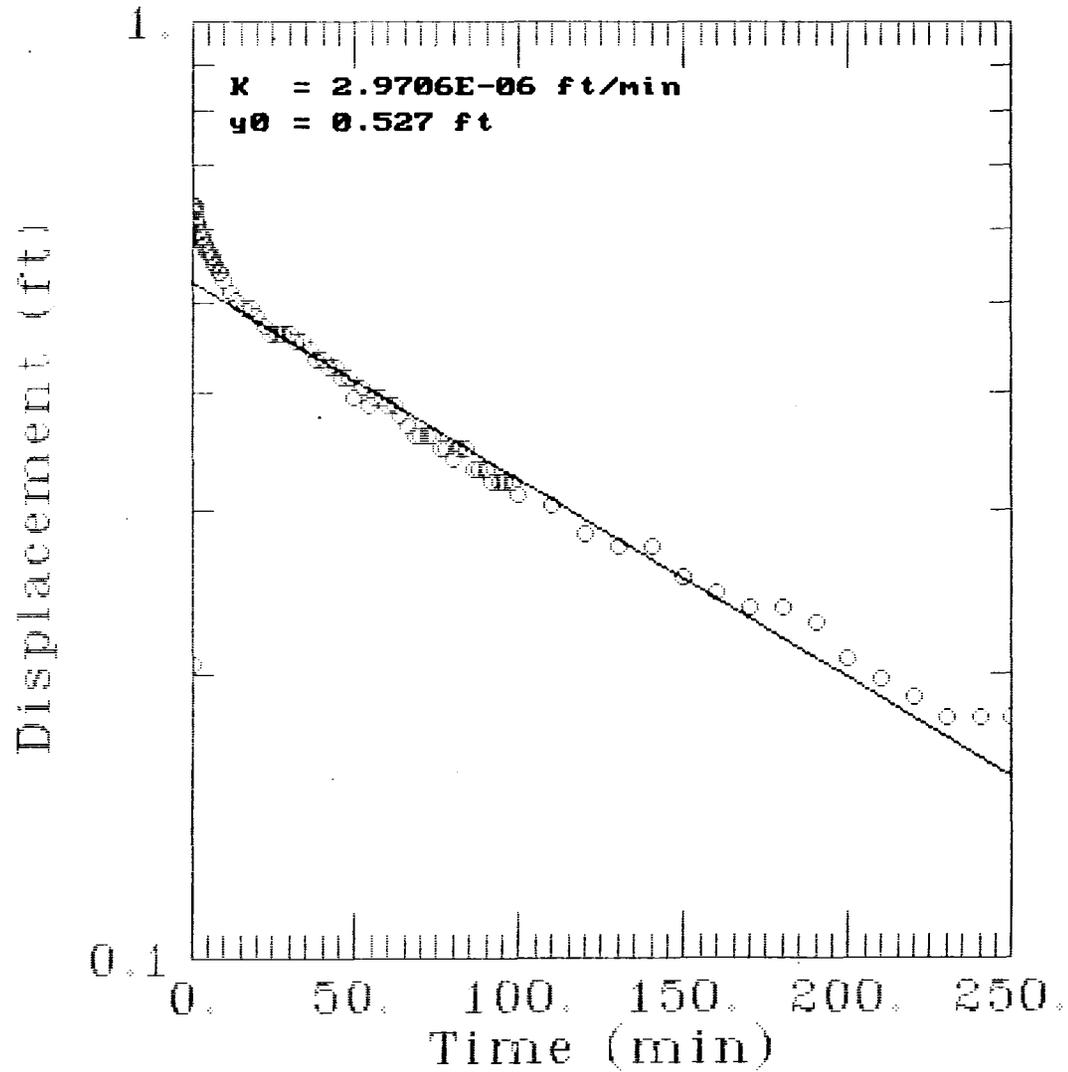


AQTESOLV

 GERAGHTY
& MILLER, INC.

 Modeling Group

MW-3 Falling Head Test



AQTESOLV

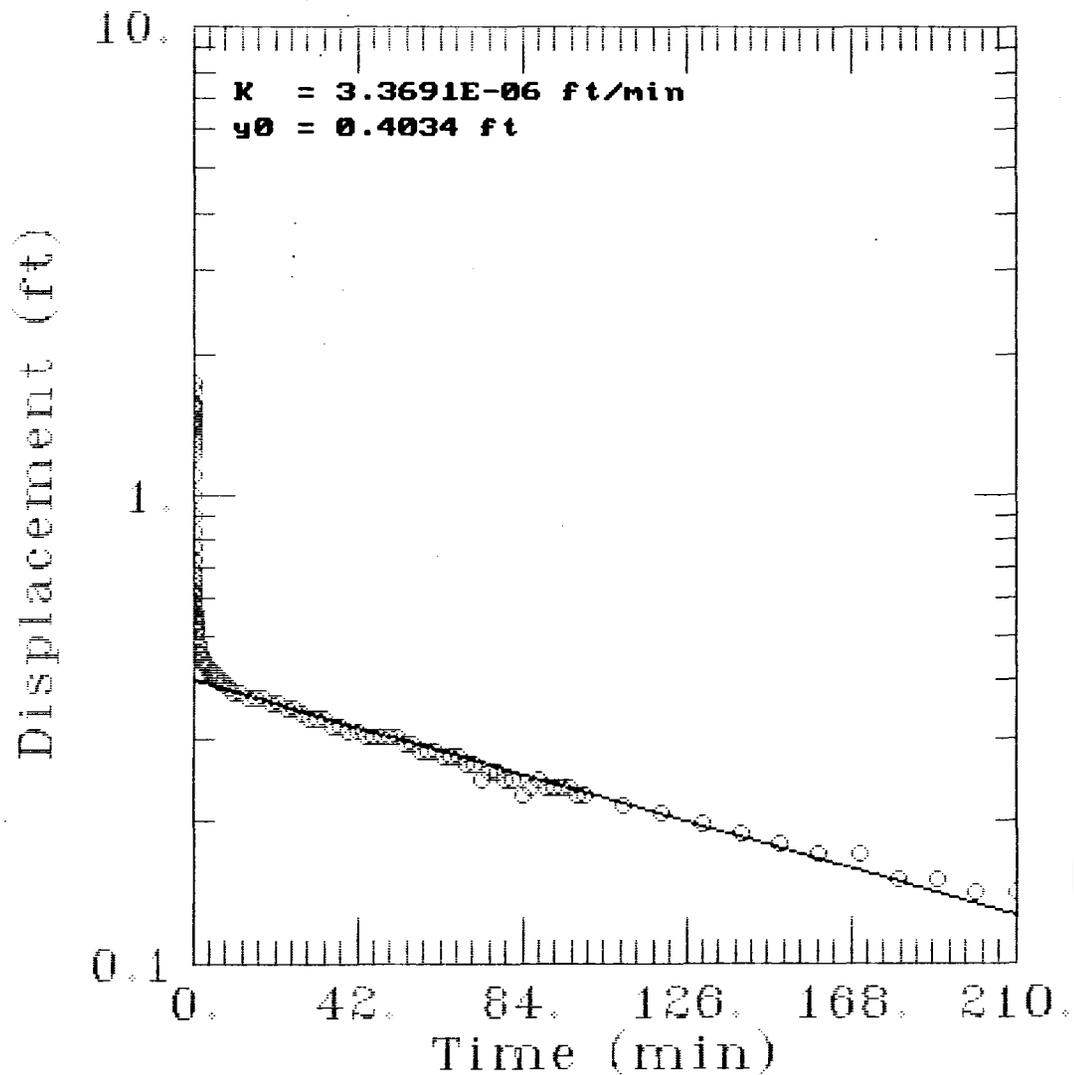


GERAGHTY
& MILLER, INC.



Modeling Group

MW-3 Rising Head Test



AQTESOLV



GERAGHTY
& MILLER, INC.



Modeling Group

APPENDIX G

**WELL CONSTRUCTION DIAGRAMS
FACILITY I.D. # 0-791709**

WELL CONSTRUCTION LOG. MEM-80-MW-1

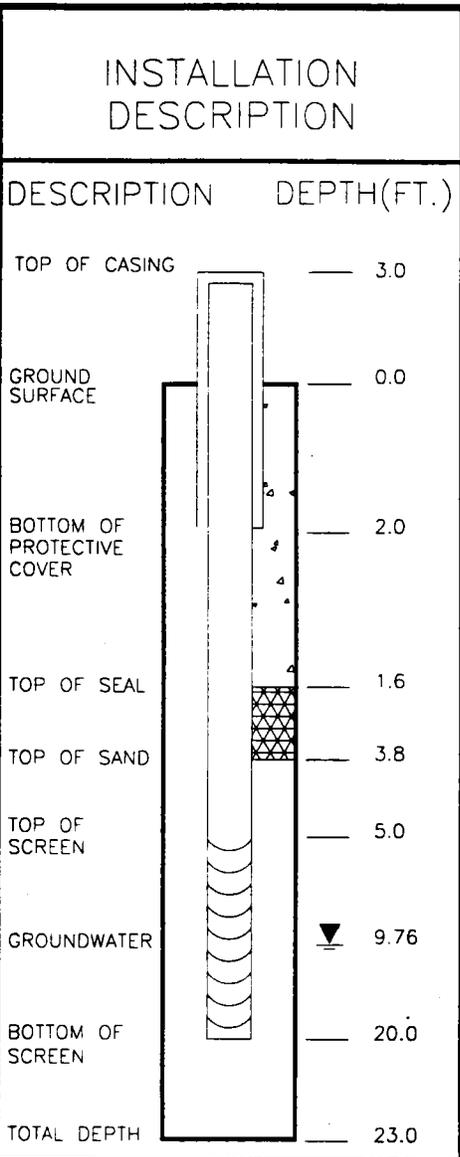
NAS MEMPHIS

WELL LOCATION USTs 304 & 1239

DATE INSTALLED 11 JULY 94

TYPE OF WELL 2 INCH ID SCH 40 PVC

1. HEIGHT OF CASING ABOVE GROUND 2.8 FEET
2. WATER SURFACE ELEV. 274.90
- a) DEPTH TO SATURATED ZONE 9.76
3. TOP OF CASING ELEV. 284.66
4. PROTECTIVE CASING YES NO
- a) CASING LENGTH 5 FT
5. LENGTH OF SCREEN 15.0 FEET
6. SIZE\TYPE OF SCREEN 0.010 INCH SLOTTED PVC
7. LENGTH OF SUMP 3.0 FT
8. TOTAL DEPTH OF BORING 20.0 HOLE DIAMETER 8 INCH
9. SCREENED INTERVAL 5.0 FEET TO 20.0 FEET
10. TYPE OF SCREEN FILTER PACK SILICA SAND
QUANTITY USED 350 lbs. SIZE 10/20 U/C
11. DEPTH TO TOP OF FILTER 3.8 FEET
12. TYPE OF SEAL 1/4 INCH BENTONITE PELLETS
QUANTITY USED 1/2 BUCKET
13. DEPTH TO TOP OF SEAL 1.6 FEET
14. TYPE OF GROUT N/A
GROUT MIXTURE _____
METHOD OF PLACEMENT _____
15. COMMENTS ANNULUS ABOVE SEAL FILLED WITH
CONCRETE DURING PAD CONSTRUCTION.



