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ASSEMBLY C SITE INVESTIGATION PLANS RESOURCE CONSERVATION AND RECOVERY FACILITY INVESTIGATION CONFIRMATORY SAMPLING INVESTIGATION

MILLINGTON SUPPACT TN

4/10/1995

ENSAFE/ ALLEN AND HOSHALL

ASSEMBLY C SITE INVESTIGATION PLANS
RCRA FACILITY INVESTIGATION
NAVAL AIR STATION MEMPHIS
MILLINGTON, TENNESSEE

CONFIRMATORY SAMPLING INVESTIGATION
REVISION 1

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

Prepared for :

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

Prepared by:

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Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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RFI WORK PLAN
NAS MEMPHIS

SITE INVESTIGATION PLAN
SWMU 15 — N-94 UNDERGROUND TANK FARM

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

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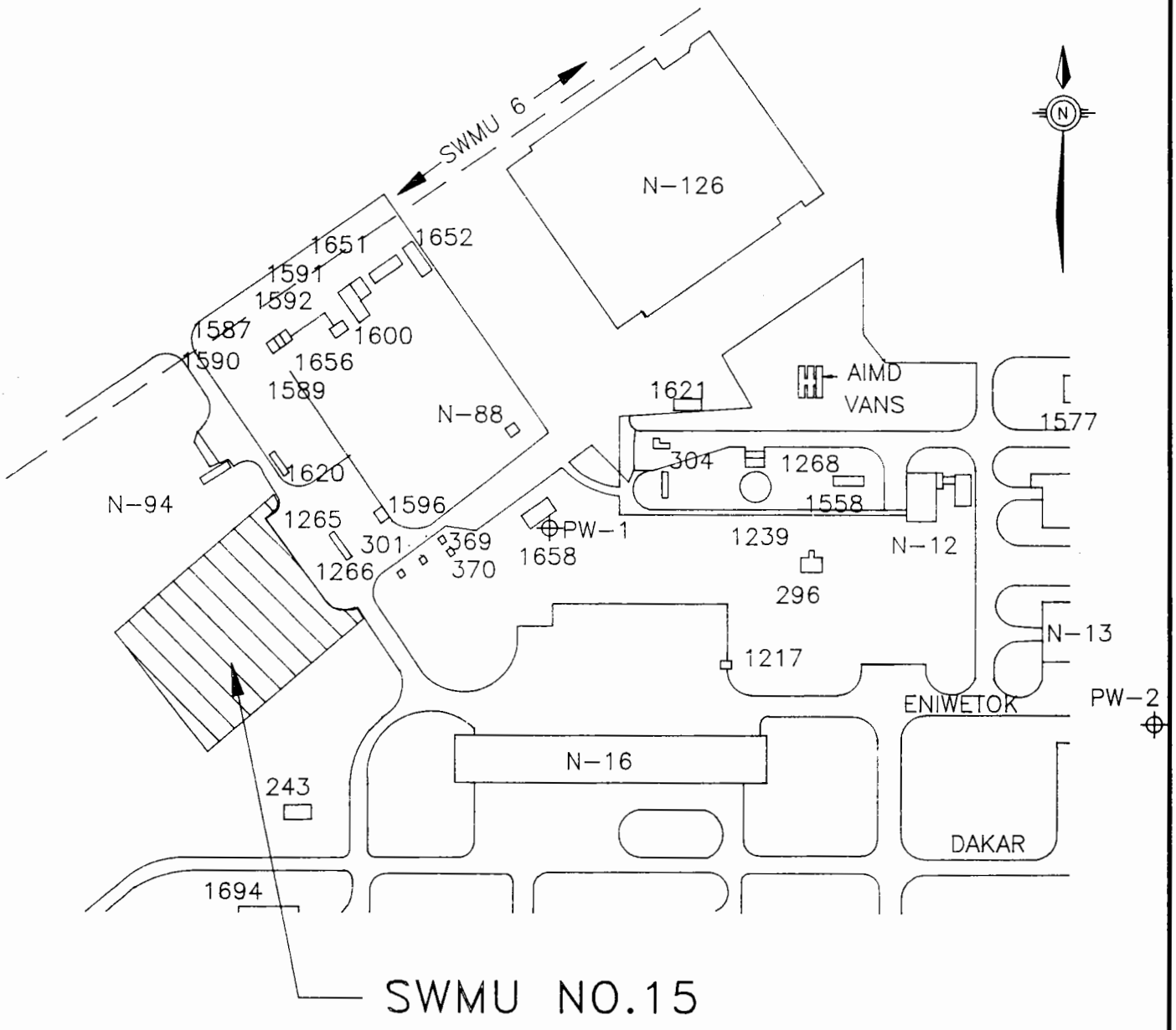
1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long Term Environmental Action Navy (CLEAN) Program, the following Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site Investigation Plan (SIP) has been prepared for a confirmatory sampling investigation at SWMU 15, the N-94 Underground Tank Farm, at the Naval Air Station (NAS) Memphis, Millington, Tennessee. The primary reference for this SIP is the *Comprehensive RFI Work Plan* (E/A&H, 1994).

2.0 ENVIRONMENTAL SETTING

SWMU 15 is a former fuel farm south of Building N-94 which occupies an approximately 40,000 square foot grassy area within the central quadrant of the NAS Memphis Northside. Based on tank layout diagrams, ten 10,000 to 25,000-gallon underground storage tanks (USTs) were present at this site. Nine were used to store aviation gasoline (Tank 302 and Tanks 1251-1258) and one was used to store lubricating oil (Tank 1250). These tanks, installed in 1943, supplied fuel and oil to approximately 75 remote fuel/oil pit boxes along the airport aprons on either side of the control tower. All the storage tanks were abandoned in 1986 and removed, reportedly along with all of the associated UST piping, in early 1992 under the Navy's UST Program. Between abandonment and removal, five of the USTs at SWMU 15 (Tanks 1250, 1255-1258) were reportedly used to improperly store liquid waste generated by the Aircraft Intermediate Maintenance Department (AIMD).

The N-94 tank farm is approximately 250 feet south of the main runway and 250 feet northeast of Building 1671. A vicinity map of SWMU 15 is provided in Figure 1. The site information obtained during the 1990 RCRA Facility Assessment is provided in Appendix A.



LEGEND

PW-1 ⊕ PRODUCTION WELL

— — — UNDERGROUND STORM SEWER

200 0 200

SCALE FEET

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
BUILDING N-94
FORMER UNDERGROUND TANK FARM
SWMU 15

DWG DATE: 04/06/95 | DWG NAME: 94N94VM

conductivity. Slug test results indicate the average soil hydraulic conductivity at the site of the two USTs to be 4.48E-03 feet per day.

Permeability data collected during a UST investigation at Building N-126 (USTs 7, 303, and 1241) (E/A&H, 1993) indicated an average hydraulic conductivity value of 4.5×10^{-7} cm/sec at a depth of 11 to 13 feet. Building N-126 is approximately 500 feet northeast of the site.

Stratigraphic Test Borings

In 1994, the USGS drilled stratigraphic test hole 4 to a total depth of approximately 200 feet at a location approximately 500 feet south of the main runway and about 750 feet west of SWMU 15. The test hole was originally to be advanced approximately 15 feet into the Cook Mountain Formation (the confining unit separating the Memphis aquifer from the overlying Cockfield Formation and shallower units). However, due to the unanticipated thinness of the Cockfield Formation, this borehole was advanced approximately 50 feet into the Memphis Sand. This test hole was visually logged by a field geologist during drilling and geophysically logged following completion. Lithologies encountered in the test hole were as follows:

Loess:	Approximately 40 feet of wind-blown silt deposits (loess) consisting of silt and clay.
Fluvial Deposits:	Approximately 30 feet of fluvial deposits consisting of sand and gravel.
Cockfield Formation:	Approximately 30 feet of alternating sand, clay and some lignite.
Cook Mountain Formation:	The Cook Mountain, characterized as a gray to blue-gray dense clay approximately 44 feet thick, is defined as the upper confining unit between the surficial aquifers and the Memphis aquifer.

- Once the USTs were removed, the excavation would be backfilled with the excavated soil associated with tank removal.

- TDEC and the Navy agreed that any potential soil or groundwater contamination associated with N-94 would be investigated and remediated through the RCRA Corrective Action Program.

The ten USTs were removed and disposed of in February and March 1992, in accordance with the procedures outlined in the February 11, 1992 Navy correspondence to TDEC. The closure reports, contained in Appendix C, indicate that obviously contaminated soil was observed during each UST excavation. The excavated soil was not sampled or field screened prior to backfilling since potentially contaminated soil would be investigated and remediated under RCRA. Rainwater which entered the excavated areas was pumped into on-site holding tanks and sampled. Based on the results of the analyses, the water was either disposed of in the sanitary sewer under an agreement with the City of Millington Sewer Department, or transported to LaidLaw, Inc. of Nashville, Tennessee for disposal. Appendix C contains the TCLP analyses for water in holding tank numbers R-1, 33, and 46. This water was determined to be nonhazardous and was disposed of in the sanitary sewer system. In accordance with the agreement between TDEC and the Navy, each UST excavation was backfilled with the potentially contaminated soil associated with UST removal. Clean soil was used to backfill the remaining volume of the UST excavations.

The residual product in select USTs was analyzed for waste characterization prior to disposal. Analytical results on the contents of a liquid waste tank indicated the presence of a halogenated solvent (approximately 7 ppm methylene chloride). Four closure soil samples were collected from the bottom corners of each UST excavation and analyzed for flash point; benzene, toluene, ethylbenzene, and xylenes (BTEX), total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and toxicity characteristic

groundwater adjacent to the UST were below state action levels, but TPH concentrations in the groundwater were above the state action level. Contaminant migration from the site was determined to be in a generally radial pattern. The EAR for USTs 304 and 1239 (E/A&H, August 1994), approximately 400 feet east of SWMU 15, found soil TPH-DRO concentrations to be above the action level (500 mg/kg) in 5 of the 15 borings (at levels up to 2,300 mg/kg). TPH-DRO concentrations in groundwater were above the action level (1.0 mg/L) in 7 of 11 monitoring wells and leak detection wells sampled (at levels ranging from 1.5 mg/L to 170 mg/L).

4.2 Data Gaps

Data gaps include the potential for surface and subsurface soil contamination and groundwater contamination in the surficial aquifers. The following data gaps, which were not addressed in the previous investigations, will be the focus of this investigation.

- The potential for surface and subsurface soil contamination, if any, associated with the use of potentially contaminated backfill soil.

- The potential for subsurface soil contamination in the loess.

- The potential for groundwater contamination in the loess and fluvial deposits.

Concentrations of contaminants identified in soil and groundwater at SWMU 15 will be compared to background soil and groundwater concentrations as determined from the five background monitoring wells which were installed in 1995 across the base, and from monitoring wells at other SWMUs to determine whether measured values occur naturally or indicate contamination. Groundwater samples collected from the background monitoring wells have been analyzed for full scan analysis (FSA) using the following methods:

4.3.1 DPT Phase

The proposed soil and groundwater investigation will initially consist of DPT sampling (Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) to collect soil and groundwater samples for field analysis. A total of 20 initial sampling locations have been selected and are shown in Figure 2. The boundary of the tank farm has been estimated from previous investigations, various aerial photographs, and engineering plans obtained from the NAS Memphis Public Works Office.

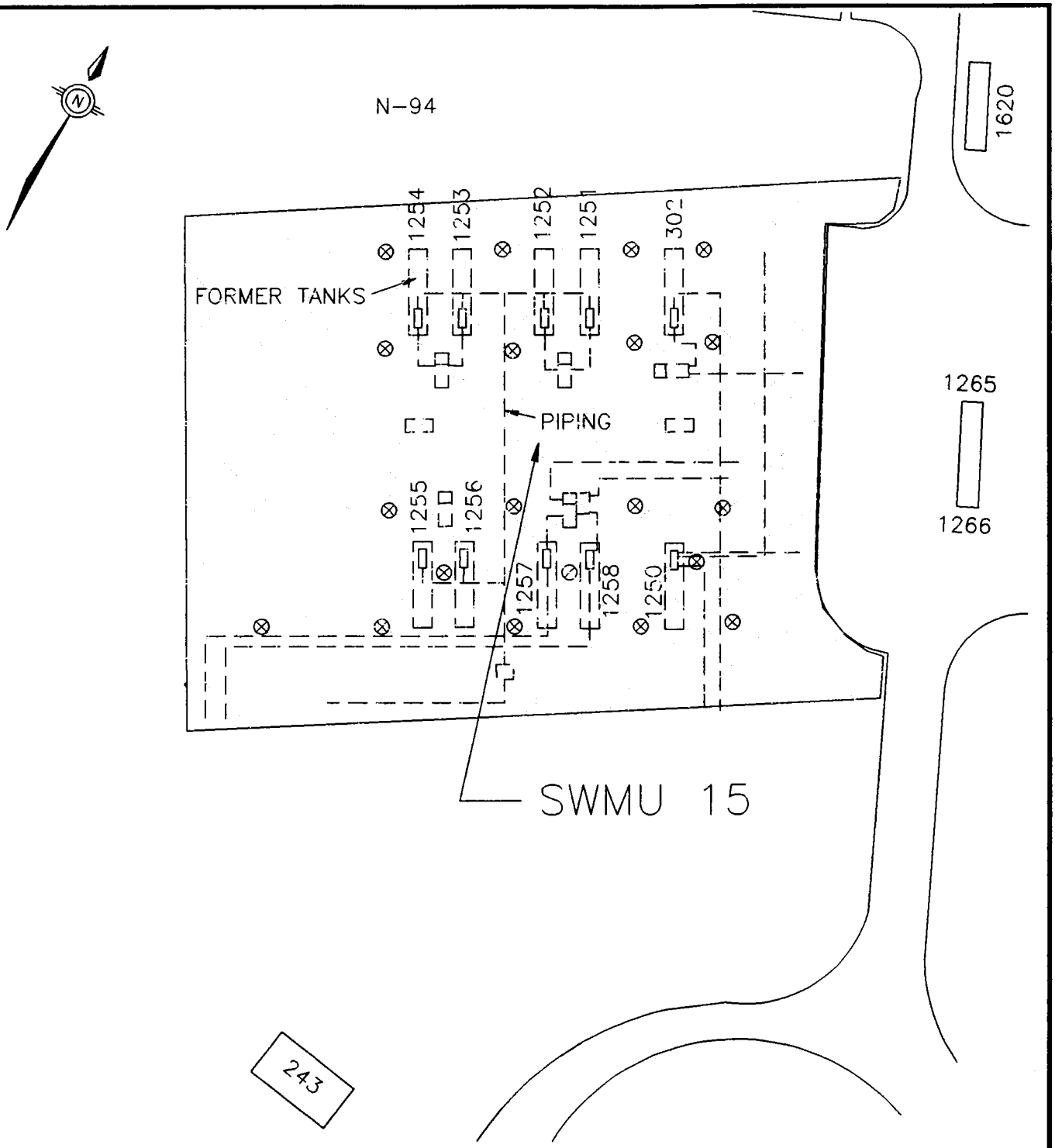
Based on previous work conducted at other SWMUs, it is anticipated that the DPT equipment will be able to penetrate through the loess into the top of the fluvial deposits (approximately 40 ft. bgs). Groundwater samples will be obtained (if possible) from the upper portion of the first water-bearing zone in the loess to check for the presence of contaminants with specific gravities less than water (e.g., fuel). Groundwater samples will also be collected from the top of the fluvial unit to check for the presence of contaminants with specific gravities greater than water (e.g., chlorinated solvents).

Three soil and/or groundwater samples will be collected from each sampling point as outlined below:

1) One soil sample will be collected from the 5 to 6-foot soil interval.

2) One sample, either soil or groundwater, will be collected from the soil-water interface in the backfill soil or loess. Under optimum conditions, a groundwater sample will be collected. However, if a groundwater sample cannot be collected at this interval, a soil sample will be collected. The sampling interval should be below any clean soil that might have been used to cap the area, thus providing a sample of the excavated soil used as backfill.

3) One groundwater sample will be collected from the top of the fluvial deposits.



LEGEND

⊗ DPT SAMPLING LOCATION

SCALE: NOT TO SCALE

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
PROPOSED DPT SAMPLING LOCATIONS
BUILDING N-94
FORMER UNDERGROUND TANK FARM
SWMU 15

DWG DATE: 04/06/95 | DWG NAME: 94N94DPT

4.4 Sample Management

Sample management procedures will adhere to Sections 4.12 and 5.0 of the *Comprehensive RFI Work Plan.*

4.5 Sample Custody

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

4.6 Quality Assurance/Quality Control

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

4.7 Decontamination Procedures

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

4.8 Investigation-Derived Waste

Investigation-derived waste (IDW) will be handled as specified in Section 4.13 of the *Comprehensive RFI Work Plan.*

5.0 POTENTIAL RECEPTORS

SWMU 15 is approximately 3,000 feet north of the nearest offsite residence. The nearest NAS Memphis personnel are located adjacent to the site at N-126. Surface water runoff is toward the SWMU 6 drainage ditch, approximately 600 feet southwest of SWMU 15. Runoff from SWMU 6, in turn, discharges into North Fork Creek, which may serve as a food and water source for various animals. SWMU 6 is related to drainage ways which are located in populated areas of the base; therefore, the potential exists for contact by base personnel. Off base, the potential exists for contact by the general public due to unrestricted access to the drainage ways. According to base personnel, no fishing or swimming occurs in North Fork Creek or Big Creek, but children may play near these drainage ways.

ERC/EDGe (September 1990). *RCRA Facility Assessment (RFA), NAS Memphis*. ERC/EDGe: Nashville, Tennessee.

ERC/EDGe (April 1990). *Visual Site Inspection Report, NAS Memphis, Millington, TN.* ERC/EDGe: Nashville, Tennessee.

Southern Division Naval Facilities Engineering Command (May 1990). *Draft Final RCRA Facility Investigation Work Plan for Naval Air Station-Memphis*. SOUTHDIV: Charleston, South Carolina.

APPENDIX A

RFA SWMU DESCRIPTION

7.15 SWMU NO. 15: N-94 UNDERGROUND TANK FARM

7.15.1 UNIT CHARACTERISTICS

7.15.1.1 TYPE OF UNIT

Inactive underground tanks.

7.15.1.2 DESIGN FEATURES

The N-94 Tank Farm consists of an area of approximately 40,000 square feet areal extent in which are buried ten, 10,000- to 25,000-gallon underground storage tanks (USTs).

7.15.1.3 OPERATING PRACTICE (PAST AND PRESENT)

Five of the tanks have been used to store general liquid wastes. These tanks are numbered 1250, 1255, 1256, 1257 and 1259. The remaining tanks (numbers 1251, 1252, 1253, 1254, and 302) contain gasoline mixed with water.

7.15.1.4 PERIOD OF OPERATION

The date the tanks were converted to waste usage is not known.

7.15.1.5 AGE OF UNIT

Forty-five years.

7.15.1.6 LOCATION OF UNIT

The unit is located on the North Side of the NAS (See Figure 7-15).

7.15.1.7 GENERAL PHYSICAL CONDITIONS

The tank farm area is generally level, graded, and covered with a layer of crushed stone to retard growth of vegetation and adsorb surface spills.

7.15.1.8 CLOSURE METHOD

Unknown.

7.15.2 WASTE CHARACTERISTICS

7.15.2.1 TYPE OF WASTE

According to Department of the Navy information, various types of liquid wastes have been stored in tanks numbered 1250, 1255, 1257, and 1528. These substances include liquid

wastes generated by the Aircraft Intermediate Maintenance Department (AIMD); including paint waste, paint solvents, freon, paint strippers, waste oil, waste gasoline, and waste alodeine (dilute chromic acid).

7.15.2.2 MIGRATION CHARACTERISTICS

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

7.15.2.3 TOXICOLOGICAL CHARACTERISTICS

The toxicological characteristics of substances potentially present could include any or all of those described previously for SWMUs No. 1, 5, and 14.

7.15.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

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

7.15.3 MIGRATION PATHWAYS

7.15.3.1 GEOLOGIC SETTING

See Section 3.2.

7.15.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.15.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

7.15.3.4 TOPOGRAPHIC CHARACTERISTICS

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

7.15.3.5 PATHWAYS

AIR

Visual inspection of this SWMU reveals no apparent surface releases of contaminants at this site. Therefore, no atmospheric releases of contaminants are anticipated.

SOIL

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

SURFACE WATER/SEDIMENT

Since the field inspections revealed no obvious surface spills at SWMU No. 15, the likelihood of surface water transport is remote. However, contaminants could be carried along existing surface ditches to streams and bodies of water.

GROUNDWATER

Contaminants contained in the USTs at this location are soluble in water and could be transported with the flow of ground water down-gradient.

SUBSURFACE GAS

VOCs from fuel or other liquid wastes could migrate.

7.15.4 CONTAMINANT RELEASE IDENTIFICATION

7.15.4.1 PRIOR INSPECTION REPORTS

The tanks are described in Appendix L of the NAS Memphis Underground Tank Survey Report. Their use as liquid waste

storage tanks is also noted in the 1983 Hazardous Waste Survey by EnSafe, Inc. The survey report indicates that typical AIMD and squadron-level maintenance wastes were stored in some of the tanks.

7.15.4.2 PUBLIC COMPLAINTS

None.

7.15.4.3 MONITORING/SAMPLING DATA

None.

7.15.4.4 EVIDENCE OF RELEASE

None observed. Past and current usage; age of unit.

7.15.5 EXPOSURE POTENTIAL

7.15.5.1 PROXIMITY TO AFFECTED POPULATION

The site is located in the NAS industrial area, which is located at a distance from the NAS permanent population.

7.15.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

There are no environmentally sensitive areas in the vicinity of SWMU No. 15.

7.15.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

If releases to groundwater have occurred, uses of groundwater could be affected.

7.15.6 DOCUMENTS REVIEWED

The documents listed in the PRD and NAS Memphis historical records were reviewed.

7.15.7 SUMMARIZED DATA GAP

7.15.7.1 SOIL

No data.

7.15.7.2 GROUNDWATER

No data.

7.15.7.3 SURFACE WATER/SEDIMENT

No data.

7.15.7.4 AIR

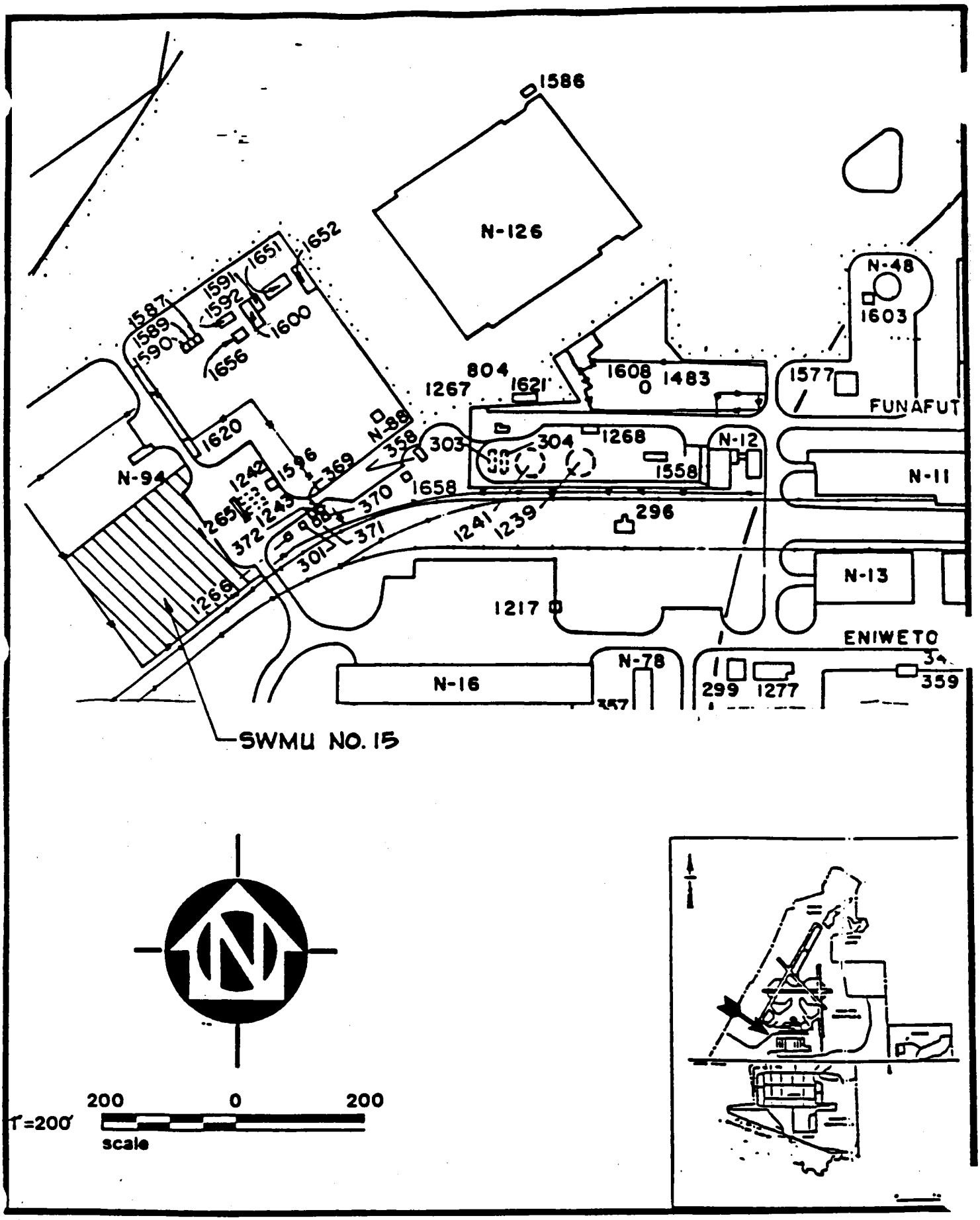
No data.

7.15.7.5 SUBSURFACE GAS

No data.

7.15.8 RECOMMENDED ACTIONS

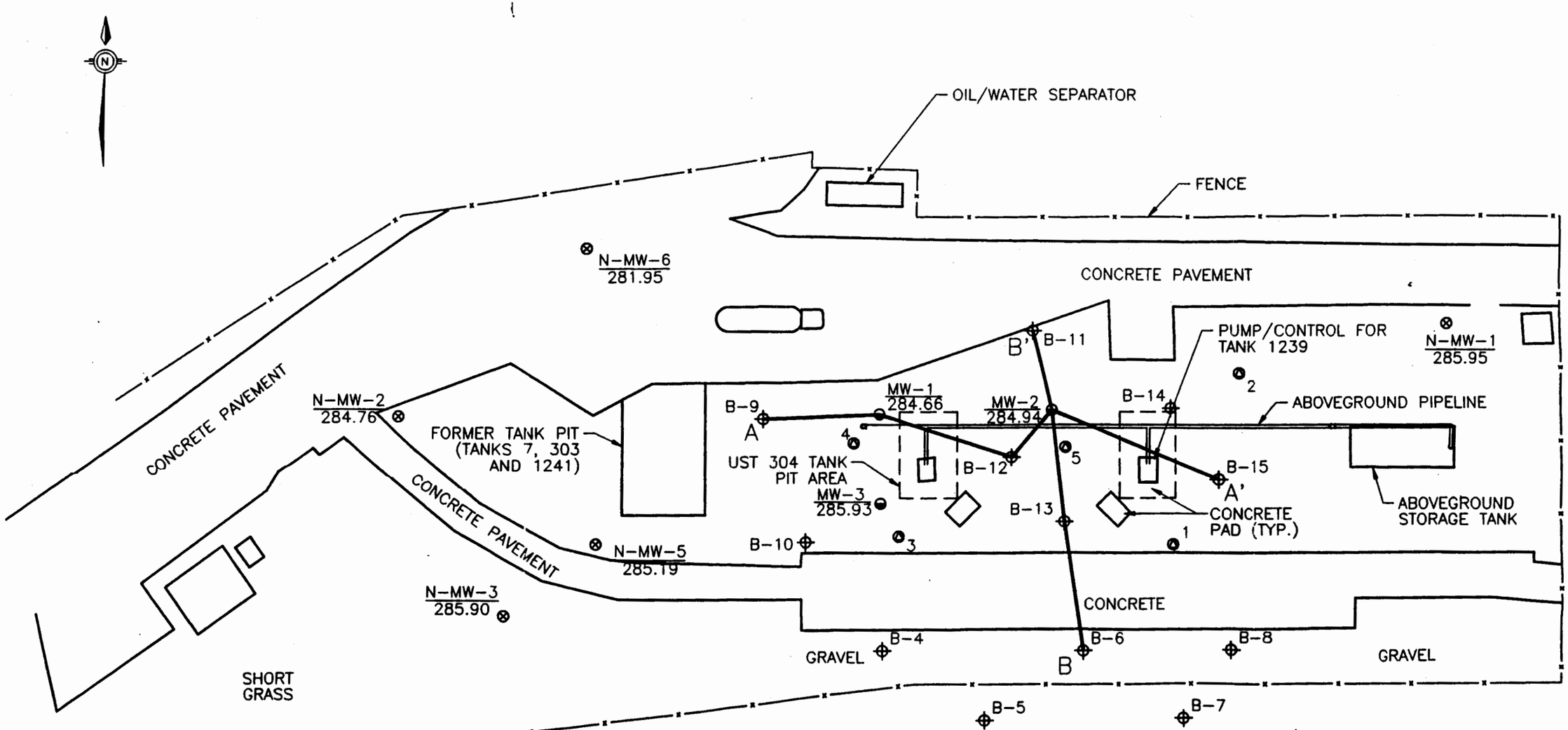
Because of extreme age (45 years) of the tanks and product distribution system at this location, it is suspected that a release of hazardous waste or hazardous waste constituents may have occurred at this location. This site has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM, EPA Region IV, and the Tennessee Department of Health and Environment. At a minimum groundwater and soil sampling are indicated.



SWMU NO. 15 N-94 TANK FARM
FIGURE 7-15 LOCATION MAP

APPENDIX B

MISCELLANEOUS BORING LOGS



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

FIGURE 3
SOIL BORING AND
MONITORING WELL LOCATION MAP
USTs 304 AND 1239 CTO-0080

DATE: 8/19/94 | DWG NAME: CTO80_02

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass				
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.
				14.0–14.5' CLAYEY SILT, BROWN, STIFF.
14.8			328	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.
				DISCONTINUED BORING AT 23.0 FEET.

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B/MW–1
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/11/1994 PROJ. #: CT0008

DATE: 8/4/1994 DWG NAME: CTOSBB–

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Gross				
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				
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				
10.5			92	10.5–15.2' SILTY CLAY, GREYISH BROWN TO TAN MOTTLED GREY, MOIST, SOFT.
13			27	
15				
15.5			120	15.2–16.0' SILTY CLAY, GREYISH BROWN, VERY MOIST, SOFT.
				16.0–18.0' SILTY CLAY, DARK BROWN, MOIST, FIRM.
18			234	18.0–20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM (WITH STRONG HYDROCARBON ODOR).
20				
20.5			136	20.5–23.0' SILTY CLAY, BROWN, MOIST, FIRM (WITH HYDROCARBON ODOR).
25				DISCONTINUED BORING AT 23.0 FEET.
30				

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B/MW–2
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/11/1994 PROJ. #: CTO00E

DATE: 8/4/1994 DWG NAME: CTOSBB–

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/6 IN.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass					
		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).
5					
		8		48	8.0–13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
10					
		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).
					DISCONTINUED BORING AT 23.0 FEET.
25					
30					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B/MW–3
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CTO008

DATE: 8/4/1994 DWG NAME: CTOSBB–3

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/6"	ORGANIC VAPORS (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
				SURFACE - Grass
5	4			4.0-6.0' CLAYEY SILT, GREYISH BROWN, MOIST, VERY FIRM TO STIFF (WITH HYDROCARBON ODOR).
10	9			9.0-11.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM TO SOFT (WITH HYDROCARBON ODOR).
				DISCONTINUED BORING AT 11.0 FEET.
15				
20				
25				
30				

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-3A
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CTO008(

DATE: 8/4/1994 | DWG NAME: CTOSB-3A

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/6"	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass				
0			9	0.0-1.5' CRUSHED LIMESTONE (FILL)
				1.5-3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, STIFF.
3			2	3.0-6.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM (WITH HYDROCARBON ODOR).
5				
5.5			9	6.0-7.0' CLAYEY SILT, BROWN MOTTLED BEIGE, MOIST, STIFF.
8			238	7.0-8.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
10				8.0-13.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH
10.5			21	HYDROCARBON ODOR).
13			11	13.0-18.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
15				
15.5			4.8	
18				DISCONTINUED BORING AT 18.0 FEET.
20				
25				
30				

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

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/5 IN.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
					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		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.
10					
		13		4	13.0–15.5' CLAYEY SILT, TAN MOTTLED GREY GRADING TO BROWN MOTTLED GREY, VERY MOIST, FIRM.
15					
		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					
		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.
25					
30					DISCONTINUED BORING AT 28.0 FEET.

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–5
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CT000

DATE: 8/4/1994 | DWG NAME: CTOSBB-

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/ 5 1 1.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Crushed Limestone				
	0		15	0.0–2.5' CLAYEY SILT, BROWN, STIFF.
				2.5–3.0' CLAYEY SILT, DARK GREY, MOIST, SOFT.
	3		4	3.0–6.0' CLAYEY SILT, GREYISH BROWN, MOIST, SOFT.
5				
	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	
				DISCONTINUED BORING AT 18.0 FEET.
20				
25				
30				

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–6
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CTO008

DATE: 8/4/1994 DWG NAME: CTOSBB–6

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass				
	0		41	0.0–4.0' CLAYEY SILT, TAN TO BROWN, DRY TO SLIGHTLY MOIST, STIFF.
	4		49	4.0–8.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM.
5				
	8		14	8.0–8.5' CLAYEY SILT, TAN TO BROWN, SLIGHTLY MOIST, FIRM, FRIABLE.
	10.5		86	8.5–13.0' CLAYEY SILT, GREYISH BROWN, MOTTLED GREY AND TAN, MOIST, FIRM (WITH HYDROCARBON ODOR).
10				
	13		94	13.0–18.0' SAME AS ABOVE (WITH HYDROCARBON ODOR).
15				
	15.5		81	
	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).
	23		0	23.0–28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM (WITH TRACE OF STAINING).
25				
	25.5		1	
30				DISCONTINUED BORING AT 28.0 FEET.

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–7
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/14/1994 PROJ. #: CT0008

DATE: 8/4/1994 DWG NAME: CTOSBB–7

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/6"	ORGANIC VAPORS (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
				SURFACE - Crushed Limestone
	0		51	0.0–0.5' CLAYEY SILT, BROWN, SLIGHTLY MOIST, FIRM.
				0.5–3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM.
	3		29	3.0–8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT GRADING TO CLAYEY SILT, GREY MOTTLED BROWN, STIFF. (WITH SLIGHT HYDRO-CARBON ODOR).
5	5.5		27	
	8		185	8.0–13.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
10	10.5		239	
	13		306	13.0–18.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
15				
				DISCONTINUED BORING AT 18.0 FEET.
20				
25				
30				

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-8
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CTO008

DATE: 8/4/1994 DWG NAME: CTOSBB-8

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5 FT	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
				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?).
5	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	10.1		3	10.1-14.7' CLAYEY SILT TO SILTY CLAY, TAN TO BROWN MOTTLED GREY, MOIST, FIRM.
	13		2	
15	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).
				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. #: CTO008(

DATE: 8/4/1994 DWG NAME: CTOSB8-9

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass					
		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		5.5		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		10.5		19	
		13		9	13.0–18.0' CLAYEY SILT, BROWN MOTTLED BEIGE AND LIGHT GREY, FIRM, VERY MOIST.
15		15.5		13	
20					DISCONTINUED BORING AT 18.0 FEET.
25					
30					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–10
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CTO008

DATE: 8/4/1994 DWG NAME: CTOSB–1C

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
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.
5					
		8		25	8.0-10.5' CLAYEY SILT, BROWN MOTTLED GREY, VERY MOIST, FIRM.
10					
		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					
		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.
20					
25					
30					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-11
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT0008

DATE: 8/4/1994 | DWG NAME: CTOSB-11

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass					
		0		40	0.0–3.8' CLAYEY SILT, BROWN MOTTLED BEIGE AND DARK BROWN, SLIGHTLY MOIST, STIFF (FILL?).
5		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).
10					
		13.0		137	14.5–14.7' SILT, BROWN, STIFF, DRY.
15		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).
20					
		23		261	23.0–25.0' CLAYEY SILT, DARK BROWN, SLIGHTLY MOIST, FRIABLE (WITH HYDROCARBON ODOR).
25		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.
30					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–12
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CT000

DATE: 8/4/1994 DWG NAME: CTOSB–1

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
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.
5					
		8		9	8.0–13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT.
10					
		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).
15					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					
		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					
		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.
30					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–13
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CTOOO

DATE: 8/4/1994 DWG NAME: CTOSB–1

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/ 5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass					
0		0		70	0.0-3.0' CLAYEY SILT, BROWN MOTTLED BEIGE, SLIGHTLY MOIST, STIFF.
5		3		64	3.0-8.0' CLAYEY SILT, BROWN WITH DARK BROWN STREAKS, MOIST, FIRM.
10		8		96	8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR).
15		13		23	13.0-18.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO SOFT (WITH SLIGHT HYDROCARBON ODOR).
20					DISCONTINUED BORING AT 18.0 FEET.
25					
30					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CT00080

SOIL BORING B-14
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CT000E

DATE: 8/4/1994 DWG NAME: CTOSB-1

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5 FT	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass				
	1		330	0.0–1.0' CLAYEY SILT, TAN MOTTLED BROWN, SLIGHTLY MOIST, STIFF.
				1.0–3.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR).
	3		213	HIT TANK AT APPROXIMATE DEPTH OF 6 FEET, OFFSET BORING 3 FEET EAST. SAMPLES BELOW 3 FEET IN DEPTH ARE FROM OFFSET BORING.
5				3.0–8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
	8		202	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.
	23		2	23.0–27.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO STIFF.
25				
	25.5		6	
				27.0–28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM.
				DISCONTINUED BORING AT 28.0 FEET.
30				

ENVIRONMENTAL ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–15
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CTO00E

DATE: 8/4/1994 DWG NAME: CTOSB–1

APPENDIX C

TANK CLOSURE REPORTS/CORRESPONDENCE

DEPARTMENT OF THE NAVY
NAVAL AIR STATION MEMPHIS
MILLINGTON, TENNESSEE 38054-5000

IN REPLY REFER TO

5090
Ser 01032/ 000625
11 FEB 1992

Tennessee Department of Environment and Conservation
Division of Solid Waste Management
Director Hazardous Waste Management Section
Customs House, Fourth Floor
701 Broadway
Nashville, Tennessee 37219-5403

Subj: EPA ID #TN2170022600

Gentlemen:

We would like to thank Mr. Ronnie Bowers of your staff for meeting with Mr. Mark Taylor of Southern Division, Naval Facilities Engineering Command on 21 January 1992 to help resolve our underground storage tank removal problem at N-94. Ms. Allison Drew of EPA IV has also been briefed on the situation and has offered helpful suggestions to rectify the situation.

For your information, the following is a recount of events pertaining to the underground storage tank (UST) farm at N-94. An engineering firm was retained by Southern Division to develop design plans and specifications to remove 37 USTs at NAS Memphis as part of the Navy's UST program. The underground tank farm at N-94, which contains 10 tanks, was identified as an UST system, i.e., containing petroleum hydrocarbons only. A construction contract was awarded and during subsequent tank excavation, analytical results of tank contents indicated a low concentration of halogenated solvent (approximately 7 ppm of methylene chloride). The UST contractor was advised by us to discontinue activities at N-94 until environmental personnel could thoroughly investigate the situation. Ensuing discussions revealed that N-94 was also identified as Solid Waste Management Unit (SWMU) #15 to be investigated under our RCRA Corrective Action Program which was previously not known by Southern Division's engineering design contractor.

Therefore, it is our understanding that the following approach would be acceptable and, we believe, offers the best environmental solution:

- Our UST contractor will continue to excavate the tanks at N-94 in accordance with 40 CFR 280 in lieu of 40 CFR 264/265. Any tank contents/residual soils will be containerized and analyzed in accordance with hazardous waste determination criteria (TCLP and F001 - F005 solvent scan) and disposed of properly.

- If any product is encountered during excavation, absorbents will be used to clean all visible contamination. The absorbents will be containerized and analyzed in accordance

with hazardous waste determination criteria and disposed of properly as stated above.

- One grab sample of water will be obtained from the water standing in each excavation. Each water sample will be analyzed for the hazardous waste criteria stated above. No groundwater will be removed from the excavation prior to backfilling.

- Four soil samples will be retrieved from the bottom of each tank excavation at N-94. Each sample will also be analyzed for hazardous waste criteria as stated above.

- The excavated soil associated with tank removal will be backfilled once the tanks are removed.

- Any soil or groundwater contamination pertaining to N-94 will be investigated and remediated through our RCRA Corrective Action Program in lieu of 40 CFR 264/265. Also, all collected data and any observations associated with tank removal at N-94 will be incorporated into and complement our RFI Workplan for NAS Memphis.

Thank you for your cooperation in resolving this situation. If you have any further questions or need any additional information, please contact Mr. Mark Taylor of Southern Division at (803) 743-0573, or Ms. Tonya Barker or NAS Memphis at (901) 873-5461.

Sincerely,

P. M. MOTOLENICH

[illegible] OFFICER

Copy to:
Commanding Officer
Southern Division, Naval Facilities Engineering Command
Code 18221, Mr. Mark Taylor and Mr. James Worthy
2155 Eagle Drive
Charleston, SC 29411-0068

Subj: EPA ID #TN2170022600

EnSafe/Allen & Hoshall
Attn: Mr. Lawson Anderson
5724 Summer Trees Drive
P. O. Box 341315
Memphis, TN 38184

Environmental Protection Agency IV
Waste Management Division
RCRA and Federal Facilities Branch
Attn: Mr. John Johnston
345 Courtland Street
Atlanta, GA 30365

Tennessee Department of Environment and Conservation
Attn: Ms. Coleen Powers and Mr. Hussein Ghelichkhani
2500 Mt. Moriah Road
Suite E 645
Perimeter Park
Memphis, TN 38115

Contract N62467-90-C-0683
Underground Storage Tank Closure Report
Tank no. 302
(SD-84)

Naval Air Station Memphis
Millington, TN

April 9, 1992

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3.0 Sampling

4.0 Analytical Results

5.0 Disposal of Materials

6.0 Warranties and Limitations

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A. Permanent Closure Report Forms

B. Field Data for Measured Tank Contents.

C. Chain of Custody Form and Analytical Results for Final Soil Samples.

D. Certifications and Manifests for Disposal of Tank 302.

E. Certifications and Manifests for the Disposal of Water from the Tank Vault and the Contents of Tank 302.

1.0 Introduction

The purpose of this report is to provide documentation that the underground storage tank listed below at the Naval Air Station was properly removed and closed as required by the applicable Tennessee state regulations and the Navy's contract specifications. Permanent closure report forms are located in Appendix A.

Navy Tank No.: Tank 302

Location:	Adjacent to Building N-94
Description:	25,000 gal. steel tank
Contents:	Water with petroleum sheen
Removal date:	February 21, 1992

2.0 Description of Work Performed

Before work began on the tanks, the fluid levels were measured and tank volumes were calculated. Tank 302 was specified to contain 420 gallons. After measurement, tank contents were determined to be 6198 gallons (Appendix B).

Prior to excavation, rainwater that had collected in the tank vault was pumped into trucks and disposed of as a hazardous waste liquid.

After pumping the liquids, excavation began to expose Tank 302. Because of the nature of the N-94 site the State of Tennessee gave permission for the Navy to backfill all excavations in the N-94 area with contaminated soil until further investigations could be made. The excavated soil was therefore stockpiled at the excavation site and was not field checked with the HNU photoionization detector (PID).

A 60 ton crane was hired to remove the tanks from the pit. Tank 302 was removed and placed on plastic sheeting on the ground. The tank gasses were checked with a combustible gas indicator (CGI) and no combustible gasses were detected. A hole was cut in the tank with non-explosive pneumatic nibblers and the tank was cleaned.

The outside of the tank was cleaned and labeled and hauled to the laydown area. The tank remained there over night and was then taken to Hutcherson Metals.

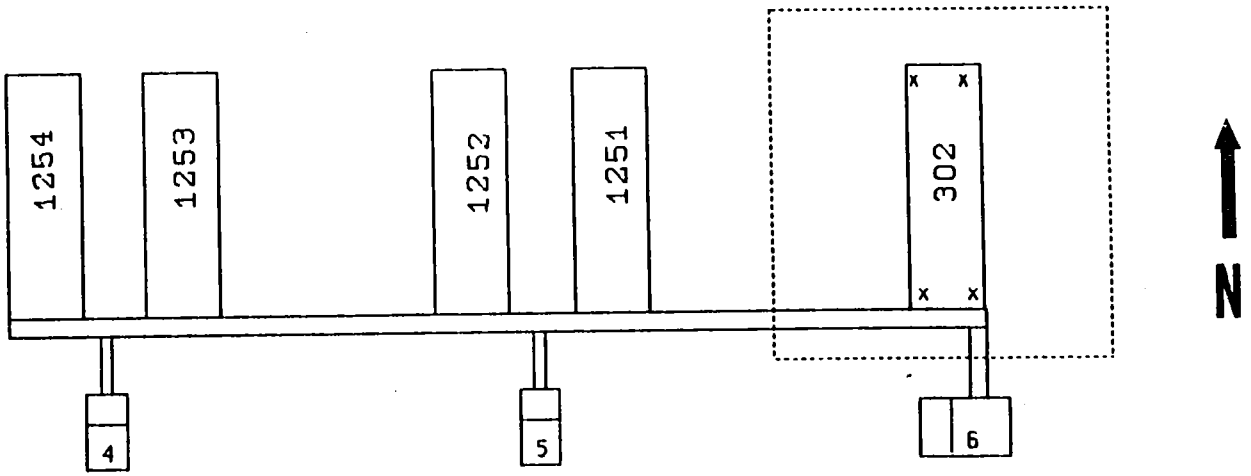
Soil samples were taken from the excavation and, as directed by the Navy, backfill began using contaminated soil from the excavation. The backfill materials from the original excavation became very muddy so it became necessary to finish the excavation with no. 86 clay gravel.

3.0 Sampling

Because permission was given by the State to backfill the excavations with contaminated soil, the soil from the excavation was not sampled or field checked with the HNU photoionization detector (PID).

Soil samples from the excavation pit were collected from each corner of the tank (4 samples). Samples were collected as grab samples from the excavator bucket and packed in clear glass jars with Teflon lined lids. The sample locations are identified on the following map.

Building N-94



x = Final Sample Locations

*** Not to Scale**

4.0 Analytical Results

All samples were shipped to Specialized Assays Environmental in Nashville Tennessee, a Navy approved and certified laboratory. Samples were analyzed using approved EPA methods for soil. Final in-situ materials were analyzed for flashpoint, BTEX, TPH, and TCLP analysis for BTEX, TPH, lead. The results of the analysis are summarized in the following tables. Laboratory reports are included in Appendix C.

Final In-situ Soils Samples

	Tank 302 Excavation			
Analysis (PPM)	NW	NE	SE	SW
TCLP Storage Tank				
Lead	<0.50	<0.50	<0.50	<0.50
Benzene	<0.100	<0.100	<0.100	<0.100
Lo Boil HC	<0.100	<0.100	<0.100	<0.100
Hi Boil HC	<0.100	<0.100	<0.100	<0.100
BTEX Soil				
Benzene	ND	ND	ND	ND
Toluene	ND	3.91	ND	ND
Ethylbenzene	ND	1.66	ND	ND
Xylene	ND	11.8	ND	ND
TPH				
Lo Boil HC	<5.0	41.2	<5.0	<5.0
Hi Boil HC	283	14.7	73.2	154
Flashpoint *	>160	>160	>160	>160

* Sample heated to 160 degrees Fahrenheit without ignition
** ND = not detected or <1.00 PPM

5.0 Disposal of Materials

All soil removed from tank excavations at the N-94 site were placed back in the excavation as directed by the Navy. Certifications and disposal manifests for tank 302 is included in Appendix D. Certifications and disposal manifests for the tank contents and tank vaults are included in Appendix E.

6.0 Warranties and Limitations

This report certifies that the storage tanks were closed in accordance with federal and state regulations and Millington Naval Air Station's contract specifications. No certification is given that all environmental contaminants have been removed from the site because of the limitations of the type of representative sampling that was required and performed for this kind of work.

DIVISION OF UNDERGROUND STORAGE TANKS
PERMANENT CLOSURE REPORT FORM

Directions: Please address the following questions in detail. Attach extra sheets if necessary. This form must be completed and submitted with the laboratory report forms.

1. Facility ID#: Tank #302 (Unregistered)

2. Facility Name: Millington Naval Air Station, Building N-94

3. Did you notify this Divison one working day prior to taking the soil samples for the closure? Yes ____ NO X O.K.

4. Was the tank atmosphere and the work zone regularly tested with a combustible gas indicator in accordance with Appendix 5 Part (3) of the UST regulations? Yes XX No ____

5. Describe how the tank(s) was purged: Purged with 1.5 lbs of dry ice (carbon dioxide) for every 100 gallons of tank volume.

6. Describe how all liquids and sludges were removed from the tank(s): liquids pumped with a pneumatic diaphram pump, sludge removed with a Tornado drum vac and aluminum squeegee.

7. Describe how all liquids and sludges were stored and disposed of: No sludge was found. Liquids were pumped into trucks and disposed of by Laidlaw Environmental

8. If the tank(s) was removed, was it labeled in accordance with Appendix 5 Part (4)(f) of the UST regulations?
Yes XX No ____

9. How and where was the tank(s) disposed of? taken by Industrial Crane to Hutcherson Metals, Inc. for recycling.

10. Was bedrock encountered during tank abandonment/closure?
Yes ____ No XX

11. Was water encountered in the tank pit during the tank abandonment activities? Yes XX No ____

12. If yes, was water sampled? Yes XX No _____ If yes, please attach the results.

13. Was obviously contaminated soil encountered during the tank abandonment (i.e. discolored soil, soil with a hydrocarbon odor, etc.)? Yes XX No _____

14. Did you excavate more than 10 feet from any edge of the tank(s)? Yes _____ No XX

15. If yes, who did you notify with this Division? _____
N/A

16. When did you make the notification? N/A

17. How much soil was removed during the tank abandonment procedure (cubic yards)? 600 C.Y.

18. What was done with this soil after it was removed from the tank excavation? (Any soil removed from a tank pit excavation will be considered contaminated until proven otherwise through laboratory analyses.) All soil was stockpiled at the site and returned to the excavation (see closure report)

19. Were all samples cooled to a proper temperature when received by the lab? Yes XX No _____

20. Were all samples stored in proper sampling containers? Yes XX No _____

21. Were the sampling containers properly prepared prior to the samples being taken? Yes XX No _____

All results from the analyses of all samples must be submitted with this report. Attach the original or carbon copies of the laboratory report forms, photostatic copies will not be accepted. The facility's name and ID# must be provided to the laboratory and printed on each sheet.

I certify that I have examined and am familiar with the information in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and Official Title of
Owner or Owner's Authorized
Representative (Print) _____

Signature: _____

close/disk2

#4 week Ending 11-17-91

UNDERGROUND STORAGE TANKS REMOVAL, NAS MEMPHIS, SUBMITTALS LOGS ( )

	TANK #	GALLONS SPEC'D	ON-SITE CALCULATED	ACTUAL PUMPED	
1	TANK 302	420 GAL	6198 GAL		1
2	TANK 1250	160 GAL	929 GAL		2
3	TANK 1251	12,400 GAL	24,881 GAL		3
4	TANK 1252	2,000 GAL	24,804 GAL		4
5	TANK 1253	120 GAL	14,907 GAL		5
6	TANK 1254	100 GAL	929 GAL		6
7	TANK 1255	930 GAL	24,881 GAL		7
8	TANK 1256	1070 GAL	22,293 GAL		8
9	TANK 1257	2,250 GAL	5275 GAL		9
10	TANK 1258	2,300 GAL	5,275 GAL		10
11	TANK 1	570 GAL	502 GAL		11
12	TANK 2	580 GAL	513 GAL		12
13	TANK 3	570 GAL	561 GAL		13
14	TANK 4	560 GAL	525 GAL		14
15	TANK 5	560 GAL	-PLUGGED-		15
16	TANK 6	560 GAL	502 GAL		16
17	TANK 303				17
18	TANK 1241				18
19	TANK 7				19
20	TANK S-75N				20
21	TANK S-75W				21
22	TANK 1244				22
23	TANK 1245				23
24	TANK 1246				24
25	TANK 1565				25
26	TANK 1566				26
27	TANK 1618				27
28	TANK S-8				28
29	TANK 553				29
30	TANK S-50				30
31	TANK S-54				31
32	TANK S-56				32
33	TANK 1594				33
34	TANK 1205N	700 GL	632		34
35	TANK 1205S	1000 GL	52		35
36	TANK N-10	80	253		36
37	TANK N-100				37
38					38
39					39
40					40
41					41
42					42
43					43
44					44
45					45
46					46
47					47
48					48
49					49
50					50
51					51
52					52

Contract N62467-90-C-0683
Underground Storage Tank Closure Report
Tank no. 1250
(SD-84)

Naval Air Station Memphis
Millington, TN

National Salvage & Service Corp.
243 E. Winslow Road
Bloomington, IN 47401

April 27, 1992

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E. Chain of Custody Form and Analytical Results for Final Soil Samples.

F. Certifications and Manifests for Disposal of Tank 1250.

G. Certifications and Manifests for the Contents of Tank 1250.

1.0 Introduction

The purpose of this report is to provide documentation that the underground storage tank listed below at the Naval Air Station was properly removed and closed as required by the applicable Tennessee state regulations and the Navy's contract specifications. Permanent closure report forms are located in Appendix A.

Navy Tank No.: Tank 1250

Location: Adjacent to Building N-94
Description: 25,000 gal. steel tank
Contents: Water with petroleum sheen
Removal date: March 13, 1992

2.0 Description of Work Performed

Before work began on the tank, the fluid level was measured and tank volume was calculated. Tank 1250 was specified to contain 160 gallons of fluid. After measurement, the volume of tank contents were determined to be 929 gallons (Appendix B).

Prior to excavation, rainwater that had collected in the tank vaults and the tanks contents were pumped into trucks and disposed of as a hazardous waste liquid.

Excavation began to expose Tank 1250. After the tank was completely exposed a crane was used to lift the tank from the excavation.

Tank gasses were purged using 1.5 lbs. of dry ice (carbon dioxide) for every 100 gallons of tank volume. Tank gasses were checked with a combustible gas indicator (CGI). When no combustible gasses were detected a hole was cut in the tank with non-explosive pneumatic nibbler and the tank was cleaned. Sludge was removed from the tank using a Tornado drum vacuum and an aluminum squeegee and stored in drums. The tank was then labeled and taken to Hutcherson Recycling for disposal.

Because of the nature of the N-94 site, the State of Tennessee gave permission for the Navy to backfill all excavations in the N-94 area with contaminated soil until further investigations could be made. The excavated soil was therefore stockpiled at the excavation site and was not field checked with the HNU photoionization detector (PID).

Soil samples were taken from the excavation immediately after tank removal. The excavation was then backfilled using contaminated soil from the excavation, as directed by the Navy.

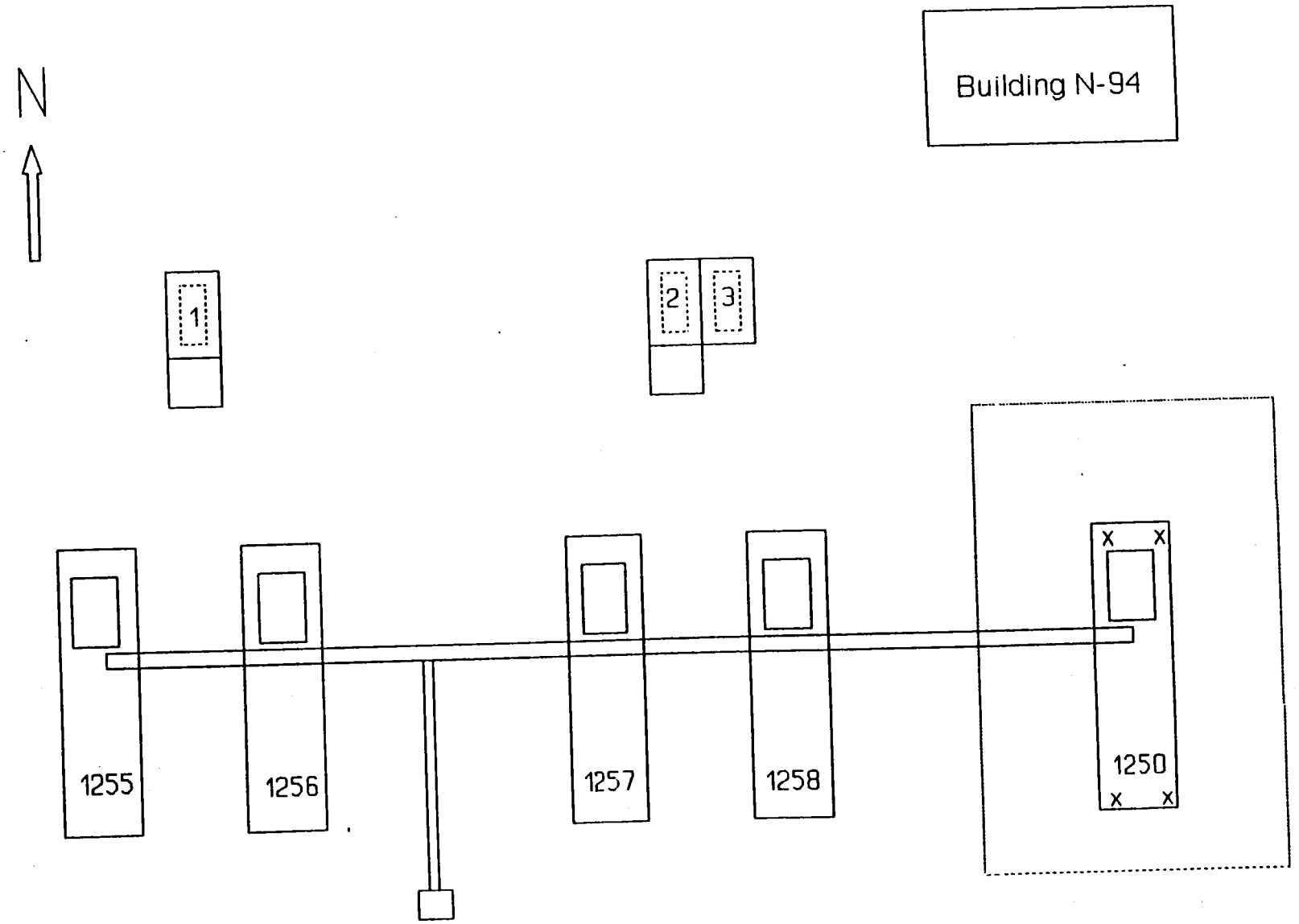
3.0 Sampling

Contaminated water from Tank 1250 was sampled using a stainless steel bomb sampler. Permission was granted for additional analysis so another sample of contaminated water was taken from Tank 1250.

Each sample consisted of one liter of liquid collected in an amber glass bottle with a teflon lined lid, plus one liter collected in the same way but with a nitric acid preservative supplied with the bottle from the laboratory, plus two clear glass vials for volatile organic analysis. Samples were collected using sterile gloves which were disposed of between samples. Bottles were labeled in the field and a chain of custody form was submitted with each shipment. Samples were shipped in coolers and iced to 4 degrees Celsius.

Because permission was given by the State to backfill the excavations with contaminated soil, the soil from the excavation was not sampled or field checked with the HNU photoionization detector (PID).

Soil samples from the excavation pit were collected the corners of the tank (4 samples). Samples were collected as grab samples from the excavator bucket and packed in clear glass jars with Teflon lined lids. The sample locations are identified on the following map.



X = Sample locations

* Not To Scale

4.0 Analytical Results

All samples were shipped to Specialized Assays Environmental in Nashville Tennessee, a Navy approved and certified laboratory. Samples were analyzed using approved EPA methods for soil and water. The initial sample from the tank was analyzed for total lead, TPH, and flashpoint. Additional analyses on the tank contents included TCLP analysis for metals, volatiles, semi-volatiles.

Final in-situ materials were analyzed for flashpoint, BTEX, TPH, volatile organic compounds, and TCLP analysis for metals, volatiles, and semi-volatiles. The results of the analysis are summarized in the following tables. Laboratory reports are included in Appendices C, D, and E respectively.

Tank Contents

Contaminated Water Tank 1250

Lo Boil Hydrocarbons	0.314
Hi Boil Hydrocarbons	<0.05
Flash Point	Sample heated to 160°F without flash or ignition
Lead	0.13

Analysis (PPM)	Tank 1250
Volatiles	
Acetone	<0.10
Acrylonitrile	<0.10
Bromoform	<0.10
Carbon Disulfide	<0.10
Carbon Tetrachloride	<0.10
Di-cl-di-f-methane	<0.10
Chlorobenzene	<0.10
Cl-di-br-methane	<0.10
Chloroethane	<0.10
2-Clethyvinyl Ether	<0.10
Chloroform	<0.10
Cyclohexanone	<0.10
Dichlorobenzenes	<0.10
Di-cl-br-methane	<0.10
1,1-Dichloroethane	<0.10
1,2-Dichloroethane	<0.10
1,1-Dichloroethylene	<0.10
1,2-Dichloroethylene	<0.10
1,2-Dichloropropane	<0.10
1,3-Dichloropropane	<0.10
Ethyl Acetate	<0.10
Ethylbenzene	<0.10
Ethyl Ether	<0.10
2-Ethoxyethanol	<1.0
Hexane	<0.10
Isobutanol	<5.0
Methyl Bromide	<0.10
Methyl Chloride	<0.10
2-Butanone (MEK)	<1.0
4-Methyl-2-Pentanone	<0.10
Methylene Chloride	<0.10
N-Butylalcohol	<5.0
Tri-cl-tri-f-ethane	<0.10
1,1,2,2-Tet-cl-ethane	<0.10
Tetrachloroethylene	<0.10
Toluene	0.12
1,1,1-Tri-cl-ethane	<0.10

Analysis (PPM)	Tank 1250
Volatiles	
1,1,2-Tri-cl-ethane	<0.10
Trichloroethylene	<0.10
Tri-cl-f-methane	<0.10
Xylene	0.27
Vinyl Chloride	<0.10
TCLP Metals	
Arsenic	<0.10
Barium	<1.0
Cadmium	<0.10
Chromium	<0.50

Analysis (PPM)	Tank 1250
Lead	<0.50
Mercury	<0.010
Selenium	<0.10
Silver	<0.10
TCLP Volatiles	
Benzene	<0.10
Carbon Tetrachloride	<0.10
Chlorobenzene	<0.10
Chloroform	<0.10
1,2-Dichloroethane	<0.10
1,1-Di-cl-ethylene	<0.10
2-Butanone (MEK)	<1.0
Tetrachloroethylene	<0.10
Trichloroethylene	<0.10
Vinyl Chloride	<0.10
TCLP semi-volatiles	
Pyridine	<0.10
O-Cresol	<0.10
M-Cresol	<0.10
P-Cresol	<0.10
1,4-Dichlorobenzene	<0.10
2,4-Dinitrotoluene	<0.10
Hexachlorobutadiene	<0.10
Hexachloroethane	<0.10
Nitrobenzene	<0.10
Pentachlorophenol	<0.10
2,4,5-Trichlorophenol	<0.10
2,4,6-Trichlorophenol	<0.10
Hexachlorobenzene	<0.10

Final In-situ Soils Samples

Analysis (PPM)	Tank 1250 Excavation NW	NE	SE	SW
BTEX Soil				
Benzene	<1	<1	<1	<1
Toluene	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1
Xylene	<1	<1	<1	<1
TPH				
Lo Boil HC	<5	<5	<5	<5
Hi Boil HC	<5	22.9	<5	<5
Volatiles				
Acetone	<0.05	<0.05	<0.05	<0.05
Acrylonitrile	ND*	ND	ND	ND
Bromoform	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Di-cl-di-f-methane	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Cl-di-br-methane	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
2-Clethyvinyl Ether	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
Cyclohexanone	ND	ND	ND	ND
Dichlorobenzenes	ND	ND	ND	ND
Di-cl-br-methane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND
Ethyl Acetate	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
Ethyl Ether	ND	ND	ND	ND
2-Ethoxyethanol	<1.0	<1.0	<1.0	<1.0
Hexane	ND	ND	ND	ND
Isobutanol	<5.0	<5.0	<5.0	<5.0
Methyl Bromide	ND	ND	ND	ND
Methyl Chloride	ND	ND	ND	ND
2-Butanone (MEK)	<0.05	<0.05	<0.05	<0.05
4-Methyl-2-Pentanone	<0.05	0.25	<0.05	<0.05
Methylene Chloride	ND	ND	ND	ND
N-Butylalcohol	<5.0	<5.0	<5.0	<5.0
Tri-cl-tri-f-ethane	ND	ND	ND	ND
1,1,2,2-Tet-cl-ethane	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND
Toluene	ND	ND	ND	ND
1,1,1-Tri-cl-ethane	ND	ND	ND	ND

Analysis (PPM)	Tank 1250 Excavation NW	NE	SE	SW
1,1,2-Tri-cl-ethane	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Tri-cl-f-methane	ND	ND	ND	ND
Xylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP Metals				
Arsenic	<0.10	<0.10	<0.10	<0.10
Barium	1.87	1.90	<1.0	2.75
Cadmium	<0.10	<0.10	<0.10	<0.10
Chromium	<0.50	<0.50	<0.50	<0.50
Lead	<0.50	<0.50	<0.50	<0.50
Mercury	<0.010	<0.010	<0.010	<0.010
Selenium	<0.10	<0.10	<0.10	<0.10
Silver	<0.10	<0.10	<0.10	<0.10
TCLP Volatiles				
Benzene	<0.10	<0.10	<0.10	<0.10
Carbon Tetrachloride	<0.10	<0.10	<0.10	<0.10
Chlorobenzene	<0.10	<0.10	<0.10	<0.10
Chloroform	<0.10	<0.10	<0.10	<0.10
1,2-Dichloroethane	<0.10	<0.10	<0.10	<0.10
1,1-Di-cl-ethylene	<0.10	<0.10	<0.10	<0.10
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	<0.10	<0.10	<0.10	<0.10
Trichloroethylene	<0.10	<0.10	<0.10	<0.10
Vinyl Chloride	<0.10	<0.10	<0.10	<0.10
TCLP semi-volatiles				
Pyridine	<0.10	<0.10	<0.10	<0.10
O-Cresol	<0.10	<0.10	<0.10	<0.10
M-Cresol	<0.10	<0.10	<0.10	<0.10
P-Cresol	<0.10	<0.10	<0.10	<0.10
1,4-Dichlorobenzene	<0.10	<0.10	<0.10	<0.10
2,4-Dinitrotoluene	<0.10	<0.10	<0.10	<0.10
Hexachlorobutadiene	<0.10	<0.10	<0.10	<0.10
Hexachloroethane	<0.10	<0.10	<0.10	<0.10
Nitrobenzene	<0.10	<0.10	<0.10	<0.10
Pentachlorophenol	<0.10	<0.10	<0.10	<0.10
2,4,5-Trichlorophenol	<0.10	<0.10	<0.10	<0.10
2,4,6-Trichlorophenol	<0.10	<0.10	<0.10	<0.10
Hexachlorobenzene	<0.10	<0.10	<0.10	<0.10

* ND = not detected or <0.01 PPM

5.0 Disposal of Materials

All soil removed from tank excavations at the N-94 site were placed back in the excavation pit as directed by the Navy. Certification and the disposal manifest for the Tank 1250 are included in Appendix F. Certifications and disposal manifests for the tank contents are included in Appendix G.

6.0 Warranties and Limitations

This report certifies that the storage tank was closed in accordance with federal and state regulations and Millington Naval Air Station's contract specifications. No certification is given that all environmental contaminants have been removed from the site because of the limitations of the type of representative sampling that was required and performed for this kind of work.

DIVISION OF UNDERGROUND STORAGE TANKS
PERMANENT CLOSURE REPORT FORM

Directions: Please address the following questions in detail. Attach extra sheets if necessary. This form must be completed and submitted with the laboratory report forms.

1. Facility ID#: Tank # 1250 (Unregistered)

2. Facility Name: Millington Naval Air Station, Building N-94

3. Did you notify this Divison one working day prior to taking the soil samples for the closure? Yes ____ NO XX

4. Was the tank atmosphere and the work zone regularly tested with a combustible gas indicator in accordance with Appendix 5 Part (3) of the UST regulations? Yes XX No ____

5. Describe how the tank(s) was purged: Purged with 1.5 lbs of dry ice (carbon dioxide) for every 100 gallons of tank volume.

6. Describe how all liquids and sludges were removed from the tank(s): liquids pumped with a pneumatic diaphram pump, sludge removed with a Tornado drum vac and aluminum squeegee.

7. Describe how all liquids and sludges were stored and disposed of: Liquid was taken by Laidlaw Environmental for disposal. Sludge stored in 17H DOT drums and will be disposed of with sludge from all N-94 tanks.

8. If the tank(s) was removed, was it labeled in accordance with Appendix 5 Part (4)(f) of the UST regulations? Yes XX No ____

9. How and where was the tank(s) disposed of? taken by Industrial Crane to Hutcherson Metals, Inc. for recycling.

10. Was bedrock encountered during tank abandonment/closure? Yes ____ No XX

11. Was water encountered in the tank pit during the tank abandonment activities? Yes XX No ____

12. If yes, was water sampled? Yes ____ No XX If yes, please attach the results.

13. Was obviously contaminated soil encountered during the tank abandonment (i.e. discolored soil, soil with a hydrocarbon odor, etc.)? Yes XX No _____

14. Did you excavate more than 10 feet from any edge of the tank(s)? Yes ____ No XX

15. If yes, who did you notify with this Division? _____
N/A

16. When did you make the notification? N/A

17. How much soil was removed during the tank abandonment procedure (cubic yards)? 600 CY

18. What was done with this soil after it was removed from the tank excavation? (Any soil removed from a tank pit excavation will be considered contaminated until proven otherwise through laboratory analyses.) All soil was stockpiled at the site and returned to the excavation (see closure report)

19. Were all samples cooled to a proper temperature when received by the lab? Yes XX No _____

20. Were all samples stored in proper sampling containers? Yes XX No _____

21. Were the sampling containers properly prepared prior to the samples being taken? Yes XX No _____

All results from the analyses of all samples must be submitted with this report. Attach the original or carbon copies of the laboratory report forms, photostatic copies will not be accepted. The facility's name and ID# must be provided to the laboratory and printed on each sheet.

I certify that I have examined and am familiar with the information in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and Official Title of
Owner or Owner's Authorized
Representative (Print) _____

Signature: _____

close/disk2

Week Ending 11-17-91

UNDERGROUND STORAGE TANKS REMOVAL, NAS MEMPHIS, SUBMITTALS LOGS ( )

	TANK #	GALLONS SPEC'D	ON-SITE CALCULATED	ACTUAL PUMPED	
1	TANK 302	420 GAL	6198 GAL		1
2	TANK 1250	160 GAL	929 GAL		2
3	TANK 1251	12,400 GAL	24,881 GAL		3
4	TANK 1252	2,000 GAL	24,804 GAL		4
5	TANK 1253	120 GAL	14,907 GAL		5
6	TANK 1254	100 GAL	929 GAL		6
7	TANK 1255	930 GAL	24,881 GAL		7
8	TANK 1256	1070 GAL	22,293 GAL		8
9	TANK 1257	2,250 GAL	5275 GAL		9
10	TANK 1258	2,300 GAL	5,275 GAL		10
11	TANK 1	570 GAL	502 GAL		11
12	TANK 2	580 GAL	513 GAL		12
13	TANK 3	570 GAL	561 GAL		13
14	TANK 4	560 GAL	525 GAL		14
15	TANK 5	560 GAL	-PLUGGED-		15
16	TANK 6	560 GAL	502 GAL		16
17	TANK 303				17
18	TANK 1241				18
19	TANK 7				19
20	TANK S-75N				20
21	TANK S-75W				21
22	TANK 1244				22
23	TANK 1245				23
24	TANK 1246				24
25	TANK 1565				25
26	TANK 1566				26
27	TANK 1618				27
28	TANK S-8				28
29	TANK 553				29
30	TANK S-50				30
31	TANK S-54				31
32	TANK S-56				32
33	TANK 1594				33
34	TANK 1205N	750 GL	632		34
35	TANK 1205S	1000 GL	52		35
36	TANK N-10	80	253		36
37	TANK N-100				37
38					38
39					39
40					40
41					41
42					42
43					43
44					44
45					45
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47					47
48					48
49					49
50					50
51					51
52					52

Contract N62467-90-C-0683
Underground Storage Tank Closure Report
Tank nos. 1251 and 1252
(SD-84)

Naval Air Station Memphis
Millington, TN

April 20, 1992

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1.0 Introduction

The purpose of this report is to provide documentation that the underground storage tank listed below at the Naval Air Station was properly removed and closed as required by the applicable Tennessee state regulations and the Navy's contract specifications. Permanent closure report forms are located in Appendix A.

Navy Tank No.: Tank System 1251 and 1252

Location: Adjacent to Building N-94
Description: 25,000 gal. steel tank
Contents: Water with petroleum sheen
Removal date: February 6, 1992

2.0 Description of Work Performed

Before work began on the tanks, the fluid levels were measured and tank volumes were calculated. Tanks 1251 and 1252 were specified to contain 12,400 and 2,000 gallons respectively. After measurement, tank contents were determined to be 24,881 and 24,804 gallons respectively (Appendix B).

Prior to excavation, rainwater that had collected in the tank vaults was pumped into trucks and disposed of as a hazardous waste liquid.

Excavation began to expose tank 1252 first. Water from the excavation for tanks 1253 and 1254 or from an unlocated water pipe partially filled the excavation. Tank 1252 then floated to the top of the water in the excavation. Workers pulled the tank to the side of the excavation and chained it down to prevent it from tipping over and filling with water. Excavation then began on tank 1251. The workers exposed one side of the tank and the banks caved in. The banks were cut back and excavation continued until the tank was exposed.

Because of the nature of the N-94 site the State of Tennessee gave permission for the Navy to backfill all excavations in the N-94 area with contaminated soil until further investigations could be made. The excavated soil was therefore stockpiled at the excavation site and was not field checked with the HNU photoionization detector (PID).

A 60 ton crane was hired to remove the tanks from the pit. Tank 1252 was removed and placed on plastic sheeting on the ground but the crane failed to extract tank 1251 from the pit. A 100 ton crane was then used to extract tank 1251. It was also placed on plastic sheeting on the ground.

The tank gasses were checked with a combustible gas indicator (CGI) and no combustible gasses were detected. A hole was cut in the tank with non-explosive pneumatic nibblers and the tank was cleaned. A small amount of scale was removed. There was no sludge found inside the tanks.

The tanks were then labeled and hauled to the laydown area. They remained there over a weekend and were then taken to Hutchinson Recycling.

Soil samples were taken from the excavation and, as directed by the Navy, backfill began using contaminated soil from the excavation. The backfill materials became to muddy so it became necessary to finish the excavation with no. 86 clay gravel.

3.0 Sampling

Contaminated water in Tank 1252 was sampled first. The sample was a composite collected from the bottom, middle, and top of the liquid using a stainless steel bomb sampler.

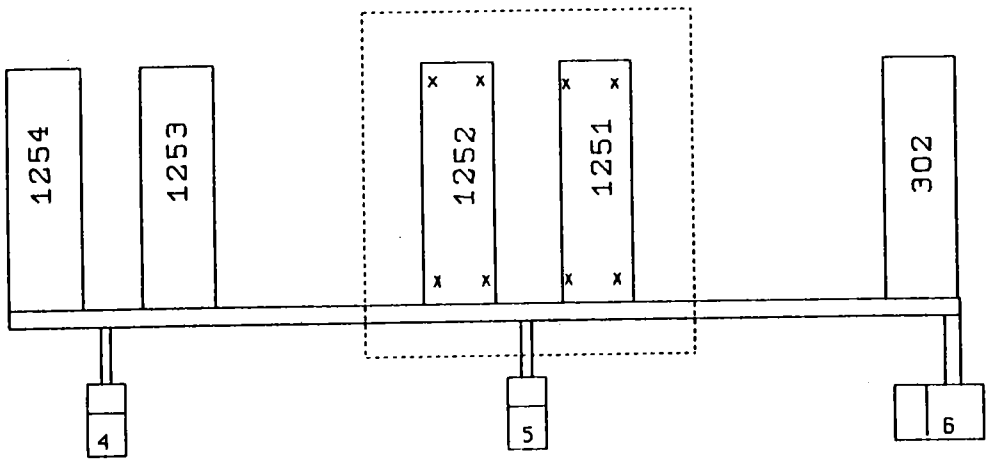
Permission was granted for additional analysis so samples were collected from all tanks including tanks 1251 and 1252.

Each sample consisted of one liter of liquid collected in an amber glass bottle with a teflon lined lid, plus one liter collected in the same way but with a nitric acid preservative supplied with the bottle from the laboratory, plus two clear glass vials for volatile organic analysis. Samples were collected using sterile gloves which were disposed of between samples. Bottles were labeled in the field and a chain of custody form was submitted with each shipment. Samples were shipped in coolers and iced to 4 degrees Celsius.

Because permission was given by the State to backfill the excavations with contaminated soil, the soil from the excavation was not sampled or field checked with the HNU photoionization detector (PID).

Soil samples from the excavation pit were collected from each corner of each tank (8 samples). Samples were collected collected as grab samples from the excavator bucket and packed in clear glass jars with Teflon lined lids. The sample locations are identified on the following map.

Building N-94



x = Final Sample Locations

*** Not to Scale**

4.0 Analytical Results

All samples were shipped to Specialized Assays Environmental in Nashville Tennessee, a Navy approved and certified laboratory. Samples were analyzed using approved EPA methods for soil and water. Water and tank contents were analyzed for flashpoint, BTEX, total lead, TPH, volatile organic compounds, TCLP metals, TCLP volatiles, and TCLP semi-volatiles. Stockpiled soils were analyzed for BTEX, TPH, as well as TCLP analysis for lead, benzene, and TPH. Final in-situ materials were analyzed for flashpoint, BTEX, TPH, volatile organic compounds, and TCLP analysis for TPH, metals, volatiles, and semi-volatiles. The results of the analysis are summarized in the following tables. Laboratory reports are included in Appendicies D, E, and F respectively.

Tank Contents

Analysis (PPM)	Tank 1252
Flashpoint *	>160
BTEX Water	
Benzene	0.237
Toluene	0.332
Ethylbenzene	3.44
Xylene	21.6
Total Lead	0.19
TPH	
Lo Boil HC	80.4
Hi Boil HC	<0.05

Analysis (PPM)	Tank 1251	Tank 1252
Volatiles		
Acetone	ND**	ND
Acrylonitrile	ND	ND
Bromoform	ND	ND
Carbon Disulfide	ND	ND
Carbon Tetrachloride	ND	ND
Di-cl-di-f-methane	ND	ND
Chlorobenzene	ND	ND
Cl-di-br-methane	ND	ND
Chloroethane	ND	ND
2-Clethyvinyl Ether	ND	ND
Chloroform	ND	ND
Cyclohexanone	ND	ND
Dichlorobenzenes	ND	ND
Di-cl-br-methane	ND	ND
1,1-Dichloroethane	ND	ND
1,2-Dichloroethane	ND	ND
1,1-Dichloroethylene	ND	ND
1,2-Dichloroethylene	ND	ND
1,2-Dichloropropane	ND	ND
1,3-Dichloropropane	ND	ND
Ethyl Acetate	ND	ND
Ethylbenzene	ND	ND
Ethyl Ether	ND	ND
2-Ethoxyethanol	<1.0	<1.0
Hexane	ND	ND
Isobutanol	<5.0	<5.0
Methyl Bromide	ND	ND
Methyl Chloride	ND	ND
2-Butanone (MEK)	<1.0	<1.0
4-Methyl-2-Pentanone	ND	ND
Methylene Chloride	ND	ND
N-Butylalcohol	<5.0	<5.0

Analysis (PPM)	Tank 1251	Tank 1252
Tri-cl-tri-f-ethane	ND**	ND
1,1,2,2-Tet-cl-ethane	ND	ND
Tetrachloroethylene	ND	ND
Toluene	ND	ND
1,1,1-Tri-cl-ethane	ND	ND
1,1,2-Tri-cl-ethane	ND	ND
Trichloroethylene	ND	ND
Tri-cl-f-methane	ND	ND
Xylene	ND	ND
Vinyl Chloride	ND	ND
TCLP Metals		
Arsenic	<0.10	<0.10
Barium	<1.0	<1.0
Cadmium	<0.10	<0.10
Chromium	<0.50	<0.50
Lead	<0.50	<0.50
Mercury	<0.010	<0.010
Selenium	<0.10	<0.10
Silver	<0.10	<0.10
TCLP Volatiles		
Benzene	ND	ND
Carbon Tetrachloride	ND	ND
Chlorobenzene	ND	ND
Chloroform	ND	ND
1,2-Dichloroethane	ND	ND
1,1-Di-cl-ethylene	ND	ND
2-Butanone (MEK)	<1.0	<1.0
Tetrachloroethylene	ND	ND
Trichloroethylene	ND	ND
Vinyl Chloride	ND	ND
TCLP semi-volatiles		
Pyridine	ND	ND
O-Cresol	ND	ND
M-Cresol	ND	ND
P-Cresol	ND	ND
1,4-Dichlorobenzene	ND	ND
2,4-Dinitrotoluene	ND	ND
Hexachlorobutadiene	ND	ND
Hexachloroethane	ND	ND
Nitrobenzene	ND	ND
Pentachlorophenol	ND	ND
2,4,5-Trichlorophenol	ND	ND
2,4,6-Trichlorophenol	ND	ND
Hexachlorobenzene	ND	ND

* sample heated to 160 degrees Fahrenheit without ignition
** ND = not detected or <0.10 PPM

Final In-situ Soils Samples

Analysis (PPM)	Tank 1251 Excavation NW	NE	SE	SW
Flashpoint *	>160	>160	>160	>160
BTEX Soil				
Benzene	ND	ND	ND	ND
Toluene	33.4	5.82	26.6	ND
Ethylbenzene	ND	ND	ND	ND
Xylene	ND	ND	ND	ND
TPH				
Lo Boil HC	257	42.4	14.2	<5.0
Hi Boil HC	2134	1654	4760	383
Volatiles				
Acetone	<1.0	<1.0	<1.0	<1.0
Acrylonitrile	ND**	ND	ND	ND
Bromoform	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Di-cl-di-f-methane	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Cl-di-br-methane	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
2-Clethyvinyl Ether	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
Cyclohexanone	ND	ND	ND	ND
Dichlorobenzenes	ND	ND	ND	ND
Di-cl-br-methane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND
Ethyl Acetate	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
Ethyl Ether	ND	ND	ND	ND
2-Ethoxyethanol	<1.0	<1.0	<1.0	<1.0
Hexane	ND	ND	ND	ND
Isobutanol	<5.0	<5.0	<5.0	<5.0
Methyl Bromide	ND	ND	ND	ND
Methyl Chloride	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	0.46	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND
N-Butylalcohol	<5.0	<5.0	<5.0	<5.0
Tri-cl-tri-f-ethane	ND	ND	ND	ND
1,1,2,2-Tet-cl-ethane	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND
Toluene	ND	ND	ND	ND

Analysis (PPM)	Tank 1251 Excavation NW	NE	SE	SW
1,1,1-Tri-cl-ethane	ND**	ND	ND	ND
1,1,2-Tri-cl-ethane	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Tri-cl-f-methane	ND	ND	ND	ND
Xylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP TPH				
Lo Boil HC	0.330	<0.100	<0.100	<0.100
Hi Boil HC	296	118	393	91
TCLP Metals				
Arsenic	<0.10	<0.10	<0.10	<0.10
Barium	1.48	1.58	1.35	1.69
Cadmium	<0.10	<0.10	<0.10	<0.10
Chromium	<0.50	<0.50	<0.50	<0.50
Lead	<0.50	<0.50	<0.50	<0.50
Mercury	<0.010	<0.010	<0.010	<0.010
Selenium	<0.10	<0.10	<0.10	<0.10
Silver	<0.10	<0.10	<0.10	<0.10
TCLP Volatiles				
Benzene	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Di-cl-ethylene	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP semi-volatiles				
Pyridine	ND	ND	ND	ND
O-Cresol	ND	ND	ND	ND
M-Cresol	ND	ND	ND	ND
P-Cresol	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND

* Sample heated to 160 degrees Fahrenheit without ignition
** ND = not detected or <0.10 PPM

Analysis (PPM)	Tank 1252 Excavation NW	NE	SE	SW
Flashpoint *	>160	>160	>160	>160
BTEX Soil				
Benzene	ND	ND	ND	ND
Toluene	19.1	13.2	2.91	ND
Ethylbenzene	ND	ND	ND	ND
Xylene	ND	ND	ND	ND
TPH				
Lo Boil HC	37.6	<5.0	<5.0	<5.0
Hi Boil HC	3240	2233	419	195
Volatiles				
Acetone	<1.0	<1.0	<1.0	<1.0
Acrylonitrile	ND**	ND	ND	ND
Bromoform	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Di-cl-di-f-methane	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Cl-di-br-methane	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
2-Clethyvinyl Ether	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
Cyclohexanone	ND	ND	ND	ND
Dichlorobenzenes	ND	ND	ND	ND
Di-cl-br-methane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND
Ethyl Acetate	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
Ethyl Ether	ND	ND	ND	ND
2-Ethoxyethanol	<1.0	<1.0	<1.0	<1.0
Hexane	ND	ND	ND	ND
Isobutanol	<5.0	<5.0	<5.0	<5.0
Methyl Bromide	ND	ND	ND	ND
Methyl Chloride	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND
N-Butylalcohol	<5.0	<5.0	<5.0	<5.0
Tri-cl-tri-f-ethane	ND	ND	ND	ND
1,1,2,2-Tet-cl-ethane	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND
Toluene	ND	ND	ND	ND
1,1,1-Tri-cl-ethane	ND	ND	ND	ND
1,1,2-Tri-cl-ethane	ND	ND	ND	ND

Analysis (PPM)	Tank 1252 Excavation NW	NE	SE	SW
Trichloroethylene	ND**	ND	ND	ND
Tri-cl-f-methane	ND	ND	ND	ND
Xylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP TPH				
Lo Boil HC	<0.100	<0.100	<0.100	<0.100
Hi Boil HC	363	348	184	77
TCLP Metals				
Arsenic	<0.10	<0.10	<0.10	<0.10
Barium	1.29	1.15	1.38	1.17
Cadmium	<0.10	<0.10	<0.10	<0.10
Chromium	<0.50	<0.50	<0.50	<0.50
Lead	<0.50	<0.50	<0.50	<0.50
Mercury	<0.010	<0.010	<0.010	<0.010
Selenium	<0.10	<0.10	<0.10	<0.10
Silver	<0.10	<0.10	<0.10	<0.10
TCLP Volatiles				
Benzene	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Di-cl-ethylene	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP semi-volatiles				
Pyridine	ND	ND	ND	ND
O-Cresol	ND	ND	ND	ND
M-Cresol	ND	ND	ND	ND
P-Cresol	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND

* Sample heated to 160 degrees Fahrenheit without ignition
** ND = not detected or <0.10 PPM

5.0 Disposal of Materials

All soil removed from tank excavations at the N-94 site were placed back in the excavation as directed by the Navy. Certifications and disposal manifests for the tanks 1251, and 1252 are included in Appendix F. Certifications and disposal manifests for the tank contents are included in Appendix G. Certifications and disposal manifests for rainwater from the tank vaults are included in Appendix H.

6.0 Warranties and Limitations

This report certifies that the storage tanks were closed in accordance with federal and state regulations and Millington Naval Air Station's contract specifications. No certification is given that all environmental contaminants have been removed from the site because of the limitations of the type of representative sampling that was required and performed for this kind of work.

DIVISION OF UNDERGROUND STORAGE TANKS
PERMANENT CLOSURE REPORT FORM

Directions: Please address the following questions in detail. Attach extra sheets if necessary. This form must be completed and submitted with the laboratory report forms.

1. Facility ID#: Tank #1251 (Unregistered)

2. Facility Name: Millington Naval Air Station, Building N-94

3. Did you notify this Divison one working day prior to taking the soil samples for the closure? Yes ____ NO X C.K.

4. Was the tank atmosphere and the work zone regularly tested with a combustible gas indicator in accordance with Appendix 5 Part (3) of the UST regulations? Yes XX No ____

5. Describe how the tank(s) was purged: Purged with 1.5 lbs of dry ice (carbon dioxide) for every 100 gallons of tank volume.

6. Describe how all liquids and sludges were removed from the tank(s): liquids pumped with a pneumatic diaphram pump, sludge removed with a Tornado drum vac and aluminum squeegee.

7. Describe how all liquids and sludges were stored and disposed of: Tank contents were pumped into a truck for disposal by Laidlaw Environmental. No sludge was found in the tank.

8. If the tank(s) was removed, was it labeled in accordance with Appendix 5 Part (4)(f) of the UST regulations?
Yes XX No ____

9. How and where was the tank(s) disposed of? taken by Industrial Crane to Hutcherson Metals, Inc. for recycling.

10. Was bedrock encountered during tank abandonment/closure?
Yes ____ No XX

11. Was water encountered in the tank pit during the tank abandonment activities? Yes XX No ____

12. If yes, was water sampled? Yes XX No _____ If yes, please attach the results.

13. Was obviously contaminated soil encountered during the tank abandonment (i.e. discolored soil, soil with a hydrocarbon odor, etc.)? Yes XX No _____

14. Did you excavate more than 10 feet from any edge of the tank(s)? Yes _____ No XX

15. If yes, who did you notify with this Division? _____
N/A

16. When did you make the notification? N/A

17. How much soil was removed during the tank abandonment procedure (cubic yards)? 600 C.Y.

18. What was done with this soil after it was removed from the tank excavation? (Any soil removed from a tank pit excavation will be considered contaminated until proven otherwise through laboratory analyses.) All soil was stockpiled at the site and returned to the excavation (see closure report)

19. Were all samples cooled to a proper temperature when received by the lab? Yes XX No _____

20. Were all samples stored in proper sampling containers? Yes XX No _____

21. Were the sampling containers properly prepared prior to the samples being taken? Yes XX No _____

All results from the analyses of all samples must be submitted with this report. Attach the original or carbon copies of the laboratory report forms, photostatic copies will not be accepted. The facility's name and ID# must be provided to the laboratory and printed on each sheet.