FACILITY I.D. 0-791709

JOB NUMBER CTO-0080



ENVIRONMENTAL
ASSESSMENT PLAN
NAS MEMPHIS
CTO-0080

USTs 304 & 1239
MONITORING WELL MEM-80-MW-1
WELL CONSTRUCTION LOG

DATE: 8-16-94

DWG NAME: -80MW-1

WELL CONSTRUCTION LOG. MEM-80-MW-2

NAS MEMPHIS

WELL LOCATION USTs 304 & 1239

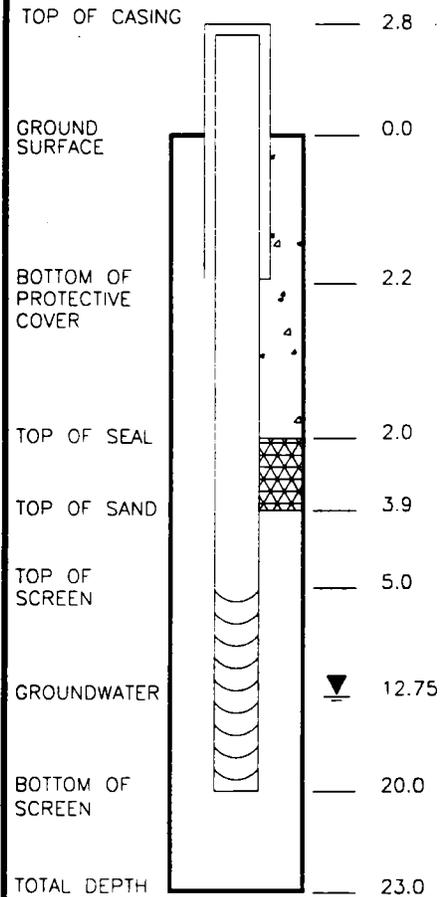
DATE INSTALLED 11 JULY 94

TYPE OF WELL 2 INCH ID SCH 40 PVC

1. HEIGHT OF CASING ABOVE GROUND 2.45 FEET
2. WATER SURFACE ELEV. 272.19
- o) DEPTH TO SATURATED ZONE 12.75
3. TOP OF CASING ELEV. 284.94
4. PROTECTIVE CASING YES NO
- o) CASING LENGTH 5 FT
5. LENGTH OF SCREEN 15.0 FEET
6. SIZE\TYPE OF SCREEN 0.010 INCH SLOTTED PVC
7. LENGTH OF SUMP 3.0 FT
8. TOTAL DEPTH OF BORING 20.0 HOLE DIAMETER 8 INCH
9. SCREENED INTERVAL 5.0 FEET TO 20.0 FEET
10. TYPE OF SCREEN FILTER PACK SILICA SAND
QUANTITY USED 417 lbs. SIZE 10/20 U/C
11. DEPTH TO TOP OF FILTER 3.9 FEET
12. TYPE OF SEAL 1/4 INCH BENTONITE PELLETS
QUANTITY USED 1/2 BUCKET
13. DEPTH TO TOP OF SEAL 2.2 FEET
14. TYPE OF GROUT N/A
GROUT MIXTURE _____
METHOD OF PLACEMENT _____
15. COMMENTS ANNULUS ABOVE SEAL FILLED WITH
CONCRETE DURING PAD CONSTRUCTION.

INSTALLATION DESCRIPTION

DESCRIPTION DEPTH(F.T.)



FACILITY I.D. 0-791709
JOB NUMBER CTO-0080



ENVIRONMENTAL
ASSESSMENT PLAN
NAS MEMPHIS
CTO-0080

USTs 304 & 1239
MONITORING WELL MEM-80-MW-2
WELL CONSTRUCTION LOG

DATE: 08-16-94

DWG NAME: -80MW-2

WELL CONSTRUCTION LOG. MEM-80-MW-3

NAS MEMPHIS

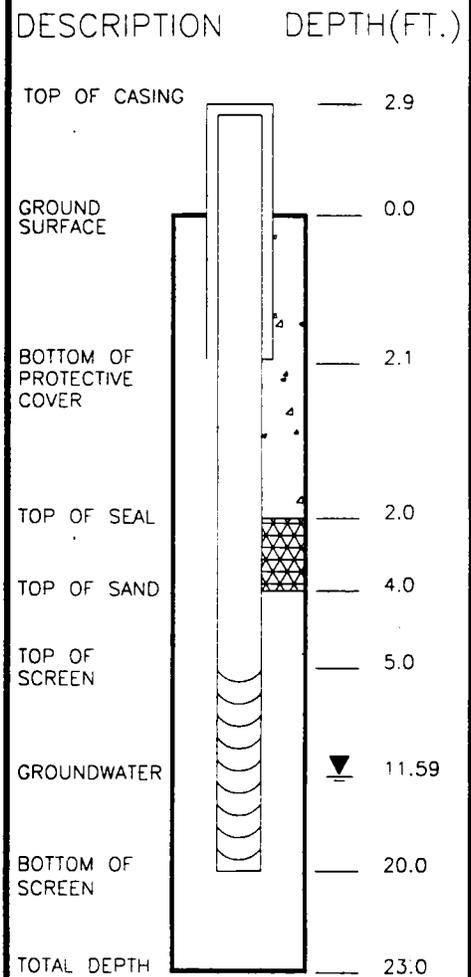
WELL LOCATION USTs 304 & 1239

DATE INSTALLED 12 JULY 94

TYPE OF WELL 2 INCH ID SCH 40 PVC

1. HEIGHT OF CASING ABOVE GROUND 2.6 FEET
2. WATER SURFACE ELEV. 274.34
- c) DEPTH TO SATURATED ZONE 11.59
3. TOP OF CASING ELEV. 285.93
4. PROTECTIVE CASING YES NO
- a) CASING LENGTH 5 FT
5. LENGTH OF SCREEN 15.0 FEET
6. SIZE\TYPE OF SCREEN 0.010 INCH SLOTTED PVC
7. LENGTH OF SUMP 3.0 FT
8. TOTAL DEPTH OF BORING 20.0 HOLE DIAMETER 8 INCH
9. SCREENED INTERVAL 5.0 FEET TO 20.0 FEET
10. TYPE OF SCREEN FILTER PACK SILICA SAND
QUANTITY USED 375 lbs. SIZE 10/20 U/C
11. DEPTH TO TOP OF FILTER 4.0 FEET
12. TYPE OF SEAL 1/4 INCH BENTONITE PELLETS
QUANTITY USED 1/2 BUCKET
13. DEPTH TO TOP OF SEAL 2.0 FEET
14. TYPE OF GROUT N/A
GROUT MIXTURE _____
METHOD OF PLACEMENT _____
15. COMMENTS ANNULUS ABOVE SEAL FILLED WITH
CONCRETE DURING PAD CONSTRUCTION.

INSTALLATION DESCRIPTION



FACILITY I.D. 0-791709
JOB NUMBER CTO-0080



ENVIRONMENTAL
ASSESSMENT PLAN
NAS MEMPHIS
CTO-0080

USTs 304 & 1239
MONITORING WELL MEM-80-MW-3
WELL CONSTRUCTION LOG

DATE: 08-16-94

DWG NAME: -80MW-3

APPENDIX H

**GROUNDWATER ANALYTICAL RESULTS
FACILITY I.D. # 0-791709**

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMHMM0100

NET Sample No: 106513

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	12000	ug/L	07/25/1994	2	2	pwh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMGMW0200

NET Sample No: 106503

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	170000	ug/L	07/25/1994	2	2	pmh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMGMW0300

NET Sample No: 106504

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	19000	ug/L	07/25/1994	2	2	puh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMGNMJ100

NET Sample No: 106505

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	<110	ug/L	07/22/1994	2	2	pwh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMGNM400

NET Sample No: 106506

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	<110	ug/L	07/22/1994	2	2	pwh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMGNM600

NET Sample No: 106507

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	1500	ug/L	07/22/1994	2	2	pwh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMGT30401

NET Sample No: 106509

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRD AQ Diesel Range Organics	11000	ug/L	07/25/1994	2	2	pwh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMGT30402

NET Sample No: 106508

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	<100	ug/L	07/22/1994	2	2	puh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMG123901

NET Sample No: 106510

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	660	ug/L	07/22/1994	2	2	pwh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMG123902

NET Sample No: 106511

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	6800	ug/L	07/25/1994	2	2	pwh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

NET Cambridge Division ANALYTICAL REPORT

Report Date: 08/02/1994

Report To: EnSafe/Allen & Hoshall

NET Job No: 94.02217

Project: Naval Air Station, Memphis

Date Rec'd: 07/16/1994

Sample ID: MEMG123903

NET Sample No: 106512

Parameter	Result	Units	Analysis Date	Prep Batch	Run Batch	Analyst
TPH (Extractable) 8100 DRO AQ Diesel Range Organics	1900	ug/L	07/23/1994	2	2	pwh

USTs T304 and T1239
North Fuel Farm,
NAS Memphis,
Millington, TN
Facility I.D. 0-791709

APPENDIX I

**CHAIN-OF-CUSTODY FORMS
FACILITY I.D. # 0-791709**

94-0215



**NAVY CLEAN
ENSAFE/ALLEN & HOSHALL**
(901) 383-9115

CHAIN OF CUSTODY RECORD

PAGE 1 OF 3

CLIENT NAS-MEMPHIS PROJECT MANAGER Ginny Gray
 ADDRESS _____ TELEPHONE NO. 901-372-7962
 PROJECT NAME/NUMBER CTO-0080 FAX NO. _____
 MEDIA STATUS: (A, B, OR C) _____ SAMPLERS: (SIGNATURE) _____

NO. OF CONTAINERS	ANALYSIS REQUIRED				REMARKS
TPM-DRD					

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION						
					TEMP.	CHEMICAL					
MEMSB00108	7/11/94		Soil	4 oz glass	4°C		X				
MEMSB00118	↓		↓	↓	↓		X				
MEMSB00123	↓		↓	↓	↓		X				
MEMSB0025.8	7/11/94		↓	↓	↓		X				
MEMSB00220.5	↓		↓	↓	↓		X				
MEMSB00223	↓		↓	↓	↓		X				
MEMSB00308	7/12/94		↓	↓	↓		X				
MEMSB00318	↓		↓	↓	↓		X				
MEMSB00323	↓		↓	↓	↓		X				
MEMSB00410.5	7/12/94		↓	↓	↓		X				

RELINQUISHED BY: SIGNATURE <u>J. Allart</u> PRINTED <u>J. Allart</u> COMPANY <u>En Safe</u> REASON <u>Analysis</u>	DATE <u>7/12/94</u> TIME <u>6:30 PM</u>	RECEIVED BY: SIGNATURE <u>Fedex</u> PRINTED <u>Fedex</u> COMPANY <u>Fedex</u> REASON _____	DATE _____ TIME _____	RELINQUISHED BY: SIGNATURE <u>Fedex</u> PRINTED <u>Fedex</u> COMPANY <u>Fedex</u> REASON _____	DATE _____ TIME _____	RECEIVED BY: <u>Michael McArthur</u> SIGNATURE <u>Michael McArthur</u> PRINTED _____ COMPANY <u>Net Chemicals</u> REASON <u>Lab</u>	DATE _____ TIME <u>10:00</u>
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METHOD OF SHIPMENT: FED EX COMMENTS: _____
 SHIPMENT NO. _____
 SPECIAL INSTRUCTION: _____

AFTER ANALYSIS, SAMPLES ARE TO BE:
 DISPOSED OF (ADDITIONAL FEE)
 STORED (90 DAYS MAX)
 STORED OVER 90 DAYS (ADDITIONAL FEE)
 RETURNED TO CUSTOMER

94-0215



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(901) 383-9115

CHAIN OF CUSTODY RECORD

PAGE 2 OF 3

CLIENT NAS - Memphis PROJECT MANAGER Ginny Gray
 ADDRESS _____ TELEPHONE NO. _____
 PROJECT NAME/NUMBER CTO - 0080 FAX NO. _____
 MEDIA STATUS: (A, B, OR C) _____ SAMPLERS: (SIGNATURE) _____

NO. OF CONTAINERS	ANALYSIS REQUIRED					REMARKS
2PH-DRO						

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION	
					TEMP.	CHEMICAL
MEMSB0413	7/12/00		Soil	4 oz gal	4°C	
MEMSB0418						
MEMSB0608						
MEMSB0610.5						
MEMSB0618						
MEMSB0808						
MEMSB0818						
MEMSB0908						
MEMSB0918						
MEMSB0920						

RELINQUISHED BY:	DATE	RECEIVED BY:	DATE	RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
SIGNATURE _____		SIGNATURE _____		SIGNATURE _____		SIGNATURE <u>Michael McCormick</u>	<u>7-13</u>
PRINTED _____		PRINTED <u>Fedex</u>		PRINTED <u>Fedex</u>		PRINTED <u>Michael McCormick</u>	
COMPANY _____	TIME _____	COMPANY _____	TIME _____	COMPANY _____	TIME _____	COMPANY <u>NET</u>	TIME <u>1000</u>
REASON _____		REASON _____		REASON _____		REASON <u>LOGIN</u>	

METHOD OF SHIPMENT: _____	COMMENTS: _____	AFTER ANALYSIS, SAMPLES ARE TO BE: <input type="checkbox"/> DISPOSED OF (ADDITIONAL FEE) <input type="checkbox"/> STORED (90 DAYS MAX) <input type="checkbox"/> STORED OVER 90 DAYS (ADDITIONAL FEE) <input type="checkbox"/> RETURNED TO CUSTOMER
SHIPMENT NO. _____		
SPECIAL INSTRUCTION: _____		

94-02 5



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CHAIN OF CUSTODY RECORD

PAGE 3 OF 3

CLIENT NAS - Memphis PROJECT MANAGER Gindy Gray
 ADDRESS _____ TELEPHONE NO. 901 - 372-7912
 PROJECT NAME/NUMBER CTD-0080 FAX. NO. _____
 MEDIA STATUS: (A, B, OR C) _____ SAMPLERS: (SIGNATURE) _____

NO. OF CONTAINERS	ANALYSIS REQUIRED				REMARKS
X					
XX					
XX					
XX					

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION	
					TEMP.	CHEMICAL
MEMSBØ1ØØ8	7/12/74		50:1	4oz gl	4°	
MEMSBØ1Ø1B	↓		↓	↓		
MEMSBØ11Ø8	↓		↓	↓		
MEMSBØ115.5	↓		↓	↓		
MEMSBØ1118	↓		↓	↓		

RELINQUISHED BY: SIGNATURE _____ PRINTED _____ COMPANY _____ REASON _____	DATE _____ TIME _____	RECEIVED BY: SIGNATURE <u>Fedex</u> PRINTED _____ COMPANY _____ REASON _____	DATE _____ TIME _____	RELINQUISHED BY: SIGNATURE _____ PRINTED _____ COMPANY _____ REASON _____	DATE _____ TIME _____	RECEIVED BY: SIGNATURE <u>Michael McCormack</u> PRINTED <u>Michael McCormack</u> COMPANY <u>Wet</u> REASON <u>LOG IN</u>	DATE <u>7-13</u> TIME <u>1000</u>
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METHOD OF SHIPMENT: _____ SHIPMENT NO. _____ SPECIAL INSTRUCTION: _____	COMMENTS: _____ _____ _____	AFTER ANALYSIS, SAMPLES ARE TO BE: <input type="checkbox"/> DISPOSED OF (ADDITIONAL FEE) <input type="checkbox"/> STORED (90 DAYS MAX) <input type="checkbox"/> STORED OVER 90 DAYS (ADDITIONAL FEE) <input type="checkbox"/> RETURNED TO CUSTOMER
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94.02186



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CHAIN OF CUSTODY RECORD

PAGE 1 OF 2

CLIENT CLEAN-NAS Memphis PROJECT MANAGER G. Gray
 ADDRESS _____ TELEPHONE NO. 901-372-7962
 PROJECT NAME/NUMBER CTO-0000 FAX. NO. _____
 MEDIA STATUS: (A, B, OR C) _____ SAMPLERS: (SIGNATURE) _____

NO. OF CONTAINERS	ANALYSIS REQUIRED				REMARKS
	TPH	DRD	_____	_____	
X					
X					
X					
X					
X					
X					
X					
X					
X					

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	ANALYSIS REQUIRED	REMARKS
					TEMP.	CHEMICAL			
MEMSB00518	7/16/94		Soil	8 oz glass	4°C		X		
MEMSB00520	↓		↓	↓	↓		X		
MEMSB00528	↓		↓	↓	↓		X		
MEMSB01208	↓		↓	↓	↓		X		
MEMSB01216	↓		↓	↓	↓		X		
MEMSB01228	↓		↓	↓	↓		X		
MEMSB01318	↓		↓	↓	↓		X		
MEMSB01325	↓		↓	↓	↓		X		
MEMSB01328	↓		↓	↓	↓		X		
MEMSB01408	↓		↓	↓	↓		X		

RELINQUISHED BY: SIGNATURE <u>JA Albert</u> PRINTED <u>JA Albert</u> COMPANY <u>EnSafe</u> REASON <u>Analytical</u>	DATE <u>7/14/94</u> TIME <u>2030</u>	RECEIVED BY: SIGNATURE <u>Fedex</u> PRINTED _____ COMPANY _____ REASON _____	DATE _____ TIME _____	RELINQUISHED BY: SIGNATURE <u>Fedex</u> PRINTED _____ COMPANY _____ REASON _____	DATE _____ TIME _____	RECEIVED BY: SIGNATURE <u>Michael McCombs</u> PRINTED <u>Michael McCombs</u> COMPANY <u>NET</u> REASON <u>LOG IN</u>	DATE <u>7/14</u> TIME <u>1300</u>
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METHOD OF SHIPMENT: FED Ex COMMENTS: _____
 SHIPMENT NO. _____
 SPECIAL INSTRUCTION: _____
 AFTER ANALYSIS, SAMPLES ARE TO BE:
 DISPOSED OF (ADDITIONAL FEE)
 STORED (90 DAYS MAX)
 STORED OVER 90 DAYS (ADDITIONAL FEE)
 RETURNED TO CUSTOMER

9/02/36



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CHAIN OF CUSTODY RECORD

PAGE 2 OF 2

CLIENT CLEAN-NAS MEMPHIS PROJECT MANAGER G. Geary
 ADDRESS _____ TELEPHONE NO. _____
 PROJECT NAME/NUMBER _____ FAX. NO. _____
 MEDIA STATUS: (A, B, OR C) _____ SAMPLERS: (SIGNATURE) _____

NO. OF CONTAINERS	ANALYSIS REQUIRED					REMARKS
TPH-DRO						

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION	
					TEMP.	CHEMICAL
MEMSB01418	7/13/94		Soil		4°C	
MEMSB01503	↓		↓		↓	
MEMSB01508	↓		↓		↓	
MEMSB01518	↓		↓		↓	
MEMSB01528	↓		↓		↓	

RELINQUISHED BY: SIGNATURE <u>[Signature]</u> PRINTED <u>BL Albert</u> COMPANY <u>Ensafe</u> REASON <u>Analytical</u>	DATE <u>7/13/94</u> TIME <u>2:30</u>	RECEIVED BY: SIGNATURE <u>[Signature]</u> PRINTED <u>Fedex</u> COMPANY _____ REASON _____	DATE _____ TIME _____	RELINQUISHED BY: SIGNATURE <u>[Signature]</u> PRINTED _____ COMPANY _____ REASON _____	DATE _____ TIME _____	RECEIVED BY: SIGNATURE <u>Michael McCorum</u> PRINTED <u>Michael McCorum</u> COMPANY <u>Wet</u> REASON <u>LOG IN</u>	DATE <u>7/14</u> TIME <u>1:30</u>
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METHOD OF SHIPMENT: _____ SHIPMENT NO. _____ SPECIAL INSTRUCTION: _____	COMMENTS: _____ _____ _____	AFTER ANALYSIS, SAMPLES ARE TO BE: <input type="checkbox"/> DISPOSED OF (ADDITIONAL FEE) <input type="checkbox"/> STORED (90 DAYS MAX) <input type="checkbox"/> STORED OVER 90 DAYS (ADDITIONAL FEE) <input type="checkbox"/> RETURNED TO CUSTOMER
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CHAIN OF CUSTODY RECORD

9402217

PAGE 1 OF 4

CLIENT NAS-Memphis PROJECT MANAGER Ms Ginny Gray
 ADDRESS _____ TELEPHONE NO. 901-372-7962
 PROJECT NAME/NUMBER CTO-0080 FAX. NO. _____
 MEDIA STATUS: (A, B, OR C) _____ SAMPLERS: (SIGNATURE) JL Albert
Ballant

NO. OF CONTAINERS	ANALYSIS REQUIRED							REMARKS
	TPH-DRO	TURBIDITY	NO ₃ -N	NO ₂ -N	TOTAL Phosphorus	Iron	Asbestos	
2	✓							per register of Christina Dworkin
2	✓							
1		✓						
1			✓					
1				✓				
1					✓			
1						✓		
2	✓							
1		✓						
1			✓					

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS	TPH-DRO	TURBIDITY	NO ₃ -N	NO ₂ -N	TOTAL Phosphorus	Iron	Asbestos
					TEMP.	CHEMICAL								
MEMGMW0100	7-15-94	0812	H ₂ O	1L Amber	4°	HCL	2	✓						
MEMHMW0100	7-15-94	0812	H ₂ O	1L Amber	4°	HCL	2	✓						
MEMGMW0100	7-15-94	0830	H ₂ O	0.5L poly	4°	none	1		✓					
MEMGMW0100	7-15-94	0830	H ₂ O	1L poly	4°	none	1			✓				
MEMGMW0100	7-15-94	0830	H ₂ O	1L poly	4°	H ₂ SO ₄	1				✓			
MEMGMW0100	7-15-94	0830	H ₂ O	125ML Amber	4°	H ₂ SO ₄	1					✓		
MEMGMW0100	7-15-94	0830	H ₂ O	1L poly	4°	H ₂ O ₂	1						✓	
MEMGMW0200	7-15-94	0905	H ₂ O	1L Amber	4°	HCL	2	✓						
MEMGMW0200	7-15-94	0905	H ₂ O	0.5L poly	4°	none	1		✓					
MEMGMW0200	7-15-94	0905	H ₂ O	1L poly	4°	none	1			✓				

RELINQUISHED BY: SIGNATURE <u>JL Albert</u> PRINTED <u>JL Albert</u> COMPANY <u>EnSafe</u> REASON <u>Analysis</u>	DATE <u>7-15-94</u> TIME <u>1500</u>	RECEIVED BY: SIGNATURE _____ PRINTED <u>Fedex</u> COMPANY _____ REASON _____	DATE _____ TIME _____	RELINQUISHED BY: SIGNATURE _____ PRINTED <u>Fedex</u> COMPANY _____ REASON _____	DATE _____ TIME _____	RECEIVED BY: SIGNATURE <u>Michael McEman</u> PRINTED <u>Michael McEman</u> COMPANY <u>West</u> REASON <u>LOGIN</u>	DATE <u>7-16</u> TIME <u>1200</u>
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METHOD OF SHIPMENT: FED EX COMMENTS: _____
 SHIPMENT NO. _____
 SPECIAL INSTRUCTION: _____

AFTER ANALYSIS, SAMPLES ARE TO BE:
 DISPOSED OF (ADDITIONAL FEE)
 STORED (90 DAYS MAX)
 STORED OVER 90 DAYS (ADDITIONAL FEE)
 RETURNED TO CUSTOMER



NAVY CLEAN
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CHAIN OF CUSTODY RECORD

PAGE 2 OF 4 94.02217

CLIENT NAS - Memphis PROJECT MANAGER Ginny Gray
 ADDRESS _____ TELEPHONE NO. 901-372-7962
 PROJECT NAME/NUMBER CTO-0080 FAX NO. _____
 MEDIA STATUS: (A, B, OR C) _____ SAMPLERS: (SIGNATURE) SL Albert