I certify that I have examined and am familiar with the information in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and Official Title of
Owner or Owner's Authorized
Representative (Print) _____

Signature: _____

close/disk2

DIVISION OF UNDERGROUND STORAGE TANKS
PERMANENT CLOSURE REPORT FORM

Directions: Please address the following questions in detail. Attach extra sheets if necessary. This form must be completed and submitted with the laboratory report forms.

1. Facility ID#: Tank #1252 (Unregistered)

2. Facility Name: Millington Naval Air Station, Building N-94

3. Did you notify this Divison one working day prior to taking the soil samples for the closure? Yes ___ NO X

4. Was the tank atmosphere and the work zone regularly tested with a combustible gas indicator in accordance with Appendix 5 Part (3) of the UST regulations? Yes XX No ___

5. Describe how the tank(s) was purged: Purged with 1.5 lbs of dry ice (carbon dioxide) for every 100 gallons of tank volume.

6. Describe how all liquids and sludges were removed from the tank(s): liquids pumped with a pneumatic diaphram pump, sludge removed with a Tornado drum vac and aluminum squeegee.

7. Describe how all liquids and sludges were stored and disposed of: Tank contents were pumped into a truck for disposal by Laidlaw Environmental. No sludge was found in the tank.

8. If the tank(s) was removed, was it labeled in accordance with Appendix 5 Part (4)(f) of the UST regulations?
Yes XX No ___

9. How and where was the tank(s) disposed of? taken by Industrial Crane to Hutcherson Metals, Inc. for recycling.

10. Was bedrock encountered during tank abandonment/closure?
Yes ___ No XX

11. Was water encountered in the tank pit during the tank abandonment activities? Yes XX No ___

12. If yes, was water sampled? Yes XX No ____ If yes, please attach the results.

13. Was obviously contaminated soil encountered during the tank abandonment (i.e. discolored soil, soil with a hydrocarbon odor, etc.)? Yes XX No ____

14. Did you excavate more than 10 feet from any edge of the tank(s)? Yes ____ No XX

15. If yes, who did you notify with this Division? ____
N/A

16. When did you make the notification? N/A

17. How much soil was removed during the tank abandonment procedure (cubic yards)? 100 CY

18. What was done with this soil after it was removed from the tank excavation? (Any soil removed from a tank pit excavation will be considered contaminated until proven otherwise through laboratory analyses.) All soil was stockpiled at the site and returned to the excavation (see closure report)

19. Were all samples cooled to a proper temperature when received by the lab? Yes YY No ____

20. Were all samples stored in proper sampling containers? Yes YY No ____

21. Were the sampling containers properly prepared prior to the samples being taken? Yes YY No ____

All results from the analyses of all samples must be submitted with this report. Attach the original or carbon copies of the laboratory report forms, photostatic copies will not be accepted. The facility's name and ID# must be provided to the laboratory and printed on each sheet.

I certify that I have examined and am familiar with the information in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and Official Title of
Owner or Owner's Authorized
Representative (Print) ____

Signature: ____

close/disk2

M [illegible] 11-17-91

UNDERGROUND STORAGE TANKS REMOVAL, NAS MEMPHIS, SUBMITTALS LOGS ( )

	TANK #	GALLONS SPEC'D	ON-SITE CALCULATED	ACTUAL PUMPED	
1	TANK 302	420 GAL	6198 GAL		1
2	TANK 1250	160 GAL	929 GAL		2
3	TANK 1251	12,400 GAL	24,881 GAL		3
4	TANK 1252	2,000 GAL	24,804 GAL		4
5	TANK 1253	120 GAL	14,907 GAL		5
6	TANK 1254	100 GAL	929 GAL		6
7	TANK 1255	930 GAL	24,881 GAL		7
8	TANK 1256	1070 GAL	22,293 GAL		8
9	TANK 1257	2,250 GAL	5,275 GAL		9
10	TANK 1258	2,300 GAL	5,275 GAL		10
11	TANK 1	570 GAL	502 GAL		11
12	TANK 2	580 GAL	513 GAL		12
13	TANK 3	570 GAL	561 GAL		13
14	TANK 4	560 GAL	525 GAL		14
15	TANK 5	560 GAL	-PLUGGED-		15
16	TANK 6	560 GAL	502 GAL		16
17	TANK 303				17
18	TANK 1241				18
19	TANK 7				19
20	TANK S-75N				20
21	TANK S-75W				21
22	TANK 1244				22
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Contract N62467-90-C-0683
Underground Storage Tank Closure Report
(SD-84)

Naval Air Station Memphis
Millington, Tn

March 10, 1992

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1.0 Introduction

The purpose of this report is to provide documentation that the underground storage tanks (UST) listed below at the Naval Air Station were properly removed and closed as required by the applicable Tennessee state regulations and the Navy's contract specifications.

Navy Tank No.: Tank System 1253 and 1254

Location: Adjacent to Building N-94
Description: 25,000 gal. steel tank
Contents: Water with petroleum sheen
Removal date: December 18, 1991

2.0 Description of Work Performed

Before work began at the N-94 site, tank fluids were measured and volumes calculated. As the tanks were opened, workers noticed a solvent-like odor. Samples were taken and additional testing was ordered.

Tanks 1253 and 1254 were specified to contain 120 and 100 gallons of water with a petroleum sheen. After measurement, the contents of tank 1253 were estimated to be 14,907 gallons, and tank 1254 was estimated at 929 gallons (Appendix A).

Prior to excavation, equipment was moved to the site and a construction fence was erected around the area. Rainwater that had collected in the tank vaults was pumped into frac tank R1. The water was sampled and analyzed prior to disposal. A diversion trench was dug around the N-94 site to prevent surface runoff from entering the excavation.

Excavation began to expose tank 1254 first but both tanks 1253 and 1254 were exposed during the initial excavation. Contaminated soil was found 8 to 12 inches below the surface. Excavated soil was checked with an HNU photoionization detector (PID). The soil was hauled to the laydown area and stockpiled on 10 mil polyethylene sheeting. All soil was segregated into potentially clean and contaminated stockpiles.

The tank liquids were pumped into frac tanks using a pneumatic diaphragm pump. The tank gasses were checked with a combustible gas indicator (CGI) and no combustible gasses were detected. Holes was cut in the tank with non-explosive pneumatic nibblers and the tanks were cleaned.

The tanks were lifted out of the excavation using a 60 ton crane. The tanks were labeled and placed on a flatbed to be removed for disposal.

Due to the extent of the contamination and the presence of

other contaminants at the tank farm, the State gave permission for the Navy to have the source of the contamination (UST) removed and backfill all excavations in the N-94 area with contaminated soil until further investigations could be made.

Soil samples were taken from the excavation and backfill began using contaminated soil from the excavation, as directed by the Navy.

0 Sampling

Contaminated tank water from the tanks was sampled first. The samples were composite samples collected from the bottom, middle, and top of the liquid using a stainless steel bomb sampler.

Soil was continually screened with an HNU photoionization detector (PID) with a 10.2 eV lamp. Every 20 to 40 yards of soil were checked during excavation. Samples were collected and submitted for analysis to confirm the PID results prior to screening the stockpiles. Finally, every bucket of stockpiled soils was checked with the PID to confirm the results.

A total of 8 samples of contaminated soil from the stockpile were sent for analysis during and after the screening process. A total of 6 samples of clean stockpiled soil were submitted for analysis plus one sample for Browning-Ferris landfills leachate analysis (lab report included in Appendix D).

Water samples were then taken for analysis prior to disposal for the excavation pit water, frac tanks 60 and 65 which contained the contents of tanks 1253 and 1254, as well as the rainwater in frac tank R1.

Each water sample consisted of one liter of liquid collected in an amber glass bottle with a teflon lined lid, plus one liter collected in the same way but with a nitric acid preservative supplied with the bottle from the laboratory, plus two clear glass vials for volatile organic analysis. Samples were collected using sterile gloves which were disposed of between samples. Samples were shipped in coolers and iced to 4 degrees Celsius.

Finally, soil samples from the excavation pit were collected from each corner of the tank. Sample locations are identified on the following map. Soils samples were packed in clear glass jars with Teflon lined lids supplied by the laboratory. All samples were labeled in the field and a chain of custody form submitted with each shipment.

Analytical Results

Field screened soils checked with the PID indicated initial concentrations of ionizable gasses at 1180, 1600, 197, and 270 PPM respectively. Results of further excavation and stockpile testing yielded the results shown in Appendix A.

Results of analysis of samples submitted to confirm field PID reading are presented in the following table and are included in Appendix B. The threshold value for contaminated soil was determined to be 200 PPM on the field instrument.

Sample no.	PID (PPM)	BTEX (PPM)				TPH (PPM)	
		Benz.	Tol.	E.benz.	Xyl.	Lo B.	Hi B.
1	388	ND*	3.0	ND	ND	505.0	<5.0
2	152	ND	ND	ND	ND	72.0	10.8
3	212	ND	1.3	ND	ND	89.0	7.1
4	98	ND	ND	ND	ND	<5.0	<5.0
5	94	ND	ND	ND	ND	16.8	<5.0
6	45.4	ND	ND	ND	ND	13.5	<5.0

* ND = not detected or <0.10 PPM

All samples were shipped to Specialized Assays Environmental in Nashville Tennessee, a Navy approved and certified laboratory. Samples were analyzed using approved EPA methods for soil and water. Water and tank contents were analyzed for flashpoint, BTEX, total lead, TPH, volatile organic compounds, TCLP metals, TCLP volatiles, and TCLP semi-volatiles. Stockpiled soils were analyzed for BTEX, TPH, as well as TCLP analysis for lead, benzene, and TPH. Final in-situ materials were analyzed for flashpoint, BTEX, TPH, volatile organic compounds, and TCLP analysis for TPH, metals, volatiles, and semi-volatiles. The results of the analysis are summarized in the following tables. Laboratory reports are included in Appendicies C, D, and E respectively.

Tank Contents

Analysis (PPM)	Tank 1253	Tank 1254
Flashpoint *	>160	>160
BTEX Water		
Benzene	0.735	0.634
Toluene	0.787	0.555
Ethylbenzene	4.20	2.07
Xylene	22.6	21.4
Total Lead	0.065	0.19
TPH		
Lo Boil HC	94.1	72.8
Hi Boil HC	<0.05	<0.05

Analysis (PPM)	Frac tank no. 60	65	R1	Excavation Pit Water
Volatiles				
Acetone	ND**	ND	ND	ND
Acrylonitrile	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Di-cl-di-f-methane	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Cl-di-br-methane	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
2-Clethyvinyl Ether	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
Cyclohexanone	ND	ND	ND	ND
Dichlorobenzenes	ND	ND	ND	ND
Di-cl-br-methane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND
Ethyl Acetate	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
Ethyl Ether	ND	ND	ND	ND
2-Ethoxyethanol	<1.0	<1.0	<1.0	<1.0
Hexane	ND	ND	ND	ND
Isobutanol	<5.0	<5.0	<5.0	<5.0
Methyl Bromide	ND	ND	ND	ND
Methyl Chloride	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND
N-Butylalcohol	<5.0	<5.0	<5.0	<5.0

Analysis (PPM)	Frac tank no. 60	65	R1	Excavation Pit Water
Tri-cl-tri-f-ethane	ND**	ND	ND	ND
1,1,2,2-Tet-cl-ethane	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND
Toluene	ND	ND	ND	ND
1,1,1-Tri-cl-ethane	ND	ND	ND	ND
1,1,2-Tri-cl-ethane	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Tri-cl-f-methane	ND	ND	ND	ND
Xylene	ND	ND	ND	1.9
Vinyl Chloride	ND	ND	ND	ND
TCLP Metals				
Arsenic	<0.10	<0.10	<0.10	<0.10
Barium	<1.0	<1.0	<1.0	<1.0
Cadmium	<0.10	<0.10	<0.10	<0.10
Chromium	<0.50	<0.50	<0.50	<0.50
Lead	<0.50	<0.50	<0.50	<0.50
Mercury	<0.010	<0.010	<0.010	<0.010
Selenium	<0.10	<0.10	<0.10	<0.10
Silver	<0.10	<0.10	<0.10	<0.10
TCLP Volatiles				
Benzene	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Di-cl-ethylene	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP semi-volatiles				
Pyridine	ND	ND	ND	ND
O-Cresol	ND	ND	ND	ND
M-Cresol	ND	ND	ND	ND
P-Cresol	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND

* sample heated to 160 degrees Fahrenheit without ignition
** ND = not detected or <0.10 PPM

Contaminated Stockpile Samples

Analysis	1	2	3	4	5	6	7	8
BTEX Soil								
Benzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	15.0	<1.0	21	<1.0	26.0	6.9	10.8	<1.0
Ethylbenz.	<1.0	<1.0	6.3	<1.0	<1.0	<1.0	<1.0	<1.0
Xylene	7.0	3.6	14	<1.0	2.1	<1.0	<1.0	<1.0
TPH								
Lo Boil HC	668.0	610	3056	146	3103	4403	557	<5.0
Hi Boil HC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
TCLP								
Lead	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzene	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lo Boil HC	0.691	1.17	2.87	0.262	0.352	0.497	0.330	<0.10
Hi Boil HC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Clean Stockpile Samples

Analysis	1	2	3	4	5	6
BTEX Soil						
Benzene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenz.	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Xylene	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TPH						
Lo Boil HC	<5.0	<5.0	<5.0	54.7	242	51.5
Hi Boil HC	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
TCLP						
Lead	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Benzene	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Lo Boil HC	<0.10	<0.10	<0.10	0.145	0.246	0.270
Hi Boil HC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

Final In-situ Soils Samples

Analysis (PPM)	Tank 1253 Excavation NW	NE	SE	SW
Flashpoint *	>160	>160	>160	>160
BTEX Soil				
Benzene	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	18.6	<1.0	51.4
Ethylbenzene	<1.0	4.3	<1.0	13.8
Xylene	<1.0	23.8	<1.0	17.0
TPH				
Lo Boil HC	<5.0	889	<5.0	2656
Hi Boil HC	22.6	12991	169	1500
Volatiles				
Acetone	<1.0	<1.0	<1.0	<1.0
Acrylonitrile	<1.0	<1.0	<1.0	<1.0
Bromoform	ND**	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Di-cl-di-f-methane	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Cl-di-br-methane	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
2-Clethyvinyl Ether	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
Cyclohexanone	ND	ND	ND	ND
Dichlorobenzenes	ND	ND	ND	ND
Di-cl-br-methane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND
Ethyl Acetate	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
Ethyl Ether	ND	ND	ND	ND
2-Ethoxyethanol	<1.0	<1.0	<1.0	<1.0
Hexane	ND	ND	ND	ND
Isobutanol	<5.0	<5.0	<5.0	<5.0
Methyl Bromide	ND	ND	ND	ND
Methyl Chloride	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND
N-Butylalcohol	<5.0	<5.0	<5.0	<5.0
Tri-cl-tri-f-ethane	ND	ND	ND	ND
1,1,2,2-Tet-cl-ethane	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND
Toluene	ND	0.12	ND	ND

Analysis (PPM)	Tank 1253 Excavation NW	NE	SE	SW
1,1,1-Tri-cl-ethane	ND**	ND	ND	ND
1,1,2-Tri-cl-ethane	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Tri-cl-f-methane	ND	ND	ND	ND
Xylene	ND	0.44	ND	1.9
Vinyl Chloride	ND	ND	ND	ND
TCLP TPH				
Lo Boil HC	<0.100	0.184	<0.100	0.472
Hi Boil HC	1.13	5.12	<0.100	2.10
TCLP Metals				
Arsenic	<0.10	<0.10	<0.10	<0.10
Barium	<1.0	<1.0	<1.0	1.14
Cadmium	<0.10	<0.10	<0.10	<0.10
Chromium	<0.50	<0.50	<0.50	<0.50
Lead	<0.50	<0.50	<0.50	<0.50
Mercury	<0.010	<0.010	<0.010	<0.010
Selenium	<0.10	<0.10	<0.10	<0.10
Silver	<0.10	<0.10	<0.10	<0.10
TCLP Volatiles				
Benzene	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Di-cl-ethylene	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP semi-volatiles				
Pyridine	ND	ND	ND	ND
O-Cresol	ND	ND	ND	ND
M-Cresol	ND	ND	ND	ND
P-Cresol	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND

* Sample heated to 160 degrees Fahrenheit without ignition
** ND = not detected or <0.10 PPM

Analysis (PPM)	Tank 1254 Excavation NW	NE	SE	SW
Flashpoint *	>160	>160	>160	>160
BTEX Soil				
Benzene	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	5.9	<1.0	22.6
Ethylbenzene	<1.0	<1.0	<1.0	3.5
Xylene	<1.0	5.5	<1.0	7.5
TPH				
Lo Boil HC	<5.0	682	<5.0	2607
Hi Boil HC	17.0	490	47.1	128
Volatiles				
Acetone	<1.0	<1.0	<1.0	<1.0
Acrylonitrile	<1.0	<1.0	<1.0	<1.0
Bromoform	ND**	ND	ND	ND
Carbon Disulfide	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Di-cl-di-f-methane	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Cl-di-br-methane	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND
2-Clethyvinyl Ether	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
Cyclohexanone	ND	ND	ND	ND
Dichlorobenzenes	ND	ND	ND	ND
Di-cl-br-methane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
1,3-Dichloropropane	ND	ND	ND	ND
Ethyl Acetate	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
Ethyl Ether	ND	ND	ND	ND
2-Ethoxyethanol	<1.0	<1.0	<1.0	<1.0
Hexane	ND	ND	ND	ND
Isobutanol	<5.0	<5.0	<5.0	<5.0
Methyl Bromide	ND	ND	ND	ND
Methyl Chloride	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
4-Methyl-2-Pentanone	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND
N-Butylalcohol	<5.0	<5.0	<5.0	<5.0
Tri-cl-tri-f-ethane	ND	ND	ND	ND
1,1,2,2-Tet-cl-ethane	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND
Toluene	ND	0.15	ND	ND
1,1,1-Tri-cl-ethane	ND	ND	ND	ND
1,1,2-Tri-cl-ethane	ND	ND	ND	ND

Analysis (PPM)	Tank 1254 Excavation NW	NE	SE	SW
Trichloroethylene	ND**	ND	ND	ND
Tri-cl-f-methane	ND	ND	ND	ND
Xylene	ND	0.68	ND	0.21
Vinyl Chloride	ND	ND	ND	ND
TCLP TPH				
Lo Boil HC	<0.100	0.112	<0.100	0.713
Hi Boil HC	<0.100	0.840	<0.100	<0.100
TCLP Metals				
Arsenic	<0.10	<0.10	<0.10	<0.10
Barium	<1.0	1.11	1.00	<1.0
Cadmium	<0.10	<0.10	<0.10	<0.10
Chromium	<0.50	<0.50	<0.50	<0.50
Lead	<0.50	<0.50	<0.50	<0.50
Mercury	<0.010	<0.010	<0.010	<0.010
Selenium	<0.10	<0.10	<0.10	<0.10
Silver	<0.10	<0.10	<0.10	<0.10
TCLP Volatiles				
Benzene	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Di-cl-ethylene	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP semi-volatiles				
Pyridine	ND	ND	ND	ND
O-Cresol	ND	ND	ND	ND
M-Cresol	ND	ND	ND	ND
P-Cresol	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND

* Sample heated to 160 degrees Fahrenheit without ignition
** ND = not detected or <0.10 PPM

0 Disposal of Materials

All soil removed from tank excavations at the N-94 site were placed back in the excavation as directed by the Navy. Disposal manifests for the tanks 1253, 1254, and N-10 are included in Appendix F. Disposal manifests for the contents of frac tanks 60, 65, and R1 plus tanks 1253 and 1254 are included in Appendix G.

6.0 Warranties and Limitations

This report certifies that the storage tank was closed in accordance with federal and state regulations and Millington Naval Air Station's contract specifications. No certification is given that all environmental contaminants have been removed from the site because of the limitations of the type of representative sampling that was required and performed for this kind of work.

DIVISION OF UNDERGROUND STORAGE TANKS
PERMANENT CLOSURE REPORT FORM

Directions: Please address the following questions in detail. Attach extra sheets if necessary. This form must be completed and submitted with the laboratory report forms.

1. **Facility ID#:** Tanks 1253 & 1254 (unregistered)

2. **Facility Name:** Millington Naval Air Station, Building N-94

3. Did you notify this Divison one working day prior to taking the soil samples for the closure? Yes X NO ____

4. Was the tank atmosphere and the work zone regularly tested with a combustible gas indicator in accordance with Appendix 5 Part (3) of the UST regulations? Yes X No ____

5. Describe how the tank(s) was purged: Purged with 15 lbs. of dry ice (carbon dioxide) for every 1,000 gallons of tank volume.

6. Describe how all liquids and sludges were removed from the tank(s): Liquids pumped with a pneumatic diaphram pump, sludge removed with a Tornado drum vac and aluminum squeegee.

7. Describe how all liquids and sludges were stored and disposed of: Liquid stored in a frac tank then taken by Laidlaw Envirornental for disposal. Sludge stored in 17H DOT drums and will be disposed of with sludge from all N-94 tanks.

8. If the tank(s) was removed, was it labeled in accordance with Appendix 5 Part (4)(f) of the UST regulations?
Yes X No ____

9. How and where was the tank(s) disposed of? Taken by Industrial Crane to Hutcherson Metals, Inc. for recycling.

10. Was bedrock encountered during tank abandonment/closure?
Yes ____ No X

11. Was water encountered in the tank pit during the tank abandonment activities? Yes X No ____

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12. If yes, was water sampled? Yes X No ____ If yes, please attach the results.

13. Was obviously contaminated soil encountered during the tank abandonment (i.e. discolored soil, soil with a hydrocarbon odor, etc.)? Yes X No ____

14. Did you excavate more than 10 feet from any edge of the tank(s)? Yes ____ No X

15. If yes, who did you notify with this Division? NA

16. When did you make the notification? NA

17. How much soil was removed during the tank abandonment procedure (cubic yards)? 840 (360 clean, 480 contaminated)

18. What was done with this soil after it was removed from the tank excavation? (Any soil removed from a tank pit excavation will be considered contaminated until proven otherwise through laboratory analyses.) All soil was stock piled in the laydown area, after analysis all soil was returned to the excavation (see closure report).

19. Were all samples cooled to a proper temperature when received by the lab? Yes X No ____

20. Were all samples stored in proper sampling containers? Yes X No ____

21. Were the sampling containers properly prepared prior to the samples being taken? Yes X No ____

All results from the analyses of all samples must be submitted with this report. Attach the original or carbon copies of the laboratory report forms, photostatic copies will not be accepted. The facility's name and ID# must be provided to the laboratory and printed on each sheet.

I certify that I have examined and am familiar with the information in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and Official Title of Owner or Owner's Authorized Representative (Print) P. M. MOTOLENICH, CDR, CEC, USN, PWO

Signature: P M Motolenich

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Contract N62467-90-C-0683
Underground Storage Tank Closure Report
Tank nos. 1255 and 1256
(SD-84)

Naval Air Station Memphis
Millington, TN

National Salvage & Service Corp.
243 E. Winslow Road
Bloomington, IN 47401

April 22, 1992

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G. Certifications and Manifests for the Contents of Tanks 1255 and 1256.

1.0 Introduction

The purpose of this report is to provide documentation that the underground storage tank listed below at the Naval Air Station was properly removed and closed as required by the applicable Tennessee state regulations and the Navy's contract specifications. Permanent closure report forms are located in Appendix A.

Navy Tank No.: Tank 1255

Location: Adjacent to Building N-94
Description: 25,000 gal. steel tank
Contents: Water with petroleum sheen
Removal date: February 27, 1992

Navy Tank No.: Tank 1256

Location: Adjacent to Building N-94
Description: 25,000 gal. steel tank
Contents: Water with petroleum sheen
Removal date: March 3, 1992

2.0 Description of Work Performed

Before work began on the tanks, the fluid levels were measured and tank volumes were calculated. Tanks 1255 and 1256 were specified to contain 930 and 1,070 gallons respectively. After measurement, the volume of tank contents were determined to be 24,881 and 22,293 gallons respectively (Appendix B). Prior to excavation the tank contents were pumped into trucks and disposed of as a hazardous waste liquid.

Excavation began to expose Tank 1255 first, then Tank 1256. After the tanks were completely exposed a 60 ton crane was hired but failed to extract the tanks. A larger crane was used to lift the tanks from the excavation.

Tank gasses were purged using 1.5 lbs. of dry ice (carbon dioxide) for every 100 gallons of tank volume. The tank gasses were checked with a combustible gas indicator (CGI). When no combustible gasses were detected a hole was cut in the tank with non-explosive pneumatic nibblers and the tank was cleaned. Sludge was removed from the tank and stored in drums using a Tornado drum vacuum and an aluminum squeegee. The tanks were then labeled and taken to Hutcherson Recycling for disposal.

Because of the nature of the N-94 site, the State of Tennessee gave permission for the Navy to backfill all excavations in the N-94 area with contaminated soil until further investigations could be made. The excavated soil was therefore stockpiled at the excavation site and was not field checked with the HNU photoionization detector (PID).

Soil samples were taken from the excavations immediately after tank removal. The excavations were then backfilled using contaminated soil from the excavation, as directed by the Navy.

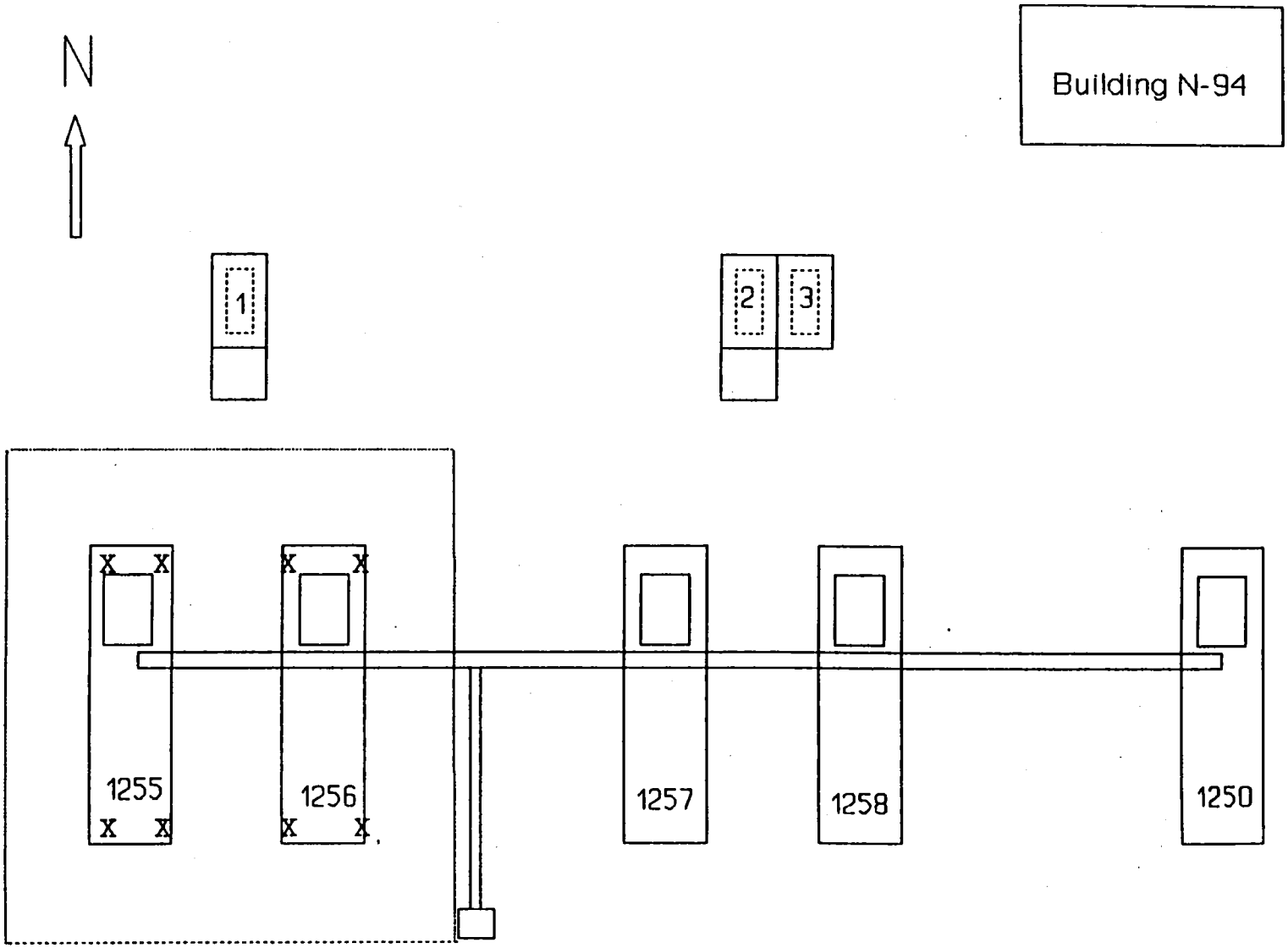
3.0 Sampling

Contaminated water from Tanks 1255, 1256, and 1257 were sampled first. The sample was a composite collected from the tanks using a stainless steel bomb sampler. Permission was granted for additional analysis so samples were collected from the oil and water phases from tanks 1255 and 1256.

Each sample consisted of one liter of liquid collected in an amber glass bottle with a teflon lined lid, plus one liter collected in the same way but with a nitric acid preservative supplied with the bottle from the laboratory, plus two clear glass vials for volatile organic analysis. Samples were collected using sterile gloves which were disposed of between samples. Bottles were labeled in the field and a chain of custody form was submitted with each shipment. Samples were shipped in coolers and iced to 4 degrees Celsius.

Because permission was given by the State to backfill the excavations with contaminated soil, the soil from the excavation was not sampled or field checked with the HNU photoionization detector (PID).

Soil samples from the excavation pit were collected from the corners of each tank (8 samples). Samples were collected as grab samples from the excavator bucket and packed in clear glass jars with Teflon lined lids. The sample locations are identified on the following map.



X = Sample locations

* Not To Scale

4.0 Analytical Results

All samples were shipped to Specialized Assays Environmental in Nashville Tennessee, a Navy approved and certified laboratory. Samples were analyzed using approved EPA methods for soil and water. The initial solvent scan on the tank contents analyzed for total lead, PCBs, BTU, flashpoint, volatile and semi-volatile organic compounds, and reactive compounds.

Additional analyses on the oil and water phases in the tanks included flashpoint, volatile organic compounds, total lead, and BTU for the oil phase. TCLP analysis run on the samples included metals, volatiles, semi-volatiles.

Final in-situ materials were analyzed for flashpoint, BTEX, TPH, volatile organic compounds, and TCLP analysis for metals, volatiles, and semi-volatiles. The results of the analysis are summarized in the following tables. Laboratory reports are included in Appendices C, D, and E respectively.

Tank Contents - Oil Layer/Composite 1255-1256-1257

Analysis (PPM)	
Lead	342
PCB's	<2.0
BTU's	19000
Flash Point	<70^0 F
Reactivity Test	
Reactive Cyanide	<2.0
Reactive Sulfide	<2.0
Volatiles	
Acetone	<1.0
Acylonitrile	<1.0
Bromoform	<1.0
Carbon Disulfide	<1.0
Carbon Tetrachloride	<1.0
Di-cl-di-f-methane	<1.0
Chlorobenzene	<1.0
Cl-di-br-methane	<1.0
Chloroethane	<1.0
2-Clethyvinyl Ether	<1.0
Chloroform	<1.0
Cyclohexanone	<1.0
Dichlorobenzene	<1.0
Di-cl-br-methane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<1.0
1,1-Dichloroethylene	<1.0
1,2-Dichloroethylene	<1.0
1,2-Dichloropropane	<1.0
1,3-Dichloropropane	<1.0
Ethyl Acetate	<1.0
Ethylbenzene	1100
Ethyl Ether	<1.0
2-Ethoxyethanol	<1.0
Hexane	<1.0
Isobutanol	<50.0
Methyl Bromide	<1.0
Methyl Chloride	<1.0
2-Butanone (MEK)	<1.0
4-Methyl-2-Pentanone	3400
Methylene Chloride	<1.0
N-Butylalcohol	<100
Tri-cl-tri-f-ethane	<1.0
1,1,2,2-Tet-cl-ethane	<1.0
Tetrachloroethylene	<1.0
Toluene	5500
1,1,1-Tri-cl-ethane	<1.0
1,1,2-Tri-cl-ethane	<1.0
Trichloroethylene	<1.0

Analysis (PPM)	
Tri-cl-f-methane	<1.0
Xylene	11000
Vinyl Chloride	<1.0
Acid Organics	
2-Chlorophenol	<500
2,4 Dichlorophenol	<500
2,4 Dimethylphenol	<500
2,4 Dinitrophenol	<500
2-Nitrophenol	<500
4-Nitrophenol	<500
P-chloro-m-cresol	<500
Pentachlorophenol	<500
Phenol	<500
2,4,6-Tri cl phenol	<500
Base Neutrals	
Acenapthene	<500
Acenapthtylene	<500
Anthracene	<500
Benzidine	<500
Benzo(a)anthracene	<500
Benzo(a)pyrene	<500
Benzo(b)fluoranthene	<500
Benzo(ghi)perylene	<500
Benzo(k)fluoranthene	<500
Bis-2-cl-ethox-metha	<500
Bis(2-cl-ethyl)ether	<500
Bis(2-cl-isopro)ether	<500
Bis(2-eth-hex)phthal	<500
4-Br-phen-phen-ether	<500
Butyl-benz-pthalate	<500
2-Chloronapthalene	<500
4-Cl-phen-phen-ether	<500
Chrysene	<500
Dibenz(a,h)anthracen	<500
1,2-Dichlorobenzene	<500
1,3-Dichlorobenzene	<500
1,4-Dichlorobenzene	<500
3,3-Dichlorobenzidine	<500
Diethyl Phthalate	<500
Dimethyl Phthalate	<500
Benzo(e)pyrene	<500
Di-n-butyl Phthalate	<500
2,4-Dinitrotoluene	<500
2,6-Dinitrotoluene	<500
Di-n-octyl phthalate	<500
1,2-Diphen-hydrazine	<500
Fluoranthene	<500
Fluorene	<500

Analysis (PPM)	
Hexachlorobenzene	<500
Hexachlorobutadiene	<500
Hexclcyclopentadiene	<500
Hexachloroethane	<500
Indeno (1,2,3-cd)pyr	<500
Isophorone	<500
Naphthalene	760
Nitrobenzene	<500
N-nit-deimethylamine	<500
N-nit-dinpropylamine	<500
N-nit-diphenylamine	<500
Phenanthrene	<500
1,2,4-Trichlorobenz	<500

Tank Contents - Oil Phase

Analysis (PPM)	Tank 1255	Tank 1256
Flash Point	Room Temp	Room Temp
Volatiles		
Acetone	<1.0	<100
Acylonitrile	<1.0	<100
Bromoform	<1.0	<100
Carbon Disulfide	<1.0	<100
Carbon Tetrachloride	<1.0	<100
Di-cl-di-f-methane	<1.0	<100
Chlorobenzene	<1.0	<100
Cl-di-br-methane	<1.0	<100
Chloroethane	<1.0	<100
2-Clethyvinyl Ether	<1.0	<100
Chloroform	<1.0	<100
Cyclohexanone	<1.0	<100
Dichlorobenzene	<1.0	<100
Di-cl-br-methane	<1.0	<100
1,1-Dichloroethane	<1.0	<100
1,2-Dichloroethane	<1.0	<100
1,1-Dichloroethylene	<1.0	<100
1,2-Dichloroethylene	<1.0	<100
1,2-Dichloropropane	<1.0	<100
1,3-Dichloropropane	<1.0	<100
Ethyl Acetate	<1.0	<100
Ethylbenzene	<1.0	<100
Ethyl Ether	<1.0	<100
2-Ethoxyethanol	<1.0	<100
Hexane	<1.0	<100
Isobutanol	<5.0	<10
Methyl Bromide	<1.0	<100
Methyl Chloride	<1.0	<100
2-Butanone (MEK)	<1.0	<100
4-Methyl-2-Pentanone	<1.0	<100
Methylene Chloride	<1.0	<100
N-Butylalcohol	8.8	<10
Tri-cl-tri-f-ethane	<1.0	<100
1,1,2,2-Tet-cl-ethane	<1.0	<100
Tetrachloroethylene	<1.0	<100
Toluene	<1.0	<100
1,1,1-Tri-cl-ethane	<1.0	<100
1,1,2-Tri-cl-ethane	<1.0	<100
Trichloroethylene	<1.0	<100
Tri-cl-f-methane	<1.0	<100
Xylene	13	11000
Vinyl Chloride	<1.0	<100
BTU's /lb	19,830	19,340
Lead	43	44

* ND = not detected or <0.10 PPM

Tank Contents - Water Phase

Analysis (PPM)	Tank 1255	Tank 1256
Flash Point	Room Temperature	100° F
Volatiles		
Acetone	<1.0	<1.0
Acylonitrile	<1.0	<1.0
Bromoform	<1.0	<1.0
Carbon Disulfide	<1.0	<1.0
Carbon Tetrachloride	<1.0	<1.0
Di-cl-di-f-methane	<1.0	<1.0
Chlorobenzene	<1.0	<1.0
Cl-di-br-methane	<1.0	<1.0
Chloroethane	<1.0	<1.0
2-Clethyvinyl Ether	<1.0	<1.0
Chloroform	<1.0	<1.0
Cyclohexanone	<1.0	<1.0
Dichlorobenzene	<1.0	<1.0
Di-cl-br-methane	<1.0	<1.0
1,1-Dichloroethane	<1.0	<1.0
1,2-Dichloroethane	<1.0	<1.0
1,1-Dichloroethylene	<1.0	<1.0
1,2-Dichloroethylene	<1.0	<1.0
1,2-Dichloropropane	<1.0	<1.0
1,3-Dichloropropane	<1.0	<1.0
Ethyl Acetate	<1.0	<1.0
Ethylbenzene	1.6	2.1
Ethyl Ether	<1.0	<1.0
2-Ethoxyethanol	<1.0	<1.0
Hexane	<1.0	<1.0
Isobutanol	<5.0	<5.0
Methyl Bromide	<1.0	<1.0
Methyl Chloride	<1.0	<1.0
2-Butanone (MEK)	<1.0	<1.0
4-Methyl-2-Pentanone	<1.0	<1.0
Methylene Chloride	<1.0	<1.0
N-Butylalcohol	<5.0	<5.0
Tri-cl-tri-f-ethane	<1.0	<1.0
1,1,2,2-Tet-cl-ethane	<1.0	<1.0
Tetrachloroethylene	<1.0	<1.0
Toluene	11	9.9
1,1,1-Tri-cl-ethane	<1.0	<1.0
1,1,2-Tri-cl-ethane	<1.0	<1.0
Trichloroethylene	<1.0	<1.0
Tri-cl-f-methane	<1.0	<1.0
Xylene	23	27
Vinyl Chloride	<1.0	<1.0
Lead	0.28	0.09

* ND = not detected or <0.10 PPM

Tank Contents

Analysis (PPM)	Tank 1255	Tank 1256
Volatiles		
Acetone	ND*	ND
Acrylonitrile	ND	ND
Bromoform	ND	ND
Carbon Disulfide	ND	ND
Carbon Tetrachloride	ND	ND
Di-cl-di-f-methane	ND	ND
Chlorobenzene	ND	ND
Chlorodibrmethane	ND	ND
Chloroethane	ND	ND
2-Clethyvinyl Ether	ND	ND
Chloroform	ND	ND
Cyclohexanone	ND	ND
Dichlorobenzene	ND	ND
Di-cl-br-methane	ND	ND
1,1-Dichloroethane	ND	ND
1,2-Dichloroethane	ND	ND
1,1-Dichloroethylene	ND	ND
1,2-Dichloroethylene	ND	ND
1,2-Dichloropropane	ND	ND
1,3-Dichloropropane	ND	ND
Ethyl Acetate	ND	ND
Ethylbenzene	5.0	ND
Ethyl Ether	ND	ND
2-Ethoxyethanol	<1.0	<1.0
Hexane	ND	ND
Isobutanol	<5.0	<5.0
Methyl Bromide	ND	ND
Methyl Chloride	ND	ND
2-Butanone (MEK)	<1.0	<1.0
4-Methyl-2-Pentanone	ND	ND
Methylene Chloride	ND	ND
N-Butylalcohol	<5.0	<5.0
Tri-cl-tri-f-ethane	ND	ND
1,1,2,2-Tet-cl-ethane	ND	ND
Tetrachloroethylene	ND	ND
Toluene	12	ND
1,1,1-Tri-cl-ethane	ND	ND
1,1,2-Tri-cl-ethane	ND	ND
Trichloroethylene	ND	ND
Tri-cl-f-methane	ND	ND
Xylene	63	ND
Vinyl Chloride	ND	ND

TCLP Metals	Tank 1255	Tank 1256
Arsenic	ND	ND
Barium	<1.0	<1.0
Cadmium	ND	ND
Chromium	<0.5	<0.50
Lead	0.92	<0.50
Mercury	<0.01	<0.01
Selenium	ND	ND
Silver	ND	ND
TCLP Volatiles		
Benzene	ND	0.44
Carbon Tetrachloride	ND	ND
Chlorobenzene	ND	ND
Chloroform	ND	ND
1,2-Dichloroethane	ND	ND
1,1-Di-cl-ethylene	ND	ND
2-Butanone (MEK)	<1.0	<1.0
Tetrachloroethylene	ND	ND
Trichloroethylene	ND	ND
Vinyl Chloride	ND	ND
TCLP semi-volatiles		
Pyridine	<2.0	ND
O-Cresol	<2.0	ND
M-Cresol	<2.0	ND
P-Cresol	<2.0	ND
1,4-Dichlorobenzene	<2.0	ND
2,4-Dinitrotoluene	<2.0	ND
Hexachlorobutadiene	<2.0	ND
Hexachloroethane	<2.0	ND
Nitrobenzene	<2.0	ND
Pentachlorophenol	<2.0	ND
2,4,5-Trichlorophenol	<2.0	ND
2,4,6-Trichlorophenol	<2.0	ND
Hexachlorobenzene	<2.0	ND

* ND = not detected or <0.10 PPM

Final In-situ Soils Samples

Analysis (PPM)	Tank 1255 Excavation NW	NE	SE	SW
BTEX Soil				
Benzene	<1	<1	<1	<1
Toluene	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1
Xylene	<1	<1	<1	<1
TPH				
Lo Boil HC	<5.0	<5.0	<5.0	<5.0
Hi Boil HC	19.7	230	<5.0	<5.0
Volatiles				
Acetone	<0.10	<0.10	<0.11	<0.10
Acrylonitrile	<0.01	<0.01	<0.01	<0.01
Bromoform	<0.01	<0.01	<0.01	<0.01
Carbon Disulfide	<0.01	<0.01	<0.01	<0.01
Carbon Tetrachloride	<0.01	<0.01	<0.01	<0.01
Di-cl-di-f-methane	<0.01	<0.01	<0.01	<0.01
Chlorobenzene	<0.01	<0.01	<0.01	<0.01
Cl-di-br-methane	<0.01	<0.01	<0.01	<0.01
Chloroethane	<0.01	<0.01	<0.01	<0.01
2-Clethyvinyl Ether	<0.01	<0.01	<0.01	<0.01
Chloroform	<0.01	<0.01	<0.01	<0.01
Cyclohexanone	<0.01	<0.01	<0.01	<0.01
Dichlorobenzene	<0.01	<0.01	<0.01	<0.01
Di-cl-br-methane	<0.01	<0.01	<0.01	<0.01
1,1-Dichloroethane	<0.01	<0.01	<0.01	<0.01
1,2-Dichloroethane	<0.01	<0.01	<0.01	<0.01
1,1-Dichloroethylene	<0.01	<0.01	<0.01	<0.01
1,2-Dichloroethylene	<0.01	<0.01	<0.01	<0.01
1,2-Dichloropropane	<0.01	<0.01	<0.01	<0.01
1,3-Dichloropropane	<0.01	<0.01	<0.01	<0.01
Ethyl Acetate	<0.01	<0 01	<0.01	<0.01
Ethylbenzene	<0.01	<0.01	<0.01	<0.01
Ethyl Ether	<0.01	<0.01	<0.01	<0.01
2-Ethoxyethanol	ND	ND	ND	ND
Hexane	<0.01	<0.01	<0.01	<0.01
Isobutanol	<5.0	<5.0	<5.0	<5.0
Methyl Bromide	<0.01	<0.01	<0.01	<0.01
Methyl Chloride	<0.01	<0.01	<0.01	<0.01
2-Butanone (MEK)	ND	0.20	0.22	0.22
4-Methyl-2-Pentanone	<0.01	0.12	<0.01	<0.01
Methylene Chloride	<0.01	<0.01	<0.01	<0.01
N-Butylalcohol	<5.0	<5.0	<5.0	<5.0
Tri-cl-tri-f-ethane	<0.01	<0.01	<0.01	<0.01
1,1,2,2-Tet-cl-ethane	<0.01	<0.01	<0.01	<0.01
Tetrachloroethylene	<0.01	<0.01	<0.01	<0.01
Toluene	<0.01	<0.01	<0.01	<0.01

Analysis (PPM)	Tank 1255 Excavation NW	NE	SE	SW
1,1,1-Tri-cl-ethane	<0.01	<0.01	<0.01	<0.01
1,1,2-Tri-cl-ethane	<0.01	<0.01	<0.01	<0.01
Trichloroethylene	<0.01	<0.01	<0.01	<0.01
Tri-cl-f-methane	<0.01	<0.01	<0.01	<0.01
Xylene	<0.01	<0.01	<0.01	<0.01
Vinyl Chloride	<0.01	<0.01	<0.01	<0.01
TCLP Metals				
Arsenic	ND	ND	ND	ND
Barium	1.36	1.14	1.07	<1.0
Cadmium	ND	ND	ND	ND
Chromium	<0.50	<0.50	<0.50	<0.50
Lead	<0.50	<0.50	<0.50	<0.50
Mercury	<0.01	<0.01	<0.01	<0.01
Selenium	ND	ND	ND	ND
Silver	ND	ND	ND	ND
TCLP Volatiles				
Benzene	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Di-cl-ethylene	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP semi-volatiles				
Pyridine	ND	ND	ND	ND
O-Cresol	ND	ND	ND	ND
M-Cresol	ND	ND	ND	ND
P-Cresol	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND

* ND = not detected or <0.10 PPM

Analysis (PPM)	Tank 1256 Excavation NW	NE	SE	SW
BTEX Soil				
Benzene	<1	<1	<1	<1
Toluene	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1
Xylene	<1	<1	<1	<1
TPH				
Lo Boil HC	2500	<5.0	<5.0	285
Hi Boil HC	<5.0	<5.0	<5.0	<5.0
Volatiles				
Acetone	<1.3	<1.3	<1.3	<1.3
Acrylonitrile	<0.63	<0.63	<0.63	<0.63
Bromoform	<0.63	<0.63	<0.63	<0.63
Carbon Disulfide	<0.63	<0.63	<0.63	<0.63
Carbon Tetrachloride	<0.63	<0.63	<0.63	<0.63
Di-cl-di-f-methane	<0.63	<0.63	<0.63	<0.63
Chlorobenzene	<0.63	<0.63	<0.63	<0.63
Cl-di-br-methane	<0.63	<0.63	<0.63	<0.63
Chloroethane	<0.63	<0.63	<0.63	<0.63
2-Clethyvinyl Ether	<0.63	<0.63	<0.63	<0.63
Chloroform	<0.63	<0.63	<0.63	<0.63
Cyclohexanone	<0.63	<0.63	<0.63	<0.63
Dichlorobenzene	<0.63	<0.63	<0.63	<0.63
Di-cl-br-methane	<0.63	<0.63	<0.63	<0.63
1,1-Dichloroethane	<0.63	<0.63	<0.63	<0.63
1,2-Dichloroethane	<0.63	<0.63	<0.63	<0.63
1,1-Dichloroethylene	<0.63	<0.63	<0.63	<0.63
1,2-Dichloroethylene	<0.63	<0.63	<0.63	<0.63
1,2-Dichloropropane	<0.63	<0.63	<0.63	<0.63
1,3-Dichloropropane	<0.63	<0.63	<0.63	<0.63
Ethyl Acetate	<0.63	<0.63	<0.63	<0.63
Ethylbenzene	<0.63	<0.63	<0.63	<0.63
Ethyl Ether	<0.63	<0.63	<0.63	<0.63
2-Ethoxyethanol	<1.3	<1.3	<1.3	<1.3
Hexane	<0.63	<0.63	<0.63	<0.63
Isobutanol	<5.0	<5.0	<5.0	<5.0
Methyl Bromide	<0.63	<0.63	<0.63	<0.63
Methyl Chloride	<0.63	<0.63	<0.63	<0.63
2-Butanone (MEK)	<1.3	<1.3	<1.3	<3.6
4-Methyl-2-Pentanone	3.1	8.8	<0.63	<0.63
Methylene Chloride	<0.63	<0.63	<0.63	<0.63
N-Butylalcohol	<5.0	<5.0	<5.0	<5.0
Tri-cl-tri-f-ethane	<0.63	<0.63	<0.63	<0.63
1,1,2,2-Tet-cl-ethane	<0.63	<0.63	<0.63	<0.63
Tetrachloroethylene	<0.63	<0.63	<0.63	<0.63
Toluene	<0.63	<0.63	<0.63	<0.63
1,1,1-Tri-cl-ethane	<0.63	<0.63	<0.63	<0.63
1,1,2-Tri-cl-ethane	<0.63	<0.63	<0.63	<0.63

Analysis (PPM)	Tank 1256 Excavation NW	NE	SE	SW
Trichloroethylene	<0.63	<0.63	<0.63	<0.63
Tri-cl-f-methane	<0.63	<0.63	<0.63	<0.63
Xylene	<0.63	<0.63	<0.63	<0.63
Vinyl Chloride	<0.63	<0.63	<0.63	<0.63
TCLP Metals				
Arsenic	ND*	ND	ND	ND
Barium	1.46	1.57	1.47	1.45
Cadmium	ND	ND	ND	ND
Chromium	<0.50	<0.50	<0.50	<0.50
Lead	<0.50	<0.50	<0.50	<0.50
Mercury	<0.01	<0.01	<0.01	<0.01
Selenium	ND	ND	ND	ND
Silver	ND	ND	ND	ND
TCLP Volatiles				
Benzene	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Di-cl-ethylene	ND	ND	ND	ND
2-Butanone (MEK)	<1.0	<1.0	<1.0	<1.0
Tetrachloroethylene	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
TCLP semi-volatiles				
Pyridine	ND	ND	ND	ND
O-Cresol	ND	ND	ND	ND
M-Cresol	ND	ND	ND	ND
P-Cresol	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND

* ND = not detected or <0.10 PPM

5.0 Disposal of Materials

All soil removed from tank excavations at the N-94 site were placed back in the excavation as directed by the Navy. Certifications and disposal manifests for the Tanks 1255, and 1256 are included in Appendix F. Certifications and disposal manifests for the tank contents are included in Appendix G.

6.0 Warranties and Limitations

This report certifies that the storage tanks were closed in accordance with federal and state regulations and Millington Naval Air Station's contract specifications. No certification is given that all environmental contaminants have been removed from the site because of the limitations of the type of representative sampling that was required and performed for this kind of work.

DIVISION OF UNDERGROUND STORAGE TANKS
PERMANENT CLOSURE REPORT FORM

Directions: Please address the following questions in detail. Attach extra sheets if necessary. This form must be completed and submitted with the laboratory report forms.

1. Facility ID#: Tank #1255 (Unregistered)

2. Facility Name: Millington Naval Air Station, Building N-94

3. Did you notify this Divison one working day prior to taking the soil samples for the closure? Yes ____ NO XX

4. Was the tank atmosphere and the work zone regularly tested with a combustible gas indicator in accordance with Appendix 5 Part (3) of the UST regulations? Yes XX No ____

5. Describe how the tank(s) was purged: Purged with 1.5 lbs of dry ice (carbon dioxide) for every 100 gallons of tank volume.

6. Describe how all liquids and sludges were removed from the tank(s): liquids pumped with a pneumatic diaphram pump, sludge removed with a Tornado drum vac and aluminum squeegee.

7. Describe how all liquids and sludges were stored and disposed of: Liquid was taken by Laidlaw Environmental for disposal. Sludge stored in 17H DOT drums and will be disposed of with sludge from all N-94 tanks.

8. If the tank(s) was removed, was it labeled in accordance with Appendix 5 Part (4)(f) of the UST regulations? Yes XX No ____

9. How and where was the tank(s) disposed of? taken by Industrial Crane to Hutcherson Metals, Inc. for recycling.

10. Was bedrock encountered during tank abandonment/closure? Yes ____ No XX

11. Was water encountered in the tank pit during the tank abandonment activities? Yes XX No ____

12. If yes, was water sampled? Yes ____ No XX If yes, please attach the results.

13. Was obviously contaminated soil encountered during the tank abandonment (i.e. discolored soil, soil with a hydrocarbon odor, etc.)? Yes XX No ____

14. Did you excavate more than 10 feet from any edge of the tank(s)? Yes ____ No XX

15. If yes, who did you notify with this Division? ____
N/A

16. When did you make the notification? N/A

17. How much soil was removed during the tank abandonment procedure (cubic yards)? 600 CY

18. What was done with this soil after it was removed from the tank excavation? (Any soil removed from a tank pit excavation will be considered contaminated until proven otherwise through laboratory analyses.) All soil was stockpiled at the site and returned to the excavation (see closure report)

19. Were all samples cooled to a proper temperature when received by the lab? Yes XX No ____

20. Were all samples stored in proper sampling containers? Yes XX No ____

21. Were the sampling containers properly prepared prior to the samples being taken? Yes XX No ____

All results from the analyses of all samples must be submitted with this report. Attach the original or carbon copies of the laboratory report forms, photostatic copies will not be accepted. The facility's name and ID# must be provided to the laboratory and printed on each sheet.

I certify that I have examined and am familiar with the information in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and Official Title of
Owner or Owner's Authorized
Representative (Print) ____

Signature: ____

close/disk2

DIVISION OF UNDERGROUND STORAGE TANKS
PERMANENT CLOSURE REPORT FORM

Directions: Please address the following questions in detail. Attach extra sheets if necessary. This form must be completed and submitted with the laboratory report forms.

1. Facility ID#: Tank #1256 (Unregistered)

2. Facility Name: Millington Naval Air Station, Building N-94

3. Did you notify this Divison one working day prior to taking the soil samples for the closure? Yes ____ NO XX

4. Was the tank atmosphere and the work zone regularly tested with a combustible gas indicator in accordance with Appendix 5 Part (3) of the UST regulations? Yes XX No ____

5. Describe how the tank(s) was purged: Purged with 1.5 lbs of dry ice (carbon dioxide) for every 100 gallons of tank volume.

6. Describe how all liquids and sludges were removed from the tank(s): liquids pumped with a pneumatic diaphram pump, sludge removed with a Tornado drum vac and aluminum squeegee.

7. Describe how all liquids and sludges were stored and disposed of: Liquid was taken by Laidlaw Environmental for disposal. Sludge stored in 17H DOT drums and will be disposed of with sludge from all N-94 tanks.

8. If the tank(s) was removed, was it labeled in accordance with Appendix 5 Part (4)(f) of the UST regulations? Yes XX No ____

9. How and where was the tank(s) disposed of? taken by Industrial Crane to Hutcherson Metals, Inc. for recycling.

10. Was bedrock encountered during tank abandonment/closure? Yes ____ No XX

11. Was water encountered in the tank pit during the tank abandonment activities? Yes XX No ____

12. If yes, was water sampled? Yes ____ No XX If yes, please attach the results.

13. Was obviously contaminated soil encountered during the tank abandonment (i.e. discolored soil, soil with a hydrocarbon odor, etc.)? Yes XX No ____

14. Did you excavate more than 10 feet from any edge of the tank(s)? Yes ____ No XX

15. If yes, who did you notify with this Division? ____
N/A

16. When did you make the notification? N/A

17. How much soil was removed during the tank abandonment procedure (cubic yards)? 600 CY

18. What was done with this soil after it was removed from the tank excavation? (Any soil removed from a tank pit excavation will be considered contaminated until proven otherwise through laboratory analyses.) All soil was stockpiled at the site and returned to the excavation (see closure report)

19. Were all samples cooled to a proper temperature when received by the lab? Yes XX No ____

20. Were all samples stored in proper sampling containers? Yes XX No ____

21. Were the sampling containers properly prepared prior to the samples being taken? Yes XX No ____

All results from the analyses of all samples must be submitted with this report. Attach the original or carbon copies of the laboratory report forms, photostatic copies will not be accepted. The facility's name and ID# must be provided to the laboratory and printed on each sheet.

I certify that I have examined and am familiar with the information in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and Official Title of
Owner or Owner's Authorized
Representative (Print) ____

Signature: ____

close/disk2

A WEEK ENDING 11-17-71

UNDERGROUND STORAGE TANKS REMOVAL, NAS MEMPHIS, SUBMITTALS LOGS ( )

	TANK #	GALLONS SPEC'D	ON-SITE CALCULATED	ACTUAL PUMPED	
1	TANK 302	420 GAL	6198 GAL		1
2	TANK 1250	160 GAL	929 GAL		2
3	TANK 1251	12,400 GAL	24,881 GAL		3
4	TANK 1252	2,000 GAL	24,804 GAL		4
5	TANK 1253	120 GAL	14,907 GAL		5
6	TANK 1254	100 GAL	929 GAL		6
7	TANK 1255	930 GAL	24,881 GAL		7
8	TANK 1256	1070 GAL	22,293 GAL		8
9	TANK 1257	2,250 GAL	5275 GAL		9
10	TANK 1258	2,300 GAL	5,275 GAL		10
11	TANK 1	570 GAL	502 GAL		11
12	TANK 2	580 GAL	513 GAL		12
13	TANK 3	570 GAL	561 GAL		13
14	TANK 4	560 GAL	525 GAL		14
15	TANK 5	560 GAL	- PLUGGED.		15
16	TANK 6	560 GAL	502 GAL		16
17	TANK 303				17
18	TANK 1241				18
19	TANK 7				19
20	TANK S-75N				20
21	TANK S-75W				21
22	TANK 1244				22
23	TANK 1245				23
24	TANK 1246				24
25	TANK 1565				25
26	TANK 1566				26
27	TANK 1618				27
28	TANK S-8				28
29	TANK 553				29
30	TANK S-50				30
31	TANK S-54				31
32	TANK S-56				32
33	TANK 1594				33
34	TANK 1205N	750 GL	632		34
35	TANK 1205S	1000 GL	52		35
36	TANK N-10	80	253		36
37	TANK N-100				37
38					38
39					39
40					40
41					41
42					42
43					43
44					44
45					45
46					46
47					47
48					48
49					49
50					50
51					51
52					52

Contract N62467-90-C-0683
Underground Storage Tank Closure Report
Tank nos. 1257 and 1258
(SD-84)

Naval Air Station Memphis
Millington, TN

National Salvage & Service Corp.
243 E. Winslow Road
Bloomington, IN 47401

April 22, 1992

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Certifications and Manifests for the Contents of Tanks 1257 and 1258.

1.0 Introduction

The purpose of this report is to provide documentation that the underground storage tank listed below at the Naval Air Station was properly removed and closed as required by the applicable Tennessee state regulations and the Navy's contract specifications. Permanent closure report forms are located in Appendix A.

Navy Tank No.: Tank 1257

Location: Adjacent to Building N-94
Description: 25,000 gal. steel tank
Contents: Water with petroleum sheen
Removal date: March 6, 1992

Navy Tank No.: Tank 1258

Location: Adjacent to Building N-94
Description: 25,000 gal. steel tank
Contents: Water with petroleum sheen
Removal date: March 6, 1992

2.0 Description of Work Performed

Before work began on the tanks, the fluid levels were measured and tank volumes were calculated. Tanks 1257 and 1258 were specified to contain 2,250 and 2,306 gallons respectively. After measurement, the volume of tank contents were determined to be 5,275 gallons for each tank (Appendix B).

Prior to excavation, rainwater that had collected in the tank vaults and the tanks contents were pumped into trucks and disposed of as a hazardous waste liquid.

Excavation began to expose Tank 1257 first, then Tank 1258. After the tanks were completely exposed a crane was used to lift the tanks from the excavation.

Tank gasses were purged using 1.5 lbs. of dry ice (carbon dioxide) for every 100 gallons of tank volume. The tank gasses were checked with a combustible gas indicator (CGI). When no combustible gasses were detected a hole was cut in the tank with non-explosive pneumatic nibblers and the tank was cleaned. Sludge was removed from the tank and stored in drums using a Tornado drum vacuum and an aluminum squeegee. The tanks were then labeled and taken to Hutcherson Recycling for disposal.

cause of the nature of the N-94 site, the State of Tennessee ve permission for the Navy to backfill all excavations in e N-94 area with contaminated soil until further vestigations could be made. The excavated soil was erefore stockpiled at the excavation site and was not field ecked with the HNU photoionization detector (PID).

oil samples were taken from the excavations immediately after ank removal. The excavations were then backfilled using ontaminated soil from the excavation, as directed by the avy.

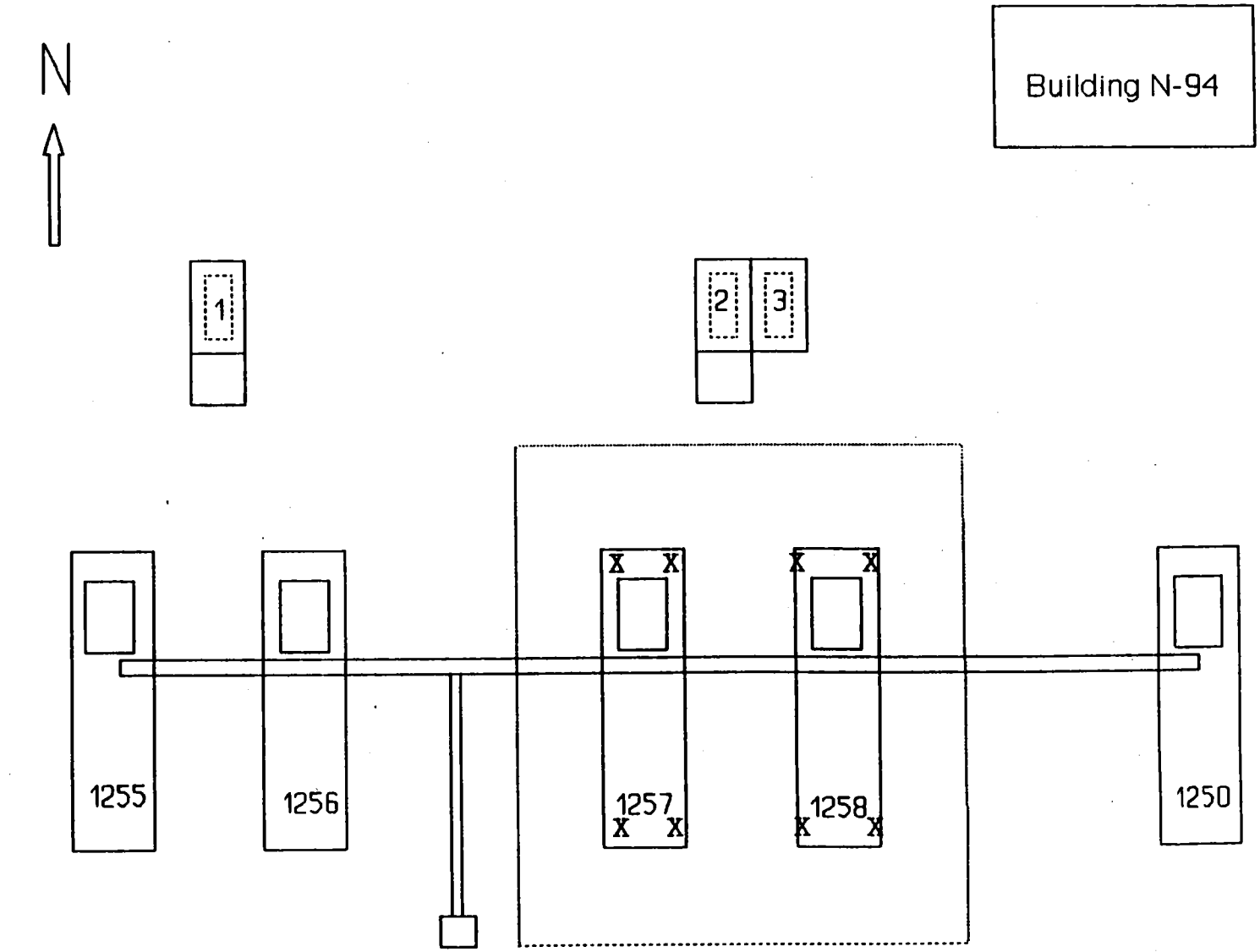
ampling

Contaminated water from Tank 1257 was sampled first. The sample was a composite combined with samples from Tanks 1255 and 1256. The sample was collected using a stainless steel bomb sampler. Permission was granted for additional analysis so a sample of contaminated water was taken from Tank 1257. A composite and the oil and water phases of the contents of Tank 1258 were also sampled for additional analysis.

Each sample consisted of one liter of liquid collected in an amber glass bottle with a teflon lined lid, plus one liter collected in the same way but with a nitric acid preservative supplied with the bottle from the laboratory, plus two clear glass vials for volatile organic analysis. Samples were collected using sterile gloves which were disposed of between samples. Bottles were labeled in the field and a chain of custody form was submitted with each shipment. Samples were shipped in coolers and iced to 4 degrees Celsius.

Because permission was given by the State to backfill the excavations with contaminated soil, the soil from the excavation was not sampled or field checked with the HNU photoionization detector (PID).

Soil samples from the excavation pit were collected the corners of each tank (8 samples). Samples were collected as grab samples from the excavator bucket and packed in clear glass jars with Teflon lined lids. The sample locations are identified on the following map.



X = Sample locations

* Not To Scale

lytical Results

ll samples were shipped to Specialized Assays Environmental n Nashville Tennessee, a Navy approved and certified aboratory. Samples were analyzed using approved EPA methods or soil and water. The initial solvent scan on the tank ontents analyzed for total lead, PCBs, BTU, flashpoint, olatile and semi-volatile organic compounds, and reactive ompounds.

dditional analyses on the oil and water phases in the tanks ncluded flashpoint, volatile organic compounds, total lead, nd BTU for the oil phase. TCLP analysis run on the samples ncluded metals, volatiles, semi-volatiles.

Final in-situ materials were analyzed for flashpoint, BTEX, TPH, volatile organic compounds, and TCLP analysis for metals, volatiles, and semi-volatiles. The results of the analysis are summarized in the following tables. Laboratory reports are included in Appendices C, D, and E respectively.

Tank Contents 1257-1258

Analysis (PPM)	1257	1258
TCLP Metals		
Arsenic	<0.10	<0.10
Barium	<1.0	<1.0
Cadmium	<0.10	<0.10
Chromium	<0.50	<0.50
Lead	<0.50	<0.50
Mercury	<0.010	<0.010
Selenium	<0.10	<0.10
Silver	<0.10	<0.10
TCLP Volatiles		
Benzene	<0.10	0.90
Carbon Tetrachloride	<0.10	<0.10
Chlorobenzene	<0.10	<0.10
Chloroform	<0.10	<0.10
1,2-Dichloroethane	<0.10	<0.10
1,1-Di-cl-ethylene	<0.10	<0.10
2-Butanone (MEK)	<1.0	<1.0
Tetrachloroethylene	<0.10	<0.10
Trichloroethylene	<0.10	<0.10
Vinyl Chloride	<0.10	<0.10
TCLP semi-volatiles		
Pyridine	<0.10	<0.10
O-Cresol	<0.10	<0.10
M-Cresol	<0.10	<0.10
P-Cresol	<0.10	<0.10
1,4-Dichlorobenzene	<0.10	<0.10
2,4-Dinitrotoluene	<0.10	<0.10
Hexachlorobutadiene	<0.10	<0.10
Hexachloroethane	<0.10	<0.10
Nitrobenzene	<0.10	<0.10
Pentachlorophenol	<0.10	<0.10
2,4,5-Trichlorophenol	<0.10	<0.10
2,4,6-Trichlorophenol	<0.10	<0.10
Hexachlorobenzene	<0.10	<0.10
Volatiles		
Acetone	<0.10	<0.10
Acrylonitrile	<0.10	<0.10
Bromoform	<0.10	<0.10
Carbon Disulfide	<0.10	<0.10
Carbon Tetrachloride	<0.10	<0.10
Di-cl-di-f-methane	<0.10	<0.10
Chlorobenzene	<0.10	<0.10
Cl-di-br-methane	<0.10	<0.10
Chloroethane	<0.10	<0.10
2-Clethyvinyl Ether	<0.10	<0.10
Chloroform	<0.10	<0.10

Analysis (PPM)	1257	1258
Cyclohexanone	<0.10	<0.10
Dichlorobenzenes	<0.10	<0.10
Di-cl-br-methane	<0.10	<0.10
1,1-Dichloroethane	<0.10	<0.10
1,2-Dichloroethane	<0.10	<0.10
1,1-Dichloroethylene	<0.10	<0.10
1,2-Dichloroethylene	<0.10	<0.10
1,2-Dichloropropane	<0.10	<0.10
1,3-Dichloropropane	<0.10	<0.10
Ethyl Acetate	<0.10	<0.10
Ethylbenzene	<0.10	0.67
Ethyl Ether	<0.10	<0.10
2-Ethoxyethanol	<1.0	<1.0
Hexane	<0.10	<0.10
Isobutanol	<5.0	<5.0
Methyl Bromide	<0.10	<0.10
Methyl Chloride	<0.10	<0.10
2-Butanone (MEK)	<1.0	<1.0
4-Methyl-2-Pentanone	<0.10	<0.10
Methylene Chloride	<0.10	<0.10
N-Butylalcohol	<5.0	<5.0
Tri-cl-tri-f-ethane	<0.10	<0.10
1,1,2,2-Tet-cl-ethane	<0.10	<0.10
Tetrachloroethylene	<0.10	<0.10
Toluene	0.87	9.5
1,1,1-Tri-cl-ethane	<0.10	<0.10
1,1,2-Tri-cl-ethane	<0.10	<0.10
Trichloroethylene	<0.10	<0.10
Tri-cl-f-methane	<0.10	<0.10
Xylene	2.4	3.6
Vinyl Chloride	<0.10	<0.10

Tank Contents - Oil Layer/Composite 1255-1256-1257

Analysis (PPM)	
Lead	342
PCB's	<2.0
BTU's	19000
Flash Point	<70^0 F
Reactivity Test	
Reactive Cyanide	<2.0
Reactive Sulfide	<2.0
Volatiles	
Acetone	<1.0
Acylonitrile	<1.0
Bromoform	<1.0
Carbon Disulfide	<1.0
Carbon Tetrachloride	<1.0
Di-cl-di-f-methane	<1.0
Chlorobenzene	<1.0
Cl-di-br-methane	<1.0
Chloroethane	<1.0
2-Clethyvinyl Ether	<1.0
Chloroform	<1.0
Cyclohexanone	<1.0
Dichlorobenzene	<1.0
Di-cl-br-methane	<1.0
1,1-Dichloroethane	<1.0
1,2-Dichloroethane	<1.0
1,1-Dichloroethylene	<1.0
1,2-Dichloroethylene	<1.0
1,2-Dichloropropane	<1.0
1,3-Dichloropropane	<1.0
Ethyl Acetate	<1.0
Ethylbenzene	1100
Ethyl Ether	<1.0
2-Ethoxyethanol	<1.0
Hexane	<1.0
Isobutanol	<50.0
Methyl Bromide	<1.0
Methyl Chloride	<1.0
2-Butanone (MEK)	<1.0
4-Methyl-2-Pentanone	3400
Methylene Chloride	<1.0
N-Butylalcohol	<100
Tri-cl-tri-f-ethane	<1.0
1,1,2,2-Tet-cl-ethane	<1.0
Tetrachloroethylene	<1.0
Toluene	5500
1,1,1-Tri-cl-ethane	<1.0
1,1,2-Tri-cl-ethane	<1.0

Analysis (PPM)	
Trichloroethylene	<1.0
Tri-cl-f-methane	<1.0
Xylene	11000
Vinyl Chloride	<1.0
Acid Organics	
2-Chlorophenol	<500
2,4 Dichlorophenol	<500
2,4 Dimethylphenol	<500
2,4 Dinitrophenol	<500
2-Nitrophenol	<500
4-Nitrophenol	<500
P-chloro-m-cresol	<500
Pentachlorophenol	<500
Phenol	<500
2,4,6-Tri cl phenol	<500
Base Neutrals	
Acenapthene	<500
Acenapthtylene	<500
Anthracene	<500
Benzidine	<500
Benzo(a)anthracene	<500
Benzo(a)pyrene	<500
Benzo(b)fluoranthene	<500
Benzo(ghi)perylene	<500
Benzo(k)fluoranthene	<500
Bis-2-cl-ethox-metha	<500
Bis(2-cl-ethyl)ether	<500
Bis(2-cl-isopro)ether	<500
Bis(2-eth-hex)phthal	<500
4-Br-phen-phen-ether	<500
Butyl-benz-pthalate	<500
2-Chloronapthalene	<500
4-Cl-phen-phen-ether	<500
Chrysene	<500
Dibenz(a,h)anthracen	<500
1,2-Dichlorobenzene	<500
1,3-Dichlorobenzene	<500
1,4-Dichlorobenzene	<500
3,3-Dichlorobenzidine	<500
Diethyl Phthalate	<500
Dimethyl Phthalate	<500
Benzo(e)pyrene	<500
Di-n-butyl Phthalate	<500
2,4-Dinitrotoluene	<500
2,6-Dinitrotoluene	<500
Di-n-octyl phthalate	<500
1,2-Diphen-hydrazine	<500
Fluoranthene	<500
Fluorene	<500

[redacted]

ysis (PPM)

chlorobenzene	<500
chlorobutadiene	<500
clcyclopentadiene	<500
chloroethane	<500
eno (1,2,3-cd)pyr	<500
phorone	<500
hthalene	760
robenzene	<500
it-deimethylamine	<500
it-dinpropylamine	<500
it-diphenylamine	<500
enanthrene	<500
2,4-Trichlorobenz	<500

Tank Contents - Water Phase

Analysis (PPM)	Tank 1257	Tank 1258
Flashpoint	*	Room Temp
Total Lead	0.27	0.72
Volatiles		
Acetone	ND**	<1.0
Acrylonitrile	ND	<1.0
Bromoform	ND	<1.0
Carbon Disulfide	ND	<1.0
Carbon Tetrachloride	ND	<1.0
Di-cl-di-f-methane	ND	<1.0
Chlorobenzene	ND	<1.0
Cl-di-br-methane	ND	<1.0
Chloroethane	ND	<1.0
2-Clethyvinyl Ether	ND	<1.0
Chloroform	ND	<1.0
Cyclohexanone	ND	<1.0
Dichlorobenzenes	ND	<1.0
Di-cl-br-methane	ND	<1.0
1,1-Dichloroethane	ND	<1.0
1,2-Dichloroethane	ND	<1.0
1,1-Dichloroethylene	ND	<1.0
1,2-Dichloroethylene	ND	<1.0
1,2-Dichloropropane	ND	<1.0
1,3-Dichloropropane	ND	<1.0
Ethyl Acetate	ND	<1.0
Ethylbenzene	ND	2.8
Ethyl Ether	ND	<1.0
2-Ethoxyethanol	ND	<1.0
Hexane	ND	<1.0
Isobutanol	<5.0	<5.0
Methyl Bromide	ND	<1.0
Methyl Chloride	ND	<1.0
2-Butanone (MEK)	ND	<1.0
4-Methyl-2-Pentanone	ND	8.9
Methylene Chloride	ND	<1.0
N-Butylalcohol	<5.0	<5.0
Tri-cl-tri-f-ethane	ND	<1.0
1,1,2,2-Tet-cl-ethane	ND	<1.0
Tetrachloroethylene	ND	<1.0
Toluene	ND	23
1,1,1-Tri-cl-ethane	ND	<1.0
1,1,2-Tri-cl-ethane	ND	<1.0
Trichloroethylene	ND	<1.0
Tri-cl-f-methane	ND	<1.0
Xylene	.13	19
Vinyl Chloride	ND	<1.0

* sample heated to 160 degrees Fahrenheit without ignition
** ND = not detected or <0.010 PPM

Final In-situ Soils Samples

Analysis (PPM)	Tank 1257 Excavation NW	NE	SE	SW
BTEX Soil				
Benzene	<1.0	<1.0	<1.0	<1.0
Toluene	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	<1.0	<1.0	<1.0	<1.0
Xylene	10.1	7.26	26.6	20.9
TPH				
Lo Boil HC	5960	3580	5330	2670
Hi Boil HC	<5.0	<5.0	<5.0	<5.0
Volatiles				
Acetone	9.8	12	<1.3	19
Acrylonitrile	<0.63	<0.63	<0.63	<0.63
Bromoform	<0.63	<0.63	<0.63	<0.63
Carbon Disulfide	<0.63	<0.63	<0.63	<0.63
Carbon Tetrachloride	<0.63	<0.63	<0.63	<0.63
Di-cl-di-f-methane	<0.63	<0.63	<0.63	<0.63
Chlorobenzene	<0.63	<0.63	<0.63	<0.63
Cl-di-br-methane	<0.63	<0.63	<0.63	<0.63
Chloroethane	<0.63	<0.63	<0.63	<0.63
2-Clethyvinyl Ether	<0.63	<0.63	<0.63	<0.63
Chloroform	<0.63	<0.63	<0.63	<0.63
Cyclohexanone	<0.63	<0.63	<0.63	<0.63
Dichlorobenzenes	<0.63	<0.63	<0.63	<0.63
Di-cl-br-methane	<0.63	<0.63	<0.63	<0.63
1,1-Dichloroethane	<0.63	<0.63	<0.63	<0.63
1,2-Dichloroethane	<0.63	<0.63	<0.63	<0.63
1,1-Dichloroethylene	<0.63	<0.63	<0.63	<0.63
1,2-Dichloroethylene	<0.63	<0.63	<0.63	<0.63
1,2-Dichloropropane	<0.63	<0.63	<0.63	<0.63
1,3-Dichloropropane	<0.63	<0.63	<0.63	<0.63
Ethyl Acetate	<0.63	<0.63	<0.63	<0.63
Ethylbenzene	<0.63	<0.63	<0.63	<0.63
Ethyl Ether	<0.63	<0.63	<0.63	<0.63
2-Ethoxyethanol	<1.3	<1.3	<1.3	<1.3
Hexane	<0.63	<0.63	<0.63	<0.63
Isobutanol	<10	<10	<10	<10
Methyl Bromide	<0.63	<0.63	<0.63	<0.63
Methyl Chloride	<0.63	<0.63	<0.63	<0.63
2-Butanone (MEK)	<1.3	<1.3	<1.3	<1.3
4-Methyl-2-Pentanone	<0.63	<0.63	<0.63	<0.63
Methylene Chloride	<0.63	<0.63	<0.63	<0.63
N-Butylalcohol	<10	<10	<10	<10
Tri-cl-tri-f-ethane	<0.63	<0.63	<0.63	<0.63
1,1,2,2-Tet-cl-ethane	<0.63	<0.63	<0.63	<0.63
Tetrachloroethylene	<0.63	<0.63	<0.63	<0.63
Toluene	<0.63	<0.63	<0.63	<0.63

DIVISION OF UNDERGROUND STORAGE TANKS
PERMANENT CLOSURE REPORT FORM

Directions: Please address the following questions in detail. Attach extra sheets if necessary. This form must be completed and submitted with the laboratory report forms.

1. Facility ID#: Tank #1257 (Unregistered)

2. Facility Name: Millington Naval Air Station, Building N-94

3. Did you notify this Divison one working day prior to taking the soil samples for the closure? Yes ____ NO XX

4. Was the tank atmosphere and the work zone regularly tested with a combustible gas indicator in accordance with Appendix 5 Part (3) of the UST regulations? Yes XX No ____

5. Describe how the tank(s) was purged: Purged with 1.5 lbs of dry ice (carbon dioxide) for every 100 gallons of tank volume.

6. Describe how all liquids and sludges were removed from the tank(s): liquids pumped with a pneumatic diaphram pump, sludge removed with a Tornado drum vac and aluminum squeegee.

7. Describe how all liquids and sludges were stored and disposed of: Liquid was taken by Laidlaw Environmental for disposal. Sludge stored in 17H DOT drums and will be disposed of with sludge from all N-94 tanks.

8. If the tank(s) was removed, was it labeled in accordance with Appendix 5 Part (4)(f) of the UST regulations?
Yes XX No ____

9. How and where was the tank(s) disposed of? taken by Industrial Crane to Hutcherson Metals, Inc. for recycling.

10. Was bedrock encountered during tank abandonment/closure?
Yes ____ No XX

11. Was water encountered in the tank pit during the tank abandonment activities? Yes XX No ____

12. If yes, was water sampled? Yes ____ No XX If yes, please attach the results.

13. Was obviously contaminated soil encountered during the tank abandonment (i.e. discolored soil, soil with a hydrocarbon odor, etc.)? Yes XX No ____

14. Did you excavate more than 10 feet from any edge of the tank(s)? Yes ____ No XX

15. If yes, who did you notify with this Division? ____
N/A

16. When did you make the notification? N/A

17. How much soil was removed during the tank abandonment procedure (cubic yards)? 600 CY

18. What was done with this soil after it was removed from the tank excavation? (Any soil removed from a tank pit excavation will be considered contaminated until proven otherwise through laboratory analyses.) All soil was stockpiled at the site and returned to the excavation (see closure report)

19. Were all samples cooled to a proper temperature when received by the lab? Yes XX No ____

20. Were all samples stored in proper sampling containers? Yes XX No ____

21. Were the sampling containers properly prepared prior to the samples being taken? Yes XX No ____

All results from the analyses of all samples must be submitted with this report. Attach the original or carbon copies of the laboratory report forms, photostatic copies will not be accepted. The facility's name and ID# must be provided to the laboratory and printed on each sheet.

I certify that I have examined and am familiar with the information in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and Official Title of
Owner or Owner's Authorized
Representative (Print) ____

Signature: ____

close/disk2

DIVISION OF UNDERGROUND STORAGE TANKS
PERMANENT CLOSURE REPORT FORM

Directions: Please address the following questions in detail. Attach extra sheets if necessary. This form must be completed and submitted with the laboratory report forms.

1. Facility ID#: Tank # 1258 (Unregistered)

2. Facility Name: Millington Naval Air Station, Building N-94

3. Did you notify this Divison one working day prior to taking the soil samples for the closure? Yes ____ NO XX

4. Was the tank atmosphere and the work zone regularly tested with a combustible gas indicator in accordance with Appendix 5 Part (3) of the UST regulations? Yes XX No ____

5. Describe how the tank(s) was purged: Purged with 1.5 lbs of dry ice (carbon dioxide) for every 100 gallons of tank volume.

6. Describe how all liquids and sludges were removed from the tank(s): liquids pumped with a pneumatic diaphram pump, sludge removed with a Tornado drum vac and aluminum squeegee.

7. Describe how all liquids and sludges were stored and disposed of: Liquid was taken by Laidlaw Environmental for disposal. Sludge stored in 17H DOT drums and will be disposed of with sludge from all N-94 tanks.

8. If the tank(s) was removed, was it labeled in accordance with Appendix 5 Part (4)(f) of the UST regulations? Yes XX No ____

9. How and where was the tank(s) disposed of? taken by Industrial Crane to Hutcherson Metals, Inc. for recycling.

10. Was bedrock encountered during tank abandonment/closure? Yes ____ No XX

11. Was water encountered in the tank pit during the tank abandonment activities? Yes XX No ____

12. If yes, was water sampled? Yes ____ No XX If yes, please attach the results.

13. Was obviously contaminated soil encountered during the tank abandonment (i.e. discolored soil, soil with a hydrocarbon odor, etc.)? Yes XX No _____

14. Did you excavate more than 10 feet from any edge of the tank(s)? Yes ____ No XX

15. If yes, who did you notify with this Division? _____
N/A

16. When did you make the notification? N/A

17. How much soil was removed during the tank abandonment procedure (cubic yards)? 600 CY

18. What was done with this soil after it was removed from the tank excavation? (Any soil removed from a tank pit excavation will be considered contaminated until proven otherwise through laboratory analyses.) All soil was stockpiled at the site and returned to the excavation (see closure report)

19. Were all samples cooled to a proper temperature when received by the lab? Yes XX No _____

20. Were all samples stored in proper sampling containers? Yes XX No _____

21. Were the sampling containers properly prepared prior to the samples being taken? Yes XX No _____

All results from the analyses of all samples must be submitted with this report. Attach the original or carbon copies of the laboratory report forms, photostatic copies will not be accepted. The facility's name and ID# must be provided to the laboratory and printed on each sheet.

I certify that I have examined and am familiar with the information in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and Official Title of
Owner or Owner's Authorized
Representative (Print) _____

Signature: _____

close/disk2

#9 · week Ending 11-17-91

UNDERGROUND STORAGE TANKS REMOVAL, NAS MEMPHIS, SUBMITTALS LOGS ( )

	TANK #	GALLONS SPEC'D	ON-SITE CALCULATED	ACTUAL PUMPED	
1	TANK 302	420 GAL	6198 GAL		1
2	TANK 1250	160 GAL	929 GAL		2
3	TANK 1251	12,400 GAL	24,881 GAL		3
4	TANK 1252	2,000 GAL	84,804 GAL		4
5	TANK 1253	120 GAL	14,907 GAL		5
6	TANK 1254	100 GAL	929 GAL		6
7	TANK 1255	930 GAL	24,881 GAL		7
8	TANK 1256	1070 GAL	22,293 GAL		8
9	TANK 1257	2,250 GAL	5275 GAL		9
10	TANK 1258	2,300 GAL	5,275 GAL		10
11	TANK 1	570 GAL	502 GAL		11
12	TANK 2	580 GAL	513 GAL		12
13	TANK 3	570 GAL	561 GAL		13
14	TANK 4	560 GAL	525 GAL		14
15	TANK 5	560 GAL	-PLUGGED-		15
16	TANK 6	560 GAL	502 GAL		16
17	TANK 303				17
18	TANK 1241				18
19	TANK 7				19
20	TANK S-75N				20
21	TANK S-75W				21
22	TANK 1244				22
23	TANK 1245				23
24	TANK 1246				24
25	TANK 1565				25
26	TANK 1566				26
27	TANK 1618				27
28	TANK S-8				28
29	TANK 553				29
30	TANK S-50				30
31	TANK S-54				31
32	TANK S-56				32
33	TANK 1594				33
34	TANK 1205N	700 GL	632		34
35	TANK 1205S	1000 GL	52		35
36	TANK N-10	80	253		36
37	TANK N-100				37
38					38
39					39
40					40
41					41
42					42
43					43
44					44
45					45
46					46
47					47
48					48
49					49
50					50
51					51
52					52

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To MARK TAYLOR	From T. BARKER
Co SODIV	Co. NAS MEMPHIS
Dept.	Phone # AV 966-5207
Fax # AV 563-0563	Fax #

OF THE NAVY
HARGE OF CONSTRUCTION
AIR STATION MEMPHIS
ENNESSEE 38054-0007
AUTOVON 966-5478
A/V 966-5788

Code R-10/MJ
900683K
25 Feb 1992

MEMORANDUM

From: RDICC
To: Public Works Engineering, attn: Tanya Barker

Subj: UNDERGROUND STORAGE TANK REMOVAL AT N-94

Encl: (1) TCLP/GCMS analysis for Frac Tank R-1
(2) TCLP/GCMS analysis for Frac Tank 33
(3) TCLP/GCMS analysis for Frac Tank 46

1. Enclosed are the lab analysis for the three (3) 22,000 gallon portable storage tanks used to store rainwater collected in the excavation pits at N-94.

2. We are request permission to pump the contents of the above listed tanks into the drainage ditch located just west of the N-94 site.

3. Please respond as soon as possible.

D. R. STEVENSON

SPECIALIZED ASSAYS
ENVIRONMENTAL
300 12th Ave. S.
Nashville, TN 37202

Specimen	Specimen ID	Acces
FRAC TANK #46 (RAINWATER)	92823259	92 823

Collection Date	Time	Recei
02/17/92	00:00	02/18

Referring Client	Client ID	Repor
BRYAN CAVINS		02/24

Test	Result	Units	Reference Limit
2,4,6-TRI CL PHENOL	ND		
HEXACHLOROBENZENE	ND		
VOLATILES			
ACETONE	<1.0	PPM	
ACRYLONITRILE	<0.10	PPM	
BROMOFORM	<0.10	PPM	
CARBON DISULFIDE	<0.10	PPM	
CARBON TETRACHLORIDE	<0.10	PPM	
DI-CL-DI-F-METHANE	<0.10	PPM	
CHLOROBENZENE	<0.10	PPM	
CHLORODIBRMETHANE	<0.10	PPM	
CHLOROETHANE	<0.10	PPM	
2-CLETHYVINYL ETHER	<0.10	PPM	
CHLOROFORM	<0.10	PPM	
CYCLOHEXANONE	<0.10	PPM	
DICHLOROBENZENES	<0.10	PPM	
DI-CL-BR-METHANE	<0.10	PPM	
1-1-DICHLOROETHANE	<0.10	PPM	
1,2-DICHLOROETHANE	<0.10	PPM	
1,1-DI-CL-ETHYLENE	<0.10	PPM	
1,2-DICHLOROETHYLENE	<0.10	PPM	
1,2-DICHLOROPROPANE	<0.10	PPM	
1,3-DICHLOROPROPENE	<0.10	PPM	
ETHYL ACETATE	<0.10	PPM	
ETHYLBENZENE	<0.10	PPM	
ETHYL ETHER	<0.10	PPM	
2-ETHOXYETHANOL	<1.0	PPM	
HEXANE	<0.10	PPM	
ISOBUTANOL	<5.0	PPM	
METHYL BROMIDE	<0.10	PPM	
METHYL CHLORIDE	<0.10	PPM	
2-BUTANONE (MEK)	<0.10	PPM	
4-METHYL-2-PENTANONE	<1.0	PPM	
METHYLENE CHLORIDE	<0.10	PPM	
N-BUTYLALCOHOL	<5.0	PPM	
TRI-CL-TRI-F-ETHANE	<0.10	PPM	

NATIONAL SALVAGE SERVICE CO.
ATT. MARY GUIDEN
243 E. WINSLOW RD.
BLOOMINGTON IN 47401 4704

[redacted]
SPECIALIZED ASSAYS
ENVIRONMENTAL
300 12th Ave. S.
Nashville, TN 37202

Specimen	Specimen ID	Acce
FRAC TANK #46 (RAINWATER)	92823259	92 82

Collection Date	Time	Rece
02/17/92	00:00	02/1

Referring Client	Client ID	Repo
BRYAN CAVINS		02/2

Test	Result	Units	Reference Limi
TCLP METALS			
ARSENIC	<0.10	PPM	
BARIUM	<1.0	PPM	
CADMIUM	<0.10	PPM	
CHROMIUM, TOTAL	<0.50	PPM	
LEAD	<0.50	PPM	
MERCURY	<0.010	PPM	
SELENIUM	<0.10	PPM	
SILVER	<0.10	PPM	
TCLP VOLATILES			
METHOD NUMBER	8240		
QUANTITATION LIMIT	0.10	PPM	
BENZENE	ND		
CARBON TETRACHLORIDE	ND		
CHLOROBENZENE	ND		
CHLOROFORM	ND		
1,2-DICHLOROETHANE	ND		
1,1-DI-CL-ETHYLENE	ND		
2-BUTANONE (MEK)	<1.0	PPM	
TETRACHLOROETHYLENE	ND		
TRICHLOROETHYLENE	ND		
VINYL CHLORIDE	ND		
TCLP EXTRACTABLES			
METHOD NUMBER	8270		
QUANTITATION LIMIT	0.10	PPM	
PYRIDINE	ND		
O-CRESOL	ND		
M-CRESOL	ND		
P-CRESOL	ND		
1,4-DICHLOROBENZENE	ND		
2,4-DINITROTOLUENE	ND		
HEXACHLOROBUTADIENE	ND		
HEXACHLOROETHANE	ND		
NITROBENZENE	ND		
PENTACHLOROPHENOL	ND		
2,4,5-TRICHLORPHENOL	ND		

NATIONAL SALVAGE SERVICE CO.
ATT. MARY GUIDEN
243 E. WINSLOW RD.
BLOOMINGTON IN 47401 4704

ENCL(3)

SPECIALIZED ASSAYS
ENVIRONMENTAL
300 12th Ave. S.
Nashville, TN 37202

Specimen	Specimen ID	Access
FRAC TANK #46 (RAINWATER)	92823259	92 8232

Collection Date	Time	Recei
02/17/92	00:00	02/18/

Referring Client	Client ID	Report
BRYAN CAVINS		02/24/

Test	Result	Units	Reference Limits
1,1,2,2 TET CL ETHAN	<0.10	PPM	
TETRACHLOROETHYLENE	<0.10	PPM	
TOLUENE	<0.10	PPM	
1,1,1-TRI-CL-ETHANE	<0.10	PPM	
1,1,2-TRI-CL-ETHANE	<0.10	PPM	
TRICHLOROETHYLENE	<0.10	PPM	
TRI-CL-F-METHANE	<0.10	PPM	
XYLENE	<0.10	PPM	
VINYL CHLORIDE	<0.10	PPM	

NATIONAL SALVAGE SERVICE CO.
ATT. MARY GUIDEN
243 E. WINSLOW RD.