NO. OF CONTAINERS	ANALYSIS REQUIRED						REMARKS
	TRA-DIB	TERBILITY	AD-AD3 TEST	TOTL Phosphorus	TOTL PHOSPHORUS	PHOSPHORUS	
1			✓				
1				✓			
1					✓		
2	✓						
1		✓					
1			✓				
1				✓			
1					✓		
1						✓	
2	✓						

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION	
					TEMP.	CHEMICAL
MEMGMW0200	7-15-94 0905	0905	H ₂ O	1L Poly	4°	H ₂ SO ₄
MEMGMW0200	7-15-94	0905	H ₂ O	125ml Amber	4°	H ₂ SO ₄
MEMGMW0200	7-15-94	0905	H ₂ O	1L Poly	4°	H ₂ O ₃
MEMGMW0300	7-15-94	0845	H ₂ O	1L Amber	4°	HCL
MEMGMW0300	7-15-94	0845	H ₂ O	.5L Amber Poly	4°	none
MEMGMW0300	7-15-94	0845	H ₂ O	1L Poly	4°	none
MEMGMW0300	7-15-94	0845	H ₂ O	1L Poly	4°	H ₂ SO ₄
MEMGMW0300	7-15-94	0845	H ₂ O	125ml Amber	4°	H ₂ SO ₄
MEMGMW0300	7-15-94	0845	H ₂ O	1L Poly	4°	H ₂ O ₃
MEMGMW0100	7-15-94	0950	H ₂ O	1L Amber	4°	HCL

RELINQUISHED BY: SIGNATURE <u>SL Albert</u> PRINTED <u>SL Albert</u> COMPANY <u>ENSAFE</u> REASON <u>ANALYSIS</u>	DATE <u>7-15-94</u> TIME <u>1500</u>	RECEIVED BY: SIGNATURE _____ PRINTED <u>Fedex</u> COMPANY _____ REASON _____	DATE TIME	RELINQUISHED BY: SIGNATURE _____ PRINTED <u>Fedex</u> COMPANY _____ REASON _____	DATE TIME	RECEIVED BY: SIGNATURE <u>Michael McCosmond</u> PRINTED <u>Michael McCosmond</u> COMPANY <u>Met</u> REASON <u>LOG IN</u>	DATE <u>7-16</u> TIME <u>1200</u>
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METHOD OF SHIPMENT: <u>FEDEX</u> SHIPMENT NO. _____ SPECIAL INSTRUCTION: _____	COMMENTS: _____ _____ _____	AFTER ANALYSIS, SAMPLES ARE TO BE: <input type="checkbox"/> DISPOSED OF (ADDITIONAL FEE) <input type="checkbox"/> STORED (90 DAYS MAX) <input type="checkbox"/> STORED OVER 90 DAYS (ADDITIONAL FEE) <input type="checkbox"/> RETURNED TO CUSTOMER
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CHAIN OF CUSTODY RECORD

94-02211

PAGE 3 OF 4

CLIENT NAS - Memphis PROJECT MANAGER Ginny Gray
 ADDRESS _____ TELEPHONE NO. 901-372-7960
 PROJECT NAME/NUMBER CTD-0080 FAX NO. _____
 MEDIA STATUS: (A, B, OR C) _____ SAMPLERS: (SIGNATURE) JL Albert

NO. OF CONTAINERS	ANALYSIS REQUIRED							REMARKS
	TPH	DAD	TC	LP	LEAD			
2	✓							
2	✓							
2	✓							
2	✓							
2	✓							
2	✓							
2	✓							
1						✓		
1	✓							
1	✓							

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION		NO. OF CONTAINERS						
					TEMP.	CHEMICAL							
MEMGWR21400	7-15-94	1015	H2O	1L Amber	4°	HCL	2	✓					
MEMGWR21600	7-15-94	1002	H2O	1L Amber	4°	HCL	2	✓					
MEMGT30402	7-15-94	0942	H2O	1L Amber	4°	HCL	2	✓					
MEMGT30401	7-15-94	0933	H2O	1L Amber	4°	HCL	2	✓					
MEMG123901	7-15-94	0915	H2O	1L Amber	4°	HCL	2	✓					
MEMG123902	7-15-94	0920	H2O	1L Amber	4°	HCL	2	✓					
MEMG123903	7-15-94	0923	H2O	1L Amber	4°	HCL	2	✓					
MEM2000100	7-15-94	1145	H2O	1L poly	4°	H2O2	1		✓				
MEMSB00708	7-14-94		SOIL	8oz glass	4°	none	1	✓					
MEMSB00715	7-14-94		SOIL	8oz glass	4°	none	1	✓					

RELINQUISHED BY: SIGNATURE <u>JL Albert</u> PRINTED <u>JL ALBERT</u> COMPANY <u>ENSURE</u> REASON <u>ANALYSIS</u>	DATE <u>7-15-94</u> TIME <u>1500</u>	RECEIVED BY: SIGNATURE _____ PRINTED <u>Fedex</u> COMPANY _____ REASON _____	DATE _____ TIME _____	RELINQUISHED BY: SIGNATURE <u>Fedex</u> PRINTED _____ COMPANY _____ REASON _____	DATE _____ TIME _____	RECEIVED BY: SIGNATURE <u>Michael McConrad</u> PRINTED <u>Michael McConrad</u> COMPANY <u>Net</u> REASON <u>LOG IN</u>	DATE <u>7-16</u> TIME <u>1200</u>
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METHOD OF SHIPMENT: FEDEX COMMENTS: _____
 SHIPMENT NO. _____
 SPECIAL INSTRUCTION: _____

AFTER ANALYSIS, SAMPLES ARE TO BE:
 DISPOSED OF (ADDITIONAL FEE)
 STORED (90 DAYS MAX)
 STORED OVER 90 DAYS (ADDITIONAL FEE)
 RETURNED TO CUSTOMER

94-02-17



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CHAIN OF CUSTODY RECORD

PAGE 4 OF 4

CLIENT NAS-MEMPHIS PROJECT MANAGER GWYN GRAY
 ADDRESS _____ TELEPHONE NO. 901-372-7962
 PROJECT NAME/NUMBER CTO-0080 FAX. NO. _____
 MEDIA STATUS: (A, B, OR C) _____ SAMPLERS: (SIGNATURE) SL Albert

NO. OF CONTAINERS	ANALYSIS REQUIRED				REMARKS
	TPH-DRO	TPH-BENZENE	TPH-TPH	TPH-LEAD	
1	✓				
1		✓			
1		✓	3.5		
1		✓			

FIELD SAMPLE NUMBER	DATE	TIME	SAMPLE TYPE	TYPE/SIZE OF CONTAINER	PRESERVATION	
					TEMP.	CHEMICAL
MEMSB00723	7-14-94	—	SOIL	202 glass	4°	none
MEMV000100	7-15-94	1100	SOIL	402 glass	4°	none
MEMV000100	7-15-94	1100	SOIL	402 glass	4°	none
MEMV0002100	7-15-94	1100	SOIL	402 glass	4°	none

RELINQUISHED BY: SIGNATURE <u>SL Albert</u> PRINTED <u>SL ALBERT</u> COMPANY <u>ENSAFE</u> REASON <u>Analysis</u>	DATE <u>7-15-94</u> TIME <u>1500</u>	RECEIVED BY: SIGNATURE _____ PRINTED <u>Fedex</u> COMPANY _____ REASON _____	DATE _____ TIME _____	RELINQUISHED BY: SIGNATURE _____ PRINTED <u>Fedex</u> COMPANY _____ REASON _____	DATE _____ TIME _____	RECEIVED BY: SIGNATURE <u>Michael McConnaughy</u> PRINTED <u>Michael McConnaughy</u> COMPANY <u>NEX</u> REASON <u>LOG IN</u>	DATE <u>7-16</u> TIME <u>1200</u>
---	---	--	--------------------------	--	--------------------------	--	--------------------------------------

METHOD OF SHIPMENT: Fedex
 SHIPMENT NO. _____
 SPECIAL INSTRUCTION: _____

COMMENTS: _____

AFTER ANALYSIS, SAMPLES ARE TO BE:
 DISPOSED OF (ADDITIONAL FEE)
 STORED (90 DAYS MAX)
 STORED OVER 90 DAYS (ADDITIONAL FEE)
 RETURNED TO CUSTOMER

APPENDIX J

UST SITE RANKING FORM

FACILITY I.D. # 0-791709

UST SITE RANKING FORM

Facility ID Number: 0 - 7 9 1 7 0 9

Facility Name: USTs 304 and 1239

Facility Address: Naval Air Station Memphis

Geologic and Hydrogeologic Factors

1	Minimum depth to the water table		
	< 5.0 Feet	50	
	5.1 to 10.0 Feet	45	
	10.1 to 15.0 Feet	40	
	15.1 to 30.0 Feet	35	
	30.1 to 50.0 Feet	25	
	50.1 to 75.0 Feet	15	
	75.1 to 100.0 Feet	10	
	> 100.0 Feet	5	
	Score		45
2	Minimum distance between water table and contaminated soil		
	< 5.0 Feet	50	
	5.1 to 10.0 Feet	45	
	10.1 to 15.0 Feet	40	
	15.1 to 30.0 Feet	35	
	30.1 to 50.0 Feet	25	
	50.1 to 75.0 Feet	15	
	75.1 to 100.0 Feet	10	
	> 100.0 Feet	5	
	Score		50
3	Soil Permeability		
	> 10 ⁻⁴ cm/sec	30	
	10 ⁻⁴ to 10 ⁻⁶ cm/sec	20	
	< 10 ⁻⁶ cm/sec	10	
	Score		10
4	Calculated Ground Water Flow Rate		
	< 10 feet/day	3	
	10 to 40 feet/day	6	
	40 to 90 feet/day	12	
	90 to 130 feet/day	18	
	130 to 260 feet/day	24	
	> 260 feet/day	30	
	Karst	30	
	Score		3

Receptor Factors

5	Basements		
	< 50.0 feet from known contamination	150	
	50.1 to 100.0 feet from known contamination	75	
	100.1 to 200.0 feet from known contamination	50	
	200.1 to 300.0 feet from known contamination	25	
	> 300.1 feet	0	
	Score		0

6	Sanitary sewers		
	< 50.0 feet from known contamination	75	
	50.1 to 100.0 feet from known contamination	40	
	100.1 to 200.0 feet from known contamination	20	
	200.1 to 300.0 feet from known contamination	10	
	> 300.1 feet	0	
	Score		20

7	Storm water sewers		
	< 50.0 feet from known contamination	50	
	50.1 to 100.0 feet from known contamination	30	
	100.1 to 200.0 feet from known contamination	10	
	200.1 to 300.0 feet from known contamination	5	
	> 300.1 feet	0	
	Score		10

8	Other subsurface utilities		
	< 50.0 feet from known contamination	30	
	50.1 to 100.0 feet from known contamination	20	
	100.1 to 200.0 feet from known contamination	10	
	200.1 to 300.0 feet from known contamination	5	
	> 300.1 feet	0	
	Score		10

9	Public water supply source		
	< .1 miles	300	
	.1 to .25 miles	200	
	.25 to .5 miles	100	
	> .51 miles	0	
	Score		300

10	Private water supply source		
	< .1 miles	200	
	.1 to .25 miles	150	
	.25 to .5 miles	100	
	> .51 miles	0	
	Score		0

11	Distance to surface water		
	< .1 miles		25
	.1 to .25 miles		15
	.25 to .5 miles		5
	> .51 miles		0
	Visibly impacted surface water from a petroleum product		200
		Score	5

Contaminant Factors

	A. Max. Contam. Levels	B. App. Cleanup Levels	C. Cont. Conc. Ratio A/B
12	Contaminant Concentration		
	Benzene in ground water		
	TPH in ground water	170mg/l	1.0mg/l 170
	BTX in soil		
	TPH in soil	2300mg/kg	500mg/kg 4.6

13	Benzene in ground water		
	<1.0	0	
	1.1 to 10.0	25	
	10.1 to 50.0	50	
	50.1 to 100.0	100	
	100.1 to 500.0	200	
	>500.1	300	
		Score	0

14	TPH in ground water		
	<1.0	0	
	1.1 to 10.0	20	
	10.1 to 50.0	40	
	50.1 to 100.0	80	
	100.1 to 500.0	120	
	>500.1	200	
		Score	120

15	BTX in soil		
	<1.0	0	
	1.1 to 5.0	25	
	5.1 to 10.0	50	
	10.1 to 50.0	100	
	>50.1	200	
		Score	0

16	TPH in soil		
	<1.0	0	
	1.1 to 5.0	20	
	5.1 to 10.0	40	
	10.1 to 50.0	80	
	>50.1	100	
		Score	20

17	Total site score		593
----	------------------	--	-----



Environmental and Safety Designs, Inc.

P. O. BOX 341315, MEMPHIS, TN 38184-1315

(901) 372-7982

Fax (901) 372-2454

DATE: 3-17-95

TO

Name: Shanna C.

Company: _____

FROM

Name: Ben B.

Total number of pages (including cover sheet): 7

COMMENTS

Shanna,
Please find John K.'s comments attached & a letter
from the TDEC.

Enjoy!
Ben



STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
MEMPHIS ENVIRONMENTAL FIELD OFFICE
SUITE E-645, PERIMETER PARK
2510 MT. MORIAH
MEMPHIS, TENNESSEE 38115-1520

March 10, 1995

Mr. John Karlyk, Commanding Officer
South NavFac Engineering Command
Code 1846, P.O. Box 190010
North Charleston, SC 29419-9010

RE: NAS Memphis
Tank No. 30411239
Building N-95, Memphis, TN
UST Facility ID # 0-791709, Shelby County

Dear Mr. Karlyk:

This letter shall serve as a follow-up to the meeting of February 22, 1995, with regard to the 2-100,000 gallon heating oil that are registered under the above referenced facility.

The Division of Underground Storage Tanks (the Division) will require the responsible party to follow routine Underground Storage Tank investigation and clean-up guidance for this project. The primary difference between this site and a routine underground storage tank site involves groundwater classification. Under the TN Water Quality Act and subsequent regulations, all groundwater in Tennessee is classified for use as drinking water. The Department will expect the responsible party to design and implement a Corrective Action which will lower contaminant levels in the groundwater to Maximum Contaminant Levels for drinking water. If after a reasonable period of time the corrective action is not able to accomplish this, the Division would consider a risk assessment from the responsible party detailing why leaving levels of contamination above drinking water levels in groundwater is not a threat to local health environment.

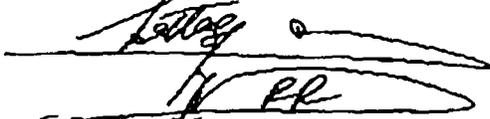
Post-It™ brand fax transmittal memo 7671 # of pages 5

To: Mr. Ben Brantley	From: John Karlyk
cc: Mr. John Steedman	Co:
Dept.:	Phone # (803) 743-0624
Fax # (901) 383-1743	Fax #:

Mr. John Karlyk
March 10, 1995
Page 2

If you have questions or comments, please feel free to call me at (901) 368-7973.

Sincerely,



Ghattas Murr

Division of Underground Storage Tanks

GEM79025068\ag

c: Nashville UST Central Office
Memphis UST Field Office

COMMENTS ON THE DRAFT CONTAMINATION ASSESSMENT REPORT
NAS MEMPHIS
FACILITY ID NO. 0-791709
CONTRACT N62467-89-D-0318
CTO 0080
Date: March 1, 1995

GENERAL COMMENTS:

This Corrective Action Plan (CAP) will require a lot more work.

I'm disappointed with the conventional cookbook approach to remedial actions in this CAP. There is no evidence that a creative alternate approach to remediate this site was even considered. Disposal at landfills is not the method of choice because disposal at landfills is becoming more difficult as they approach 100% capacity as well as long term liability to the NAVY.

Enhanced bioremediation and pump and treat in soils that have permeabilities as high as $8E-7$ cm/sec are not workable.

SPECIFIC COMMENTS:

1. In this CAP change the phrase " Building 126 area" to "Building 126 UST site" or "former UST's 7, 303, 1241 site" as appropriate.
2. Page 1-5, change Jet A fuel to AVGAS.
3. Table 1-1, add a footer stating that boring B1, 2, 3, became monitoring wells MW-1, 2, 3. Add the outline of tank 304 and 1239 to all the figures in this CAP. The tanks are about 45 feet in diameter, so their true location will have a significant bearing on the plume, groundwater (GW) migration and extent of excavation.

The plumes shown in figure 2-1 appear to originate in the center of the storage tanks

4. The fact that storage tanks 304 and 1239 are not regulated USTs complicates this CAP. In Section 1.4, the listed cleanup levels are only applicable to regulated USTs or the Bldg 126 UST site. Tanks 304 and 1239 are not regulated per 40 CFR 280 because these tanks were used to store heating oil. TDEC does not have a policy dealing with releases from unregulated heating oil storage tanks, but has in the past required the Navy to comply with the requirements of the Clean Water ACT. I suggest that you touch basis with Mr. Murr and or Mr. Birdwell at TDEC Memphis field office to obtain guidelines. This CAP will require careful reevaluation and a rewrite.

5. Section 2.1, same issue as comment No.4. It would be beneficial to try to convince regulators that diesel fuel is same as No. 2 heating fuel and that it would be to everyones advantage if Bldg 126 UST site and Tanks 304/1239 site were cleaned up per

UST requirements.

6. The plumes shown in Fig. 2-1 may have to be revised when you add the outline of tanks 304 and 1239. As shown about 30% of the plume is within or under the tank. Data per table 1-1 indicate that contaminants are at the 3-10 foot depth and tank bottom is at 18 feet, so plume appears to include the tanks?

7. Section 3 to be reevaluated to accommodate the heating oil issue.

8. Fig. 3, add outline of "projected limits" of excavation.

9. Section 3.2.1, natural biodegradation is known as intrinsic bioremediation.

Long term monitoring (pg. 3-13 last paragraph) may not be an option. The property will be given to the city. The city may find long term monitoring unacceptable. Remedial action that provides a clean closure is preferred.

11. Dewatering: I would like to propose the following for your consideration. Dewater the pit to accommodate excavation and while the pit is still open pump the inflowing GW for several days. The pumped GW can be treated at a 50 gpm rate via a high velocity stripper and then hauled to a utility treatment plant for disposal. This has been done at one of my other sites and proved to be very effective.

Backfill the pit with gravel to one foot above the GW level. This will prevent the future problems with compacting of the backfill soil due to GW infiltrating the uncompacted soil in the pit. The gravel will form a "french drain". Any future pump and treat or GW bioremediation will be enhanced by this french drain. The french drain opens up many new opportunities for GW remediation.

Obtain data from the Memphis Utility Board about acceptable levels of petroleum contamination for discharge into sanitary sewer or direct discharge at the treatment plant.

12. Page 3-16, I realize that this remedial action is only a consideration, but the idea of pumping GW, treating it and then reinjecting the water in soils with permeabilities in the $8E-7$ cm/sec range is not workable. The distance from the pump wells to the first set of injection wells is about 140 feet and 175 feet the second set. With soil permeabilities in the $8E-7$ cm/sec range flushing the GW as depicted in this CAP will not work.

13. Section 4, Soil remediation is addressed but GW remediation is undefined. Natural biodegradation = intrinsic bioremediation.

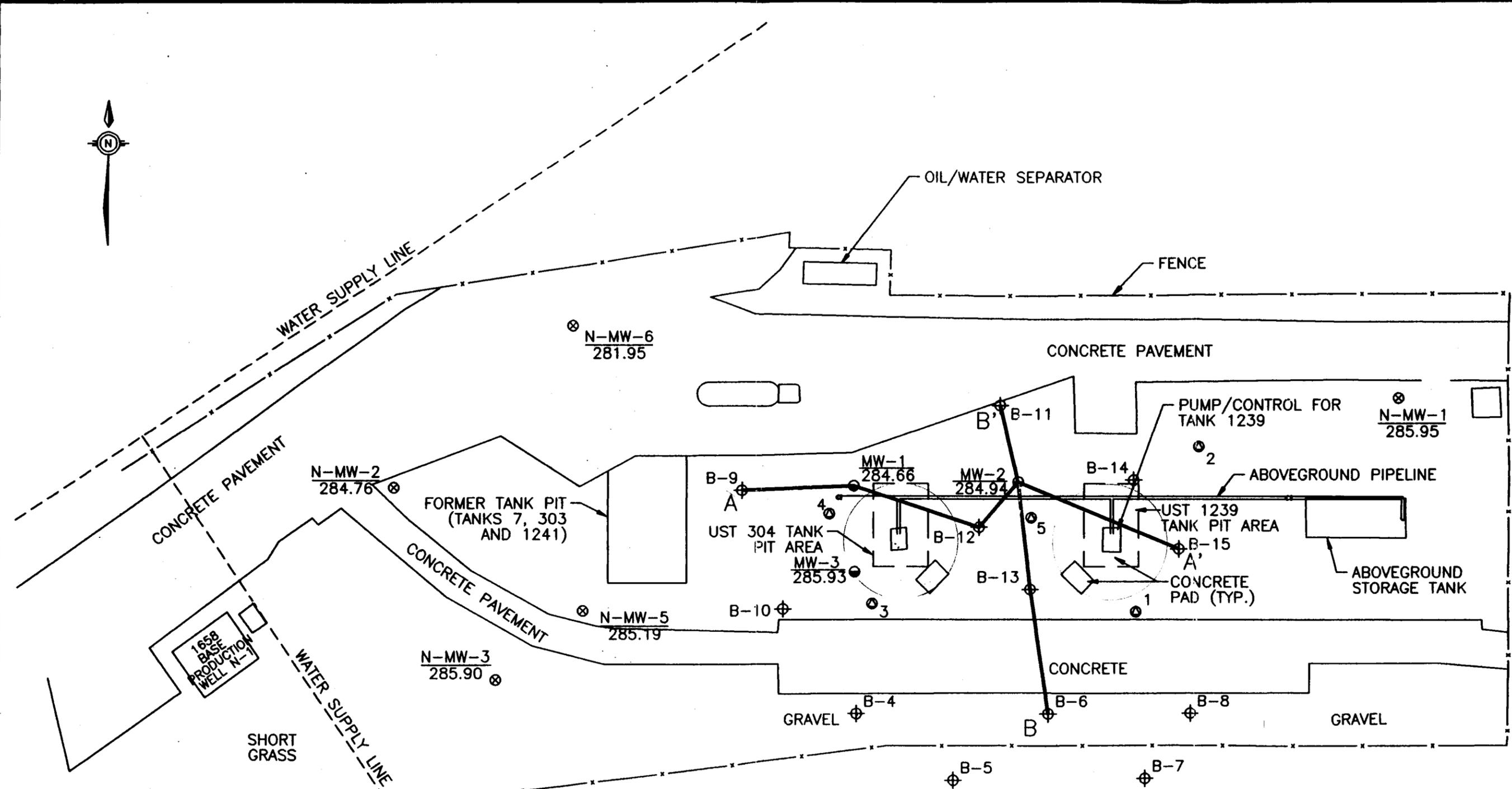
14. Section 5, the proposed schedule is unrealistic. A contractor cannot be brought on line in 60 days. A project of this size will require detailed remediation plans to facilitate the Federal

Acquisition process. Navy has to solicit bids from several sources. Even if we used the RAC, with Phase I, Phase II, PCAS/RAM and mobilization it is impossible to start in 60 days. Developing plans and specs will take 240 days.