SPECIALIZED ASSAYS
ENVIRONMENTAL
300 12th Ave. S.
Nashville, TN 37202

Specimen	Specimen ID	Access
FRAC TANK #R1 (RAINWATER)	92823257	92 8232

Collection Date	Time	Receiv
02/17/92	00:00	02/18/

Referring Client	Client ID	Report
BRYAN CAVINS		02/24/

Test	Result	Units	Reference Limits
TCLP METALS			
ARSENIC	<0.10	PPM	
BARIUM	<1.0	PPM	
CADMIUM	<0.10	PPM	
CHROMIUM, TOTAL	<0.50	PPM	
LEAD	<0.50	PPM	
MERCURY	<0.010	PPM	
SELENIUM	<0.10	PPM	
SILVER	<0.10	PPM	
TCLP VOLATILES			
METHOD NUMBER	8240		
QUANTITATION LIMIT	0.10	PPM	
BENZENE	ND		
CARBON TETRACHLORIDE	ND		
CHLOROBENZENE	ND		
CHLOROFORM	ND		
1,2-DICHLOROETHANE	ND		
1,1-DI-CL-ETHYLENE	ND		
2-BUTANONE (MEK)	2.3	PPM	
TETRACHLOROETHYLENE	ND		
TRICHLOROETHYLENE	ND		
VINYL CHLORIDE	ND		
TCLP EXTRACTABLES			
METHOD NUMBER	8270		
QUANTITATION LIMIT	0.10	PPM	
PYRIDINE	ND		
O-CRESOL	ND		
M-CRESOL	ND		
P-CRESOL	ND		
1,4-DICHLOROBENZENE	ND		
2,4-DINITROTOLUENE	ND		
HEXACHLOROBUTADIENE	ND		
HEXACHLOROETHANE	ND		
NITROBENZENE	ND		
PENTACHLOROPHENOL	ND		
2,4,5-TRICHLORPHENOL	ND		

NATIONAL SALVAGE SERVICE CO. Telephone: 812 339 9000
ATT. MARY GUIDEN
243 E. WINSLOW RD.
BLOOMINGTON IN 47401 4704

FROM SPECIALIZED ASSAYS ENVIORMENTAL 02.24.1992 13:23

SPECIALIZED ASSAYS
ENVIRONMENTAL
300 12th Ave. S.
Nashville, TN 37202

Specimen	Specimen ID	Acces
FRAC TANK #R1 (RAINWATER)	92823257	92 823

Collection Date	Time	Recei
02/17/92	00:00	02/18

Referring Client	Client ID	Repor
BRYAN CAVINS		02/24

Test	Result	Units	Reference Limit
2,4,6-TRI CL PHENOL	ND		
HEXACHLOROBENZENE	ND		
VOLATILES			
ACETONE	<1.0	PPM	
ACRYLONITRILE	<0.10	PPM	
BROMOFORM	<0.10	PPM	
CARBON DISULFIDE	<0.10	PPM	
CARBON TETRACHLORIDE	<0.10	PPM	
DI-CL-DI-F-METHANE	<0.10	PPM	
CHLOROBENZENE	<0.10	PPM	
CHLORODIBRMETHANE	<0.10	PPM	
CHLOROETHANE	<0.10	PPM	
2-CLETHYVINYL ETHER	<0.10	PPM	
CHLOROFORM	<0.10	PPM	
CYCLOHEXANONE	<0.10	PPM	
DICHLOROBENZENES	<0.10	PPM	
DI-CL-BR-METHANE	<0.10	PPM	
1-1-DICHLOROETHANE	<0.10	PPM	
1,2-DICHLOROETHANE	<0.10	PPM	
1,1-DI-CL-ETHYLENE	<0.10	PPM	
1,2-DICHLOROETHYLENE	<0.10	PPM	
1,2-DICHLOROPROPANE	<0.10	PPM	
1,3-DICHLOROPROPENE	<0.10	PPM	
ETHYL ACETATE	<0.10	PPM	
ETHYLBENZENE	<0.10	PPM	
ETHYL ETHER	<0.10	PPM	
2-ETHOXYETHANOL	<1.0	PPM	
HEXANE	<0.10	PPM	
ISOBUTANOL	<5.0	PPM	
METHYL BROMIDE	<0.10	PPM	
METHYL CHLORIDE	<0.10	PPM	
2-BUTANONE (MEK)	2.3	PPM	
4-METHYL-2-PENTANONE	<0.10	PPM	
METHYLENE CHLORIDE	<0.10	PPM	
N-BUTYLALCOHOL	<5.0	PPM	
TRI-CL-TRI-F-ETHANE	<0.10	PPM	

NATIONAL SALVAGE SERVICE CO. Telephone: 812 339 9000
ATT. MARY GUIDEN
243 E. WINSLOW RD.
BLOOMINGTON IN 47404

[redacted]
ENVIRONMENTAL
300 12th Ave. S.
Nashville, TN 37202

FRAC TANK #R1 (RAINWATER) 92823257 92 823

Collection Date	Time	Recei
02/17/92	00:00	02/18

Referring Client	Client ID	Repor
BRYAN CAVINS		02/24

Test	Result	Units	Reference Limit
1,1,2,2 TET CL ETHAN	<0.10	PPM	
TETRACHLOROETHYLENE	<0.10	PPM	
TOLUENE	<0.10	PPM	
1,1,1-TRI-CL-ETHANE	<0.10	PPM	
1,1,2-TRI-CL-ETHANE	<0.10	PPM	
TRICHLOROETHYLENE	<0.10	PPM	
TRI-CL-F-METHANE	<0.10	PPM	
XYLENE	<0.10	PPM	
VINYL CHLORIDE	<0.10	PPM	

NATIONAL SALVAGE SERVICE CO. Telephone: 812 339 9000
ATT. MARY GUIDEN
243 E. WINSLOW RD.
BLOOMINGTON IN 47401 4704

ENCL(1)

SPECIALIZED ASSAYS
ENVIRONMENTAL
300 12th Ave. S.
Nashville, TN 37202

Specimen	Specimen ID	Access
FRAC TANK #33 (RAINWATER)	92823258	92 8232

Collection Date	Time	Receiv
02/17/92	00:00	02/18/

Referring Client	Client ID	Report
BRYAN CAVINS		02/24/

Test	Result	Units	Reference Limits
TCLP METALS			
ARSENIC	<0.10	PPM	
BARIUM	<1.0	PPM	
CADMIUM	<0.10	PPM	
CHROMIUM, TOTAL	<0.50	PPM	
LEAD	<0.50	PPM	
MERCURY	<0.010	PPM	
SELENIUM	<0.10	PPM	
SILVER	<0.10	PPM	
TCLP VOLATILES			
METHOD NUMBER	8240		
QUANTITATION LIMIT	0.10	PPM	
BENZENE	ND		
CARBON TETRACHLORIDE	ND		
CHLOROBENZENE	ND		
CHLOROFORM	ND		
1,2-DICHLOROETHANE	ND		
1,1-DI-CL-ETHYLENE	ND		
2-BUTANONE (MEK)	<1.0	PPM	
TETRACHLOROETHYLENE	ND		
TRICHLOROETHYLENE	ND		
VINYL CHLORIDE	ND		
TCLP EXTRACTABLES			
METHOD NUMBER	8270		
QUANTITATION LIMIT	0.10	PPM	
PYRIDINE	ND		
O-CRESOL	ND		
M-CRESOL	ND		
P-CRESOL	ND		
1,4-DICHLOROBENZENE	ND		
2,4-DINITROTOLUENE	ND		
HEXACHLOROBUTADIENE	ND		
HEXACHLOROETHANE	ND		
NITROBENZENE	ND		
PENTACHLOROPHENOL	ND		
2,4,5-TRICHLORPHENOL	ND		

NATIONAL SALVAGE SERVICE CO.
ATT. MARY GUIDEN
243 E. WINSLOW RD.
BLOOMINGTON IN 47401 4704

FROM SPECIALIZED ASSAYS ENVIORMENTAL 02.24.1992 13:25

SPECIALIZED ASSAYS
ENVIRONMENTAL
300 12th Ave. S.
Nashville, TN 37202

Specimen	Specimen ID	Acces
FRAC TANK #33 (RAINWATER)	92823258	92 823
Collection Date	**Time**	**Recei**
02/17/92	00:00	02/18
Referring Client	**Client ID**	**Repor**
BRYAN CAVINS		02/24

Test	Result	Units	Reference Limit
2,4,6-TRI CL PHENOL	ND		
HEXACHLOROBENZENE	ND		
VOLATILES			
ACETONE	<1.0	PPM	
ACRYLONITRILE	<0.10	PPM	
BROMOFORM	<0.10	PPM	
CARBON DISULFIDE	<0.10	PPM	
CARBON TETRACHLORIDE	<0.10	PPM	
DI-CL-DI-F-METHANE	<0.10	PPM	
CHLOROBENZENE	<0.10	PPM	
CHLORODIBRMETHANE	<0.10	PPM	
CHLOROETHANE	<0.10	PPM	
2-CLETHYVINYL ETHER	<0.10	PPM	
CHLOROFORM	<0.10	PPM	
CYCLOHEXANONE	<0.10	PPM	
DICHLOROBENZENES	<0.10	PPM	
DI-CL-BR-METHANE	<0.10	PPM	
1-1-DICHLOROETHANE	<0.10	PPM	
1,2-DICHLOROETHANE	<0.10	PPM	
1,1-DI-CL-ETHYLENE	<0.10	PPM	
1,2-DICHLOROETHYLENE	<0.10	PPM	
1,2-DICHLOROPROPANE	<0.10	PPM	
1,3-DICHLOROPROPENE	<0.10	PPM	
ETHYL ACETATE	<0.10	PPM	
ETHYLBENZENE	<0.10	PPM	
ETHYL ETHER	<0.10	PPM	
2-ETHOXYETHANOL	<1.0	PPM	
HEXANE	<0.10	PPM	
ISOBUTANOL	<5.0	PPM	
METHYL BROMIDE	<0.10	PPM	
METHYL CHLORIDE	<0.10	PPM	
2-BUTANONE (MEK)	<1.0	PPM	
4-METHYL-2-PENTANONE	<0.10	PPM	
METHYLENE CHLORIDE	<0.10	PPM	
N-BUTYLALCOHOL	<5.0	PPM	
TRI-CL-TRI-F-ETHANE	<0.10	PPM	

NATIONAL SALVAGE SERVICE CO.
ATT. MARY GUIDEN
243 E. WINSLOW RD.
BLOOMINGTON IN 47401 4704

SPECIALIZED ASSAYS
ENVIRONMENTAL
300 12th Ave. S.
Nashville, TN 37202

Specimen	Specimen ID	Accessio
FRAC TANK #33 (RAINWATER)	92823258	92 823258

Collection Date	Time	Received
02/17/92	00:00	02/18/92

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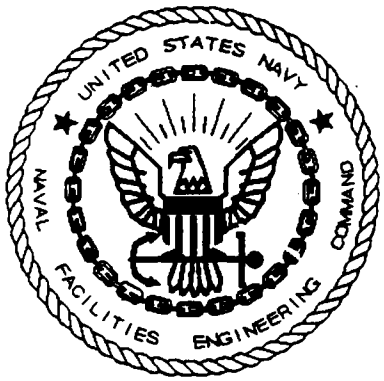
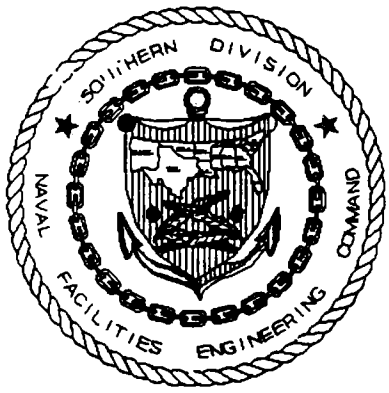
TOLUENE	<0.10	PPM	
1,1,1-TRI-CL-ETHANE	<0.10	PPM	
1,1,2-TRI-CL-ETHANE	<0.10	PPM	
TRICHLOROETHYLENE	<0.10	PPM	
TRI-CL-F-METHANE	<0.10	PPM	
XYLENE	<0.10	PPM	
VINYL CHLORIDE	<0.10	PPM	

NATIONAL SALVAGE SERVICE CO.
ATT. MARY GUIDEN
243 E. WINSLOW RD.

APPENDIX D

SITE-SPECIFIC HEALTH AND SAFETY PLAN





COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY
NAVAL AIR STATION
MEMPHIS, TENNESSEE

SITE-SPECIFIC HEALTH AND SAFETY PLAN
SWMU 15 — N-94 UNDERGROUND TANK FARM

CTO-094
Contract Number:N62467-89-D-0318

Prepared for:

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

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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Attachment B	Directions to Emergency Medical Facilities
Attachment C	Health and Safety Plan Forms

1.0 INTRODUCTION

A RCRA Facility Investigation (RFI) is being conducted at the N-94 Underground Tank Farm (SWMU 15) located at the Naval Air Station Memphis (NAS Memphis), Millington, Tennessee. The purpose of the monitoring program is to assess the nature and extent of potential contamination at the site and to determine if additional action is required to maintain compliance with environmental regulations.

This Site-Specific Health and Safety Plan (SSHSP) is written for field operations to be conducted at SWMU 15. This plan is to be used in conjunction with the approved NAS Memphis Comprehensive Health and Safety Plan (CHASP). Copies of both this plan and the CHASP should be onsite during all field operations. The Navy project contract number with EnSafe/Allen & Hoshall (E/A&H) is N62467-89-D-0318, CTO-094.

Applicability

See CHASP Section 7.0.

Current Hazardous Waste and Emergency Response Operators (HAZWOPER) training certificates for E/A&H and U.S. Geological Survey (USGS) employees and all subcontractors anticipated to be conducting field work onsite will be filed onsite and available for review. Individuals whose certifications are not on file, or those who have a more recent certificate (have attended a refresher course), will provide the Site Supervisor with a copy of their certificate before being allowed to enter a work area.

Current OSHA refresher training certificates will be available onsite for all employees involved in field activities if their refresher course requirements come up for renewal before the project begins. All subcontractors, Navy oversight personnel, and any other site visitors must provide health and safety certification with appropriate refresher course documentation prior to site entry.

2.0 SITE CHARACTERIZATION

2.1 Site Description

SWMU 15 is a former fuel farm south of Building N-94 which occupies an approximately 40,000-square-foot grassy area within the central quadrant of the NAS Memphis Northside. A vicinity map of SWMU 15 is provided in Figure 1. Based on tank layout diagrams, 10 25,000-gallon underground tanks were present at this site. Nine were used to store aviation gasoline (Tank 302 and Tanks 1251-1258) and one was used to store lubricating oil (Tank 1250). These tanks, installed in 1943, supplied fuel and oil to approximately 75 remote fuel/oil pit boxes along the airport aprons on either side of the control tower. All the storage tanks were abandoned in 1986 and removed in early 1992 under the Navy's UST Program. Between abandonment and removal, five of the tanks at SWMU 15 (Tanks 1250, 1255-1258) were reportedly used to improperly store liquid waste generated by the Aircraft Intermediate Maintenance Department (AIMD).

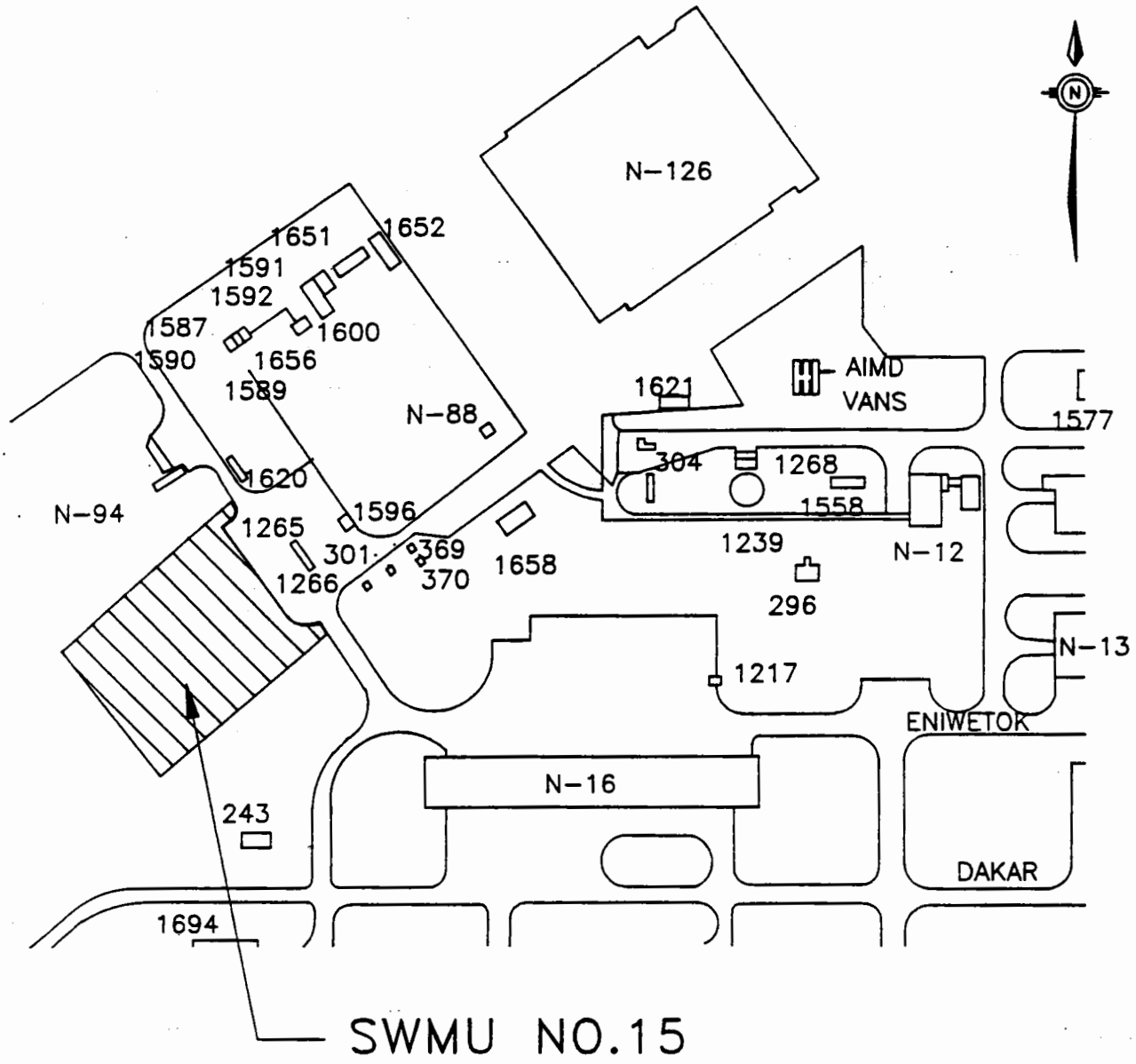
The N-94 tank farm is approximately 250 feet south of the main runway and 250 feet northeast of Building 1671. A site map of SWMU 15 is provided in Figure 2.

2.2 Work Areas

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

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ), and
- Support Zone (SZ).

For a description of field activities to be conducted at the site and within each work area see the Site Investigation Plan (SIP).



200 0 200

SCALE FEET

RFI HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
BUILDING N–94
FORMER UNDERGROUND TANK FARM
SWMU 15

DWG DATE: 01/18/95 | DWG NAME: 94HSP1

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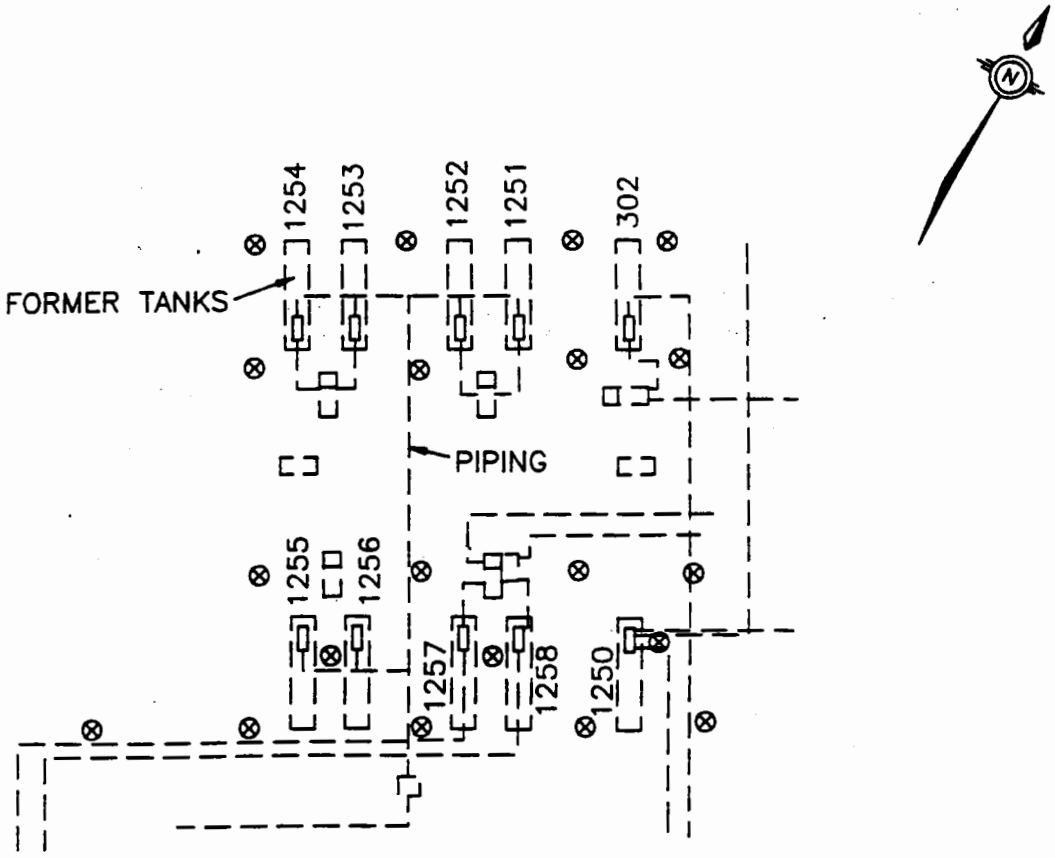

N-94 TANK FARM

LEGEND

⊗ DPT SAMPLING LOCATION

SCALE: NOT TO SCALE

RFI HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
PROPOSED DPT SAMPLING LOCATIONS
BUILDING N-94
FORMER UNDERGROUND TANK FARM
SWMU 15

DWG DATE: 01/18/95 | DWG NAME: 94HSP2

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2.3 Work Area Access

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

2.4 Work Zones

The EZ, CRZ, and SZ locations will be based on physical layout of the site, work task requirements, and current meteorological conditions. The EZ will be established using yellow caution tape.

3.0 SITE ACTIVITIES

Site activities will include Direct Push Technology (DPT) soil and groundwater sampling. Subsequent activities may include soil boring and monitoring well installation, well development, purging, and sampling as required. Field methods described in the *Comprehensive RFI Work Plan*.

4.0 CHEMICAL HAZARDS

The site history suggests a potential for exposure to various hazardous materials. Table 4-1 lists exposure guidelines for potential site chemicals.

Table 4-1
Exposure Guidelines For Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	OSHA PEL[b] (ppm)	ACGIH TLV[c] (ppm)	NIOSH REL[d] (ppm)	Action Level[e] (ppm)	Flammable Range (% by Volume)
Toluene	40	100 150 STEL	50	100 150 STEL	25	1.3 to 7.1%

Table 4-1
Exposure Guidelines For Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	OSHA PEL[b] (ppm)	ACGIH TLV[c] (ppm)	NIOSH REL[d] (ppm)	Action Level[e] (ppm)	Flammable Range (% by Volume)
Ethylbenzene	140	100 125 STEL	100 125 STEL	N.A.	50	1.0 to 6.7%
Benzene	4.68	1 5 STEL	0.1 Confirmed Human Carc.	0.1 1 STEL Potential Occupational Carcinogen	0.05	1.3 to 7.1%
Xylene	Not Listed	100 150 STEL	100 150 STEL	100 150 STEL	50	1.0 to 7.0%

Notes:

[a] Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values

[b] 29 CFR 1910.1000, Table Z-1-A. Limits For Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)

[c] 1990-1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienist. (STEL = Short Term Exposure Limit)

[d] National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, June 1990. (REL = Recommended Exposure Limit)

[e] Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50 percent of the PEL, TLV, or REL, whichever is lower.

N.A. = Substance information not available, or substance unlisted.

Material Safety Data Sheets (MSDS) for these materials are included in Attachment A.

5.0 OPERATIONS AND PHYSICAL HAZARDS

Physical hazards typically encountered during environmental investigations will be present at this site. These hazards include cold-related illnesses, uneven terrain, slippery surfaces, materials handling, lifting, and use of heavy equipment. The Site Supervisor and Site Health and Safety Officer shall be aware of the potential for cold stress and other weather-related illnesses, and as necessary, implement appropriate work regimens to minimize the likelihood of field personnel becoming ill or injured.

Heavy equipment and drill rig operations will be conducted in accordance with the procedures outlined in the CHASP, Attachment A, Drilling Safety Guide. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. If working in areas supporting habitat for poisonous snakes, personnel should wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

6.0 EMPLOYEE PROTECTION

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

6.1 Standard Safe Work Practices

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

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

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

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

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

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

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

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

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

6.2 NAS Memphis General Rules of Conduct

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

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

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

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

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

- Securing government tools in a personal or contractors tool box is forbidden.

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

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

- Compliance with posted signs and notices is required.

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

- Fighting or threatening bodily harm to another is forbidden.

- Defacing any government property is forbidden.

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

- All persons operating motor vehicles will obey all NAS Memphis traffic regulations.

6.3 Selection of Personal Protective Equipment

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

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

Field activities which disturb soils will be initiated in modified Level D protection except when stated otherwise in the SSHSP or when site conditions (e.g., sampling results from previous studies) indicate that modified Level D is inappropriate. Modified Level D protection consists of a hard hat, appropriate chemical-resistant gloves (vinyl or nitrile), eye protection, and chemical-resistant, steel-toed and shank boots. Work coveralls (full length sleeves and pants) will be worn if free product or contaminants identified as skin irritants are encountered. This level of protection was selected because the levels of contamination detected in previous studies were low and free product was not detected.

PPE upgrades to Level C will be initiated if airborne concentrations exceed 2 ppm above the background concentration in the breathing zone or if the concentration of any contaminant exceeds 50 percent of the OSHA Permissible Exposure Limit (PEL). See Table 6-1 for the specific criteria for use and equipment for each level of protection.

Table 6-1
Level Of Protection And Criteria

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

Table 6-1
Level Of Protection And Criteria

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

Notes:

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

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

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

Level C protection will be selected when the types and concentrations of inseparable material are known, or reasonably assumed to be no greater than the protection factors associated with air-purifying respirators, and exposure to the unprotected areas of the body is unlikely to cause harm. Dust concentrations require Level C PPE, where the respirable fractions exceed the PEL of 5 mg/m3 or the total concentrations exceed the PEL of 15 mg/m3.

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

6.4 Air Monitoring

Site history and previous site work indicates that workers may potentially be exposed to low concentrations of numerous chemicals including VOCs, halogenated compounds, and combustible gases/vapors. Based on site history and existing sampling data, "worst case" contaminated areas will be identified before field activities begin.

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

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

If breathing zone levels exceed 2 ppm above background or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact both the Project Manager and the Project Health and Safety Officer. The Project Health and Safety Officer will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. (Typically, PPE will be upgraded to Level C assuming that cartridge respirators are appropriate, otherwise Level B.) See Table 6-1 for specific criteria for each protection level. Work shall not proceed until breathing zone levels return to background levels and it is reasonably anticipated that breathing zone samples will stay approximately at background levels, or the chemical constituent(s) are identified and appropriate PPE is donned.

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

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

6.5 Procedures and Equipment for Extreme Hot or Cold Weather Conditions

See CHASP Section 7.5.5.

Severe Weather Conditions

All field work shall immediately cease at the first sign of thunder or lightning. Field personnel shall perform emergency personal and equipment decontamination (see Section 6.6) and seek immediate shelter.

6.6 Personal Decontamination

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

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

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

6.6.1 Personal Decontamination Procedures

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

- Brushing heavily soiled boots and rinsing outer gloves and boots with soap and water.
- Removing outer gloves and depositing them in a labeled plastic-lined container.
- Remove outer chemical protective clothing.
- Wash and rinse inner gloves.
- Hard hats and eye protection should be washed thoroughly at the end of each work day with a soap and water solution.
- Disposable gloves and other disposable clothing will be disposed of in sealable bags and placed in a labeled 55-gallon drum for disposal at the site.
- All field personnel are to be instructed to shower as soon as possible after leaving the site.

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

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

6.6.2 Closure of the Personal Decontamination Station

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

6.7 Work Limitations

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional 8 hours of training in site management. All personnel must complete an 8-hour refresher training course on an annual basis in order to continue working at the site.

6.8 Exposure Evaluation

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

The content of the annual or termination examination will be the same as the baseline physical. A qualified physician will review the results of the annual examination and exposure data and request further tests or issue medical clearances as appropriate.

After any job-related injury or illness, there will be a medical examination to determine fitness for duty or any job restrictions. The Site Health and Safety Officer will review the results with the examining physician before releasing the employee for work. A similar examination will be performed if an employee has missed at least three days of work due to a non-job related injury or illness requiring medical attention. Medical records shall be maintained by the employer or the physician for at least 30 years following the termination of employment.

7.0 MEDICAL MONITORING PROGRAM

See CHASP Section 7.6.

8.0 AUTHORIZED PERSONNEL

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

• Principal-In-Charge	Dr. James Speakman (E/A&H)
• Task Order Manager/Project Manager	Mr. Lawson Anderson (E/A&H)
• Project Health & Safety Officer	Mr. Doug Petty (E/A&H)
• Site Supervisor	To Be Determined
• Site Health & Safety Officers	Mr. Matt Norton (E/A&H)
	Mr. Robert Smith (E/A&H)
	Mr. Ben Brantley (E/A&H)
• Engineer-in-Charge	Mr. Mark Taylor (SOUTHDIV)
• Naval Air Station Memphis Site Contact	Ms. Tonya Barker

8.1 Responsibilities of Site Supervisor

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

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

- Field staff have current HAZWOPER training.

- Field staff know who the Site Health and Safety Officer is.

- Field staff know the site-specific safety and health concerns.

- There is an adequate onsite supply of health and safety equipment.

- Field staff participate in the E/A&H Medical surveillance program (or in the case of the USGS or subcontractors, an equivalent program).

- Field staff attend safety and health "kick-off" orientation and other site safety briefings.

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

8.2 Responsibilities of Site Health and Safety Officer

The responsibilities of the Site Health and Safety Officer include:

- Providing the Site Supervisor technical input on site health and safety issues.

- Observing field personnel and reporting to the Site Supervisor on the effectiveness of the CHASP and SSHSP and whether field staff are utilizing proper work practices and decontamination procedures.

- Reporting significant safety violations to the Project Manager and/or Project Health and Safety Officer.

- Conducting safety briefings during field activities.

- Assuring that a copies of the CHASP and SSHSP are maintained onsite during all field activities.

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

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

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

alternate Health and Safety Officer must meet the criteria for the Site Health and Safety Officer listed above.

The following criteria outline when the Site Health and Safety Officer will be replaced:

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

8.3 Responsibilities of Onsite Field Staff

The health and safety responsibilities of field staff include:

- Being familiar with and complying with this CHASP and SSHSP.
- Attending site health and safety briefings and being aware of anticipated chemical, physical, and biological hazards and what to do when these hazards are encountered.
- Being properly trained on PPE to be used, safety work practices, decontamination procedures to be followed, and emergency procedures and communications.
- Utilizing required PPE including respiratory protective.
- Having up to date HAZWOPER training and providing the Site Supervisor with documentation that their training is current.
- Being an up to date participant in an acceptable medical surveillance program.

- Being fit-tested and physically capable of using a respirator and being in a position where using a respirator may be a requirement. Should the use of respiratory protection be required, field workers shall not have facial hair which intrudes into the sealing surface of the respirator.

- Using the buddy system when wearing respiratory protective equipment. When working in Level C or higher, a third person shall be at the work area. This person shall be suitably equipped to provide logistical and safety support to the entry team.

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

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

9.0 EMERGENCY INFORMATION

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

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

Contact	Agency or Organization	Telephone
Tonya Barker	NAS Memphis	(901) 873-5461/5462
Mark Taylor	SOUTHDIV EIC	(803) 743-0573
Law Enforcement	NAS Memphis Base Security	9-911
Fire Department	NAS Memphis	9-911
Ambulance Service	Naval Hospital, Millington Navy Road	(901) 873-5801/5802 or 9-911
Hospital	Methodist North Hospital 3960 Covington Pike	(901) 372-5211 or 9-911
Southern Poison Control Center	—	(901) 528-6048
Lawson Anderson	EnSafe/Allen & Hoshall	(901) 372-7962
Doug Petty	EnSafe/Allen & Hoshall	(901) 372-7962

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

9.1 Site Resources

Cellular telephones or the telephone at the nearby Aircraft Firefighting Training Facility office trailer will be used for emergency use and communication/coordination with NAS Memphis. First aid and eye wash equipment will be available at the work area.

9.2 Emergency Procedures

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

The following emergency procedures should be followed:

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

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

- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the Site Health and Safety Officer to indicate possible routes for upwind escape.

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

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

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

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

Additional information on appropriate chemical exposure treatment methods will be provided through Material Safety Data Sheets (MSDS) in Attachment A.

10.0 FORMS

The following forms will be used to implement this Health and Safety Plan:

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

The Plan Acceptance Form will be filled out by all employees working on the site before site activities begin. The Plan Feedback Form will be filled out by the Site Safety Officer and any other onsite employee who wishes to fill one out. The Exposure History Form will be

completed by both the Field Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in Attachment C of this plan.

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

ATTACHMENT A

MATERIAL SAFETY DATA SHEETS

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 511 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: 2-BUTANONE

SYNONYMS: ACETONE, METHYL-; AETHYLMETHYLKETON (German); BUTANONE; BUTANONE 2 (French); ETHYL METHYL CETONE (French); ETHYLMETHYLKETON (Dutch); ETHYL METHYL KETONE; ETHYL METHYL KETONE (DOT); KETONE, ETHYL METHYL; MEETCO; METHYL ACETONE; METHYL ACETONE (DOT); METHYL ETHYL KETONE; METHYL ETHYL KETONE (DOT); METILETILCHETONE (Italian); METYLOETYLOKETON (Polish); 2-BUTANONE; MEK; BUTAN-2-ONE; KETONE, METHYL ETHYL; 2-OXOBUTANE; METHYL ETHYL KETONE (MEK)

CAS: 78-93-3 RTECS: EL6475000

FORMULA: C4H8O MOL WT: 72.12

WLN: 2V1

CHEMICAL CLASS: Ketone

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: clear colorless liquid with a fragrant, mint-like, moderately sharp odor

BOILING POINT:	352.72 K	79.5 C	175.2 F
MELTING POINT:	187.04 K	-86.2 C	-123 F
FLASH POINT:	267.4 K	-5.75 C	21.6 F
AUTO IGNITION:	788.7 K	515.5 C	960 F
CRITICAL TEMP:	535.7 K	262.55 C	504.59 F
CRITICAL PRESS:	4.15 kN/M2	40.9 atm	601 psia
HEAT OF VAP:	191 Btu/lb	106.07 cal/g	4.438x E5 J/kg
HEAT OF COMB:	-13480 Btu/lb	-7494 cal/g	-313x E5 J/kg

VAPOR PRESSURE: 71.2 mm Hg @ 20 C

UEL: 11.5 %

LEL: 1.8 %

IONIZATION POTENTIAL (eV): 6.7

VAPOR DENSITY: 2.42 (air=1)

EVAPORATION RATE: 7.12

SPECIFIC GRAVITY: 0.806 @ 20 C

DENSITY: 0.805 g/mL @ 20 C

WATER SOLUBILITY: 27%

INCOMPATIBILITIES: very strong oxidizers, chlorosulfonic acid, oleum, potassium-tert-butoxide, heat or flame, chloroform, hydrogen peroxide, nitric acid

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: NO REACTION Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS:	NOT PERTINENT Source: SAX
POLYMERIZATION POSSIBILITIES:	NOT PERTINENT Source: SAX
TOXIC FIRE GASES:	UNBURNED VAPORS
ODOR DETECTED AT (ppm):	10 ppm
ODOR DESCRIPTION:	Like acetone; pleasant; pungent Source:CHRIS
100 % ODOR DETECTION:	6.0 ppm

---------- REGULATIONS ----------

DOT hazard class:	3 FLAMMABLE LIQUID
DOT guide:	26
Identification number:	UN1193
DOT shipping name:	Ethyl methyl ketone [or] methyl ethyl ketone
Packing group:	II
Label(s) required:	FLAMMABLE LIQUID
Special provisions:	T8
Packaging exceptions:	173.150
Non bulk packaging:	173.202
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	5 L
Cargo aircraft only:	60 L
Vessel stowage:	B
Other stowage provisions:	
STCC NUMBER:	4909243
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	CAA '90 Listed
EPA WASTE NUMBER:	U159,D035,D001
CERCLA REF:	Y
RQ DESIGNATION:	D 5000 pounds (2270 kg) CERCLA
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin. Fire hazard: flammable.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Flammable liquid - Mailable as ORM-D
Mailability:	Domestic surface mail only
Max per parcel:	1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

2-BUTANONE [78-93-3]
ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
First Third Wastes List. 40 CFR 268.10. 54 FR 26594 (June 23, 1989)
Massachusetts Substance List.
Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: human exposures to levels of 350 ppm caused irritation of the nose and throat. numbness in fingers, arms and legs accompanied by headache, nausea, vomiting and fainting have occurred after exposure to levels of 300-600 ppm. SKIN: contact with liquid or vapor at levels of 300-600 ppm caused severe irritation. liquid is absorbed readily and may cause numbing of fingers and arms. Eyes: exposure to levels of 200 ppm produced irritation. INGESTION: can cause

irritation of the mouth, throat and stomach, the severity of which will be dependent upon amount swallowed. symptoms of poisoning include nausea, vomiting, stomach pain and diarrhea. death can occur from ingestion of as little as 1 ounce.(NYDH)

LONG TERM TOXICITY: has been implicated in certain nervous disorders characterized by weakness, fatigue, heaviness in chest and numbness of hands and feet. these symptoms may develop after 1 year of exposure to vapor concentrations of 50-200 ppm. improvement is gradual and may take years after exposure is discontinued.(NYDH)

TARGET ORGANS: CNS, lungs. peripheral nervous system. eye irritation at 350 ppm.

SYMPTOMS: Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: 200 ppm Time weighted averages for 8-hour exposure
590 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 200ppm(590 mg/M3)
ACGIH STEL: STEL = 300 ppm

OSHA PEL: Transitional Limits:
PEL = 200 ppm(590mg/M3)
Final Rule Limits:
TWA = 200 ppm (590 mg/M3)
STEL = 300 ppm(885 mg/M3)

MAK INFORMATION: 200 ppm
590 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:100 ppm/5M JIHTAB 25,282,43
SENSE ORGANS
Nose
Other
SENSE ORGANS
Eye
Conjunctive irritation
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:2737 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2737 mg/kg
ihl-rat LC50:23500 mg/m3/8H
ipr-rat LD50:607 mg/kg
orl-mus LD50:4050 mg/kg
ihl-mus LC50:40 gm/m3/2H
ipr-mus LD50:616 mg/kg
skn-rbt LD50:6480 mg/kg
ipr-gpg LDLo:2 gm/kg
ihl-mam LC50:38 gm/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

eye-hmn 350 ppm
skn-rbt 500 mg/24H MOD
skn-rbt 402 mg/24H MLD
skn-rbt 13780 ug/24H open MLD
eye-rbt 80 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:3000 ppm/7H (6-15D preg) TXAPA9 28,452,74
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

ihl-rat TCLo:1000 ppm/7H (6-15D preg) TXAPA9 28,452,74
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Methyl ethyl ketone (MEK); CASRN 78-93-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Methyl ethyl ketone (MEK)
CASRN -- 78-93-3
Last Revised -- 12/01/89

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on no human carcinogenicity data and inadequate animal data.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. No data were available to assess the carcinogenic potential of methyl ethyl ketone by the oral or inhalation routes. In a skin carcinogenesis study, two groups of 10 male C3H/He mice received dermal applications of 50 mg of a solution containing 25 or 29% methyl ethyl ketone in 70% dodecylbenzene twice a week for 1 year. No skin tumors developed in the group of mice treated with 25% methyl ethyl ketone. After 27 weeks, a single skin tumor developed in 1 of 10 mice receiving 29% methyl ethyl ketone (Horton et al., 1965).

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Methyl ethyl ketone was not mutagenic for Salmonella typhimurium strains 98, TA100, TA1535, or TA1537 with or without rat hepatic homogenates (Florin et al., 1980; Douglas et al., 1980). Methyl ethyl ketone induced aneuploidy in the diploid D61, M strain of Saccharomyces cerevisiae (Zimmermann et al., 1985). Low levels of methyl ethyl ketone combined with low levels of nocodazole (another inducer of aneuploidy), also produced significantly elevated levels of aneuploidy in the system (Mayer and Goin, 1987).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1985. Health and Environmental Effects Profile for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 1988. Updated Health Effects Assessment for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1988 Updated Health Effects Assessment for Methyl Ethyl Ketone has received Agency review.

Agency Work Group Review: 05/30/89

Verification Date: 05/30/89

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
organic canister or air pack; plastic gloves; goggles or face shield.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (2-BUTANONE)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
3000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove victim to fresh air; if breathing is irregular or has
opped, start resuscitation and administer oxygen.
ES: wash with plenty of water for at least 15 min. and call physician.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Alcohol foam, dry chemical, or carbon dioxide.
Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethyl methyl ketone [or] methyl ethyl ketone
DOT ID NUMBER: UN1193

ERG93 GUIDE 26

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
or explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it

without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 1715 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: NAPHTHA, SOLVENT

SYNONYMS: AROMATIC SOLVENT; HI-FLASH NAPHTHAYETHYLEN; NAPHTA (DOT); NAPHTHA; NAPHTHA DISTILLATE (DOT); NAPHTHA, SOLVENT (DOT); PETROLEUM BENZIN; PETROLEUM DISTILLATES (NAPHTHA); PETROLEUM ETHER; PETROLEUM ETHER (DOT); PETROLEUM NAPHTHA (DOT)

CAS: 8030-30-6 RTECS: DE3030000

FORMULA: W99 MOL WT:

WLN: A10-15

CHEMICAL CLASS:Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION:	
BOILING POINT:	NA
MELTING POINT:	NA
FLASH POINT:	Not available
AUTO IGNITION:	Not available
VAPOR PRESSURE:	
UEL:	~
[illegible]:	~
IONIZATION POTENTIAL (eV):	7.16 TO 7.46
VAPOR DENSITY:	No data
EVAPORATION RATE:	5.53(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY:	No data
DENSITY:	
WATER SOLUBILITY:	
INCOMPATIBILITIES:	
REACTIVITY WITH WATER:	No data on water reactivity
REACTIVITY WITH COMMON MATERIALS:	No data
STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):	Unknown
ODOR DESCRIPTION:	No data
100 % ODOR DETECTION:	No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide:	27
Identification number:	UN1256
DOT shipping name:	Naphtha, [solvent]
Packing group:	II - III
Label(s) required:	FLAMMABLE LIQUID - FLAMMABLE LIQUID
Special provisions:	T8,T31■B1,T7,T30
Packaging exceptions:	173.150■150
Non bulk packaging:	173.202■203
Bulk packaging:	173.242■242
Quantity limitations-	
Passenger air/rail:	5 L■60 L
Cargo aircraft only:	60 L■220 L
Vessel stowage:	B■A
Other stowage provisions:	
STCC NUMBER:	4915241, 4910241
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D001
CERCLA REF:	Not listed
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Fire hazard: flammable.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE):	Unspecified
FLAMMABILITY (RED) :	Unspecified
REACTIVITY (YELLOW):	Unspecified
SPECIAL :	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
NAPHTHA, SOLVENT [8030-30-6]
New Jersey Right To Know Substance List. (December 1987)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: Source:

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: ppm
mG/M3

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* ihl-hmn LCLo:3 pph/5M TABIA2 3,231,33

LD50 value: orl-rat LD50:>5 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>5 gm/kg
ihl-rat LCLo:1600 ppm/6H
ihl-mus LCLo:10600 mg/m3/6H
skn-rbt LD50:>3 gm/kg
ipr-mam LDLo:2500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (NAPHTHA, SOLVENT)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
2500 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
5000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
10000 ppm: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSHP
EYE: None given
SKIN: None given
INHALATION: None given
INGESTION: None given

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Naphtha, [solvent]
DOT ID NUMBER: UN1256

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate horities.
FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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IDENTIFIERS

CHEMTOX RECORD 1513 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: KEROSENE

SYNONYMS: COAL OIL; KEROSINE; ILLUMINATING OIL; RANGE OIL; A FUEL OIL NO. 1; JET FUEL; JP-1

CAS: 8008-20-6 RTECS: NY9350000

FORMULA: CnH2n+2 MOL WT:

WLN:

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless watery liquid with a fuel oil odor; pale yellow or water white, mobile oily liquid

BOILING POINT:	448.16-598.16 K	175-325 C	347-617 F
MELTING POINT:	227.55 K	-45.6 C	-50.1 F
FLASH POINT:	310.92 K	37.77 C	99.9 F
AUTO IGNITION:	502 K	228.8 C	444 F

VAPOR PRESSURE: 2 mmHg @ 21 C

UEL: 5.0 %

LEL: 0.7 %

IONIZATION POTENTIAL (eV): 6.79

VAPOR DENSITY: 4.5 (air=1)

EVAPORATION RATE: 0.212138

SPECIFIC GRAVITY: 0.80 15C

DENSITY: 0.80 g/mL

WATER SOLUBILITY: INSOLUBLE

INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 1 ppm

ODOR DESCRIPTION: Fuel oil odor Source:CHRIS

100 % ODOR DETECTION: No data

REGULATIONS

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27

Identification number: UN1223

DOT shipping name:	Kerosene
Packing group:	III
Label(s) required:	FLAMMABLE LIQUID
Special provisions:	B1,T1
Packaging exceptions:	173.150
Non bulk packaging:	173.203
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	60 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	

STCC NUMBER:	4915171

CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D001
CERCLA REF:	Not listed
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Chronic toxicity: mutagen. Fire hazard: flammable. Chronic toxicity: carcinogen

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Combustible liquid - Mailable as ORM-D
Mailability:	Domestic service and air transportation shipper's declaration
Max per parcel:	1 GAL

NFPA CODES:

HEALTH HAZARD (BLUE)	:	(0) No unusual health hazard.
FLAMMABILITY (RED)	:	(2) This material must be moderately heated before ignition will occur.
REACTIVITY (YELLOW)	:	(0) Stable even under fire conditions.
SPECIAL	:	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
KEROSENE [8008-20-6]

Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
nsylvania Hazardous Substance List
A Hazardous Waste

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: does not evaporate fast enough to cause health effects except when heated or in enclosed spaces. headache, tiredness, stupor, dizziness, nausea, coma and death, may occur with increasing exposure. SKIN: if not promptly removed, may cause reddening, blisters, itching and an increased risk of infection. Eyes: irritation may occur. INGESTION: accidental ingestion of unknown amounts has caused irritation of mouth, throat and stomach, nausea, vomiting, rapid breathing, blue skin coloration, and convulsions. death may result from as little as 1 fluid ounce. inhalation into lungs following ingestion may result in bronchitis, chemical pneumonia, accumulation of fluid and blood in lungs, and death. as little as 1/30 oz. may be fatal in this way. (NYDH)

LONG TERM TOXICITY: absorption through skin is slow but repeated skin contact over many years has caused muscular weakness, anemia, changes in white blood cells, fever and death. (NYDH)

TARGET ORGANS:

SYMPTOMS: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL: 100 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC
to be probably carcinogenic to
humans with (usually) at least
limited human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:26 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:26 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
protective gloves; goggles or face sheild.

FIRST AID SOURCE: CHRIS Manual 1991
ASPIRATION: enforce bed rest; administer oxygen; call a doctor.
INGESTION: do NOT induce vomiting; call a doctor.
EYES: wash with plenty of water.
SKIN: wipe off and wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam, dry chemical, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Kerosene
[illegible]T ID NUMBER: UN1223

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate [illegible]horities.
[illegible]IRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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IDENTIFIERS

CHEMTOX RECORD 369 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: SULFURIC ACID

SYNONYMS: OIL OF VITRIOL; NORDHAUSEN ACID; DIPPING ACID; SPIRIT OF SULFUR; HYDROGEN SULFATE; SULPHURIC ACID; VITRIOL BROWN OIL

CAS: 7664-93-9 RTECS: WS5600000

FORMULA: H2SO4 MOL WT: 98.08

WLN: H2 S-O4

CHEMICAL CLASS: Non-oxidizing min. acid

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: odorless colorless oily liquid

BOILING POINT:	543.15 K	270 C	518 F
MELTING POINT:	275.93 K	2.7 C	37 F
FLASH POINT:	Not applicable		
AUTO IGNITION:	Not applicable		
VAPOR PRESSURE:	<0.001 MM		
UEL:	Not applicable		
LEL:	Not applicable		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	1.84 20C		
DENSITY:	1.84 g/cc or 17.112 lb/gal		
WATER SOLUBILITY:	MISCIBLE		
INCOMPATIBILITIES:	organics: chlorates, carbides, fulminates, picrates, metals		

REACTIVITY WITH WATER: REACTS VIOLENTLY WITH EVOLUTION OF HEAT. SPATTERING OCCURS WHEN WATER IS ADDED TO THE COMPOUND.

REACTIVITY WITH COMMON MATERIALS: EXTREMELY HAZARDOUS IN CONTACT WITH MANY MATERIALS, ESP METALS AND COMBUST. DILUTE ACID REACTS WITH MOST METALS, RELEASING HYDROGEN WHICH CAN FORM EXPLOSIVE MIXTURES WITH AIR IN CONFINED SPACES.

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: DILUTE WITH WATER, THEN NEUTRALIZE WITH LIME, LIMESTONE OR SODA ASH.

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): >1

ODOR DESCRIPTION: ODORLESS UNLESS HOT, THEN CHOKING.

	Source:CHRIS
100 % ODOR DETECTION:	No data

---------- REGULATIONS ----------

DOT hazard class:	8 CORROSIVE
DOT guide:	39
Identification number:	UN1830
DOT shipping name:	Sulfuric acid
Packing group:	II
Label(s) required:	CORROSIVE
Special provisions:	A3,A7,B3,B83,B84,N34,T9,T27
Packaging exceptions:	173.154
Non bulk packaging:	173.202
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	1 L
Cargo aircraft only:	30 L
Vessel stowage:	C
Other stowage provisions:	14

STCC NUMBER:	4930040
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	Yes
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D002
CERCLA REF:	Y
RQ DESIGNATION:	C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE:	1000 pounds
SARA Sect. 312 categories:	Acute toxicity: corrosive Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Not given
Mailability:	Nonmailable
Max per parcel:	0

NFPA CODES:

HEALTH HAZARD (BLUE): (3) Extremely hazardous to health. Full protection required. No skin surface should be exposed.

FLAMMABILITY (RED) : (0) This material does not readily burn.

REACTIVITY (YELLOW): (2) Normally unstable and readily undergoes violent change, but does not detonate.

SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

GIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
SARA Title III Extremely Hazardous Substance. Sections 302 and 304.
SULFURIC ACID [7664-93-9]
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: resp sys,eyes,skin,teeth,lungs, mucous membranes.

SYMPTOMS: EYE, NOSE, THROAT IRRIT; PULM EDEMA, BRON; EMPHYSEMA; CONJ; STOMATITIS, DENT EROSION; TRACHBRONC; SKIN, EYE, BURNS; DERM. EXTREMELY IRRITATING, CORROSIVE AND TOXIC TO TISSUE - WORKERS EXPOSED TO LOW CONCENTRATIONS OF VAPOR GRADUALLY LOSE SENSITIVITY TO IRRITATING ACTION - INHALATION OF CONCENTRATED VAPORS CAN CAUSE RAPID UNCONSCIOUSNESS WITH SERIOUS DAMAGE TO LUNG TISSUE - CAN CAUSE NECROSIS OF SKIN ACCOMPANIED BY SHOCK AND COLLAPSE - SEVERE EXPOSURE MAY CAUSE CHEMICAL PNEUMONITIS. Source: SAX

CONC IDLH: 80mg/M3

NIOSH REL: 1 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 1mg/M3
ACGIH STEL: STEL = 3 mg/M3

OSHA PEL: Transitional Limits:

PEL = 1mg/M3
Final Rule Limits:
TWA = 1 mg/M3

MAK INFORMATION: 1.5 calculated as total dust mG/M3

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:3 mg/m3/24W BJIMAG 18,63,61
MUSCULOSKELETAL
Changes in teeth and suporting structures

LD50 value: orl-rat LD50:2140 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2140 mg/kg
ihl-rat LC50:510 mg/m3/2H
ihl-mus LC50:320 mg/m3/2H
ihl-gpg LC50:18 mg/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rbt TCLo:20 mg/m3/7H (6-18D preg) JEHSDH 13,251,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
provide safety shower; eyewash fountain; safety goggles; face shield; approved respirator(self-contained or air-line); rubber safety shoes; rubber apron

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of liquid contact and repeated or prolonged vapor contact

WEAR EYE PROTECTION TO PREVENT:
Any possibility of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (SULFURIC ACID)
25 mg/M3: Any powered air-purifying respirator with a high efficiency particulate filter and an acid gas cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
50 mg/M3: Any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with a high-efficiency particulate filter. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted acid gas canister. / Any air-purifying respirator with a high-efficiency particulate filter.
80 mg/M3: Any supplied-air respirator with a full facepiece and operated a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor and acid gas canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: water flush immed
INHALATION: art resp
INGESTION: water, no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material

from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Sulfuric acid
DOT ID NUMBER: UN1830

ERG93 GUIDE 39

POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if inhaled or swallowed.
Contact causes severe burns to skin and eyes.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
May ignite other combustible materials (wood, paper, oil, etc.).
Violent reaction with water.
Flammable/poisonous gases may accumulate in tanks and hopper cars.
Runoff to sewer may create fire or explosion hazard.
Material may be transported in a molten form.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection.
*Structural firefighters' protective clothing is not effective for these materials. Isolate the leak or spill area immediately for at least 150 feet in all directions. See the Table of Initial Isolation and Protective Action Distances. If you find the ID Number and the name of the material there, begin protective action. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300.
*FIRE
Do not get water inside container.
Small Fires: Dry chemical or CO2.
Large Fires: Flood fire area with water from a distance.
Do not get solid stream of water on spilled material. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk. Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. Use water spray to reduce vapor; do not put water directly on leak, spill area or inside container. Keep combustibles (wood, paper, oil, etc.) away from

spilled material.
Spills: Dike for later disposal; do not apply water unless directed to do so. Cleanup only under supervision of an expert.

IRST AID

ve victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 2264 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: OIL MIST, MINERAL

SYNONYMS: NUJOL ; MIST OF WHITE MINERAL OIL; CUTTING OIL; HEAT-TREATING OIL; HYDRAULIC OIL; CABLE OIL; LUBRICATING OIL

CAS: 8012-95-1 RTECS: XH7480000

FORMULA: W99 MOL WT: N.A.

WLN:

CHEMICAL CLASS: Paraffin

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: mist with an odor like burned lube oil

BOILING POINT:	633.15 K	360 C	680 F
MELTING POINT:	NA		
FLASH POINT:	408 K	134.85 C	274.7 F
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	2.2 mmHg @ 21 C		
UEL:	N.A.		
LEL:	N.A.		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	No data		
DENSITY:	0.83		
WATER SOLUBILITY:	INSOLUBLE		
INCOMPATIBILITIES:	none hazardous		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

REGULATIONS

DOT hazard class: Not given

DOT guide:

Identification number:

DOT shipping name:

Packing group:

Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Fire hazard: combustible.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OIL MIST, MINERAL [8012-95-1]
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

'ORT TERM TOXICITY: ASPIRATION PNEUMONIA, CARCINOGEN OF SKIN AND SCROTUM.
** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: NONE REPORTED Source: NIOSHP

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = 5mg/M3
ACGIH STEL: STEL = 10 mg/M3

OSHA PEL: Transitional Limits:
PEL = 5mg/M3
Final Rule Limits:
TWA = 5 mg/M3

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below

'CINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:>24 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>24 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes wet.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (OIL MIST, MINERAL)
50 mg/M3: Any supplied-air respirator. / Any self-contained breathing apparatus. / Any air-purifying respirator with a high-efficiency particulate filter.
125 mg/M3: Any supplied-air respirator operated in a continuous flow mode. / Any powered air-purifying respirator with a high-efficiency particulate filter.
250 mg/M3: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. / Any supplied-air respirator with a tight-fitting facepiece operated in a continuous flow mode. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
2500 mg/M3: Any supplied-air respirator with a half-mask and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: None given
SKIN: soap wash
INHALATION: fresh air
INGESTION: None given

---------- INITIAL INCIDENT RESPONSE ----------

DOT Guide information for this compound.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 496 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: ETHYLENE GLYCOL
SYNONYMS: 1,2-ETHANEDIOL; 1,2-DIHYDROXYETHANE; 2-HYDROXYETHANOL; GLYCOL ALCOHOL; GLYCOL; EG
CAS: 107-21-1 RTECS: KW2975000
FORMULA: C2H6O2 MOL WT: 62.08
WLN: Q2Q
CHEMICAL CLASS:Alcohol

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: clear, colorless, slightly syrupy liquid.(nydh)

BOILING POINT:	470.15 K	197 C	386.6 F
MELTING POINT:	260.15 K	-13 C	8.6 F
FLASH POINT:	384.1 K	110.95 C	231.7 F
AUTO IGNITION:	673 K	399.8 C	751.8 F

VAPOR PRESSURE: .06 mm Hg @ 20 C
UEL: ~
LEL: 3.2 %
IONIZATION POTENTIAL (eV): 9.3
VAPOR DENSITY: 2.14 (air=1)
EVAPORATION RATE: 0.01(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY: 1.1135 @ 20 C
DENSITY: 1.113
WATER SOLUBILITY: > 100mg/mL @ 17 C
INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: REACTS VIOLENTLY WITH CHLOROSULFURIC ACID, SULFURIC ACID AND OLEUM Source: CSDS
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): Not pertinent
ODOR DESCRIPTION: Slight odor Source:CHRIS
100 % ODOR DETECTION: O.I @ 20 C = 3 ppm

---------- REGULATIONS ----------

DOT hazard class: Not given
DOT guide:

Identification number:
DOT shipping name:
Packing group:
Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (1) This material must be preheated before ignition can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE GLYCOL [107-21-1]
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
SARA Section 313 Toxic Chemicals List
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: mild throat irritation resulted from exposures of 28 mg/m3. levels above 140 mg/m3 resulted in more marked irritation, with levels of more than 250 mg/m3 being unbreathable. these levels are only reached at elevated temperatures. SKIN: may cause mild irritation if not promptly removed. Eyes: accidental eye contact with concentrated ethylene glycol resulted in extreme swelling of the eye, cloudy vision and slow response to light. these symptoms lasted a month. INGESTION: may cause symptoms in the nervous system, heart, lungs and kidneys. earliest effects are usually felt in the nervous system between 1/2 to 12 hours after ingestion. symptoms from 1 liquid ounce may include nausea, vomiting, dizziness, loss of coordination and abdominal pain. large amounts may cause stupor, coma, convulsions and death. survival of this stage may lead to development of rapid heart beat, enlarged heart and fluid in the lungs which, too, can lead to death usually after 1 to 3 days. some individuals who drank 3 to 4 fluid ounces who survived both the above stages because of prompt medical treatment, later (3 to 17 days) died of kidney failure.(NYDH)

LONG TERM TOXICITY: occupational exposure to heated ethylene glycol has caused involuntary eye movement that may indicate nerve damage. some individuals also reported attacks of unconsciousness lasting 5 to 10 minutes which went away when they stopped working with ethylene glycol.(NYDH)

TARGET ORGANS: eyes, skin, resp system

SYMPTOMS: Inhalation of vapor is not hazardous. Ingestion causes stupor or coma, sometimes leading to fatal kidney injury. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = C 50ppm(C 127 mg/M3) VAPOR AND MIST
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
CEILING = 50 ppm (125 mg/M3)

MAK INFORMATION: 10 ppm
26 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-chd TDLo:5500 mg/kg PGMJAO 52,598,76
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Respiratory stimulation
KIDNEY,URETER,BLADDER
Other changes

orl-hmn LDLo:786 mg/kg EJTXAZ 9,373,76
BEHAVIORAL
Convulsions or effect on seizure threshold
BEHAVIORAL
Coma
GASTROINTESTINAL
Hypermotility,diarrhea

orl-hmn LDLo:398 mg/kg SMEZA5 26(2),48,83

BEHAVIORAL
Headache
GASTROINTESTINAL
Nausea or vomiting
LIVER
Other changes

ihl-hmn TCLo:10000 mg/m3 AGGHAR 5,1,33
SENSE ORGANS
Eye
Lacrimation
LUNGS, THORAX, OR RESPIRATION
Cough
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:4700 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4700 mg/kg
ihl-rat LC :>198 mg/m3
ipr-rat LD50:5010 mg/kg
scu-rat LD50:2800 mg/kg
ivn-rat LD50:3260 mg/kg
ims-rat LDLo:3300 mg/kg
unr-rat LD50:13 gm/kg
orl-mus LD50:7500 mg/kg
ipr-mus LD50:5614 mg/kg
scu-mus LDLo:2700 mg/kg
ivn-mus LD50:3 gm/kg
unr-mus LD50:8050 mg/kg
orl-dog LD50:5500 mg/kg
orl-cat LD50:1650 mg/kg
scu-cat LDLo:2000 mg/kg
skn-rbt LD50:9530 mg/kg
ipr-rbt LDLo:1 gm/kg
ivn-rbt LDLo:5 gm/kg
ims-rbt LDLo:5500 mg/kg
unr-rbt LD50:5017 mg/kg
orl-gpg LD50:6610 mg/kg
scu-gpg LDLo:5 gm/kg
unr-gpg LD50:11150 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:50 gm/kg (6-15D preg) TXAPA9 81,113,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Skin and skin appendages
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

orl-rat TDLo:8580 mg/kg (6-15D preg) CHYCDW 20,289,86
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:12500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:25 gm/kg (6-15D preg) NTIS** PB85-104594
MATERNAL EFFECTS
Uterus,cervix,vagina
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-rat TDLo:50 gm/kg (6-15D preg) NTIS** PB85-104594
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:7500 mg/kg (6-15D preg) TXAPA9 81,113,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:7500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:84 gm/kg (1-21D preg/21D post) TOXID9 4,136,84
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN

Delayed effects

orl-mus TDLo:88720 mg/kg (7-14D preg) EVHPAZ 57,141,84
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON NEWBORN
Stillbirth
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: CHRIS Manual 1991
INGESTION: induce vomiting and call a physician.
SKIN AND
EYES: flush with water.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Water fog, alcohol foam, carbon dioxide, or dry chemical. Note: Water or foam may cause frothing. CHRIS91

No DOT Guide information for this compound.
DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 247 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: LEAD

SYNONYMS: C.I. PIGMENT METAL 4; C.I. 77575; KS-4; LEAD FLAKE; LEAD S2; OLOW (Polish); SI; SO

CAS: 7439-92-1 RTECS: OF7525000

FORMULA: Pb MOL WT: 207.19

WLN: PB

CHEMICAL CLASS: Metal

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: bluish-grey, soft metal; heavy ductile, soft, gray solid

BOILING POINT:	2013 K	1739.8 C	3163.7 F
MELTING POINT:	600.6 K	327.4 C	621.4 F

FLASH POINT: Not available

AUTO IGNITION: Not available

VAPOR PRESSURE: 1mm @ 973 C

UEL: ~

LEL: ~

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 11.34

DENSITY: 11.34 g/mL @ 20 C

WATER SOLUBILITY: INSOLUBLE; DISSOLVES SLOWLY IN WATER CONTAINING A WEAK ACID

INCOMPATIBILITIES: strong ox, hydrogen peroxide, active metals, sodium, potassium, chlorine trifluoride, hydrogen peroxide, zirconium, disdium acetylide, oxidants

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: RELATIVELY IMPENETRABLE TO RADIATION

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: WHEN HEATED EMITS HIGHLY TOXIC FUMES; CAN REACT VIGOROUSLY WITH OXIDIZING MATERIALS

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

National Primary Ambient Air Quality Standards
1.5 ug/M3 maximum arithmetic mean averaged over a calendar year
National Secondary Ambient Air Quality Standards
same as primary standard

DOT hazard class:	6.1 POISON
DOT guide:	53
Identification number:	UN2291
DOT shipping name:	LEAD COMPOUNDS, SOLUBLE, N.O.S.
Packing group:	III
Label(s) required:	KEEP AWAY FROM FOOD
Special provisions:	
Packaging exceptions:	173.153
Non bulk packaging:	173.213
Bulk packaging:	173.240
Quantity limitations-	
Passenger air/rail:	100 KG
Cargo aircraft only:	200 KG
Vessel stowage:	A
Other stowage provisions:	

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:No
National Primary Drinking Water Regulations
  Maximum Contaminant Levels (MCL): Treatment technique (12/07/92)
  Maximum Contaminant Level Goals (MCLG): 0 mg/L (12/07/92)
CLEAN AIR ACT: CAA '90 By category and CAA '77 Sect 109
EPA WASTE NUMBER: D008
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Chronic toxicity: carcinogen
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-B
Mailability: Domestic service and air transportation; shipper's declaration
Max per parcel: 25 LBS; 5 LBS

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Developmental Toxin List
California Proposition 65 Female Reproductive Toxin List
California Proposition 65 Male Reproductive Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 109 National Ambient Air Quality Standards List
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
LEAD [7439-92-1]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a teratogen.
'A Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Specifically regulated substance. See 29 CFR 1910.1025
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: LASSITUDE, INSOMNIA, PALLOR, EYE GROUNDS, ANOREXIA, LOW-WEIGHT, MALNUTRITION, CONSTIPATION, ABDOMINAL PAIN, COLIC; HYPOTENSE, ANEMIA; GINGIVAL LEAD LINE; TREMBLING PARALYSIS WRIST. ** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS: gi,CNS,kidneys,blood,gingival tissue

SYMPTOMS: LASS, INSOM, PAL, EYE GROUNDS, ANOR, LOW-WT, MALNUT, CONSTI, ABDOM PAIN, COLIC; HYPOTENSE, ANEMIA, GINGIVAL LEAD LINE; TREM, PARA WRIST. METALLIC TASTE, INCREASED SALIVATION, PYORRHEA (FLOW OF MUCOUS). NEUROMUSCULAR: NUMBNESS AND TINGLING OF EXTREMITIES WITH SENSORY

DISTRUBANCE, EXTENSOR WEAKNESS OF WRISTS AND ANKLES, LOSS OF MUSCLE TONE, TREMOR INCREASED DEEP-TENDON REFLEXES, MUSCULAR CRAMPS AND ACHING, MUSCULAR ATROPHY. CNS: VISUAL DISTURBANCES, HEADACHE, NERVOUSNESS OF DEPRESSION, INSOMNIA, MENTAL CONFUSION, DELIRIUM. Source: NIOSHP, THIC

CONC IDLH: 700mg/M3

NIOSH REL: <0.1 mg/M3 Air level to be maintained so that worker blood level remains <0.06 mg/100 g of whole blood

ACGIH TLV: TLV = 0.15mg/M3 as LEAD
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = See 29 CFR 1910.1025 and 1926.62
50 ug/M3

MAK INFORMATION: 0.1 mG/M3
Substance with systemic effects, onset of effect over 2 hours: Peak = 10xMAK for 30 minutes, once per shift of 8 hours.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL
Hallucinations, distorted perceptions
BEHAVIORAL
Muscle weakness

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

ipr-rat LDLo:1 gm/kg
orl-pgn LDLo:160 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:790 mg/kg (multigenerations) AEHLAU 23,102,71
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-rat TDLo:1140 mg/kg (14D pre-21D post) PHMCAA 20,201,78
EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:520 mg/kg (7-22D preg/10D post) FEPRA7 37,394,78
EFFECTS ON NEWBORN

orl-rat TDLo:1100 mg/kg (1-22D preg) FEPRA7 37,895,78
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:10 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-rat TCLo:3 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON NEWBORN

orl-mus TDLo:1120 mg/kg (multigenerations) AEHLAU 23,102,71

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:6300 mg/kg (1-21D preg) EXPEAM 31,1312,75
EFFECTS ON FERTILITY
Female fertility index
EFFECTS ON FERTILITY
Pre-implantation mortility

orl-mus TDLo:300 mg/kg (1-2D preg) TXCYAC 6,129,76
EFFECTS ON FERTILITY
Other measures of fertility

orl-mus TDLo:4800 mg/kg (1-16D preg) BECTA6 18,271,77
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

orl-dom TDLo:662 mg/kg (1-21W preg) TXAPA9 25,466,73
EFFECTS ON NEWBORN
Behavioral

California Prop 65: Developmental toxin (02/27/87)
Female reproductive toxin (02/27/87)
Male reproductive toxin (02/27/87)
Acceptable intake level-inhalation .5 ugD (01/01/94)
Carcinogen (10/01/92)

---------- EPA's IRIS DATA SUMMARY ----------
Lead and compounds (inorganic); CASRN 7439-92-1 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Lead and compounds (inorganic)
CASRN -- 7439-92-1
Last Revised -- 05/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for

information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B2; probable human carcinogen

Basis -- Sufficient animal evidence. Ten rat bioassays and one mouse assay have shown statistically significant increases in renal tumors with dietary and subcutaneous exposure to several soluble lead salts. Animal assays provide reproducible results in several laboratories, in multiple rat strains with some evidence of multiple tumor sites. Short term studies show that lead affects gene expression. Human evidence is inadequate.

___II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. There are four epidemiologic studies of occupational cohorts exposed to lead and lead compounds. Two studies (Dingwall-Fordyce and Lane, 1963; Nelson et al., 1982) did not find any association between exposure and cancer mortality. Selevan et al. (1985), in their retrospective cohort mortality study of primary lead smelter workers, found a slight decrease in the total cancer mortality (SMR=95). Apparent excesses were observed for respiratory cancer (SMR=111, obs=41, p>0.05) and kidney cancer (SMR=204, obs=6, p>0.05). Cooper and Gaffey (1975) and Cooper (1985 update) performed a short mortality study of battery plant workers and lead smelter workers. They found statistically significant excesses for total cancer mortality (SMR=113, obs=344), stomach cancer (SMR=168, obs=34), and lung cancer (SMR=124, obs=109) in the battery plant workers. Although similar excesses were observed in the smelter workers, they were not statistically significant. Cooper and Gaffey (1975) felt it was possible that individual subjects were monitored primarily on the basis of obvious signs of lead exposure, while others who showed no symptoms of lead poisoning were not monitored.

All of the available studies lacked quantitative exposure information, as well as information on the possible contribution from smoking. All studies also included exposures to other metals such as arsenic, cadmium, and zinc for which no adjustment was done. The cancer excesses observed in the lung and stomach were relatively small (<200). There was no consistency of site among the various studies, and no study showed any dose-response relationship. Thus, the available human evidence is considered to be inadequate to refute or demonstrate any potential carcinogenicity for humans from lead exposure.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. The carcinogenic potential of lead salts (primarily phosphates and acetates) administered via the oral route or by injection has

been demonstrated in rats and mice by more than 10 investigators. The most characteristic cancer response is bilateral renal carcinoma. Rats given lead acetate or subacetate orally have developed gliomas, and lead subacetate also produced lung adenomas in mice after i.p. adminstration. Most of these investigations found a carcinogenic response only at the highest dose. The lead compounds tested in animals are almost all soluble salts. Metallic lead, lead oxide and lead tetralkyls have not been tested adequately. Studies of inhalation exposure have not been located in the literature.

Azar et al. (1973) administerd 10, 50, 100, and 500 ppm lead as lead acetate in dietary concentrations to 50 rats/sex/group for 2 years. Control rats (100/sex) received the basal laboratory diet. In a second 2-year feeding study, 20 rats/group were given diets containing 0, 1000, and 2000 ppm lead as lead acetate. No renal tumors were reported in the control groups or in treated animals of either sex receiving 10 to 100 ppm. Male rats fed 500, 1000, and 2000 ppm lead acetate had an increased renal tumor incidence of 5/50, 10/20, and 16/20, while 7/20 females in the 2000-ppm group developed renal tumors.

The Azar et al. (1973) study is limited by the lack of experimental detail. The possibility of environmental contamination from lead in the air or drinking water was not mentioned. The strains of rats used were not specified in the study, but the Health Effects Assessment for Lead (U.S. EPA, 1984) indicates the rats were Wistar strain. The weight gain at 1000 and 2000 ppm was reported to be depressed, but details were not given.

Kasprzak et al. (1985), in investigating the interaction of dietary calcium on lead carcinogenicity, fed 1% lead subacetate (8500 ppm Pb) to male Sprague-Dawley rats in the diet for 79 weeks. Of the rats surviving (29/30) in this treatment group beyond 58 weeks, 44.8% had renal tumors. Four rats had adenocarcinomas; the remainaing nine had adenomas. Bilateral tumors were noted. No renal tumors were noted among the controls.

As part of a study to determine interactions between sodium nitrite, ethyl urea and lead, male Sprague-Dawley rats were given lead acetate in their drinking water for 76 weeks (Koller et al., 1986). The concentration of lead was 2600 ppm. No kidney tumors were detected among the 10 control rats. Thirteen of 16 (81%) lead-treated rats had renal tubular carcinoma; three tumors were detected at 72 weeks and the remainder detected at the termination of the study.

Van Esch and Kroes (1969) fed basic lead acetate at 0, 0.1%, and 1.0% in the diet to 25 Swiss mice/sex/group for 2 years. No renal tumors developed in the control group, but 6/25 male mice of 0.1% basic lead acetate group had renal tumors (adenomas and carcinomas combined). In the 1.0% group, one female had a renal tumor. The authors thought that the low incidence in the 1.0% group was due to early mortality.

Hamsters given lead subacetate at 0.5% and 1% in the diet had no significant renal tumor response (Van Esch and Kroes, 1969).

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Lead acetate induces cell transformation in Syrian hamster embryo cells (DiPaolo et al., 1978) and also enhances the incidence of simian adenovirus induction. Lead oxide showed similar enhanced adenovirus induction (Casto et al., 1979).

Under certain conditions lead compounds are capable of inducing chromosomal aberrations in vivo and in tissue cultures. Grandjean et al. (1983) showed a relationship between SCE and lead exposure in exposed workers. Lead has been shown, in a number of DNA structure and function assays, to affect the molecular processes associated with the regulation of gene expression (U.S. EPA, 1986).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

Quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release, and excretion of lead. In addition, current knowledge of lead pharmacokinetics indicates that an estimate derived by standard procedures would not truly describe the potential risk. Thus, the Carcinogen Assessment Group recommends that a numerical estimate not be used.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1984. Health Effects Assessment for Lead. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/055. NTIS PB85-163996/AS.

U.S. EPA. 1986. Air Quality Criteria Document for Lead. Volumes III, IV.

Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC, for the Office of Air Quality Planning and Standards. EPA-600/8-83/028dF.

U.S. EPA. 1987. Preliminary review of the carcinogenic potential of lead associated with oral exposure. Prepared by the Office of Health and Environmental Assessment, Carcinogenic Assessment Group, Washington DC, for the Office of Drinking Water, Office of Solid Waste and the Office of Emergency and Remedial Response (Superfund). OHEA-C-267. Internal Review Draft.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The review of the carcinogenic potential of lead associated with oral exposure has received Agency review.

The 1986 Air Quality Criteria Document for Lead has received Agency and External Review.

Agency Work Group Review: 05/04/88

Verification Date: 05/04/88

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

William Pepelko / ORD -- (202)260-5898 / FTS 260-5898

James Cogliano / ORD -- (202)260-9243 / FTS 260-9243

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
At the end of each work shift.

** REMOVE CLOTHING:

Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

COMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (LEAD)
Not in excess of 0.5 mg/M3: Half-mask, air-purifying respirator equipped with high efficiency filters.
Not in excess of 2.5 mg/M3: Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 50 mg/M3: (1) Any powered, air-purifying respirator with high efficiency filters; or (2) Half-mask supplied-air respirator operated in positive-pressure mode.
Not in excess of 100 mg/M3: Supplied air respirator with full facepiece hood, or helmet or suit and operated in positive pressure mode.
Unknown concentration or Firefighting: Full facepiece, self-contained breathing apparatus operated in postive-pressure mode.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap flush promptly
INHALATION: art resp
INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: LEAD COMPOUNDS, SOLUBLE, N.O.S.
DOT ID NUMBER: UN2291

ERG93 GUIDE 53

POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if swallowed.
Inhalation of dust or mist may be poisonous.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water

pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 59 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: BENZENE

SYNONYMS: BENZOL; COAL TAR NAPHTHA; CYCLOHEXATRIENE; PHENYL HYDRIDE; PHENE; COAL NAPHTHA; PYROBENZOL

CAS: 71-43-2 RTECS: CY1400000

FORMULA: C6H6 MOL WT: 78.11

WLN: RH

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless to pale yellow watery liquid with a gasoline-like odor

BOILING POINT:	353.15 K	80 C	176 F
MELTING POINT:	278.71 K	5.5 C	42 F
FLASH POINT:	262 K	-11.15 C	11.9 F
AUTO IGNITION:	864.8 K	591.6 C	1097 F
CRITICAL TEMP:	562.1 K	288.95 C	552.11 F
CRITICAL PRESS:	4.89 kN/M2	48.2 atm	708 psia
HEAT OF VAP:	169 Btu/lb	93.85 cal/g	3.927x E5 J/kg
HEAT OF COMB:	-17460 Btu/lb	-9707 cal/g	-406x E5 J/kg

VAPOR PRESSURE: 75 mm @ 20 C

UEL: 7.1 %

LEL: 1.3 %

IONIZATION POTENTIAL (eV): 9.25

VAPOR DENSITY: 2.77 (air=1)

EVAPORATION RATE: 3.50(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.86-0.88 20 C

DENSITY: 0.8794 @ 20 C

WATER SOLUBILITY: 0.06%

INCOMPATIBILITIES: strong ox,chlorine,bromine with iron

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS(Br2, F2, CL2, CrO3, NaClO4, O2, O3), PERCHLORATES (AlCl3 +NaClO4), (H2SO4 & PERMANGANATES), K2O2, (AgClO4 & ACETIC ACID), Na2O2 Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: VAPOR IS HEAVIER THAN AIR AND MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.

ODOR DETECTED AT (ppm): 4.68 ppm
ODOR DESCRIPTION: odor; characteristic odor Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1114
DOT shipping name: Benzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T8
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:40

STCC NUMBER: 4908110

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.005 mg/L (01/09/89)
Maximum Contaminant Level Goals (MCLG): 0 mg/L (01/09/89)
CLEAN AIR ACT: CAA '90 Listed and CAA '77 Sect 109
EPA WASTE NUMBER: U019,D018,D001
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: carcinogen
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/89/209464/AS)
BENZENE [71-43-2]
California OSHA Carcinogens List.
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act Section 112 Hazardous Air Pollutants List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
National Toxicology Program (NTP) list of human carcinogens
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
New Jersey Right to Know Substance List. Listed as a mutagen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
OSHA Specifically regulated substance. See 29 CFR 1910.1028
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Suspected carcinogen (ACGIH). "Threshold Limit Values for 1992-1993"
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: benzene may produce both nerve and blood effects. irritation of the nose, throat and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). lung congestion may occur. nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness and slurred speech. at high levels, slowed breathing and death may result. death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes. SKIN: irritation may occur, with redness and blistering if not promptly removed. benzene is poorly absorbed. whole body exposure for 30 minutes has been reported with no health effects. Eyes: may cause severe irritation. INGESTION: may cause irritation of mouth, throat and stomach. symptoms are similar to those listed under inhalation. one tablespoon may cause collapse, bronchitis, pneumonia and death.(NYDH)

LONG TERM TOXICITY: may cause loss of appetite, nausea, weight loss, fatigue, muscle weakness, headache, dizziness, nervousness and irritability. mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. at levels between 100 and 200 ppm for periods of 6 months, or more, severe irreversible blood changes and damage to liver and heart may occur. temporary partial paralysis has been reported.(NYDH)

TARGET ORGANS: blood, CNS, skin, bone marrow, eyes, resp sys

SYMPTOMS: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: Potential occupational carcinogen 0.1 ppm Time weighted averages for 8-hour exposure 0.32 mg/M3 Time weighted averages for 8-hour exposure 1 ppm Ceiling exposures which shall at no time be exceeded 3.2 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 10ppm Suspected human carcinogen (A2)
ACGIH STEL: Suspected human carcinogen (A2)

OSHA PEL: Final Rule Limits:
TWA = 1 ppm
STEL = 5 ppm
CONSULT 29CFR 1910.1028

MAK INFORMATION: Danger of cutaneous absorption
Carcinogenic working material without MAK
Capable of inducing malignant tumors as shown by

experience with humans.
Substances which has been demonstrated to cause genetic damage in mammalian (including human) germ cells without proof of transmission.

CARCINOGEN?: Y STATUS: See below
REFERENCES:

HUMAN SUSPECTED IARC** 7,203,74
HUMAN SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 29,93,82
HUMAN POSITIVE IARC** 29,93,82
ANIMAL INDEFINITE IARC** 7,203,74

CARCINOGEN LISTS:

IARC: Carcinogen as defined by IARC as carcinogenic to humans, with sufficient epidemiological evidence.
MAK: Capable of inducing malignant tumors as shown by experience in humans.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as known to be carcinogenic, with evidence from human studies.
ACGIH: Carcinogen defined by ACGIH TLV Committee as a confirmed human carcinogen, recognized to have carcinogenic or cocarcinogenic potential.
OSHA: Cancer hazard

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* ihl-hmn LCLo:2 pph/5M TABIA2 3,231,33

* orl-man LDLo:50 mg/kg YAKUD5 22,883,80

* ihl-hmn LCLo:2000 ppm/5M YAKUD5 22,883,80

ihl-man TCLo:150 ppm/1Y-I BLUTA9 28,293,74
BLOOD
Other changes
NUTRITIONAL AND GROSS METABOLIC
Changes in:
Body temperature increase

ihl-hmn TCLo:100 ppm INMEAF 17,199,48
BEHAVIORAL
Somnolence(general depressed activity)
GASTROINTESTINAL
Nausea or vomiting

SKIN AND APPENDAGES
Skin - after systemic exposure
Dermatitis,other

ihl-hmn LCLo:65 mg/m3/5Y ARGEAR 44,145,74
BLOOD
Other changes

LD50 value: orl-rat LD50:930 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:930 mg/kg
ihl-rat LC50:10000 ppm/7H
ipr-rat LD50:2890 ug/kg
orl-mus LD50:4700 mg/kg
ihl-mus LC50:9980 ppm
ipr-mus LD50:340 mg/kg
orl-dog LDLo:2 gm/kg
ihl-dog LCLo:146000 mg/m3
ihl-cat LCLo:170000 mg/m3
ihl-rbt LCLo:45000 ppm/30M
skn-rbt LD50:>9400 mg/kg
ivn-rbt LDLo:88 mg/kg
skn-gpg LD50:>9400 mg/kg
ipr-gpg LDLo:527 mg/kg
scu-frg LDLo:1400 mg/kg
ihl-mam LCLo:20000 ppm/5M
ipr-mam LDLo:1500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:670 mg/m3/24H (15D pre/1-22D preg) HYSAAV 33(1-3),327,68
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:56600 ug/m3/24H (1-22D preg) HYSAAV 33(7-9),112,68
EFFECTS ON NEWBORN

ihl-rat TCLo:50 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:150 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON FERTILITY
Post-implantation mortality
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:12 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:6500 mg/kg (8-12D preg) TCMUD8 6,361,86
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-mus TCLo:500 ppm/7H (6-15D preg) AIHAAP 40,993,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:500 mg/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:5 ppm (6-15D preg) TXCYAC 42,171,86
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-mus TCLo:20 ppm/6H (6-15D preg) FAATDF 10,224,88
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ipr-mus TDLo:5 mg/kg (1D male) TPKVAL 15,30,79
EFFECTS ON FERTILITY
Pre-implantation mortility
EFFECTS ON EMBRYO OR FETUS
Fetal death

ipr-mus TDLo:219 mg/kg (14D preg) EMMUEG 18,1,91
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and

marrow)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Hapatobilinary system

scu-mus TDLo:1100 mg/kg (12D preg) TOXID9 1,125,81
EFFECTS ON EMBRYO OR FETUS
Other effects on embryo or fetus

scu-mus TDLo:7030 mg/kg (12-13D preg) SEIJBO 15,47,75
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ivn-mus TDLo:13200 ug/kg (13-16D preg) ICHUDW 4(6),24,82
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

par-mus TDLo:4 gm/kg (12D preg) NEZAAQ 25,438,70
EFFECTS ON NEWBORN
Weaning or lactation index(#alive at weaning per # alive at day 4)

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON FERTILITY
Abortion
EFFECTS ON EMBRYO OR FETUS
Fetal death

California Prop 65: Carcinogen (02/27/87)
No significant risk level 7. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------

Benzene; CASRN 71-43-2 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Benzene
CASRN -- 71-43-2
Last Revised -- 04/01/92

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood

that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- A; human carcinogen

Basis -- Several studies of increased incidence of nonlymphocytic leukemia from occupational exposure, increased incidence of neoplasia in rats and mice exposed by inhalation and gavage, and some supporting data form the basis for this classification.

II.A.2. HUMAN CARCINOGENICITY DATA

Aksoy et al. (1974) reported effects of benzene exposure among 28,500 Turkish workers employed in the shoe industry. Mean duration of employment was 9.7 years (1-15 year range) and mean age was 34.2 years. Peak exposure was reported to be 210-650 ppm. Twenty-six cases of leukemia and a total of 34 leukemias or preleukemias were observed, corresponding to an incidence of 13/100,000 (by comparison to 6/100,000 for the general population). A follow-up paper (Aksoy, 1980) reported eight additional cases of leukemia as well as evidence suggestive of increases in other malignancies.

In a retrospective cohort mortality study Infante et al. (1977a,b) examined leukemogenic effects of benzene exposure in 748 white males exposed while employed in the manufacturing of rubber products. Exposure occurred from 1940-1949, and vital statistics were obtained through 1975. A statistically significant increase (p less than or equal to 0.002) of leukemias was found by comparison to the general U.S. population. There was no evidence of solvent exposure other than benzene. Air concentrations were generally found to be below the recommended limits in effect during the study period.

In a subsequent retrospective cohort mortality study Rinsky et al. (1981) observed seven deaths from leukemia among 748 workers exposed to benzene and followed for at least 24 years (17,020 person-years). This increased incidence was statistically significant; standard mortality ratio (SMR) was 560. For the five leukemia deaths that occurred among workers with more than 5 years exposure, the SMR was 2100. Exposures (which ranged from 10-100 ppm

8-hour TWA) were described as less than the recommended standards for the time period of 1941-1969.

In an updated version of the Rinsky et al. (1981) study, the authors followed the same cohort to 12/31/81 (Rinsky et al., 1987). An in his earlier study, cumulative exposure was derived from historic air-sampling data or interpolated estimates based on exisitng data. Standardized mortality rates ranged from 109 at cumulative benzene exposures under 40 ppm-years and increased montonically to 6637 (6 cases) at 400 ppm-years or more. The authors found significantly elevated risks of leukemia at cumulative exposures less than the equivalent current standard for occupational exposure which is 10 ppm over a 40-year working lifetime.

Ott et al. (1978) observed three deaths from leukemia among 594 workers followed for at least 23 years in a retrospective cohort mortality study, but the increase was not statistically significant. Exposures ranged from <2 to >25 ppm 8-hour TWA.

Wong et al. (1983) reported on the mortality of male chemical workers who had been exposed to benzene for at least 6 months during the years 1946-1975. The study population of 4062 persons was drawn from seven chemical plants, and jobs were categorized as to peak exposure. Those with at least 3 days/week exposure (3036 subjects) were further categorizeed on the basis of an 8-hour TWA. The control subjects held jobs at the same plants for at least 6 months but were never subject to benzene exposure. Dose-dependent increases were seen in leukemia and lymphatic and hematopoietic cancer. The incidence of leukemia was responsible for the majority of the increase. It was noted that the significance of the increase is due largely to a less than expected incidence of neoplasia in the unexposed subjects.

Numerous other epidemiologic and case studies have reported an increased incidence or a causal relationship between leukemia and exposure to benzene (IARC, 1982).

___II.A.3. ANIMAL CARCINOGENICITY DATA

Both gavage and inhalation exposure of rodents to benzene have resulted in development of neoplasia. Maltoni and Scarnato (1979) and Maltoni et al. (1983) administered benzene by gavage at dose levels of 0, 50, 250, and 500 mg/kg bw to 30-40 Sprague-Dawley rats/sex for life. Dose-related increased incidences of mammary tumors were seen in females and of Zymbal gland carcinomas, oral cavity carcinomas and leukemias/lymphomas in both sexes.

In an NTP (1986) study, benzene was administered by gavage doses of 0, 50, 100, or 200 mg/kg bw to 50 F344/N rats/sex or 0, 25, 50, or 100 mg/kg bw to 50 B6C3F1 mice/sex. Treatment was 5 times/week for 103 weeks. Significantly increased incidences ($p<0.05$) of various neoplasic growths were seen in both sexes of both species. Both male and female rats and mice had increased incidence of carcinomas of the Zymbal gland. Male and female rats had oral cavity tumors, and males showed increased incidences of skin tumors. Mice of both sexes had increased incidence of lymphomas and lung tumors. Males were

observed to have harderian and preputial gland tumors and females had tumors of mammary gland and ovary. In general, the increased incidence was dose-related.

Slightly increased incidences of hematopoietic neoplasms were reported for male C57Bl mice exposed by inhalation to 300 ppm benzene 6 hours/day, 5 days/week for 488 days. There was no increase in tumor incidence in male AKR or CD-1 mice similarly exposed to 100 ppm or 100 or 300 ppm benzene, respectively. Likewise male Sprague-Dawley rats exposed by inhalation to 300 ppm benzene were not observed to have increased incidence of neoplasia (Snyder et al., 1981).

Maltoni et al. (1983) treated male and female Sprague-Dawley rats in the following manner. Starting at 13 weeks of age rats were exposed to 200 ppm benzene 4 hours/day, 5 days/week for 7 weeks; 200 ppm 7 hours/day, 5 days/week for 12 weeks; 300 ppm 7 hours/day, 5 days/week for 85 weeks. An 8-hour/day TWA for 5 days/week was calculated to be 241 ppm. A statistically significant increase was noted in hepatomas and carcinomas of the Zymbal gland.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Numerous investigators have found significant increases in chromosomal aberrations of bone marrow cells and peripheral lymphocytes from workers with exposure to benzene (IARC, 1982). Benzene also induced chromosomal aberrations in bone marrow cells from rabbits (Kissling and Speck, 1973), mice (Meyne and Legator, 1980) and rats (Anderson and Richardson, 1979). Several investigators have reported positive results for benzene in mouse micronucleus assays (Meyne and Legator, 1980). Benzene was not mutagenic in several bacterial and yeast systems, in the sex-linked recessive lethal mutation assay with Drosophila melanogaster or in mouse lymphoma cell forward mutation assay.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

___II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- 2.9E-2 per (mg/kg)/day

Drinking Water Unit Risk -- 8.3E-7 per (ug/L)

Extrapolation Method -- One-hit (pooled data)

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+2 ug/L

E-5 (1 in 100,000) 1E+1 ug/L
E-6 (1 in 1,000,000) 1E+0 ug/L

___II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

Tumor Type -- leukemia
Test Animals -- human
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

The slope factor was derived from human data for inhalation exposure (see dose-response data for inhalation quantitative estimate). The human respiratory rate was assumed to be 20 cu.m/day and the human drinking water intake was assumed to be 2 L/day. The fraction of the administered dose absorbed systemically via inhalation and via drinking water were assumed to be equal.

___II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study as described in the additional comments section for inhalation data.

The unit risk should not be used if the water concentration exceeds 1E+4 ug/L, since above this concentration the unit risk may not be appropriate.

___II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an adequate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2. Regression models give an estimate similar to the geometric mean.

The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate.

Risk estimates based on animal gavage studies are about 5 times higher than those derived from human data. Pharmacokinetic data which could impact the risk assessment are currently being evaluated.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- 8.3E-6 per (ug/cu.m)

Extrapolation Method -- One-hit (pooled data)

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+1 ug/cu.m
E-5 (1 in 100,000)	1E+0 ug/cu.m
E-6 (1 in 1,000,000)	1E-1 ug/cu.m

II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- leukemia
Test Animals -- humans
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study. The Rinsky data used were from an updated tape which reports one more case of leukemia than was published in 1981. Equal weight was given to cumulative dose and weighted cumulative dose exposure categories as well as to relative and absolute risk model forms. The results of the Wong et al. (1983) study were incorporated by assuming that the ratio of the Rinsky-Ott-Wong studies to the Rinsky-Ott studies for the relative risk cumulative dose model was the same as for other model-exposure category combinations and multiplying this ratio by the Rinsky-Ott geometric mean. The age-specific U.S. death rates for 1978 (the most current year available) were used for background leukemia and total death rates. It should be noted that a recently published paper (Rinsky et al., 1987) reported yet another case of leukemia from the study population.

The unit risk should not be used if the air concentration exceeds 100 ug/cu.m, since above this concentration the unit risk may not be appropriate.

___II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an ade quate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2/ppm. Regression models give an estimate similar to the geometric mean.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Benzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office (Cincinnati, OH) and Carcinogen Assessment Group (Washington, DC), and the Environmental Research Labs (Corvalis, OR; Duluth, MN; Gulf Breeze, FL) for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-018.

U.S. EPA. 1985. Interim Quantitative Cancer Unit Risk Estimates Due to Inhalation of Benzene. Prepared by the Office of Health and Environmental Assessment, Carcinogen Assessment Group, Washington, DC for the Office of Air Quality Planning and Standards, Washington, DC.

U.S. EPA. 1987. Memorandum from J. Orme, HEB, CSD/ODW to C. Vogt, Criteria and Standards Division, ODW, June, 1987.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1985 Interim Evaluation was reviewed by the Carcinogen Assessment Group.

The 1987 memorandum is an internal document.

Agency Work Group Review: 03/05/87, 10/09/87

Verification Date: 10/09/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

D.L. Bayliss / ORD -- (202)260-5726 / FTS 260-5726

R. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
hydrocarbon vapor canister, supplied air or hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.

OSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly wash with soap when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BENZENE)
Less than or equal to 10 ppm: Half-mask air-purifying respirator with organic vapor cartridge.
Less than or equal to 50 ppm: Full facepiece respirator with organic vapor cartridges. / Full facepiece gas mask with chin style canister.
Less than or equal to 100 ppm: Full facepiece powered air-purifying respirator with organic vapor canister.

Less than or equal to 1000 ppm: Supplied air respirator with full facepiece in positive-pressure mode.
Greater than 1000 ppm or Unknown concentration: (1) Self-contained breathing apparatus with full face-piece in positive pressure mode. (2) Full facepiece positive-pressure supplied-air respirator with auxiliary self-contained air supply.
Escape : (1) Any organic vapor gas mask; or (2) Any self-contained breathing apparatus with full facepiece.
Firefighting : Any full facepiece self-contained breathing apparatus operated in positive pressure mode.

FIRST AID SOURCE: NIOSHP
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin.
EYES: flush with plenty of water until irritation subsides.
INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Dry chemical, foam, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Benzene
DOT ID NUMBER: UN1114

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POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 398 LAST UPDATE OF THIS RECORD: 06/03/93

NAME:	TOLUENE		
SYNONYMS:	TOLUOL; PHENYL METHANE; METHYL BENZENE; BENZENE, METHYL-		
CAS:	108-88-3	RTECS:	XS5250000
FORMULA:	C7H8	MOL WT:	92
WLN:	1R		
CHEMICAL CLASS:	Aromatic hydrocarbon		

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless watery liquid with a pleasant odor

BOILING POINT:	383.6 K	110.4 C	230.8 F
MELTING POINT:	178.00 K	-95.2 C	-139.3 F
FLASH POINT:	277.6 K	4.45 C	40 F
AUTO IGNITION:	809 K	535.8 C	996.6 F
CRITICAL TEMP:	591.8 K	318.65 C	605.57 F
CRITICAL PRESS:	4.108 kN/M2	40.5 atm	595 psia
HEAT OF VAP:	155 Btu/lb	86.08 cal/g	3.601x E5 J/kg
HEAT OF COMB:	-17430 Btu/lb	-9690 cal/g	-405x E5 J/kg

VAPOR PRESSURE:	36.7 mm @ 30 C
[illegible]L:	7.1 %
[illegible]:	1.3 %
IONIZATION POTENTIAL (eV):	8.82
VAPOR DENSITY:	3.14 (air=1)
EVAPORATION RATE:	2.00(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY:	0.867 @ 20 C
DENSITY:	0.867
WATER SOLUBILITY:	0.05%
INCOMPATIBILITIES:	strong ox
REACTIVITY WITH WATER:	No data on water reactivity
REACTIVITY WITH COMMON MATERIALS:	No data
STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):	40 PPM
ODOR DESCRIPTION:	STRONG, PLEASANT Source:NYDH
100 % ODOR DETECTION:	No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27
Identification number: UN1294
DOT shipping name: Toluene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909305

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 1 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 1 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U220,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312 categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

Fire hazard: flammable.
Chronic toxicity: carcinogen
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/90/198904/AS)
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Department of Health Services Drinking Water Action List.
California Proposition 65 Developmental Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
TOLUENE [108-88-3]
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 100 ppm exposure can cause dizziness, drowsiness and hallucinations. 100-200 ppm can cause depression. 200-500 ppm can cause headaches, nausea, loss of appetite, loss of energy, loss of coordination and coma. in addition to the above, death has resulted from exposure to 10,000 ppm for an unknown time. SKIN: can cause dryness and irritation. absorption may cause or increase the severity of

symptoms listed above. Eyes: can cause irritation at 300 ppm. INGESTION: can cause a burning sensation in the mouth and stomach, upper abdominal pain, cough, hoarseness, headache, nausea, loss of appetite, loss of energy, loss of coordination and coma.(NYDH)

LONG TERM TOXICITY: levels below 200 ppm may produce headache, tiredness and nausea. from 200 to 750 ppm symptoms may include insomnia, irritability, dizziness, some loss of memory, loss of appetite, a feeling of drunkeness and disturbed menstruation. levels up to 1,500 ppm may cause heart palpitations and loss of coordination. blood effects and anemia have been reported but are probably due to contamination by benzene. most of these effects area believed to go away when exposure stops.(NYDH)

TARGET ORGANS: CNS, liver, kidneys, skin, eyes

SYMPTOMS: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. Source: CHRIS

CONC IDLH: 2000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure 375 mg/M3 Time weighted averages for 8-hour exposure 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 750 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 50ppm(188 mg/M3) Skin
ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 200 PPM; CEILING = 300 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 100 ppm (375 mg/M3)
STEL = 150 ppm(560 mg/M3)

MAK INFORMATION: 50 ppm
190 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 5xMAK for 30 minutes, 2 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

RCINOGEN LISTS:

IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-hmn TCLo:200 ppm JAMAAP 123,1106,43
BRAIN AND COVERINGS
Recordings from specific areas of CNS
BEHAVIORAL
Antipsychotic
BLOOD
Changes in bone marrow not included above

LD50 value: orl-rat LD50:636 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:636 mg/kg
ihl-rat LC50:>26700 ppm/1H
ipr-rat LD50:1332 mg/kg
ivn-rat LD50:1960 mg/kg
unr-rat LD50:6900 mg/kg
ihl-mus LC50:400 ppm/24H
ipr-mus LD50:59 mg/kg
scu-mus LD50:2250 mg/kg
unr-mus LD50:2 gm/kg
ihl-rbt LCLo:55000 ppm/40M
skn-rbt LD50:12124 mg/kg
ivn-rbt LDLo:130 mg/kg
ihl-gpg LCLo:1600 ppm
ipr-gpg LD50:500 mg/kg
scu-frg LDLo:920 mg/kg
ipr-mam LDLo:1750 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:1500 mg/m3/24H (1-8D preg) TXCYAC 11,55,78

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 mg/m3/24H (7-14D preg) FMORAO 28,286,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:800 mg/m3/6H (14-20D preg) BJMRDK 23,533,90
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON NEWBORN
Behavioral

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:15 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:30 gm/kg (6-15D preg) TJADAB 19,41A,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-mus TCLo:500 mg/m3/24H (6-13D preg) TXCYAC 11,55,78
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1000 ppm/6H (2-17D preg) TJEMDR 7,265,82
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:400 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
EFFECTS ON NEWBORN

ihl-mus TCLo:200 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Abortion

ihl-rbt TDLo:100 ppm/6H (6-18D preg) ARTODN 66,373,92
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Cardiovascular(circulatory)system

California Prop 65: Developmental toxin (01/01/91)
Acceptable intake level-inhalation 13000. ugD (01/01/94)
Acceptable intake level-oral intake 7000. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Toluene; CASRN 108-88-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Toluene
CASRN -- 108-88-3
Last Revised -- 08/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classified

Basis -- No human data and inadequate animal data. Toluene did not produce positive results in the majority of genotoxic assays.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

A chronic (106-week) bioassay of toluene in F344 rats of both sexes

reported no carcinogenic responses (CIIT, 1980). A total of 960 rats were exposed by inhalation for 6 hours/day, 5 days/week to toluene at 0, 30, 100, or 300 ppm. Groups of 20/sex/dose were sacrificed at 18 months. Gross and microscopic examination of tissues and organs identified no increase in neoplastic tissue or tumor masses among treated rats when compared with controls. The study is considered inadequate because the highest dose administered was well below the MTD for toluene and because of the high incidence of lesions and pathological changes in the control animals.

Several studies have examined the carcinogenicity of toluene following repeated dermal applications. Toluene (dose not reported) applied to shaved interscapular skin of 54 male mice (strains A/He, C3HeB, SWR) throughout their lifetime (3 times weekly) produced no carcinogenic response (Poel, 1963). One drop of toluene (about 6 mL) applied to the dorsal skin of 20 random-bred albino mice twice weekly for 50 weeks caused no skin papillomas or carcinomas after a 1-year latency period was allowed (Coombs et al., 1973). No increase in the incidence of skin or systemic tumors was demonstrated in male or female mice of three strains (CF, C3H, or CBaH) when toluene was applied to the back of 25 mice of each sex of each strain at 0.05-0.1 mL/mouse, twice weekly for 56 weeks (Doak et al., 1976). One skin papilloma and a single skin carcinoma were reported among a group of 30 mice treated dermally with one drop of 0.2% (w/v) solution toluene twice weekly, administered from droppers delivering 16-20 uL per drop for 72 weeks (Lijinsky and Garcia, 1972). It is not reported whether evaporation of toluene from the skin was prevented during these studies.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Toluene was found to be nonmutagenic in reverse mutation assays with S. typhimurium (Mortelmans and Riccio, 1980; Nestmann et al., 1980; Bos et al., 1981; Litton Bionetics, Inc., 1981; Snow et al., 1981) and E. coli (Mortelmans and Riccio, 1980), with and without metabolic activation. Toluene did not induce mitotic gene conversion (Litton Bionetics, Inc., 1981; Mortelmans and Riccio, 1980) or mitotic crossing over (Mortelmans and Riccio, 1980) in S. cerevisiae. Although Litton Bionetics, Inc. (1981) reported that toluene did not cause increased chromosomal aberrations in bone marrow cells, several Russian studies (Dobrokhotov, 1972; Lyapkalo, 1973) report toluene as effective in causing chromosal damage in bone marrow cells of rats. There was no evidence of chromosomal aberrations in blood lymphocytes of workers exposed to toluene only (Maki-Paakkanen et al., 1980; Forni et al., 1971), although a slight increase was noted in workers exposed to toluene and benzene (Forni et al., 1971; Funes-Craviota et al., 1977). This finding is supported by studies of cultured human lymphocytes exposed to toluene in vitro; no elevation of chromosomal aberrations or sister chromatid exchanges was observed (Gerner-Smidt and Friedrich, 1978).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Toluene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-408.

_ _II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The values in the 1987 Drinking Water Criteria Document for Toluene have received peer and administrative review.

Agency Work Group Review: 09/15/87

Verification Date: 09/15/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

Robert E. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TOLUENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor.

INGESTION: do NOT induce vomiting; call a doctor.
EYES: flush with water for at least 15 min.
SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Toluene
DOT ID NUMBER: UN1294

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive

fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 206 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYL BENZENE

SYNONYMS: AETHYLBENZOL (German); EB; ETHYLBENZEEN (Dutch); ETHYL BENZENE; ETHYL BENZENE (DOT); ETHYLBENZOL; ETILBENZENE (Italian); ETYLOBENZEN (Polish); NCI-C56393; PHENYLETHANE

CAS: 100-41-4 RTECS: DA0700000

FORMULA: C8H10 MOL WT: 106.18

WLN: 2R

CHEMICAL CLASS:Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless liquid with a sweet, gasoline-like odor.

BOILING POINT:	409.2 K	136 C	276.8 F
MELTING POINT:	178.15 K	-95 C	-139 F
FLASH POINT:	294.26 K	21.11 C	69.9 F
AUTO IGNITION:	733 K	459.8 C	859.8 F
CRITICAL TEMP:	617.1 K	343.95 C	651.11 F
CRITICAL PRESS:	3.61 kN/M2	35.5 atm	523 psia
HEAT OF VAP:	144 Btu/lb	79.97 cal/g	3.346x E5 J/kg
HEAT OF COMB:	-17780 Btu/lb	-9885 cal/g	-413x E5 J/kg

VAPOR PRESSURE: 10mm @ 25.9 C

UEL: 6.7 %

LEL: 1.0 %

IONIZATION POTENTIAL (eV): 8.76

VAPOR DENSITY: 3.7 (air=1)

EVAPORATION RATE: 0.84(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.867 20C

DENSITY: 0.866 g/mL @ 20 C

WATER SOLUBILITY: 0.015%

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 140

ODOR DESCRIPTION: AROMATIC Source:CHRIS

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1175
DOT shipping name: Ethylbenzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909163

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.7 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 0.7 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: D001
CERCLA REF: Y
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/19/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYL BENZENE [100-41-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 200 ppm for 30 minutes can cause irritation of the nose and throat, dizziness, difficult breathing and depression. very high levels can cause unconsciousness. SKIN: can cause irritation, inflammation, blisters and burns. Eyes: 200 ppm can cause irritation. higher levels can cause burning, tearing and injury. INGESTION: can cause headache, sleepiness and coma.(NYDH)

LONG TERM TOXICITY: may cause skin rash and irritation of eyes, nose and throat.(NYDH)

TARGET ORGANS: eyes, upper resp sys, skin, CNS

SYMPTOMS: Inhalation may cause irritation of nose, dizziness,

depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. Source: CHRIS

CONC IDLH: 2000PPM

NIOSH REL:

ACGIH TLV: TLV = 100ppm(434 mg/M3)
ACGIH STEL: STEL = 125 ppm(543 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 125 ppm(545 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:100 ppm/8H AIHAAP 31,206,70
SENSE ORGANS
Eye
Other
BEHAVIORAL
Sleep
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:3500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:3500 mg/kg
ihl-rat LCLo:4000 ppm/4H
ihl-mus LDLo:50 gm/m3/2H
ipr-mus LD50:2272 mg/kg
skn-rbt LD50:17800 mg/kg

ihl-gpg LCLo:10000 ppm

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 15 mg/24H open MLD
eye-rbt 100 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:97 ppm/7H (15D pre) NTIS** PB83-208074
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:985 ppm/7H (1-19D preg) NTIS** PB83-208074
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:96 ppm/7H (1-19D preg) NTIS** PB83-208074
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetal death
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:2400 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rbt TCLo:99 ppm/7H (1-18D preg) NTIS** PB83-208074
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Ethylbenzene; CASRN 100-41-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Ethylbenzene
CASRN -- 100-41-4

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- nonclassifiable due to lack of animal bioassays and human studies.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

None. NTP has plans to initiate bioassay. Metabolism and excretion studies at 3.5, 35 and 350 mg/kg are to be conducted as well.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The metabolic pathways for humans and rodents are different (Engstrom et al., 1984). Major metabolites in humans, mandelic acid and phenylglyoxylic acid, are minor metabolites in rats and rabbits (Kiese and Lenk, 1974). The major animal metabolites were not detected in the urine of exposed workers (Engstrom et al., 1984).

Ethylbenzene at 0.4 mg/plate was not mutagenic for Salmonella strains TA98, TA1535, TA1537 and TA1538 with or without Aroclor 1254 induced rat

liver homogenates (S9) (Nestmann et al., 1980). Ethylbenzene was shown to increase the mean number of sister chromatid exchanges in human whole blood lymphocyte culture at the highest dose examined without any metabolic activation system (Norppa and Vainio, 1983).

Dean et al. (1985) used a battery of short-term tests including bacterial mutation assays, mitotic gene conversion in Saccharomyces cerevisiae JD1 in the presence and absence of S9 and chromosomal damage in a cultured rat liver cell line. Ethylbenzene was not mutagenic in the range of concentrations tested (0.2, 2, 20, 50 and 200 ug/plate) for S. typhimurium TA98, TA100, TA1535, TA1537 and TA1538 or for Escherichia coli WP2 and WP2uvrA. Ethylbenzene also showed no response in the S. cerevisiae JD1 gene conversion assay. In contrast, ethylbenzene hydroperoxide showed positive responses with E. coli WP2 at 200 ug/plate in the presence of S9 and an equally significant response with the gene conversion system of yeast.

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-048. NTIS PB 81-117590.

U.S. EPA. 1984. Health Effects Assessment for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/008.

U.S. EPA. 1987. Drinking Water Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Ambient Water Quality Criteria Document and the Health Assessment Document have received Agency and external review. The Drinking Water Criteria Document has been extensively reviewed.

Agency Work Group Review: 10/07/87

Verification Date: 10/07/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Arthur S. Chiu / ORD -- (202)260-6764 / FTS 260-6764

Lynn Papa / ORD -- (513)569-7523 / FTS 684-7523

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
self-contained breathing apparatus; safety goggles.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (ETHYL BENZENE)
1000 ppm: Any powered air-purifying respirator with organic vapor

cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection. / Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration.
INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis.
SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam (most effective), water fog, carbon dioxide or dry chemical. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethylbenzene
DOT ID NUMBER: UN1175

ERG93 GUIDE 26

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies

or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 421 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: XYLENE

SYNONYMS: XYLENE (XYLOL); XYLOL; METHYL TOLUENE; BENZENE, DIMETHYL-; DIMETHYLBENZENE; NCI-C55232; VIOLET 3; XYLOL (DOT); SOCAL AQUATIC SOLVENT 3501

CAS: 1330-20-7 RTECS: ZE2100000

FORMULA: C8H10 MOL WT: 106.18

WLN: 1R X1

CHEMICAL CLASS:Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless liquid with aromatic odor

BOILING POINT:	412 K	138.8 C	281.9 F
MELTING POINT:	247 K	-26.2 C	-15.1 F
FLASH POINT:	300.35-305.35 K	27.2-32.2 C	80.9-89.9 F
AUTO IGNITION:	736.45-802.05 K	463.3-528.9 C	866-984.1 F

VAPOR PRESSURE: 6.7 mm @ 21 C

UEL: 7 %

LEL: 1 %

IONIZATION POTENTIAL (eV): 8.56

VAPOR DENSITY: 3.7 (air=1)

EVAPORATION RATE: 0.77(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.861 20C

DENSITY: 0.861 g/cc or 8.0073 lb/gal

WATER SOLUBILITY: VERY SL SOL

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 0.05

ODOR DESCRIPTION: LIKE BENZENE; CHARACTERISTIC AROMATIC
Source:CHRIS

100 % ODOR DETECTION: 0.4-20 ppm

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27

Identification number: UN1307
DOT shipping name: XYLENES
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909350, 4909351

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 10 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 10 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U239,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
Chronic toxicity: carcinogen
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
lifornia Assembly Bill 1803 Well Monitoring Chemicals.
anadian Domestic Substances List
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
isconsin Air Toxics Control Regulation NR-445 (December 1988)
ENE [1330-20-7]

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: CNS, eyes, gi tract, blood, liver, kidneys, skin

SYMPTOMS: DIZZ, EXCITEMENT, DROW, INCO, STAGGERING GAIT, IRRIT EYES, NOSE, THROAT, CORNEAL VACUOLIZATION, ANOREXIA, NAU, VOMIT, ABDOM PAIN; DERM Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure 434 mg/M3 Time weighted averages for 8-hour exposure 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 868 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 100ppm(434 mg/M3)

ACGIH STEL: STEL = 150 ppm(651 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 150 ppm(655 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-man LCLo:10000 ppm/6H BMJOAE 3,442,70
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Cyanosis
BLOOD
Other changes

LD50 value: orl-rat LD50:4300 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4300 mg/kg
ihl-rat LC50:5000 ppm/4H
ipr-rat LD50:2459 mg/kg
scu-rat LD50:1700 mg/kg
ipr-mus LD50:1548 mg/kg
ivn-rbt LDLo:129 mg/kg
ihl-gpg LCLo:450 ppm
ipr-gpg LDLo:2 gm/kg
ipr-mam LDLo:2 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:250 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Other developmental abnormalities
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) PCBRD2
163B,295,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:20600 ug/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:31 mg/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:4000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN
Physical

ihl-mus TCLo:2000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1 gm/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Xylenes; CASRN 1330-20-7 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Xylenes
CASRN -- 1330-20-7
Last Revised -- 03/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- Orally administered technical xylene mixtures did not result in significant increases in incidences in tumor responses in rats or mice of both sexes.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. In an NTP (1986) study, 50 male and 50 female F344/N rats were treated by gavage with mixed xylenes in corn oil (60% m-xylene, 14% p-xylene, 9% o-xylene and 17% ethylbenzene) at dosages of 0, 250 or 500 mg/kg/day, 5 days/week for 103 weeks. Similarly, 50 male and 50 female B6C3F1 mice were treated with the same xylene mixture at dosages of 0, 500 or 1000 mg/kg/day. Animals were killed and examined histologically when moribund or after 104-105 weeks. An apparent dose-related increased mortality was observed in male rats, but this difference was statistically significant for the high dose group, only. No other differences in survival between dosage groups of either sex were observed. Interstitial cell tumors of the testes could not be attributed to administration of the test compound observed in male rats (43/50 control, 38/50 low-dose and 41/49 high-dose). NTP (1986) reported that there were no significant changes in the incidence of neoplastic or nonneoplastic lesions in either the rats or mice that could be considered related to the mixed xylene treatment, and concluded that under the conditions of these 2-year gavage studies, there was "no evidence of carcinogenicity" of xylene (mixed) for rats or mice of either sex at any dosage tested.

Maltoni et al. (1985), in a limited study, reported higher incidences (compared with controls) of malignant tumors in male and female Sprague-Dawley rats treated by gavage with xylene in olive oil at 500 mg/kg/day, 4 or 5 days/week for 104 weeks. This study did not report survival rates or specific tumor types; therefore, the results cannot be interpreted.

Berenblum (1941) reported that "undiluted" xylene applied at weekly intervals produced one tumor-bearing animal out of 40 after 25 weeks in skin-painting experiments in mice. No control groups were described. Pound (1970) reported negative results in initiation-promotion experiments with xylene as the initiator and croton oil as the promotor.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The frequency of sister chromatid exchanges and chromosomal aberrations were nearly identical between a group of 17 paint industry workers exposed to xylene and their respective referents (Haglund et al., 1980). In vitro, xylene caused no increase in the number of sister chromatid exchanges in human lymphocytes (Gerner-Smidt and Friedrich, 1978). Studies indicate that xylene isomers, technical grade xylene or mixed xylene are not mutagenic in tests with Salmonella typhimurium (Florin et al., 1980; NTP, 1986; Bos et al., 1981) nor in mutant reversion assays with Escherichia coli (McCarroll et al., 1981). Technical grade xylene, but not o- and m-xylene, was weakly mutagenic in Drosophila recessive lethal tests. Chromosomal aberrations were not increased in bone marrow cells of rats exposed to xylenes by inhalation (Donner et al., 1980).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Xylene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-416. Final.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Drinking Water Criteria Document for Xylene has received Agency and external review.

Agency Work Group Review: 12/02/87

Verification Date: 12/02/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Bruce Mintz / ODW -- (202)260-9569 / FTS 260-9569

W. Bruce Peirano / ORD -- (513)569-7540 / FTS 684-7540

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (XYLENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with

running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: XYLENES
DOT ID NUMBER: UN1307

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 5249 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYLENE, TETRACHLORO-

SYNONYMS: ANKILOSTIN; ANTISOL 1; CARBON BICHLORIDE; CARBON DICHLORIDE; CZTEROCHLOROETYLEN (Polish); DIDAKENE; DOW-PER; ENT 1,860; ETHENE, TETRACHLORO-; ETHYLENE TETRACHLORIDE; FEDAL-UN; NCI-C04580; NEMA; PER; PERAWIN; PERC; PERCHLOORETHYLEEN, PER (Dutch); PERCHLOR; PERCHLORAETHYLEN, PER (German); PERCHLORETHYLENE; PERCHLORETHYLENE, PER (French); PERCHLOROETHYLENE; PERCLENE; PERCLOROETILENE (Italian); PERCOSOLVE; PERK; PERKLONE; PERSEC; TETLEN; TETRACAP; TETRACHLOORETHEEN (Dutch); TETRACHLORAETHEN (German); TETRACHLORETHYLENE; TETRACHLOROETHENE; TETRACHLOROETHYLENE; 1,1,2,2,-TETRACHLOROETHYLENE; TETRACHLOROETHYLENE (DOT); TETRACLOROETENE (Italian); TETRALENO; TETRALEX; TETRAVEC; TETROGUER; TETROPIL

CAS: 127-18-4 RTECS: KX3850000

FORMULA: C2Cl4 MOL WT: 165.82

WLN: GYGUYGG

CHEMICAL CLASS: FT

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless liquid, chloroform-like odor.

BOILING POINT:	394.2 K	121 C	249.8 F
MELTING POINT:	249.65 K	-23.5 C	-10.3 F
FLASH POINT:	Not available		
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	15.8MM @ 22C		
UEL:	~		
LEL:	~		
IONIZATION POTENTIAL (eV):	9.32		
VAPOR DENSITY:	No data		
EVAPORATION RATE:	2.59(n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.625 @20/4C		
DENSITY:	1.6311 @ 15/4C		
WATER SOLUBILITY:	QUITE SOLUBLE IN H2O(0.015G/ML @20C), IT IS MISCIBLE WITH MOST ORGANIC SOLVENTS AND OILS.		
INCOMPATIBILITIES:	strong oxidizers, chemically active metals, such as barium, lithium, beryllium, sodium		
REACTIVITY WITH WATER:	No data on water reactivity		
REACTIVITY WITH COMMON MATERIALS:	No data		

STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	HCL AND PHOSGENE\CORROSIVE
ODOR DETECTED AT (ppm):	5 ppm
ODOR DESCRIPTION:	mildly sweet Source:CHRIS
100 % ODOR DETECTION:	No data

---------- REGULATIONS ----------

DOT hazard class:	6.1 POISON
DOT guide:	74
Identification number:	UN1897
DOT shipping name:	Tetrachloroethylene
Packing group:	III
Label(s) required:	KEEP AWAY FROM FOOD
Special provisions:	N36,T1
Packaging exceptions:	173.153
Non bulk packaging:	173.203
Bulk packaging:	173.241
Quantity limitations-	
Passenger air/rail:	60 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	40
STCC NUMBER:	4940355
CLEAN WATER ACT Sect.307:	Yes
CLEAN WATER ACT Sect.311:	No
National Primary Drinking Water Regulations	
Maximum Contaminant Levels (MCL):	0.005 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG):	0 mg/L (07/30/92)
CLEAN AIR ACT:	CAA '90 Listed
EPA WASTE NUMBER:	U210,D039
CERCLA REF:	Y
RQ DESIGNATION:	B 100 pounds (45.4 kg) CERCLA
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: carcinogen Chronic toxicity: adverse effect to target organ after long period of exposure. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-A
Mailability: Domestic service and air transportation; shipper's declaration
: per parcel: 10 GAL; 1 PT

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (0) This material does not readily burn.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/01/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE, TETRACHLORO- [127-18-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: exposures of 200 ppm for 1 hour can cause irritation of the nose, mouth and throat, dizziness,

headaches and lightheadedness; exposures of 1,000 ppm for 30 minutes can cause difficult breathing, weakness, loss of muscle control, irritability, tremors, convulsions, paralysis, coma, heart irregularities and death. SKIN: can cause dry, scaly skin, a mild to moderate burning sensation, redness and inflammation. Eyes: can cause burning and irritation. INGESTION: can cause nausea, vomiting, diarrhea, bloody stool, a reddening of face and neck, weakness and loss of muscle control.(NYDH)

LONG TERM TOXICITY: exposures over 200 ppm during weeks or months can cause irritation of the respiratory tract, nausea, headache, sleeplessness, abdominal pains, constipation, dizziness, increased perspiration, fatigue, skin infection, kidney and liver damage, fluid in the lungs and coma. most of these effects will disappear after exposure is stopped. tetrachloroethylene at high levels has caused cancer and birth defects in mice. whether it causes cancer in humans is unknown.(NYDH)

TARGET ORGANS: skin, mucous membrane, eyes, CNS, gastrointestinal tract. liver, kidneys.

SYMPTOMS: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury. Source: CHRIS

CONC IDLH: 500ppm

NIOSH REL: Potential occupational carcinogen --MINIMIZE EXPOSURE (Limit of quantitation 0.4 ppm)

ACGIH TLV: TLV = 25ppm(170 mg/M3) A3
ACGIH STEL: STEL = 100 ppm(685 mg/M3)»A3

OSHA PEL: Transitional Limits:
PEL = 100 PPM; CEILING = 200 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 25 ppm (170 mg/M3)

MAK INFORMATION: 50 ppm
345 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.
A compound which is justifiably suspected of having

carcinogenic potential.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: A compound which is justifiably suspected of having carcinogenic potential.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as reasonably anticipated to be carcinogenic, with limited evidence in humans or sufficient evidence in experimental animals.
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:96 ppm/7H NTIS** PB257-185
PERIPHERAL NERVE AND SENSATION
Local anesthetic
SENSE ORGANS
Eye
Conjunctive irritation
BEHAVIORAL
Hallucinations, distorted perceptions

orl-chd TDLo:545 mg/kg JTCTDW 23,103,85
BEHAVIORAL
Coma

LD50 value: orl-rat LD50:2629 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2629 mg/kg
ihl-rat LC50:34200 mg/m3/8H
ipr-rat LD50:4678 mg/kg
orl-mus LD50:8100 mg/kg
ihl-mus LC50:5200 ppm/4H
scu-mus LD50:65 gm/kg

orl-dog LDLo:4 gm/kg
ipr-dog LD50:2100 mg/kg
ivn-dog LDLo:85 mg/kg
orl-cat LDLo:4 gm/kg
orl-rbt LDLo:5 gm/kg
scu-rbt LDLo:2200 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 810 mg/24H SEV
eye-rbt 162 mg MLD

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:1000 ppm/24H (14D pre/1-22D preg) APTOD9 19,A21,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 ppm/24H (1-22D preg) APTOD9 19,A21,80
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:900 ppm/7H (7-13D preg) TJADAB 19,41A,79
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN

EFFECTS ON NEWBORN
Behavioral

ihl-rat TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

California Prop 65: Carcinogen (04/01/88)
No significant risk level 14. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Tetrachloroethylene; CASRN 127-18-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Tetrachloroethylene

.s substance/agent has been evaluated by the U.S. EPA for evidence of human carcinogenic potential. This does not imply that this agent is necessarily a carcinogen. The evaluation for this chemical is under review by an inter-office Agency work group. A risk assessment summary will be included on IRIS when the review has been completed.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention.
INGESTION: induce vomiting only on physician's recommendation.
EYES AND
SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give

oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Tetrachloroethylene
DOT ID NUMBER: UN1897

ERG93 GUIDE 74

POTENTIAL HAZARDS

*HEALTH HAZARDS
Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Most vapors heavier than air.
*Air/vapor mixtures may explode when ignited.
Container may explode in heat of fire.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. Remove and isolate contaminated clothing at the site. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical or CO2.
Large Fires: Water spray, fog or regular foam.
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Small Liquid Spills: Take up with sand, earth or other noncombustible absorbent material.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

Use first aid treatment according to the nature of the injury.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 2191 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: CHLORODIPHENYL (54% CHLORINE)

SYNONYMS: AROCHLOR 1254; AROCLOR 1254; CHLORIERTE BIPHENYLE, CHLORGEHALT 54% (German); CHLORODIPHENYL (54% Cl); CLORODIFENILI, CLORO 54% (Italian); DIPHENYLE CHLORE, 54% DE CHLORE (French); NCI-C02664; POLYCHLORINATED BIPHENYL; PCB

CAS: 27323-18-8 RTECS: DV2063000

FORMULA: C12H5Cl3 (APPROX) MOL WT: 326

WLN:

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION:

BOILING POINT:	638.15 K	365 C	689 F
MELTING POINT:	283.15 K	10 C	50 F
FLASH POINT:	495 K	221.85 C	431.3 F
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	0.00006		
[illegible]:	~		
[illegible]:	~		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	No data		
DENSITY:			
WATER SOLUBILITY:	INSOLUBLE		
INCOMPATIBILITIES:	strong oxidizers		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 9 CLASS 9

DOT guide: 31

Identification number: UN2315

DOT shipping name: POLYCHLORINATED BIPHENYLS
Packing group: II
Label(s) required: CLASS 9
Special provisions: 9, N61
Packaging exceptions: 173.155
Non bulk packaging: 173.202
Bulk packaging: 173.241
Quantity limitations-
Passenger air/rail: 100 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions: 34

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307: No
CLEAN WATER ACT Sect.311: No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: None
CERCLA REF: Y
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Chronic toxicity: carcinogen
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin (Prop 65).

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
CHLORODIPHENYL (54% CHLORINE) [27323-18-8]
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: skin, liver, kidneys

SYMPTOMS: IRRIT EYES, SKIN; ACNE-FORM DERM, JAUN; DARK URINE
Source: NIOSHP

CONC IDLH: 5MG/M3

NIOSH REL: Not given

ACGIH TLV: TLV = 0.5mg/M3 SKIN
ACGIH STEL: STEL = 1 mg/M3»SKIN

OSHA PEL: Transitional Limits:
PEL = 0.5mg/M3(SKIN)
Final Rule Limits:
TWA = 0.5 mg/M3(SKIN)

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below
REFERENCES:
HUMAN SUSPECTED IARC** 18,43,78
ANIMAL POSITIVE IARC** 7,261,74
ANIMAL POSITIVE IARC** 18,43,78

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

unr-rat LD50:2450 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated, and imme

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (CHLORODIPHENYL (54% CHLORINE))
Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash immed
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: POLYCHLORINATED BIPHENYLS
ID NUMBER: UN2315

ERG93 GUIDE 31

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Material may be transported hot.
*HEALTH HAZARDS
Contact may cause burns to skin and eyes.
Inhalation of asbestos dust may have a damaging effect on the lungs.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*Do not scatter spilled material with high-pressure water streams.
Dike fire control water for later disposal.
SPILL OR LEAK
Stop leak if you can do it without risk.
Avoid inhalation of asbestos dust.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
Cover powder spill with plastic sheet or tarp to minimize spreading.
*FIRST AID
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

ATTACHMENT B

DIRECTIONS TO EMERGENCY MEDICAL FACILITIES

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

The nearest hospital **and** the nearest facility capable of treating chemical burns are the same facility, which is located at Methodist North Hospital. Therefore, there is only one set of directions.

Nearest Hospital

Methodist North Hospital
3960 Covington Pike
Memphis, Tennessee

Emergency Room Telephone Number - (901) 372-5211

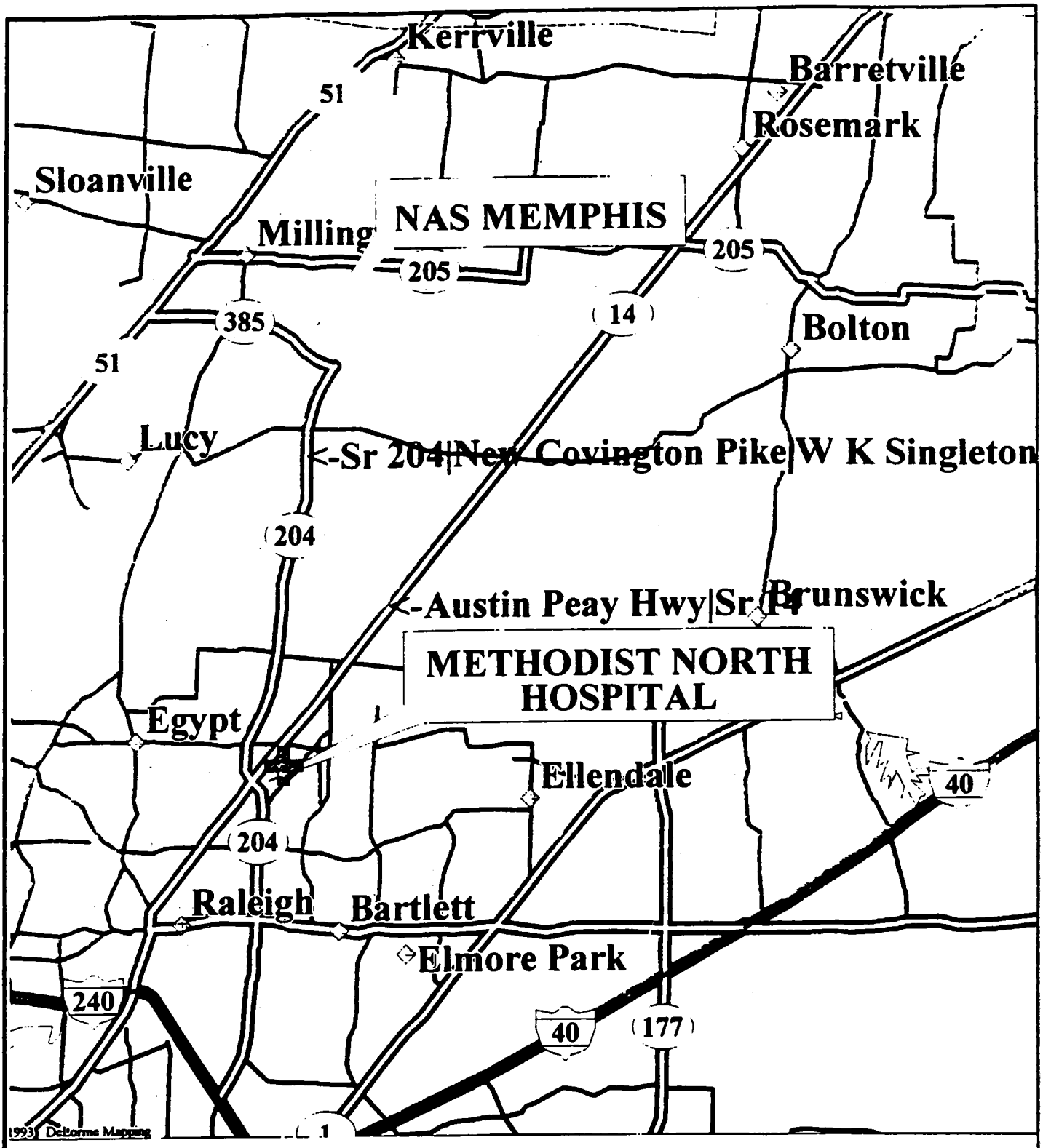
Directions to Methodist North Hospital from NAS Memphis Main Gate:

1) Exit site through South Gate (Singleton Parkway).

2) Continue on Singleton Parkway through the stop signs.

3) Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).

4) You will see the entrance to the emergency room 700 feet past this light on the left.



HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

DIRECTIONS TO THE HOSPITAL

DWG DATE: 10/04/94 | DWG NAME: BOARD

ATTACHMENT C

HEALTH AND SAFETY PLAN FORMS

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project site and returned to: EnSafe/Allen & Hoshall, Memphis, Tennessee.

Job No: 2151-094

Contract No: N62467-89-D-0318

Project: SWMU 15 — N-94 Underground Tank Farm

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

_____

Signed

_____

Print Name

_____

Company

_____

Date

EMPLOYEE EXPOSURE HISTORY FORM

Employee:

Job Name: _____

Date(s) From/To: _____

Hours On Site: _____

Contaminants (Suspected/Reported):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions:

ACCIDENT REPORT FORM

SUPERVISOR'S REPORT OF ACCIDENT	DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS
TO	FROM TELEPHONE (Include area code)
NAME OF INJURED OR ILL WORKER AND COMPANY	
WORKER'S SOCIAL SECURITY NUMBER	

DATE OF ACCIDENT	TIME OF ACCIDENT	EXACT LOCATION OF ACCIDENT

NARRATIVE DESCRIPTION OF ACCIDENT

NATURE OF ILLNESS OR INJURY AND PART OF BODY INVOLVED	LOST TIME YES ☐ NO ☐

PROBABLE DISABILITY (Check one)

FATAL ☐ | LOST WORK DAY WITH ____DAYS AWAY FROM WORK | LOST WORK DAY WITH ____DAYS OF RESTRICTED ACTIVITY | NO LOST WORK DAY ☐ | FIRST-AID ONLY ☐

CORRECTIVE ACTION RECOMMENDED (By whom and by when)

NAME OF SUPERVISOR	TITLE
SIGNATURE	DATE

RFI WORK PLAN
NAS MEMPHIS

SITE INVESTIGATION PLAN
SWMU 21 — N-10 UNDERGROUND WASTE TANK

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

Prepared for:

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

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long Term Environmental Action Navy (CLEAN) Program, the following Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site Investigation Plan (SIP) has been prepared for a confirmatory sampling investigation at SWMU 21, the N-10 Underground Waste Tank, at the Naval Air Station (NAS) Memphis, Millington, Tennessee. The primary reference for this SIP is the *Comprehensive RFI Work Plan* (E/A&H, 1994).

2.0 ENVIRONMENTAL SETTING

SWMU 21 is the former site of a steel, 3,000-gallon waste oil and hydraulic fluid underground storage tank (UST) approximately 200 feet southeast of Building N-9 in the central quadrant of the NAS Memphis Northside. A vicinity map of SWMU 21 is provided in Figure 1. Installed in 1943, the tank reportedly serviced an automobile repair and aircraft maintenance shop once located nearby, although no records were identified which described the design features of the former building or tank. The UST was removed in November 1991, and the site is presently covered with grass. A concrete runway apron is immediately to the northeast and a fenced-in, inactive drum storage area is immediately to the south. Based on the February 17, 1992 UST Closure Report, the tank capacity was originally thought to be 5,000 gallons. The site information obtained during the 1990 RCA Facility Assessment is presented in Appendix A.

2.1 Topography and Drainage

This area has presumably been disturbed by past removal activities but is generally level. The site drains to the southwest into the SWMU 4 storm sewer and drainage ditch, which is approximately 1,000 feet south of SWMU 21. SWMU 4 ultimately empties into North Fork Creek.

2.2 Geologic and Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12, respectively, of the *Comprehensive RFI Work Plan*.

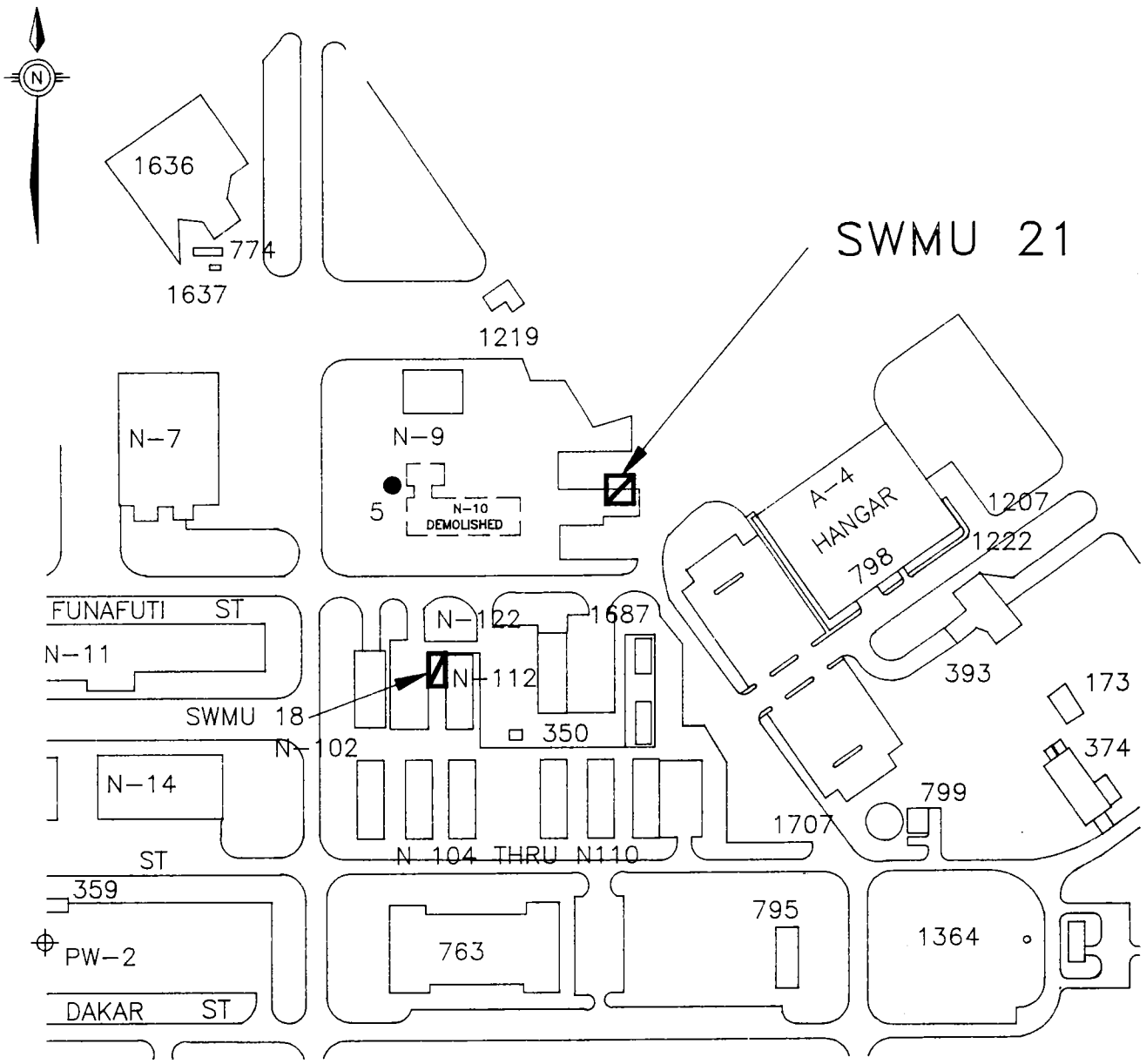
Previous Investigations

Shallow subsurface soil information was reported in the environmental assessment reports (EARs) for three separate UST investigations at sites in the vicinity of SWMU 21. Miscellaneous boring locations and logs from these EARs are presented in Appendix B.

An assessment of two USTs at the former Flying Club (USTs 1205N and 1205S), approximately 1,000 feet west of SWMU 21 (E/A&H, 1993) included collecting soil samples for hydraulic conductivity testing. The laboratory-measured hydraulic conductivities for the silty-clay unit were reported from 1.1×10^{-6} to 3.5×10^{-6} centimeters per second (cm/sec); no conductivity data are available for the underlying silt unit.

Permeability data collected during a UST investigation at Building N-126 (USTs 7, 303, and 1241) (E/A&H, 1993a) indicated an average hydraulic conductivity value of 4.5×10^{-7} cm/sec at a depth of 11 to 13 feet. Building N-126 is approximately 1,500 feet northwest of the site.

A third EAR (E/A&H, 1994) was submitted following the assessment of two USTs (304 and 1239) in the N-94 tank farm, approximately 2,000 feet west of SWMU 21. Soil encountered during this investigation consisted primarily of clayey silts and silty clays, which are part of the surficial loess deposits. Groundwater levels ranged from 6.79 to 13.59 feet below ground surface (bgs). Hydraulic conductivity of site soil in the interval immediately above the water table was reported to be 1.8E-07 cm/sec and 8.4E-07 cm/sec for two Shelby tube samples collected during the investigation. Slug test results indicate the average soil hydraulic conductivity at the site of the two USTs to be 4.48E-03 ft/day.



LEGEND

● STRATIGRAPHIC TEST HOLE

PW-2 ⊕ PRODUCTION WELL

200 0 200

SCALE FEET

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
BUILDING N-10
UNDERGROUND WASTE TANK
SWMU 21

DWG DATE: 04/10/95 | DWG NAME: 94N10UWT

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Stratigraphic Test Borings

United States Geological Survey (USGS) stratigraphic test hole 5, drilled in 1994 just north of Building N-122 (Figure 1), provides lithologic data for the area near SWMU 21. The stratigraphic test hole was advanced a few feet into the top of the Cook Mountain Formation to better understand site lithologies prior to monitoring well installation. The test hole was visually logged by a field geologist during drilling and geophysically logged to its total depth following completion. Stratigraphy and lithologies encountered in the test hole are as follows:

Loess:	Approximately 30 to 40 feet of wind-blown silt deposits (loess). These materials were described as silt and clay.
Fluvial Deposits:	Approximately 45 feet of fluvial deposits. These materials were described as sand and gravel.
Cockfield Formation:	Approximately 115 feet of alternating sand and clay with some lignite.
Cook Mountain Formation:	Characterized as a gray to blue-gray dense clay. Defined as the upper confining unit between the surficial aquifers and the Memphis aquifer. Because the stratigraphic test hole was only advanced twenty feet into the Cook Mountain Formation, the entire thickness is not known.

2.3 Climatological Data

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

3.0 SOURCE CHARACTERIZATION

The 1990 RFA lists various constituents potentially associated with waste oil and hydraulic storage, including heavy petroleum hydrocarbons; volatile organic compounds (VOCs) such as xylene, benzene and toluene; and PCBs. During the N-10 UST removal in 1991, three soil samples were initially collected from the corners of the excavation and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) and total petroleum hydrocarbons (TPH). According

to the UST closure report, no BTEX was detected. However, TPH was detected in two of the soil samples (184 mg/kg and 1,876 mg/kg; action level is 500 mg/kg), which prompted further excavation. After excavating an additional two vertical feet of soil from the floor of the excavation, four closure soil samples were collected from the corners of the excavation and analyzed for BTEX and TPH. No BTEX or TPH were detected in the closure samples. Rainwater which collected in the excavation pit was also sampled and found to be less than 0.05 mg/L, which is below the TPH action level (1.0 mg/L). A copy of the N-10 UST closure report is included in Appendix C.

Field sampling will be performed to confirm or refute the presence of these non-petroleum contaminants (e.g., solvents, metals, PCBs) as outlined in Section 4.3. If contamination is verified, the scope of the investigation will be expanded to meet the requirements of a RCRA Facility Investigation (RFI). Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of any contaminants identified during the RFI as exceeding the appropriate action levels. The procedures and references used to determine these characteristics will be documented in the RFI report.

4.0 CHARACTERIZATION OF HAZARDOUS CONSTITUENT RELEASES

4.1 Previous Investigations

Other than the limited sampling conducted during the tank removal, no known investigations of this site have been performed. Several UST investigations have been performed in the vicinity of SWMU 21, including the assessment at the Flying Club USTs (1205N and 1205S), the Building N-126 USTs (7, 303, and 1241), and USTs 304 and 1239. Petroleum constituent concentrations above state action levels in soil or groundwater have been detected at these UST sites; however, due to their distance from SWMU 21 (greater than 1,200 feet), no impact is anticipated.

4.2 Data Gaps

Data gaps include the potential for subsurface soil contamination and groundwater contamination in the surficial aquifers. The following data gaps will be the focus of this investigation.

- Extent of surface soil contamination.

- The potential for subsurface soil contamination by non-petroleum compounds in the loess.

- The potential for groundwater contamination by non-petroleum and petroleum compounds in the loess and fluvial deposits.

Concentrations of contaminants identified in soil and groundwater at SWMU 21 will be compared to background soil and groundwater concentrations to determine whether measured values occur naturally or indicate contamination. Background concentrations will be determined from the five background monitoring well locations which have been installed across the base and from monitoring wells at other SWMUs. Groundwater samples collected from the background monitoring wells have been be analyzed for full scan analysis (FSA) using the following methods:

- Volatile Organic Compounds (USEPA Method 8240)
- Semivolatile Organic Compounds (USEPA Method 8270)
- Total Petroleum Hydrocarbons (TPH, USEPA Method 418.1)
- Gasoline Range Organics (GRO) (TN Modified 8015/GRO)
- Diesel Range Organics (DRO) (TN Modified 8015/DRO)
- Chlorinated Pesticides/PCBs (USEPA Method 8080)
- Organophosphorus Pesticides (USEPA Method 8140)
- Chlorinated Herbicides (USEPA Method 8150)
- RCRA Part 264, Appendix IX Total Metals (USEPA Method 6010/7000 series)
- Total Cyanide (USEPA Method 9010)

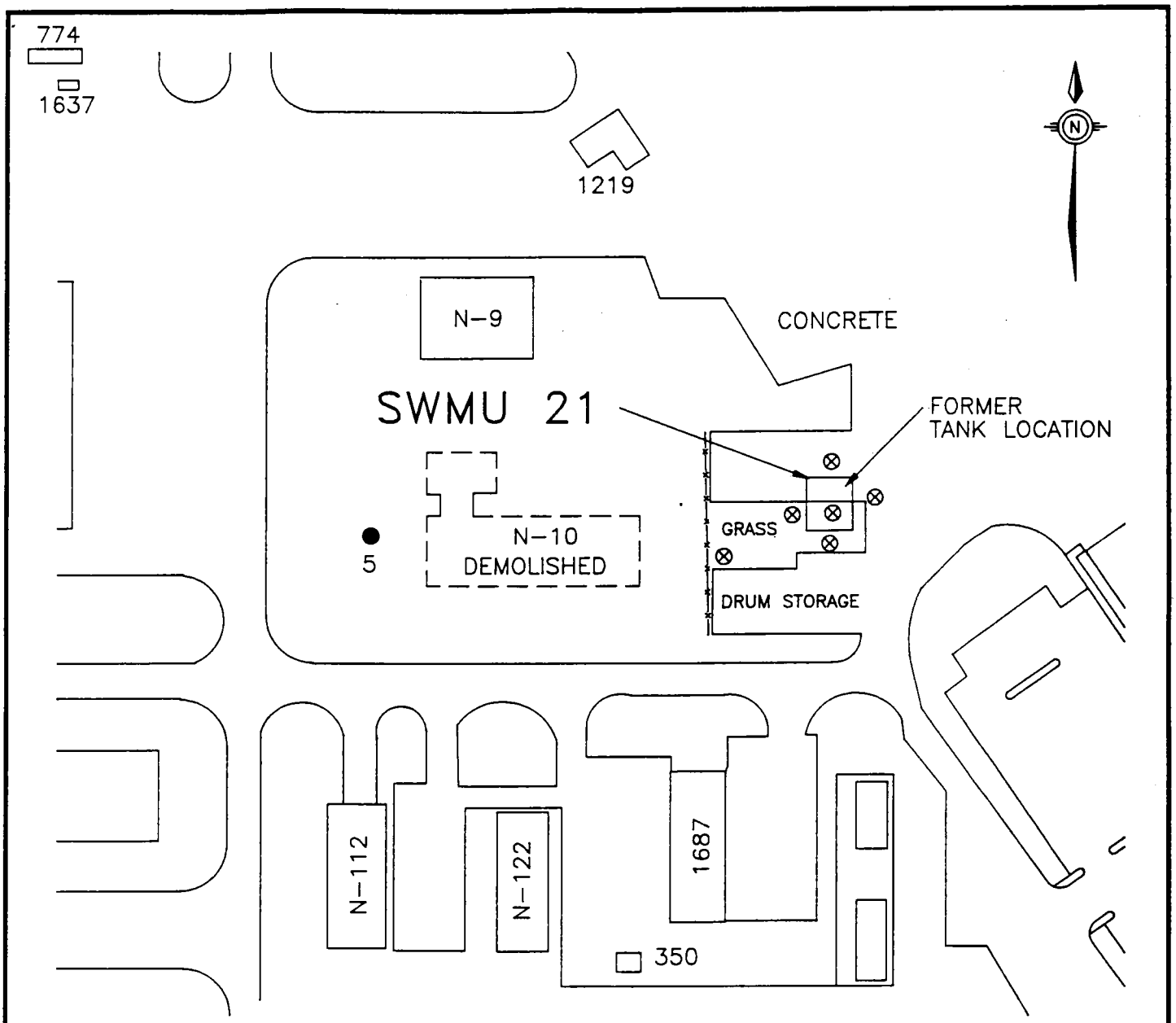
4.3 Objective and Proposed Field Investigation

The objectives of the proposed field investigation are to fill the data gaps identified in Section 4.2 and to delineate the horizontal and vertical extent of any soil and groundwater contamination present at SWMU 21. The field sampling investigation will consist of two phases in which soil and groundwater samples will be collected as outlined below. All sample collection and processing will be in accordance with Section 4 of the *Comprehensive RFI Work Plan*.

The first phase will consist of a soil and groundwater screening investigation that will be conducted using Direct Push Technology (DPT), as well as hand auger and/or Geoprobe-type (or equivalent) samples. Results of the DPT investigation will be used to plan the number, placement, and depth of monitoring wells (and possibly soil borings) in the second phase of the investigation, if necessary. Sampling and analytical strategies for the second phase will also be based on DPT results.

4.3.1 DPT Phase

The proposed soil and groundwater investigation will initially consist of DPT sampling (Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) to collect soil and groundwater samples for field analysis. Based on previous work conducted at other SWMUs, it is anticipated that the DPT equipment will be able to penetrate into the top of the fluvial deposits (approximately 40 ft. bgs). Groundwater samples will be collected from this unit to check for the presence of contaminants with specific gravities greater than water (e.g., chlorinated solvents). A total of 6 initial sampling locations have been selected and are shown in Figure 2. The location of the tank has been estimated from engineering plans and the tank closure report obtained from the NAS Memphis Public Works Office.



LEGEND

⊗ DPT SAMPLING LOCATION

● STRATIGRAPHIC TEST HOLE

100 0 100

SCALE FEET

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
PROPOSED DPT SAMPLE LOCATIONS
BUILDING N-10
UNDERGROUND WASTE TANK
SWMU 21

DWG DATE: 01/18/95 | DWG NAME: 94N10DSL

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Up to three soil and/or groundwater samples will be collected as outlined below.

1) One soil sample will be collected from the 9 to 10-foot soil interval, which should be just below the bottom of the former tank.

2) If possible, a groundwater sample will be collected from the soil/water interface in the loess. If a groundwater sample cannot be collected at this interval, a soil sample will not be collected, as this interval should be within several feet of the 9 to 10-foot soil sample interval.

3) One groundwater sample will also be collected from the top of the fluvial deposits.

Field personnel may deviate from this strategy if field conditions or data (i.e., piezocone or gas chromatograph) suggest that additional or different intervals may be successfully sampled or yield more useful information. The investigatory area may then be expanded or concentrated, based on the results of the initial data.

The samples will be analyzed in the field for VOCs using a portable gas chromatograph (USEPA Method 8021). At least 25 percent of the soil and groundwater samples will be split for laboratory analysis for confirmatory purposes. Split samples submitted to the offsite laboratory will be analyzed for VOCs using USEPA Method 8240. Split sample selection will be determined in the field.

4.3.2 Soil Boring/Monitoring Well Phase

After the BRAC Cleanup Team reviews the analytical data from the DPT phase of this investigation, a second phase, consisting of installing and sampling soil borings and monitoring wells, may be implemented. The number, placement, and depth of borings and monitoring wells will be determined using data from the DPT phase of this investigation. If the DPT survey

identifies soil or groundwater contamination, the investigation may be expanded to include soil borings and/or monitoring wells to better define the nature and extent of contamination. Samples collected during the second phase of the investigation will be analyzed for FSA using the methods outlined in Section 4.2. An addendum to this SIP describing the proposed drilling, sampling, and analytical strategies for the expanded investigation will be prepared and submitted to the BRAC Cleanup Team for review and comment should a second phase be necessary.

4.3.3 Field Analytical Requirements

Field measurements at SWMU 21 will be conducted in accordance with Section 4.10.1 of the *Comprehensive RFI Work Plan*. Field measurements will include pH, temperature, specific conductivity, and groundwater level for monitoring wells, and organic vapor detection for soil samples and boreholes. Soil and groundwater samples collected during the DPT survey will be analyzed in the field with a portable gas chromatograph at Level II DQO.

4.4 Sample Management

Sample management procedures will adhere to Sections 4.12 and 5.0 of the *Comprehensive RFI Work Plan*.

4.5 Sample Custody

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

4.6 Quality Assurance/Quality Control

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

4.7 Decontamination Procedures

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

4.8 Investigation-Derived Waste

Investigation-derived waste (IDW) will be handled as specified in Section 4.13 of the *Comprehensive RFI Work Plan.*

5.0 POTENTIAL RECEPTORS

SWMU 21 is located approximately one mile west of the nearest offsite residence. The nearest NAS Memphis personnel are located at building N-9, approximately 200 feet northwest of SWMU 21. Because potential contaminants at this site are subsurface, surface water runoff is not a likely contaminant pathway. Two drinking water production wells, PW-1 and PW-2, are near SWMU 21. PW-1 is approximately 1,500 feet west of SWMU 21, and PW-2 is approximately 850 feet southwest. Both production wells are screened in the Memphis Aquifer, with the Cook Mountain confining unit above the screened intervals. A more detailed analysis of potential receptors will be conducted and presented in the RFI report if contamination is found at SWMU 21.

6.0 QUALITY ASSURANCE PLAN

The Quality Assurance Plan (QAP) presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout the RFI at SWMU 21.

7.0 DATA MANAGEMENT PLAN

The Data Management Plan (DMP) presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during the RFI for SWMU 21.

8.0 HEALTH AND SAFETY PLAN

The Site-specific Health and Safety Plan for SWMU 21 is included in Appendix D of this document. The Comprehensive Health and Safety Plan is included in Section 7 of the *Comprehensive RFI Work Plan.*

9.0 REFERENCES

EnSafe/Allen & Hoshall (October 1994). *Comprehensive RFI Work Plan for Naval Air Station Memphis*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall (August 1994). *Environmental Assessment Report, USTs 304 and 1239, Naval Air Station, Memphis Tennessee*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall (September 1993). *Environmental Assessment Report for Flying Club USTs, Naval Air Station, Memphis Tennessee*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall (September 1993a). *Environmental Assessment Report for Building N-126 USTs, Naval Air Station, Memphis Tennessee*. E/A&H: Memphis, Tennessee.

ERC/EDGe (September 1990). *RCRA Facility Assessment (RFA), NAS Memphis*. ERC/EDGe: Nashville, Tennessee.

Geraghty & Miller, Inc. (November 1985). *NACIP Program Confirmation Study, Verification Phase, NAS Memphis*. G & M: Tampa, Florida.

Southern Division Naval Facilities Engineering Command (May 1990). *Draft Final RCRA Facility Investigation Work Plan for Naval Air Station-Memphis*. SOUTHDIV: Charleston, South Carolina.

APPENDIX A

RFA SWMU DESCRIPTION

7.21 SWMU NO. 21: N-10 UNDERGROUND WASTE TANK

7.21.1 UNIT CHARACTERISTICS

7.21.1.1 TYPE OF UNIT

Underground Waste Storage Tank.

7.21.1.2 DESIGN FEATURES

This tank is 5,000 gallons in capacity and holds waste oil and hydraulic fluid. Piping connected to the tank may include feed lines and a vent line which runs to undetermined locations.

7.21.1.3 OPERATING PRACTICE (PAST AND PRESENT)

According to Department of the Navy information, this tank system is used to handle and store waste oil and hydraulic fluid generated by an automotive repair operation and possibly used later as an aircraft maintenance shop.

7.21.1.4 PERIOD OF OPERATION

This tank is presumed to have been installed in 1943.

7.21.1.5 AGE OF UNIT

Approximately 46 years.

7.21.1.6 LOCATION OF UNIT

The N-10 underground waste tank, presently located near Building N-10, served a building which no longer exists. See Figure 7-21.

7.21.1.7 GENERAL PHYSICAL CONDITIONS

To be determined.

7.21.1.8 CLOSURE METHOD

Not applicable.

7.21.2 WASTE CHARACTERISTICS

7.21.2.1 TYPE OF WASTE

In addition to heavy petroleum hydrocarbons, waste materials generated by the above described operation might contain volatile petroleum constituents such as benzene, xylene, and toluene, and heavy metals. PCBs are possible.

7.21.2.2 MIGRATION CHARACTERISTICS

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

7.21.2.3 TOXICOLOGICAL CHARACTERISTICS

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

7.21.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

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

7.21.3 MIGRATION PATHWAYS

7.21.3.1 GEOLOGIC SETTING

See Section 3.2.

7.21.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.21.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

7.21.3.4 TOPOGRAPHIC CHARACTERISTICS

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

7.21.3.5 PATHWAYS

AIR

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

SOIL

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

SURFACE WATER/SEDIMENT

Preliminary evaluation of the UST system at SWMU No. 21 indicates no obvious points of surface contamination attributable to this unit. Therefore, the likelihood of surface water transport is remote.

GROUNDWATER

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

SUBSURFACE GAS

Migration of POL VOCs is possible if a release has occurred.

7.21.4 CONTAMINANT RELEASE IDENTIFICATION

7.21.4.1 PRIOR INSPECTION REPORTS

None available.

7.21.4.2 PUBLIC COMPLAINTS

None.

7.21.4.3 MONITORING/SAMPLING DATA

None available.

7.21.4.4 EVIDENCE OF RELEASE

None observed.

7.21.5 EXPOSURE POTENTIAL

7.21.5.1 PROXIMITY TO AFFECTED POPULATION

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

7.21.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The unit is distant from sensitive environments.

7.21.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

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

7.21.6 DOCUMENTS REVIEWED

See PRD.

7.21.7 SUMMARIZED DATA GAP

7.21.7.1 SOIL

None available.

7.21.7.2 GROUNDWATER

No available data.

7.21.7.3 SURFACE WATER/SEDIMENT

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

7.21.7.4 AIR

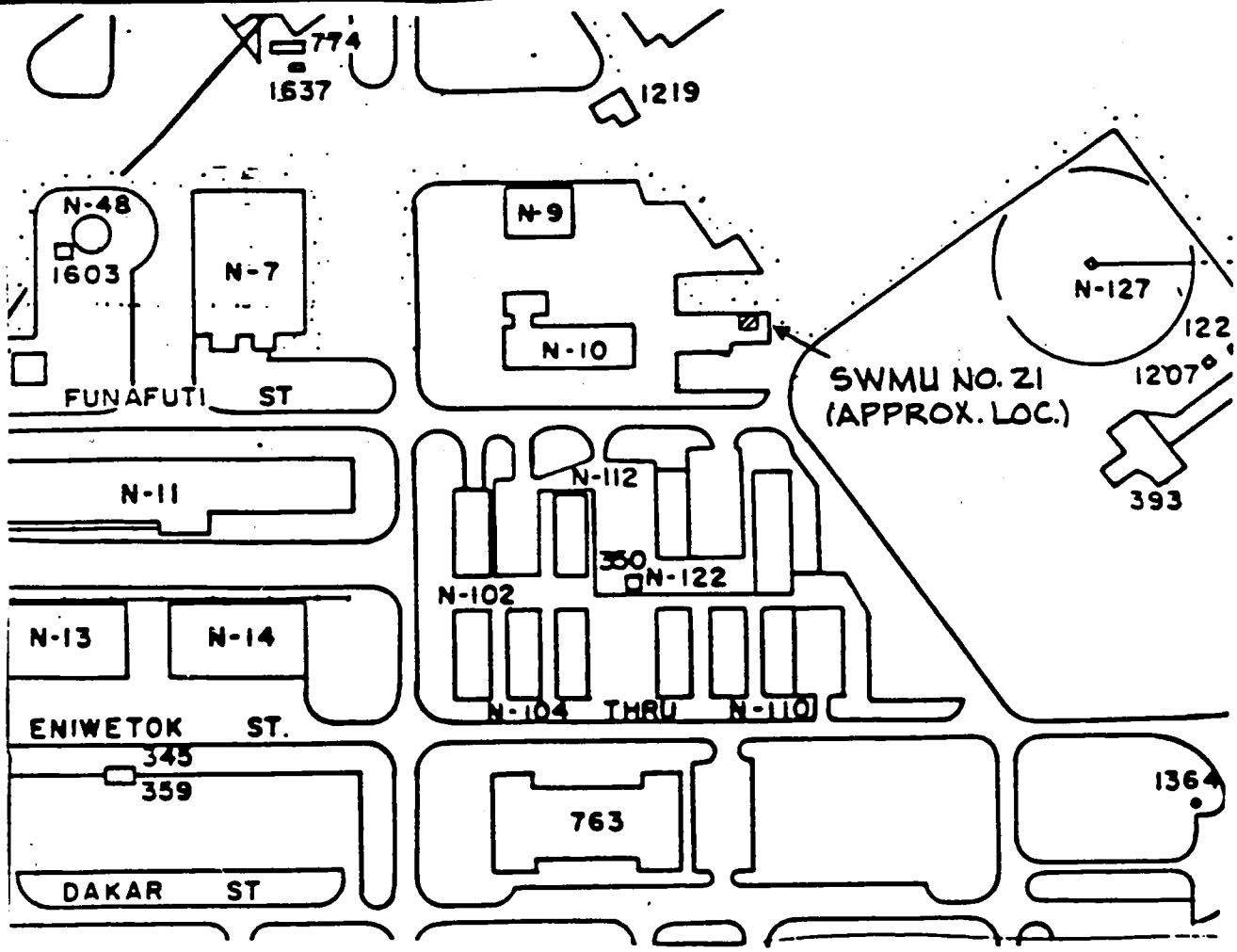
No previous data.

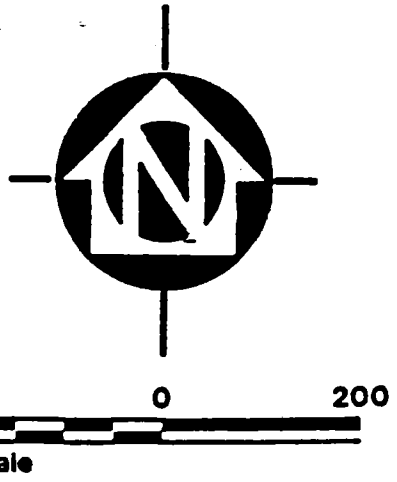
7.21.7.5 SUBSURFACE GAS

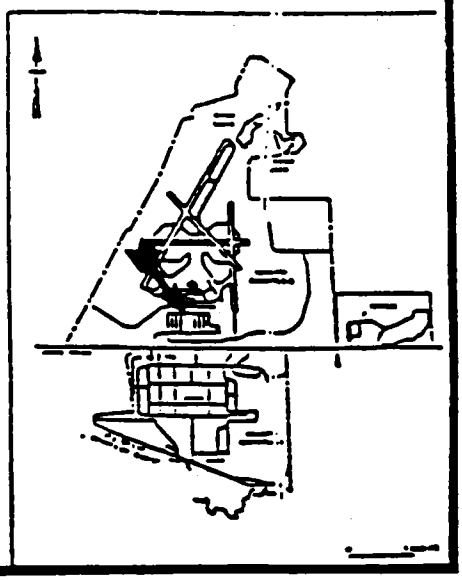
No previous data. Subsurface gas monitoring is not needed for this SWMU.

7.21.8 RECOMMENDED ACTIONS

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







SWMU NO. 21 **N-10 UNDERGROUND WASTE TANK**
FIGURE 7-21 **LOCATION MAP**

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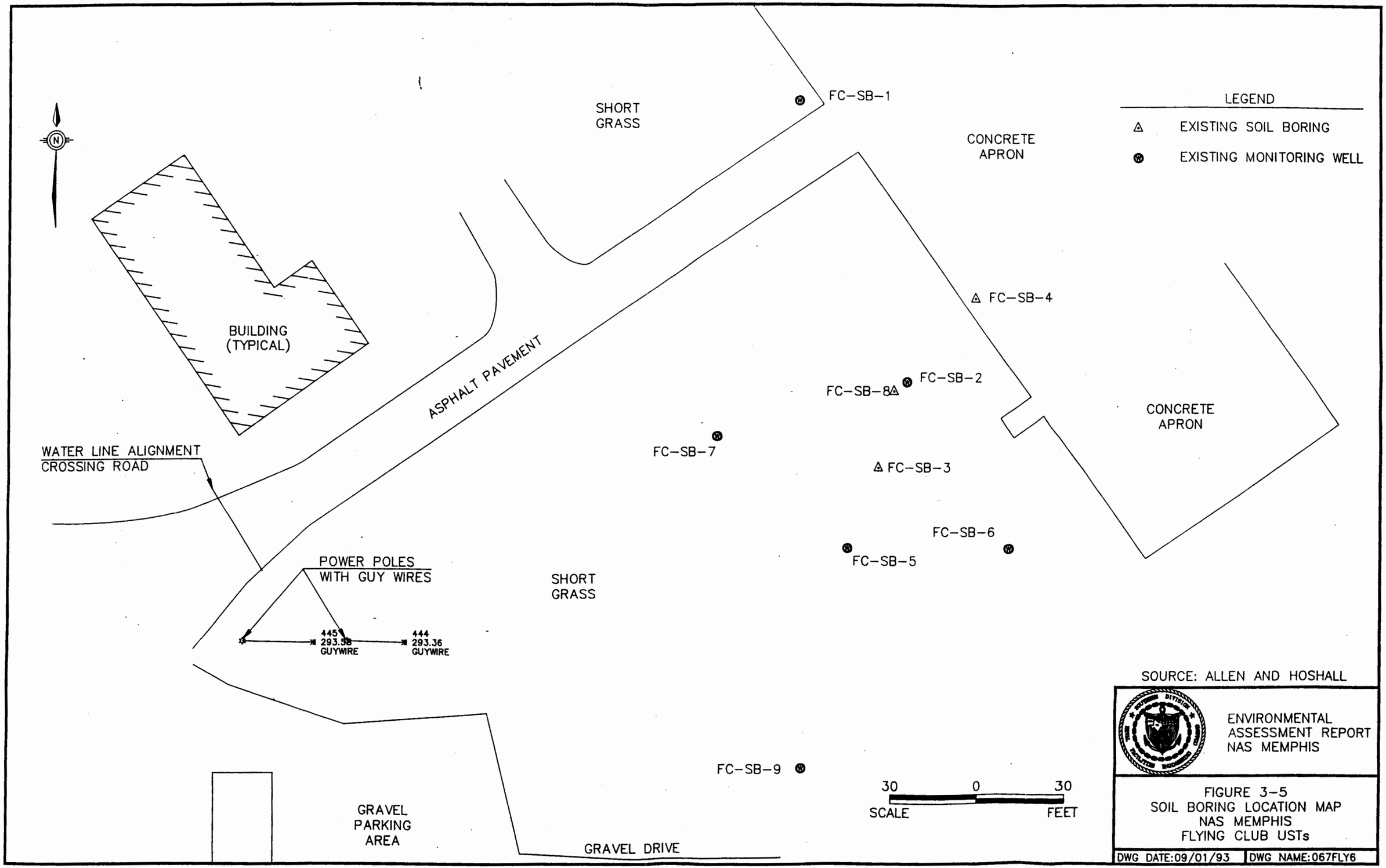
APPENDIX B

MISCELLANEOUS BORING LOGS


LEGEND
EXISTING SOIL BORING
EXISTING MONITORING WELL
SHORT GRASS
FC-SB-1
CONCRETE APRON
BUILDING (TYPICAL)
ASPHALT PAVEMENT
FC-SB-4
FC-SB-8
FC-SB-2
CONCRETE APRON
FC-SB-7
FC-SB-3
FC-SB-6
FC-SB-5
WATER LINE ALIGNMENT CROSSING ROAD
POWER POLES WITH GUY WIRES
445 293.36 GUYWIRE
444 293.36 GUYWIRE
SHORT GRASS
FC-SB-9
GRAVEL PARKING AREA
GRAVEL DRIVE
30 0 30
SCALE FEET
SOURCE: ALLEN AND HOSHALL
ENVIRONMENTAL ASSESSMENT REPORT NAS MEMPHIS
FIGURE 3-5
SOIL BORING LOCATION MAP
NAS MEMPHIS
FLYING CLUB USTs
DWG DATE:09/01/93
DWG NAME:067FLY6

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	GC	LIGHT BROWN SILTY SOFT CLAY WITH TAN CHERT COBBLES TO 0.8'
			0	SM	REDDISH BROWN COARSE SANDY SILT FROM 1.6 TO 1.9'
	SS	53	0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH WHITE CLAY
			N/R		
5			N/R		
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0	M/L	GROUNDWATER AT 8.4'
			0		
10			0	CH	MEDIUM BROWN SILTY SOFT CLAY, WET MOTTLED WITH GRAY CLAY
			0		
			0		
	SS	100	0	CH/CL	MEDIUM BROWN SILTY SOFT CLAY, SATURATED TO 13.5', THEN DRYER
			0		
15			0		
	TD				
20					
25					

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FC-SB-1
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR1

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	CL	MEDIUM BROWN SILTY SOFT CLAY MOTTLED WHITE CLAY
			0		
	SS	100	0		
			0		
			0		
5			0	CL	MEDIUM BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0	CL	MEDIUM BROWN SILTY SOFT CLAY WITH GRAY CLAY INCREASING TO 50%
			0	M/L	GROUNDWATER AT 9.5'
10			0	CH	CONTACT LIGHT GRAY SILTY MOIST CLAY FROM 11.0' TO 11.3'
			20		
	SS	100	50	CL	MEDIUM TO DARK BROWN SILTY CLAY, DRYER
			100		
			270	CH	DARK BROWN SILTY STIFF CLAY, WET WITH VERY STRONG PETROLEUM ODO
15			100	CH	MEDIUM BROWN SILTY SOFT CLAY WET, STRONG PETROLEUM ODOR
			70		
	SS	100	5		
			15	CH	MEDIUM BROWN SILTY SOFT CLAY MOTTLED WITH REDDISH BROWN CLAY AT 18.5'
20			0	OH	CONTACT MEDIUM BROWN SILTY SOFT CLAY WITH BLACK BITUMINOUS NODULES FROM 19.3' 19.6', DRYER
	TD				
25					

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FC-SB-2
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR2

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0		
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH LIGHT GRAY TO WHITE CLAY
	SS	100	0		
			0		
5			0		
			0	CL	LIGHT TO MEDIUM BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	73	0	M/L	GROUNDWATER AT 8.3'
			0		
10			0	CH	MEDIUM BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
			1		
	SS	100	3	CH	DARK BROWN SILTY SOFT CLAY DRYER WITH PETROLEUM ODOR AT 13.0
			5		
15			N/R		
			5	CH	DARK BROWN SILTY SOFT CLAY MOTTLED WITH GRAY, WET, PETROLEUM ODO
			8		
	SS	100	3		
			3		
20			0		CONTACT LIGHT BROWN STIFF DRY SILTY CLAY MOTTLED WITH ORANGE/ BROWN CLAY AT 19.8'
	TD				
25					

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FC-SB-3
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR3

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	
			0		0–0.5' ASPHALT
			0	CL	DARK GRAY SILTY STIFF CLAY FROM 0.5' TO 4.5'
	SS	63	0		
			N/R	CL	
5			N/R		CONTRACT LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY AT 4
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	56	0		
			N/R		GROUNDWATER AT 8.5'
			N/R	M L	
10			0	CH	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY AND VERY MOIST
			1		
	SS	100	3		
			5	CH	DARK BROWN SILTY SOFT CLAY WITH STRONG PETROLEUM ODOR
15			6		
			5	CH	DARK BROWN SILTY SOFT CLAY, PETROLEUM ODOR STILL PRESENT
			1		
	SS	100	0		
			0		
20			0		CONTACT LIGHT BROWN SILTY STIFF DRY CLAY MOTTLED WITH ORANGE/ BROWN CLAY AT 19.5'
	TD				
25					

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FC–SB–4
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR4

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	CL	
			0		LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
	SS	100	0		
			0		
5			0		
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
				M	GROUNDWATER 8.1'
			0	L	
10			0		
			0	CH	LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0		
				CH	CONTRACT DARK BROWN SILTY MOIST CLAY SOME MOTTLING WITH GRAY
15			0.1		AT 14.1'
			0	CH	DARK BROWN SILTY SOFT CLAY, SLIGHT PETROLEUM ODOR
			0		
	SS	100	4	CL	LIGHT BROWN SILTY STIFF CLAY, DRYER NO ODOR
			0		
			0	CL	LIGHT BROWN SILTY STIFF CLAY
20	TD				
25					

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FC-SB-5
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR5

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	GC	LIGHT BROWN SILTY SOFT CLAY WITH CHERT GRAVEL FROM SURFACE TO 0.4
			0		
	SS	63	0		
			0	CL	DARK BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
5			0		
			0		LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0	M/L	GROUNDWATER AT 7.4'
			0		
10			0		
			0	CH	LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0		
			0	CL	DARK BROWN SILTY SOFT CLAY, DRYER AT 14.2
15			0		
			0	CH	DARK BROWN SILTY WET CLAY AT 15.6'
			0		
	SS	35	0		
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
20			N/R		
	TD				
25					

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FC-SB-6
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR6

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY AND DARK BROWN CLAY
			0		
	SS	90	0		
			0		
5			0		
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	93	0		
			0	M/L	GROUNDWATER AT 8.6'
10			0		
			0	CH	LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		CONTACT DARK BROWN SILTY STIFF CLAY, DRYER AT 13.2'
			0		
			0	CL	
15			0	CH	LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0		
			0	CL	CONTACT LIGHT BROWN SILTY STIFF CLAY MOTTLED WITH ORANGE/BROWN CLAY AT 19.5'
20	TD		0		
25					

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FC-SB-7
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR7

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
5				CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
	ST	100	N/A		
10				CH	LIGHT BROWN SILTY SOFT CLAY, MOIST MOTTLED WITH GRAY CLAY
				CH	DARK BROWN SILTY MOIST CLAY
	ST	108	N/A		
15				CH	DARK BROWN SILTY WET CLAY
	TD				
20					
25					

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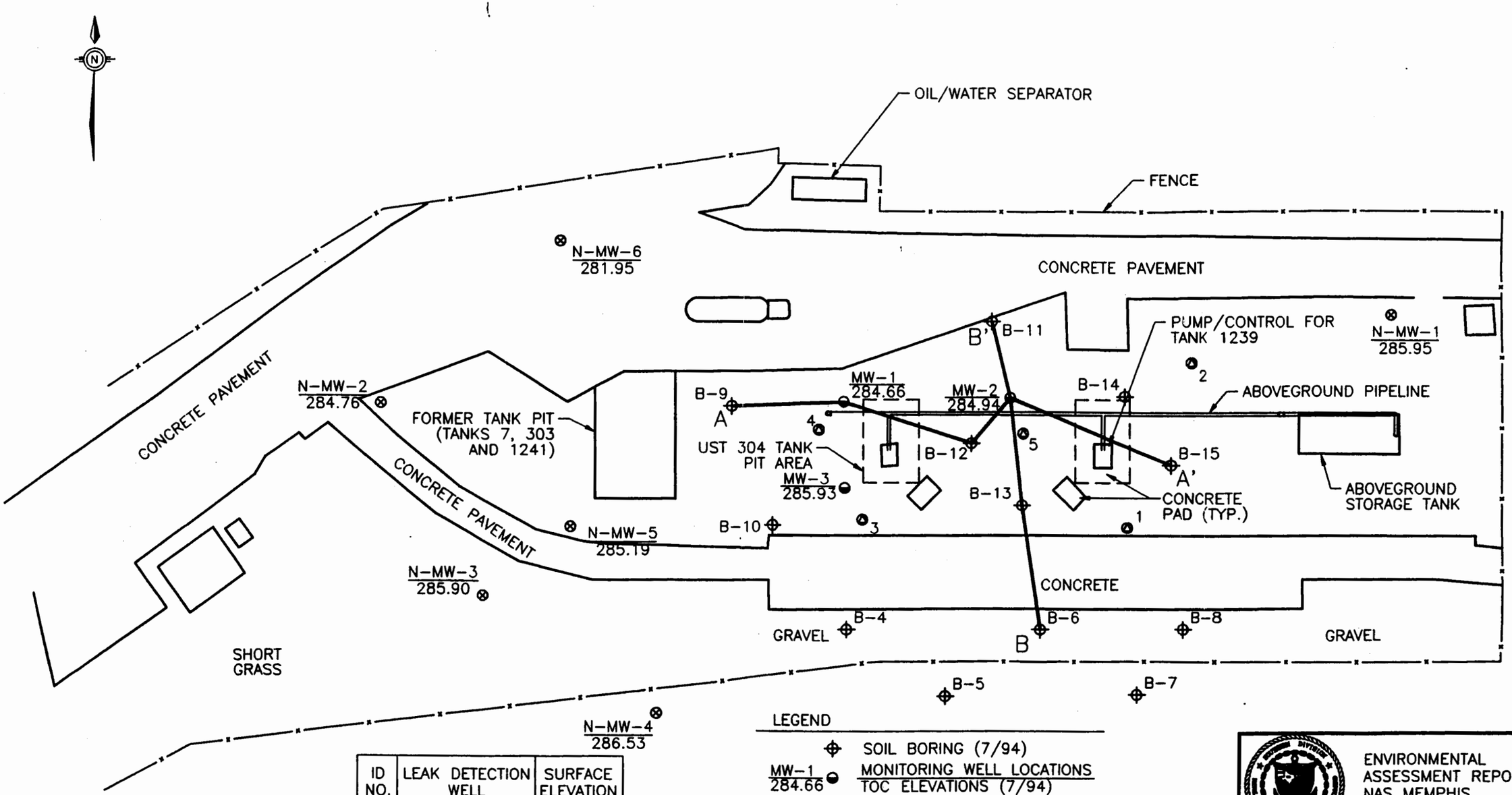
GEOTECHINICAL SOIL BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FGBR1



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

35 0 35

SCALE FEET

SCALE: 1in. = 35ft.