15. Section 6, I assume that during the excavation of tanks and soil several if not most of GW monitoring wells will be destroyed. There will be no (9) GW monitoring well to use. During site status monitoring only wells that showed contaminants above the action level are required to be sampled. Sampling all the wells will be expensive and is not needed. Closure monitoring shall be per TDEC TGD 007.

Bldg. 126 UST site will require BTEX, DRO/GRO TPH analysis.

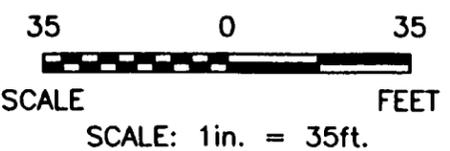
→ No



ID NO.	LEAK DETECTION WELL	SURFACE ELEVATION
1	MEM-T304-1	284.34'
2	MEM-T304-2	283.83'
3	MEM-T1239-1	284.08'
4	MEM-T1239-2	283.28'
5	MEM-1239-3	283.64'

- LEGEND**
- ⊕ SOIL BORING (7/94)
 - MW-1 284.66 ● MONITORING WELL LOCATIONS TOC ELEVATIONS (7/94)
 - N-MW-4 286.53 ⊗ EXISTING MONITORING WELLS TOP OF CASING ELEVATION
 - ⊙ EXISTING LEAK DETECTION MONITORING WELLS

NOTE: WELLS INSTALLED (7/94) ARE IDENTIFIED AS MEM-80-MW-1 THROUGH MW-3



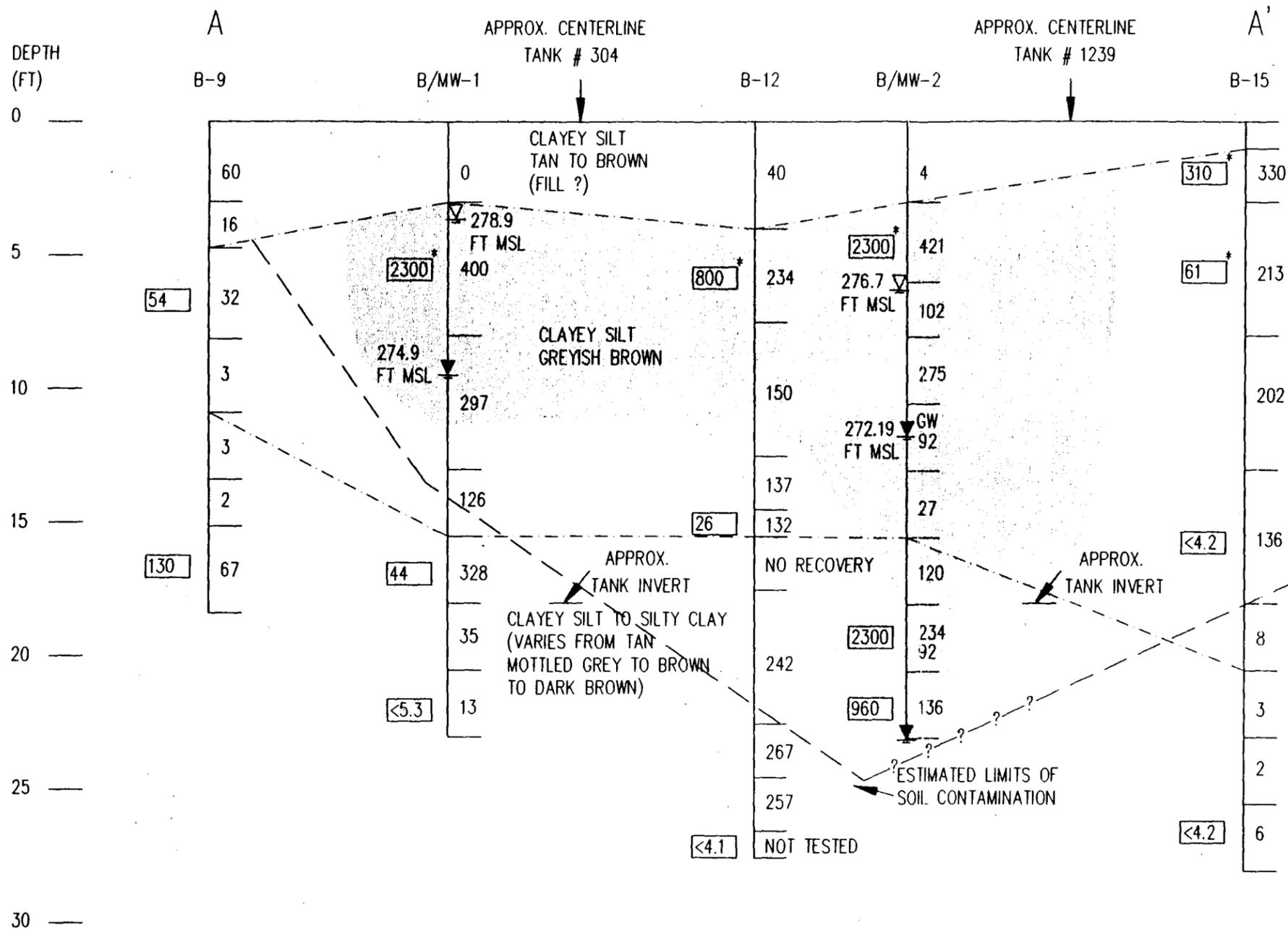


ENVIRONMENTAL ASSESSMENT REPORT
NAS MEMPHIS
MILLINGTON, TN
FACILITY NO. 0-791709

FIGURE 2
SOIL BORING AND
MONITORING WELL LOCATION MAP
USTs 304 AND 1239 CTO-0080

DATE: 10/06/94 DWG NAME: CTO80_02

0043988013



LEGEND

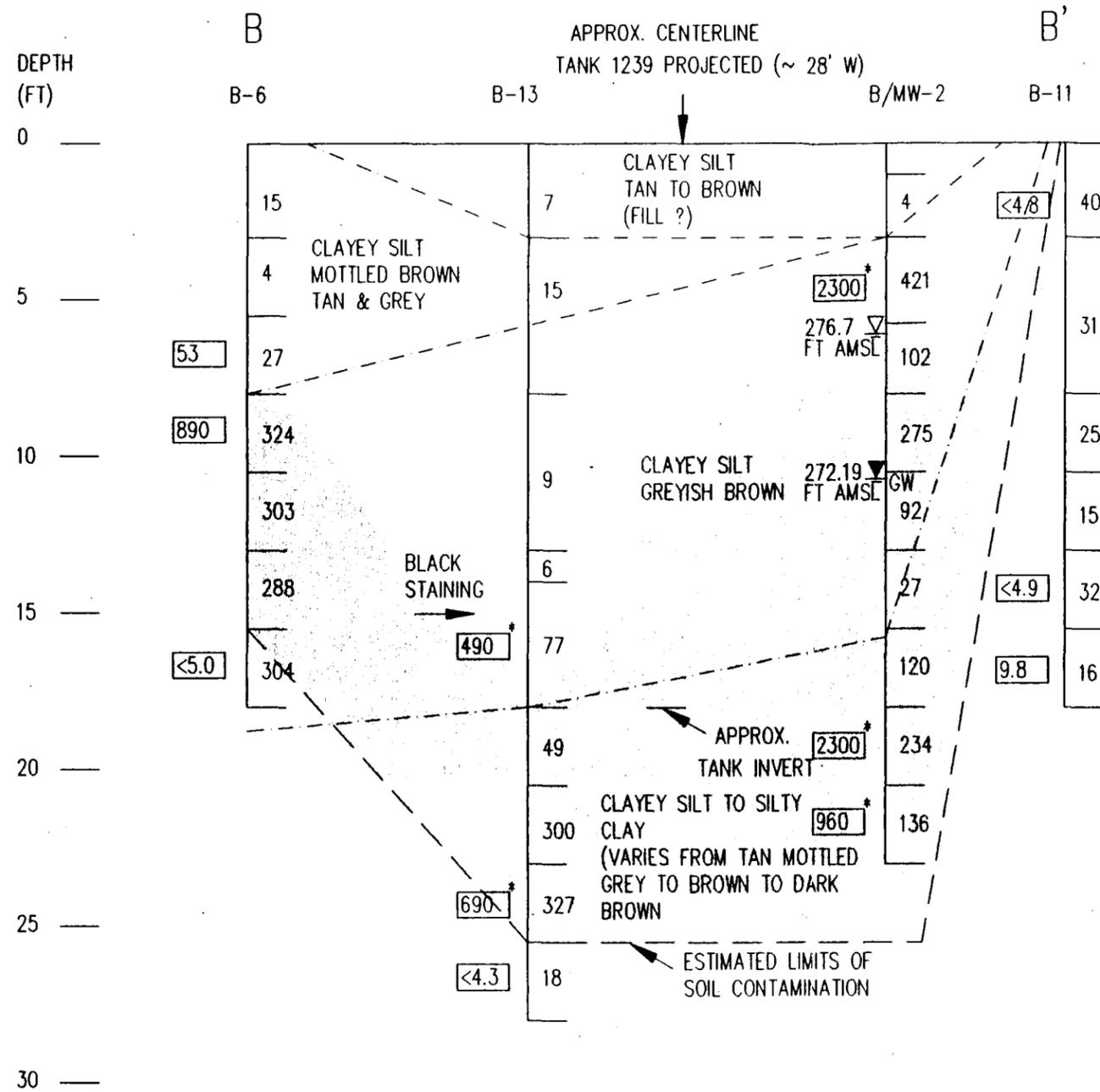
- SOIL SAMPLE LOCATION
- TPH-DRO (ppm)
 - 330 - OVM READING (ppm)
 - 310
 - 800* - INDICATES PRESENCE OF TPH-GRO CONSTITUENT (IN ADDITION TO TPH-DRO)
 - ▽ - FIRST ENCOUNTER
 - ▼ - POTENTIOMETRIC SURFACE IN COMPLETED WELL (MEASURED JULY 19, 1994)
 - - - - - SOIL LITHOLOGY CONTACT
 - - - - - ESTIMATED LIMITS OF SOIL CONTAMINATION
 - - - - - SOIL CONTAMINATION WITH ≥ 500 MG/KG DRO


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 MILLINGTON, TN
 FACILITY NO. 0-791709

FIGURE 3
 TPH CONTAMINANT PLUME MAP
 USTs 304 & 1239
 SECTION A-A'

DWG DATE: 10/26/94 | DWG NAME: 80SECTA

00139 606 B22.