ENVIRONMENTAL ASSESSMENT REPORT
NAS MEMPHIS
MILLINGTON, TN

FIGURE 3
SOIL BORING AND
MONITORING WELL LOCATION MAP
USTs 304 AND 1239 CTO-0080

DATE: 8/19/94 | DWG NAME: CTO80_02

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass				
	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).
5				
	8		297	8.0–13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
10				
	13		126	13.0–14.0' CLAYEY SILT, GREYISH BROWN, SOFT.
				14.0–14.5' CLAYEY SILT, BROWN, STIFF.
15	14.8		328	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				
	20.5		13	20.5–23.0' SILTY CLAY, TAN MOTTLED YELLOW TAN, FIRM TO STIFF.
				DISCONTINUED BORING AT 23.0 FEET.
25				
30				

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SOIL BORING B/MW–1
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/11/1994 PROJ. #: CT00080

DATE: 8/4/1994 | DWG NAME: CTOSBB–1

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5 in.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass				
	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	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	10.5		92	10.5–15.2' SILTY CLAY, GREYISH BROWN TO TAN MOTTLED GREY, MOIST, SOFT.
	13		27	
15	15.5		120	15.2–16.0' SILTY CLAY, GREYISH BROWN, VERY MOIST, SOFT.
				16.0–18.0' SILTY CLAY, DARK BROWN, MOIST, FIRM.
	18		234	18.0–20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM (WITH STRONG HYDROCARBON ODOR).
20	20.5		136	20.5–23.0' SILTY CLAY, BROWN, MOIST, FIRM (WITH HYDROCARBON ODOR).
25				DISCONTINUED BORING AT 23.0 FEET.
30				

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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

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
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).
15		13		81	13.0–18.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
20		18		86	18.0–20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM TO STIFF (WITH HYDROCARBON ODOR).
		20.5		112	20.5–23.0' SILTY CLAY, BROWN GRADING TO TAN, MOIST, FIRM TO STIFF (WITH SLIGHT HYDROCARBON ODOR).
25					DISCONTINUED BORING AT 23.0 FEET.
30					

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SOIL BORING B/MW–3
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 DWG NAME: CTOSBB–3

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass				
5	4			4.0–6.0' CLAYEY SILT, GREYISH BROWN, MOIST, VERY FIRM TO STIFF (WITH HYDROCARBON ODOR).
10	9			9.0–11.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM TO SOFT (WITH HYDROCARBON ODOR).
				DISCONTINUED BORING AT 11.0 FEET.
15				
20				
25				
30				

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SOIL BORING B–3A
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 DWG NAME: CTOSB–3A

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
					SURFACE – Grass
		0		9	0.0–1.5' CRUSHED LIMESTONE (FILL)
					1.5–3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, STIFF.
		3		2	3.0–6.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM (WITH HYDROCARBON ODOR).
5					
		5.5		9	6.0–7.0' CLAYEY SILT, BROWN MOTTLED BEIGE, MOIST, STIFF.
		8		238	7.0–8.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
					8.0–13.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH
10					
		10.5		121	HYDROCARBON ODOR).
		13		11	13.0–18.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
15					
		15.5		4.8	
					DISCONTINUED BORING AT 18.0 FEET.
20					
25					
30					

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NAS MEMPHIS
CTO–0080

SOIL BORING B–4
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 DWG NAME: CTOSBB–4

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
					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		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.
10					
		13		4	13.0–15.5' CLAYEY SILT, TAN MOTTLED GREY GRADING TO BROWN MOTTLED GREY, VERY MOIST, FIRM.
15		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					
		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.
25					
					DISCONTINUED BORING AT 28.0 FEET.
30					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–5
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CT00080

DATE: 8/4/1994 | DWG NAME: CTOSBB–5

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Crushed Limestone				
	0		15	0.0–2.5' CLAYEY SILT, BROWN, STIFF.
				2.5–3.0' CLAYEY SILT, DARK GREY, MOIST, SOFT.
	3		4	3.0–6.0' CLAYEY SILT, GREYISH BROWN, MOIST, SOFT.
5				
	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	
				DISCONTINUED BORING AT 18.0 FEET.
20				
25				
30				

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–6
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 | DWG NAME: CTOSBB–6

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass				
0			41	0.0–4.0' CLAYEY SILT, TAN TO BROWN, DRY TO SLIGHTLY MOIST, STIFF.
4			49	4.0–8.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM.
8			14	8.0–8.5' CLAYEY SILT, TAN TO BROWN, SLIGHTLY MOIST, FIRM, FRIABLE.
10.5			86	8.5–13.0' CLAYEY SILT, GREYISH BROWN, MOTTLED GREY AND TAN, MOIST, FIRM (WITH HYDROCARBON ODOR).
13			94	13.0–18.0' SAME AS ABOVE (WITH HYDROCARBON ODOR).
15.5			81	
18			7	18.0–20.5' CLAYEY SILT, GREYISH BROWN, MOTTLED TAN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
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).
23			0	23.0–28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM (WITH TRACE OF STAINING).
25.5			1	
				DISCONTINUED BORING AT 28.0 FEET.

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
5		0		51	0.0–0.5' CLAYEY SILT, BROWN, SLIGHTLY MOIST, FIRM.
					0.5–3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM.
		3		29	3.0–8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT GRADING TO CLAYEY SILT, GREY MOTTLED BROWN, STIFF. (WITH SLIGHT HYDRO-CARBON ODOR).
		5.5		27	
10		8		185	8.0–13.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
		10.5		239	
15		13		306	13.0–18.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
20					DISCONTINUED BORING AT 18.0 FEET.
25					
30					

ENVIRONMENTAL ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-8
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 DWG NAME: CTOSBB-8

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
					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?).
5		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		10.1		3	10.1-14.7' CLAYEY SILT TO SILTY CLAY, TAN TO BROWN MOTTLED GREY, MOIST, FIRM.
		13		2	
15		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).
					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: CTOSBB-9

DEPTH (FEET)	SAMPLE TYPE — SAMPLE DEPTH	BLOWS/5" FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass				
5	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	
10	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	
15	13		9	13.0–18.0' CLAYEY SILT, BROWN MOTTLED BEIGE AND LIGHT GREY, FIRM, VERY MOIST.
	15.5		13	
20				DISCONTINUED BORING AT 18.0 FEET.
25				
30				

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: CTOSB–10

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Gross					
		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.
5					
		8		25	8.0–10.5' CLAYEY SILT, BROWN MOTTLED GREY, VERY MOIST, FIRM.
10					
		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					
		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.
20					
25					
30					

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

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
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).
5					
		8		150	8.0-14.5' CLAYEY SILT, GREYISH BROWN WITH BLACK STAINING, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
10					
		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).
15					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).
20					
		23		261	23.0-25.0' CLAYEY SILT, DARK BROWN, SLIGHTLY MOIST, FRIABLE (WITH HYDROCARBON ODOR).
25		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.
30					

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: CTOSB-12

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
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.
5				
	8		9	8.0–13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT.
10				
	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).
15				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				
	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				
	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.
30				

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–13
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 DWG NAME: CTOSB–13

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
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.
5				
	8		96	8.0–13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR).
10				
	13		23	13.0–18.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO SOFT (WITH SLIGHT HYDROCARBON ODOR).
15				
				DISCONTINUED BORING AT 18.0 FEET.
20				
25				
30				

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO0080

SOIL BORING B–14
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CTO0080

DATE: 8/4/1994 DWG NAME: CTOSB–14

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass					
		1		330	0.0–1.0' CLAYEY SILT, TAN MOTTLED BROWN, SLIGHTLY MOIST, STIFF.
					1.0–3.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR).
		3		213	HIT TANK AT APPROXIMATE DEPTH OF 6 FEET, OFFSET BORING 3 FEET EAST. SAMPLES BELOW 3 FEET IN DEPTH ARE FROM OFFSET BORING.
5					3.0–8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
		8		202	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.
		23		2	23.0–27.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO STIFF.
25					
		25.5		6	
					27.0–28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM.
					DISCONTINUED BORING AT 28.0 FEET.
30					

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

APPENDIX C

TANK CLOSURE REPORT

Contract N62467-90-C-0683
Underground Storage Tank Closure Report
(SD-84)

Naval Air Station Memphis
Millington, Tn

February 17, 1992

I hereby certify that the Closure Report shown and marked in this submittal is that proposed to be incorporated into Contract Number N62467-90-C-0683, is in compliance with the Contract drawings and specification, can be installed in the allocated spaces, and is submitted for Government approval.

Certified by _____ Date 2/18/92

RECEIVED
FEB 19 1992
ROICC MEMPHIS

Table of Contents

1.0 Introduction

2.0 Description of Work

3.0 Sampling

4.0 Laboratory Analysis

5.0 Disposal of Materials

6.0 Warranties and Limitations

Appendices

A. Map of Sample Locations, Chain of Custody Form, and Analytical Results for Initial Excavation

B. Map of Sample Locations, Chain of Custody Form and Analytical Results for Final Excavation

C. Chain of Custody Form, and Analytical Results for Rainwater in Excavation

D. Chain of Custody Form, and Analytical Results for Clean and Contaminated Stockpiles

1.0 Introduction

The purpose of this report is to provide documentation that the underground storage tank listed below at the Naval Air Station was properly removed and closed as required by the applicable Tennessee state regulations and the Navy's contract specifications.

Navy Tank No.: Tank System N-10

Location: Adjacent to Building N-10
Description: 5,000 gal. steel tank
Contents: Water with petroleum sheen
Removal date: November 26, 1991

2.0 Description of Work Performed

Soil that was removed to expose the tank was field checked with an HNU photoionization detector (PID). Soil was segregated into a contaminated and a potentially clean stockpile based on the PID measurements. All soil that was removed was placed on polyethylene sheeting to protect the environment from contamination until test results were obtained.

When work began on tank N-10, the contents were found to be waste oil. A Tornado drum vacuum was used to pump the contents into three H-17 DOT barrels. The explosive gas level was then checked with a combustible gas indicator (CGI). The tank gasses were purged with 150 pounds of dry ice (carbon dioxide), then the explosive gas levels were checked again with the CGI. A hole was cut in the tank with pneumatic nibblers and the sidewalls were scraped with an aluminum squeegee. The sludge was pumped into DOT barrels with the drum pump.

The excavation of the tank was then finished and the tank was found to be a 3,000 gallon tank instead of a 5,000 gallon tank. The tank was lifted out of the excavation and hauled to the laydown area. Sampling and analysis of the pit floor revealed that the excavation was still contaminated. Permission was granted to excavate an additional two feet due to the smaller tank size and the contamination found. The floor of the excavation was sampled and analyzed again and found to be clean.

After excavation, rainwater entered the pit. The water was sampled, analyzed and found to be clean. The Government gave permission to pump the water into a nearby drainage ditch. Government permission was also given to backfill the excavation with flowable fill (lean concrete). The excavation was filled to one foot below grade and 14 cubic yards of topsoil were used to finish the earthwork.

3.0 Sampling

Soil was continually screened with an HNU photoionization detector (PID) with a 10.2 eV lamp. The soils were segregated into clean and contaminated stockpiles as necessary. Every 60 yards of material from the clean and contaminated stockpiles were sampled for laboratory analysis as directed by the Navy. Four samples were submitted for analysis to confirm readings from our PID instrument. Samples were collected by Brian Cavins and Tony Potter of National Salvage and Service. Copies of the chain of custody forms are included with the analytical results in Appendix A.

After tank removal, in-situ materials were sampled from the excavation floor and from 2 feet below the excavation floor at the north and south ends. Rainwater was sampled and analyzed prior to disposal and final excavation. Final samples were collected from the four corners of the excavation floor.

Samples were collected in glass sample jars with Teflon lined lids. Samples were collected using sterile gloves which were disposed of between samples. Bottles were labeled in the field and a chain of custody form was submitted with each shipment. Samples were shipped in coolers and iced to 4 degrees Celsius.

4.0 Analysis

All samples were shipped to Specialized Assays Environmental in Nashville Tennessee, a Navy approved and certified laboratory. Samples were analyzed using approved EPA methods. Initial excavation stockpiles and in-situ materials were analyzed for BTEX and TPH. Rainwater in the excavation was analyzed for TPH only. Final stockpiled materials were analyzed for BTEX, TPH, TCLP metals, and ignitability. Final in-situ materials from the excavation floor were analyzed for BTEX and TPH. The analytical results are presented in the following table.

SAMPLE	BTEX (PPM)				TPH (PPM)		TCLP (PPM)			
	BENZENE	TOLUENE	ETHEL BENZENE	XYLENE	LO BOIL	HI BOIL	LEAD	BENZENE	LO BOIL	HI BOIL
Initial Excavation										
#5	ND*	ND	ND	ND	<5.0	184				
#6	ND	ND	ND	ND	<5.0	1876				
#7	ND	ND	ND	ND	<5.0	<5.0				
Final Excavation										
#1	ND	ND	ND	ND	<5.0	<5.0				
#2	ND	ND	ND	ND	<5.0	<5.0				
#3	ND	ND	ND	ND	<5.0	<5.0				
#4	ND	ND	ND	ND	<5.0	<5.0				
Excavation Water					<0.05	<0.05				
Contaminated Stockpile 1-60 Yds	ND	ND	ND	ND	<5.0	345	<0.5	<0.1	<0.1	<0.1
Clean Stockpile										
1-60 Yds	ND	ND	ND	ND	<5.0	10.6	<0.5	<0.1	<0.1	<0.1
61-120 Yds	ND	ND	ND	ND	<5.0	31.9	<0.5	<0.1	<0.1	<0.1

* ND - Not Detected

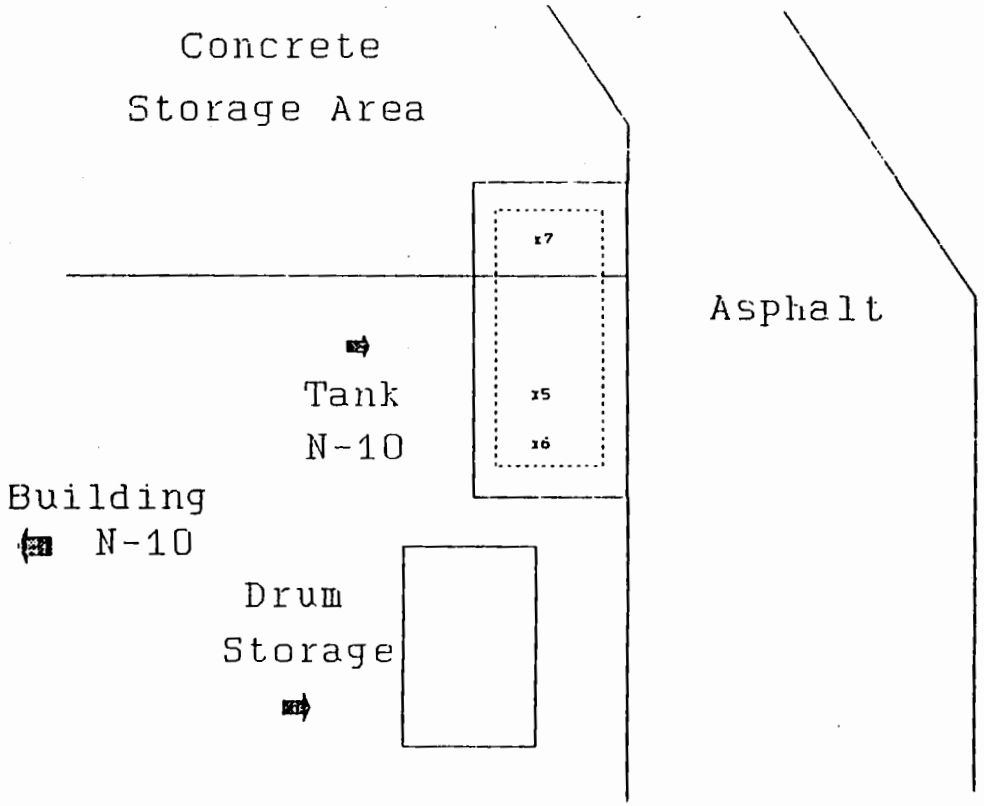
5.0 Disposal of Materials

Contaminated soils are stockpiled in the laydown area. The Government has instructed us to dispose of it with the N-94 contaminated soils. Because of the smaller size of Tank N-10 the Government granted approval to temporarily store the excavated tank at the laydown area until it can be disposed of with another shipment. Manifests for the tank will be included with manifests for the rest of the shipment. The three drums of waste oil found in N-10 was taken to the N-94 tank area and will be disposed of with the N-94 materials in accordance with Government instructions. Manifests for the waste will be included with the N-94 manifests.

6.0 Warranties and Limitations

This report certifies that the storage tank was closed in accordance with federal and state regulations and Millington Naval Air Station's contract specifications. No certification is given that all environmental contaminants have been removed from the site because of the limitations of the type of representative sampling that was required and performed for this kind of work.

Naval Air Station Memphis
Map of Sample Locations for Initial Excavation
Tank N-10 Area



*Not to Scale

Date 2-17-92

Remove Underground Storage Tanks Basewide
Contract N62467-90-C-0683

Appendix D

Site-Specific Health and Safety Plan

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY
NAVAL AIR STATION
MEMPHIS, TENNESSEE

SITE-SPECIFIC HEALTH AND SAFETY PLAN
SWMU 21 — N-10 UNDERGROUND WASTE TANK

CTO-094
Contract Number:N62467-89-D-0318

Prepared for:

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

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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1.0 INTRODUCTION

A RCRA Facility Investigation (RFI) is being conducted at the N-10 Underground Waste Tank (SWMU 21) located at the Naval Air Station Memphis (NAS Memphis), Millington, Tennessee. The purpose of the monitoring program is to assess the nature and extent of potential contamination at the site and to determine if additional action is required to maintain compliance with environmental regulations.

This Site-Specific Health and Safety Plan (SSHSP) is written for field operations to be conducted at SWMU 21. This plan is to be used in conjunction with the approved NAS Memphis Comprehensive Health and Safety Plan (CHASP). Copies of both this plan and the CHASP should be onsite during all field operations. The Navy project contract number with EnSafe/Allen & Hoshall (E/A&H) is N62467-89-D-0318, CTO-094.

Applicability

See CHASP Section 7.0.

Current Hazardous Waste and Emergency Response Operators (HAZWOPER) training certificates for E/A&H and U.S. Geological Survey (USGS) employees and all subcontractors anticipated to be conducting field work onsite will be filed onsite and available for review. Individuals whose certifications are not on file, or those who have a more recent certificate (have attended a refresher course), will provide the Site Supervisor with a copy of their certificate before being allowed to enter a work area.

Current OSHA refresher training certificates will be available onsite for all employees involved in field activities if their refresher course requirements come up for renewal before the project begins. All subcontractors, Navy oversight personnel, and any other site visitors must provide health and safety certification with appropriate refresher course documentation prior to site entry.

2.0 SITE CHARACTERIZATION

2.1 Site Description

SWMU 21 is the former site of a steel, 3,000-gallon underground waste oil and hydraulic fluid storage tank approximately 200 feet southeast of Building N-9 in the central quadrant of the NAS Memphis Northside. A vicinity map of SWMU 21 is provided in Figure 1. Installed in 1943, the tank reportedly serviced an automobile repair and aircraft maintenance shop once located nearby, although no records were identified which described the design features of the former building or tank. The site of the, which was removed in November 1991, is presently covered with grass. A concrete runway apron is immediately to the northeast and a fenced-in, apparently inactive drum storage area is immediately to the south. Based on the February 17, 1992 UST Closure Report, the tank capacity was originally thought to be 5,000 gallons. A site map is provided in Figure 2.

2.2 Work Areas

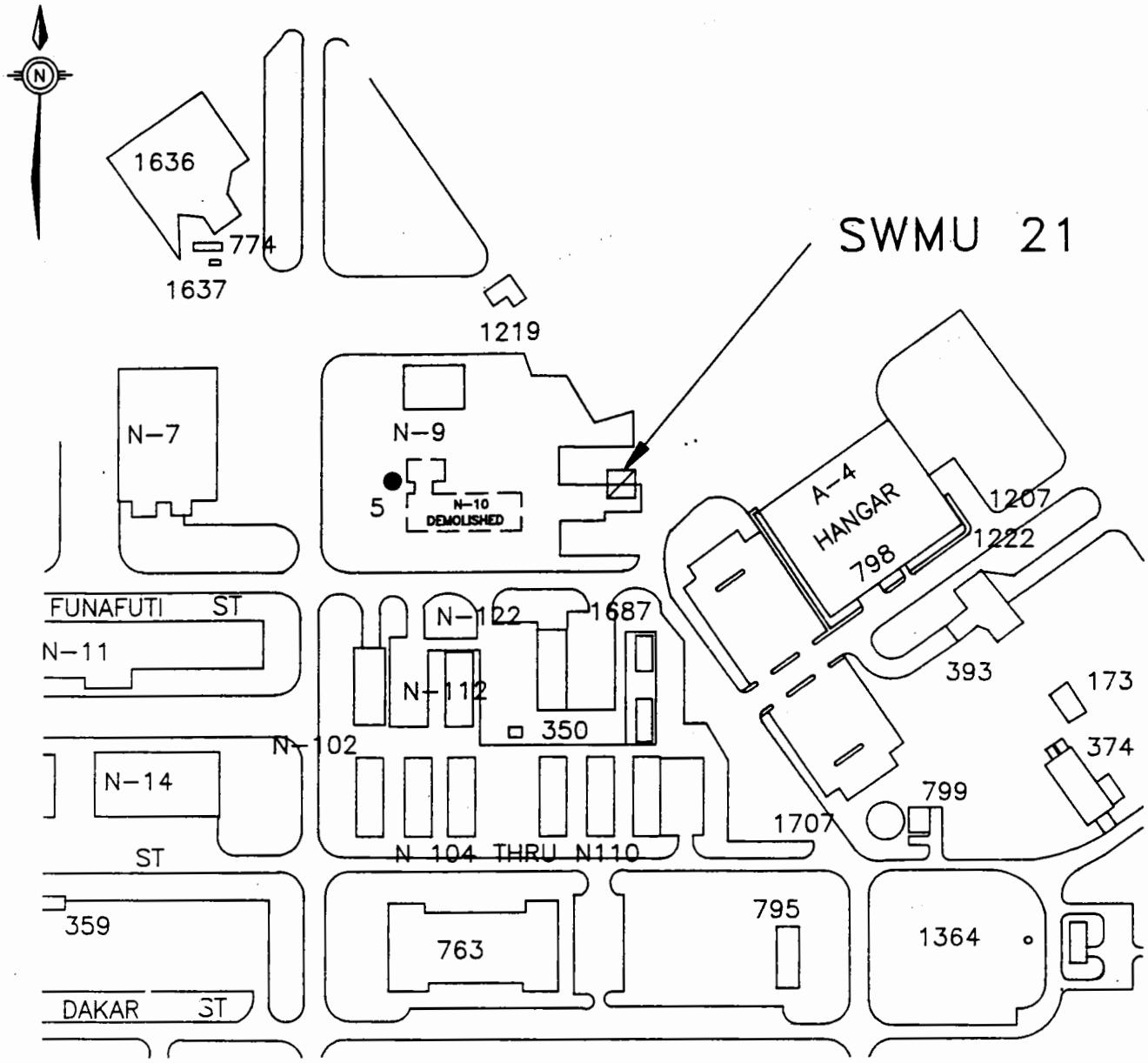
See Section 7.1.1 of the CHASP for a description of the following work zones:

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ), and
- Support Zone (SZ).

For a description of field activities to be conducted at the site and within each work area see the Site Investigation Plan (SIP).

2.3 Work Area Access

Authorized personnel will be allowed access to work areas as long as they have presented documentation of 40-hour OSHA training (29 CFR 1910.120), have signed a CHASP plan acceptance form and a SSHSP plan acceptance form, and have received a hazard communication



LEGEND

● STRATIGRAPHIC TEST HOLE

200 0 200

SCALE FEET

RFI HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
BUILDING N-10
UNDERGROUND WASTE TANK
SWMU 21

DWG DATE: 01/18/95	DWG NAME: 94HSP6

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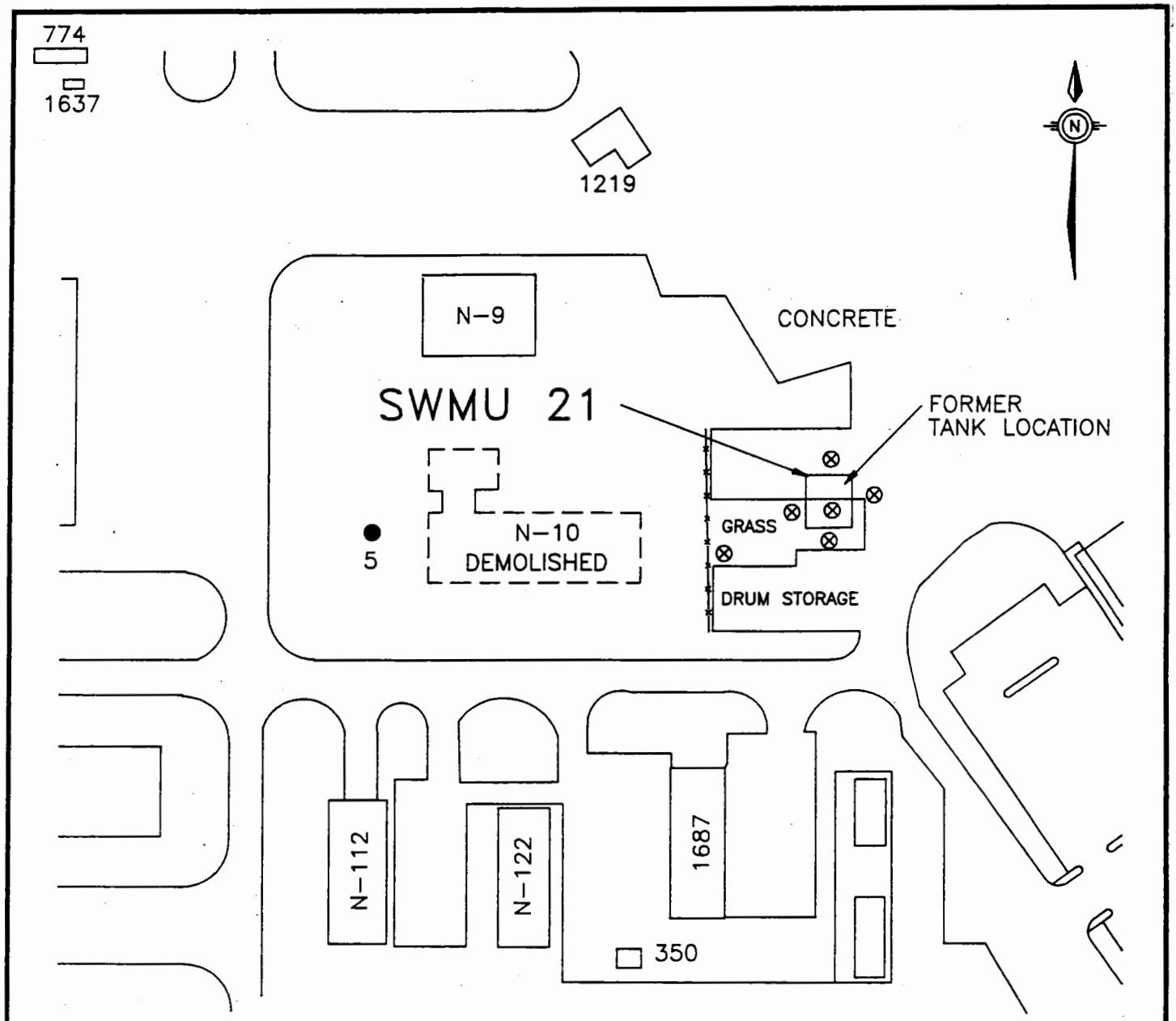

LEGEND

⊗ DPT SAMPLING LOCATION

● STRATIGRAPHIC TEST HOLE

100 0 100

SCALE FEET

RFI HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
PROPOSED DPT SAMPLE LOCATIONS
BUILDING N-10
UNDERGROUND WASTE TANK
SWMU 21

DWG DATE: 01/18/95 | DWG NAME: 94HSP5

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briefing from the site health and safety officer or site manager. See also work Area Access, Section 7.1.2 of CHASP.

2.4 Work Zones

The EZ, CRZ, and SZ locations will be based on physical layout of the site, work task requirements, and current meteorological conditions. The EZ will be established using yellow caution tape.

3.0 SITE ACTIVITIES

Site activities will include Direct Push Technology (DPT) soil and groundwater sampling. Subsequent activities may include soil boring and monitoring well installation, well development, purging, and sampling as required. Field methods described in the *Comprehensive RFI Work Plan.*

4.0 CHEMICAL HAZARDS

The site history suggests a potential for exposure to chemicals. Table 4-1 lists exposure guidelines for potential site chemicals.

Table 4-1
Exposure Guidelines For Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	OSHA PEL[b] (ppm)	ACGIH TLV[c] (ppm)	NIOSH REL[d] (ppm)	Action Level[e] (ppm)	Flammable range (% by volume)
Toluene	40	100 150 STEL	50	100 150 STEL	25	1.3 to 7.1%
Ethylbenzene	140	100 125 STEL	100 125 STEL	N.A.	50	1.0 to 6.7%
Benzene	4.68	1 5 STEL	0.1 Confirmed Human Carc.	0.1 1 STEL Potential Occupational Carcinogen	0.05	1.3 to 7.1%

Table 4-1
Exposure Guidelines For Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	OSHA PEL[b] (ppm)	ACGIH TLV[c] (ppm)	NIOSH REL[d] (ppm)	Action Level[e] (ppm)	Flammable range (% by volume)
Xylene	Not Listed	100 150 STEL	100 150 STEL	100 150 STEL	50	1.0 to 7.0%

Notes:

[a] Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values

[b] 29 CFR 1910.1000, Table Z-1-A. Limits For Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)

[c] 1990-1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienist. (STEL = Short Term Exposure Limit)

[d] National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, June 1990. (REL = Recommended Exposure Limit)

[e] Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50 percent of the PEL, TLV, or REL, whichever is lower.

N.A. = Substance information not available, or substance unlisted.

Material Safety Data Sheets (MSDS) for these materials are included in Attachment A.

5.0 OPERATIONS AND PHYSICAL HAZARDS

Physical hazards typically encountered during environmental investigations will be present at this site. These hazards include cold-related illnesses, uneven terrain, slippery surfaces, lifting, and use of heavy equipment. The Site Supervisor and Site Health and Safety Officer shall be aware of the potential for heat and/or cold stress and other weather-related illnesses, and as necessary, implement appropriate work regimens to minimize the likelihood of field personnel becoming ill or injured.

Heavy equipment and drill rig operations will be conducted in accordance with the procedures outlined in the CHASP, Attachment A, Drilling Safety Guide. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. If working in areas supporting habitat for poisonous snakes, personnel should wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

6.0 EMPLOYEE PROTECTION

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

6.1 Standard Safe Work Practices

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

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

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

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

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

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

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

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

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

6.2 NAS Memphis General Rules of Conduct

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

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

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

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

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

- Securing government tools in a personal or contractors tool box is forbidden.

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

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

- Compliance with posted signs and notices is required.

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

- Fighting or threatening bodily harm to another is forbidden.

- Defacing any government property is forbidden.

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

- All persons operating motor vehicles will obey all NAS Memphis traffic regulations.

6.3 Selection of Personal Protective Equipment

It is important that PPE be appropriate to protect against the potential or known hazards at each cleanup or investigation site. Protective equipment will be selected based on the types,

concentrations, and routes of personal exposure that may be encountered. In situations where the types of materials and possibilities of contact are unknown or the hazards are not clearly identifiable, a more subjective determination must be made of the PPE required, based on past experiences and sound safety practices.

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

Field activities which disturb soils will be initiated in modified Level D protection except when stated otherwise in the SSHSP or when site conditions (e.g., sampling results from previous studies) indicate that modified Level D is inappropriate. Modified Level D protection consists of a hard hat, appropriate chemical-resistant gloves (vinyl or nitrile), eye protection, and chemical-resistant, steel-toed and shank boots. Work coveralls (full length sleeves and pants) will be worn if free product or contaminants identified as skin irritants are encountered. This level of protection was selected because the levels of contamination detected in previous studies were low and free product was not detected.

PPE upgrades to Level C will be initiated if airborne concentrations exceed 2 ppm above the background concentration in the breathing zone or if the concentration of any contaminant exceeds 50 percent of the OSHA Permissible Exposure Limit (PEL). See Table 6-1 for the specific criteria for use and equipment for each level of protection.

Table 6-1
Level Of Protection And Criteria

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

Table 6-1
Level Of Protection And Criteria

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

Notes:

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

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

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

Level C protection will be selected when the types and concentrations of inseparable material are known, or reasonably assumed to be no greater than the protection factors associated with air-purifying respirators, and exposure to the unprotected areas of the body is unlikely to cause harm. Dust concentrations require Level C PPE, where the respirable fractions exceed the PEL of 5 mg/m3 or the total concentrations exceed the PEL of 15 mg/m3.

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

6.4 Air Monitoring

Site history and previous site work indicates that workers may potentially be exposed to low concentrations of numerous chemicals including VOCs, halogenated compounds, and combustible gases/vapors. Based on site history and existing sampling data, "worst case" contaminated areas will be identified before field activities begin.

Air monitoring using a PID and/or other appropriate sampling equipment will be conducted prior to beginning field activities at a new EZ and during ground-disturbing activities. The PID will be field calibrated to measure VOCs relative to a 100 ppm isobutylene standard. If VOCs are

detected downhole, colorimetric detector tubes and/or other sampling media may be used to determine the identification and approximate concentration of these compounds.

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

If breathing zone levels exceed 2 ppm above background or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact both the Project Manager and the Project Health and Safety Officer. The Project Health and Safety Officer will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. (Typically, PPE will be upgraded to Level C assuming that cartridge respirators are appropriate, otherwise Level B.) See Table 6-1 for specific criteria for each protection level. Work shall not proceed until breathing zone levels return to background levels and it is reasonably anticipated that breathing zone samples will stay approximately at background levels, or the chemical constituent(s) are identified and appropriate PPE is donned.

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

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

6.5 Procedures and Equipment for Extreme Hot or Cold Weather Conditions

See CHASP Section 7.5.5.

Severe Weather Conditions

All field work shall immediately cease at the first sign of thunder or lightning. Field personnel shall perform emergency personal and equipment decontamination (see Section 6.6) and seek immediate shelter.

6.6 Personal Decontamination

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

As a general rule, equipment will be decontaminated using a soap and clean water wash solution. Equipment decontamination will be completed by personnel in Level D PPE. In the event of inclement weather (e.g., lightning) or an emergency requiring immediate evacuation, all

contaminated equipment will be wrapped and taped in 6-mil polyethylene sheeting and tagged as "contaminated" for later decontamination.

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

6.6.1 Personal Decontamination Procedures

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

- Brushing heavily soiled boots and rinsing outer gloves and boots with soap and water.
- Removing outer gloves and depositing them in a labeled plastic-lined container.
- Remove outer chemical protective clothing.
- Wash and rinse inner gloves.
- Hard hats and eye protection should be washed thoroughly at the end of each work day with a soap and water solution.
- Disposable gloves and other disposable clothing will be disposed of in sealable bags and placed in a labeled 55-gallon drum for disposal at the site.
- All field personnel are to be instructed to shower as soon as possible after leaving the site.

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

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

6.6.2 Closure of the Personal Decontamination Station

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

6.7 Work Limitations

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional 8 hours of training in site management. All personnel must complete an 8-hour refresher training course on an annual basis in order to continue working at the site.

6.8 Exposure Evaluation

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

The content of the annual or termination examination will be the same as the baseline physical. A qualified physician will review the results of the annual examination and exposure data and request further tests or issue medical clearances as appropriate.

After any job-related injury or illness, there will be a medical examination to determine fitness for duty or any job restrictions. The Site Health and Safety Officer will review the results with the examining physician before releasing the employee for work. A similar examination will be performed if an employee has missed at least three days of work due to a non-job related injury or illness requiring medical attention. Medical records shall be maintained by the employer or the physician for at least 30 years following the termination of employment.

7.0 MEDICAL MONITORING PROGRAM

See CHASP Section 7.6.

8.0 AUTHORIZED PERSONNEL

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

• Principal-In-Charge	Dr. James Speakman (E/A&H)
• Task Order Manager/Project Manager	Mr. Lawson Anderson (E/A&H)
• Project Health & Safety Officer	Mr. Doug Petty (E/A&H)
• Site Supervisor	To Be Determined
• Site Health & Safety Officer	Mr. Matt Norton (E/A&H)
	Mr. Robert Smith (E/A&H)
	Mr. Ben Brantley (E/A&H)
• Engineer-in-Charge	Mr. Mark Taylor (SOUTHDIV)
• Naval Air Station Memphis Site Contact	Ms. Tonya Barker

8.1 Responsibilities of Site Supervisor

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

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

- Field staff have current HAZWOPER training.

- Field staff know who the Site Health and Safety Officer is.

- Field staff know the site-specific safety and health concerns.

- There is an adequate onsite supply of health and safety equipment.

- Field staff participate in the E/A&H Medical surveillance program (or in the case of the USGS or subcontractors, an equivalent program).

- Field staff attend safety and health "kick-off" orientation and other site safety briefings.

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

8.2 Responsibilities of Site Health and Safety Officer

The responsibilities of the Site Health and Safety Officer include:

- Providing the Site Supervisor technical input on site health and safety issues.

- Observing field personnel and reporting to the Site Supervisor on the effectiveness of the CHASP and SSHSP and whether field staff are utilizing proper work practices and decontamination procedures.

- Reporting significant safety violations to the Project Manager and/or Project Health and Safety Officer.

- Conducting safety briefings during field activities.

- Assuring that a copies of the CHASP and SSHSP are maintained onsite during all field activities.

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

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

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

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

8.3 Responsibilities of Onsite Field Staff

The health and safety responsibilities of field staff include:

- Being familiar with and complying with this CHASP and SSHSP.
- Attending site health and safety briefings and being aware of anticipated chemical, physical, and biological hazards and what to do when these hazards are encountered.
- Being properly trained on PPE to be used, safety work practices, decontamination procedures to be followed, and emergency procedures and communications.
- Utilizing required PPE including respiratory protective.

- Having up to date HAZWOPER training and providing the Site Supervisor with documentation that their training is current.

- Being an up to date participant in an acceptable medical surveillance program.

- Being fit-tested and physically capable of using a respirator and being in a position where using a respirator may be a requirement. Should the use of respiratory protection be required, field workers shall not have facial hair which intrudes into the sealing surface of the respirator.

- Using the buddy system when wearing respiratory protective equipment. When working in Level C or higher, a third person shall be at the work area. This person shall be suitably equipped to provide logistical and safety support to the entry team.

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

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

9.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations risk is minimized by establishing good work practices, staying alert, and using proper

PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

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

Contact	**Agency or Organization**	**Telephone**
Tonya Barker	NAS Memphis	(901) 873-5461/5462
Mark Taylor	SOUTHDIV EIC	(803) 743-0573
Law Enforcement	NAS Memphis Base Security	9-911
Fire Department	NAS Memphis	9-911
Ambulance Service	Naval Hospital, Millington Navy Road	(901) 873-5801/5802 or 9-911
Hospital	Methodist North Hospital 3960 Covington Pike	(901) 372-5211 or 9-911
Southern Poison Control Center	—	(901) 528-6048
Lawson Anderson	EnSafe/Allen & Hoshall	(901) 372-7962
Doug Petty	EnSafe/Allen & Hoshall	(901) 372-7962 (901) 362-0252

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

9.1 Site Resources

Cellular telephones or the telephone at the nearby Aircraft Firefighting Training Facility office trailer will be used for emergency use and communication/coordination with NAS Memphis. First aid and eye wash equipment will be available at the work area.

9.2 Emergency Procedures

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

The following emergency procedures should be followed:

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

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

- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the Site Health and Safety Officer to indicate possible routes for upwind escape.

- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the Site Health and

Safety Officer has evaluated the situation and provided the appropriate instructions to the field team.

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

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

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

Additional information on appropriate chemical exposure treatment methods will be provided through Material Safety Data Sheets (MSDS) in Attachment A.

10.0 FORMS

The following forms will be used to implement this Health and Safety Plan:

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

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

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

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Attachment A

Material Safety Data Sheets

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 511 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: 2-BUTANONE

SYNONYMS: ACETONE, METHYL-; AETHYLMETHYLKETON (German); BUTANONE; BUTANONE 2 (French); ETHYL METHYL CETONE (French); ETHYLMETHYLKETON (Dutch); ETHYL METHYL KETONE; ETHYL METHYL KETONE (DOT); KETONE, ETHYL METHYL; MEETCO; METHYL ACETONE; METHYL ACETONE (DOT); METHYL ETHYL KETONE; METHYL ETHYL KETONE (DOT); METILETILCHETONE (Italian); METYLOETYLOKETON (Polish); 2-BUTANONE; MEK; BUTAN-2-ONE; KETONE, METHYL ETHYL; 2-OXOBUTANE; METHYL ETHYL KETONE (MEK)

CAS: 78-93-3 RTECS: EL6475000

FORMULA: C4H8O MOL WT: 72.12

WLN: 2V1

CHEMICAL CLASS: Ketone

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: clear colorless liquid with a fragrant, mint-like, moderately sharp odor

BOILING POINT:	352.72 K	79.5 C	175.2 F
MELTING POINT:	187.04 K	-86.2 C	-123 F
FLASH POINT:	267.4 K	-5.75 C	21.6 F
AUTO IGNITION:	788.7 K	515.5 C	960 F
CRITICAL TEMP:	535.7 K	262.55 C	504.59 F
CRITICAL PRESS:	4.15 kN/M2	40.9 atm	601 psia
HEAT OF VAP:	191 Btu/lb	106.07 cal/g	4.438x E5 J/kg
HEAT OF COMB:	-13480 Btu/lb	-7494 cal/g	-313x E5 J/kg

VAPOR PRESSURE: 71.2 mm Hg @ 20 C

UEL: 11.5 %

LEL: 1.8 %

IONIZATION POTENTIAL (eV): 6.7

VAPOR DENSITY: 2.42 (air=1)

EVAPORATION RATE: 7.12

SPECIFIC GRAVITY: 0.806 @ 20 C

DENSITY: 0.805 g/mL @ 20 C

WATER SOLUBILITY: 27%

INCOMPATIBILITIES: very strong oxidizers, chlorosulfonic acid, oleum, potassium-tert-butoxide, heat or flame, chloroform, hydrogen peroxide, nitric acid

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: NO REACTION Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS:	NOT PERTINENT Source: SAX
POLYMERIZATION POSSIBILITIES:	NOT PERTINENT Source: SAX
TOXIC FIRE GASES:	UNBURNED VAPORS
ODOR DETECTED AT (ppm):	10 ppm
ODOR DESCRIPTION:	Like acetone; pleasant; pungent Source:CHRIS
100 % ODOR DETECTION:	6.0 ppm

---------- REGULATIONS ----------

DOT hazard class:	3 FLAMMABLE LIQUID
DOT guide:	26
Identification number:	UN1193
DOT shipping name:	Ethyl methyl ketone [or] methyl ethyl ketone
Packing group:	II
Label(s) required:	FLAMMABLE LIQUID
Special provisions:	T8
Packaging exceptions:	173.150
Non bulk packaging:	173.202
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	5 L
Cargo aircraft only:	60 L
Vessel stowage:	B
Other stowage provisions:	
STCC NUMBER:	4909243
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	CAA '90 Listed
EPA WASTE NUMBER:	U159,D035,D001
CERCLA REF:	Y
RQ DESIGNATION:	D 5000 pounds (2270 kg) CERCLA
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin. Fire hazard: flammable.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Flammable liquid - Mailable as ORM-D
Mailability:	Domestic surface mail only
Max per parcel:	1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

2-BUTANONE [78-93-3]
ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
First Third Wastes List. 40 CFR 268.10. 54 FR 26594 (June 23, 1989)
Massachusetts Substance List.
' Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: human exposures to levels of 350 ppm caused irritation of the nose and throat. numbness in fingers, arms and legs accompanied by headache, nausea, vomiting and fainting have occurred after exposure to levels of 300-600 ppm. SKIN: contact with liquid or vapor at levels of 300-600 ppm caused severe irritation. liquid is absorbed readily and may cause numbing of fingers and arms. Eyes: exposure to levels of 200 ppm produced irritation. INGESTION: can cause

irritation of the mouth, throat and stomach, the severity of which will be dependent upon amount swallowed. symptoms of poisoning include nausea, vomiting, stomach pain and diarrhea. death can occur from ingestion of as little as 1 ounce.(NYDH)

LONG TERM TOXICITY: has been implicated in certain nervous disorders characterized by weakness, fatigue, heaviness in chest and numbness of hands and feet. these symptoms may develop after 1 year of exposure to vapor concentrations of 50-200 ppm. improvement is gradual and may take years after exposure is discontinued.(NYDH)

TARGET ORGANS: CNS, lungs. peripheral nervous system. eye irritation at 350 ppm.

SYMPTOMS: Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: 200 ppm Time weighted averages for 8-hour exposure
590 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 200ppm(590 mg/M3)
ACGIH STEL: STEL = 300 ppm

OSHA PEL: Transitional Limits:
PEL = 200 ppm(590mg/M3)
Final Rule Limits:
TWA = 200 ppm (590 mg/M3)
STEL = 300 ppm(885 mg/M3)

MAK INFORMATION: 200 ppm
590 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:100 ppm/5M JIHTAB 25,282,43
SENSE ORGANS
Nose
Other
SENSE ORGANS
Eye
Conjunctive irritation
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:2737 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2737 mg/kg
ihl-rat LC50:23500 mg/m3/8H
ipr-rat LD50:607 mg/kg
orl-mus LD50:4050 mg/kg
ihl-mus LC50:40 gm/m3/2H
ipr-mus LD50:616 mg/kg
skn-rbt LD50:6480 mg/kg
ipr-gpg LDLo:2 gm/kg
ihl-mam LC50:38 gm/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

eye-hmn 350 ppm
skn-rbt 500 mg/24H MOD
skn-rbt 402 mg/24H MLD
skn-rbt 13780 ug/24H open MLD
eye-rbt 80 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:3000 ppm/7H (6-15D preg) TXAPA9 28,452,74
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

ihl-rat TCLo:1000 ppm/7H (6-15D preg) TXAPA9 28,452,74
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Methyl ethyl ketone (MEK); CASRN 78-93-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Methyl ethyl ketone (MEK)
CASRN -- 78-93-3
Last Revised -- 12/01/89

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on no human carcinogenicity data and inadequate animal data.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. No data were available to assess the carcinogenic potential of methyl ethyl ketone by the oral or inhalation routes. In a skin carcinogenesis study, two groups of 10 male C3H/He mice received dermal applications of 50 mg of a solution containing 25 or 29% methyl ethyl ketone in 70% dodecylbenzene twice a week for 1 year. No skin tumors developed in the group of mice treated with 25% methyl ethyl ketone. After 27 weeks, a single skin tumor developed in 1 of 10 mice receiving 29% methyl ethyl ketone (Horton et al., 1965).

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Methyl ethyl ketone was not mutagenic for Salmonella typhimurium strains 98, TA100, TA1535, or TA1537 with or without rat hepatic homogenates (Florin et al., 1980; Douglas et al., 1980). Methyl ethyl ketone induced aneuploidy in the diploid D61, M strain of Saccharomyces cerevisiae (Zimmermann et al., 1985). Low levels of methyl ethyl ketone combined with low levels of nocodazole (another inducer of aneuploidy), also produced significantly elevated levels of aneuploidy in the system (Mayer and Goin, 1987).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1985. Health and Environmental Effects Profile for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 1988. Updated Health Effects Assessment for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1988 Updated Health Effects Assessment for Methyl Ethyl Ketone has received Agency review.

Agency Work Group Review: 05/30/89

Verification Date: 05/30/89

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
organic canister or air pack; plastic gloves; goggles or face shield.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (2-BUTANONE)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
3000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove victim to fresh air; if breathing is irregular or has
opped, start resuscitation and administer oxygen.
ES: wash with plenty of water for at least 15 min. and call physician.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Alcohol foam, dry chemical, or carbon dioxide.
Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethyl methyl ketone [or] methyl ethyl ketone
DOT ID NUMBER: UN1193

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POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
or explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it

without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk.

Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 1715 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: NAPHTHA, SOLVENT

SYNONYMS: AROMATIC SOLVENT; HI-FLASH NAPHTHAYETHYLEN; NAPHTA (DOT); NAPHTHA; NAPHTHA DISTILLATE (DOT); NAPHTHA, SOLVENT (DOT); PETROLEUM BENZIN; PETROLEUM DISTILLATES (NAPHTHA); PETROLEUM ETHER; PETROLEUM ETHER (DOT); PETROLEUM NAPHTHA (DOT)

CAS: 8030-30-6 RTECS: DE3030000

FORMULA: W99 MOL WT:

WLN: A10-15

CHEMICAL CLASS:Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION:

BOILING POINT: NA

MELTING POINT: NA

FLASH POINT: Not available

AUTO IGNITION: Not available

VAPOR PRESSURE:

UEL: ~

: ~

IONIZATION POTENTIAL (eV): 7.16 TO 7.46

VAPOR DENSITY: No data

EVAPORATION RATE: 5.53(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: No data

DENSITY:

WATER SOLUBILITY:

INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27
Identification number: UN1256
DOT shipping name: Naphtha, [solvent]
Packing group: II - III
Label(s) required: FLAMMABLE LIQUID - FLAMMABLE LIQUID
Special provisions: T8,T31■B1,T7,T30
Packaging exceptions: 173.150■150
Non bulk packaging: 173.202■203
Bulk packaging: 173.242■242
Quantity limitations-
Passenger air/rail: 5 L■60 L
Cargo aircraft only: 60 L■220 L
Vessel stowage: B■A
Other stowage provisions:

STCC NUMBER: 4915241, 4910241

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: D001
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Fire hazard: flammable.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
NAPHTHA, SOLVENT [8030-30-6]
New Jersey Right To Know Substance List. (December 1987)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: Source:

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: ppm
mG/M3

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* ihl-hmn LCLo:3 pph/5M TABIA2 3,231,33

LD50 value: orl-rat LD50:>5 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>5 gm/kg
ihl-rat LCLo:1600 ppm/6H
ihl-mus LCLo:10600 mg/m3/6H
skn-rbt LD50:>3 gm/kg
ipr-mam LDLo:2500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (NAPHTHA, SOLVENT)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
2500 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
5000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
10000 ppm: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSHP
EYE: None given
SKIN: None given
INHALATION: None given
INGESTION: None given

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Naphtha, [solvent]
DOT ID NUMBER: UN1256

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate horities.
FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 1513 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: KEROSENE

SYNONYMS: COAL OIL; KEROSINE; ILLUMINATING OIL; RANGE OIL; A FUEL OIL NO. 1; JET FUEL; JP-1

CAS: 8008-20-6 RTECS: NY9350000

FORMULA: CnH2n+2 MOL WT:

WLN:

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless watery liquid with a fuel oil odor; pale yellow or water white, mobile oily liquid

BOILING POINT:	448.16-598.16 K	175-325 C	347-617 F
MELTING POINT:	227.55 K	-45.6 C	-50.1 F
FLASH POINT:	310.92 K	37.77 C	99.9 F
AUTO IGNITION:	502 K	228.8 C	444 F

VAPOR PRESSURE: 2 mmHg @ 21 C

UEL: 5.0 %

LEL: 0.7 %

IONIZATION POTENTIAL (eV): 6.79

VAPOR DENSITY: 4.5 (air=1)

EVAPORATION RATE: 0.212138

SPECIFIC GRAVITY: 0.80 15C

DENSITY: 0.80 g/mL

WATER SOLUBILITY: INSOLUBLE

INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 1 ppm

ODOR DESCRIPTION: Fuel oil odor Source:CHRIS

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27

Identification number: UN1223

DOT shipping name:	Kerosene
Packing group:	III
Label(s) required:	FLAMMABLE LIQUID
Special provisions:	B1,T1
Packaging exceptions:	173.150
Non bulk packaging:	173.203
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	60 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	

STCC NUMBER:	4915171

CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D001
CERCLA REF:	Not listed
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Chronic toxicity: mutagen. Fire hazard: flammable. Chronic toxicity: carcinogen

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Combustible liquid - Mailable as ORM-D
Mailability:	Domestic service and air transportation shipper's declaration
Max per parcel:	1 GAL

NFPA CODES:

HEALTH HAZARD (BLUE)	:	(0) No unusual health hazard.
FLAMMABILITY (RED)	:	(2) This material must be moderately heated before ignition will occur.
REACTIVITY (YELLOW)	:	(0) Stable even under fire conditions.
SPECIAL	:	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
KEROSENE [8008-20-6]

Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
nsylvania Hazardous Substance List
RA Hazardous Waste

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: does not evaporate fast enough to cause health effects except when heated or in enclosed spaces. headache, tiredness, stupor, dizziness, nausea, coma and death, may occur with increasing exposure. SKIN: if not promptly removed, may cause reddening, blisters, itching and an increased risk of infection. Eyes: irritation may occur. INGESTION: accidental ingestion of unknown amounts has caused irritation of mouth, throat and stomach, nausea, vomiting, rapid breathing, blue skin coloration, and convulsions. death may result from as little as 1 fluid ounce. inhalation into lungs following ingestion may result in bronchitis, chemical pneumonia, accumulation of fluid and blood in lungs, and death. as little as 1/30 oz. may be fatal in this way.(NYDH)

LONG TERM TOXICITY: absorption through skin is slow but repeated skin contact over many years has caused muscular weakness, anemia, changes in white blood cells, fever and death.(NYDH)

TARGET ORGANS:

SYMPTOMS: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL: 100 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC
to be probably carcinogenic to
humans with (usually) at least
limited human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:26 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:26 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
protective gloves; goggles or face sheild.

FIRST AID SOURCE: CHRIS Manual 1991
ASPIRATION: enforce bed rest; administer oxygen; call a doctor.
INGESTION: do NOT induce vomiting; call a doctor.
EYES: wash with plenty of water.
SKIN: wipe off and wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam, dry chemical, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Kerosene
T ID NUMBER: UN1223

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POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate horities.
FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 369 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: SULFURIC ACID

SYNONYMS: OIL OF VITRIOL; NORDHAUSEN ACID; DIPPING ACID; SPIRIT OF SULFUR; HYDROGEN SULFATE; SULPHURIC ACID; VITRIOL BROWN OIL

CAS: 7664-93-9 RTECS: WS5600000

FORMULA: H2SO4 MOL WT: 98.08

WLN: H2 S-O4

CHEMICAL CLASS: Non-oxidizing min. acid

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: odorless colorless oily liquid

BOILING POINT:	543.15 K	270 C	518 F
MELTING POINT:	275.93 K	2.7 C	37 F

FLASH POINT: Not applicable

AUTO IGNITION: Not applicable

VAPOR PRESSURE: <0.001 MM

UEL: Not applicable

LEL: Not applicable

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 1.84 20C

DENSITY: 1.84 g/cc or 17.112 lb/gal

WATER SOLUBILITY: MISCIBLE

INCOMPATIBILITIES: organics: chlorates, carbides, fulminates, picrates, metals

REACTIVITY WITH WATER: REACTS VIOLENTLY WITH EVOLUTION OF HEAT. SPATTERING OCCURS WHEN WATER IS ADDED TO THE COMPOUND.

REACTIVITY WITH COMMON MATERIALS: EXTREMELY HAZARDOUS IN CONTACT WITH MANY MATERIALS, ESP METALS AND COMBUST. DILUTE ACID REACTS WITH MOST METALS, RELEASING HYDROGEN WHICH CAN FORM EXPLOSIVE MIXTURES WITH AIR IN CONFINED SPACES.

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: DILUTE WITH WATER, THEN NEUTRALIZE WITH LIME, LIMESTONE OR SODA ASH.

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): >1

ODOR DESCRIPTION: ODORLESS UNLESS HOT, THEN CHOKING.

Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 8 CORROSIVE
DOT guide: 39
Identification number: UN1830
DOT shipping name: Sulfuric acid
Packing group: II
Label(s) required: CORROSIVE
Special provisions: A3,A7,B3,B83,B84,N34,T9,T27
Packaging exceptions: 173.154
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 1 L
Cargo aircraft only: 30 L
Vessel stowage: C
Other stowage provisions:14

STCC NUMBER: 4930040

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: D002
CERCLA REF: Y
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: 1000 pounds
SARA Sect. 312
categories:
Acute toxicity: corrosive
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:
HEALTH HAZARD (BLUE): (3) Extremely hazardous to health. Full protection required. No skin surface should be exposed.
FLAMMABILITY (RED) : (0) This material does not readily burn.
REACTIVITY (YELLOW): (2) Normally unstable and readily undergoes violent change, but does not detonate.

SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
SARA Title III Extremely Hazardous Substance. Sections 302 and 304.
SULFURIC ACID [7664-93-9]
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: resp sys,eyes,skin,teeth,lungs, mucous membranes.

SYMPTOMS: EYE, NOSE, THROAT IRRIT; PULM EDEMA, BRON; EMPHYSEMA; CONJ; STOMATITIS, DENT EROSION; TRACHBRONC; SKIN, EYE, BURNS; DERM. EXTREMELY IRRITATING, CORROSIVE AND TOXIC TO TISSUE - WORKERS EXPOSED TO LOW CONCENTRATIONS OF VAPOR GRADUALLY LOSE SENSITIVITY TO IRRITATING ACTION - INHALATION OF CONCENTRATED VAPORS CAN CAUSE RAPID UNCONSCIOUSNESS WITH SERIOUS DAMAGE TO LUNG TISSUE - CAN CAUSE NECROSIS OF SKIN ACCOMPANIED BY SHOCK AND COLLAPSE - SEVERE EXPOSURE MAY CAUSE CHEMICAL PNEUMONITIS. Source: SAX

CONC IDLH: 80mg/M3

NIOSH REL: 1 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 1mg/M3
ACGIH STEL: STEL = 3 mg/M3

OSHA PEL: Transitional Limits:

PEL = 1mg/M3
Final Rule Limits:
TWA = 1 mg/M3

MAK INFORMATION: 1.5 calculated as total dust mG/M3

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:3 mg/m3/24W BJIMAG 18,63,61
MUSCULOSKELETAL
Changes in teeth and suporting structures

LD50 value: orl-rat LD50:2140 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2140 mg/kg
ihl-rat LC50:510 mg/m3/2H
ihl-mus LC50:320 mg/m3/2H
ihl-gpg LC50:18 mg/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rbt TCLo:20 mg/m3/7H (6-18D preg) JEHSDH 13,251,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
provide safety shower; eyewash fountain; safety goggles; face shield; approved respirator(self-contained or air-line); rubber safety shoes; rubber apron

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of liquid contact and repeated or prolonged vapor contact

WEAR EYE PROTECTION TO PREVENT:
Any possibility of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (SULFURIC ACID)
25 mg/M3: Any powered air-purifying respirator with a high efficiency particulate filter and an acid gas cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
50 mg/M3: Any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with a high-efficiency particulate filter. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted acid gas canister. / Any air-purifying respirator with a high-efficiency particulate filter.
80 mg/M3: Any supplied-air respirator with a full facepiece and operated a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor and acid gas canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: water flush immed
INHALATION: art resp
INGESTION: water, no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material

from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Sulfuric acid
DOT ID NUMBER: UN1830

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POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if inhaled or swallowed.
Contact causes severe burns to skin and eyes.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
May ignite other combustible materials (wood, paper, oil, etc.).
Violent reaction with water.
Flammable/poisonous gases may accumulate in tanks and hopper cars.
Runoff to sewer may create fire or explosion hazard.
Material may be transported in a molten form.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection.
*Structural firefighters' protective clothing is not effective for these materials. Isolate the leak or spill area immediately for at least 150 feet in all directions. See the Table of Initial Isolation and Protective Action Distances. If you find the ID Number and the name of the material there, begin protective action. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300.
*FIRE
Do not get water inside container.
Small Fires: Dry chemical or CO2.
Large Fires: Flood fire area with water from a distance.
Do not get solid stream of water on spilled material. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk. Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. Use water spray to reduce vapor; do not put water directly on leak, spill area or inside container. Keep combustibles (wood, paper, oil, etc.) away from

spilled material.
Spills: Dike for later disposal; do not apply water unless directed to do so. Cleanup only under supervision of an expert.

FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 2264 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: OIL MIST, MINERAL
SYNONYMS: NUJOL ; MIST OF WHITE MINERAL OIL; CUTTING OIL; HEAT-TREATING OIL; HYDRAULIC OIL; CABLE OIL; LUBRICATING OIL
CAS: 8012-95-1 RTECS: XH7480000
FORMULA: W99 MOL WT: N.A.
WLN:
CHEMICAL CLASS: Paraffin

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: mist with an odor like burned lube oil
BOILING POINT: 633.15 K 360 C 680 F
MELTING POINT: NA
FLASH POINT: 408 K 134.85 C 274.7 F
AUTO IGNITION: Not available
VAPOR PRESSURE: 2.2 mmHg @ 21 C
UEL: N.A.
LEL: N.A.
VAPOR DENSITY: No data
SPECIFIC GRAVITY: No data
DENSITY: 0.83
WATER SOLUBILITY: INSOLUBLE
INCOMPATIBILITIES: none hazardous

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): Unknown
ODOR DESCRIPTION: No data
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: Not given
DOT guide:
Identification number:
DOT shipping name:
Packing group:

Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Fire hazard: combustible.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OIL MIST, MINERAL [8012-95-1]
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

ORT TERM TOXICITY: ASPIRATION PNEUMONIA, CARCINOGEN OF SKIN AND SCROTUM.
** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: NONE REPORTED Source: NIOSHP

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = 5mg/M3
ACGIH STEL: STEL = 10 mg/M3

OSHA PEL: Transitional Limits:
PEL = 5mg/M3
Final Rule Limits:
TWA = 5 mg/M3

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below

RCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:>24 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>24 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes wet.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (OIL MIST, MINERAL)
50 mg/M3: Any supplied-air respirator. / Any self-contained breathing apparatus. / Any air-purifying respirator with a high-efficiency particulate filter.
125 mg/M3: Any supplied-air respirator operated in a continuous flow mode. / Any powered air-purifying respirator with a high-efficiency particulate filter.
250 mg/M3: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. / Any supplied-air respirator with a tight-fitting facepiece operated in a continuous flow mode. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
2500 mg/M3: Any supplied-air respirator with a half-mask and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: None given
SKIN: soap wash
INHALATION: fresh air
INGESTION: None given

---------- INITIAL INCIDENT RESPONSE ----------

DOT Guide information for this compound.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 496 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: ETHYLENE GLYCOL
SYNONYMS: 1,2-ETHANEDIOL; 1,2-DIHYDROXYETHANE; 2-HYDROXYETHANOL; GLYCOL ALCOHOL; GLYCOL; EG
CAS: 107-21-1 RTECS: KW2975000
FORMULA: C2H6O2 MOL WT: 62.08
WLN: Q2Q
CHEMICAL CLASS: Alcohol

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: clear, colorless, slightly syrupy liquid.(nydh)

BOILING POINT:	470.15 K	197 C	386.6 F
MELTING POINT:	260.15 K	-13 C	8.6 F
FLASH POINT:	384.1 K	110.95 C	231.7 F
AUTO IGNITION:	673 K	399.8 C	751.8 F

VAPOR PRESSURE: .06 mm Hg @ 20 C
UEL: ~
LEL: 3.2 %
IONIZATION POTENTIAL (eV): 9.3
VAPOR DENSITY: 2.14 (air=1)
EVAPORATION RATE: 0.01(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY: 1.1135 @ 20 C
DENSITY: 1.113
WATER SOLUBILITY: > 100mg/mL @ 17 C
INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: REACTS VIOLENTLY WITH CHLOROSULFURIC ACID, SULFURIC ACID AND OLEUM Source: CSDS
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): Not pertinent
ODOR DESCRIPTION: Slight odor Source:CHRIS
100 % ODOR DETECTION: O.I @ 20 C = 3 ppm

---------- REGULATIONS ----------

DOT hazard class: Not given
DOT guide:

Identification number:
DOT shipping name:
Packing group:
Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (1) This material must be preheated before ignition can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE GLYCOL [107-21-1]
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
SARA Section 313 Toxic Chemicals List
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: mild throat irritation resulted from exposures of 28 mg/m3. levels above 140 mg/m3 resulted in more marked irritation, with levels of more than 250 mg/m3 being unbreathable. these levels are only reached at elevated temperatures. SKIN: may cause mild irritation if not promptly removed. Eyes: accidental eye contact with concentrated ethylene glycol resulted in extreme swelling of the eye, cloudy vision and slow response to light. these symptoms lasted a month. INGESTION: may cause symptoms in the nervous system, heart, lungs and kidneys. earliest effects are usually felt in the nervous system between 1/2 to 12 hours after ingestion. symptoms from 1 liquid ounce may include nausea, vomiting, dizziness, loss of coordination and abdominal pain. large amounts may cause stupor, coma, convulsions and death. survival of this stage may lead to development of rapid heart beat, enlarged heart and fluid in the lungs which, too, can lead to death usually after 1 to 3 days. some individuals who drank 3 to 4 fluid ounces who survived both the above stages because of prompt medical treatment, later (3 to 17 days) died of kidney failure.(NYDH)

LONG TERM TOXICITY: occupational exposure to heated ethylene glycol has caused involuntary eye movement that may indicate nerve damage. some individuals also reported attacks of unconsciousness lasting 5 to 10 minutes which went away when they stopped working with ethylene glycol.(NYDH)

TARGET ORGANS: eyes, skin, resp system

SYMPTOMS: Inhalation of vapor is not hazardous. Ingestion causes stupor or coma, sometimes leading to fatal kidney injury. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = C 50ppm(C 127 mg/M3) VAPOR AND MIST
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
CEILING = 50 ppm (125 mg/M3)

MAK INFORMATION: 10 ppm
26 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-chd TDLo:5500 mg/kg PGMJAO 52,598,76
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Respiratory stimulation
KIDNEY,URETER,BLADDER
Other changes

orl-hmn LDLo:786 mg/kg EJTXAZ 9,373,76
BEHAVIORAL
Convulsions or effect on seizure threshold
BEHAVIORAL
Coma
GASTROINTESTINAL
Hypermotility,diarrhea

orl-hmn LDLo:398 mg/kg SMEZA5 26(2),48,83

BEHAVIORAL
Headache
GASTROINTESTINAL
Nausea or vomiting
LIVER
Other changes

ihl-hmn TCLo:10000 mg/m3 AGGHAR 5,1,33
SENSE ORGANS
Eye
Lacrimation
LUNGS, THORAX, OR RESPIRATION
Cough
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:4700 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4700 mg/kg
ihl-rat LC :>198 mg/m3
ipr-rat LD50:5010 mg/kg
scu-rat LD50:2800 mg/kg
ivn-rat LD50:3260 mg/kg
ims-rat LDLo:3300 mg/kg
unr-rat LD50:13 gm/kg
orl-mus LD50:7500 mg/kg
ipr-mus LD50:5614 mg/kg
scu-mus LDLo:2700 mg/kg
ivn-mus LD50:3 gm/kg
unr-mus LD50:8050 mg/kg
orl-dog LD50:5500 mg/kg
orl-cat LD50:1650 mg/kg
scu-cat LDLo:2000 mg/kg
skn-rbt LD50:9530 mg/kg
ipr-rbt LDLo:1 gm/kg
ivn-rbt LDLo:5 gm/kg
ims-rbt LDLo:5500 mg/kg
unr-rbt LD50:5017 mg/kg
orl-gpg LD50:6610 mg/kg
scu-gpg LDLo:5 gm/kg
unr-gpg LD50:11150 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:50 gm/kg (6-15D preg) TXAPA9 81,113,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Skin and skin appendages
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

orl-rat TDLo:8580 mg/kg (6-15D preg) CHYCDW 20,289,86
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:12500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:25 gm/kg (6-15D preg) NTIS** PB85-104594
MATERNAL EFFECTS
Uterus,cervix,vagina
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-rat TDLo:50 gm/kg (6-15D preg) NTIS** PB85-104594
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:7500 mg/kg (6-15D preg) TXAPA9 81,113,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:7500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:84 gm/kg (1-21D preg/21D post) TOXID9 4,136,84
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN

Delayed effects

orl-mus TDLo:88720 mg/kg (7-14D preg) EVHPAZ 57,141,84
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON NEWBORN
Stillbirth
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: CHRIS Manual 1991
INGESTION: induce vomiting and call a physician.
SKIN AND
EYES: flush with water.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Water fog, alcohol foam, carbon dioxide, or dry chemical. Note: Water or foam may cause frothing. CHRIS91

No DOT Guide information for this compound.
DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 247 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: LEAD

SYNONYMS: C.I. PIGMENT METAL 4; C.I. 77575; KS-4; LEAD FLAKE; LEAD S2; OLOW (Polish); SI; SO

CAS: 7439-92-1 RTECS: OF7525000

FORMULA: Pb MOL WT: 207.19

WLN: PB

CHEMICAL CLASS: Metal

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: bluish-grey, soft metal; heavy ductile, soft, gray solid

BOILING POINT:	2013 K	1739.8 C	3163.7 F
MELTING POINT:	600.6 K	327.4 C	621.4 F
FLASH POINT:	Not available		
AUTO IGNITION:	Not available		

VAPOR PRESSURE: 1mm @ 973 C

UEL: ~

LEL: ~

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 11.34

DENSITY: 11.34 g/mL @ 20 C

WATER SOLUBILITY: INSOLUBLE; DISSOLVES SLOWLY IN WATER CONTAINING A WEAK ACID

INCOMPATIBILITIES: strong ox, hydrogen peroxide, active metals, sodium, potassium, chlorine trifluoride, hydrogen peroxide, zirconium, disdium acetylide, oxidants

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: RELATIVELY IMPENETRABLE TO RADIATION

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: WHEN HEATED EMITS HIGHLY TOXIC FUMES; CAN REACT VIGOROUSLY WITH OXIDIZING MATERIALS

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

REGULATIONS

National Primary Ambient Air Quality Standards
1.5 ug/M3 maximum arithmetic mean averaged over a calendar year
National Secondary Ambient Air Quality Standards
same as primary standard

DOT hazard class:	6.1 POISON
DOT guide:	53
Identification number:	UN2291
DOT shipping name:	LEAD COMPOUNDS, SOLUBLE, N.O.S.
Packing group:	III
Label(s) required:	KEEP AWAY FROM FOOD
Special provisions:	
Packaging exceptions:	173.153
Non bulk packaging:	173.213
Bulk packaging:	173.240
Quantity limitations-	
Passenger air/rail:	100 KG
Cargo aircraft only:	200 KG
Vessel stowage:	A
Other stowage provisions:	

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:No
National Primary Drinking Water Regulations
  Maximum Contaminant Levels (MCL): Treatment technique (12/07/92)
  Maximum Contaminant Level Goals (MCLG): 0 mg/L (12/07/92)
CLEAN AIR ACT: CAA '90 By category and CAA '77 Sect 109
EPA WASTE NUMBER: D008
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Chronic toxicity: carcinogen
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-B
Mailability: Domestic service and air transportation; shipper's declaration
Max per parcel: 25 LBS; 5 LBS

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Developmental Toxin List
California Proposition 65 Female Reproductive Toxin List
California Proposition 65 Male Reproductive Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 109 National Ambient Air Quality Standards List
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
LEAD [7439-92-1]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a teratogen.
'A Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
HA Specifically regulated substance. See 29 CFR 1910.1025
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: LASSITUDE, INSOMNIA, PALLOR, EYE GROUNDS, ANOREXIA, LOW-WEIGHT, MALNUTRITION, CONSTIPATION, ABDOMINAL PAIN, COLIC; HYPOTENSE, ANEMIA; GINGIVAL LEAD LINE; TREMBLING PARALYSIS WRIST. ** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS: gi,CNS,kidneys,blood,gingival tissue

SYMPTOMS: LASS, INSOM, PAL, EYE GROUNDS, ANOR, LOW-WT, MALNUT, CONSTI, ABDOM PAIN, COLIC; HYPOTENSE, ANEMIA, GINGIVAL LEAD LINE; TREM, PARA WRIST. METALLIC TASTE, INCREASED SALIVATION, PYORRHEA (FLOW OF MUCOUS). NEUROMUSCULAR: NUMBNESS AND TINGLING OF EXTREMITIES WITH SENSORY

DISTRUBANCE, EXTENSOR WEAKNESS OF WRISTS AND ANKLES, LOSS OF MUSCLE TONE, TREMOR INCREASED DEEP-TENDON REFLEXES, MUSCULAR CRAMPS AND ACHING, MUSCULAR ATROPHY. CNS: VISUAL DISTURBANCES, HEADACHE, NERVOUSNESS OF DEPRESSION, INSOMNIA, MENTAL CONFUSION, DELIRIUM. Source: NIOSHP, THIC

CONC IDLH: 700mg/M3

NIOSH REL: <0.1 mg/M3 Air level to be maintained so that worker blood level remains <0.06 mg/100 g of whole blood

ACGIH TLV: TLV = 0.15mg/M3 as LEAD
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = See 29 CFR 1910.1025 and 1926.62
50 ug/M3

MAK INFORMATION: 0.1 mG/M3
Substance with systemic effects, onset of effect over 2 hours: Peak = 10xMAK for 30 minutes, once per shift of 8 hours.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL
Hallucinations, distorted perceptions
BEHAVIORAL
Muscle weakness

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

ipr-rat LDLo:1 gm/kg
orl-pgn LDLo:160 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:790 mg/kg (multigenerations) AEHLAU 23,102,71
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-rat TDLo:1140 mg/kg (14D pre-21D post) PHMCAA 20,201,78
EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:520 mg/kg (7-22D preg/10D post) FEPRA7 37,394,78
EFFECTS ON NEWBORN

orl-rat TDLo:1100 mg/kg (1-22D preg) FEPRA7 37,895,78
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:10 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-rat TCLo:3 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON NEWBORN

orl-mus TDLo:1120 mg/kg (multigenerations) AEHLAU 23,102,71

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:6300 mg/kg (1-21D preg) EXPEAM 31,1312,75
EFFECTS ON FERTILITY
Female fertility index
EFFECTS ON FERTILITY
Pre-implantation mortility

orl-mus TDLo:300 mg/kg (1-2D preg) TXCYAC 6,129,76
EFFECTS ON FERTILITY
Other measures of fertility

orl-mus TDLo:4800 mg/kg (1-16D preg) BECTA6 18,271,77
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

orl-dom TDLo:662 mg/kg (1-21W preg) TXAPA9 25,466,73
EFFECTS ON NEWBORN
Behavioral

California Prop 65: Developmental toxin (02/27/87)
Female reproductive toxin (02/27/87)
Male reproductive toxin (02/27/87)
Acceptable intake level-inhalation .5 ugD (01/01/94)
Carcinogen (10/01/92)

---------- EPA's IRIS DATA SUMMARY ----------
Lead and compounds (inorganic); CASRN 7439-92-1 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Lead and compounds (inorganic)
CASRN -- 7439-92-1
Last Revised -- 05/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for

information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B2; probable human carcinogen

Basis -- Sufficient animal evidence. Ten rat bioassays and one mouse assay have shown statistically significant increases in renal tumors with dietary and subcutaneous exposure to several soluble lead salts. Animal assays provide reproducible results in several laboratories, in multiple rat strains with some evidence of multiple tumor sites. Short term studies show that lead affects gene expression. Human evidence is inadequate.

___II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. There are four epidemiologic studies of occupational cohorts exposed to lead and lead compounds. Two studies (Dingwall-Fordyce and Lane, 1963; Nelson et al., 1982) did not find any association between exposure and cancer mortality. Selevan et al. (1985), in their retrospective cohort mortality study of primary lead smelter workers, found a slight decrease in the total cancer mortality (SMR=95). Apparent excesses were observed for respiratory cancer (SMR=111, obs=41, p>0.05) and kidney cancer (SMR=204, obs=6, p>0.05). Cooper and Gaffey (1975) and Cooper (1985 update) performed a ort mortality study of battery plant workers and lead smelter workers. ney found statistically significant excesses for total cancer mortality (SMR=113, obs=344), stomach cancer (SMR=168, obs=34), and lung cancer (SMR=124, obs=109) in the battery plant workers. Although similar excesses were observed in the smelter workers, they were not statistically significant. Cooper and Gaffey (1975) felt it was possible that individual subjects were monitored primarily on the basis of obvious signs of lead exposure, while others who showed no symptoms of lead poisoning were not monitored.

All of the available studies lacked quantitative exposure information, as well as information on the possible contribution from smoking. All studies also included exposures to other metals such as arsenic, cadmium, and zinc for which no adjustment was done. The cancer excesses observed in the lung and stomach were relatively small (<200). There was no consistency of site among the various studies, and no study showed any dose-response relationship. Thus, the available human evidence is considered to be inadequate to refute or demonstrate any potential carcinogenicity for humans from lead exposure.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. The carcinogenic potential of lead salts (primarily phosphates and acetates) administered via the oral route or by injection has

been demonstrated in rats and mice by more than 10 investigators. The most characteristic cancer response is bilateral renal carcinoma. Rats given lead acetate or subacetate orally have developed gliomas, and lead subacetate also produced lung adenomas in mice after i.p. adminstration. Most of these investigations found a carcinogenic response only at the highest dose. The lead compounds tested in animals are almost all soluble salts. Metallic lead, lead oxide and lead tetralkyls have not been tested adequately. Studies of inhalation exposure have not been located in the literature.

Azar et al. (1973) administerd 10, 50, 100, and 500 ppm lead as lead acetate in dietary concentrations to 50 rats/sex/group for 2 years. Control rats (100/sex) received the basal laboratory diet. In a second 2-year feeding study, 20 rats/group were given diets containing 0, 1000, and 2000 ppm lead as lead acetate. No renal tumors were reported in the control groups or in treated animals of either sex receiving 10 to 100 ppm. Male rats fed 500, 1000, and 2000 ppm lead acetate had an increased renal tumor incidence of 5/50, 10/20, and 16/20, while 7/20 females in the 2000-ppm group developed renal tumors.

The Azar et al. (1973) study is limited by the lack of experimental detail. The possibility of environmental contamination from lead in the air or drinking water was not mentioned. The strains of rats used were not specified in the study, but the Health Effects Assessment for Lead (U.S. EPA, 1984) indicates the rats were Wistar strain. The weight gain at 1000 and 2000 ppm was reported to be depressed, but details were not given.

Kasprzak et al. (1985), in investigating the interaction of dietary calcium on lead carcinogenicity, fed 1% lead subacetate (8500 ppm Pb) to male Sprague-Dawley rats in the diet for 79 weeks. Of the rats surviving (29/30) in this treatment group beyond 58 weeks, 44.8% had renal tumors. Four rats had adenocarcinomas; the remainaing nine had adenomas. Bilateral tumors were noted. No renal tumors were noted among the controls.

As part of a study to determine interactions between sodium nitrite, ethyl urea and lead, male Sprague-Dawley rats were given lead acetate in their drinking water for 76 weeks (Koller et al., 1986). The concentration of lead was 2600 ppm. No kidney tumors were detected among the 10 control rats. Thirteen of 16 (81%) lead-treated rats had renal tubular carcinoma; three tumors were detected at 72 weeks and the remainder detected at the termination of the study.

Van Esch and Kroes (1969) fed basic lead acetate at 0, 0.1%, and 1.0% in the diet to 25 Swiss mice/sex/group for 2 years. No renal tumors developed in the control group, but 6/25 male mice of 0.1% basic lead acetate group had renal tumors (adenomas and carcinomas combined). In the 1.0% group, one female had a renal tumor. The authors thought that the low incidence in the 1.0% group was due to early mortality.

Hamsters given lead subacetate at 0.5% and 1% in the diet had no significant renal tumor response (Van Esch and Kroes, 1969).

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Lead acetate induces cell transformation in Syrian hamster embryo cells (DiPaolo et al., 1978) and also enhances the incidence of simian adenovirus induction. Lead oxide showed similar enhanced adenovirus induction (Casto et al., 1979).

Under certain conditions lead compounds are capable of inducing chromosomal aberrations in vivo and in tissue cultures. Grandjean et al. (1983) showed a relationship between SCE and lead exposure in exposed workers. Lead has been shown, in a number of DNA structure and function assays, to affect the molecular processes associated with the regulation of gene expression (U.S. EPA, 1986).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

Quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release, and excretion of lead. In addition, current knowledge of lead pharmacokinetics indicates that an estimate derived by standard procedures would not truly describe the potential risk. Thus, the Carcinogen Assessment Group recommends that a numerical estimate not be used.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1984. Health Effects Assessment for Lead. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/055. NTIS PB85-163996/AS.

U.S. EPA. 1986. Air Quality Criteria Document for Lead. Volumes III, IV.

Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC, for the Office of Air Quality Planning and Standards. EPA-600/8-83/028dF.

U.S. EPA. 1987. Preliminary review of the carcinogenic potential of lead associated with oral exposure. Prepared by the Office of Health and Environmental Assessment, Carcinogenic Assessment Group, Washington DC, for the Office of Drinking Water, Office of Solid Waste and the Office of Emergency and Remedial Response (Superfund). OHEA-C-267. Internal Review Draft.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The review of the carcinogenic potential of lead associated with oral exposure has received Agency review.

The 1986 Air Quality Criteria Document for Lead has received Agency and External Review.

Agency Work Group Review: 05/04/88

Verification Date: 05/04/88

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

William Pepelko / ORD -- (202)260-5898 / FTS 260-5898

James Cogliano / ORD -- (202)260-9243 / FTS 260-9243

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
At the end of each work shift.

** REMOVE CLOTHING:

Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

:OMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (LEAD)
Not in excess of 0.5 mg/M3: Half-mask, air-purifying respirator equipped with high efficiency filters.
Not in excess of 2.5 mg/M3: Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 50 mg/M3: (1) Any powered, air-purifying respirator with high efficiency filters; or (2) Half-mask supplied-air respirator operated in positive-pressure mode.
Not in excess of 100 mg/M3: Supplied air respirator with full facepiece hood, or helmet or suit and operated in positive pressure mode.
Unknown concentration or Firefighting: Full facepiece, self-contained breathing apparatus operated in postive-pressure mode.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap flush promptly
INHALATION: art resp
INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: LEAD COMPOUNDS, SOLUBLE, N.O.S.
DOT ID NUMBER: UN2291

ERG93 GUIDE 53

POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if swallowed.
Inhalation of dust or mist may be poisonous.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water

pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 59 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: BENZENE

SYNONYMS: BENZOL; COAL TAR NAPHTHA; CYCLOHEXATRIENE; PHENYL HYDRIDE; PHENE; COAL NAPHTHA; PYROBENZOL

CAS: 71-43-2 RTECS: CY1400000

FORMULA: C6H6 MOL WT: 78.11

WLN: RH

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless to pale yellow watery liquid with a gasoline-like odor

BOILING POINT:	353.15 K	80 C	176 F
MELTING POINT:	278.71 K	5.5 C	42 F
FLASH POINT:	262 K	-11.15 C	11.9 F
AUTO IGNITION:	864.8 K	591.6 C	1097 F
CRITICAL TEMP:	562.1 K	288.95 C	552.11 F
CRITICAL PRESS:	4.89 kN/M2	48.2 atm	708 psia
HEAT OF VAP:	169 Btu/lb	93.85 cal/g	3.927x E5 J/kg
HEAT OF COMB:	-17460 Btu/lb	-9707 cal/g	-406x E5 J/kg

VAPOR PRESSURE: 75 mm @ 20 C

UEL: 7.1 %

LEL: 1.3 %

IONIZATION POTENTIAL (eV): 9.25

VAPOR DENSITY: 2.77 (air=1)

EVAPORATION RATE: 3.50(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.86-0.88 20 C

DENSITY: 0.8794 @ 20 C

WATER SOLUBILITY: 0.06%

INCOMPATIBILITIES: strong ox,chlorine,bromine with iron

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS(Br2, F2, CL2, CrO3, NaClO4, O2, O3), PERCHLORATES (AlCl3 +NaClO4), (H2SO4 & PERMANGANATES), K2O2, (AgClO4 & ACETIC ACID), Na2O2 Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: VAPOR IS HEAVIER THAN AIR AND MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.

ODOR DETECTED AT (ppm): 4.68 ppm
ODOR DESCRIPTION: odor; characteristic odor Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1114
DOT shipping name: Benzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T8
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:40

STCC NUMBER: 4908110

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.005 mg/L (01/09/89)
Maximum Contaminant Level Goals (MCLG): 0 mg/L (01/09/89)
CLEAN AIR ACT: CAA '90 Listed and CAA '77 Sect 109
EPA WASTE NUMBER: U019,D018,D001
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312 categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: carcinogen
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/89/209464/AS)
BENZENE [71-43-2]
California OSHA Carcinogens List.
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act Section 112 Hazardous Air Pollutants List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
National Toxicology Program (NTP) list of human carcinogens
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
New Jersey Right to Know Substance List. Listed as a mutagen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
OSHA Specifically regulated substance. See 29 CFR 1910.1028
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Suspected carcinogen (ACGIH). "Threshold Limit Values for 1992-1993"
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: benzene may produce both nerve and blood effects. irritation of the nose, throat and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). lung congestion may occur. nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness and slurred speech. at high levels, slowed breathing and death may result. death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes. SKIN: irritation may occur, with redness and blistering if not promptly removed. benzene is poorly absorbed. whole body exposure for 30 minutes has been reported with no health effects. Eyes: may cause severe irritation. INGESTION: may cause irritation of mouth, throat and stomach. symptoms are similar to those listed under inhalation. one tablespoon may cause collapse, bronchitis, pneumonia and death.(NYDH)

LONG TERM TOXICITY: may cause loss of appetite, nausea, weight loss, fatigue, muscle weakness, headache, dizziness, nervousness and irritability. mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. at levels between 100 and 200 ppm for periods of 6 months, or more, severe irreversible blood changes and damage to liver and heart may occur. temporary partial paralysis has been reported.(NYDH)

TARGET ORGANS: blood, CNS, skin, bone marrow, eyes, resp sys

SYMPTOMS: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: Potential occupational carcinogen 0.1 ppm Time weighted averages for 8-hour exposure 0.32 mg/M3 Time weighted averages for 8-hour exposure 1 ppm Ceiling exposures which shall at no time be exceeded 3.2 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 10ppm Suspected human carcinogen (A2)
ACGIH STEL: Suspected human carcinogen (A2)

OSHA PEL: Final Rule Limits:
TWA = 1 ppm
STEL = 5 ppm
CONSULT 29CFR 1910.1028

MAK INFORMATION: Danger of cutaneous absorption
Carcinogenic working material without MAK
Capable of inducing malignant tumors as shown by

experience with humans.
Substances which has been demonstrated to cause genetic damage in mammalian (including human) germ cells without proof of transmission.

CARCINOGEN?: Y STATUS: See below
REFERENCES:

HUMAN SUSPECTED IARC** 7,203,74
HUMAN SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 29,93,82
HUMAN POSITIVE IARC** 29,93,82
ANIMAL INDEFINITE IARC** 7,203,74

CARCINOGEN LISTS:

IARC: Carcinogen as defined by IARC as carcinogenic to humans, with sufficient epidemiological evidence.
MAK: Capable of inducing malignant tumors as shown by experience in humans.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as known to be carcinogenic, with evidence from human studies.
ACGIH: Carcinogen defined by ACGIH TLV Committee as a confirmed human carcinogen, recognized to have carcinogenic or cocarcinogenic potential.
OSHA: Cancer hazard

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* ihl-hmn LCLo:2 pph/5M TABIA2 3,231,33

* orl-man LDLo:50 mg/kg YAKUD5 22,883,80

* ihl-hmn LCLo:2000 ppm/5M YAKUD5 22,883,80

ihl-man TCLo:150 ppm/1Y-I BLUTA9 28,293,74
BLOOD
Other changes
NUTRITIONAL AND GROSS METABOLIC
Changes in:
Body temperature increase

ihl-hmn TCLo:100 ppm INMEAF 17,199,48
BEHAVIORAL
Somnolence(general depressed activity)
GASTROINTESTINAL
Nausea or vomiting

SKIN AND APPENDAGES
Skin - after systemic exposure
Dermatitis,other

ihl-hmn LCLo:65 mg/m3/5Y ARGEAR 44,145,74
BLOOD
Other changes

LD50 value: orl-rat LD50:930 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:930 mg/kg
ihl-rat LC50:10000 ppm/7H
ipr-rat LD50:2890 ug/kg
orl-mus LD50:4700 mg/kg
ihl-mus LC50:9980 ppm
ipr-mus LD50:340 mg/kg
orl-dog LDLo:2 gm/kg
ihl-dog LCLo:146000 mg/m3
ihl-cat LCLo:170000 mg/m3
ihl-rbt LCLo:45000 ppm/30M
skn-rbt LD50:>9400 mg/kg
ivn-rbt LDLo:88 mg/kg
skn-gpg LD50:>9400 mg/kg
ipr-gpg LDLo:527 mg/kg
scu-frg LDLo:1400 mg/kg
ihl-mam LCLo:20000 ppm/5M
ipr-mam LDLo:1500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:670 mg/m3/24H (15D pre/1-22D preg) HYSAAV 33(1-3),327,68
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:56600 ug/m3/24H (1-22D preg) HYSAAV 33(7-9),112,68
EFFECTS ON NEWBORN

ihl-rat TCLo:50 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:150 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON FERTILITY
Post-implantation mortality
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:12 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:6500 mg/kg (8-12D preg) TCMUD8 6,361,86
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-mus TCLo:500 ppm/7H (6-15D preg) AIHAAP 40,993,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:500 mg/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:5 ppm (6-15D preg) TXCYAC 42,171,86
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-mus TCLo:20 ppm/6H (6-15D preg) FAATDF 10,224,88
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ipr-mus TDLo:5 mg/kg (1D male) TPKVAL 15,30,79
EFFECTS ON FERTILITY
Pre-implantation mortility
EFFECTS ON EMBRYO OR FETUS
Fetal death

ipr-mus TDLo:219 mg/kg (14D preg) EMMUEG 18,1,91
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and

marrow)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Hapatobilinary system

scu-mus TDLo:1100 mg/kg (12D preg) TOXID9 1,125,81
EFFECTS ON EMBRYO OR FETUS
Other effects on embryo or fetus

scu-mus TDLo:7030 mg/kg (12-13D preg) SEIJBO 15,47,75
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ivn-mus TDLo:13200 ug/kg (13-16D preg) ICHUDW 4(6),24,82
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

par-mus TDLo:4 gm/kg (12D preg) NEZAAQ 25,438,70
EFFECTS ON NEWBORN
Weaning or lactation index(#alive at weaning per # alive at day 4)

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON FERTILITY
Abortion
EFFECTS ON EMBRYO OR FETUS
Fetal death

California Prop 65: Carcinogen (02/27/87)
No significant risk level 7. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------

Benzene; CASRN 71-43-2 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Benzene
CASRN -- 71-43-2
Last Revised -- 04/01/92

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood

that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- A; human carcinogen

Basis -- Several studies of increased incidence of nonlymphocytic leukemia from occupational exposure, increased incidence of neoplasia in rats and mice exposed by inhalation and gavage, and some supporting data form the basis for this classification.

II.A.2. HUMAN CARCINOGENICITY DATA

Aksoy et al. (1974) reported effects of benzene exposure among 28,500 Turkish workers employed in the shoe industry. Mean duration of employment was 9.7 years (1-15 year range) and mean age was 34.2 years. Peak exposure was reported to be 210-650 ppm. Twenty-six cases of leukemia and a total of 34 leukemias or preleukemias were observed, corresponding to an incidence of 13/100,000 (by comparison to 6/100,000 for the general population). A follow-up paper (Aksoy, 1980) reported eight additional cases of leukemia as well as evidence suggestive of increases in other malignancies.

In a retrospective cohort mortality study Infante et al. (1977a,b) examined leukemogenic effects of benzene exposure in 748 white males exposed while employed in the manufacturing of rubber products. Exposure occurred from 1940-1949, and vital statistics were obtained through 1975. A statistically significant increase (p less than or equal to 0.002) of leukemias was found by comparison to the general U.S. population. There was no evidence of solvent exposure other than benzene. Air concentrations were generally found to be below the recommended limits in effect during the study period.

In a subsequent retrospective cohort mortality study Rinsky et al. (1981) observed seven deaths from leukemia among 748 workers exposed to benzene and followed for at least 24 years (17,020 person-years). This increased incidence was statistically significant; standard mortality ratio (SMR) was 560. For the five leukemia deaths that occurred among workers with more than 5 years exposure, the SMR was 2100. Exposures (which ranged from 10-100 ppm

8-hour TWA) were described as less than the recommended standards for the time period of 1941-1969.

In an updated version of the Rinsky et al. (1981) study, the authors followed the same cohort to 12/31/81 (Rinsky et al., 1987). An in his earlier study, cumulative exposure was derived from historic air-sampling data or interpolated estimates based on exisitng data. Standardized mortality rates ranged from 109 at cumulative benzene exposures under 40 ppm-years and increased montonically to 6637 (6 cases) at 400 ppm-years or more. The authors found significantly elevated risks of leukemia at cumulative exposures less than the equivalent current standard for occupational exposure which is 10 ppm over a 40-year working lifetime.

Ott et al. (1978) observed three deaths from leukemia among 594 workers followed for at least 23 years in a retrospective cohort mortality study, but the increase was not statistically significant. Exposures ranged from <2 to >25 ppm 8-hour TWA.

Wong et al. (1983) reported on the mortality of male chemical workers who had been exposed to benzene for at least 6 months during the years 1946-1975. The study population of 4062 persons was drawn from seven chemical plants, and jobs were categorized as to peak exposure. Those with at least 3 days/week exposure (3036 subjects) were further categorizeed on the basis of an 8-hour TWA. The control subjects held jobs at the same plants for at least 6 months but were never subject to benzene exposure. Dose-dependent increases were seen in leukemia and lymphatic and hematopoietic cancer. The incidence of leukemia was responsible for the majority of the increase. It was noted that the significance of the increase is due largely to a less than expected incidence of neoplasia in the unexposed subjects.

Numerous other epidemiologic and case studies have reported an increased incidence or a causal relationship between leukemia and exposure to benzene (IARC, 1982).

___II.A.3. ANIMAL CARCINOGENICITY DATA

Both gavage and inhalation exposure of rodents to benzene have resulted in development of neoplasia. Maltoni and Scarnato (1979) and Maltoni et al. (1983) administered benzene by gavage at dose levels of 0, 50, 250, and 500 mg/kg bw to 30-40 Sprague-Dawley rats/sex for life. Dose-related increased incidences of mammary tumors were seen in females and of Zymbal gland carcinomas, oral cavity carcinomas and leukemias/lymphomas in both sexes.

In an NTP (1986) study, benzene was administered by gavage doses of 0, 50, 100, or 200 mg/kg bw to 50 F344/N rats/sex or 0, 25, 50, or 100 mg/kg bw to 50 B6C3F1 mice/sex. Treatment was 5 times/week for 103 weeks. Significantly increased incidences ($p<0.05$) of various neoplasic growths were seen in both sexes of both species. Both male and female rats and mice had increased incidence of carcinomas of the Zymbal gland. Male and female rats had oral cavity tumors, and males showed increased incidences of skin tumors. Mice of both sexes had increased incidence of lymphomas and lung tumors. Males were

observed to have harderian and preputial gland tumors and females had tumors of mammary gland and ovary. In general, the increased incidence was dose-related.

Slightly increased incidences of hematopoietic neoplasms were reported for male C57Bl mice exposed by inhalation to 300 ppm benzene 6 hours/day, 5 days/week for 488 days. There was no increase in tumor incidence in male AKR or CD-1 mice similarly exposed to 100 ppm or 100 or 300 ppm benzene, respectively. Likewise male Sprague-Dawley rats exposed by inhalation to 300 ppm benzene were not observed to have increased incidence of neoplasia (Snyder et al., 1981).

Maltoni et al. (1983) treated male and female Sprague-Dawley rats in the following manner. Starting at 13 weeks of age rats were exposed to 200 ppm benzene 4 hours/day, 5 days/week for 7 weeks; 200 ppm 7 hours/day, 5 days/week for 12 weeks; 300 ppm 7 hours/day, 5 days/week for 85 weeks. An 8-hour/day TWA for 5 days/week was calculated to be 241 ppm. A statistically significant increase was noted in hepatomas and carcinomas of the Zymbal gland.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Numerous investigators have found significant increases in chromosomal aberrations of bone marrow cells and peripheral lymphocytes from workers with exposure to benzene (IARC, 1982). Benzene also induced chromosomal aberrations in bone marrow cells from rabbits (Kissling and Speck, 1973), mice (Meyne and Legator, 1980) and rats (Anderson and Richardson, 1979). Several investigators have reported positive results for benzene in mouse micronucleus assays (Meyne and Legator, 1980). Benzene was not mutagenic in several bacterial and yeast systems, in the sex-linked recessive lethal mutation assay with Drosophila melanogaster or in mouse lymphoma cell forward mutation assay.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

___II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- 2.9E-2 per (mg/kg)/day

Drinking Water Unit Risk -- 8.3E-7 per (ug/L)

Extrapolation Method -- One-hit (pooled data)

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+2 ug/L

E-5 (1 in 100,000) 1E+1 ug/L
E-6 (1 in 1,000,000) 1E+0 ug/L

___II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

Tumor Type -- leukemia
Test Animals -- human
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

The slope factor was derived from human data for inhalation exposure (see dose-response data for inhalation quantitative estimate). The human respiratory rate was assumed to be 20 cu.m/day and the human drinking water intake was assumed to be 2 L/day. The fraction of the administered dose absorbed systemically via inhalation and via drinking water were assumed to be equal.

___II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study as described in the additional comments section for inhalation data.

The unit risk should not be used if the water concentration exceeds 1E+4 ug/L, since above this concentration the unit risk may not be appropriate.

___II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an adequate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2. Regression models give an estimate similar to the geometric mean.

The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate.

Risk estimates based on animal gavage studies are about 5 times higher than those derived from human data. Pharmacokinetic data which could impact the risk assessment are currently being evaluated.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- 8.3E-6 per (ug/cu.m)

Extrapolation Method -- One-hit (pooled data)

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+1 ug/cu.m
E-5 (1 in 100,000)	1E+0 ug/cu.m
E-6 (1 in 1,000,000)	1E-1 ug/cu.m

II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- leukemia
Test Animals -- humans
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study. The Rinsky data used were from an updated tape which reports one more case of leukemia than was published in 1981. Equal weight was given to cumulative dose and weighted cumulative dose exposure categories as well as to relative and absolute risk model forms. The results of the Wong et al. (1983) study were incorporated by assuming that the ratio of the Rinsky-Ott-Wong studies to the Rinsky-Ott studies for the relative risk cumulative dose model was the same as for other model-exposure category combinations and multiplying this ratio by the Rinsky-Ott geometric mean. The age-specific U.S. death rates for 1978 (the most current year available) were used for background leukemia and total death rates. It should be noted that a recently published paper (Rinsky et al., 1987) reported yet another case of leukemia from the study population.

The unit risk should not be used if the air concentration exceeds 100 ug/cu.m, since above this concentration the unit risk may not be appropriate.

___II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an adequate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2/ppm. Regression models give an estimate similar to the geometric mean.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Benzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office (Cincinnati, OH) and Carcinogen Assessment Group (Washington, DC), and the Environmental Research Labs (Corvalis, OR; Duluth, MN; Gulf Breeze, FL) for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-018.

U.S. EPA. 1985. Interim Quantitative Cancer Unit Risk Estimates Due to Inhalation of Benzene. Prepared by the Office of Health and Environmental Assessment, Carcinogen Assessment Group, Washington, DC for the Office of Air Quality Planning and Standards, Washington, DC.

U.S. EPA. 1987. Memorandum from J. Orme, HEB, CSD/ODW to C. Vogt, Criteria and Standards Division, ODW, June, 1987.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1985 Interim Evaluation was reviewed by the Carcinogen Assessment Group.

The 1987 memorandum is an internal document.

Agency Work Group Review: 03/05/87, 10/09/87

Verification Date: 10/09/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

D.L. Bayliss / ORD -- (202)260-5726 / FTS 260-5726

R. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
hydrocarbon vapor canister, supplied air or hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.

OSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly wash with soap when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BENZENE)
Less than or equal to 10 ppm: Half-mask air-purifying respirator with organic vapor cartridge.
Less than or equal to 50 ppm: Full facepiece respirator with organic vapor cartridges. / Full facepiece gas mask with chin style canister.
Less than or equal to 100 ppm: Full facepiece powered air-purifying respirator with organic vapor canister.

Less than or equal to 1000 ppm: Supplied air respirator with full facepiece in positive-pressure mode.
Greater than 1000 ppm or Unknown concentration: (1) Self-contained breathing apparatus with full face-piece in positive pressure mode. (2) Full facepiece positive-pressure supplied-air respirator with auxiliary self-contained air supply.
Escape : (1) Any organic vapor gas mask; or (2) Any self-contained breathing apparatus with full facepiece.
Firefighting : Any full facepiece self-contained breathing apparatus operated in positive pressure mode.

FIRST AID SOURCE: NIOSHP
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin.
EYES: flush with plenty of water until irritation subsides.
INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Dry chemical, foam, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Benzene
DOT ID NUMBER: UN1114

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 398 LAST UPDATE OF THIS RECORD: 06/03/93

NAME:	TOLUENE		
SYNONYMS:	TOLUOL; PHENYL METHANE; METHYL BENZENE; BENZENE, METHYL-		
CAS:	108-88-3	RTECS:	XS5250000
FORMULA:	C7H8	MOL WT:	92
WLN:	1R		
CHEMICAL CLASS:	Aromatic hydrocarbon		

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless watery liquid with a pleasant odor

BOILING POINT:	383.6 K	110.4 C	230.8 F
MELTING POINT:	178.00 K	-95.2 C	-139.3 F
FLASH POINT:	277.6 K	4.45 C	40 F
AUTO IGNITION:	809 K	535.8 C	996.6 F
CRITICAL TEMP:	591.8 K	318.65 C	605.57 F
CRITICAL PRESS:	4.108 kN/M2	40.5 atm	595 psia
HEAT OF VAP:	155 Btu/lb	86.08 cal/g	3.601x E5 J/kg
HEAT OF COMB:	-17430 Btu/lb	-9690 cal/g	-405x E5 J/kg

VAPOR PRESSURE:	36.7 mm @ 30 C
[illegible]:	7.1 %
[illegible]:	1.3 %
IONIZATION POTENTIAL (eV):	8.82
VAPOR DENSITY:	3.14 (air=1)
EVAPORATION RATE:	2.00(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY:	0.867 @ 20 C
DENSITY:	0.867
WATER SOLUBILITY:	0.05%
INCOMPATIBILITIES:	strong ox
REACTIVITY WITH WATER:	No data on water reactivity
REACTIVITY WITH COMMON MATERIALS:	No data
STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):	40 PPM
ODOR DESCRIPTION:	STRONG, PLEASANT Source:NYDH
100 % ODOR DETECTION:	No data

REGULATIONS

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27
Identification number: UN1294
DOT shipping name: Toluene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909305

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 1 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 1 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U220,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

Fire hazard: flammable.
Chronic toxicity: carcinogen
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/90/198904/AS)
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Department of Health Services Drinking Water Action List.
California Proposition 65 Developmental Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
TOLUENE [108-88-3]
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 100 ppm exposure can cause dizziness, drowsiness and hallucinations. 100-200 ppm can cause depression. 200-500 ppm can cause headaches, nausea, loss of appetite, loss of energy, loss of coordination and coma. in addition to the above, death has resulted from exposure to 10,000 ppm for an unknown time. SKIN: can cause dryness and irritation. absorption may cause or increase the severity of

symptoms listed above. Eyes: can cause irritation at 300 ppm. INGESTION: can cause a burning sensation in the mouth and stomach, upper abdominal pain, cough, hoarseness, headache, nausea, loss of appetite, loss of energy, loss of coordination and coma.(NYDH)

LONG TERM TOXICITY: levels below 200 ppm may produce headache, tiredness and nausea. from 200 to 750 ppm symptoms may include insomnia, irritability, dizziness, some loss of memory, loss of appetite, a feeling of drunkeness and disturbed menstruation. levels up to 1,500 ppm may cause heart palpitations and loss of coordination. blood effects and anemia have been reported but are probably due to contamination by benzene. most of these effects area believed to go away when exposure stops.(NYDH)

TARGET ORGANS: CNS, liver, kidneys, skin, eyes

SYMPTOMS: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. Source: CHRIS

CONC IDLH: 2000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure
375 mg/M3 Time weighted averages for 8-hour exposure
200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 750 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 50ppm(188 mg/M3) Skin
ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 200 PPM; CEILING = 300 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 100 ppm (375 mg/M3)
STEL = 150 ppm(560 mg/M3)

MAK INFORMATION: 50 ppm
190 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 5xMAK for 30 minutes, 2 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-hmn TCLo:200 ppm JAMAAP 123,1106,43
BRAIN AND COVERINGS
Recordings from specific areas of CNS
BEHAVIORAL
Antipsychotic
BLOOD
Changes in bone marrow not included above

LD50 value: orl-rat LD50:636 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:636 mg/kg
ihl-rat LC50:>26700 ppm/1H
ipr-rat LD50:1332 mg/kg
ivn-rat LD50:1960 mg/kg
unr-rat LD50:6900 mg/kg
ihl-mus LC50:400 ppm/24H
ipr-mus LD50:59 mg/kg
scu-mus LD50:2250 mg/kg
unr-mus LD50:2 gm/kg
ihl-rbt LCLo:55000 ppm/40M
skn-rbt LD50:12124 mg/kg
ivn-rbt LDLo:130 mg/kg
ihl-gpg LCLo:1600 ppm
ipr-gpg LD50:500 mg/kg
scu-frg LDLo:920 mg/kg
ipr-mam LDLo:1750 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:1500 mg/m3/24H (1-8D preg) TXCYAC 11,55,78

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 mg/m3/24H (7-14D preg) FMORAO 28,286,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:800 mg/m3/6H (14-20D preg) BJMRDK 23,533,90
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON NEWBORN
Behavioral

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:15 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:30 gm/kg (6-15D preg) TJADAB 19,41A,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-mus TCLo:500 mg/m3/24H (6-13D preg) TXCYAC 11,55,78
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1000 ppm/6H (2-17D preg) TJEMDR 7,265,82
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:400 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
EFFECTS ON NEWBORN

ihl-mus TCLo:200 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Abortion

ihl-rbt TDLo:100 ppm/6H (6-18D preg) ARTODN 66,373,92
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Cardiovascular(circulatory)system

California Prop 65: Developmental toxin (01/01/91)
Acceptable intake level-inhalation 13000. ugD (01/01/94)
Acceptable intake level-oral intake 7000. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Toluene; CASRN 108-88-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Toluene
CASRN -- 108-88-3
Last Revised -- 08/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classified

Basis -- No human data and inadequate animal data. Toluene did not produce positive results in the majority of genotoxic assays.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

A chronic (106-week) bioassay of toluene in F344 rats of both sexes

reported no carcinogenic responses (CIIT, 1980). A total of 960 rats were exposed by inhalation for 6 hours/day, 5 days/week to toluene at 0, 30, 100, or 300 ppm. Groups of 20/sex/dose were sacrificed at 18 months. Gross and microscopic examination of tissues and organs identified no increase in neoplastic tissue or tumor masses among treated rats when compared with controls. The study is considered inadequate because the highest dose administered was well below the MTD for toluene and because of the high incidence of lesions and pathological changes in the control animals.

Several studies have examined the carcinogenicity of toluene following repeated dermal applications. Toluene (dose not reported) applied to shaved interscapular skin of 54 male mice (strains A/He, C3HeB, SWR) throughout their lifetime (3 times weekly) produced no carcinogenic response (Poel, 1963). One drop of toluene (about 6 mL) applied to the dorsal skin of 20 random-bred albino mice twice weekly for 50 weeks caused no skin papillomas or carcinomas after a 1-year latency period was allowed (Coombs et al., 1973). No increase in the incidence of skin or systemic tumors was demonstrated in male or female mice of three strains (CF, C3H, or CBaH) when toluene was applied to the back of 25 mice of each sex of each strain at 0.05-0.1 mL/mouse, twice weekly for 56 weeks (Doak et al., 1976). One skin papilloma and a single skin carcinoma were reported among a group of 30 mice treated dermally with one drop of 0.2% (w/v) solution toluene twice weekly, administered from droppers delivering 16-20 uL per drop for 72 weeks (Lijinsky and Garcia, 1972). It is not reported whether evaporation of toluene from the skin was prevented during these studies.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Toluene was found to be nonmutagenic in reverse mutation assays with S. typhimurium (Mortelmans and Riccio, 1980; Nestmann et al., 1980; Bos et al., 1981; Litton Bionetics, Inc., 1981; Snow et al., 1981) and E. coli (Mortelmans and Riccio, 1980), with and without metabolic activation. Toluene did not induce mitotic gene conversion (Litton Bionetics, Inc., 1981; Mortelmans and Riccio, 1980) or mitotic crossing over (Mortelmans and Riccio, 1980) in S. cerevisiae. Although Litton Bionetics, Inc. (1981) reported that toluene did not cause increased chromosomal aberrations in bone marrow cells, several Russian studies (Dobrokhotov, 1972; Lyapkalo, 1973) report toluene as effective in causing chromosal damage in bone marrow cells of rats. There was no evidence of chromosomal aberrations in blood lymphocytes of workers exposed to toluene only (Maki-Paakkanen et al., 1980; Forni et al., 1971), although a slight increase was noted in workers exposed to toluene and benzene (Forni et al., 1971; Funes-Craviota et al., 1977). This finding is supported by studies of cultured human lymphocytes exposed to toluene in vitro; no elevation of chromosomal aberrations or sister chromatid exchanges was observed (Gerner-Smidt and Friedrich, 1978).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Toluene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-408.

_ _II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The values in the 1987 Drinking Water Criteria Document for Toluene have received peer and administrative review.

Agency Work Group Review: 09/15/87

Verification Date: 09/15/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

Robert E. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TOLUENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor.

INGESTION: do NOT induce vomiting; call a doctor.
EYES: flush with water for at least 15 min.
SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Toluene
DOT ID NUMBER: UN1294

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive

fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 206 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYL BENZENE

SYNONYMS: AETHYLBENZOL (German); EB; ETHYLBENZEEN (Dutch); ETHYL BENZENE; ETHYL BENZENE (DOT); ETHYLBENZOL; ETILBENZENE (Italian); ETYLOBENZEN (Polish); NCI-C56393; PHENYLETHANE

CAS: 100-41-4 RTECS: DA0700000

FORMULA: C8H10 MOL WT: 106.18

WLN: 2R

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless liquid with a sweet, gasoline-like odor.

BOILING POINT:	409.2 K	136 C	276.8 F
MELTING POINT:	178.15 K	-95 C	-139 F
FLASH POINT:	294.26 K	21.11 C	69.9 F
AUTO IGNITION:	733 K	459.8 C	859.8 F
CRITICAL TEMP:	617.1 K	343.95 C	651.11 F
CRITICAL PRESS:	3.61 kN/M2	35.5 atm	523 psia
HEAT OF VAP:	144 Btu/lb	79.97 cal/g	3.346x E5 J/kg
HEAT OF COMB:	-17780 Btu/lb	-9885 cal/g	-413x E5 J/kg

VAPOR PRESSURE: 10mm @ 25.9 C

UEL: 6.7 %

LEL: 1.0 %

IONIZATION POTENTIAL (eV): 8.76

VAPOR DENSITY: 3.7 (air=1)

EVAPORATION RATE: 0.84(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.867 20C

DENSITY: 0.866 g/mL @ 20 C

WATER SOLUBILITY: 0.015%

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 140

ODOR DESCRIPTION: AROMATIC Source:CHRIS

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1175
DOT shipping name: Ethylbenzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909163

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.7 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 0.7 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: D001
CERCLA REF: Y
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312 categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

GIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/19/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYL BENZENE [100-41-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 200 ppm for 30 minutes can cause irritation of the nose and throat, dizziness, difficult breathing and depression. very high levels can cause unconsciousness. SKIN: can cause irritation, inflammation, blisters and burns. Eyes: 200 ppm can cause irritation. higher levels can cause burning, tearing and injury. INGESTION: can cause headache, sleepiness and coma.(NYDH)

LONG TERM TOXICITY: may cause skin rash and irritation of eyes, nose and throat.(NYDH)

TARGET ORGANS: eyes, upper resp sys, skin, CNS

SYMPTOMS: Inhalation may cause irritation of nose, dizziness,

depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. Source: CHRIS

CONC IDLH: 2000PPM

NIOSH REL:

ACGIH TLV: TLV = 100ppm(434 mg/M3)
ACGIH STEL: STEL = 125 ppm(543 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 125 ppm(545 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:100 ppm/8H AIHAAP 31,206,70
SENSE ORGANS
Eye
Other
BEHAVIORAL
Sleep
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:3500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:3500 mg/kg
ihl-rat LCLo:4000 ppm/4H
ihl-mus LDLo:50 gm/m3/2H
ipr-mus LD50:2272 mg/kg
skn-rbt LD50:17800 mg/kg

ihl-gpg LCLo:10000 ppm

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 15 mg/24H open MLD
eye-rbt 100 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:97 ppm/7H (15D pre) NTIS** PB83-208074
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:985 ppm/7H (1-19D preg) NTIS** PB83-208074
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:96 ppm/7H (1-19D preg) NTIS** PB83-208074
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetal death
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:2400 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rbt TCLo:99 ppm/7H (1-18D preg) NTIS** PB83-208074
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Ethylbenzene; CASRN 100-41-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Ethylbenzene
CASRN -- 100-41-4

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- nonclassifiable due to lack of animal bioassays and human studies.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

None. NTP has plans to initiate bioassay. Metabolism and excretion studies at 3.5, 35 and 350 mg/kg are to be conducted as well.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The metabolic pathways for humans and rodents are different (Engstrom et al., 1984). Major metabolites in humans, mandelic acid and phenylglyoxylic acid, are minor metabolites in rats and rabbits (Kiese and Lenk, 1974). The major animal metabolites were not detected in the urine of exposed workers (Engstrom et al., 1984).

Ethylbenzene at 0.4 mg/plate was not mutagenic for Salmonella strains TA98, TA1535, TA1537 and TA1538 with or without Aroclor 1254 induced rat

liver homogenates (S9) (Nestmann et al., 1980). Ethylbenzene was shown to increase the mean number of sister chromatid exchanges in human whole blood lymphocyte culture at the highest dose examined without any metabolic activation system (Norppa and Vainio, 1983).

Dean et al. (1985) used a battery of short-term tests including bacterial mutation assays, mitotic gene conversion in Saccharomyces cerevisiae JD1 in the presence and absence of S9 and chromosomal damage in a cultured rat liver cell line. Ethylbenzene was not mutagenic in the range of concentrations tested (0.2, 2, 20, 50 and 200 ug/plate) for S. typhimurium TA98, TA100, TA1535, TA1537 and TA1538 or for Escherichia coli WP2 and WP2uvrA. Ethylbenzene also showed no response in the S. cerevisiae JD1 gene conversion assay. In contrast, ethylbenzene hydroperoxide showed positive responses with E. coli WP2 at 200 ug/plate in the presence of S9 and an equally significant response with the gene conversion system of yeast.

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-048. NTIS PB 81-117590.

U.S. EPA. 1984. Health Effects Assessment for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/008.

U.S. EPA. 1987. Drinking Water Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Ambient Water Quality Criteria Document and the Health Assessment Document have received Agency and external review. The Drinking Water Criteria Document has been extensively reviewed.

Agency Work Group Review: 10/07/87

Verification Date: 10/07/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Arthur S. Chiu / ORD -- (202)260-6764 / FTS 260-6764

Lynn Papa / ORD -- (513)569-7523 / FTS 684-7523

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
self-contained breathing apparatus; safety goggles.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (ETHYL BENZENE)
1000 ppm: Any powered air-purifying respirator with organic vapor

cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / / self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection. / Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration.
INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis.
SKIN AND
ES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam (most effective), water fog, carbon dioxide or dry chemical. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethylbenzene
DOT ID NUMBER: UN1175

ERG93 GUIDE 26

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 421 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: XYLENE

SYNONYMS: XYLENE (XYLOL); XYLOL; METHYL TOLUENE; BENZENE, DIMETHYL-; DIMETHYLBENZENE; NCI-C55232; VIOLET 3; XYLOL (DOT); SOCAL AQUATIC SOLVENT 3501

CAS: 1330-20-7 RTECS: ZE2100000

FORMULA: C8H10 MOL WT: 106.18

WLN: 1R X1

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless liquid with aromatic odor

BOILING POINT:	412 K	138.8 C	281.9 F
MELTING POINT:	247 K	-26.2 C	-15.1 F
FLASH POINT:	300.35-305.35 K	27.2-32.2 C	80.9-89.9 F
AUTO IGNITION:	736.45-802.05 K	463.3-528.9 C	866-984.1 F

VAPOR PRESSURE: 6.7 mm @ 21 C

UEL: 7 %

LEL: 1 %

NIZATION POTENTIAL (eV): 8.56

POR DENSITY: 3.7 (air=1)

EVAPORATION RATE: 0.77(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.861 20C

DENSITY: 0.861 g/cc or 8.0073 lb/gal

WATER SOLUBILITY: VERY SL SOL

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 0.05

ODOR DESCRIPTION: LIKE BENZENE; CHARACTERISTIC AROMATIC
Source:CHRIS

100 % ODOR DETECTION: 0.4-20 ppm

REGULATIONS

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27

Identification number: UN1307
DOT shipping name: XYLENES
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909350, 4909351

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 10 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 10 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U239,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
Chronic toxicity: carcinogen
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)
XYLENE [1330-20-7]

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: CNS, eyes, gi tract, blood, liver, kidneys, skin

SYMPTOMS: DIZZ, EXCITEMENT, DROW, INCO, STAGGERING GAIT, IRRIT EYES, NOSE, THROAT, CORNEAL VACUOLIZATION, ANOREXIA, NAU, VOMIT, ABDOM PAIN; DERM Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure 434 mg/M3 Time weighted averages for 8-hour exposure 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 868 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 100ppm(434 mg/M3)

ACGIH STEL: STEL = 150 ppm(651 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 150 ppm(655 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-man LCLo:10000 ppm/6H BMJOAE 3,442,70
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Cyanosis
BLOOD
Other changes

LD50 value: orl-rat LD50:4300 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4300 mg/kg
ihl-rat LC50:5000 ppm/4H
ipr-rat LD50:2459 mg/kg
scu-rat LD50:1700 mg/kg
ipr-mus LD50:1548 mg/kg
ivn-rbt LDLo:129 mg/kg
ihl-gpg LCLo:450 ppm
ipr-gpg LDLo:2 gm/kg
ipr-mam LDLo:2 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:250 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Other developmental abnormalities
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) PCBRD2
163B,295,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:20600 ug/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:31 mg/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:4000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN
Physical

ihl-mus TCLo:2000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1 gm/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------

Xylenes; CASRN 1330-20-7 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Xylenes
CASRN -- 1330-20-7
Last Revised -- 03/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- Orally administered technical xylene mixtures did not result in significant increases in incidences in tumor responses in rats or mice of both sexes.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. In an NTP (1986) study, 50 male and 50 female F344/N rats were treated by gavage with mixed xylenes in corn oil (60% m-xylene, 14% p-xylene, 9% o-xylene and 17% ethylbenzene) at dosages of 0, 250 or 500 mg/kg/day, 5 days/week for 103 weeks. Similarly, 50 male and 50 female B6C3F1 mice were treated with the same xylene mixture at dosages of 0, 500 or 1000 mg/kg/day. Animals were killed and examined histologically when moribund or after 104-105 weeks. An apparent dose-related increased mortality was observed in male rats, but this difference was statistically significant for the high dose group, only. No other differences in survival between dosage groups of either sex were observed. Interstitial cell tumors of the testes could not be attributed to administration of the test compound observed in male rats (43/50 control, 38/50 low-dose and 41/49 high-dose). NTP (1986) reported that there were no significant changes in the incidence of neoplastic or nonneoplastic lesions in either the rats or mice that could be considered related to the mixed xylene treatment, and concluded that under the conditions of these 2-year gavage studies, there was "no evidence of carcinogenicity" of xylene (mixed) for rats or mice of either sex at any dosage tested.

Maltoni et al. (1985), in a limited study, reported higher incidences (compared with controls) of malignant tumors in male and female Sprague-Dawley rats treated by gavage with xylene in olive oil at 500 mg/kg/day, 4 or 5 ·s/week for 104 weeks. This study did not report survival rates or specific ıor types; therefore, the results cannot be interpreted.

Berenblum (1941) reported that "undiluted" xylene applied at weekly intervals produced one tumor-bearing animal out of 40 after 25 weeks in skin-painting experiments in mice. No control groups were described. Pound (1970) reported negative results in initiation-promotion experiments with xylene as the initiator and croton oil as the promotor.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The frequency of sister chromatid exchanges and chromosomal aberrations were nearly identical between a group of 17 paint industry workers exposed to xylene and their respective referents (Haglund et al., 1980). In vitro, xylene caused no increase in the number of sister chromatid exchanges in human lymphocytes (Gerner-Smidt and Friedrich, 1978). Studies indicate that xylene isomers, technical grade xylene or mixed xylene are not mutagenic in tests with Salmonella typhimurium (Florin et al., 1980; NTP, 1986; Bos et al., 1981) nor in mutant reversion assays with Escherichia coli (McCarroll et al., 1981). Technical grade xylene, but not o- and m-xylene, was weakly mutagenic in Drosophila recessive lethal tests. Chromosomal aberrations were not increased in bone marrow cells of rats exposed to xylenes by inhalation (Donner et al., 1980).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Xylene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-416. Final.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Drinking Water Criteria Document for Xylene has received Agency and external review.

Agency Work Group Review: 12/02/87

Verification Date: 12/02/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Bruce Mintz / ODW -- (202)260-9569 / FTS 260-9569

W. Bruce Peirano / ORD -- (513)569-7540 / FTS 684-7540

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
)M THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (XYLENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation damage may require eye protection. / Any supplied-air respirator. *)stance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with

running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: XYLENES
DOT ID NUMBER: UN1307

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 5249 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYLENE, TETRACHLORO-

SYNONYMS: ANKILOSTIN; ANTISOL 1; CARBON BICHLORIDE; CARBON DICHLORIDE; CZTEROCHLOROETYLEN (Polish); DIDAKENE; DOW-PER; ENT 1,860; ETHENE, TETRACHLORO-; ETHYLENE TETRACHLORIDE; FEDAL-UN; NCI-C04580; NEMA; PER; PERAWIN; PERC; PERCHLOORETHYLEEN, PER (Dutch); PERCHLOR; PERCHLORAETHYLEN, PER (German); PERCHLORETHYLENE; PERCHLORETHYLENE, PER (French); PERCHLOROETHYLENE; PERCLENE; PERCLOROETILENE (Italian); PERCOSOLVE; PERK; PERKLONE; PERSEC; TETLEN; TETRACAP; TETRACHLOORETHEEN (Dutch); TETRACHLORAETHEN (German); TETRACHLORETHYLENE; TETRACHLOROETHENE; TETRACHLOROETHYLENE; 1,1,2,2,-TETRACHLOROETHYLENE; TETRACHLOROETHYLENE (DOT); TETRACLOROETENE (Italian); TETRALENO; TETRALEX; TETRAVEC; TETROGUER; TETROPIL

CAS: 127-18-4 RTECS: KX3850000

FORMULA: C2Cl4 MOL WT: 165.82

WLN: GYGUYGG

CHEMICAL CLASS: FT

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless liquid, chloroform-like odor.

BOILING POINT:	394.2 K	121 C	249.8 F
MELTING POINT:	249.65 K	-23.5 C	-10.3 F
FLASH POINT:	Not available		
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	15.8MM @ 22C		
UEL:	~		
LEL:	~		
IONIZATION POTENTIAL (eV):	9.32		
VAPOR DENSITY:	No data		
EVAPORATION RATE:	2.59(n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.625 @20/4C		
DENSITY:	1.6311 @ 15/4C		
WATER SOLUBILITY:	QUITE SOLUBLE IN H2O(0.015G/ML @20C), IT IS MISCIBLE WITH MOST ORGANIC SOLVENTS AND OILS.		
INCOMPATIBILITIES:	strong oxidizers, chemically active metals, such as barium, lithium, beryllium, sodium		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	HCL AND PHOSGENE\CORROSIVE
ODOR DETECTED AT (ppm):	5 ppm
ODOR DESCRIPTION:	mildly sweet Source:CHRIS
100 % ODOR DETECTION:	No data

---------- REGULATIONS ----------

DOT hazard class:	6.1 POISON
DOT guide:	74
Identification number:	UN1897
DOT shipping name:	Tetrachloroethylene
Packing group:	III
Label(s) required:	KEEP AWAY FROM FOOD
Special provisions:	N36,T1
Packaging exceptions:	173.153
Non bulk packaging:	173.203
Bulk packaging:	173.241
Quantity limitations-	
Passenger air/rail:	60 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	40
STCC NUMBER:	4940355
CLEAN WATER ACT Sect.307:	Yes
CLEAN WATER ACT Sect.311:	No
National Primary Drinking Water Regulations	
Maximum Contaminant Levels (MCL):	0.005 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG):	0 mg/L (07/30/92)
CLEAN AIR ACT:	CAA '90 Listed
EPA WASTE NUMBER:	U210,D039
CERCLA REF:	Y
RQ DESIGNATION:	B 100 pounds (45.4 kg) CERCLA
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: carcinogen Chronic toxicity: adverse effect to target organ after long period of exposure. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-A
Mailability: Domestic service and air transportation; shipper's declaration
x per parcel: 10 GAL; 1 PT

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (0) This material does not readily burn.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/01/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE, TETRACHLORO- [127-18-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: exposures of 200 ppm for 1 hour can cause irritation of the nose, mouth and throat, dizziness,

headaches and lightheadedness; exposures of 1,000 ppm for 30 minutes can cause difficult breathing, weakness, loss of muscle control, irritability, tremors, convulsions, paralysis, coma, heart irregularities and death. SKIN: can cause dry, scaly skin, a mild to moderate burning sensation, redness and inflammation. Eyes: can cause burning and irritation. INGESTION: can cause nausea, vomiting, diarrhea, bloody stool, a reddening of face and neck, weakness and loss of muscle control.(NYDH)

LONG TERM TOXICITY: exposures over 200 ppm during weeks or months can cause irritation of the respiratory tract, nausea, headache, sleeplessness, abdominal pains, constipation, dizziness, increased perspiration, fatigue, skin infection, kidney and liver damage, fluid in the lungs and coma. most of these effects will disappear after exposure is stopped. tetrachloroethylene at high levels has caused cancer and birth defects in mice. whether it causes cancer in humans is unknown.(NYDH)

TARGET ORGANS: skin, mucous membrane, eyes, CNS, gastrointestinal tract. liver, kidneys.

SYMPTOMS: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury. Source: CHRIS

CONC IDLH: 500ppm

NIOSH REL: Potential occupational carcinogen --MINIMIZE EXPOSURE (Limit of quantitation 0.4 ppm)

ACGIH TLV: TLV = 25ppm(170 mg/M3) A3
ACGIH STEL: STEL = 100 ppm(685 mg/M3)»A3

OSHA PEL: Transitional Limits:
PEL = 100 PPM; CEILING = 200 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 25 ppm (170 mg/M3)

MAK INFORMATION: 50 ppm
345 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.
A compound which is justifiably suspected of having

carcinogenic potential.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: A compound which is justifiably suspected of having carcinogenic potential.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as reasonably anticipated to be carcinogenic, with limited evidence in humans or sufficient evidence in experimental animals.
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:96 ppm/7H NTIS** PB257-185
PERIPHERAL NERVE AND SENSATION
Local anesthetic
SENSE ORGANS
Eye
Conjunctive irritation
BEHAVIORAL
Hallucinations, distorted perceptions

orl-chd TDLo:545 mg/kg JTCTDW 23,103,85
BEHAVIORAL
Coma

LD50 value: orl-rat LD50:2629 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2629 mg/kg
ihl-rat LC50:34200 mg/m3/8H
ipr-rat LD50:4678 mg/kg
orl-mus LD50:8100 mg/kg
ihl-mus LC50:5200 ppm/4H
scu-mus LD50:65 gm/kg

orl-dog LDLo:4 gm/kg
ipr-dog LD50:2100 mg/kg
ivn-dog LDLo:85 mg/kg
orl-cat LDLo:4 gm/kg
orl-rbt LDLo:5 gm/kg
scu-rbt LDLo:2200 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 810 mg/24H SEV
eye-rbt 162 mg MLD

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:1000 ppm/24H (14D pre/1-22D preg) APTOD9 19,A21,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 ppm/24H (1-22D preg) APTOD9 19,A21,80
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:900 ppm/7H (7-13D preg) TJADAB 19,41A,79
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN

EFFECTS ON NEWBORN
Behavioral

ihl-rat TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

California Prop 65: Carcinogen (04/01/88)
No significant risk level 14. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Tetrachloroethylene; CASRN 127-18-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Tetrachloroethylene

s substance/agent has been evaluated by the U.S. EPA for evidence of human carcinogenic potential. This does not imply that this agent is necessarily a carcinogen. The evaluation for this chemical is under review by an inter-office Agency work group. A risk assessment summary will be included on IRIS when the review has been completed.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention.
INGESTION: induce vomiting only on physician's recommendation.
EYES AND
SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give

oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Tetrachloroethylene
DOT ID NUMBER: UN1897

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POTENTIAL HAZARDS

*HEALTH HAZARDS
Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Most vapors heavier than air.
*Air/vapor mixtures may explode when ignited.
Container may explode in heat of fire.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. Remove and isolate contaminated clothing at the site. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical or CO2.
Large Fires: Water spray, fog or regular foam.
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Small Liquid Spills: Take up with sand, earth or other noncombustible absorbent material.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

Use first aid treatment according to the nature of the injury.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 2191 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: CHLORODIPHENYL (54% CHLORINE)

SYNONYMS: AROCHLOR 1254; AROCLOR 1254; CHLORIERTE BIPHENYLE, CHLORGEHALT 54% (German); CHLORODIPHENYL (54% Cl); CLORODIFENILI, CLORO 54% (Italian); DIPHENYLE CHLORE, 54% DE CHLORE (French); NCI-C02664; POLYCHLORINATED BIPHENYL; PCB

CAS: 27323-18-8 RTECS: DV2063000

FORMULA: C12H5Cl3 (APPROX) MOL WT: 326

WLN:

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION:

BOILING POINT:	638.15 K	365 C	689 F
MELTING POINT:	283.15 K	10 C	50 F
FLASH POINT:	495 K	221.85 C	431.3 F
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	0.00006		
[illegible]:	~		
[illegible]:	~		

VAPOR DENSITY: No data

SPECIFIC GRAVITY: No data

DENSITY:

WATER SOLUBILITY: INSOLUBLE

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

REGULATIONS

DOT hazard class: 9 CLASS 9

DOT guide: 31

Identification number: UN2315

DOT shipping name:	POLYCHLORINATED BIPHENYLS
Packing group:	II
Label(s) required:	CLASS 9
Special provisions:	9, N61
Packaging exceptions:	173.155
Non bulk packaging:	173.202
Bulk packaging:	173.241
Quantity limitations-	
Passenger air/rail:	100 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	34

STCC NUMBER:	Not listed

CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	None
CERCLA REF:	Y
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Chronic toxicity: carcinogen Chronic toxicity: adverse effect to target organ after long period of exposure. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin (Prop 65).

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE):	Unspecified
FLAMMABILITY (RED) :	Unspecified
REACTIVITY (YELLOW):	Unspecified
SPECIAL :	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
CHLORODIPHENYL (54% CHLORINE) [27323-18-8]
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: skin, liver, kidneys

SYMPTOMS: IRRIT EYES, SKIN; ACNE-FORM DERM, JAUN; DARK URINE
Source: NIOSHP

CONC IDLH: 5MG/M3

NIOSH REL: Not given

ACGIH TLV: TLV = 0.5mg/M3 SKIN
ACGIH STEL: STEL = 1 mg/M3»SKIN

OSHA PEL: Transitional Limits:
PEL = 0.5mg/M3(SKIN)
Final Rule Limits:
TWA = 0.5 mg/M3(SKIN)

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below
REFERENCES:
HUMAN SUSPECTED IARC** 18,43,78
ANIMAL POSITIVE IARC** 7,261,74
ANIMAL POSITIVE IARC** 18,43,78

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

unr-rat LD50:2450 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated, and imme

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (CHLORODIPHENYL (54% CHLORINE))
Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash immed
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: POLYCHLORINATED BIPHENYLS
ID NUMBER: UN2315

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POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Material may be transported hot.
*HEALTH HAZARDS
Contact may cause burns to skin and eyes.
Inhalation of asbestos dust may have a damaging effect on the lungs.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*Do not scatter spilled material with high-pressure water streams.
Dike fire control water for later disposal.
SPILL OR LEAK
Stop leak if you can do it without risk.
Avoid inhalation of asbestos dust.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
Cover powder spill with plastic sheet or tarp to minimize spreading.
*FIRST AID
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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Attachment B

Directions to Emergency Medical Facilities

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

The nearest hospital **and** the nearest facility capable of treating chemical burns are the same facility, which is located at Methodist North Hospital. Therefore, there is only one set of directions.

Nearest Hospital

Methodist North Hospital
3960 Covington Pike
Memphis, Tennessee

Emergency Room Telephone Number - (901) 372-5211

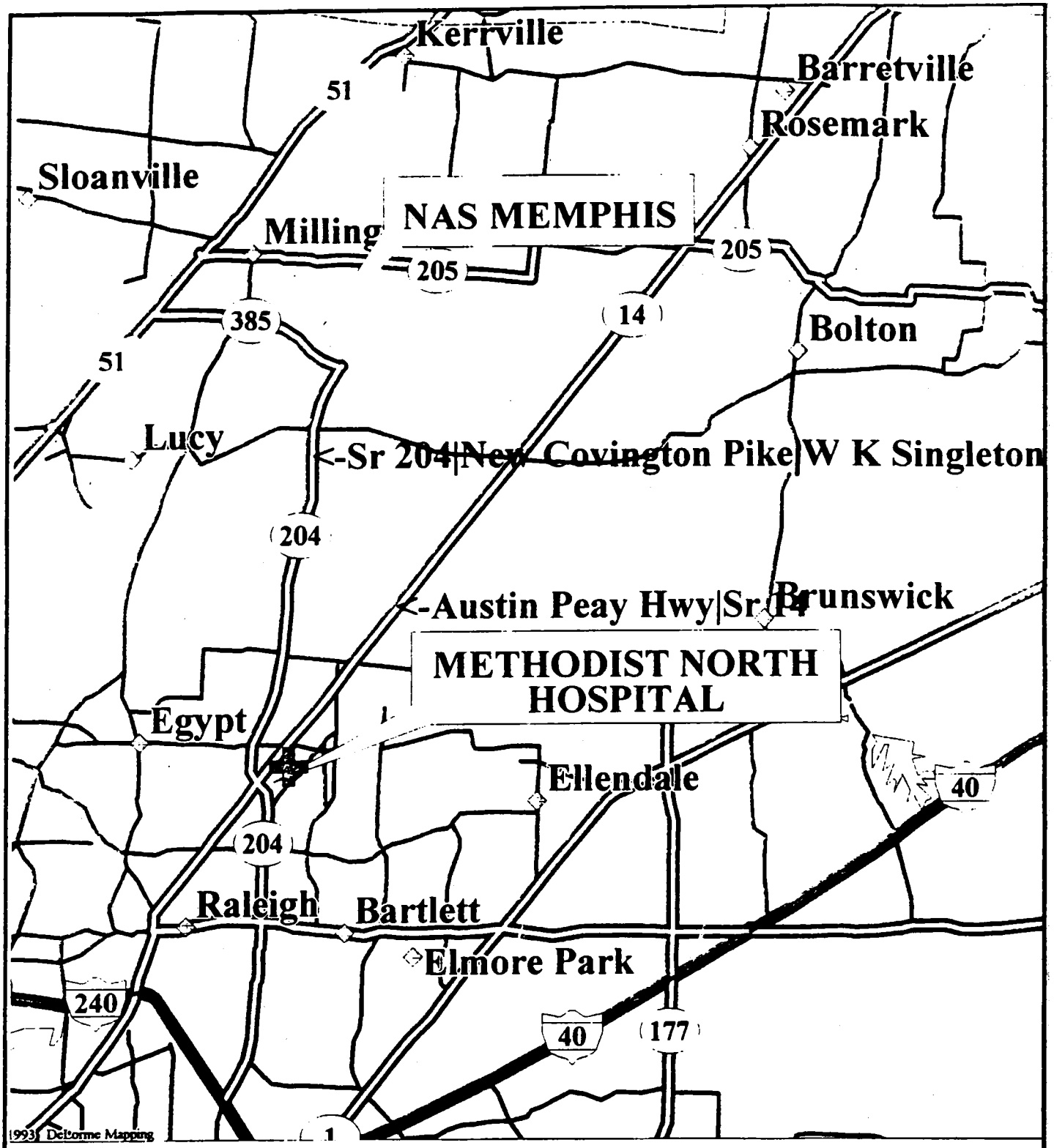
Directions to Methodist North Hospital from NAS Memphis Main Gate:

1) Exit site through South Gate (Singleton Parkway).

2) Continue on Singleton Parkway through the stop signs.

3) Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).

4) You will see the entrance to the emergency room 700 feet past this light on the left.



HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

DIRECTIONS TO THE HOSPITAL

DWG DATE: 10/04/94 | DWG NAME: BOARD

Attachment C

Health and Safety Plan Forms

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project site and returned to: EnSafe/Allen & Hoshall, Memphis, Tennessee.

Job No: 2151-094

Contract No: N62467-89-D-0318

Project: SWMU 21 — N-10 Underground Waste Tank

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

_____

Signed

_____

Print Name

_____

Company

_____

Date

EMPLOYEE EXPOSURE HISTORY FORM

Employee:

Job Name: _____

Date(s) From/To: _____

Hours On Site: _____

Contaminants (Suspected/Reported):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions:

ACCIDENT REPORT FORM

SUPERVISOR'S REPORT OF ACCIDENT	DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS
TO	FROM TELEPHONE (Include area code)
NAME OF INJURED OR ILL WORKER AND COMPANY	
WORKER'S SOCIAL SECURITY NUMBER	

DATE OF ACCIDENT	TIME OF ACCIDENT	EXACT LOCATION OF ACCIDENT

NARRATIVE DESCRIPTION OF ACCIDENT

NATURE OF ILLNESS OR INJURY AND PART OF BODY INVOLVED	LOST TIME YES ☐ NO ☐

PROBABLE DISABILITY (Check one)

FATAL ☐ | LOST WORK DAY WITH ____DAYS AWAY FROM WORK | LOST WORK DAY WITH ____DAYS OF RESTRICTED ACTIVITY | NO LOST WORK DAY ☐ | FIRST-AID ONLY ☐

CORRECTIVE ACTION RECOMMENDED (By whom and by when)

NAME OF SUPERVISOR	TITLE
SIGNATURE	DATE

RFI WORK PLAN
NAS MEMPHIS

SITE INVESTIGATION PLAN
SWMU 26 — N-102 BATTERY ACID NEUTRALIZATION UNIT

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

Prepared for:

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

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long Term Environmental Action Navy (CLEAN) Program, the following Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site Investigation Plan (SIP) has been prepared for a confirmatory sampling investigation at SWMU 26, the N-102 Battery Acid Neutralization Unit, at the Naval Air Station (NAS) Memphis, Millington, Tennessee. The primary reference for this SIP is the *Comprehensive RFI Work Plan* (E/A&H, 1994).

2.0 ENVIRONMENTAL SETTING

SWMU 26 is the site of an inactive, subsurface acid dilution basin that was installed in 1980 and used in conjunction with the Building N-102 Battery Shop, immediately to the southwest. A vicinity map of SWMU 26 is provided in Figure 1. The sump, covered by a 6-inch thick pad and a 3-foot diameter manhole on the surface, is constructed of two 3-foot high by 3-foot diameter reinforced concrete pipes set in a 6-inch thick concrete base pad. This unit received drainage from a pair of lead sinks in the northeast corner of Building N-102 and was designed to neutralize drained battery acid and flush water prior to discharge into the sanitary sewer system. During its operation, the sump was pumped out and crushed limestone (sodium carbonate) replenished every 6 months to maintain the effectiveness of the system. The neutralization unit was bypassed in 1992 when the Naval Environmental Inspection Team indicated that it might qualify as a potential hazardous waste site. A sample was collected from its contents on June 29, 1992, and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals, base neutrals and acid extractables (BNAs), and volatiles. Results of the TCLP analyses (Appendix C) indicate constituent concentrations within the tank were below regulatory levels for each constituent. A schematic diagram of the structure is provided in Figure 2. The site information obtained during the 1990 RCRA Facility Assessment is presented in Appendix A.

2.1 Topography and Drainage

The site is located on an elevated paved area between Buildings N-102 and N-112 which has a retaining wall facing Funafuti Street to the north. The street is approximately 3 feet below the paved area. The site drains to the southwest into the SWMU 4 storm sewer and drainage ditch, which is approximately 1,000 feet south of SWMU 26 at its closest point. SWMU 4 ultimately empties into the North Fork Creek.

2.2 Geologic and Hydrogeologic Information

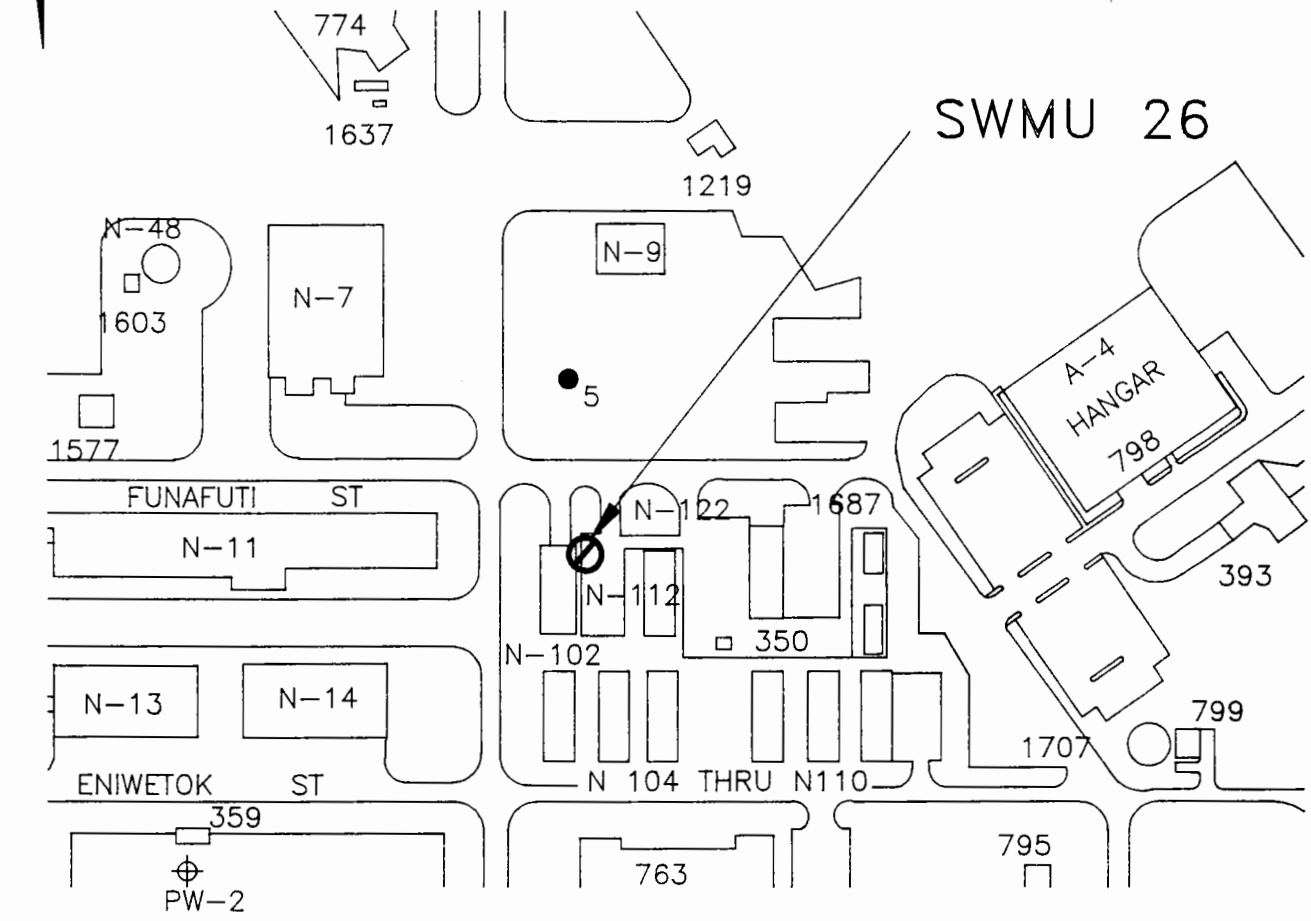
The regional and local hydrogeology are described in Sections 2.11 and 2.12, respectively, of the *Comprehensive RFI Work Plan*.

Previous Investigations

Shallow subsurface soil information was reported in the environmental assessment reports (EARs) for three separate UST investigations at sites in the vicinity of SWMU 26. Miscellaneous boring locations and logs from these EARs are presented in Appendix B.

An assessment of two underground storage tanks (USTs) at the former Flying Club (USTs 1205N and 1205S), approximately 1,000 feet west of SWMU 26 (E/A&H, 1993) included collecting soil samples for hydraulic conductivity testing. The EAR for this site indicated that laboratory-measured hydraulic conductivities for the silty-clay unit ranged from 1.1×10^{-6} to 3.5×10^{-6} cm/sec; no conductivity data are available for the underlying silt unit.

Permeability data collected during a UST investigation at Building N-126 (USTs 7, 303, and 1241) (E/A&H, 1993a) indicated an average hydraulic conductivity value of 4.5×10^{-7} centimeters per second (cm/sec) at a depth of 11 to 13 feet. Building N-126 is approximately 1,500 feet northwest of the site.



LEGEND

● STRATIGRAPHIC TEST HOLE

⊕ PRODUCTION WELL
PW-2

200 0 200

SCALE FEET

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
BUILDING N-102
BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

DWG DATE: 04/06/95 | DWG NAME: 94N102VM

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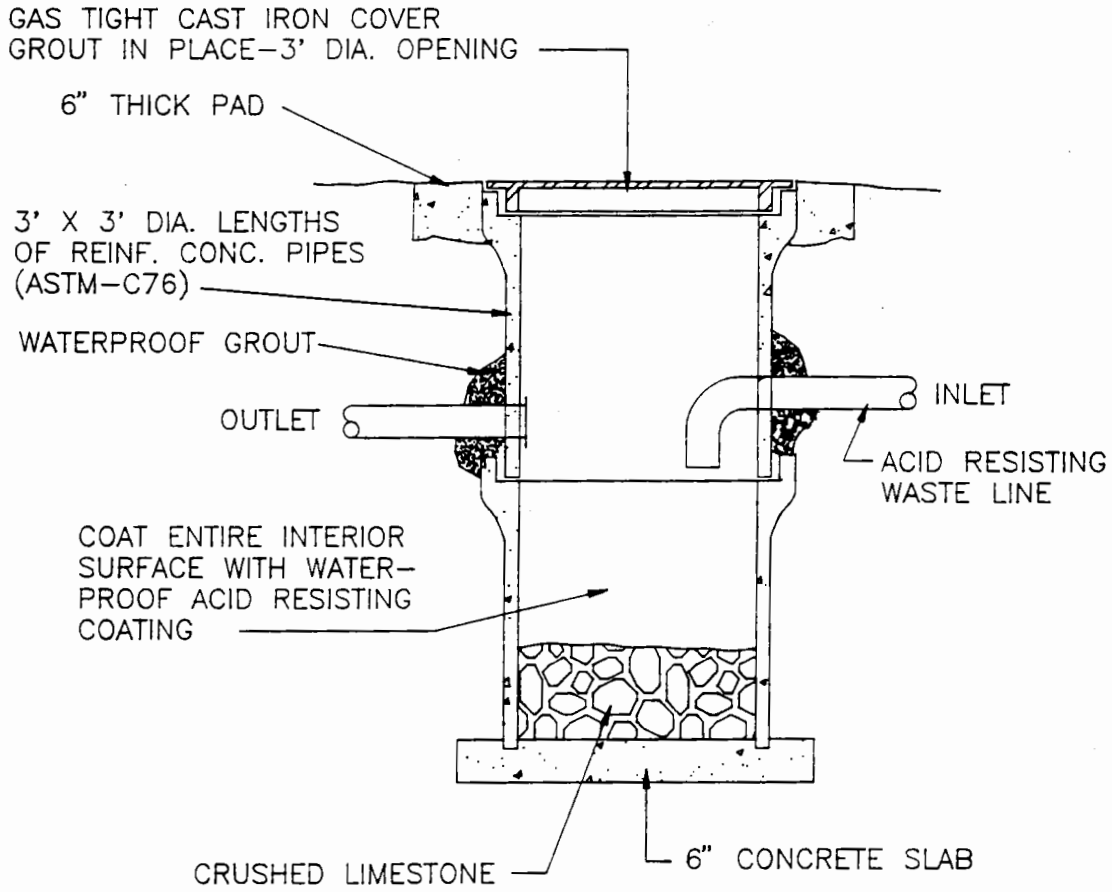

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
UNIT DETAIL
BUILDING N–102
BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

SCALE: NOT TO SCALE

DWG DATE: 01/19/95 | DWG NAME: 94N102BN

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A third EAR (E/A&H, 1994) was submitted following the assessment of two USTs (304 and 1239) in the N-94 tank farm, approximately 2,000 feet west of SWMU 21. Soil encountered during this investigation consisted primarily of clayey silts and silty clays, which are part of the surficial loess deposits. Groundwater levels ranged from 6.79 to 13.59 feet below ground surface (bgs). Hydraulic conductivity of site soil in the interval immediately above the water table was reported to be 1.8E-07 cm/sec and 8.4E-07 cm/sec for the interval representing the zone of highest hydraulic conductivity. Slug test results indicate the average soil hydraulic conductivity at the site of the two USTs to be 4.48E-03 ft/day.

Stratigraphic Test Borings

United States Geological Survey (USGS) stratigraphic test hole 5, drilled in 1994 just north of Building N-122 (Figure 1), provides lithologic data for the area near SWMU 26. The stratigraphic test hole was advanced a few feet into the top of the Cook Mountain Formation to better understand site lithologies prior to monitoring well installation. The test hole was visually logged by a field geologist during drilling and geophysically logged to its total depth following completion. Stratigraphy and lithologies encountered in the test hole are as follows:

Loess:	Approximately 30 to 40 feet of wind-blown silt deposits (loess). These materials were described as silt and clay.
Fluvial Deposits:	Approximately 45 feet of fluvial deposits. These materials were described as sand and gravel.
Cockfield Formation:	Approximately 115 feet of alternating sand and clay with some lignite.
Cook Mountain Formation:	Characterized as a gray to blue-gray dense clay. Defined as the upper confining unit between the surficial aquifers and the Memphis aquifer. Because the stratigraphic test hole was only advanced twenty feet into the Cook Mountain Formation, the entire thickness is not known.

2.3 Climatological Data

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

3.0 SOURCE CHARACTERIZATION

This unit is a former receptor of diluted battery acid, therefore metals are the primary contaminant of concern. However, analysis of a sample collected from the liquid/sludge within the unit indicated the tank's contents were non-hazardous. Field sampling will be performed to confirm or refute the presence of anticipated constituents as outlined in Section 4.3. If contamination is verified, the scope of the investigation will be expanded to meet the requirements of a RCRA Facility Investigation (RFI). Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of any contaminants identified during the RFI as exceeding the appropriate action levels. The procedures and references used to determine these characteristics will be documented in the RFI report.

4.0 CHARACTERIZATION OF HAZARDOUS CONSTITUENT RELEASES

4.1 Previous Investigations

A Visual Site Inspection (VSI) of the unit was conducted in 1990 (ERC/EDGe, 1990) and no adverse conditions were cited. The unit was bypassed in 1992. On June 29, 1992, the sump contents (liquid/solid) were sampled for the analyses of TCLP metals, BNAs, and VOCs. Constituent concentrations were below regulatory limits for disposal as a hazardous waste. Appendix C contains a copy of the analytical report.

Several UST investigations have been performed in the vicinity of SWMU 26, including the assessment at the Flying Club USTs (1205N and 1205S), the Building N-126 USTs (7, 303, and 1241), and USTs 304 and 1239. Petroleum constituent concentrations above state action levels in soil or groundwater have been detected at these UST sites; however, due to their distance from SWMU 26 (greater than 1,200 feet), no impact is anticipated.

4.2 Data Gaps

Data gaps include the potential for subsurface soil contamination and groundwater contamination in the surficial aquifer. The following data gaps will be the focus of this investigation.

- The status and/or impact of the underground acid dilution basin.
- The potential for subsurface soil contamination in the loess.
- The potential for groundwater contamination in the loess.

Concentrations of contaminants identified in soil and groundwater at SWMU 26 will be compared to background soil and groundwater concentrations to determine whether measured values occur naturally or indicate contamination. Background concentrations will be determined from the five background monitoring well locations which have been installed across the base and from monitoring wells at other SWMUs. Groundwater samples collected from the background monitoring wells have been analyzed for full scan analysis (FSA) using the following methods:

- Volatile Organic Compounds (USEPA Method 8240)
- Semivolatile Organic Compounds (USEPA Method 8270)
- Total Petroleum Hydrocarbons (TPH, USEPA Method 418.1)
- Gasoline Range Organics (GRO) (TN Modified 8015/GRO)
- Diesel Range Organics (DRO) (TN Modified 8015/DRO)
- Chlorinated Pesticides/PCBs (USEPA Method 8080)
- Organophosphorus Pesticides (USEPA Method 8140)
- Chlorinated Herbicides (USEPA Method 8150)
- RCRA Part 264, Appendix IX Total Metals (USEPA Method 6010/7000 series)
- Total Cyanide (USEPA Method 9010)

4.3 Objective and Proposed Field Investigation

The objectives of the proposed field investigation are to fill the data gaps in Section 4.2 and to delineate the horizontal and vertical extent of any soil and groundwater contamination present at SWMU 26. The field sampling investigation will consist of two phases in which soil and groundwater samples will be collected as outlined below. All sample collection and processing will be in accordance with Section 4 of the *Comprehensive RFI Work Plan.*

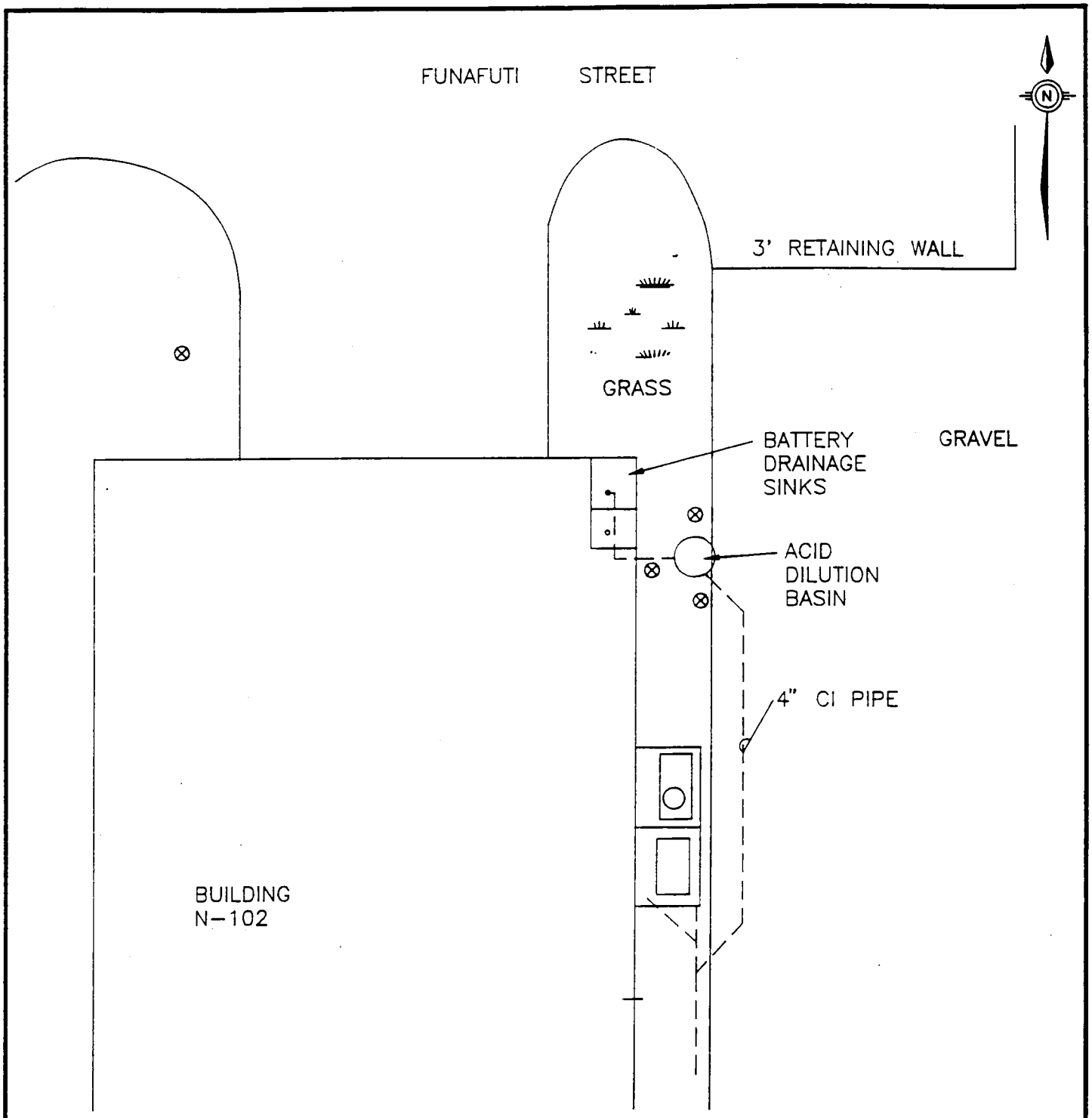
The first phase will consist of a soil and groundwater screening investigation that will be conducted using Direct Push Technology (DPT) or Geoprobe-type (or equivalent) sampling equipment. Results of the screening investigation will be used to plan the number, placement, and depth of monitoring wells (and possibly soil borings) in the second phase of the investigation, if necessary. Sampling and analytical strategies for the second phase will also be based on the screening results.

4.3.1 Screening Phase

The proposed soil and groundwater investigation will initially consist of DPT or Geoprobe sampling (Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) to collect soil and groundwater samples for laboratory analysis. A total of 4 initial sampling locations have been selected; three immediately adjacent to the basin and one far enough from the basin to provide background data for comparison. These proposed locations are shown in Figure 3. The location of the unit has been estimated from visual observations and engineering plans obtained from the NAS Memphis Public Works Office.

Three soil and/or groundwater samples will be collected from each sampling point as outlined below:

1) One soil sample will be collected from the shallow (3 to 4-foot) soil interval just below the piping.



LEGEND

⊗ DPT SAMPLING LOCATION

10 0 10

SCALE FEET

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 3
DPT SAMPLING LOCATION
BUILDING N-102
BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

DWG DATE: 01/18/95 | DWG NAME: 94N10226

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2) One soil sample will be collected from the 6 to 7-foot interval, just below the base of the unit.

3) One soil or groundwater sample will be collected from the soil/water interface in the loess. Under optimum conditions, a groundwater sample will be collected. However, if a groundwater sample cannot be collected at this interval, a soil sample will be collected.

The soil samples may be collected using DPT, a hand auger, or a Geoprobe-type (or equivalent) sampler. Field personnel may deviate from this strategy if field conditions suggest that additional or different intervals may be successfully sampled or yield more useful information. The investigatory area may then be expanded or concentrated, based on the results of the initial data. The samples will be shipped to an offsite laboratory for metals analysis (USEPA Method 6010/7000 series).

4.3.2 Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the screening phase of this investigation, a second phase, consisting of installing and sampling soil borings and monitoring wells, may be implemented. The number, placement, and depth of borings and monitoring wells will be determined using data from the screening phase of this investigation. Samples collected during the second phase of the investigation will be analyzed for FSA using the methods outlined in Section 4.2. An addendum to this SIP describing the proposed drilling, sampling, and analytical strategies for the expanded investigation will be prepared and submitted to the BRAC Cleanup Team for review and comment should a second phase be necessary.

4.3.3 Analytical Requirements

Soil and groundwater samples sent to the offsite laboratory will be analyzed for lead, nickel, cadmium, zinc, mercury and arsenic using USEPA Method 6010/7000. Level III Data Quality

Objectives (DQO) will be used for 95 percent of the samples and DQO Level IV for the remaining 5 percent. Field sampling personnel will determine which samples will receive a Level IV DQO.

Field measurements at SWMU 26 will be conducted in accordance with Section 4.10.1 of the *Comprehensive RFI Work Plan*. Field measurements will include pH, temperature, specific conductivity, and groundwater level for monitoring wells, and organic vapor detection for soil samples and boreholes.

4.4 Sample Management

Sample management procedures will adhere to Sections 4.12 and 5.0 of the *Comprehensive RFI Work Plan*.

4.5 Sample Custody

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

4.6 Quality Assurance/Quality Control

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

4.7 Decontamination Procedures

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

4.8 Investigation-Derived Waste

Investigation-derived waste (IDW) will be handled as specified in Section 4.13 of the *Comprehensive RFI Work Plan*.

5.0 POTENTIAL RECEPTORS

SWMU 26 is located approximately 1 mile west of the nearest offsite residence. The nearest NAS Memphis personnel are located in the site area. Runoff from the SWMU flows to the south and west via the SWMU 4 storm sewer, which is approximately 1,000 feet south of SWMU 26 at its closest point. SWMU 4 ultimately empties into the North Fork Creek. SWMU 4 is related to drainage ways which are located in populated areas of the base; therefore, the potential exists for contact by base personnel. Off base, the potential exists for contact by the general public due to unrestricted access to the drainage ways. According to base personnel, no fishing or swimming occurs in North Fork Creek or Big Creek, but children may play near these drainage ways.

Two drinking water production wells, PW-1 and PW-2, are near SWMU 21. PW-1 is approximately 1,200 feet west of SWMU 21, and PW-2 is approximately 500 feet southwest. Both production wells are screened in the Memphis Aquifer, with the Cook Mountain confining unit above the screened intervals. A more detailed analysis of potential receptors will be conducted and presented in the RFI report if contamination is found at SWMU 26.

6.0 QUALITY ASSURANCE PLAN

The Quality Assurance Plan (QAP) presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout the RFI at SWMU 26.

7.0 DATA MANAGEMENT PLAN

The Data Management Plan (DMP) presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during the RFI for SWMU 26.

8.0 HEALTH AND SAFETY PLAN

The Site-specific Health and Safety Plan for SWMU 26 is included in Appendix D of this document. The Comprehensive Health and Safety Plan is included in Section 7 of the *Comprehensive RFI Work Plan.*

9.0 REFERENCES

EnSafe/Allen & Hoshall (October 1994). *Comprehensive RFI Work Plan for Naval Air Station Memphis*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall (August 1994). *Environmental Assessment Report, USTs 304 and 1239, Naval Air Station, Memphis Tennessee*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall (September 1993). *Environmental Assessment Report for Flying Club USTs, Naval Air Station, Memphis Tennessee*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall (September 1993a). *Environmental Assessment Report for Building N-126 USTs, Naval Air Station, Memphis Tennessee*. E/A&H: Memphis, Tennessee.

ERC/EDGe (September 1990). *RCRA Facility Assessment (RFA), NAS Memphis*. ERC/EDGe: Nashville, Tennessee.

Geraghty & Miller, Inc. (November 1985). *NACIP Program Confirmation Study, Verification Phase, NAS Memphis*. G & M: Tampa, Florida.

Southern Division Naval Facilities Engineering Command (May 1990). *Draft Final RCRA Facility Investigation Work Plan for Naval Air Station-Memphis*. SOUTHDIV: Charleston, South Carolina.

Appendix A

RFA SWMU Description

7.26 SWMU NO. 26: N-102 BATTERY ACID NEUTRALIZATION UNIT

7.26.1 UNIT CHARACTERISTICS

7.26.1.1 TYPE OF UNIT

Active Treatment Unit

7.26.1.2 DESIGN FEATURES

This unit initially consisted of an obsolete lead-lined sink. There is an underground "water overflow" tank prior to entering the sewer.

7.26.1.3 OPERATING PRACTICE (PAST AND PRESENT)

A lead-lined sink in the building was used to neutralize battery acid prior to discharge to the sewer. This lead-lined sink was removed and replaced by a neoprene (plastic) sink between 1987 and 1989.

7.26.1.4 PERIOD OF OPERATION

Period of operation is 1980 to present.

7.26.1.5 AGE OF UNIT

Ten years.

7.26.1.6 LOCATION OF UNIT

Located at Building N-102, off 5th Avenue on the NAS North Side. See Figure 7-26.

7.26.1.7 GENERAL PHYSICAL CONDITIONS

The current neutralization tank structure is in good condition. Condition and disposition of the earlier lead-lined sink is unknown and not pertinent to this effort.

7.26.1.8 CLOSURE METHOD

Unknown.

7.26.2 WASTE CHARACTERISTICS

7.26.2.1 TYPE OF WASTE

Sulfuric acid and sodium carbonate.

7.26.2.2 MIGRATION CHARACTERISTICS

The waste constituents may be mobile under acidic condition.

7.26.2.3 TOXICOLOGICAL CHARACTERISTICS

Battery acid contains sulfuric acid in aqueous solution. It is corrosive to tissue on contact. Acid is neutralized with sodium carbonate prior to discharge to the sewer. Heavy metals (lead, zinc, cadmium) may be present in solution.

7.26.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Acid is in liquid form before, during, and after neutralization.

7.26.3 MIGRATION PATHWAYS

Not expected.

7.26.4 CONTAMINANT RELEASE IDENTIFICATION

7.26.4.1 PRIOR INSPECTION REPORTS

Visual inspection reveals area to be clean with no evidence of releases in this area.

7.26.4.2 PUBLIC COMPLAINTS

None.

7.26.4.3 MONITORING/SAMPLING DATA

None available.

7.26.4.4 EVIDENCE OF RELEASE

Visual inspection reveals area to be clean with no evidence of releases.

7.26.5 EXPOSURE POTENTIAL

None.

7.26.6 DOCUMENTS REVIEWED

See PRD.

7.26.7 SUMMARIZED DATA GAPS

7.26.7.1 AIR

No data. Air data is not needed for this unit.

7.26.7.2 SOIL

No data. Soil data is not needed for this unit.

7.26.7.3 GROUNDWATER

No data. Groundwater data is not needed for this unit.

7.26.7.4 SURFACE WATER/SEDIMENT

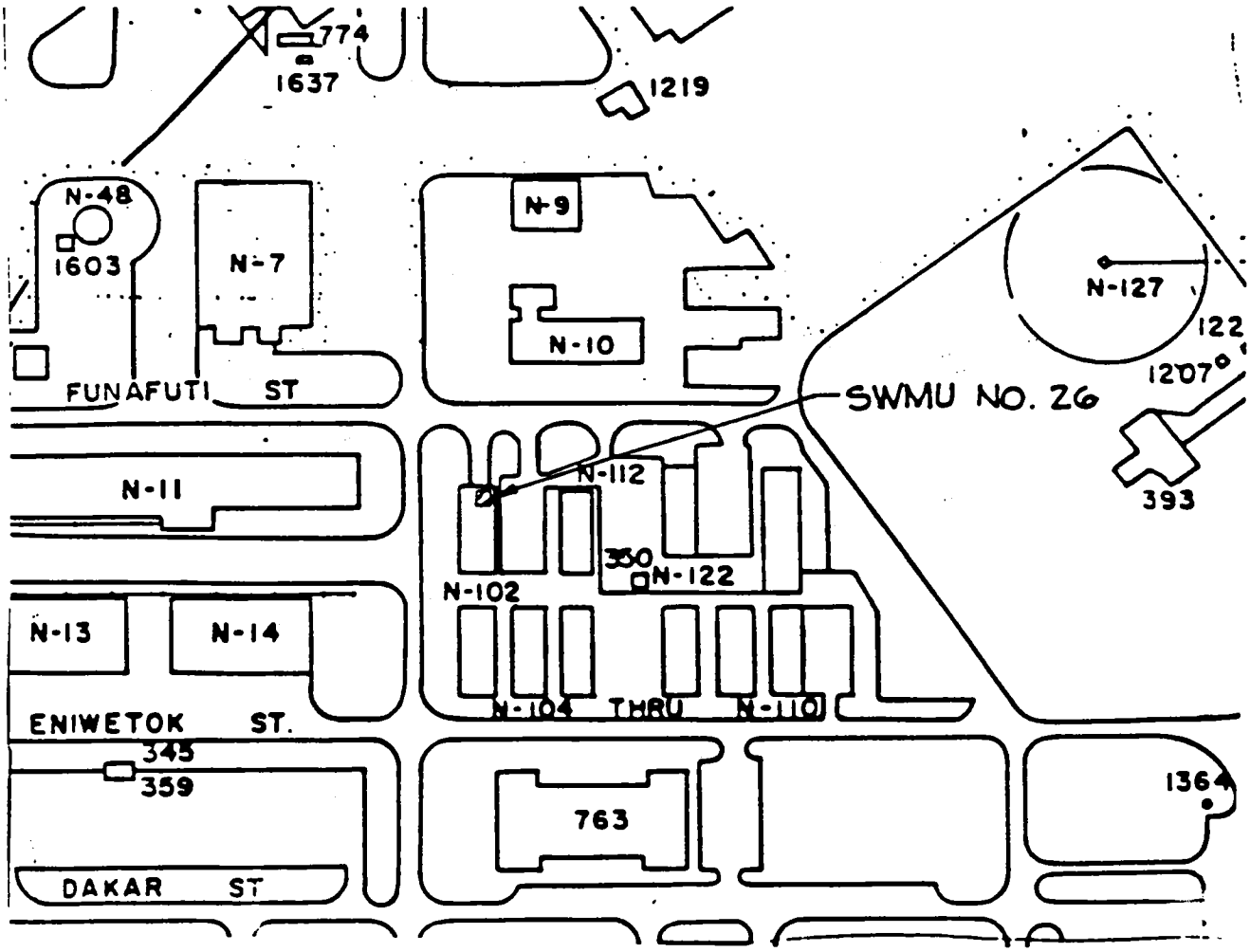
No data. Surface water or sediment data is not needed for this unit.

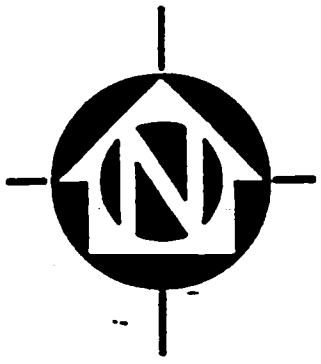
7.26.7.5 SUBSURFACE GAS

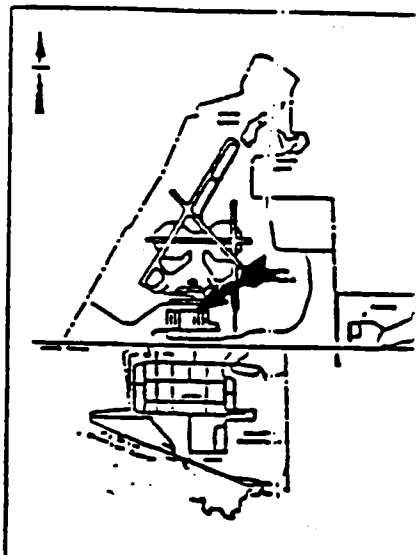
No data. Subsurface gas data is not needed for this unit.

7.26.8 RECOMMENDED ACTIONS

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



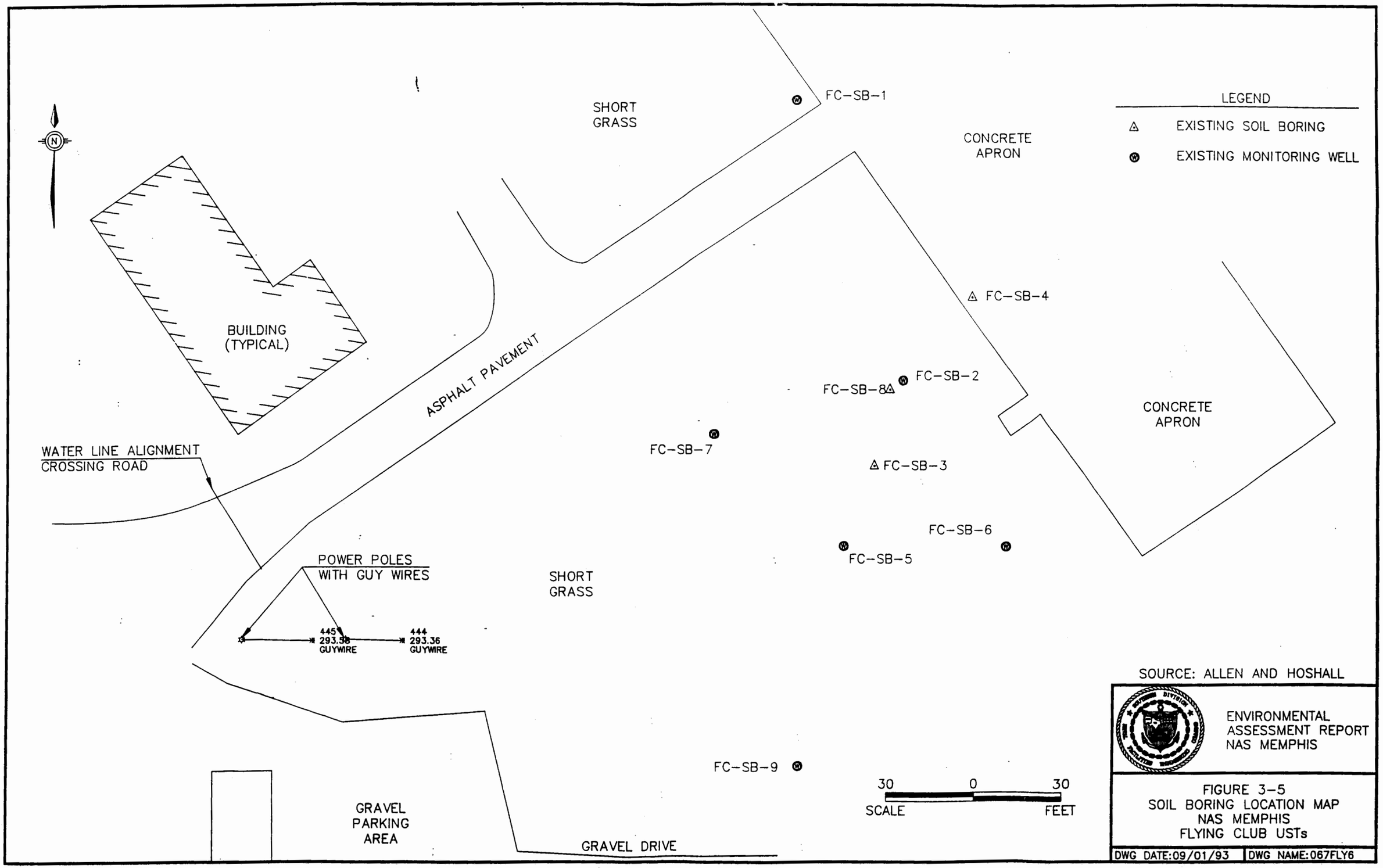




SWMU NO. 26 N-102 BATTERY ACID TREATMENT
FIGURE 7-26 LOCATION MAP

Appendix B

Miscellaneous Boring Logs



SOURCE: ALLEN AND HOSHALL

ENVIRONMENTAL ASSESSMENT REPORT
NAS MEMPHIS

FIGURE 3-5
SOIL BORING LOCATION MAP
NAS MEMPHIS
FLYING CLUB USTs

DWG DATE:09/01/93 | DWG NAME:067FLY6

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	GC	LIGHT BROWN SILTY SOFT CLAY WITH TAN CHERT COBBLES TO 0.8'
			0	SM	REDDISH BROWN COARSE SANDY SILT FROM 1.6 TO 1.9'
	SS	53	0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH WHITE CLAY
			N/R		
5			N/R		
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0	M	GROUNDWATER AT 8.4'
			0	L	
10			0	CH	MEDIUM BROWN SILTY SOFT CLAY, WET MOTTLED WITH GRAY CLAY
			0		
			0		
	SS	100	0		
			0	CH	
			0	CL	MEDIUM BROWN SILTY SOFT CLAY, SATURATED TO 13.5', THEN DRYER
15			0		
	TD				
20					
25					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-67

FC-SB-1
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR1

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	CL	MEDIUM BROWN SILTY SOFT CLAY MOTTLED WHITE CLAY
			0		
	SS	100	0		
			0		
			0		
5			0	CL	MEDIUM BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0	CL	MEDIUM BROWN SILTY SOFT CLAY WITH GRAY CLAY INCREASING TO 50%
			0	M L	GROUNDWATER AT 9.5'
10			0	CH	CONTACT LIGHT GRAY SILTY MOIST CLAY FROM 11.0' TO 11.3'
			20		
	SS	100	50	CL	MEDIUM TO DARK BROWN SILTY CLAY, DRYER
			100		
			270	CH	DARK BROWN SILTY STIFF CLAY, WET WITH VERY STRONG PETROLEUM OD
15			100	CH	MEDIUM BROWN SILTY SOFT CLAY WET, STRONG PETROLEUM ODOR
			70		
	SS	100	5		
			15	CH	MEDIUM BROWN SILTY SOFT CLAY MOTTLED WITH REDDISH BROWN CLAY AT 18.5'
20			0	OH	CONTACT MEDIUM BROWN SILTY SOFT CLAY WITH BLACK BITUMINOUS NODULES FROM 19.3' 19.6', DRYER
	TD				
25					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-67

FC-SB-2
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR2

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0		
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH LIGHT GRAY TO WHITE CLAY
	SS	100	0		
			0		
5			0		
			0	CL	LIGHT TO MEDIUM BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	73	0	M/L	GROUNDWATER AT 8.3'
			0		
10			0	CH	MEDIUM BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
			1		
	SS	100	3	CH	DARK BROWN SILTY SOFT CLAY DRYER WITH PETROLEUM ODOR AT 13.0
			5		
15			N/R		
			5	CH	DARK BROWN SILTY SOFT CLAY MOTTLED WITH GRAY, WET, PETROLEUM OD
			8		
	SS	100	3		
			3		
20			0		CONTACT LIGHT BROWN STIFF DRY SILTY CLAY MOTTLED WITH ORANGE/ BROWN CLAY AT 19.8'
	TD				
25					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO-67

FC-SB-3
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR3

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0		0–0.5' ASPHALT
			0	CL	DARK GRAY SILTY STIFF CLAY FROM 0.5' TO 4.5'
	SS	63	0		
			N/R	CL	
5			N/R		CONTRACT LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY AT 4
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	56	0		
			N/R		GROUNDWATER AT 8.5'
10			N/R	M L	
			0	CH	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY AND VERY MOIST
			1		
	SS	100	3		
			5	CH	DARK BROWN SILTY SOFT CLAY WITH STRONG PETROLEUM ODOR
15			6		
			5	CH	DARK BROWN SILTY SOFT CLAY, PETROLEUM ODOR STILL PRESENT
			1		
	SS	100	0		
			0		
20			0		CONTACT LIGHT BROWN SILTY STIFF DRY CLAY MOTTLED WITH ORANGE/ BROWN CLAY AT 19.5'
	TD				
25					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–67

FC–SB–4
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR4

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	CL	
			0		LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
	SS	100	0		
			0		
5			0		
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0	M/L	GROUNDWATER 8.1'
			0		
10			0		
			0	CH	LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0		
			0.1	CH	CONTRACT DARK BROWN SILTY MOIST CLAY SOME MOTTLING WITH GRAY AT 14.1'
15			0	CH	DARK BROWN SILTY SOFT CLAY, SLIGHT PETROLEUM ODOR
			0		
	SS	100	4	CL	LIGHT BROWN SILTY STIFF CLAY, DRYER NO ODOR
			0		
			0	CL	LIGHT BROWN SILTY STIFF CLAY
20	TD				
25					

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FC-SB-5
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR5

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	GC	LIGHT BROWN SILTY SOFT CLAY WITH CHERT GRAVEL FROM SURFACE TO 0.4
			0		
	SS	63	0		
			0	CL	DARK BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
5			0		
			0		LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0	M/L	GROUNDWATER AT 7.4'
			0		
10			0		
			0	CH	LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0		
			0	CL	DARK BROWN SILTY SOFT CLAY, DRYER AT 14.2
15			0		
			0	CH	DARK BROWN SILTY WET CLAY AT 15.6'
			0		
	SS	85	0		
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
20			N/R		
	TD				
25					

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NAS MEMPHIS
CTO-67

FC-SB-6
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR6

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY AND DARK BROWN CLAY
			0		
	SS	90	0		
			0		
			0		
5			0	CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	93	0		
			0	M/L	GROUNDWATER AT 8.6'
10			0		
			0	CH	LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		CONTACT DARK BROWN SILTY STIFF CLAY, DRYER AT 13.2'
			0	CL	
15			0		
			0	CH	LIGHT BROWN SILTY WET CLAY MOTTLED WITH GRAY CLAY
			0		
	SS	100	0		
			0		
			0	CL	CONTACT LIGHT BROWN SILTY STIFF CLAY MOTTLED WITH ORANGE/BROWN CLAY AT 19.5'
20			0		
	TD				
25					

ENVIRONMENTAL
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FC-SB-7
BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FBR7

DEPTH (FEET)	SAMPLE TYPE	% RECOVERY	HNU READING	USCS SYMBOL	DESCRIPTION OF SUBSURFACE MATERIALS
5				CL	LIGHT BROWN SILTY SOFT CLAY MOTTLED WITH GRAY CLAY
10	ST	100	N/A	CH	LIGHT BROWN SILTY SOFT CLAY, MOIST MOTTLED WITH GRAY CLAY
				CH	DARK BROWN SILTY MOIST CLAY
15	ST	108	N/A	CH	DARK BROWN SILTY WET CLAY
	TD				
20					
25					

ENVIRONMENTAL
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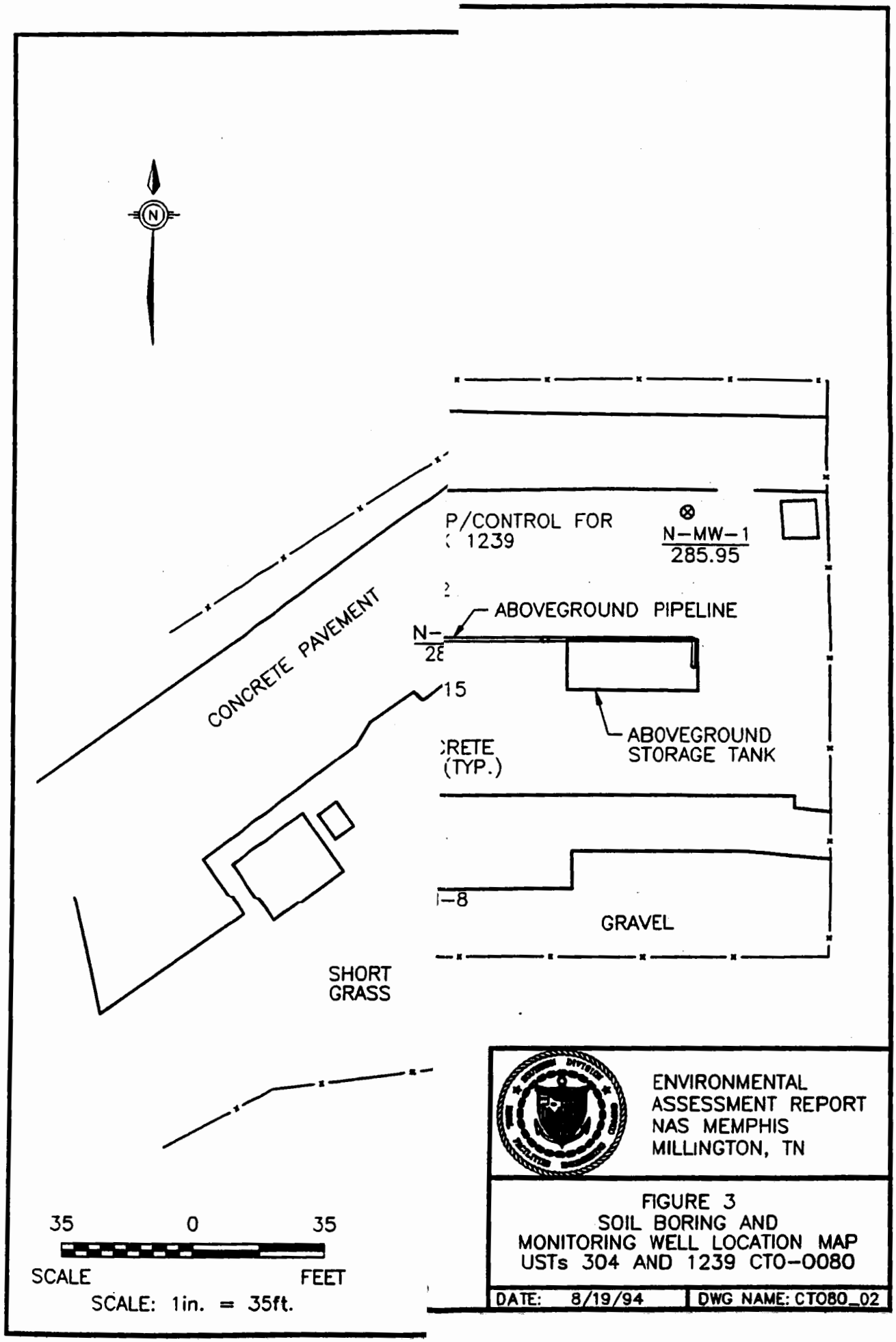
GEOTECHINICAL SOIL BORING LOG
FLYING CLUB UST SITE
NAS MEMPHIS

DWG DATE: 08/12/93 | DWG NAME: 067FGBR1



ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
MILLINGTON, TN

FIGURE 3
SOIL BORING AND
MONITORING WELL LOCATION MAP
USTs 304 AND 1239 CTO-0080

DATE: 8/19/94 | DWG NAME: CTO80_02

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/ 5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass				
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.
				14.0-14.5' CLAYEY SILT, BROWN, STIFF.
14.8			328	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.
				DISCONTINUED BORING AT 23.0 FEET.