LEGEND

SOIL SAMPLE LOCATION

TPH-DRO (ppm)

310

330 - OVM READING (ppm)

800* - INDICATES PRESENCE OF TPH-GRO CONSTITUENT (IN ADDITION TO TPH-DRO)

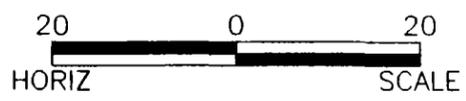
▽ - FIRST ENCOUNTER

▼ - POTENTIOMETRIC SURFACE IN COMPLETED WELL (MEASURED JULY 19, 1994)

--- - SOIL LITHOLOGY CONTACT

- - - - ESTIMATED LIMITS OF SOIL CONTAMINATION

- - - - SOIL CONTAMINATION WITH ≥ 500 MG/KG DRO



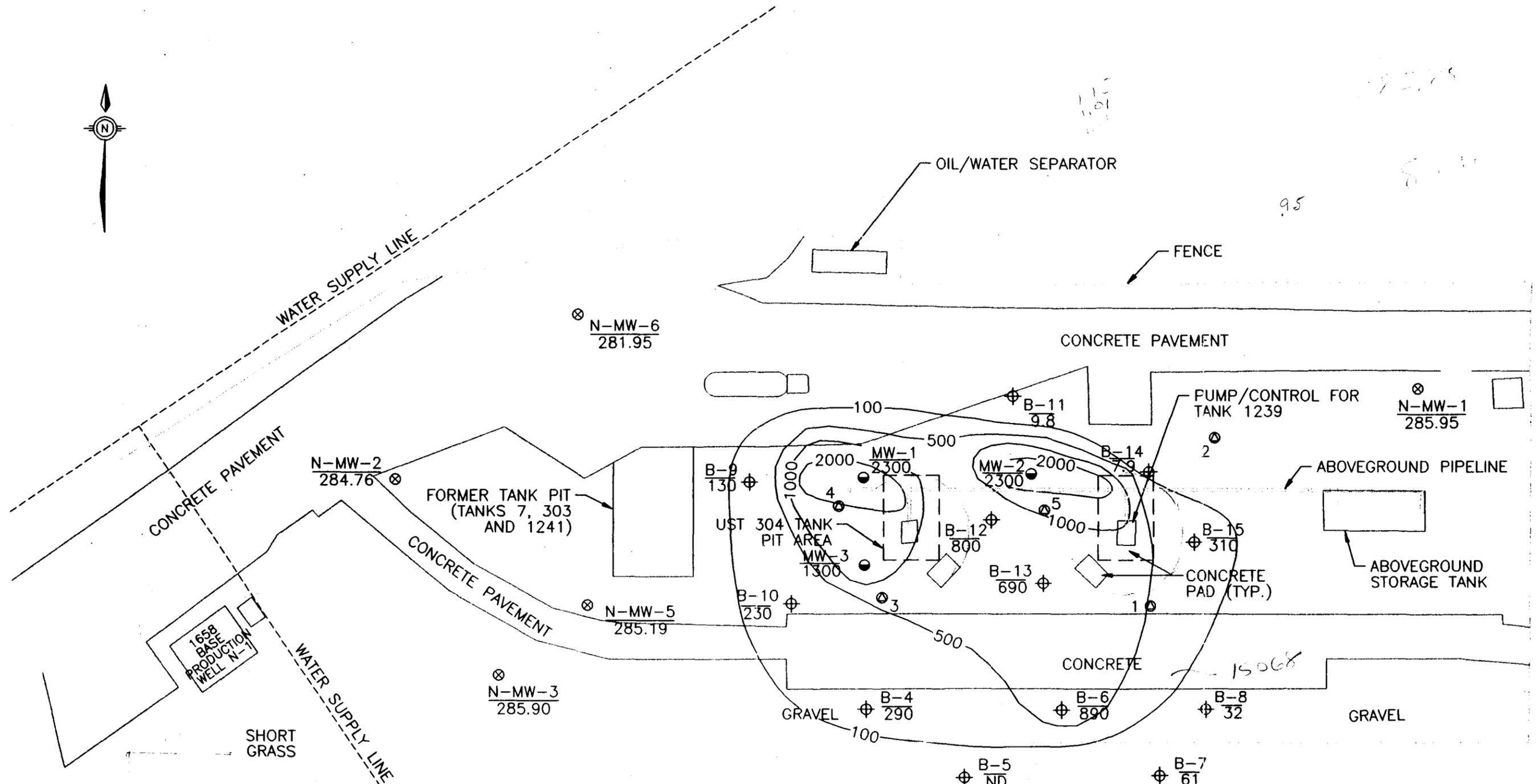
ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
MILLINGTON, TN
FACILITY NO. 0-791709

FIGURE 4
TPH CONTAMINANT PLUME MAP
USTs 304 & 1239
SECTION B-B'

DWG DATE: 10/26/94 DWG NAME: 80SECTB



95



1658
BASE
PRODUCTION
WELL N-1

ID NO.	LEAK DETECTION WELL	SURFACE ELEVATION
1	MEM-T304-1	284.34'
2	MEM-T304-2	283.83'
3	MEM-T1239-1	284.08'
4	MEM-T1239-2	283.28'
5	MEM-1239-3	283.64'

- LEGEND**
- B-5 ND ⊕ SOIL BORING (7/94)
 - HIGHEST TPH-DRO CONCENTRATION (ppm)
 - MW-1 2300 ● MONITORING WELL LOCATIONS (INSTALLED 7/94)
 - HIGHEST TPH-DRO CONCENTRATION (ppm)
 - N-MW-4 286.53 ⊗ EXISTING MONITORING WELLS
 - TOP OF CASING ELEVATION
 - ⊕ EXISTING LEAK DETECTION MONITORING WELLS
 - TPH-DRO CONCENTRATION ISOPLETH (ppm)



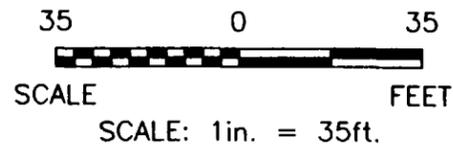
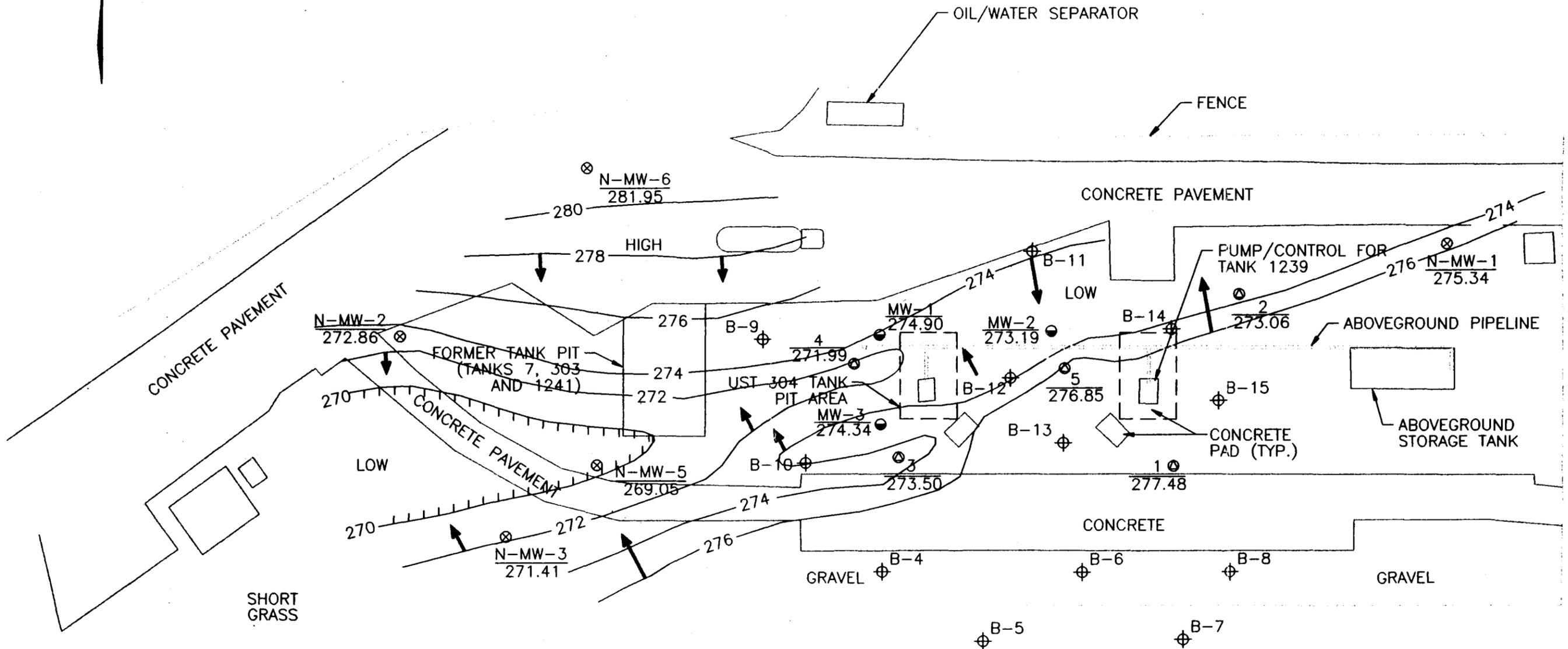
ENVIRONMENTAL
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NAS MEMPHIS
MILLINGTON, TN
FACILITY NO. 0-791709

FIGURE 5
SOIL TPH-DRO
CONTAMINATION LIMITS
USTs 304 AND 1239 CTO-0080

DATE: 10/06/94 DWG NAME: CTO80_04

35 0 35
SCALE FEET
SCALE: 1 in. = 35ft.

00439666132



ID NO.	LEAK DETECTION WELL	SURFACE ELEVATION
1	MEM-T304-1	284.34'
2	MEM-T304-2	283.83'
3	MEM-T1239-1	284.08'
4	MEM-T1239-2	283.28'
5	MEM-1239-3	283.64'

LEGEND

- ⊕ SOIL BORING (7/94)
 - MW-1 284.66 ● MONITORING WELL LOCATIONS (INSTALLED 7/94)
 - N-MW-4 286.53 ⊗ EXISTING MONITORING WELLS
 - 1 277.48 ⊗ EXISTING LEAK DETECTION MONITORING WELLS
 - GROUNDWATER FLOW DIRECTION
- NOTE: WELLS INSTALLED (7/94) ARE IDENTIFIED AS MEM-80-MW-1 THROUGH MW-3

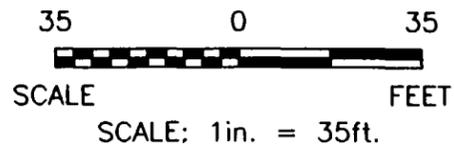
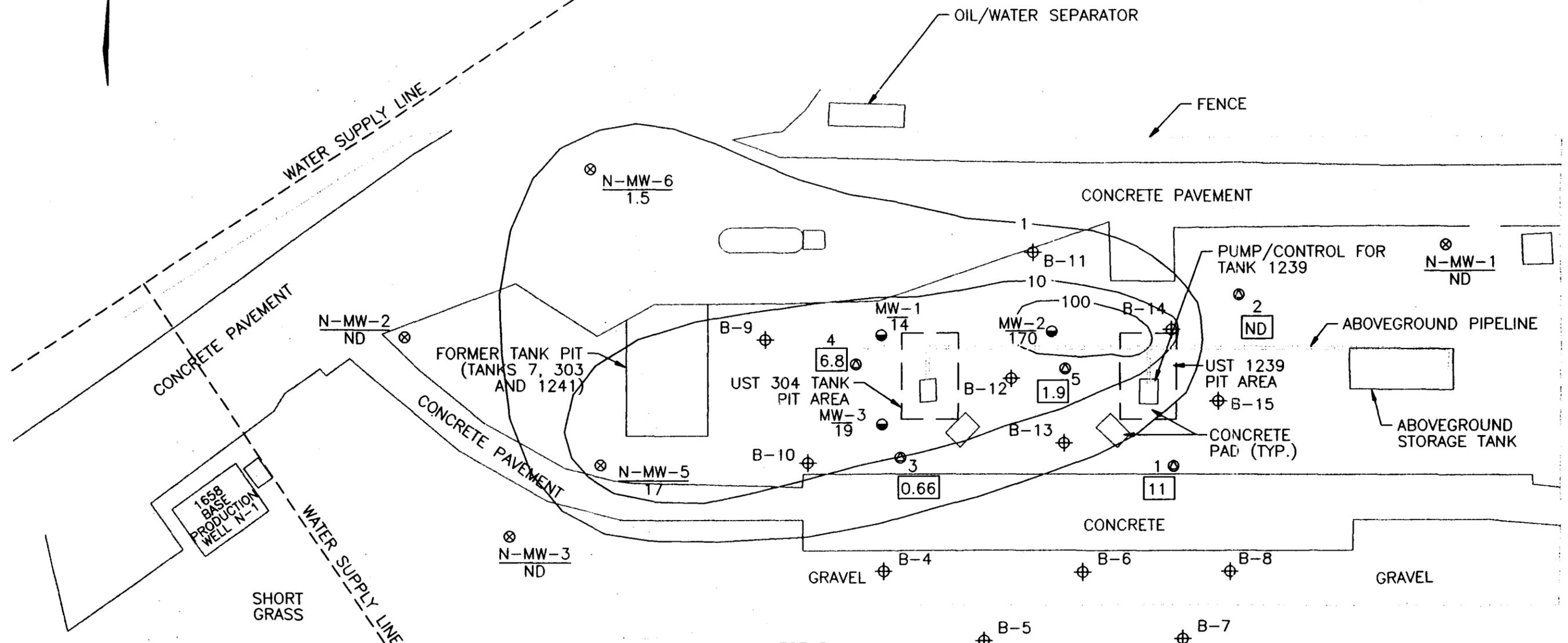


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 NAS MEMPHIS MILLINGTON, TN
 FACILITY NO. 0-791709

FIGURE 6
 POTENTIOMETRIC SURFACE MAP
 JULY 19, 1994
 USTs 304 AND 1239 CTO-0080

DATE: 10/06/94 DWG NAME: CTO80_03

00439666042



ID NO.	LEAK DETECTION WELL	SURFACE ELEVATION
1	MEM-T304-1	284.34'
2	MEM-T304-2	283.83'
3	MEM-T1239-1	284.08'
4	MEM-T1239-2	283.28'
5	MEM-1239-3	283.64'

- LEGEND**
- ⊕ SOIL BORING (7/94)
 - MW-1 ● MONITORING WELL LOCATIONS (INSTALLED 7/94)
 - 284.66 ● TPH-DRO CONCENTRATION (ppm)
 - N-MW-4 ⊕ EXISTING MONITORING WELLS
 - ND ⊕ TPH-DRO CONCENTRATION (ppm)
 - 1 ● EXISTING LEAK DETECTION MONITORING WELLS
 - 0.66 ● TPH-DRO CONCENTRATION (ppm)(SEE NOTE)
 - ESTIMATED TPH-DRO CONCENTRATION ISOPLETH (ppm)

NOTE: TPH-DRO CONCENTRATIONS IN GROUNDWATER FROM LEAK DETECTION WELLS APPEAR ANOMALOUS AND WERE NOT INCLUDED WHEN ISOPLETHS WERE DRAWN.

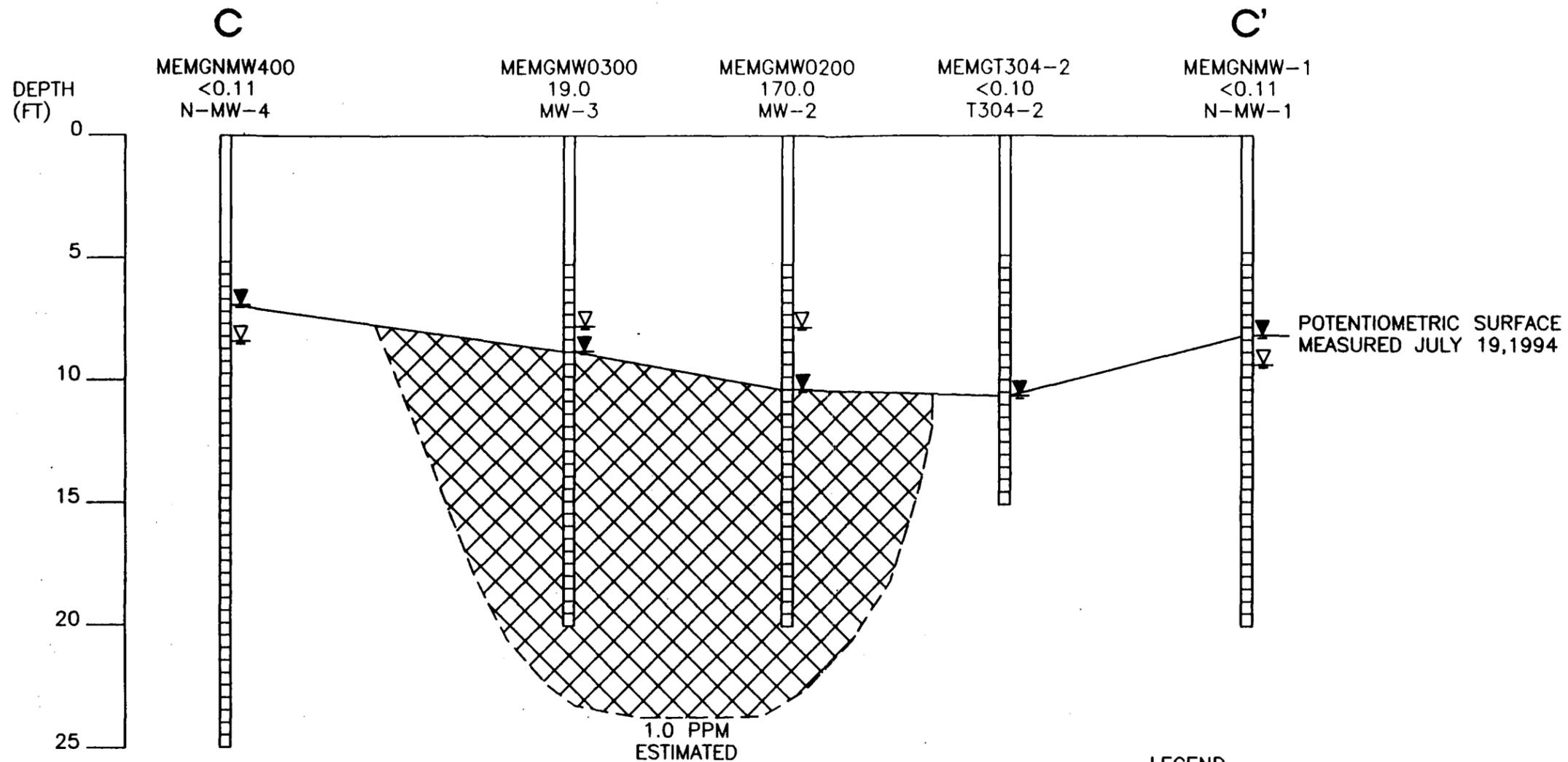


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 MILLINGTON, TN
 FACILITY NO. 0-791709

FIGURE 7
 GROUNDWATER TPH-DRO
 CONTAMINATION PLUME
 USTs 304 AND 1239 CTO-0080

DATE: 10/06/94 DWG NAME: CT080_05

00439666 B52



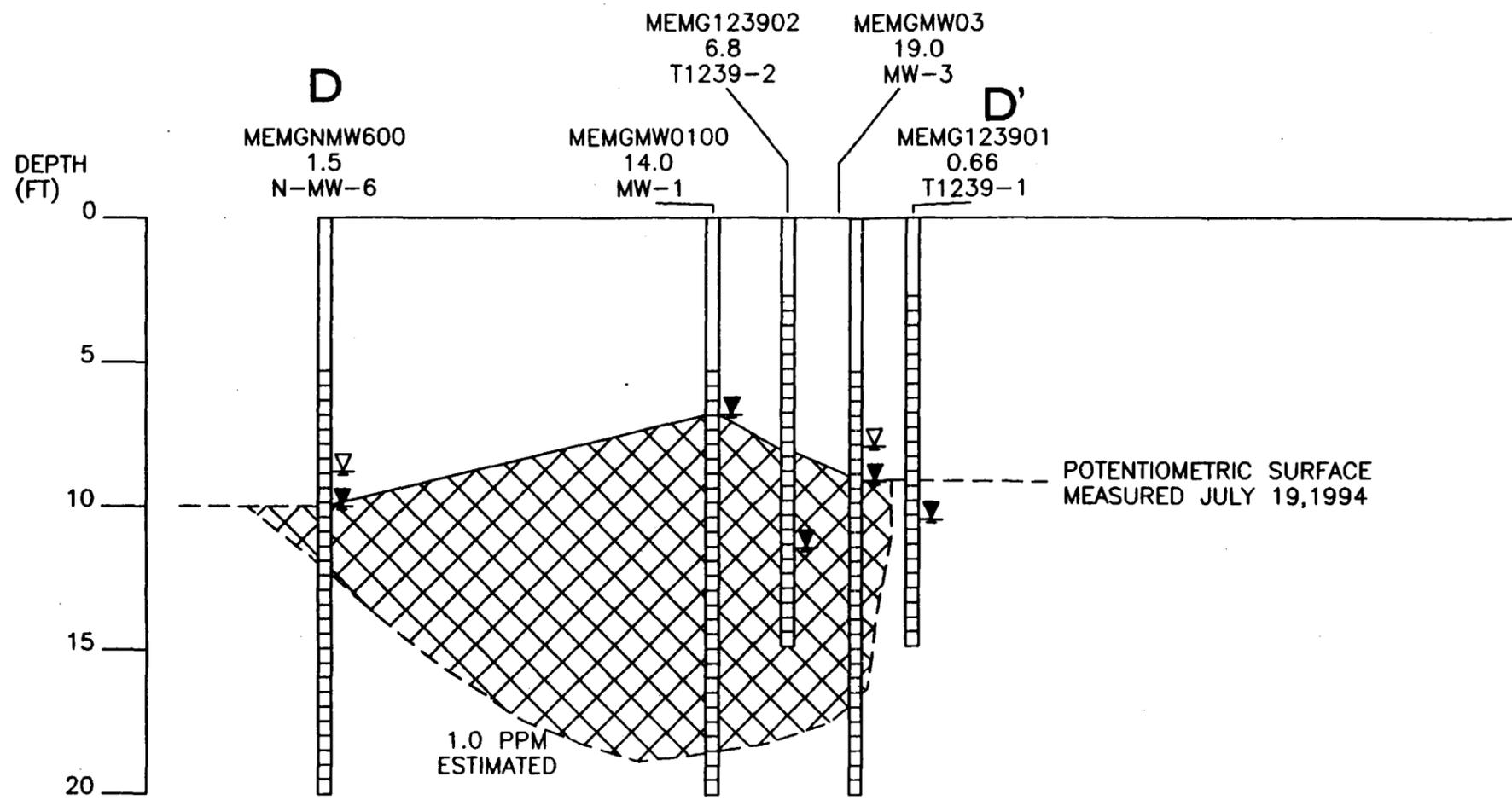
HORIZONTAL SCALE
 35 0 35
 SCALE FEET
 SCALE 1IN = 35FT
 VERTICAL SCALE 1IN=5FT

LEGEND	
MEMGMW0300	SAMPLE #
19.0 PPM	RESULT
MW-3	WELL#
▼	POTENTIOMETRIC SURFACE
▽	FIRST ENCOUNTERED WATER
---	ISOPLETH 1.0 PPM CLEAN UP LEVEL
□	WELL SCREEN INTERVAL



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FIGURE 8
 USTs 304 & 1239
 SECTION C-C'



HORIZONTAL SCALE
 40 0 40
 SCALE FEET
 SCALE 1IN = 40FT
 VERTICAL SCALE 1IN=5FT

NOTE: THE MEASURED POTENTIOMETRIC SURFACE FOR WELLS T1239-1 & T1239-2 ARE CONSIDERED ANOMOLUS.

LEGEND	
MEMGMW0300	SAMPLE #
19.0 PPM	RESULT
MW-3	WELL#
▼	POTENTIOMETRIC SURFACE
▽	FIRST ENCOUNTERED WATER
---	ISOPLETH 1.0 PPM CLEAN UP LEVEL
□	WELL SCREEN INTERVAL



ENVIRONMENTAL ASSESSMENT REPORT
 NAS MEMPHIS
 MILLINGTON, TN
 FACILITY NO. 0-791709

FIGURE 9
 USTs 304 & 1239
 SECTION D-D'