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NAS MEMPHIS
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SOIL BORING B/MW-1
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/11/1994 PROJ. #: CTO008(

DATE: 8/4/1994 DWG NAME: CTOSBB-1

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/5 IN.	ORGANIC VAPOR (ppm)	
SURFACE - Grass					
		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		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		10.5		92	10.5-15.2' SILTY CLAY, GREYISH BROWN TO TAN MOTTLED GREY, MOIST, SOFT.
		13		27	
15		15.5		120	15.2-16.0' SILTY CLAY, GREYISH BROWN, VERY MOIST, SOFT. 16.0-18.0' SILTY CLAY, DARK BROWN, MOIST, FIRM.
		18		234	18.0-20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM (WITH STRONG HYDROCARBON ODOR).
20		20.5		136	20.5-23.0' SILTY CLAY, BROWN, MOIST, FIRM (WITH HYDROCARBON ODOR).
					DISCONTINUED BORING AT 23.0 FEET.
25					
30					

ENVIRONMENTAL ASSESSMENT REPORT
NAS MEMPHIS
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SOIL BORING B/MW-2
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/11/1994 PROJ. #: CTO008

DATE: 8/4/1994 DWG NAME: CTOSBB-2

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass					
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).
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).
18			86		18.0-20.5' SILTY CLAY, DARK BROWN, MOIST, FIRM TO STIFF (WITH HYDROCARBON ODOR).
20.5			112		20.5-23.0' SILTY CLAY, BROWN GRADING TO TAN, MOIST, FIRM TO STIFF (WITH SLIGHT HYDROCARBON ODOR).
					DISCONTINUED BORING AT 23.0 FEET.

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NAS MEMPHIS
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SOIL BORING B/MW-3
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 DWG NAME: CTOSBB-3

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/6"	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
				SURFACE - Grass
5	4			4.0–6.0' CLAYEY SILT, GREYISH BROWN, MOIST, VERY FIRM TO STIFF (WITH HYDROCARBON ODOR).
10	9			9.0–11.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM TO SOFT (WITH HYDROCARBON ODOR).
				DISCONTINUED BORING AT 11.0 FEET.
15				
20				
25				
30				

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SOIL BORING B-3A
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 | DWG NAME: CTOSB-3A

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5"	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
				SURFACE - Grass
	0		9	0.0-1.5' CRUSHED LIMESTONE (FILL)
				1.5-3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, STIFF.
	3		2	3.0-6.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM (WITH HYDROCARBON ODOR)
5	5.5		9	6.0-7.0' CLAYEY SILT, BROWN MOTTLED BEIGE, MOIST, STIFF.
	8		238	7.0-8.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
10				8.0-13.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH
	10.5		121	HYDROCARBON ODOR).
	13		11	13.0-18.0' CLAYEY SILT, BROWNISH GREY MOTTLED GREY, VERY MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
15	15.5		4.8	
				DISCONTINUED BORING AT 18.0 FEET.
20				
25				
30				

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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

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5 11	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
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	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.
10				
	13		4	13.0-15.5' CLAYEY SILT, TAN MOTTLED GREY GRADING TO BROWN MOTTLED GREY, VERY MOIST, FIRM.
15	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	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.
25				
				DISCONTINUED BORING AT 28.0 FEET.
30				

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SOIL BORING B-5
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CT00080

DATE: 8/4/1994 | DWG NAME: CTOSBB-5

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Crushed Limestone				
	0		15	0.0-2.5' CLAYEY SILT, BROWN, STIFF
				2.5-3.0' CLAYEY SILT, DARK GREY, MOIST, SOFT.
	3		4	3.0-6.0' CLAYEY SILT, GREYISH BROWN, MOIST, SOFT.
5				
	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	
				DISCONTINUED BORING AT 18.0 FEET.
20				
25				
30				

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SOIL BORING B-6
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 | DWG NAME: CTOSBB-6

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5 FT.	ORGANIC VAPORS (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass				
0			41	0.0–4.0' CLAYEY SILT, TAN TO BROWN, DRY TO SLIGHTLY MOIST, STIFF.
4			49	4.0–8.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM.
8			14	8.0–8.5' CLAYEY SILT, TAN TO BROWN, SLIGHTLY MOIST, FIRM, FRIABLE.
10.5			86	8.5–13.0' CLAYEY SILT, GREYISH BROWN, MOTTLED GREY AND TAN, MOIST, FIRM (WITH HYDROCARBON ODOR).
13			94	13.0–18.0' SAME AS ABOVE (WITH HYDROCARBON ODOR).
15.5			81	
18			7	18.0–20.5' CLAYEY SILT, GREYISH BROWN, MOTTLED TAN, MOIST, FIRM (WITH SLIGHT HYDROCARBON ODOR).
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).
23			0	23.0–28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM (WITH TRACE OF STAINING).
25.5			1	
				DISCONTINUED BORING AT 28.0 FEET.

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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

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/6"	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Crushed Limestone				
	0		51	0.0–0.5' CLAYEY SILT, BROWN, SLIGHTLY MOIST, FIRM.
				0.5–3.0' CLAYEY SILT, GREYISH BROWN, SLIGHTLY MOIST, FIRM.
	3		29	3.0–8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT GRADING TO CLAYEY SILT, GREY MOTTLED BROWN, STIFF. (WITH SLIGHT HYDRO-CARBON ODOR).
5	5.5		27	
	8		185	8.0–13.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
10	10.5		239	
	13		306	13.0–18.0' CLAYEY SILT, GREYISH BROWN MOTTLED GREY, MOIST, FIRM (WITH HYDROCARBON ODOR).
15				
				DISCONTINUED BORING AT 18.0 FEET.
20				
25				
30				

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CTO-0080

SOIL BORING B-8
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CTO008(

DATE: 8/4/1994 | DWG NAME: CTOSBB-8

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/ 5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
					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?).
5		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		10.1		3	10.1-14.7' CLAYEY SILT TO SILTY CLAY, TAN TO BROWN MOTTLED GREY, MOIST, FIRM.
		13		2	
15		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).
					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. #: CT00080

DATE: 8/4/1994 | DWG NAME: CTOSBB-9

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/5 FT	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass				
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				
5.5			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				
10.5			19	
13			9	13.0–18.0' CLAYEY SILT, BROWN MOTTLED BEIGE AND LIGHT GREY, FIRM, VERY MOIST.
15				
15.5			13	
20				DISCONTINUED BORING AT 18.0 FEET.
25				
30				

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CTO–0080

SOIL BORING B–10
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CTO008(

DATE: 8/4/1994 | DWG NAME: CTOSB–10

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
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.
5					
		8		25	8.0-10.5' CLAYEY SILT, BROWN MOTTLED GREY, VERY MOIST, FIRM.
10					
		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					
		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.
20					
25					
30					

ENVIRONMENTAL
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SOIL BORING B-11
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 DWG NAME: CTOSB-11

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE – Grass					
		0		40	0.0–3.8' CLAYEY SILT, BROWN MOTTLED BEIGE AND DARK BROWN, SLIGHTLY MOIST, STIFF (FILL?).
5		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).
10					
		13.0		137	14.5–14.7' SILT, BROWN, STIFF, DRY.
15		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).
20					
		23		261	23.0–25.0' CLAYEY SILT, DARK BROWN, SLIGHTLY MOIST, FRIABLE (WITH HYDROCARBON ODOR).
25		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.
30					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–12
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CT0008

DATE: 8/4/1994 DWG NAME: CTOSB–12

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.

ENVIRONMENTAL ASSESSMENT REPORT
NAS MEMPHIS
CTO-0080

SOIL BORING B-13
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/12/1994 PROJ. #: CT00080

DATE: 8/4/1994 DWG NAME: CTOSB-13

DEPTH (FEET)	SAMPLE TYPE	SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
SURFACE - Grass					
0		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.
5					
		8		96	8.0-13.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR).
10					
		13		23	13.0-18.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO SOFT (WITH SLIGHT HYDROCARBON ODOR)
15					
					DISCONTINUED BORING AT 18.0 FEET.
20					
25					
30					

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO0080

SOIL BORING B-14
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CTO0080

DATE: 8/4/1994 DWG NAME: CTOSB-14

DEPTH (FEET)	SAMPLE TYPE / SAMPLE DEPTH	BLOWS/.5 FT.	ORGANIC VAPOR (ppm)	DESCRIPTION OF SUBSURFACE MATERIALS
				SURFACE – Grass
	1		330	0.0–1.0' CLAYEY SILT, TAN MOTTLED BROWN, SLIGHTLY MOIST, STIFF.
				1.0–3.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH HYDROCARBON ODOR).
	3		213	HIT TANK AT APPROXIMATE DEPTH OF 6 FEET, OFFSET BORING 3 FEET EAST. SAMPLES BELOW 3 FEET IN DEPTH ARE FROM OFFSET BORING.
5				3.0–8.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, SOFT (WITH STRONG HYDROCARBON ODOR).
	8		202	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.
	23		2	23.0–27.0' CLAYEY SILT, BROWN, VERY MOIST, FIRM TO STIFF.
25				
	25.5		6	
				27.0–28.0' CLAYEY SILT, GREYISH BROWN, VERY MOIST, FIRM.
				DISCONTINUED BORING AT 28.0 FEET.
30				

ENVIRONMENTAL
ASSESSMENT REPORT
NAS MEMPHIS
CTO–0080

SOIL BORING B–15
UST's 304 & 1239
MILLINGTON, TN
DATE INSTALLED: 7/13/1994 PROJ. #: CTO008(

DATE: 8/4/1994 | DWG NAME: CTOSB–15

Appendix C

Analytical Data

ENVIRONMENTAL TESTING & CONSULTING INC.
2924 WALNUT GROVE RD · MEMPHIS, TN 38111 · PHONE (901) 327-2760 FAX (901) 327-6334

July 14, 1992

Ms. Jan Campbell
Del-Jen, Inc. (NAS)
P.O. Box 54188
Millington, TN 38054

SWMU #26

REF: ANALYTICAL TESTING
SAMPLE DATE: 6/29/92
SITE ID: NAS
SAMPLE ID: NORTH 102 BATTERY ACID (LIQUID-SOLID)

Dear Ms. Campbell:

The above referenced sample has been analyzed per your instructions. The tests were performed in our laboratory (#02027) in accordance with the Solid Waste Manual, SW-846. The sample was leached/filtered according to Method 1311, Toxicity Characteristic Leaching Procedure. The results are shown on the attached Analysis Data Sheets.

Please call our office if you have any questions.

Sincerely,

Randall H. Thomas
Vice President

jw

Attachment

0629-034

Post-it™ brand fax transmittal memo 7671 | # of pages ▸

To James Worthy	From LT Ron Gruzesky
Co. SouthDiv	Co. NAS Memphis
Dept. Envir.	Phone # DSN 966-5461
Fax # DSN 963-0465	Fax # (901) 873-5300

ENVIRONMENTAL TESTING AND CONSULTING, INC.
MEMPHIS, TN
TCLP METALS

Client Name : Del-Jen, Inc.
Site ID : NAS

Sample ID : NORTH 102 BATTERY ACID
Sample Date : 6/29/92 File Name : _0629-034__
Date Arrived : 6/29/92 Sample ID : _0629-034-1

Date of TCLP Extraction : 7/01/92, Leachate/Filtrate Combined
Matrix Classification : Miscellaneous/Liquid-Solid

Metals	Results (ppm)	MS REC[1]	Results Fac(ppm)[2]	Regulatory Level (ppm)	Method (SW-846)	Date Analyzed	By
Arsenic	0.061	104 NF	0.061	5.0	7061	7/08/92	JF
Barium	0.30	112 NF	0.30	100.0	7080	7/02/92	BB
Cadmium	0.066	102 NF	0.066	1.0	7130	7/02/92	BB
Chromium	<0.02	97	<0.02	5.0	7190	7/01/92	BB
Lead	2.66	95	2.80	5.0	7420	7/09/92	BB
Mercury	0.0015	100 NF	0.0015	0.2	7470	7/01/92	JF
Silver	<0.01	100 NF	<0.01	5.0	7760	7/02/92	BB
Selenium	0.006	91	0.007	1.0	7741	7/08/92	JF
VOCs	See Attached						
BNAs	See Attached						

Detection Limits (ppm)	
Arsenic	0.002
Barium	0.03
Cadmium	0.002
Chromium	0.02
Lead	0.05
Mercury	0.001
Silver	0.01
Selenium	0.002

1 - Matrix Spike (%)Percent Recovery for Matrix Classification
2 - Sample results factored for Matrix Recovery Bias per Federal Regist June 29, 1990.
NF - No Factor applied.

Randall H. Thomas
Vice President

ENVIRONMENTAL TESTING AND CONSULTING, INC.
MEMPHIS, TN
ORGANIC ANALYSIS DATA SHEET
TCLP BASE NEUTRALS AND ACID EXTRACTABLES

CLIENT NAME : DEL-JEN, INC. PROJECT # :
SITE ID : NAS ANALYST : RR
SAMPLE ID : NORTH 102 BATTERY ACID
SAMPLE DATE : 06/29/92
DATE ARRIVED : 06/29/92 FILE NAME : 0629-034.DOC
MATRIX : TCLP LEACHATE/FILTRATE SAMPLE # : 0629-034

DATE OF TCLP EXTRACTION : 07/01/92
MATRIX CLASSIFICATION : MISC LIQUID/SOLID

DATE EXTRACTED : 07/08/92 METHOD (SW-846): 8270
DATE ANALYZED : 07/16-17/92

COMPOUND	SAMPLE RESULTS (ppm)	MS REC[2] (%)	SAMPLE RESULTS FAC(ppm)[3]	DL[1] (ppm)	REGULATORY LEVEL (ppm)
2,4-Dinitrotoluene	BDL	NF	BDL	0.05	0.13
Hexachlorobenzene	BDL	NF	BDL	0.05	0.13
Hexachlorobutadiene	BDL	NF	BDL	0.05	0.50
Hexachloroethane	BDL	NF	BDL	0.05	3.00
2-Methylphenol(o-cresol)	BDL	NF	BDL	0.05	200
3-Methylphenol(m-cresol)	BDL	NF	BDL	0.05	200
4-Methylphenol(p-cresol)	BDL	NF	BDL	0.05	200
Nitrobenzene	BDL	NF	BDL	0.05	2.00
Pentachlorophenol	0.05	85	0.06	0.05	100
2,4,5-Trichlorophenol	BDL	NF	BDL	0.05	400
2,4,6-Trichlorophenol	BDL	NF	BDL	0.05	2.00
Pyridine	BDL	NF	BDL	0.05	5.00

SURROGATE STANDARDS	RESULT	EXP(ng/ul)	%REC	QC LIMITS
Nitrobenzene-d5	111	100	111	35-114
2-Fluorobiphenyl	112	100	112	43-116
4-Terphenyl-d14	104	100	104	33-141
Phenol-D6	171	200	86	10-94
2,4,6-Tribromophenol	199	200	100	10-123
2-Fluorophenol	196	200	98	21-100

1 - DETECTION LIMIT
2 - MATRIX SPIKE RECOVERY FOR MATRIX CLASSIFICATION
3 - SAMPLE RESULTS FACTORED FOR MATRIX RECOVERY BIAS PER FEDERAL REGISTE JUNE 29, 1990.
BDL - BELOW DETECTION LIMIT
NF - NO FACTOR APPLIED.

LABORATORY MANAGER

ENVIRONMENTAL TESTING AND CONSULTING, INC.
MEMPHIS, TN
ORGANIC ANALYSIS DATA SHEET
TCLP VOLATILE COMPOUNDS

CLIENT NAME : _DEL-JEN, INC.
SITE ID : _NAS_____
SAMPLE ID : _NORTH 102 BATTERY ACID
SAMPLE DATE : _06/29/92_____
DATE ARRIVED : _06/29/92_____
MATRIX : _TCLP LEACHATE/FILTRATE
PROJECT # : _____
ANALYST : _LS_____
FILE NAME : _0629-034.DOC_
SAMPLE # : _0629-034_____

DATE OF TCLP EXTRACTION : _07/01/92_
MATRIX CLASSIFICATION : _MISC LIQUID/SOLID

DATE ANALYZED : _07/14/92_
METHOD (SW-846): _8240_____

COMPOUND	SAMPLE RESULTS (ppm)	MS REC[2] (%)	SAMPLE RESULTS FAC(ppm)[3]	DL[1] (ppm)	REGULATOI LEVEL (ppm)
Benzene	BDL	NF	BDL	0.005	0.50
Carbon Tetrachloride	BDL	NF	BDL	0.005	0.50
Chlorobenzene	BDL	NF	BDL	0.005	100
Chloroform	BDL	NF	BDL	0.050	6.00
1,4-Dichlorobenzene	BDL	NF	BDL	0.005	7.50
1,2-Dichloroethane	BDL	NF	BDL	0.005	0.50
1,1-Dichloroethene	BDL	NF	BDL	0.005	0.70
Methyl Ethyl Ketone	BDL	NF	BDL	0.050	200
Tetrachloroethene	BDL	NF	BDL	0.005	0.70
Trichloroethene	BDL	NF	BDL	0.005	0.50
Vinyl Chloride	BDL	NF	BDL	0.005	0.20

SURROGATE STANDARDS	RESULT	EXP(ug/L)	%REC	QC LIMITS
1,2-Dichloroethane-d4	39.9	50.0	80	76-114
Toluene-d8	45.3	50.0	91	88-110
4-Bromofluorobenzene	46.6	50.0	93	86-115

1 - DETECTION LIMIT
2 - MATRIX SPIKE RECOVERY FOR MATRIX CLASSIFICATION.
3 - SAMPLE RESULTS FACTORED FOR MATRIX RECOVERY BIAS PER FEDERAL REGISTI JUNE 29, 1990.
BDL - BELOW DETECTION LIMIT
NF - NO FACTOR APPLIED.

LABORATORY MANAGER

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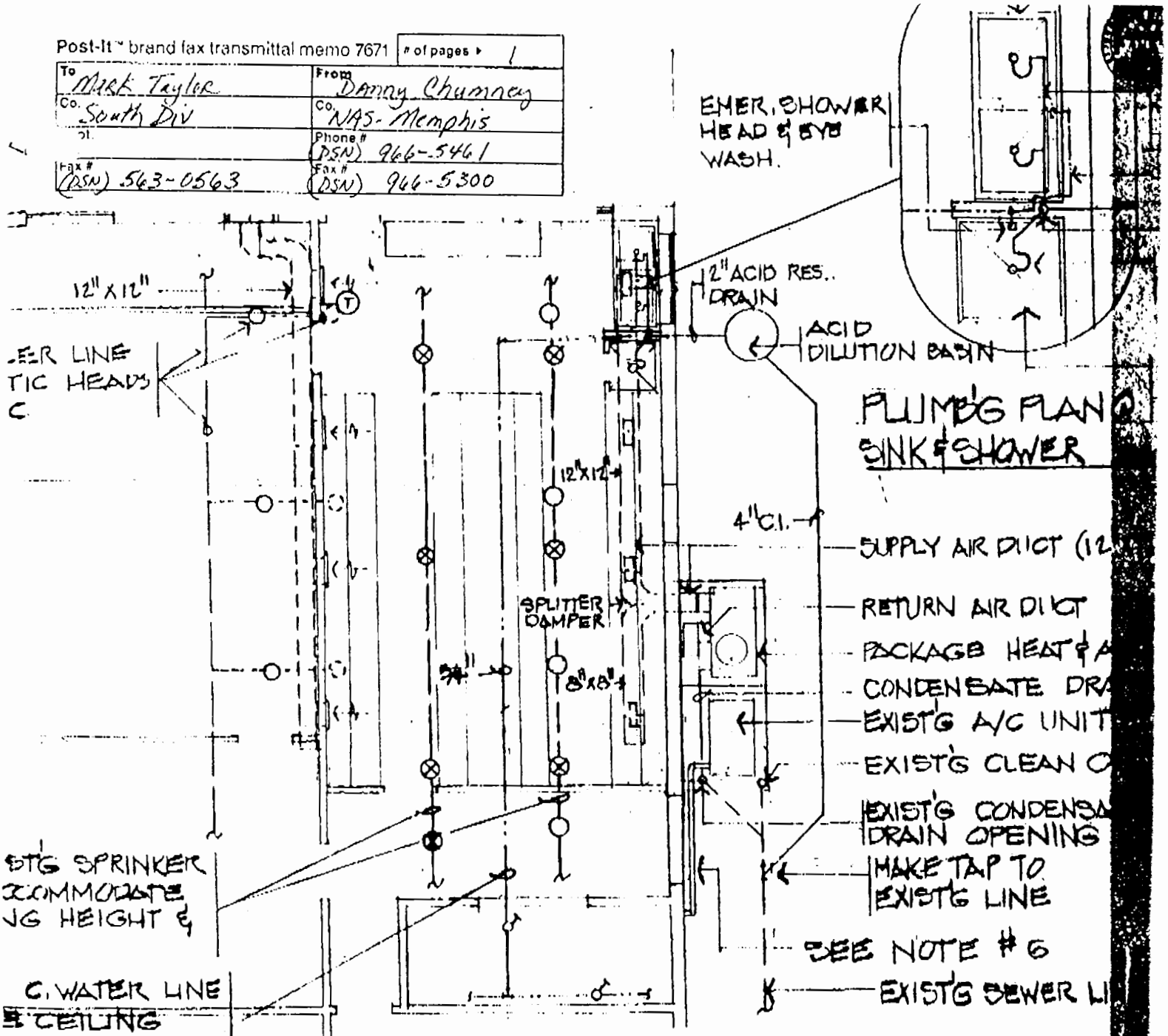
To James Worthy	From Lt. Gruzesky
Co. Southern Division	Co. NAS - Memphis
Dept.	Phone # (DSN) 966-5461
Fax # DSN 563-0465	Fax # (DSN) 966-5300

Post-It™ brand fax transmittal memo 7671 | # of pages ▸ 1

To	From
Mark Taylor	Danny Chumney
Co. South Div	Co. NAS - Memphis
Dept.	Phone # (DSN) 966-5461
Fax # (DSN) 563-0563	Fax # (DSN) 966-5300



LEGEND

⊗ RELOCATED EXPOSED SPRINKLER HEAD.

⊗ NEW EXPOSED SPRINKLER HEAD.

○ RELOCATED SPRINKLER HEAD IN ATTIC

SUPPLY AIR REG. 12"x 6" IN CEILING

EXHAUST AIR REG 12"x6" IN WALL. (4

ECHANICAL PLAN

CALE 1/8" = 1'-0"

LL DUCTWORK SHALL BE ALVANIZED STEEL.

GAS TIGHT CAST IRON COVER GROUT IN PLACE - 5' DIA. OPEN'G

Appendix D

Site-Specific Health and Safety Plan

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY
NAVAL AIR STATION
MEMPHIS, TENNESSEE

SITE-SPECIFIC HEALTH AND SAFETY PLAN
SWMU 26 — N-102 BATTERY ACID NEUTRALIZATION UNIT

CTO-094
Contract Number:N62467-89-D-0318

Prepared for:

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

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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Attachment B Directions to Emergency Medical Facilities
Attachment C Health and Safety Plan Forms

1.0 INTRODUCTION

A RCRA Facility Investigation (RFI) is being conducted at the N-102 Battery Acid Neutralization Unit (SWMU 26) located at the Naval Air Station Memphis (NAS Memphis), Millington, Tennessee. The purpose of the monitoring program is to assess the nature and extent of potential contamination at the site and to determine if additional action is required to maintain compliance with environmental regulations.

This Site-Specific Health and Safety Plan (SSHSP) is written for field operations to be conducted at SWMU 26. This plan is to be used in conjunction with the approved NAS Memphis Comprehensive Health and Safety Plan (CHASP). Copies of both this plan and the CHASP should be onsite during all field operations. The Navy project contract number with EnSafe/Allen & Hoshall (E/A&H) is N62467-89-D-0318, CTO-094.

Applicability

See CHASP Section 7.0.

Current Hazardous Waste and Emergency Response Operators (HAZWOPER) training certificates for E/A&H and U.S. Geological Survey (USGS) employees and all subcontractors anticipated to be conducting field work onsite will be filed onsite and available for review. Individuals whose certifications are not on file, or those who have a more recent certificate (have attended a refresher course), will provide the Site Supervisor with a copy of their certificate before being allowed to enter a work area.

Current OSHA refresher training certificates will be available onsite for all employees involved in field activities if their refresher course requirements come up for renewal before the project begins. All subcontractors, Navy oversight personnel, and any other site visitors must provide health and safety certification with appropriate refresher course documentation prior to site entry.

2.0 SITE CHARACTERIZATION

2.1 Site Description

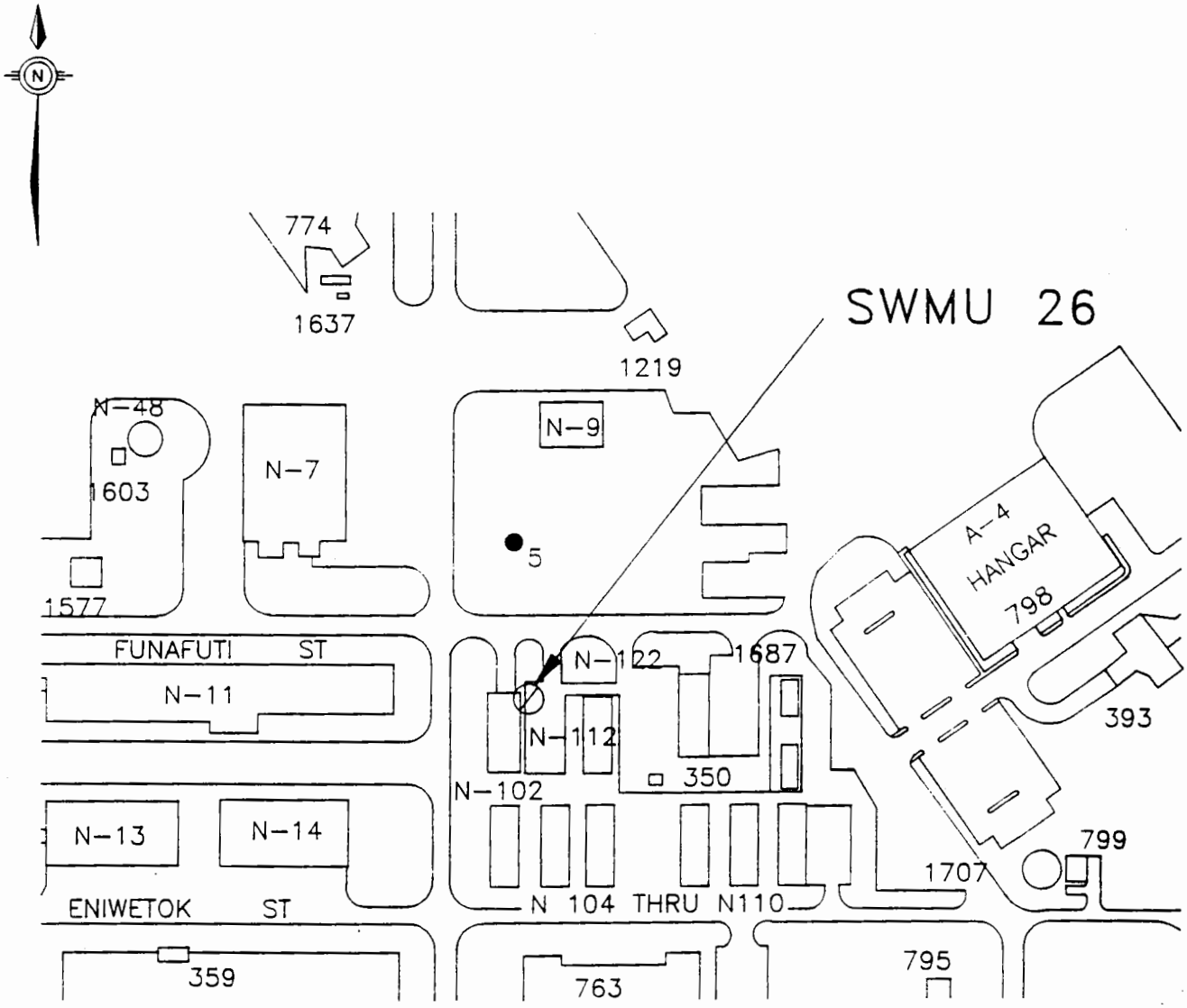
SWMU 26 is the site of a inactive, subsurface acid dilution basin that was installed in 1980 and used in conjunction with the Building N-102 Battery Shop, immediately to the southwest. A vicinity map of SWMU 26 is provided in Figure 1. The sump, covered by a 6-inch thick pad and a 3-foot diameter manhole on the surface, is constructed of two 3-foot by 3-foot diameter reinforced concrete pipes set in a 6-inch thick concrete base pad. This unit received drainage from a pair of lead sinks in the northeast corner of Building N-102 and was designed to neutralize drained battery acid and flush water prior to discharge into the sanitary sewer system. During its operation, the sump was pumped out and crushed limestone (sodium carbonate) replenished every 6 months to maintain the effectiveness of the system. The neutralization unit was bypassed in 1992 when the Naval Environmental Inspection Team indicated that it might qualify as a potential hazardous waste site. A site map is provided in Figure 2.

2.2 Work Areas

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

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ), and
- Support Zone (SZ).

For a description of field activities to be conducted at the site and within each work area see the Site Investigation Plan (SIP).



LEGEND

● STRATIGRAPHIC TEST HOLE

200 0 200

SCALE FEET

RFI HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
BUILDING N-102
BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

DWG DATE: 01/18/95 | DWG NAME: 94HSP7

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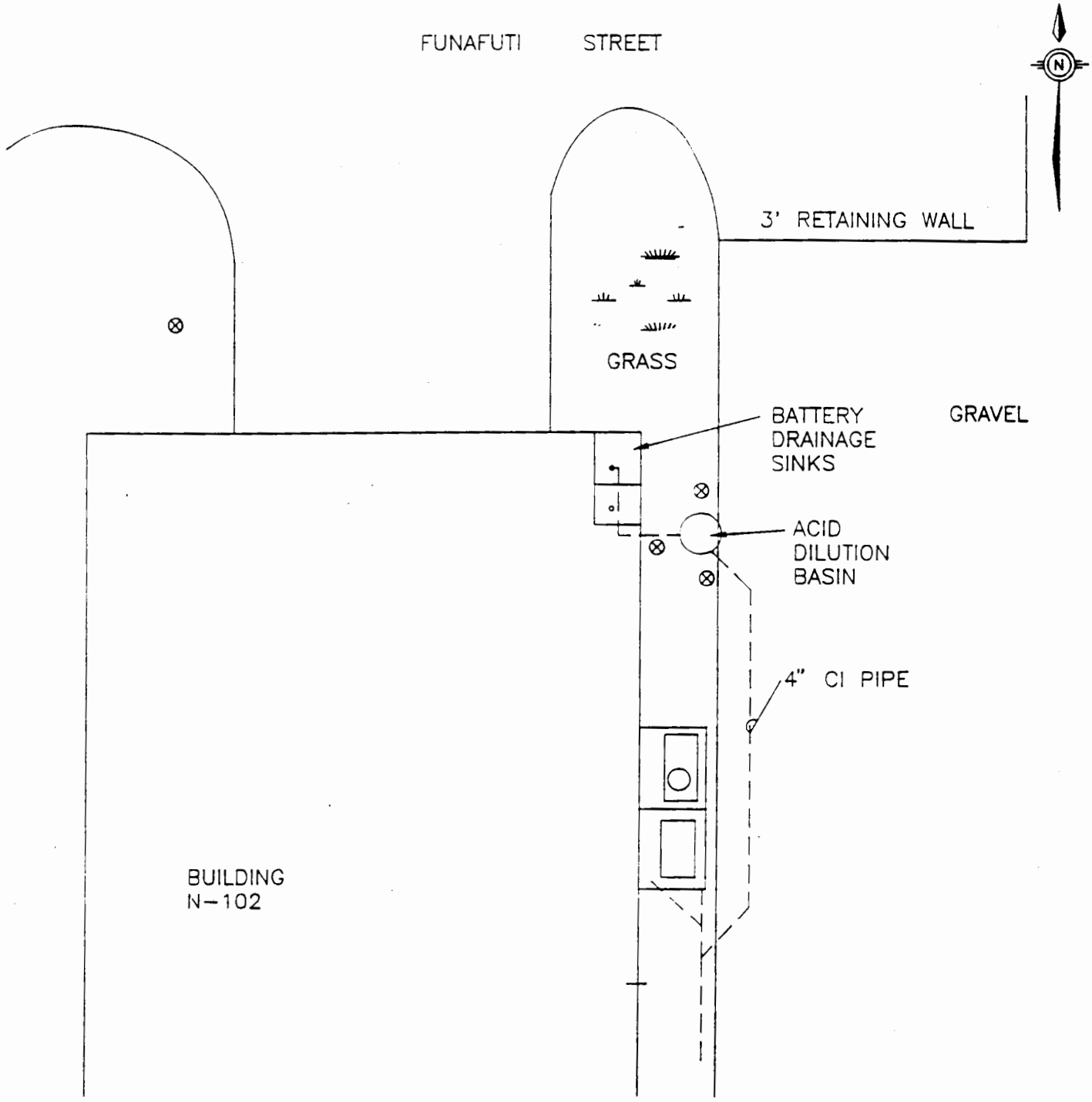

LEGEND

⊗ DPT SAMPLING LOCATION

10 0 10

SCALE FEET

RFI HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
DPT SAMPLING LOCATION
BUILDING N-102
BATTERY ACID NEUTRALIZATION UNIT
SWMU 26

DWG DATE: 01/18/95 | DWG NAME: 94HSP8

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2.3 Work Area Access

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

2.4 Work Zones

The EZ, CRZ, and SZ locations will be based on physical layout of the site, work task requirements, and current meteorological conditions. The EZ will be established using yellow caution tape.

3.0 SITE ACTIVITIES

Site activities will include Direct Push Technology (DPT) soil and groundwater sampling. Subsequent activities may include soil boring and monitoring well installation, well development, purging, and sampling as required. Field methods described in the *Comprehensive RFI Work Plan*.

4.0 CHEMICAL HAZARDS

The site history suggests a potential for exposure to chemicals. Table 4-1 lists exposure guidelines for potential site chemicals.

Table 4-1
Exposure Guidelines For Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	OSHA PEL[b] (ppm)	ACGIH TLV[c] (ppm)	NIOSH REL[d] (ppm)	Action Level[e] (ppm)	Flammable range (% by volume)
Sulfuric Acid	N.A.	1 mg/m^3	1 mg/m^3	1 mg/m^3	0.5 mg/m^3	N.A.
Lead	N.A.	0.05 mg/m^3	0.15 mg/m^3	< 0.1 mg/m^3	0.025 mg/m^3	N.A.

Table 4-1
Exposure Guidelines For Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	OSHA PEL[b] (ppm)	ACGIH TLV[c] (ppm)	NIOSH REL[d] (ppm)	Action Level[e] (ppm)	Flammable range (% by volume)
Toluene	40	100 150 STEL	50	100 150 STEL	25	1.3 to 7.1%
Ethylbenzene	140	100 125 STEL	100 125 STEL	N.A.	50	1.0 to 6.7%
Benzene	4.68	1 5 STEL	0.1 Confirmed Human Carc.	0.1 1 STEL Potential Occupation al Carcinogen	0.05	1.3 to 7.1%
Xylene	Not Listed	100 150 STEL	100 150 STEL	100 150 STEL	50	1.0 to 7.0%

Notes:

- Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values
- [b] 29 CFR 1910.1000, Table Z-1-A. Limits For Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)
- [c] 1990-1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienist. (STEL = Short Term Exposure Limit)
- [d] National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, June 1990. (REL = Recommended Exposure Limit)
- Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50 percent of the PEL, TLV, or REL, whichever is lower.
  N.A. = Substance information not available, or substance unlisted.

Material Safety Data Sheets (MSDS) for these materials are included in Attachment A.

5.0 OPERATIONS AND PHYSICAL HAZARDS

Physical hazards typically encountered during environmental investigations will be present at this site. These hazards include cold-related illnesses, uneven terrain, slippery surfaces, lifting, and use of heavy equipment. The Site Supervisor and Site Health and Safety Officer shall be aware of the potential for heat and/or cold stress and other weather-related illnesses, and as necessary, implement appropriate work regimens to minimize the likelihood of field personnel becoming ill or injured.

Heavy equipment and drill rig operations will be conducted in accordance with the procedures outlined in the CHASP, Attachment A, Drilling Safety Guide. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. If working in areas supporting habitat for poisonous snakes, personnel should wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

6.0 EMPLOYEE PROTECTION

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

6.1 Standard Safe Work Practices

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

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

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

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

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

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

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

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

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

6.2 NAS Memphis General Rules of Conduct

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

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

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

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

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

- Securing government tools in a personal or contractors tool box is forbidden.

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

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

- Compliance with posted signs and notices is required.

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

- Fighting or threatening bodily harm to another is forbidden.

- Defacing any government property is forbidden.

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

- All persons operating motor vehicles will obey all NAS Memphis traffic regulations.

6.3 Selection of Personal Protective Equipment

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

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

Field activities which disturb soils will be initiated in modified Level D protection except when stated otherwise in the SSHSP or when site conditions (e.g., sampling results from previous studies) indicate that modified Level D is inappropriate. Modified Level D protection consists of a hard hat, appropriate chemical-resistant gloves (vinyl or nitrile), eye protection, and chemical-resistant, steel-toed and shank boots. Work coveralls (full length sleeves and pants) will be worn if free product or contaminants identified as skin irritants are encountered. This level of protection was selected because the levels of contamination detected in previous studies were low and free product was not detected.

PPE upgrades to Level C will be initiated if airborne concentrations exceed 2 ppm above the background concentration in the breathing zone or if the concentration of any contaminant exceeds 50 percent of the OSHA Permissible Exposure Limit (PEL). See Table 6-1 for the specific criteria for use and equipment for each level of protection.

Table 6-1
Level Of Protection And Criteria

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

Table 6-1
Level Of Protection And Criteria

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

Notes:

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

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

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

Level C protection will be selected when the types and concentrations of inseparable material are known, or reasonably assumed to be no greater than the protection factors associated with air-purifying respirators, and exposure to the unprotected areas of the body is unlikely to cause harm. Dust concentrations require Level C PPE, where the respirable fractions exceed the PEL of 5 mg/m3 or the total concentrations exceed the PEL of 15 mg/m3.

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

6.4 Air Monitoring

Site history and previous site work indicates that workers may potentially be exposed to low concentrations of numerous chemicals including VOCs, halogenated compounds, and combustible gases/vapors. Based on site history and existing sampling data, "worst case" contaminated areas will be identified before field activities begin.

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

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

If breathing zone levels exceed 2 ppm above background or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact both the Project Manager and the Project Health and Safety Officer. The Project Health and Safety Officer will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. (Typically, PPE will be upgraded to Level C assuming that cartridge respirators are appropriate, otherwise Level B.) See Table 6-1 for specific criteria for each protection level. Work shall not proceed until breathing zone levels return to background levels and it is reasonably anticipated that breathing zone samples will stay approximately at background levels, or the chemical constituent(s) are identified and appropriate PPE is donned.

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

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

6.5 Procedures and Equipment for Extreme Hot or Cold Weather Conditions

See CHASP Section 7.5.5.

Severe Weather Conditions

All field work shall immediately cease at the first sign of thunder or lightning. Field personnel shall perform emergency personal and equipment decontamination (see Section 6.6) and seek immediate shelter.

6.6 Personal Decontamination

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

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

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

6.6.1 Personal Decontamination Procedures

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

- Brushing heavily soiled boots and rinsing outer gloves and boots with soap and water.
- Removing outer gloves and depositing them in a labeled plastic-lined container.
- Remove outer chemical protective clothing.
- Wash and rinse inner gloves.
- Hard hats and eye protection should be washed thoroughly at the end of each work day with a soap and water solution.
- Disposable gloves and other disposable clothing will be disposed of in sealable bags and placed in a labeled 55-gallon drum for disposal at the site.
- All field personnel are to be instructed to shower as soon as possible after leaving the site.

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

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

6.6.2 Closure of the Personal Decontamination Station

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

6.7 Work Limitations

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional 8 hours of training in site management. All personnel must complete an 8-hour refresher training course on an annual basis in order to continue working at the site.

6.8 Exposure Evaluation

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

The content of the annual or termination examination will be the same as the baseline physical. A qualified physician will review the results of the annual examination and exposure data and request further tests or issue medical clearances as appropriate.

After any job-related injury or illness, there will be a medical examination to determine fitness for duty or any job restrictions. The Site Health and Safety Officer will review the results with the examining physician before releasing the employee for work. A similar examination will be performed if an employee has missed at least three days of work due to a non-job related injury or illness requiring medical attention. Medical records shall be maintained by the employer or the physician for at least 30 years following the termination of employment.

7.0 MEDICAL MONITORING PROGRAM

See CHASP Section 7.6.

8.0 AUTHORIZED PERSONNEL

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

• Principal-In-Charge	Dr. James Speakman (E/A&H)
• Task Order Manager/Project Manager	Mr. Lawson Anderson (E/A&H)
• Project Health & Safety Officer	Mr. Doug Petty (E/A&H)
• Site Supervisor — To Be Determined	
• Site Health & Safety Officer	Mr. Matt Norton (E/A&H)
	Mr. Robert Smith (E/A&H)
	Mr. Ben Brantley (E/A&H)
• Engineer-in-Charge	Mr. Mark Taylor (SOUTHDIV)
• Naval Air Station Memphis Site Contact	Ms. Tonya Barker

8.1 Responsibilities of Site Supervisor

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

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

- Field staff have current HAZWOPER training.

- Field staff know who the Site Health and Safety Officer is.

- Field staff know the site-specific safety and health concerns.

- There is an adequate onsite supply of health and safety equipment.

- Field staff participate in the E/A&H Medical surveillance program (or in the case of the USGS or subcontractors, an equivalent program).

- Field staff attend safety and health "kick-off" orientation and other site safety briefings.

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

8.2 Responsibilities of Site Health and Safety Officer

The responsibilities of the Site Health and Safety Officer include:

- Providing the Site Supervisor technical input on site health and safety issues.

- Observing field personnel and reporting to the Site Supervisor on the effectiveness of the CHASP and SSHSP and whether field staff are utilizing proper work practices and decontamination procedures.

- Reporting significant safety violations to the Project Manager and/or Project Health and Safety Officer.

- Conducting safety briefings during field activities.

- Assuring that a copies of the CHASP and SSHSP are maintained onsite during all field activities.

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

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

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

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

8.3 Responsibilities of Onsite Field Staff

The health and safety responsibilities of field staff include:

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

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

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

- Utilizing required PPE including respiratory protective.

- Having up to date HAZWOPER training and providing the Site Supervisor with documentation that their training is current.

- Being an up to date participant in an acceptable medical surveillance program.

- Being fit-tested and physically capable of using a respirator and being in a position where using a respirator may be a requirement. Should the use of respiratory protection be required, field workers shall not have facial hair which intrudes into the sealing surface of the respirator.

- Using the buddy system when wearing respiratory protective equipment. When working in Level C or higher, a third person shall be at the work area. This person shall be suitably equipped to provide logistical and safety support to the entry team.

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

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

9.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations risk is minimized by establishing good work practices, staying alert, and using proper

PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

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

Contact	**Agency or Organization**	**Telephone**
Tonya Barker	NAS Memphis	(901) 873-5461/5462
Mark Taylor	SOUTHDIV EIC	(803) 743-0573
Law Enforcement	NAS Memphis Base Security	9-911
Fire Department	NAS Memphis	9-911
Ambulance Service	Naval Hospital, Millington Navy Road	(901) 873-5801/5802 or 9-911
Hospital	Methodist North Hospital 3960 Covington Pike	(901) 372-5211 or 9-911
Southern Poison Control Center	—	(901) 528-6048
Lawson Anderson	EnSafe/Allen & Hoshall	(901) 372-7962
Doug Petty	EnSafe/Allen & Hoshall	(901) 372-7962 (901) 362-0252

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

9.1 Site Resources

Cellular telephones or the telephone at the nearby Aircraft Firefighting Training Facility office trailer will be used for emergency use and communication/coordination with NAS Memphis. First aid and eye wash equipment will be available at the work area.

9.2 Emergency Procedures

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

The following emergency procedures should be followed:

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

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

- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the Site Health and Safety Officer to indicate possible routes for upwind escape.

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

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

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

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

Additional information on appropriate chemical exposure treatment methods will be provided through Material Safety Data Sheets (MSDS) in Attachment A.

10.0 FORMS

The following forms will be used to implement this Health and Safety Plan:

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

The Plan Acceptance Form will be filled out by all employees working on the site before site activities begin. The Plan Feedback Form will be filled out by the Site Safety Officer and any other onsite employee who wishes to fill one out. The Exposure History Form will be

completed by both the Field Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in Attachment C of this plan.

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

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ATTACHMENT A

MATERIAL SAFETY DATA SHEETS

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 511 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: 2-BUTANONE

SYNONYMS: ACETONE, METHYL-; AETHYLMETHYLKETON (German); BUTANONE; BUTANONE 2 (French); ETHYL METHYL CETONE (French); ETHYLMETHYLKETON (Dutch); ETHYL METHYL KETONE; ETHYL METHYL KETONE (DOT); KETONE, ETHYL METHYL; MEETCO; METHYL ACETONE; METHYL ACETONE (DOT); METHYL ETHYL KETONE; METHYL ETHYL KETONE (DOT); METILETILCHETONE (Italian); METYLOETYLOKETON (Polish); 2-BUTANONE; MEK; BUTAN-2-ONE; KETONE, METHYL ETHYL; 2-OXOBUTANE; METHYL ETHYL KETONE (MEK)

CAS: 78-93-3 RTECS: EL6475000

FORMULA: C4H8O MOL WT: 72.12

WLN: 2V1

CHEMICAL CLASS: Ketone

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: clear colorless liquid with a fragrant, mint-like, moderately sharp odor

BOILING POINT:	352.72 K	79.5 C	175.2 F
MELTING POINT:	187.04 K	-86.2 C	-123 F
FLASH POINT:	267.4 K	-5.75 C	21.6 F
AUTO IGNITION:	788.7 K	515.5 C	960 F
CRITICAL TEMP:	535.7 K	262.55 C	504.59 F
CRITICAL PRESS:	4.15 kN/M2	40.9 atm	601 psia
HEAT OF VAP:	191 Btu/lb	106.07 cal/g	4.438x E5 J/kg
HEAT OF COMB:	-13480 Btu/lb	-7494 cal/g	-313x E5 J/kg

VAPOR PRESSURE: 71.2 mm Hg @ 20 C

UEL: 11.5 %

LEL: 1.8 %

IONIZATION POTENTIAL (eV): 6.7

VAPOR DENSITY: 2.42 (air=1)

EVAPORATION RATE: 7.12

SPECIFIC GRAVITY: 0.806 @ 20 C

DENSITY: 0.805 g/mL @ 20 C

WATER SOLUBILITY: 27%

INCOMPATIBILITIES: very strong oxidizers, chlorosulfonic acid, oleum, potassium-tert-butoxide, heat or flame, chloroform, hydrogen peroxide, nitric acid

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: NO REACTION Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS:	NOT PERTINENT Source: SAX
POLYMERIZATION POSSIBILITIES:	NOT PERTINENT Source: SAX
TOXIC FIRE GASES:	UNBURNED VAPORS
ODOR DETECTED AT (ppm):	10 ppm
ODOR DESCRIPTION:	Like acetone; pleasant; pungent Source:CHRIS
100 % ODOR DETECTION:	6.0 ppm

---------- REGULATIONS ----------

DOT hazard class:	3 FLAMMABLE LIQUID
DOT guide:	26
Identification number:	UN1193
DOT shipping name:	Ethyl methyl ketone [or] methyl ethyl ketone
Packing group:	II
Label(s) required:	FLAMMABLE LIQUID
Special provisions:	T8
Packaging exceptions:	173.150
Non bulk packaging:	173.202
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	5 L
Cargo aircraft only:	60 L
Vessel stowage:	B
Other stowage provisions:	
STCC NUMBER:	4909243
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	CAA '90 Listed
EPA WASTE NUMBER:	U159,D035,D001
CERCLA REF:	Y
RQ DESIGNATION:	D 5000 pounds (2270 kg) CERCLA
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin. Fire hazard: flammable.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Flammable liquid - Mailable as ORM-D
Mailability:	Domestic surface mail only
Max per parcel:	1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

2-BUTANONE [78-93-3]
ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
First Third Wastes List. 40 CFR 268.10. 54 FR 26594 (June 23, 1989)
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: human exposures to levels of 350 ppm caused irritation of the nose and throat. numbness in fingers, arms and legs accompanied by headache, nausea, vomiting and fainting have occurred after exposure to levels of 300-600 ppm. SKIN: contact with liquid or vapor at levels of 300-600 ppm caused severe irritation. liquid is absorbed readily and may cause numbing of fingers and arms. Eyes: exposure to levels of 200 ppm produced irritation. INGESTION: can cause

irritation of the mouth, throat and stomach, the severity of which will be dependent upon amount swallowed. symptoms of poisoning include nausea, vomiting, stomach pain and diarrhea. death can occur from ingestion of as little as 1 ounce.(NYDH)

LONG TERM TOXICITY: has been implicated in certain nervous disorders characterized by weakness, fatigue, heaviness in chest and numbness of hands and feet. these symptoms may develop after 1 year of exposure to vapor concentrations of 50-200 ppm. improvement is gradual and may take years after exposure is discontinued.(NYDH)

TARGET ORGANS: CNS, lungs. peripheral nervous system. eye irritation at 350 ppm.

SYMPTOMS: Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: 200 ppm Time weighted averages for 8-hour exposure
590 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 200ppm(590 mg/M3)
ACGIH STEL: STEL = 300 ppm

OSHA PEL: Transitional Limits:
PEL = 200 ppm(590mg/M3)
Final Rule Limits:
TWA = 200 ppm (590 mg/M3)
STEL = 300 ppm(885 mg/M3)

MAK INFORMATION: 200 ppm
590 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:100 ppm/5M JIHTAB 25,282,43
SENSE ORGANS
Nose
Other
SENSE ORGANS
Eye
Conjunctive irritation
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:2737 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2737 mg/kg
ihl-rat LC50:23500 mg/m3/8H
ipr-rat LD50:607 mg/kg
orl-mus LD50:4050 mg/kg
ihl-mus LC50:40 gm/m3/2H
ipr-mus LD50:616 mg/kg
skn-rbt LD50:6480 mg/kg
ipr-gpg LDLo:2 gm/kg
ihl-mam LC50:38 gm/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

eye-hmn 350 ppm
skn-rbt 500 mg/24H MOD
skn-rbt 402 mg/24H MLD
skn-rbt 13780 ug/24H open MLD
eye-rbt 80 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:3000 ppm/7H (6-15D preg) TXAPA9 28,452,74
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

ihl-rat TCLo:1000 ppm/7H (6-15D preg) TXAPA9 28,452,74
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Methyl ethyl ketone (MEK); CASRN 78-93-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Methyl ethyl ketone (MEK)
CASRN -- 78-93-3
Last Revised -- 12/01/89

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on no human carcinogenicity data and inadequate animal data.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. No data were available to assess the carcinogenic potential of methyl ethyl ketone by the oral or inhalation routes. In a skin carcinogenesis study, two groups of 10 male C3H/He mice received dermal applications of 50 mg of a solution containing 25 or 29% methyl ethyl ketone in 70% dodecylbenzene twice a week for 1 year. No skin tumors developed in the group of mice treated with 25% methyl ethyl ketone. After 27 weeks, a single skin tumor developed in 1 of 10 mice receiving 29% methyl ethyl ketone (Horton et al., 1965).

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Methyl ethyl ketone was not mutagenic for Salmonella typhimurium strains 98, TA100, TA1535, or TA1537 with or without rat hepatic homogenates (Florin et al., 1980; Douglas et al., 1980). Methyl ethyl ketone induced aneuploidy in the diploid D61, M strain of Saccharomyces cerevisiae (Zimmermann et al., 1985). Low levels of methyl ethyl ketone combined with low levels of nocodazole (another inducer of aneuploidy), also produced significantly elevated levels of aneuploidy in the system (Mayer and Goin, 1987).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1985. Health and Environmental Effects Profile for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 1988. Updated Health Effects Assessment for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1988 Updated Health Effects Assessment for Methyl Ethyl Ketone has received Agency review.

Agency Work Group Review: 05/30/89

Verification Date: 05/30/89

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
organic canister or air pack; plastic gloves; goggles or face shield.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (2-BUTANONE)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
3000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen.
EYES: wash with plenty of water for at least 15 min. and call physician.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Alcohol foam, dry chemical, or carbon dioxide.
Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethyl methyl ketone [or] methyl ethyl ketone
DOT ID NUMBER: UN1193

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POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Poor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it

without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk.

Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 1715 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: NAPHTHA, SOLVENT

SYNONYMS: AROMATIC SOLVENT; HI-FLASH NAPHTHAYETHYLEN; NAPHTA (DOT); NAPHTHA; NAPHTHA DISTILLATE (DOT); NAPHTHA, SOLVENT (DOT); PETROLEUM BENZIN; PETROLEUM DISTILLATES (NAPHTHA); PETROLEUM ETHER; PETROLEUM ETHER (DOT); PETROLEUM NAPHTHA (DOT)

CAS: 8030-30-6 RTECS: DE3030000

FORMULA: W99 MOL WT:

WLN: A10-15

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION:

BOILING POINT: NA

MELTING POINT: NA

FLASH POINT: Not available

AUTO IGNITION: Not available

VAPOR PRESSURE:

[illegible]: ~

: ~

IONIZATION POTENTIAL (eV): 7.16 TO 7.46

VAPOR DENSITY: No data

EVAPORATION RATE: 5.53(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: No data

DENSITY:

WATER SOLUBILITY:

INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide:	27
Identification number:	UN1256
DOT shipping name:	Naphtha, [solvent]
Packing group:	II - III
Label(s) required:	FLAMMABLE LIQUID - FLAMMABLE LIQUID
Special provisions:	T8,T31■B1,T7,T30
Packaging exceptions:	173.150■150
Non bulk packaging:	173.202■203
Bulk packaging:	173.242■242
Quantity limitations-	
Passenger air/rail:	5 L■60 L
Cargo aircraft only:	60 L■220 L
Vessel stowage:	B■A
Other stowage provisions:	
STCC NUMBER:	4915241, 4910241
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D001
CERCLA REF:	Not listed
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Fire hazard: flammable.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE):	Unspecified
FLAMMABILITY (RED) :	Unspecified
REACTIVITY (YELLOW):	Unspecified
SPECIAL :	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
NAPHTHA, SOLVENT [8030-30-6]
New Jersey Right To Know Substance List. (December 1987)

Pennsylvania Hazardous Substance List
RCRA Hazardous Waste

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: Source:

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: ppm
mG/M3

CARCINOGEN?: N STATUS: See below

CINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* ihl-hmn LCLo:3 pph/5M TABIA2 3,231,33

LD50 value: orl-rat LD50:>5 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>5 gm/kg
ihl-rat LCLo:1600 ppm/6H
ihl-mus LCLo:10600 mg/m3/6H
skn-rbt LD50:>3 gm/kg
ipr-mam LDLo:2500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (NAPHTHA, SOLVENT)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
2500 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
5000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
10000 ppm: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSHP
EYE: None given
SKIN: None given
INHALATION: None given
INGESTION: None given

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Naphtha, [solvent]
DOT ID NUMBER: UN1256

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 1513 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: KEROSENE
SYNONYMS: COAL OIL; KEROSINE; ILLUMINATING OIL; RANGE OIL; A FUEL OIL NO. 1; JET FUEL; JP-1
CAS: 8008-20-6 RTECS: NY9350000
FORMULA: CnH2n+2 MOL WT:
WLN:
CHEMICAL CLASS:

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless watery liquid with a fuel oil odor; pale yellow or water white, mobile oily liquid

BOILING POINT:	448.16-598.16 K	175-325 C	347-617 F
MELTING POINT:	227.55 K	-45.6 C	-50.1 F
FLASH POINT:	310.92 K	37.77 C	99.9 F
AUTO IGNITION:	502 K	228.8 C	444 F

VAPOR PRESSURE: 2 mmHg @ 21 C
UEL: 5.0 %
LEL: 0.7 %
IONIZATION POTENTIAL (eV): 6.79
VAPOR DENSITY: 4.5 (air=1)
EVAPORATION RATE: 0.212138
SPECIFIC GRAVITY: 0.80 15C
DENSITY: 0.80 g/mL
WATER SOLUBILITY: INSOLUBLE
INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): 1 ppm
ODOR DESCRIPTION: Fuel oil odor Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1223

DOT shipping name:	Kerosene
Packing group:	III
Label(s) required:	FLAMMABLE LIQUID
Special provisions:	B1,T1
Packaging exceptions:	173.150
Non bulk packaging:	173.203
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	60 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	

STCC NUMBER:	4915171

CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D001
CERCLA REF:	Not listed
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Chronic toxicity: mutagen. Fire hazard: flammable. Chronic toxicity: carcinogen

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Combustible liquid - Mailable as ORM-D
Mailability:	Domestic service and air transportation shipper's declaration
Max per parcel:	1 GAL

NFPA CODES:

HEALTH HAZARD (BLUE):	(0) No unusual health hazard.
FLAMMABILITY (RED) :	(2) This material must be moderately heated before ignition will occur.
REACTIVITY (YELLOW):	(0) Stable even under fire conditions.
SPECIAL :	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
KEROSENE [8008-20-6]

Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: does not evaporate fast enough to cause health effects except when heated or in enclosed spaces. headache, tiredness, stupor, dizziness, nausea, coma and death, may occur with increasing exposure. SKIN: if not promptly removed, may cause reddening, blisters, itching and an increased risk of infection. Eyes: irritation may occur. INGESTION: accidental ingestion of unknown amounts has caused irritation of mouth, throat and stomach, nausea, vomiting, rapid breathing, blue skin coloration, and convulsions. death may result from as little as 1 fluid ounce. inhalation into lungs following ingestion may result in bronchitis, chemical pneumonia, accumulation of fluid and blood in lungs, and death. as little as 1/30 oz. may be fatal in this way.(NYDH)

LONG TERM TOXICITY: absorption through skin is slow but repeated skin contact over many years has caused muscular weakness, anemia, changes in white blood cells, fever and death.(NYDH)

TARGET ORGANS:

SYMPTOMS: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL: 100 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC
to be probably carcinogenic to
humans with (usually) at least
limited human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:26 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:26 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
protective gloves; goggles or face sheild.

FIRST AID SOURCE: CHRIS Manual 1991
ASPIRATION: enforce bed rest; administer oxygen; call a doctor.
INGESTION: do NOT induce vomiting; call a doctor.
EYES: wash with plenty of water.
SKIN: wipe off and wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam, dry chemical, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Kerosene
T ID NUMBER: UN1223

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate horities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 369 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: SULFURIC ACID

SYNONYMS: OIL OF VITRIOL; NORDHAUSEN ACID; DIPPING ACID; SPIRIT OF SULFUR; HYDROGEN SULFATE; SULPHURIC ACID; VITRIOL BROWN OIL

CAS: 7664-93-9 RTECS: WS5600000

FORMULA: H2SO4 MOL WT: 98.08

WLN: H2 S-O4

CHEMICAL CLASS: Non-oxidizing min. acid

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: odorless colorless oily liquid

BOILING POINT:	543.15 K	270 C	518 F
MELTING POINT:	275.93 K	2.7 C	37 F
FLASH POINT:	Not applicable		
AUTO IGNITION:	Not applicable		
VAPOR PRESSURE:	<0.001 MM		
UEL:	Not applicable		
LEL:	Not applicable		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	1.84 20C		
DENSITY:	1.84 g/cc or 17.112 lb/gal		
WATER SOLUBILITY:	MISCIBLE		
INCOMPATIBILITIES:	organics: chlorates, carbides, fulminates, picrates, metals		

REACTIVITY WITH WATER: REACTS VIOLENTLY WITH EVOLUTION OF HEAT. SPATTERING OCCURS WHEN WATER IS ADDED TO THE COMPOUND.

REACTIVITY WITH COMMON MATERIALS: EXTREMELY HAZARDOUS IN CONTACT WITH MANY MATERIALS, ESP METALS AND COMBUST. DILUTE ACID REACTS WITH MOST METALS, RELEASING HYDROGEN WHICH CAN FORM EXPLOSIVE MIXTURES WITH AIR IN CONFINED SPACES.

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: DILUTE WITH WATER, THEN NEUTRALIZE WITH LIME, LIMESTONE OR SODA ASH.

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): >1

ODOR DESCRIPTION: ODORLESS UNLESS HOT, THEN CHOKING.

	Source:CHRIS
100 % ODOR DETECTION:	No data

---------- REGULATIONS ----------

DOT hazard class:	8 CORROSIVE
DOT guide:	39
Identification number:	UN1830
DOT shipping name:	Sulfuric acid
Packing group:	II
Label(s) required:	CORROSIVE
Special provisions:	A3,A7,B3,B83,B84,N34,T9,T27
Packaging exceptions:	173.154
Non bulk packaging:	173.202
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	1 L
Cargo aircraft only:	30 L
Vessel stowage:	C
Other stowage provisions:	14

STCC NUMBER:	4930040
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	Yes
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D002
CERCLA REF:	Y
RQ DESIGNATION:	C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE:	1000 pounds
SARA Sect. 312 categories:	Acute toxicity: corrosive Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Not given
Mailability:	Nonmailable
Max per parcel:	0

NFPA CODES:

HEALTH HAZARD (BLUE): (3) Extremely hazardous to health. Full protection required. No skin surface should be exposed.

FLAMMABILITY (RED) : (0) This material does not readily burn.

REACTIVITY (YELLOW): (2) Normally unstable and readily undergoes violent change, but does not detonate.

SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
SARA Title III Extremely Hazardous Substance. Sections 302 and 304.
SULFURIC ACID [7664-93-9]
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: resp sys,eyes,skin,teeth,lungs, mucous membranes.

SYMPTOMS: EYE, NOSE, THROAT IRRIT; PULM EDEMA, BRON; EMPHYSEMA; CONJ; STOMATITIS, DENT EROSION; TRACHBRONC; SKIN, EYE, BURNS; DERM. EXTREMELY IRRITATING, CORROSIVE AND TOXIC TO TISSUE - WORKERS EXPOSED TO LOW CONCENTRATIONS OF VAPOR GRADUALLY LOSE SENSITIVITY TO IRRITATING ACTION - INHALATION OF CONCENTRATED VAPORS CAN CAUSE RAPID UNCONSCIOUSNESS WITH SERIOUS DAMAGE TO LUNG TISSUE - CAN CAUSE NECROSIS OF SKIN ACCOMPANIED BY SHOCK AND COLLAPSE - SEVERE EXPOSURE MAY CAUSE CHEMICAL PNEUMONITIS. Source: SAX

CONC IDLH: 80mg/M3

NIOSH REL: 1 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 1mg/M3
ACGIH STEL: STEL = 3 mg/M3

OSHA PEL: Transitional Limits:

PEL = 1mg/M3
Final Rule Limits:
TWA = 1 mg/M3

MAK INFORMATION: 1.5 calculated as total dust mG/M3

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:3 mg/m3/24W BJIMAG 18,63,61
MUSCULOSKELETAL
Changes in teeth and suporting structures

LD50 value: orl-rat LD50:2140 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2140 mg/kg
ihl-rat LC50:510 mg/m3/2H
ihl-mus LC50:320 mg/m3/2H
ihl-gpg LC50:18 mg/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rbt TCLo:20 mg/m3/7H (6-18D preg) JEHSDH 13,251,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
provide safety shower; eyewash fountain; safety goggles; face shield; approved respirator(self-contained or air-line); rubber safety shoes; rubber apron

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of liquid contact and repeated or prolonged vapor contact

WEAR EYE PROTECTION TO PREVENT:
Any possibility of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (SULFURIC ACID)
25 mg/M3: Any powered air-purifying respirator with a high efficiency particulate filter and an acid gas cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
50 mg/M3: Any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with a high-efficiency particulate filter. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted acid gas canister. / Any air-purifying respirator with a high-efficiency particulate filter.
^^ mg/M3: Any supplied-air respirator with a full facepiece and operated a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor and acid gas canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: water flush immed
INHALATION: art resp
INGESTION: water, no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material

from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Sulfuric acid
DOT ID NUMBER: UN1830

ERG93 GUIDE 39

POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if inhaled or swallowed.
Contact causes severe burns to skin and eyes.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
May ignite other combustible materials (wood, paper, oil, etc.).
Violent reaction with water.
Flammable/poisonous gases may accumulate in tanks and hopper cars.
Runoff to sewer may create fire or explosion hazard.
Material may be transported in a molten form.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection.
*Structural firefighters' protective clothing is not effective for these materials. Isolate the leak or spill area immediately for at least 150 feet in all directions. See the Table of Initial Isolation and Protective Action Distances. If you find the ID Number and the name of the material there, begin protective action. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300.
*FIRE
Do not get water inside container.
Small Fires: Dry chemical or CO2.
Large Fires: Flood fire area with water from a distance.
Do not get solid stream of water on spilled material. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk. Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. Use water spray to reduce vapor; do not put water directly on leak, spill area or inside container. Keep combustibles (wood, paper, oil, etc.) away from

spilled material.
Spills: Dike for later disposal; do not apply water unless directed to do so. Cleanup only under supervision of an expert.

FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 2264 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: OIL MIST, MINERAL
SYNONYMS: NUJOL ; MIST OF WHITE MINERAL OIL; CUTTING OIL; HEAT-TREATING OIL; HYDRAULIC OIL; CABLE OIL; LUBRICATING OIL
CAS: 8012-95-1 RTECS: XH7480000
FORMULA: W99 MOL WT: N.A.
WLN:
CHEMICAL CLASS: Paraffin

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: mist with an odor like burned lube oil
BOILING POINT: 633.15 K 360 C 680 F
MELTING POINT: NA
FLASH POINT: 408 K 134.85 C 274.7 F
AUTO IGNITION: Not available
VAPOR PRESSURE: 2.2 mmHg @ 21 C
UEL: N.A.
LEL: N.A.
VAPOR DENSITY: No data
SPECIFIC GRAVITY: No data
DENSITY: 0.83
WATER SOLUBILITY: INSOLUBLE
INCOMPATIBILITIES: none hazardous

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): Unknown
ODOR DESCRIPTION: No data
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: Not given
DOT guide:
Identification number:
DOT shipping name:
Packing group:

Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Fire hazard: combustible.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OIL MIST, MINERAL [8012-95-1]
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

)RT TERM TOXICITY: ASPIRATION PNEUMONIA, CARCINOGEN OF SKIN AND SCROTUM.
** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: NONE REPORTED Source: NIOSHP

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = 5mg/M3
ACGIH STEL: STEL = 10 mg/M3

OSHA PEL: Transitional Limits:
PEL = 5mg/M3
Final Rule Limits:
TWA = 5 mg/M3

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below

.CINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:>24 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>24 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes wet.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (OIL MIST, MINERAL)
50 mg/M3: Any supplied-air respirator. / Any self-contained breathing apparatus. / Any air-purifying respirator with a high-efficiency particulate filter.
125 mg/M3: Any supplied-air respirator operated in a continuous flow mode. / Any powered air-purifying respirator with a high-efficiency particulate filter.
250 mg/M3: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. / Any supplied-air respirator with a tight-fitting facepiece operated in a continuous flow mode. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
2500 mg/M3: Any supplied-air respirator with a half-mask and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: None given
SKIN: soap wash
INHALATION: fresh air
INGESTION: None given

---------- INITIAL INCIDENT RESPONSE ----------

NO DOT Guide information for this compound.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 496 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: ETHYLENE GLYCOL
SYNONYMS: 1,2-ETHANEDIOL; 1,2-DIHYDROXYETHANE; 2-HYDROXYETHANOL; GLYCOL ALCOHOL; GLYCOL; EG
CAS: 107-21-1 RTECS: KW2975000
FORMULA: C2H6O2 MOL WT: 62.08
WLN: Q2Q
CHEMICAL CLASS:Alcohol

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: clear, colorless, slightly syrupy liquid.(nydh)

BOILING POINT:	470.15 K	197 C	386.6 F
MELTING POINT:	260.15 K	-13 C	8.6 F
FLASH POINT:	384.1 K	110.95 C	231.7 F
AUTO IGNITION:	673 K	399.8 C	751.8 F

VAPOR PRESSURE: .06 mm Hg @ 20 C
UEL: ~
LEL: 3.2 %
IONIZATION POTENTIAL (eV): 9.3
VAPOR DENSITY: 2.14 (air=1)
EVAPORATION RATE: 0.01(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY: 1.1135 @ 20 C
DENSITY: 1.113
WATER SOLUBILITY: > 100mg/mL @ 17 C
INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: REACTS VIOLENTLY WITH CHLOROSULFURIC ACID, SULFURIC ACID AND OLEUM Source: CSDS
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): Not pertinent
ODOR DESCRIPTION: Slight odor Source:CHRIS
100 % ODOR DETECTION: O.I @ 20 C = 3 ppm

---------- REGULATIONS ----------

DOT hazard class: Not given
DOT guide:

Identification number:
DOT shipping name:
Packing group:
Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (1) This material must be preheated before ignition can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
\ List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE GLYCOL [107-21-1]
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
SARA Section 313 Toxic Chemicals List
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: mild throat irritation resulted from exposures of 28 mg/m3. levels above 140 mg/m3 resulted in more marked irritation, with levels of more than 250 mg/m3 being unbreathable. these levels are only reached at elevated temperatures. SKIN: may cause mild irritation if not promptly removed. Eyes: accidental eye contact with concentrated ethylene glycol resulted in extreme swelling of the eye, cloudy vision and slow response to light. these symptoms lasted a month. INGESTION: may cause symptoms in the nervous system, heart, lungs and kidneys. earliest effects are usually felt in the nervous system between 1/2 to 12 hours after ingestion. symptoms from 1 liquid ounce may include nausea, vomiting, dizziness, loss of coordination and abdominal pain. large amounts may cause stupor, coma, convulsions and death. survival of this stage may lead to development of rapid heart beat, enlarged heart and fluid in the lungs which, too, can lead to death usually after 1 to 3 days. some individuals who drank 3 to 4 fluid ounces who survived both the above stages because of prompt medical treatment, later (3 to 17 days) died of kidney failure.(NYDH)

LONG TERM TOXICITY: occupational exposure to heated ethylene glycol has caused involuntary eye movement that may indicate nerve damage. some individuals also reported attacks of unconsciousness lasting 5 to 10 minutes which went away when they stopped working with ethylene glycol.(NYDH)

TARGET ORGANS: eyes, skin, resp system

SYMPTOMS: Inhalation of vapor is not hazardous. Ingestion causes stupor or coma, sometimes leading to fatal kidney injury. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = C 50ppm(C 127 mg/M3) VAPOR AND MIST
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
CEILING = 50 ppm (125 mg/M3)

MAK INFORMATION: 10 ppm
26 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-chd TDLo:5500 mg/kg PGMJAO 52,598,76
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Respiratory stimulation
KIDNEY,URETER,BLADDER
Other changes

orl-hmn LDLo:786 mg/kg EJTXAZ 9,373,76
BEHAVIORAL
Convulsions or effect on seizure threshold
BEHAVIORAL
Coma
GASTROINTESTINAL
Hypermotility,diarrhea

orl-hmn LDLo:398 mg/kg SMEZA5 26(2),48,83

BEHAVIORAL
Headache
GASTROINTESTINAL
Nausea or vomiting
LIVER
Other changes

ihl-hmn TCLo:10000 mg/m3 AGGHAR 5,1,33
SENSE ORGANS
Eye
Lacrimation
LUNGS, THORAX, OR RESPIRATION
Cough
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:4700 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4700 mg/kg
ihl-rat LC :>198 mg/m3
ipr-rat LD50:5010 mg/kg
scu-rat LD50:2800 mg/kg
ivn-rat LD50:3260 mg/kg
ims-rat LDLo:3300 mg/kg
unr-rat LD50:13 gm/kg
orl-mus LD50:7500 mg/kg
ipr-mus LD50:5614 mg/kg
scu-mus LDLo:2700 mg/kg
ivn-mus LD50:3 gm/kg
unr-mus LD50:8050 mg/kg
orl-dog LD50:5500 mg/kg
orl-cat LD50:1650 mg/kg
scu-cat LDLo:2000 mg/kg
skn-rbt LD50:9530 mg/kg
ipr-rbt LDLo:1 gm/kg
ivn-rbt LDLo:5 gm/kg
ims-rbt LDLo:5500 mg/kg
unr-rbt LD50:5017 mg/kg
orl-gpg LD50:6610 mg/kg
scu-gpg LDLo:5 gm/kg
unr-gpg LD50:11150 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:50 gm/kg (6-15D preg) TXAPA9 81,113,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Skin and skin appendages
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

orl-rat TDLo:8580 mg/kg (6-15D preg) CHYCDW 20,289,86
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:12500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:25 gm/kg (6-15D preg) NTIS** PB85-104594
MATERNAL EFFECTS
Uterus,cervix,vagina
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-rat TDLo:50 gm/kg (6-15D preg) NTIS** PB85-104594
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:7500 mg/kg (6-15D preg) TXAPA9 81,113,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:7500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:84 gm/kg (1-21D preg/21D post) TOXID9 4,136,84
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN

Delayed effects

orl-mus TDLo:88720 mg/kg (7-14D preg) EVHPAZ 57,141,84
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON NEWBORN
Stillbirth
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: CHRIS Manual 1991
INGESTION: induce vomiting and call a physician.
SKIN AND
EYES: flush with water.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Water fog, alcohol foam, carbon dioxide, or dry chemical. Note: Water or foam may cause frothing. CHRIS91

No DOT Guide information for this compound.
DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 247 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: LEAD

SYNONYMS: C.I. PIGMENT METAL 4; C.I. 77575; KS-4; LEAD FLAKE; LEAD S2; OLOW (Polish); SI; SO

CAS: 7439-92-1 RTECS: OF7525000

FORMULA: Pb MOL WT: 207.19

WLN: PB

CHEMICAL CLASS: Metal

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: bluish-grey, soft metal; heavy ductile, soft, gray solid

BOILING POINT:	2013 K	1739.8 C	3163.7 F
MELTING POINT:	600.6 K	327.4 C	621.4 F
FLASH POINT:	Not available		
AUTO IGNITION:	Not available		

VAPOR PRESSURE: 1mm @ 973 C

UEL: ~

LEL: ~

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 11.34

DENSITY: 11.34 g/mL @ 20 C

WATER SOLUBILITY: INSOLUBLE; DISSOLVES SLOWLY IN WATER CONTAINING A WEAK ACID

INCOMPATIBILITIES: strong ox, hydrogen peroxide, active metals, sodium, potassium, chlorine trifluoride, hydrogen peroxide, zirconium, disdium acetylide, oxidants

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: RELATIVELY IMPENETRABLE TO RADIATION

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: WHEN HEATED EMITS HIGHLY TOXIC FUMES; CAN REACT VIGOROUSLY WITH OXIDIZING MATERIALS

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

REGULATIONS

National Primary Ambient Air Quality Standards
1.5 ug/M3 maximum arithmetic mean averaged over a calendar year
National Secondary Ambient Air Quality Standards
same as primary standard

DOT hazard class:	6.1 POISON
DOT guide:	53
Identification number:	UN2291
DOT shipping name:	LEAD COMPOUNDS, SOLUBLE, N.O.S.
Packing group:	III
Label(s) required:	KEEP AWAY FROM FOOD
Special provisions:	
Packaging exceptions:	173.153
Non bulk packaging:	173.213
Bulk packaging:	173.240
Quantity limitations-	
Passenger air/rail:	100 KG
Cargo aircraft only:	200 KG
Vessel stowage:	A
Other stowage provisions:	

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:No
National Primary Drinking Water Regulations
  Maximum Contaminant Levels (MCL): Treatment technique (12/07/92)
  Maximum Contaminant Level Goals (MCLG): 0 mg/L (12/07/92)
CLEAN AIR ACT: CAA '90 By category and CAA '77 Sect 109
EPA WASTE NUMBER: D008
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Chronic toxicity: carcinogen
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-B
Mailability: Domestic service and air transportation; shipper's declaration
Max per parcel: 25 LBS; 5 LBS

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Developmental Toxin List
California Proposition 65 Female Reproductive Toxin List
California Proposition 65 Male Reproductive Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 109 National Ambient Air Quality Standards List
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
LEAD [7439-92-1]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a teratogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Specifically regulated substance. See 29 CFR 1910.1025
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: LASSITUDE, INSOMNIA, PALLOR, EYE GROUNDS, ANOREXIA, LOW-WEIGHT, MALNUTRITION, CONSTIPATION, ABDOMINAL PAIN, COLIC; HYPOTENSE, ANEMIA; GINGIVAL LEAD LINE; TREMBLING PARALYSIS WRIST. ** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS: gi,CNS,kidneys,blood,gingival tissue

SYMPTOMS: LASS, INSOM, PAL, EYE GROUNDS, ANOR, LOW-WT, MALNUT, CONSTI, ABDOM PAIN, COLIC; HYPOTENSE, ANEMIA, GINGIVAL LEAD LINE; TREM, PARA WRIST. METALLIC TASTE, INCREASED SALIVATION, PYORRHEA (FLOW OF MUCOUS). NEUROMUSCULAR: NUMBNESS AND TINGLING OF EXTREMITIES WITH SENSORY

DISTRUBANCE, EXTENSOR WEAKNESS OF WRISTS AND ANKLES, LOSS OF MUSCLE TONE, TREMOR INCREASED DEEP-TENDON REFLEXES, MUSCULAR CRAMPS AND ACHING, MUSCULAR ATROPHY. CNS: VISUAL DISTURBANCES, HEADACHE, NERVOUSNESS OF DEPRESSION, INSOMNIA, MENTAL CONFUSION, DELIRIUM. Source: NIOSHP, THIC

CONC IDLH: 700mg/M3

NIOSH REL: <0.1 mg/M3 Air level to be maintained so that worker blood level remains <0.06 mg/100 g of whole blood

ACGIH TLV: TLV = 0.15mg/M3 as LEAD
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = See 29 CFR 1910.1025 and 1926.62
50 ug/M3

MAK INFORMATION: 0.1 mG/M3
Substance with systemic effects, onset of effect over 2 hours: Peak = 10xMAK for 30 minutes, once per shift of 8 hours.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL
Hallucinations, distorted perceptions
BEHAVIORAL
Muscle weakness

LD50 value: No LD50 in RTECS 1992

ER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

ipr-rat LDLo:1 gm/kg
orl-pgn LDLo:160 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:790 mg/kg (multigenerations) AEHLAU 23,102,71
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-rat TDLo:1140 mg/kg (14D pre-21D post) PHMCAA 20,201,78
EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:520 mg/kg (7-22D preg/10D post) FEPRA7 37,394,78
EFFECTS ON NEWBORN

orl-rat TDLo:1100 mg/kg (1-22D preg) FEPRA7 37,895,78
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:10 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-rat TCLo:3 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON NEWBORN

orl-mus TDLo:1120 mg/kg (multigenerations) AEHLAU 23,102,71

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:6300 mg/kg (1-21D preg) EXPEAM 31,1312,75
EFFECTS ON FERTILITY
Female fertility index
EFFECTS ON FERTILITY
Pre-implantation mortility

orl-mus TDLo:300 mg/kg (1-2D preg) TXCYAC 6,129,76
EFFECTS ON FERTILITY
Other measures of fertility

orl-mus TDLo:4800 mg/kg (1-16D preg) BECTA6 18,271,77
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

orl-dom TDLo:662 mg/kg (1-21W preg) TXAPA9 25,466,73
EFFECTS ON NEWBORN
Behavioral

California Prop 65: Developmental toxin (02/27/87)
Female reproductive toxin (02/27/87)
Male reproductive toxin (02/27/87)
Acceptable intake level-inhalation .5 ugD (01/01/94)
Carcinogen (10/01/92)

---------- EPA's IRIS DATA SUMMARY ----------
Lead and compounds (inorganic); CASRN 7439-92-1 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Lead and compounds (inorganic)
CASRN -- 7439-92-1
Last Revised -- 05/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for

information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B2; probable human carcinogen

Basis -- Sufficient animal evidence. Ten rat bioassays and one mouse assay have shown statistically significant increases in renal tumors with dietary and subcutaneous exposure to several soluble lead salts. Animal assays provide reproducible results in several laboratories, in multiple rat strains with some evidence of multiple tumor sites. Short term studies show that lead affects gene expression. Human evidence is inadequate.

___II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. There are four epidemiologic studies of occupational cohorts exposed to lead and lead compounds. Two studies (Dingwall-Fordyce and Lane, 1963; Nelson et al., 1982) did not find any association between exposure and cancer mortality. Selevan et al. (1985), in their retrospective cohort mortality study of primary lead smelter workers, found a slight decrease in the total cancer mortality (SMR=95). Apparent excesses were observed for respiratory cancer (SMR=111, obs=41, p>0.05) and kidney cancer (SMR=204, obs=6, p>0.05). Cooper and Gaffey (1975) and Cooper (1985 update) performed a short mortality study of battery plant workers and lead smelter workers. They found statistically significant excesses for total cancer mortality (SMR=113, obs=344), stomach cancer (SMR=168, obs=34), and lung cancer (SMR=124, obs=109) in the battery plant workers. Although similar excesses were observed in the smelter workers, they were not statistically significant. Cooper and Gaffey (1975) felt it was possible that individual subjects were monitored primarily on the basis of obvious signs of lead exposure, while others who showed no symptoms of lead poisoning were not monitored.

All of the available studies lacked quantitative exposure information, as well as information on the possible contribution from smoking. All studies also included exposures to other metals such as arsenic, cadmium, and zinc for which no adjustment was done. The cancer excesses observed in the lung and stomach were relatively small (<200). There was no consistency of site among the various studies, and no study showed any dose-response relationship. Thus, the available human evidence is considered to be inadequate to refute or demonstrate any potential carcinogenicity for humans from lead exposure.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. The carcinogenic potential of lead salts (primarily phosphates and acetates) administered via the oral route or by injection has

been demonstrated in rats and mice by more than 10 investigators. The most characteristic cancer response is bilateral renal carcinoma. Rats given lead acetate or subacetate orally have developed gliomas, and lead subacetate also produced lung adenomas in mice after i.p. adminstration. Most of these investigations found a carcinogenic response only at the highest dose. The lead compounds tested in animals are almost all soluble salts. Metallic lead, lead oxide and lead tetralkyls have not been tested adequately. Studies of inhalation exposure have not been located in the literature.

Azar et al. (1973) administerd 10, 50, 100, and 500 ppm lead as lead acetate in dietary concentrations to 50 rats/sex/group for 2 years. Control rats (100/sex) received the basal laboratory diet. In a second 2-year feeding study, 20 rats/group were given diets containing 0, 1000, and 2000 ppm lead as lead acetate. No renal tumors were reported in the control groups or in treated animals of either sex receiving 10 to 100 ppm. Male rats fed 500, 1000, and 2000 ppm lead acetate had an increased renal tumor incidence of 5/50, 10/20, and 16/20, while 7/20 females in the 2000-ppm group developed renal tumors.

The Azar et al. (1973) study is limited by the lack of experimental detail. The possibility of environmental contamination from lead in the air or drinking water was not mentioned. The strains of rats used were not specified in the study, but the Health Effects Assessment for Lead (U.S. EPA, 1984) indicates the rats were Wistar strain. The weight gain at 1000 and 2000 ppm was reported to be depressed, but details were not given.

Kasprzak et al. (1985), in investigating the interaction of dietary calcium on lead carcinogenicity, fed 1% lead subacetate (8500 ppm Pb) to male Sprague-Dawley rats in the diet for 79 weeks. Of the rats surviving (29/30) in this treatment group beyond 58 weeks, 44.8% had renal tumors. Four rats had adenocarcinomas; the remainaing nine had adenomas. Bilateral tumors were noted. No renal tumors were noted among the controls.

As part of a study to determine interactions between sodium nitrite, ethyl urea and lead, male Sprague-Dawley rats were given lead acetate in their drinking water for 76 weeks (Koller et al., 1986). The concentration of lead was 2600 ppm. No kidney tumors were detected among the 10 control rats. Thirteen of 16 (81%) lead-treated rats had renal tubular carcinoma; three tumors were detected at 72 weeks and the remainder detected at the termination of the study.

Van Esch and Kroes (1969) fed basic lead acetate at 0, 0.1%, and 1.0% in the diet to 25 Swiss mice/sex/group for 2 years. No renal tumors developed in the control group, but 6/25 male mice of 0.1% basic lead acetate group had renal tumors (adenomas and carcinomas combined). In the 1.0% group, one female had a renal tumor. The authors thought that the low incidence in the 1.0% group was due to early mortality.

Hamsters given lead subacetate at 0.5% and 1% in the diet had no significant renal tumor response (Van Esch and Kroes, 1969).

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Lead acetate induces cell transformation in Syrian hamster embryo cells (Paolo et al., 1978) and also enhances the incidence of simian adenovirus induction. Lead oxide showed similar enhanced adenovirus induction (Casto et al., 1979).

Under certain conditions lead compounds are capable of inducing chromosomal aberrations in vivo and in tissue cultures. Grandjean et al. (1983) showed a relationship between SCE and lead exposure in exposed workers. Lead has been shown, in a number of DNA structure and function assays, to affect the molecular processes associated with the regulation of gene expression (U.S. EPA, 1986).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

Quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release, and excretion of lead. In addition, current knowledge of lead pharmacokinetics indicates that an estimate derived by standard procedures would not truly describe the potential risk. Thus, the Carcinogen Assessment Group recommends that a numerical estimate not be used.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1984. Health Effects Assessment for Lead. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/055. NTIS PB85-163996/AS.

U.S. EPA. 1986. Air Quality Criteria Document for Lead. Volumes III, IV.

Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC, for the Office of Air Quality Planning and Standards. EPA-600/8-83/028dF.

U.S. EPA. 1987. Preliminary review of the carcinogenic potential of lead associated with oral exposure. Prepared by the Office of Health and Environmental Assessment, Carcinogenic Assessment Group, Washington DC, for the Office of Drinking Water, Office of Solid Waste and the Office of Emergency and Remedial Response (Superfund). OHEA-C-267. Internal Review Draft.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The review of the carcinogenic potential of lead associated with oral exposure has received Agency review.

The 1986 Air Quality Criteria Document for Lead has received Agency and External Review.

Agency Work Group Review: 05/04/88

Verification Date: 05/04/88

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

William Pepelko / ORD -- (202)260-5898 / FTS 260-5898

James Cogliano / ORD -- (202)260-9243 / FTS 260-9243

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
At the end of each work shift.

** REMOVE CLOTHING:

Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (LEAD)
Not in excess of 0.5 mg/M3: Half-mask, air-purifying respirator equipped with high efficiency filters.
Not in excess of 2.5 mg/M3: Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 50 mg/M3: (1) Any powered, air-purifying respirator with high efficiency filters; or (2) Half-mask supplied-air respirator operated in positive-pressure mode.
Not in excess of 100 mg/M3: Supplied air respirator with full facepiece hood, or helmet or suit and operated in positive pressure mode.
Unknown concentration or Firefighting: Full facepiece, self-contained breathing apparatus operated in postive-pressure mode.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap flush promptly
INHALATION: art resp
INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: LEAD COMPOUNDS, SOLUBLE, N.O.S.
DOT ID NUMBER: UN2291

ERG93 GUIDE 53

POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if swallowed.
Inhalation of dust or mist may be poisonous.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water

pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 59 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: BENZENE

SYNONYMS: BENZOL; COAL TAR NAPHTHA; CYCLOHEXATRIENE; PHENYL HYDRIDE; PHENE; COAL NAPHTHA; PYROBENZOL

CAS: 71-43-2 RTECS: CY1400000

FORMULA: C6H6 MOL WT: 78.11

WLN: RH

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless to pale yellow watery liquid with a gasoline-like odor

BOILING POINT:	353.15 K	80 C	176 F
MELTING POINT:	278.71 K	5.5 C	42 F
FLASH POINT:	262 K	-11.15 C	11.9 F
AUTO IGNITION:	864.8 K	591.6 C	1097 F
CRITICAL TEMP:	562.1 K	288.95 C	552.11 F
CRITICAL PRESS:	4.89 kN/M2	48.2 atm	708 psia
HEAT OF VAP:	169 Btu/lb	93.85 cal/g	3.927x E5 J/kg
HEAT OF COMB:	-17460 Btu/lb	-9707 cal/g	-406x E5 J/kg

VAPOR PRESSURE: 75 mm @ 20 C

UEL: 7.1 %

LEL: 1.3 %

IONIZATION POTENTIAL (eV): 9.25

VAPOR DENSITY: 2.77 (air=1)

EVAPORATION RATE: 3.50(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.86-0.88 20 C

DENSITY: 0.8794 @ 20 C

WATER SOLUBILITY: 0.06%

INCOMPATIBILITIES: strong ox,chlorine,bromine with iron

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS(Br2, F2, CL2, CrO3, NaClO4, O2, O3), PERCHLORATES (AlCl3 +NaClO4), (H2SO4 & PERMANGANATES), K2O2, (AgClO4 & ACETIC ACID), Na2O2 Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: VAPOR IS HEAVIER THAN AIR AND MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.

ODOR DETECTED AT (ppm): 4.68 ppm
ODOR DESCRIPTION: odor; characteristic odor Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1114
DOT shipping name: Benzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T8
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:40

STCC NUMBER: 4908110

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.005 mg/L (01/09/89)
Maximum Contaminant Level Goals (MCLG): 0 mg/L (01/09/89)
CLEAN AIR ACT: CAA '90 Listed and CAA '77 Sect 109
EPA WASTE NUMBER: U019,D018,D001
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: carcinogen
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/89/209464/AS)
BENZENE [71-43-2]
California OSHA Carcinogens List.
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act Section 112 Hazardous Air Pollutants List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
National Toxicology Program (NTP) list of human carcinogens
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
New Jersey Right to Know Substance List. Listed as a mutagen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
OSHA Specifically regulated substance. See 29 CFR 1910.1028
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Suspected carcinogen (ACGIH). "Threshold Limit Values for 1992-1993"
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: benzene may produce both nerve and blood effects. irritation of the nose, throat and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). lung congestion may occur. nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness and slurred speech. at high levels, slowed breathing and death may result. death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes. SKIN: irritation may occur, with redness and blistering if not promptly removed. benzene is poorly absorbed. whole body exposure for 30 minutes has been reported with no health effects. Eyes: may cause severe irritation. INGESTION: may cause irritation of mouth, throat and stomach. symptoms are similar to those listed under inhalation. one tablespoon may cause collapse, bronchitis, pneumonia and death.(NYDH)

LONG TERM TOXICITY: may cause loss of appetite, nausea, weight loss, fatigue, muscle weakness, headache, dizziness, nervousness and irritability. mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. at levels between 100 and 200 ppm for periods of 6 months, or more, severe irreversible blood changes and damage to liver and heart may occur. temporary partial paralysis has been reported.(NYDH)

TARGET ORGANS: blood, CNS, skin, bone marrow, eyes, resp sys

SYMPTOMS: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: Potential occupational carcinogen 0.1 ppm Time weighted averages for 8-hour exposure 0.32 mg/M3 Time weighted averages for 8-hour exposure 1 ppm Ceiling exposures which shall at no time be exceeded 3.2 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 10ppm Suspected human carcinogen (A2)
ACGIH STEL: Suspected human carcinogen (A2)

OSHA PEL: Final Rule Limits:
TWA = 1 ppm
STEL = 5 ppm
CONSULT 29CFR 1910.1028

MAK INFORMATION: Danger of cutaneous absorption
Carcinogenic working material without MAK
Capable of inducing malignant tumors as shown by

experience with humans.
Substances which has been demonstrated to cause genetic damage in mammalian (including human) germ cells without proof of transmission.

CARCINOGEN?: Y STATUS: See below
REFERENCES:

HUMAN SUSPECTED IARC** 7,203,74
HUMAN SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 29,93,82
HUMAN POSITIVE IARC** 29,93,82
ANIMAL INDEFINITE IARC** 7,203,74

CARCINOGEN LISTS:

IARC: Carcinogen as defined by IARC as carcinogenic to humans, with sufficient epidemiological evidence.
MAK: Capable of inducing malignant tumors as shown by experience in humans.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as known to be carcinogenic, with evidence from human studies.
ACGIH: Carcinogen defined by ACGIH TLV Committee as a confirmed human carcinogen, recognized to have carcinogenic or cocarcinogenic potential.
OSHA: Cancer hazard

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* ihl-hmn LCLo:2 pph/5M TABIA2 3,231,33

* orl-man LDLo:50 mg/kg YAKUD5 22,883,80

* ihl-hmn LCLo:2000 ppm/5M YAKUD5 22,883,80

ihl-man TCLo:150 ppm/1Y-I BLUTA9 28,293,74
BLOOD
Other changes
NUTRITIONAL AND GROSS METABOLIC
Changes in:
Body temperature increase

ihl-hmn TCLo:100 ppm INMEAF 17,199,48
BEHAVIORAL
Somnolence(general depressed activity)
GASTROINTESTINAL
Nausea or vomiting

SKIN AND APPENDAGES
Skin - after systemic exposure
Dermatitis,other

ihl-hmn LCLo:65 mg/m3/5Y ARGEAR 44,145,74
BLOOD
Other changes

LD50 value: orl-rat LD50:930 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:930 mg/kg
ihl-rat LC50:10000 ppm/7H
ipr-rat LD50:2890 ug/kg
orl-mus LD50:4700 mg/kg
ihl-mus LC50:9980 ppm
ipr-mus LD50:340 mg/kg
orl-dog LDLo:2 gm/kg
ihl-dog LCLo:146000 mg/m3
ihl-cat LCLo:170000 mg/m3
ihl-rbt LCLo:45000 ppm/30M
skn-rbt LD50:>9400 mg/kg
ivn-rbt LDLo:88 mg/kg
skn-gpg LD50:>9400 mg/kg
ipr-gpg LDLo:527 mg/kg
scu-frg LDLo:1400 mg/kg
ihl-mam LCLo:20000 ppm/5M
ipr-mam LDLo:1500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:670 mg/m3/24H (15D pre/1-22D preg) HYSAAV 33(1-3),327,68
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:56600 ug/m3/24H (1-22D preg) HYSAAV 33(7-9),112,68
EFFECTS ON NEWBORN

ihl-rat TCLo:50 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:150 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON FERTILITY
Post-implantation mortality
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:12 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:6500 mg/kg (8-12D preg) TCMUD8 6,361,86
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-mus TCLo:500 ppm/7H (6-15D preg) AIHAAP 40,993,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:500 mg/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:5 ppm (6-15D preg) TXCYAC 42,171,86
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-mus TCLo:20 ppm/6H (6-15D preg) FAATDF 10,224,88
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ipr-mus TDLo:5 mg/kg (1D male) TPKVAL 15,30,79
EFFECTS ON FERTILITY
Pre-implantation mortility
EFFECTS ON EMBRYO OR FETUS
Fetal death

ipr-mus TDLo:219 mg/kg (14D preg) EMMUEG 18,1,91
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and

marrow)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Hapatobilinary system

scu-mus TDLo:1100 mg/kg (12D preg) TOXID9 1,125,81
EFFECTS ON EMBRYO OR FETUS
Other effects on embryo or fetus

scu-mus TDLo:7030 mg/kg (12-13D preg) SEIJBO 15,47,75
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ivn-mus TDLo:13200 ug/kg (13-16D preg) ICHUDW 4(6),24,82
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

par-mus TDLo:4 gm/kg (12D preg) NEZAAQ 25,438,70
EFFECTS ON NEWBORN
Weaning or lactation index(#alive at weaning per # alive at day 4)

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON FERTILITY
Abortion
EFFECTS ON EMBRYO OR FETUS
Fetal death

California Prop 65: Carcinogen (02/27/87)
No significant risk level 7. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------

Benzene; CASRN 71-43-2 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Benzene
CASRN -- 71-43-2
Last Revised -- 04/01/92

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood

that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- A; human carcinogen

Basis -- Several studies of increased incidence of nonlymphocytic leukemia from occupational exposure, increased incidence of neoplasia in rats and mice exposed by inhalation and gavage, and some supporting data form the basis for this classification.

___II.A.2. HUMAN CARCINOGENICITY DATA

Aksoy et al. (1974) reported effects of benzene exposure among 28,500 Turkish workers employed in the shoe industry. Mean duration of employment was 9.7 years (1-15 year range) and mean age was 34.2 years. Peak exposure was reported to be 210-650 ppm. Twenty-six cases of leukemia and a total of 34 leukemias or preleukemias were observed, corresponding to an incidence of 13/100,000 (by comparison to 6/100,000 for the general population). A follow-up paper (Aksoy, 1980) reported eight additional cases of leukemia as well as evidence suggestive of increases in other malignancies.

In a retrospective cohort mortality study Infante et al. (1977a,b) examined leukemogenic effects of benzene exposure in 748 white males exposed while employed in the manufacturing of rubber products. Exposure occurred from 1940-1949, and vital statistics were obtained through 1975. A statistically significant increase (p less than or equal to 0.002) of leukemias was found by comparison to the general U.S. population. There was no evidence of solvent exposure other than benzene. Air concentrations were generally found to be below the recommended limits in effect during the study period.

In a subsequent retrospective cohort mortality study Rinsky et al. (1981) observed seven deaths from leukemia among 748 workers exposed to benzene and followed for at least 24 years (17,020 person-years). This increased incidence was statistically significant; standard mortality ratio (SMR) was 560. For the five leukemia deaths that occurred among workers with more than 5 years exposure, the SMR was 2100. Exposures (which ranged from 10-100 ppm

8-hour TWA) were described as less than the recommended standards for the time period of 1941-1969.

In an updated version of the Rinsky et al. (1981) study, the authors followed the same cohort to 12/31/81 (Rinsky et al., 1987). An in his earlier study, cumulative exposure was derived from historic air-sampling data or interpolated estimates based on exisitng data. Standardized mortality rates ranged from 109 at cumulative benzene exposures under 40 ppm-years and increased montonically to 6637 (6 cases) at 400 ppm-years or more. The authors found significantly elevated risks of leukemia at cumulative exposures less than the equivalent current standard for occupational exposure which is 10 ppm over a 40-year working lifetime.

Ott et al. (1978) observed three deaths from leukemia among 594 workers followed for at least 23 years in a retrospective cohort mortality study, but the increase was not statistically significant. Exposures ranged from <2 to >25 ppm 8-hour TWA.

Wong et al. (1983) reported on the mortality of male chemical workers who had been exposed to benzene for at least 6 months during the years 1946-1975. The study population of 4062 persons was drawn from seven chemical plants, and jobs were categorized as to peak exposure. Those with at least 3 days/week exposure (3036 subjects) were further categorizeed on the basis of an 8-hour TWA. The control subjects held jobs at the same plants for at least 6 months but were never subject to benzene exposure. Dose-dependent increases were seen in leukemia and lymphatic and hematopoietic cancer. The incidence of leukemia was responsible for the majority of the increase. It was noted that the significance of the increase is due largely to a less than expected incidence of neoplasia in the unexposed subjects.

Numerous other epidemiologic and case studies have reported an increased incidence or a causal relationship between leukemia and exposure to benzene (IARC, 1982).

___II.A.3. ANIMAL CARCINOGENICITY DATA

Both gavage and inhalation exposure of rodents to benzene have resulted in development of neoplasia. Maltoni and Scarnato (1979) and Maltoni et al. (1983) administered benzene by gavage at dose levels of 0, 50, 250, and 500 mg/kg bw to 30-40 Sprague-Dawley rats/sex for life. Dose-related increased incidences of mammary tumors were seen in females and of Zymbal gland carcinomas, oral cavity carcinomas and leukemias/lymphomas in both sexes.

In an NTP (1986) study, benzene was administered by gavage doses of 0, 50, 100, or 200 mg/kg bw to 50 F344/N rats/sex or 0, 25, 50, or 100 mg/kg bw to 50 B6C3F1 mice/sex. Treatment was 5 times/week for 103 weeks. Significantly increased incidences ($p<0.05$) of various neoplasic growths were seen in both sexes of both species. Both male and female rats and mice had increased incidence of carcinomas of the Zymbal gland. Male and female rats had oral cavity tumors, and males showed increased incidences of skin tumors. Mice of both sexes had increased incidence of lymphomas and lung tumors. Males were

observed to have harderian and preputial gland tumors and females had tumors of mammary gland and ovary. In general, the increased incidence was dose-related.

Slightly increased incidences of hematopoietic neoplasms were reported for male C57Bl mice exposed by inhalation to 300 ppm benzene 6 hours/day, 5 days/week for 488 days. There was no increase in tumor incidence in male AKR or CD-1 mice similarly exposed to 100 ppm or 100 or 300 ppm benzene, respectively. Likewise male Sprague-Dawley rats exposed by inhalation to 300 ppm benzene were not observed to have increased incidence of neoplasia (Snyder et al., 1981).

Maltoni et al. (1983) treated male and female Sprague-Dawley rats in the following manner. Starting at 13 weeks of age rats were exposed to 200 ppm benzene 4 hours/day, 5 days/week for 7 weeks; 200 ppm 7 hours/day, 5 days/week for 12 weeks; 300 ppm 7 hours/day, 5 days/week for 85 weeks. An 8-hour/day TWA for 5 days/week was calculated to be 241 ppm. A statistically significant increase was noted in hepatomas and carcinomas of the Zymbal gland.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Numerous investigators have found significant increases in chromosomal aberrations of bone marrow cells and peripheral lymphocytes from workers with exposure to benzene (IARC, 1982). Benzene also induced chromosomal aberrations in bone marrow cells from rabbits (Kissling and Speck, 1973), mice (Meyne and Legator, 1980) and rats (Anderson and Richardson, 1979). Several investigators have reported positive results for benzene in mouse micronucleus assays (Meyne and Legator, 1980). Benzene was not mutagenic in several bacterial and yeast systems, in the sex-linked recessive lethal mutation assay with Drosophila melanogaster or in mouse lymphoma cell forward mutation assay.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

___II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- 2.9E-2 per (mg/kg)/day

Drinking Water Unit Risk -- 8.3E-7 per (ug/L)

Extrapolation Method -- One-hit (pooled data)

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+2 ug/L

E-5 (1 in 100,000) 1E+1 ug/L
E-6 (1 in 1,000,000) 1E+0 ug/L

___II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

Tumor Type -- leukemia
Test Animals -- human
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

The slope factor was derived from human data for inhalation exposure (see dose-response data for inhalation quantitative estimate). The human respiratory rate was assumed to be 20 cu.m/day and the human drinking water intake was assumed to be 2 L/day. The fraction of the administered dose absorbed systemically via inhalation and via drinking water were assumed to be equal.

___II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study as described in the additional comments section for inhalation data.

The unit risk should not be used if the water concentration exceeds 1E+4 ug/L, since above this concentration the unit risk may not be appropriate.

___II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an adequate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2. Regression models give an estimate similar to the geometric mean.

The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate.

Risk estimates based on animal gavage studies are about 5 times higher than those derived from human data. Pharmacokinetic data which could impact the risk assessment are currently being evaluated.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- 8.3E-6 per (ug/cu.m)

Extrapolation Method -- One-hit (pooled data)

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+1 ug/cu.m
E-5 (1 in 100,000)	1E+0 ug/cu.m
E-6 (1 in 1,000,000)	1E-1 ug/cu.m

II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- leukemia
Test Animals -- humans
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study. The Rinsky data used were from an updated tape which reports one more case of leukemia than was published in 1981. Equal weight was given to cumulative dose and weighted cumulative dose exposure categories as well as to relative and absolute risk model forms. The results of the Wong et al. (1983) study were incorporated by assuming that the ratio of the Rinsky-Ott-Wong studies to the Rinsky-Ott studies for the relative risk cumulative dose model was the same as for other model-exposure category combinations and multiplying this ratio by the Rinsky-Ott geometric mean. The age-specific U.S. death rates for 1978 (the most current year available) were used for background leukemia and total death rates. It should be noted that a recently published paper (Rinsky et al., 1987) reported yet another case of leukemia from the study population.

The unit risk should not be used if the air concentration exceeds 100 ug/cu.m, since above this concentration the unit risk may not be appropriate.

___II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an ade quate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2/ppm. Regression models give an estimate similar to the geometric mean.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Benzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office (Cincinnati, OH) and Carcinogen Assessment Group (Washington, DC), and the Environmental Research Labs (Corvalis, OR; Duluth, MN; Gulf Breeze, FL) for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-018.

U.S. EPA. 1985. Interim Quantitative Cancer Unit Risk Estimates Due to Inhalation of Benzene. Prepared by the Office of Health and Environmental Assessment, Carcinogen Assessment Group, Washington, DC for the Office of Air Quality Planning and Standards, Washington, DC.

U.S. EPA. 1987. Memorandum from J. Orme, HEB, CSD/ODW to C. Vogt, Criteria and Standards Division, ODW, June, 1987.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1985 Interim Evaluation was reviewed by the Carcinogen Assessment Group.

The 1987 memorandum is an internal document.

Agency Work Group Review: 03/05/87, 10/09/87

Verification Date: 10/09/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

D.L. Bayliss / ORD -- (202)260-5726 / FTS 260-5726

R. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
hydrocarbon vapor canister, supplied air or hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.

OSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly wash with soap when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BENZENE)
Less than or equal to 10 ppm: Half-mask air-purifying respirator with organic vapor cartridge.
Less than or equal to 50 ppm: Full facepiece respirator with organic vapor cartridges. / Full facepiece gas mask with chin style canister.
Less than or equal to 100 ppm: Full facepiece powered air-purifying respirator with organic vapor canister.

Less than or equal to 1000 ppm: Supplied air respirator with full facepiece in positive-pressure mode.
Greater than 1000 ppm or Unknown concentration: (1) Self-contained breathing apparatus with full face-piece in positive pressure mode. (2) Full facepiece positive-pressure supplied-air respirator with auxiliary self-contained air supply.
Escape : (1) Any organic vapor gas mask; or (2) Any self-contained breathing apparatus with full facepiece.
Firefighting : Any full facepiece self-contained breathing apparatus operated in positive pressure mode.

FIRST AID SOURCE: NIOSHP
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin.
EYES: flush with plenty of water until irritation subsides.
INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Dry chemical, foam, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Benzene
DOT ID NUMBER: UN1114

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 398 LAST UPDATE OF THIS RECORD: 06/03/93

NAME:	TOLUENE		
SYNONYMS:	TOLUOL; PHENYL METHANE; METHYL BENZENE; BENZENE, METHYL-		
CAS:	108-88-3	RTECS:	XS5250000
FORMULA:	C7H8	MOL WT:	92
WLN:	1R		
CHEMICAL CLASS:	Aromatic hydrocarbon		

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless watery liquid with a pleasant odor

BOILING POINT:	383.6 K	110.4 C	230.8 F
MELTING POINT:	178.00 K	-95.2 C	-139.3 F
FLASH POINT:	277.6 K	4.45 C	40 F
AUTO IGNITION:	809 K	535.8 C	996.6 F
CRITICAL TEMP:	591.8 K	318.65 C	605.57 F
CRITICAL PRESS:	4.108 kN/M2	40.5 atm	595 psia
HEAT OF VAP:	155 Btu/lb	86.08 cal/g	3.601x E5 J/kg
HEAT OF COMB:	-17430 Btu/lb	-9690 cal/g	-405x E5 J/kg

VAPOR PRESSURE:	36.7 mm @ 30 C
[illegible]L:	7.1 %
[illegible]:	1.3 %
IONIZATION POTENTIAL (eV):	8.82
VAPOR DENSITY:	3.14 (air=1)
EVAPORATION RATE:	2.00(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY:	0.867 @ 20 C
DENSITY:	0.867
WATER SOLUBILITY:	0.05%
INCOMPATIBILITIES:	strong ox
REACTIVITY WITH WATER:	No data on water reactivity
REACTIVITY WITH COMMON MATERIALS:	No data
STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):	40 PPM
ODOR DESCRIPTION:	STRONG, PLEASANT Source:NYDH
100 % ODOR DETECTION:	No data

REGULATIONS

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27
Identification number: UN1294
DOT shipping name: Toluene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909305

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 1 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 1 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U220,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

Fire hazard: flammable.
Chronic toxicity: carcinogen.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/90/198904/AS)
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Department of Health Services Drinking Water Action List.
California Proposition 65 Developmental Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ssachusetts Substance List.
w Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
TOLUENE [108-88-3]
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 100 ppm exposure can cause dizziness, drowsiness and hallucinations. 100-200 ppm can cause depression. 200-500 ppm can cause headaches, nausea, loss of appetite, loss of energy, loss of coordination and coma. in addition to the above, death has resulted from exposure to 10,000 ppm for an unknown time. SKIN: can cause dryness and irritation. absorption may cause or increase the severity of

symptoms listed above. Eyes: can cause irritation at 300 ppm. INGESTION: can cause a burning sensation in the mouth and stomach, upper abdominal pain, cough, hoarseness, headache, nausea, loss of appetite, loss of energy, loss of coordination and coma.(NYDH)

LONG TERM TOXICITY: levels below 200 ppm may produce headache, tiredness and nausea. from 200 to 750 ppm symptoms may include insomnia, irritability, dizziness, some loss of memory, loss of appetite, a feeling of drunkeness and disturbed menstruation. levels up to 1,500 ppm may cause heart palpitations and loss of coordination. blood effects and anemia have been reported but are probably due to contamination by benzene. most of these effects area believed to go away when exposure stops.(NYDH)

TARGET ORGANS: CNS, liver, kidneys, skin, eyes

SYMPTOMS: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. Source: CHRIS

CONC IDLH: 2000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure 375 mg/M3 Time weighted averages for 8-hour exposure 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 750 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 50ppm(188 mg/M3) Skin
ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 200 PPM; CEILING = 300 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 100 ppm (375 mg/M3)
STEL = 150 ppm(560 mg/M3)

MAK INFORMATION: 50 ppm
190 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 5xMAK for 30 minutes, 2 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

RCINOGEN LISTS:

IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-hmn TCLo:200 ppm JAMAAP 123,1106,43
BRAIN AND COVERINGS
Recordings from specific areas of CNS
BEHAVIORAL
Antipsychotic
BLOOD
Changes in bone marrow not included above

LD50 value: orl-rat LD50:636 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:636 mg/kg
ihl-rat LC50:>26700 ppm/1H
ipr-rat LD50:1332 mg/kg
ivn-rat LD50:1960 mg/kg
unr-rat LD50:6900 mg/kg
ihl-mus LC50:400 ppm/24H
ipr-mus LD50:59 mg/kg
scu-mus LD50:2250 mg/kg
unr-mus LD50:2 gm/kg
ihl-rbt LCLo:55000 ppm/40M
skn-rbt LD50:12124 mg/kg
ivn-rbt LDLo:130 mg/kg
ihl-gpg LCLo:1600 ppm
ipr-gpg LD50:500 mg/kg
scu-frg LDLo:920 mg/kg
ipr-mam LDLo:1750 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:1500 mg/m3/24H (1-8D preg) TXCYAC 11,55,78

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 mg/m3/24H (7-14D preg) FMORAO 28,286,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:800 mg/m3/6H (14-20D preg) BJMRDK 23,533,90
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON NEWBORN
Behavioral

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:15 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:30 gm/kg (6-15D preg) TJADAB 19,41A,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-mus TCLo:500 mg/m3/24H (6-13D preg) TXCYAC 11,55,78
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1000 ppm/6H (2-17D preg) TJEMDR 7,265,82
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:400 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
EFFECTS ON NEWBORN

ihl-mus TCLo:200 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Abortion

ihl-rbt TDLo:100 ppm/6H (6-18D preg) ARTODN 66,373,92
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Cardiovascular(circulatory)system

California Prop 65: Developmental toxin (01/01/91)
Acceptable intake level-inhalation 13000. ugD (01/01/94)
Acceptable intake level-oral intake 7000. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Toluene; CASRN 108-88-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Toluene
CASRN -- 108-88-3
Last Revised -- 08/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classified

Basis -- No human data and inadequate animal data. Toluene did not produce positive results in the majority of genotoxic assays.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

A chronic (106-week) bioassay of toluene in F344 rats of both sexes

reported no carcinogenic responses (CIIT, 1980). A total of 960 rats were exposed by inhalation for 6 hours/day, 5 days/week to toluene at 0, 30, 100, or 300 ppm. Groups of 20/sex/dose were sacrificed at 18 months. Gross and microscopic examination of tissues and organs identified no increase in neoplastic tissue or tumor masses among treated rats when compared with controls. The study is considered inadequate because the highest dose administered was well below the MTD for toluene and because of the high incidence of lesions and pathological changes in the control animals.

Several studies have examined the carcinogenicity of toluene following repeated dermal applications. Toluene (dose not reported) applied to shaved interscapular skin of 54 male mice (strains A/He, C3HeB, SWR) throughout their lifetime (3 times weekly) produced no carcinogenic response (Poel, 1963). One drop of toluene (about 6 mL) applied to the dorsal skin of 20 random-bred albino mice twice weekly for 50 weeks caused no skin papillomas or carcinomas after a 1-year latency period was allowed (Coombs et al., 1973). No increase in the incidence of skin or systemic tumors was demonstrated in male or female mice of three strains (CF, C3H, or CBaH) when toluene was applied to the back of 25 mice of each sex of each strain at 0.05-0.1 mL/mouse, twice weekly for 56 weeks (Doak et al., 1976). One skin papilloma and a single skin carcinoma were reported among a group of 30 mice treated dermally with one drop of 0.2% (w/v) solution toluene twice weekly, administered from droppers delivering 16-20 uL per drop for 72 weeks (Lijinsky and Garcia, 1972). It is not reported whether evaporation of toluene from the skin was prevented during these studies.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Toluene was found to be nonmutagenic in reverse mutation assays with S. typhimurium (Mortelmans and Riccio, 1980; Nestmann et al., 1980; Bos et al., 1981; Litton Bionetics, Inc., 1981; Snow et al., 1981) and E. coli (Mortelmans and Riccio, 1980), with and without metabolic activation. Toluene did not induce mitotic gene conversion (Litton Bionetics, Inc., 1981; Mortelmans and Riccio, 1980) or mitotic crossing over (Mortelmans and Riccio, 1980) in S. cerevisiae. Although Litton Bionetics, Inc. (1981) reported that toluene did not cause increased chromosomal aberrations in bone marrow cells, several Russian studies (Dobrokhotov, 1972; Lyapkalo, 1973) report toluene as effective in causing chromosal damage in bone marrow cells of rats. There was no evidence of chromosomal aberrations in blood lymphocytes of workers exposed to toluene only (Maki-Paakkanen et al., 1980; Forni et al., 1971), although a slight increase was noted in workers exposed to toluene and benzene (Forni et al., 1971; Funes-Craviota et al., 1977). This finding is supported by studies of cultured human lymphocytes exposed to toluene in vitro; no elevation of chromosomal aberrations or sister chromatid exchanges was observed (Gerner-Smidt and Friedrich, 1978).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Toluene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-408.

_II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The values in the 1987 Drinking Water Criteria Document for Toluene have received peer and administrative review.

Agency Work Group Review: 09/15/87

Verification Date: 09/15/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

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Robert E. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TOLUENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor.

INGESTION: do NOT induce vomiting; call a doctor.
EYES: flush with water for at least 15 min.
SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Toluene
DOT ID NUMBER: UN1294

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Poor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive

fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 206 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: ETHYL BENZENE
SYNONYMS: AETHYLBENZOL (German); EB; ETHYLBENZEEN (Dutch); ETHYL BENZENE; ETHYL BENZENE (DOT); ETHYLBENZOL; ETILBENZENE (Italian); ETYLOBENZEN (Polish); NCI-C56393; PHENYLETHANE
CAS: 100-41-4 RTECS: DA0700000
FORMULA: C8H10 MOL WT: 106.18
WLN: 2R
CHEMICAL CLASS:Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless liquid with a sweet, gasoline-like odor.

BOILING POINT:	409.2 K	136 C	276.8 F
MELTING POINT:	178.15 K	-95 C	-139 F
FLASH POINT:	294.26 K	21.11 C	69.9 F
AUTO IGNITION:	733 K	459.8 C	859.8 F
CRITICAL TEMP:	617.1 K	343.95 C	651.11 F
CRITICAL PRESS:	3.61 kN/M2	35.5 atm	523 psia
HEAT OF VAP:	144 Btu/lb	79.97 cal/g	3.346x E5 J/kg
HEAT OF COMB:	-17780 Btu/lb	-9885 cal/g	-413x E5 J/kg

VAPOR PRESSURE: 10mm @ 25.9 C
UEL: 6.7 %
LEL: 1.0 %
IONIZATION POTENTIAL (eV): 8.76
VAPOR DENSITY: 3.7 (air=1)
EVAPORATION RATE: 0.84(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY: 0.867 20C
DENSITY: 0.866 g/mL @ 20 C
WATER SOLUBILITY: 0.015%
INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS Source: SAX
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): 140
ODOR DESCRIPTION: AROMATIC Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1175
DOT shipping name: Ethylbenzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909163

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.7 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 0.7 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: D001
CERCLA REF: Y
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/19/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYL BENZENE [100-41-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 200 ppm for 30 minutes can cause irritation of the nose and throat, dizziness, difficult breathing and depression. very high levels can cause unconsciousness. SKIN: can cause irritation, inflammation, blisters and burns. Eyes: 200 ppm can cause irritation. higher levels can cause burning, tearing and injury. INGESTION: can cause headache, sleepiness and coma.(NYDH)

LONG TERM TOXICITY: may cause skin rash and irritation of eyes, nose and throat.(NYDH)

TARGET ORGANS: eyes, upper resp sys, skin, CNS

SYMPTOMS: Inhalation may cause irritation of nose, dizziness,

depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. Source: CHRIS

CONC IDLH: 2000PPM

NIOSH REL:

ACGIH TLV: TLV = 100ppm(434 mg/M3)
ACGIH STEL: STEL = 125 ppm(543 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 125 ppm(545 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:100 ppm/8H AIHAAP 31,206,70
SENSE ORGANS
Eye
Other
BEHAVIORAL
Sleep
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:3500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:3500 mg/kg
ihl-rat LCLo:4000 ppm/4H
ihl-mus LDLo:50 gm/m3/2H
ipr-mus LD50:2272 mg/kg
skn-rbt LD50:17800 mg/kg

ihl-gpg LCLo:10000 ppm

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 15 mg/24H open MLD
eye-rbt 100 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:97 ppm/7H (15D pre) NTIS** PB83-208074
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:985 ppm/7H (1-19D preg) NTIS** PB83-208074
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:96 ppm/7H (1-19D preg) NTIS** PB83-208074
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetal death
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:2400 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rbt TCLo:99 ppm/7H (1-18D preg) NTIS** PB83-208074
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Ethylbenzene; CASRN 100-41-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Ethylbenzene
CASRN -- 100-41-4

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- nonclassifiable due to lack of animal bioassays and human studies.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

None. NTP has plans to initiate bioassay. Metabolism and excretion studies at 3.5, 35 and 350 mg/kg are to be conducted as well.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The metabolic pathways for humans and rodents are different (Engstrom et al., 1984). Major metabolites in humans, mandelic acid and phenylglyoxylic acid, are minor metabolites in rats and rabbits (Kiese and Lenk, 1974). The major animal metabolites were not detected in the urine of exposed workers (Engstrom et al., 1984).

Ethylbenzene at 0.4 mg/plate was not mutagenic for Salmonella strains TA98, TA1535, TA1537 and TA1538 with or without Aroclor 1254 induced rat

liver homogenates (S9) (Nestmann et al., 1980). Ethylbenzene was shown to increase the mean number of sister chromatid exchanges in human whole blood lymphocyte culture at the highest dose examined without any metabolic activation system (Norppa and Vainio, 1983).

Dean et al. (1985) used a battery of short-term tests including bacterial mutation assays, mitotic gene conversion in Saccharomyces cerevisiae JD1 in the presence and absence of S9 and chromosomal damage in a cultured rat liver cell line. Ethylbenzene was not mutagenic in the range of concentrations tested (0.2, 2, 20, 50 and 200 ug/plate) for S. typhimurium TA98, TA100, TA1535, TA1537 and TA1538 or for Escherichia coli WP2 and WP2uvrA. Ethylbenzene also showed no response in the S. cerevisiae JD1 gene conversion assay. In contrast, ethylbenzene hydroperoxide showed positive responses with E. coli WP2 at 200 ug/plate in the presence of S9 and an equally significant response with the gene conversion system of yeast.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-048. NTIS PB 81-117590.

U.S. EPA. 1984. Health Effects Assessment for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/008.

U.S. EPA. 1987. Drinking Water Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Ambient Water Quality Criteria Document and the Health Assessment Document have received Agency and external review. The Drinking Water Criteria Document has been extensively reviewed.

Agency Work Group Review: 10/07/87

Verification Date: 10/07/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Arthur S. Chiu / ORD -- (202)260-6764 / FTS 260-6764

Lynn Papa / ORD -- (513)569-7523 / FTS 684-7523

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
self-contained breathing apparatus; safety goggles.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (ETHYL BENZENE)
1000 ppm: Any powered air-purifying respirator with organic vapor

cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / / self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection. / Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration.
INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis.
IN AND
ES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam (most effective), water fog, carbon dioxide or dry chemical. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethylbenzene
DOT ID NUMBER: UN1175

ERG93 GUIDE 26

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 421 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: XYLENE

SYNONYMS: XYLENE (XYLOL); XYLOL; METHYL TOLUENE; BENZENE, DIMETHYL-; DIMETHYLBENZENE; NCI-C55232; VIOLET 3; XYLOL (DOT); SOCAL AQUATIC SOLVENT 3501

CAS: 1330-20-7 RTECS: ZE2100000

FORMULA: C8H10 MOL WT: 106.18

WLN: 1R X1

CHEMICAL CLASS:Aromatic hydrocarbon

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless liquid with aromatic odor

BOILING POINT:	412 K	138.8 C	281.9 F
MELTING POINT:	247 K	-26.2 C	-15.1 F
FLASH POINT:	300.35-305.35 K	27.2-32.2 C	80.9-89.9 F
AUTO IGNITION:	736.45-802.05 K	463.3-528.9 C	866-984.1 F

VAPOR PRESSURE: 6.7 mm @ 21 C

UEL: 7 %

LEL: 1 %

IONIZATION POTENTIAL (eV): 8.56

VAPOR DENSITY: 3.7 (air=1)

EVAPORATION RATE: 0.77(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.861 20C

DENSITY: 0.861 g/cc or 8.0073 lb/gal

WATER SOLUBILITY: VERY SL SOL

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 0.05

ODOR DESCRIPTION: LIKE BENZENE; CHARACTERISTIC AROMATIC
Source:CHRIS

100 % ODOR DETECTION: 0.4-20 ppm

REGULATIONS

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27

Identification number: UN1307
DOT shipping name: XYLENES
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909350, 4909351

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 10 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 10 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U239,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
Chronic toxicity: carcinogen
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ifornia Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)
ENE [1330-20-7]

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: CNS, eyes, gi tract, blood, liver, kidneys, skin

SYMPTOMS: DIZZ, EXCITEMENT, DROW, INCO, STAGGERING GAIT, IRRIT EYES, NOSE, THROAT, CORNEAL VACUOLIZATION, ANOREXIA, NAU, VOMIT, ABDOM PAIN; DERM Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure 434 mg/M3 Time weighted averages for 8-hour exposure 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 868 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 100ppm(434 mg/M3)

ACGIH STEL: STEL = 150 ppm(651 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 150 ppm(655 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-man LCLo:10000 ppm/6H BMJOAE 3,442,70
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Cyanosis
BLOOD
Other changes

LD50 value: orl-rat LD50:4300 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4300 mg/kg
ihl-rat LC50:5000 ppm/4H
ipr-rat LD50:2459 mg/kg
scu-rat LD50:1700 mg/kg
ipr-mus LD50:1548 mg/kg
ivn-rbt LDLo:129 mg/kg
ihl-gpg LCLo:450 ppm
ipr-gpg LDLo:2 gm/kg
ipr-mam LDLo:2 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:250 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Other developmental abnormalities
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) PCBRD2 163B,295,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:20600 ug/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:31 mg/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:4000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN
Physical

ihl-mus TCLo:2000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1 gm/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------

Xylenes; CASRN 1330-20-7 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Xylenes
CASRN -- 1330-20-7
Last Revised -- 03/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- Orally administered technical xylene mixtures did not result in significant increases in incidences in tumor responses in rats or mice of both sexes.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. In an NTP (1986) study, 50 male and 50 female F344/N rats were treated by gavage with mixed xylenes in corn oil (60% m-xylene, 14% p-xylene, 9% o-xylene and 17% ethylbenzene) at dosages of 0, 250 or 500 mg/kg/day, 5 days/week for 103 weeks. Similarly, 50 male and 50 female B6C3F1 mice were treated with the same xylene mixture at dosages of 0, 500 or 1000 mg/kg/day. Animals were killed and examined histologically when moribund or after 104-105 weeks. An apparent dose-related increased mortality was observed in male rats, but this difference was statistically significant for the high dose group, only. No other differences in survival between dosage groups of either sex were observed. Interstitial cell tumors of the testes could not be attributed to administration of the test compound observed in male rats (43/50 control, 38/50 low-dose and 41/49 high-dose). NTP (1986) reported that there were no significant changes in the incidence of neoplastic or nonneoplastic lesions in either the rats or mice that could be considered related to the mixed xylene treatment, and concluded that under the conditions of these 2-year gavage studies, there was "no evidence of carcinogenicity" of xylene (mixed) for rats or mice of either sex at any dosage tested.

Maltoni et al. (1985), in a limited study, reported higher incidences (compared with controls) of malignant tumors in male and female Sprague-Dawley rats treated by gavage with xylene in olive oil at 500 mg/kg/day, 4 or 5 days/week for 104 weeks. This study did not report survival rates or specific tumor types; therefore, the results cannot be interpreted.

Berenblum (1941) reported that "undiluted" xylene applied at weekly intervals produced one tumor-bearing animal out of 40 after 25 weeks in skin-painting experiments in mice. No control groups were described. Pound (1970) reported negative results in initiation-promotion experiments with xylene as the initiator and croton oil as the promotor.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The frequency of sister chromatid exchanges and chromosomal aberrations were nearly identical between a group of 17 paint industry workers exposed to xylene and their respective referents (Haglund et al., 1980). In vitro, xylene caused no increase in the number of sister chromatid exchanges in human lymphocytes (Gerner-Smidt and Friedrich, 1978). Studies indicate that xylene isomers, technical grade xylene or mixed xylene are not mutagenic in tests with Salmonella typhimurium (Florin et al., 1980; NTP, 1986; Bos et al., 1981) nor in mutant reversion assays with Escherichia coli (McCarroll et al., 1981). Technical grade xylene, but not o- and m-xylene, was weakly mutagenic in Drosophila recessive lethal tests. Chromosomal aberrations were not increased in bone marrow cells of rats exposed to xylenes by inhalation (Donner et al., 1980).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Xylene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-416. Final.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Drinking Water Criteria Document for Xylene has received Agency and external review.

Agency Work Group Review: 12/02/87

Verification Date: 12/02/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Bruce Mintz / ODW -- (202)260-9569 / FTS 260-9569

W. Bruce Peirano / ORD -- (513)569-7540 / FTS 684-7540

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
)M THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (XYLENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with

running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: XYLENES
DOT ID NUMBER: UN1307

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin. Vapors may cause dizziness or suffocation. Contact may irritate or burn skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 5249 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYLENE, TETRACHLORO-

SYNONYMS: ANKILOSTIN; ANTISOL 1; CARBON BICHLORIDE; CARBON DICHLORIDE; CZTEROCHLOROETYLEN (Polish); DIDAKENE; DOW-PER; ENT 1,860; ETHENE, TETRACHLORO-; ETHYLENE TETRACHLORIDE; FEDAL-UN; NCI-C04580; NEMA; PER; PERAWIN; PERC; PERCHLOORETHYLEEN, PER (Dutch); PERCHLOR; PERCHLORAETHYLEN, PER (German); PERCHLORETHYLENE; PERCHLORETHYLENE, PER (French); PERCHLOROETHYLENE; PERCLENE; PERCLOROETILENE (Italian); PERCOSOLVE; PERK; PERKLONE; PERSEC; TETLEN; TETRACAP; TETRACHLOORETHEEN (Dutch); TETRACHLORAETHEN (German); TETRACHLORETHYLENE; TETRACHLOROETHENE; TETRACHLOROETHYLENE; 1,1,2,2,-TETRACHLOROETHYLENE; TETRACHLOROETHYLENE (DOT); TETRACLOROETENE (Italian); TETRALENO; TETRALEX; TETRAVEC; TETROGUER; TETROPIL

CAS: 127-18-4 RTECS: KX3850000

FORMULA: C2Cl4 MOL WT: 165.82

WLN: GYGUYGG

CHEMICAL CLASS: FT

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless liquid, chloroform-like odor.

BOILING POINT:	394.2 K	121 C	249.8 F
MELTING POINT:	249.65 K	-23.5 C	-10.3 F
FLASH POINT:	Not available		
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	15.8MM @ 22C		
UEL:	~		
LEL:	~		
IONIZATION POTENTIAL (eV):	9.32		
VAPOR DENSITY:	No data		
EVAPORATION RATE:	2.59(n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.625 @20/4C		
DENSITY:	1.6311 @ 15/4C		
WATER SOLUBILITY:	QUITE SOLUBLE IN H2O(0.015G/ML @20C), IT IS MISCIBLE WITH MOST ORGANIC SOLVENTS AND OILS.		
INCOMPATIBILITIES:	strong oxidizers, chemically active metals, such as barium, lithium, beryllium, sodium		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	HCL AND PHOSGENE\CORROSIVE
ODOR DETECTED AT (ppm):	5 ppm
ODOR DESCRIPTION:	mildly sweet Source:CHRIS
100 % ODOR DETECTION:	No data

---------- REGULATIONS ----------

DOT hazard class:	6.1 POISON
DOT guide:	74
Identification number:	UN1897
DOT shipping name:	Tetrachloroethylene
Packing group:	III
Label(s) required:	KEEP AWAY FROM FOOD
Special provisions:	N36,T1
Packaging exceptions:	173.153
Non bulk packaging:	173.203
Bulk packaging:	173.241
Quantity limitations-	
Passenger air/rail:	60 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	40
STCC NUMBER:	4940355
CLEAN WATER ACT Sect.307:	Yes
CLEAN WATER ACT Sect.311:	No
National Primary Drinking Water Regulations	
Maximum Contaminant Levels (MCL):	0.005 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG):	0 mg/L (07/30/92)
CLEAN AIR ACT:	CAA '90 Listed
EPA WASTE NUMBER:	U210,D039
CERCLA REF:	Y
RQ DESIGNATION:	B 100 pounds (45.4 kg) CERCLA
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: carcinogen Chronic toxicity: adverse effect to target organ after long period of exposure. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-A
Mailability: Domestic service and air transportation; shipper's declaration
< per parcel: 10 GAL; 1 PT

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (0) This material does not readily burn.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/01/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE, TETRACHLORO- [127-18-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: exposures of 200 ppm for 1 hour can cause irritation of the nose, mouth and throat, dizziness,

headaches and lightheadedness; exposures of 1,000 ppm for 30 minutes can cause difficult breathing, weakness, loss of muscle control, irritability, tremors, convulsions, paralysis, coma, heart irregularities and death. SKIN: can cause dry, scaly skin, a mild to moderate burning sensation, redness and inflammation. Eyes: can cause burning and irritation. INGESTION: can cause nausea, vomiting, diarrhea, bloody stool, a reddening of face and neck, weakness and loss of muscle control.(NYDH)

LONG TERM TOXICITY: exposures over 200 ppm during weeks or months can cause irritation of the respiratory tract, nausea, headache, sleeplessness, abdominal pains, constipation, dizziness, increased perspiration, fatigue, skin infection, kidney and liver damage, fluid in the lungs and coma. most of these effects will disappear after exposure is stopped. tetrachloroethylene at high levels has caused cancer and birth defects in mice. whether it causes cancer in humans is unknown.(NYDH)

TARGET ORGANS: skin, mucous membrane, eyes, CNS, gastrointestinal tract. liver, kidneys.

SYMPTOMS: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury. Source: CHRIS

CONC IDLH: 500ppm

NIOSH REL: Potential occupational carcinogen --MINIMIZE EXPOSURE (Limit of quantitation 0.4 ppm)

ACGIH TLV: TLV = 25ppm(170 mg/M3) A3
ACGIH STEL: STEL = 100 ppm(685 mg/M3)»A3

OSHA PEL: Transitional Limits:
PEL = 100 PPM; CEILING = 200 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 25 ppm (170 mg/M3)

MAK INFORMATION: 50 ppm
345 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.
A compound which is justifiably suspected of having

carcinogenic potential.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: A compound which is justifiably suspected of having carcinogenic potential.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as reasonably anticipated to be carcinogenic, with limited evidence in humans or sufficient evidence in experimental animals.
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:96 ppm/7H NTIS** PB257-185
PERIPHERAL NERVE AND SENSATION
Local anesthetic
SENSE ORGANS
Eye
Conjunctive irritation
BEHAVIORAL
Hallucinations, distorted perceptions

orl-chd TDLo:545 mg/kg JTCTDW 23,103,85
BEHAVIORAL
Coma

LD50 value: orl-rat LD50:2629 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2629 mg/kg
ihl-rat LC50:34200 mg/m3/8H
ipr-rat LD50:4678 mg/kg
orl-mus LD50:8100 mg/kg
ihl-mus LC50:5200 ppm/4H
scu-mus LD50:65 gm/kg

orl-dog LDLo:4 gm/kg
ipr-dog LD50:2100 mg/kg
ivn-dog LDLo:85 mg/kg
orl-cat LDLo:4 gm/kg
orl-rbt LDLo:5 gm/kg
scu-rbt LDLo:2200 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 810 mg/24H SEV
eye-rbt 162 mg MLD

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:1000 ppm/24H (14D pre/1-22D preg) APTOD9 19,A21,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 ppm/24H (1-22D preg) APTOD9 19,A21,80
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:900 ppm/7H (7-13D preg) TJADAB 19,41A,79
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN

EFFECTS ON NEWBORN
Behavioral

ihl-rat TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

California Prop 65: Carcinogen (04/01/88)
No significant risk level 14. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Tetrachloroethylene; CASRN 127-18-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Tetrachloroethylene

.s substance/agent has been evaluated by the U.S. EPA for evidence of human carcinogenic potential. This does not imply that this agent is necessarily a carcinogen. The evaluation for this chemical is under review by an inter-office Agency work group. A risk assessment summary will be included on IRIS when the review has been completed.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention.
INGESTION: induce vomiting only on physician's recommendation.
EYES AND
SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give

oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Tetrachloroethylene
DOT ID NUMBER: UN1897

ERG93 GUIDE 74

POTENTIAL HAZARDS

*HEALTH HAZARDS
Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Most vapors heavier than air.
*Air/vapor mixtures may explode when ignited.
Container may explode in heat of fire.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. Remove and isolate contaminated clothing at the site. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical or CO2.
Large Fires: Water spray, fog or regular foam.
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Small Liquid Spills: Take up with sand, earth or other noncombustible absorbent material.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

Use first aid treatment according to the nature of the injury.

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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 2191 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: CHLORODIPHENYL (54% CHLORINE)

SYNONYMS: AROCHLOR 1254; AROCLOR 1254; CHLORIERTE BIPHENYLE, CHLORGEHALT 54% (German); CHLORODIPHENYL (54% Cl); CLORODIFENILI, CLORO 54% (Italian); DIPHENYLE CHLORE, 54% DE CHLORE (French); NCI-C02664; POLYCHLORINATED BIPHENYL; PCB

CAS: 27323-18-8 RTECS: DV2063000

FORMULA: C12H5Cl3 (APPROX) MOL WT: 326

WLN:

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION:

BOILING POINT:	638.15 K	365 C	689 F
MELTING POINT:	283.15 K	10 C	50 F
FLASH POINT:	495 K	221.85 C	431.3 F
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	0.00006		
[illegible]:	~		
[illegible]:	~		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	No data		
DENSITY:			
WATER SOLUBILITY:	INSOLUBLE		
INCOMPATIBILITIES:	strong oxidizers		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

REGULATIONS

DOT hazard class: 9 CLASS 9

DOT guide: 31

Identification number: UN2315

DOT shipping name:	POLYCHLORINATED BIPHENYLS
Packing group:	II
Label(s) required:	CLASS 9
Special provisions:	9, N61
Packaging exceptions:	173.155
Non bulk packaging:	173.202
Bulk packaging:	173.241
Quantity limitations-	
Passenger air/rail:	100 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	34

STCC NUMBER:	Not listed

CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	None
CERCLA REF:	Y
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Chronic toxicity: carcinogen Chronic toxicity: adverse effect to target organ after long period of exposure. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin (Prop 65).

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE):	Unspecified
FLAMMABILITY (RED) :	Unspecified
REACTIVITY (YELLOW):	Unspecified
SPECIAL :	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
CHLORODIPHENYL (54% CHLORINE) [27323-18-8]
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: skin, liver, kidneys

SYMPTOMS: IRRIT EYES, SKIN; ACNE-FORM DERM, JAUN; DARK URINE
Source: NIOSHP

CONC IDLH: 5MG/M3

NIOSH REL: Not given

ACGIH TLV: TLV = 0.5mg/M3 SKIN
ACGIH STEL: STEL = 1 mg/M3»SKIN

OSHA PEL: Transitional Limits:
PEL = 0.5mg/M3(SKIN)
Final Rule Limits:
TWA = 0.5 mg/M3(SKIN)

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below
REFERENCES:
HUMAN SUSPECTED IARC** 18,43,78
ANIMAL POSITIVE IARC** 7,261,74
ANIMAL POSITIVE IARC** 18,43,78

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

unr-rat LD50:2450 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated, and imme

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (CHLORODIPHENYL (54% CHLORINE))
Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash immed
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: POLYCHLORINATED BIPHENYLS
ID NUMBER: UN2315

ERG93 GUIDE 31

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Material may be transported hot.
*HEALTH HAZARDS
Contact may cause burns to skin and eyes.
Inhalation of asbestos dust may have a damaging effect on the lungs.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*Do not scatter spilled material with high-pressure water streams.
Dike fire control water for later disposal.
SPILL OR LEAK
Stop leak if you can do it without risk.
Avoid inhalation of asbestos dust.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
Cover powder spill with plastic sheet or tarp to minimize spreading.
*FIRST AID
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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ATTACHMENT B

DIRECTIONS TO EMERGENCY MEDICAL FACILITIES

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

The nearest hospital **and** the nearest facility capable of treating chemical burns are the same facility, which is located at Methodist North Hospital. Therefore, there is only one set of directions.

Nearest Hospital

Methodist North Hospital
3960 Covington Pike
Memphis, Tennessee

Emergency Room Telephone Number - (901) 372-5211

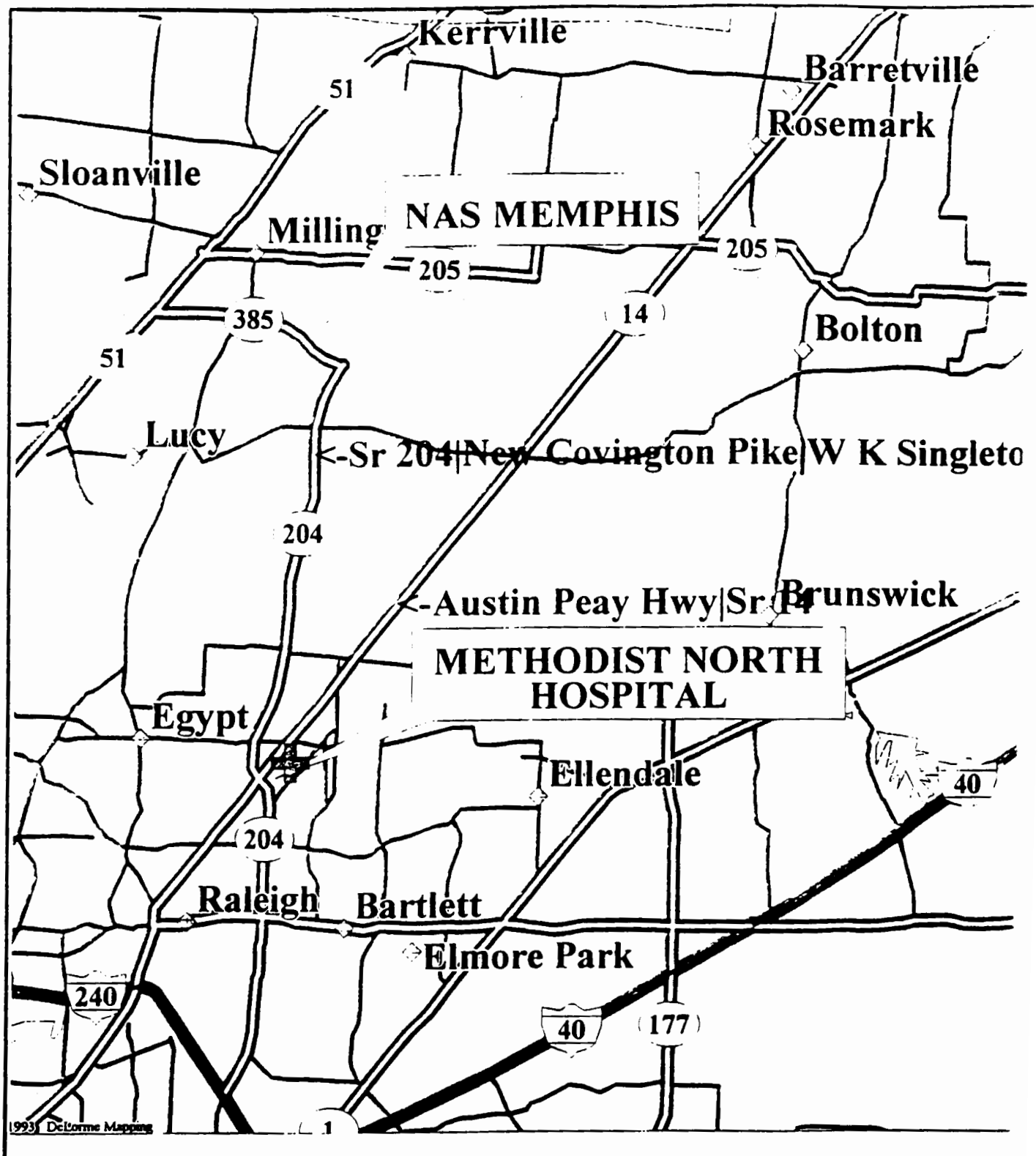
Directions to Methodist North Hospital from NAS Memphis Main Gate:

1) Exit site through South Gate (Singleton Parkway).

2) Continue on Singleton Parkway through the stop signs.

3) Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).

4) You will see the entrance to the emergency room 700 feet past this light on the left.



HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

DIRECTIONS TO THE HOSPITAL

DWG DATE: 10/04/94 | DWG NAME: BOARD

ATTACHMENT C

HEALTH AND SAFETY PLAN FORMS

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project site and returned to: EnSafe/Allen & Hoshall, Memphis, Tennessee.

Job No: 2151-094

Contract No: N62467-89-D-0318

Project: SWMU 26 — N-102 Battery Neutralization Unit

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

_____

Signed

_____

Print Name

_____

Company

_____

Date

EMPLOYEE EXPOSURE HISTORY FORM

Employee:

Job Name: _____

Date(s) From/To: _____

Hours On Site: _____

Contaminants (Suspected/Reported):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions:

ACCIDENT REPORT FORM

SUPERVISOR'S REPORT OF ACCIDENT	DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS
TO	FROM TELEPHONE (Include area code)

NAME OF INJURED OR ILL WORKER AND COMPANY
WORKER'S SOCIAL SECURITY NUMBER

DATE OF ACCIDENT	TIME OF ACCIDENT	EXACT LOCATION OF ACCIDENT

NARRATIVE DESCRIPTION OF ACCIDENT

NATURE OF ILLNESS OR INJURY AND PART OF BODY INVOLVED	LOST TIME YES ☐ NO ☐

PROBABLE DISABILITY (Check one)

FATAL ☐	LOST WORK DAY WITH ____DAYS AWAY FROM WORK	LOST WORK DAY WITH ____DAYS OF RESTRICTED ACTIVITY	NO LOST WORK DAY ☐ FIRST-AID ONLY ☐

CORRECTIVE ACTION RECOMMENDED (By whom and by when)

NAME OF SUPERVISOR	TITLE
SIGNATURE	DATE

RFI WORK PLAN
NAS MEMPHIS

SITE INVESTIGATION PLAN
SWMU 27 — NORTHSIDE SEWAGE TREATMENT PLANT

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

Prepared for:

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

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long Term Environmental Action Navy (CLEAN) Program, the following Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site Investigation Plan (SIP) has been prepared for a confirmatory sampling investigation at SWMU 27, the Northside Sewage Treatment Plant, at the Naval Air Station (NAS) Memphis, Millington, Tennessee. The primary reference for this SIP is the *Comprehensive RFI Work Plan* (E/A&H, 1994).

2.0 ENVIRONMENTAL SETTING

SWMU 27 is the site of a former sewage treatment plant (STP) at the southwest corner of the NAS Memphis Northside at the end of Dakar Street Extended and Outlet Avenue. A vicinity map of SWMU 27 is provided in Figure 1. The STP was constructed in 1943 and included a digester tank (N-44), a control house, six treatment tanks (N-45) and four sludge drying beds (N-46).

There are numerous construction plans and sectional details of the STP dated 1942 available from the Public Works Department and all appropriate diagrams will be reviewed in detail prior to any invasive activity. Although this information will be helpful in locating proposed sampling locations, depths, etc., the dimensions and depths of the STP features, as derived from plan diagrams, may not reflect actual conditions at the site, because demolition activities may have considerably altered their condition.

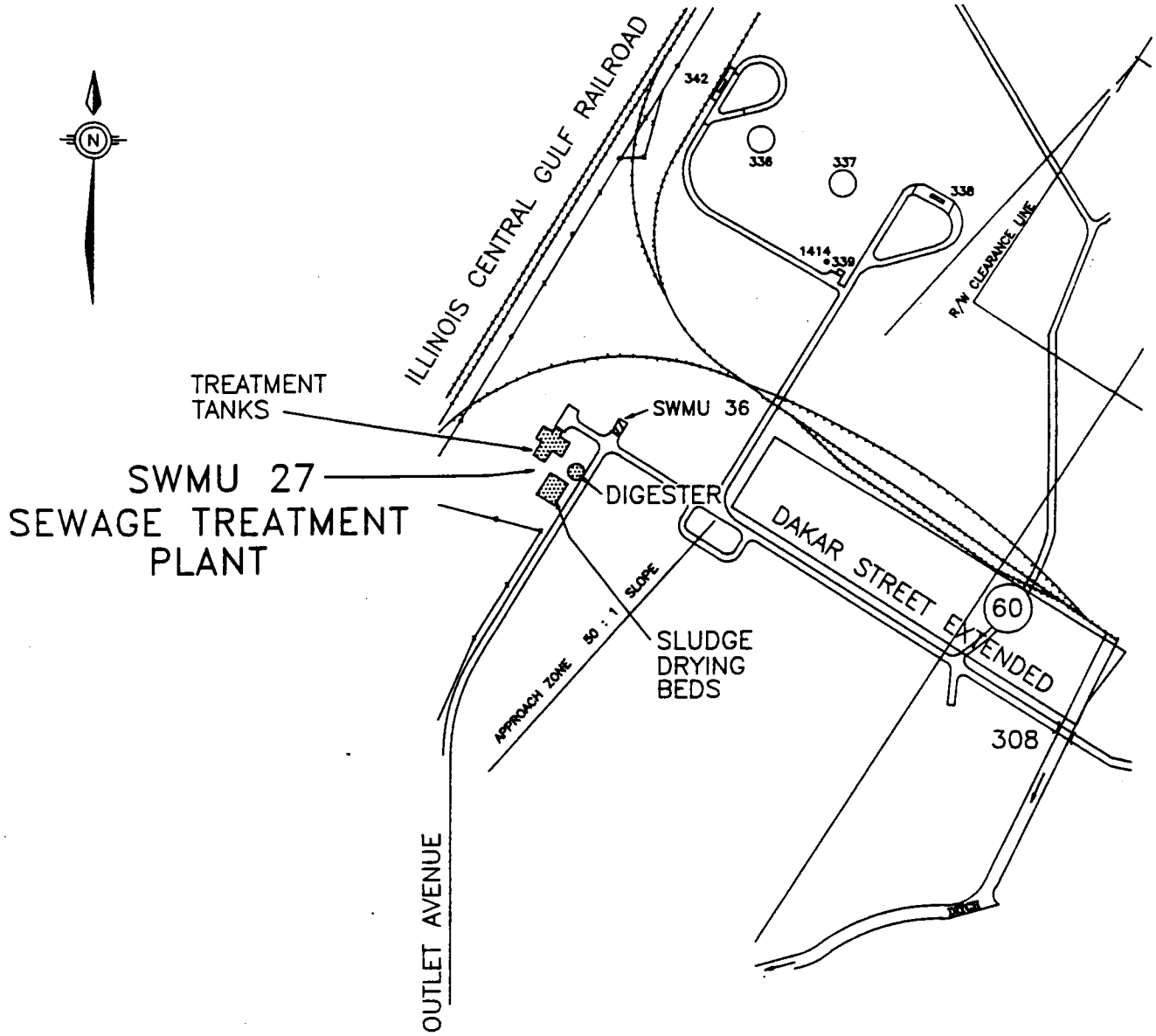
There are conflicting dates as to when the STP was demolished — either in the mid-1970s or as late as 1984. There are also reports of the operations discontinuing between the late 1940s and early 1950s, suggesting less than 15 years of operation. The current condition of the site exhibits extensive site revegetation, both natural and anthropogenic, which, based on the maturity of the trees, is more likely the result of a 20-year period of natural regrowth.

A Visual Site Inspection (VSI) was conducted by E/A&H in January of 1995; when most of the vegetation was dormant. Although a previous VSI conducted in April of 1990 did not identify traces of the STP, the greater mobility and visibility allowed by sparse winter vegetation made a few remnants more evident. Indicating that some remnant foundations/structures may still exist beneath the top soil, a small exposed portion of a reinforced concrete surface was observed beneath approximately 4 to 6 inches of soil and detritus in the area of the former digester. On the western portion of the site, approximately 150 feet of a 3-foot wide, 6-inch thick concrete walkway was exposed in several areas as well. In one such area, the top of an open ended, 12-inch diameter iron pipe was visible crossing beneath the walk. The walk was oriented east to west near the north edge of the N-45 and extended to the old railroad tracks which run along the western property line. Although still quite prominent, this feature was not recognized on the STP construction plans and its purpose is unknown.

Also discernable in the leaf litter south of the site was the large, octagonal concrete manhole/cap identified on the 1942 STP plans as "M.H. #3"; which apparently provides access to an 18-inch sewer discharge pipe and contains a 15-inch automatic flood gate.

The remainder of the site is overgrown, dominated by rows of planted pine trees with mixed deciduous trees and a thick understory. The dirt roadway to the east of the STP is still maintained to allow for occasional access. Beneath an inch of topsoil and high grass, the gravel drive to the north of the STP is also present. No other STP features were apparent during the 1995 VSI.

This remote area appears to be a site of minor incidents of past unauthorized dumping, as evidenced by construction debris and brush/mulch pile along the edges of Dakar Extended and Outlet Avenue. The site information obtained during the 1990 RCRA Facility Assessment is presented in Appendix A.



500 0 500

SCALE FEET

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
FORMER NORTHSIDE SEWAGE TREATMENT PLANT
SWMU 27

DWG DATE: 01/18/95 | DWG NAME: 94STP27

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2.1 Topography and Drainage

This area has been disturbed by past activities but is generally level. There are several small sink holes in the wooded areas, some of which contained standing water. SWMU 27 is approximately 1,000 feet east of North Fork Creek and 500 feet from a ditch along the base boundary according to the USGS 7.5-minute quadrangle map of the area.

2.2 Geologic and Hydrogeologic Information

The regional and local hydrogeology are described in Sections 2.11 and 2.12, respectively, of the *Comprehensive RFI Work Plan*.

Previous Investigations

Shallow subsurface soil information was collected while implementing the Interim Measures (SOUTHNAVFACENGCOM & E/A&H, 1993) and underground storage tank (UST) investigations at SWMU 5 (Aircraft Fire Fighting Training Facility). SWMU 5 is approximately 3,000 feet southeast of SWMU 27. The studies indicated the presence of low- to very low-permeability silts with varying degrees of clay to a depth of approximately 20 feet below ground surface (bgs). Laboratory-measured hydraulic conductivities for the silty-clay unit were reported from 10^{-8} to 10^{-7} cm/sec (E/A&H, 1992); no conductivity data are available for the underlying silt unit. Boring logs from the UST investigation at SWMU 5 are provided in Appendix B of this document.

Stratigraphic Test Borings

The USGS drilled stratigraphic test hole 4 to a total depth of approximately 200 feet at a location approximately 500 feet south of the main runway and about 2,100 feet northeast of SWMU 27. The test hole was originally to be advanced approximately 15 feet into the Cook Mountain Formation (the confining unit separating the Memphis aquifer from the overlying Cockfield Formation and shallower units). However, due to the unanticipated thinness of the Cockfield Formation, this borehole was advanced approximately 50 feet into the Memphis Sand.

This test hole was visually logged by a field geologist during drilling and geophysically logged following completion. Lithologies encountered in the test hole were as follows:

Loess:	Approximately 40 feet of wind-blown silt deposits (loess) consisting of silt and clay.
Fluvial Deposits:	Approximately 30 feet of fluvial deposits consisting of sand and gravel.
Cockfield Formation:	Approximately 30 feet of alternating sand, clay and some lignite.
Cook Mountain Formation:	The Cook Mountain, characterized as a gray to blue-gray dense clay approximately 44 feet thick, is defined as the upper confining unit between the surficial aquifer(s) and the Memphis aquifer.

2.3 Climatological Data

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

3.0 SOURCE CHARACTERIZATION

While in operation, the STP reportedly received mostly sanitary waste from the north side of the base. There was, however, a period during the 1940s and 1950s in which some industrial waste (oils, solvents, and paints) was reportedly discharged to the system from various operations.

Water was removed from sewage sludge by pumping it onto the four 20-foot by 55-foot drying beds. This is the only treatment process in which waste was likely to directly contact native soil. The sludge was pumped onto a 3-layered filter substrate, which consisted of 8 inches of sand, 6 inches of pea gravel and a 10 to 13-inch layer of coarse aggregate. Within the aggregate layer was a system of 6-inch drain lines to transport percolated water to the sewer discharge line. According to drying bed diagrams, each bed was open to undisturbed earth below the aggregate substrate. This interface is the most likely release point for STP contaminants.

Field sampling will be performed to confirm or refute the presence of anticipated site constituents as outlined in Section 4.3. If contamination is verified, the scope of the investigation will be expanded to meet the requirements of a RCRA Facility Investigation (RFI). Reference materials will be used to determine the physical, chemical, and migration/dispersal characteristics of any contaminants identified during the RFI as exceeding the appropriate action levels. The procedures and references used to determine these characteristics will be documented in the RFI report.

4.0 CHARACTERIZATION OF HAZARDOUS CONSTITUENT RELEASES

4.1 Previous Investigations

No known investigations of this site have been performed.

4.2 Data Gaps

Data gaps include the potential for subsurface soil contamination and groundwater contamination in the surficial aquifers as a result of sludge drying practices. The following data gaps will be the focus of this investigation.

- Presence/location of subsurface foundations/structures.
- The potential for subsurface soil contamination in the loess.
- The potential for groundwater contamination in the loess and fluvial deposits.

Concentrations of contaminants identified in soil and groundwater at SWMU 27 will be compared to background soil and groundwater concentrations to determine whether measured values occur naturally or indicate contamination. Background concentrations will be determined from the five background monitoring well locations which have been installed across the base and from monitoring wells at other SWMUs. Groundwater samples collected from the background monitoring wells have been analyzed for full scan analysis (FSA) using the following methods:

- Volatile Organic Compounds (USEPA Method 8240)
- Semivolatile Organic Compounds (USEPA Method 8270)
- Total Petroleum Hydrocarbons (USEPA Method 418.1)
- Gasoline Range Organics (GRO) (TN Modified 8015/GRO)
- Diesel Range Organics (DRO) (TN Modified 8015/DRO)
- Chlorinated Pesticides/PCBs (USEPA Method 8080)
- Organophosphorus Pesticides (USEPA Method 8140)
- Chlorinated Herbicides (USEPA Method 8150)
- RCRA Part 264, Appendix IX Total Metals (USEPA Method 6010/7000 series)
- Total Cyanide (USEPA Method 9010)

4.3 Objective and Proposed Field Investigation

The objectives of the proposed field investigation are to fill the data gaps identified in Section 4.2 and to delineate the horizontal and vertical extent of any soil and groundwater contamination present at SWMU 27. The following field sampling investigation will consist of two phases in which soil and groundwater samples will be collected as outlined below. All sample collection and processing will be in accordance with Section 4 of the *Comprehensive RFI Work Plan*.

The first phase will consist of a soil and groundwater screening investigation that will be conducted using Direct Push Technology (DPT), as well as hand auger and Geoprobe-type (or equivalent) sampling equipment. It is anticipated that a hand auger or Geoprobe will be used to collect shallow (< 2.5 feet bgs) samples and DPT or a Geoprobe to collect deeper samples. The results of the screening phase of the investigation will be used to plan the number, placement, and depth of monitoring wells (and possibly soil borings) in the second phase of the investigation, if necessary. Sampling and analytical strategies will also be based on screening results.

4.3.1 Screening Phase

The proposed soil and groundwater screening investigation will consist of hand auger and DPT or Geoprobe sampling (Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) to collect soil and groundwater samples for field and laboratory analysis. A total of 9 initial sampling locations have been selected: two in each of the four sludge drying beds and one background location (Figure 2). Based on previous work conducted at other SWMUs, it is anticipated that the DPT or Geoprobe equipment will be able to penetrate to the top of the fluvial deposits (approximately 40 ft. bgs), allowing for the collection of groundwater samples from this unit.

The location of the drying beds will be estimated from aerial photographs, engineering plans obtained from the NAS Memphis Public Works Office, and field measurements using Manhole 3 as a reference point. To allow access for DPT or Geoprobe sampling of the interior STP areas, moderate clearing of vegetation and leveling of berms might be required. All requested clearing will be kept to the absolute minimum, yet must still allow for maneuvering and overhead clearance for the necessary sampling equipment.

Four soil and/or groundwater samples will be collected from each sampling point as outlined below:

1) One soil sample will be collected from the surface (0 to 1-foot) soil interval.

2) One soil sample will be collected in the native soil just beneath the bottom layer of filter bed aggregate.

3) One sample, either soil or groundwater, will be collected from the soil-water interface in the loess. Under optimum conditions, a groundwater sample will be collected. However, if a groundwater sample cannot be collected at this interval, a soil sample will be collected.

4) One groundwater sample will be collected from the top of the fluvial deposits.

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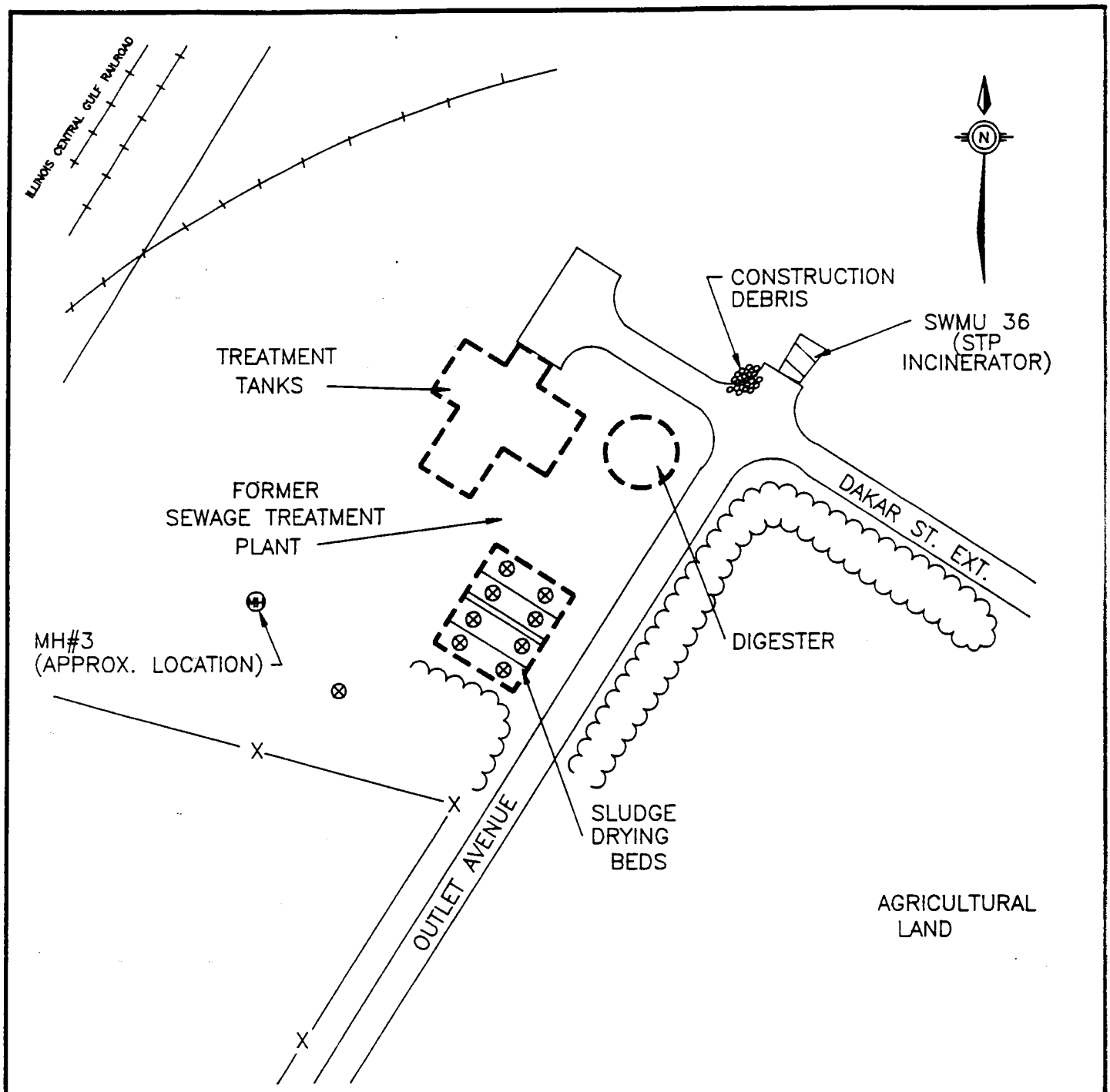

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
PROPOSED DPT SAMPLING LOCATIONS
NORTHSIDE
SEWAGE TREATMENT PLANT
SWMU 27

DWG DATE: 01/19/95 | DWG NAME: 94DPT27

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Field personnel may deviate from this strategy if field conditions or data (i.e., piezocone or gas chromatograph) suggest that additional or different intervals may be successfully sampled or yield more useful information. The investigatory area may then be expanded or concentrated, based on the results of the initial data.

VOC analysis (USEPA Method 8021 or 8240) of these samples will be performed in the field using a portable gas chromatograph. At least 25 percent of the soil and groundwater samples will be split for offsite laboratory analysis for confirmatory purposes. Split sample selection will be determined in the field. Split samples submitted to the offsite laboratory will be analyzed for VOCs using USEPA Method 8240. In addition, all soil and groundwater samples except for those collected from the top of the fluvial deposits will be submitted to an offsite laboratory for RCRA Appendix IX metals (USEPA Method 6010/7000 Series) analyses.

4.3.2 Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the screening phase of the investigation, a second phase, consisting of installing and sampling soil borings and monitoring wells, may be implemented to better define the nature and extent of contamination. The number, placement, and depth of borings and monitoring wells will be determined using data from the screening phase of this investigation. An addendum to this SIP describing the proposed drilling, sampling, and analytical strategies for the expanded investigation will be prepared and submitted to the BRAC Cleanup Team for review and comment, should a second phase be required.

4.3.3 Analytical Requirements

Field measurements at SWMU 27 will be conducted in accordance with Section 4.10.1 of the *Comprehensive RFI Work Plan*. Field measurements will include pH, temperature, specific conductivity, and groundwater level for monitoring wells, and organic vapor detection for soil samples and boreholes. Soil and groundwater samples collected during the screening survey will be analyzed in the field with a portable gas chromatograph at Level II DQO.

Screening samples submitted to an offsite laboratory for analysis will adhere to Level III Data Quality Objectives (DQO), which will be used for 95 percent of the samples and DQO Level IV for the remaining 5 percent. Field sampling personnel will determine which samples will receive Level IV DQO. Samples collected during the second phase of the investigation will be analyzed for FSA using the methods outlined in Section 4.2.

4.4 Sample Management

Sample management procedures will adhere to Sections 4.12 and 5.0 of the *Comprehensive RFI Work Plan.*

4.5 Sample Custody

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

4.6 Quality Assurance/Quality Control

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

4.7 Decontamination Procedures

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

4.8 Investigation-Derived Waste

Investigation-derived waste (IDW) will be handled as specified in Section 4.13 of the *Comprehensive RFI Work Plan.*

5.0 POTENTIAL RECEPTORS

SWMU 27 is approximately 2,000 east of the nearest offsite residence. The nearest NAS Memphis personnel are 3,000 feet to the southeast at the fire fighting training area. Runoff from the SWMU flows south and west into drainage ditches and ultimately to North Fork Creek.

which may serve as a water and food source for various animals. Off base, the potential exists for contact by the general public due to unrestricted access to the drainage ways. According to base personnel, no fishing or swimming occurs in North Fork Creek or Big Creek, but children may play near these drainage ways.

Other potential receptors include two production wells (PW-1 and PW-2). PW-1 is approximately 3,750 feet east of SWMU 27, and PW-2 is approximately 4,500 feet east. Both production wells are screened in the Memphis Aquifer, with the Cook Mountain confining unit above the screened intervals. A more detailed analysis of potential receptors will be conducted and presented in the RFI report if contamination is found at SWMU 27.

6.0 QUALITY ASSURANCE PLAN

The Quality Assurance Plan (QAP) presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout the RFI at SWMU 27.

7.0 DATA MANAGEMENT PLAN

The Data Management Plan (DMP) presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during the RFI for SWMU 27.

8.0 HEALTH AND SAFETY PLAN

The Site-specific Health and Safety Plan for SWMU 27 is included in Appendix C of this document. The Comprehensive Health and Safety Plan is included in Section 7 of the *Comprehensive RFI Work Plan.*

9.0 REFERENCES

EnSafe/Allen & Hoshall (October 1994). *Comprehensive RFI Work Plan for Naval Air Station Memphis*. E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall (September 1992). UST Investigation, AFFTF USTs for Naval Air Station Memphis. E/A&H: Memphis, Tennessee.

ERC/EDGe (September 1990). *RCRA Facility Assessment (RFA), NAS Memphis*. ERC/EDGe: Nashville, Tennessee.

Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) (May 1990). *Draft Final RCRA Facility Investigation Work Plan for Naval Air Station-Memphis*. SOUTHDIV: Charleston, South Carolina.

Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) & EnSafe/Allen & Hoshall (February 1993). *NAS Memphis Technical Memorandum, SWMUs 4 and 5; Interim Measures Field and Analytical Summary*. E/A&H: Memphis, Tennessee.

APPENDIX A

RFA SWMU DESCRIPTION

7.27 SWMU NO. 27: NORTH SIDE SEWAGE TREATMENT PLANT

7.27.1 UNIT CHARACTERISTICS

7.27.1.1 TYPE OF UNIT

Inactive Sewage Treatment Plant (NSSTP). Demolished in mid-1970s.

7.27.1.2 DESIGN FEATURES

The NSSTP included aeration tanks, digesters, polishing tanks and sludge drying beds.

7.27.1.3 OPERATING PRACTICE (PAST AND PRESENT)

Sewage treatment.

7.27.1.4 PERIOD OF OPERATION

The NSSTP operated from 1943 to 1984.

7.27.1.5 AGE OF UNIT

The unit was approximately 41 years of age at time of demolition in 1984.

7.27.1.6 LOCATION OF UNIT

The North Side Sewage Treatment Plant site is located on the NAS North Side Complex on the northwest corner of property on Dakar Street Extended at Outlet Avenue, as shown in Figure 7-27.

7.27.1.7 GENERAL PHYSICAL CONDITIONS

Not applicable (abandoned and demolished facility).

7.27.1.8 CLOSURE METHOD

Demolished on site.

7.27.2 WASTE CHARACTERISTICS

7.27.2.1 TYPE OF WASTE

The sewer system which discharged to the NSSTP served housing and some industrial areas. The industrial areas are presumed to have discharged a variety of oils, solvents, paints and other chemicals in addition to domestic sewage.

7.27.2.2 MIGRATION CHARACTERISTICS

The potential contaminants listed above are reasonably mobile in the environment. If released, they will migrate into the soil. Once in the soil, they will continue to move through it in response to the movement of ground water. Accordingly, the soil mass around the NSSTP and beneath it could be contaminated if a release occurred.

7.27.2.3 TOXICOLOGICAL CHARACTERISTICS

Toxicological characteristics of treated sewage are considerably different from those of the individual waste streams that comprise the incoming sewage. Potential toxic discharges to the system include oils, solvents, and paints. Residual contamination, if any, is probably limited to the sludge drying beds; heavy metals could potentially be present in the soil exposed to supernatant or leachate.

7.27.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Residual contaminants would be present as particulates or adsorbate on soil particles.

7.27.3 MIGRATION PATHWAYS

7.27.3.1 GEOLOGIC SETTING

See Section 3.2.

7.27.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.27.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0.

7.27.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general information. The area is generaly level with some irregularities. Surface drainage is toward the south and west. A nearby drainage ditch flows to the southwest.

7.27.3.5 PATHWAYS

AIR

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

SOIL

The potential contaminants listed above are reasonably mobile in the environment. If released, they will migrate into the soil. Once in the soil, they will continue to move through it in response to the movement of ground water. Should a release of hazardous constituents ever occur at this location, contaminants would likely be released into the soil. Soil particle bonding, which naturally exists in the silt and clay type soils typical to this area, provide strong attenuation for these potential contaminants. Minor releases from this system would be trapped in the vadose soil zone until natural driving forces are exerted (surface water infiltration) to transport these substances to the ground water surface. Accordingly, the soil mass around the NSSTP and beneath it should be contaminated if a release has occurred.

SURFACE WATER/SEDIMENT

Visual assessment of SWMU No. 27 indicates no obvious points of surface contamination attributable to this unit. Therefore, the likelihood of surface water transport is remote.

GROUNDWATER

Contaminants of interest that may have been contained in this SWMU are probably generally soluble in water and would be transported generally down gradient with the flow of ground water.

SUBSURFACE GAS

Not applicable due to the nature of the unit and time since the unit was deactivated.

7.27.4 CONTAMINANT RELEASE IDENTIFICATION

7.27.4.1 PRIOR INSPECTION REPORTS

None available.

7.27.4.2 PUBLIC COMPLAINTS

None.

7.27.4.3 MONITORING/SAMPLING DATA

None available.

7.27.4.4 EVIDENCE OF RELEASE

None.

7.27.5 EXPOSURE POTENTIAL

7.27.5.1 PROXIMITY TO AFFECTED POPULATION

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

7.27.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The unit is distant from sensitive environments.

7.27.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

It has not been determined whether or not a release of hazardous constituents has ever occurred at the NSSTP. Since the NSSTP served some industrial areas of the NAS, the potential for hazardous constituents to be present in the soil surrounding the NSSTP cannot be discounted.

7.27.6 DOCUMENTS REVIEWED

See PRD.

7.27.7 SUMMARIZED DATA GAP

7.27.7.1 SOIL

None available.

7.27.7.2 GROUNDWATER

No available data.

7.27.7.3 SURFACE WATER/SEDIMENT

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

7.27.7.4 AIR

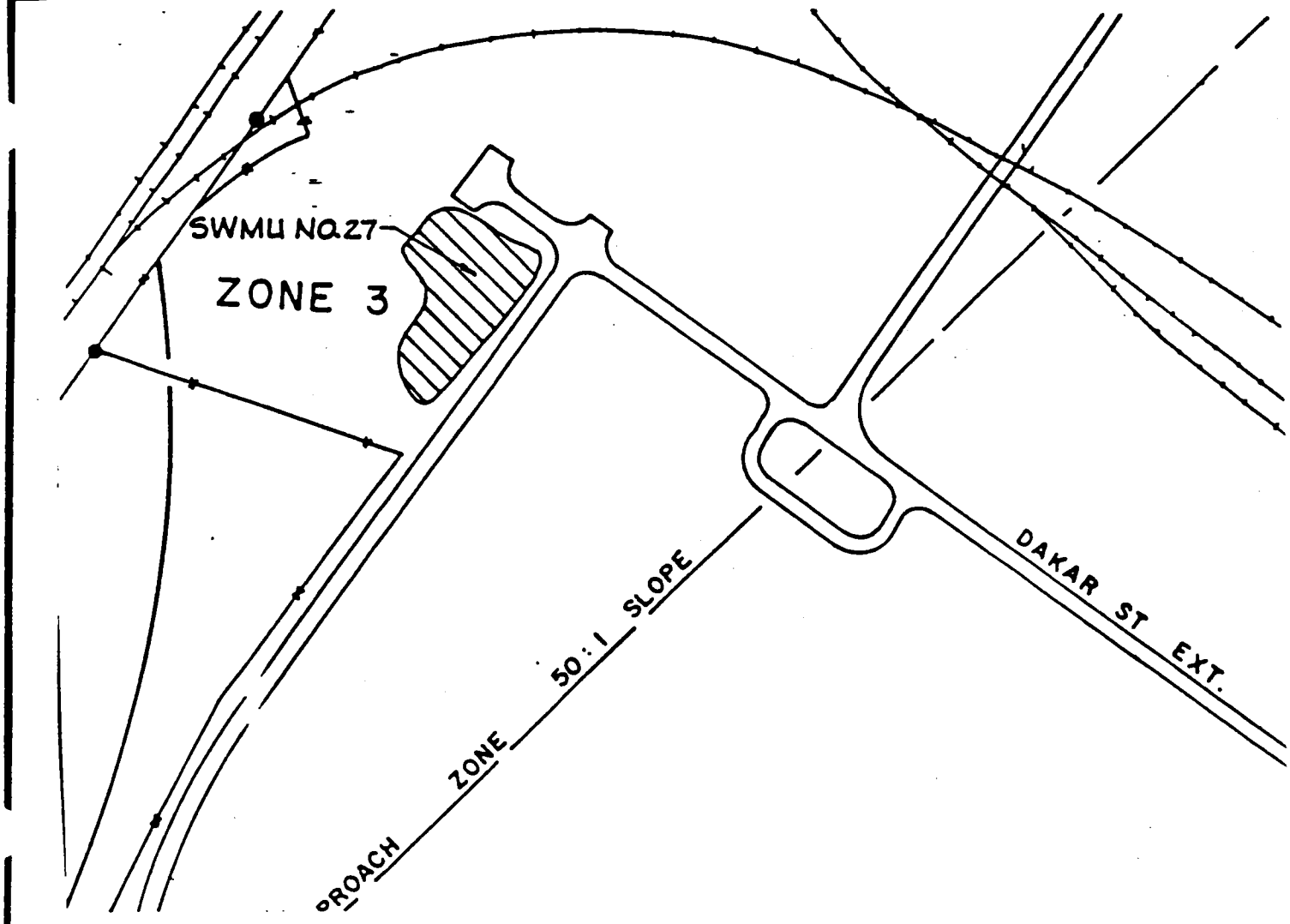
No previous data. Air sampling is not needed for this SWMU.

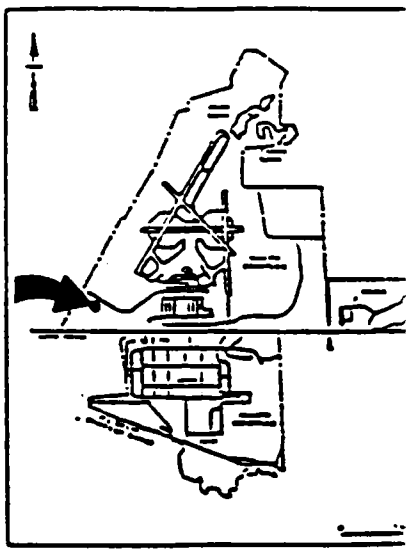
7.27.7.5 SUBSURFACE GAS

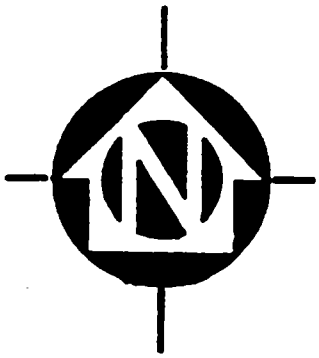
No previous data. Subsurface gas monitoring is not needed for this SWMU.

7.27.8 RECOMMENDED ACTIONS

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



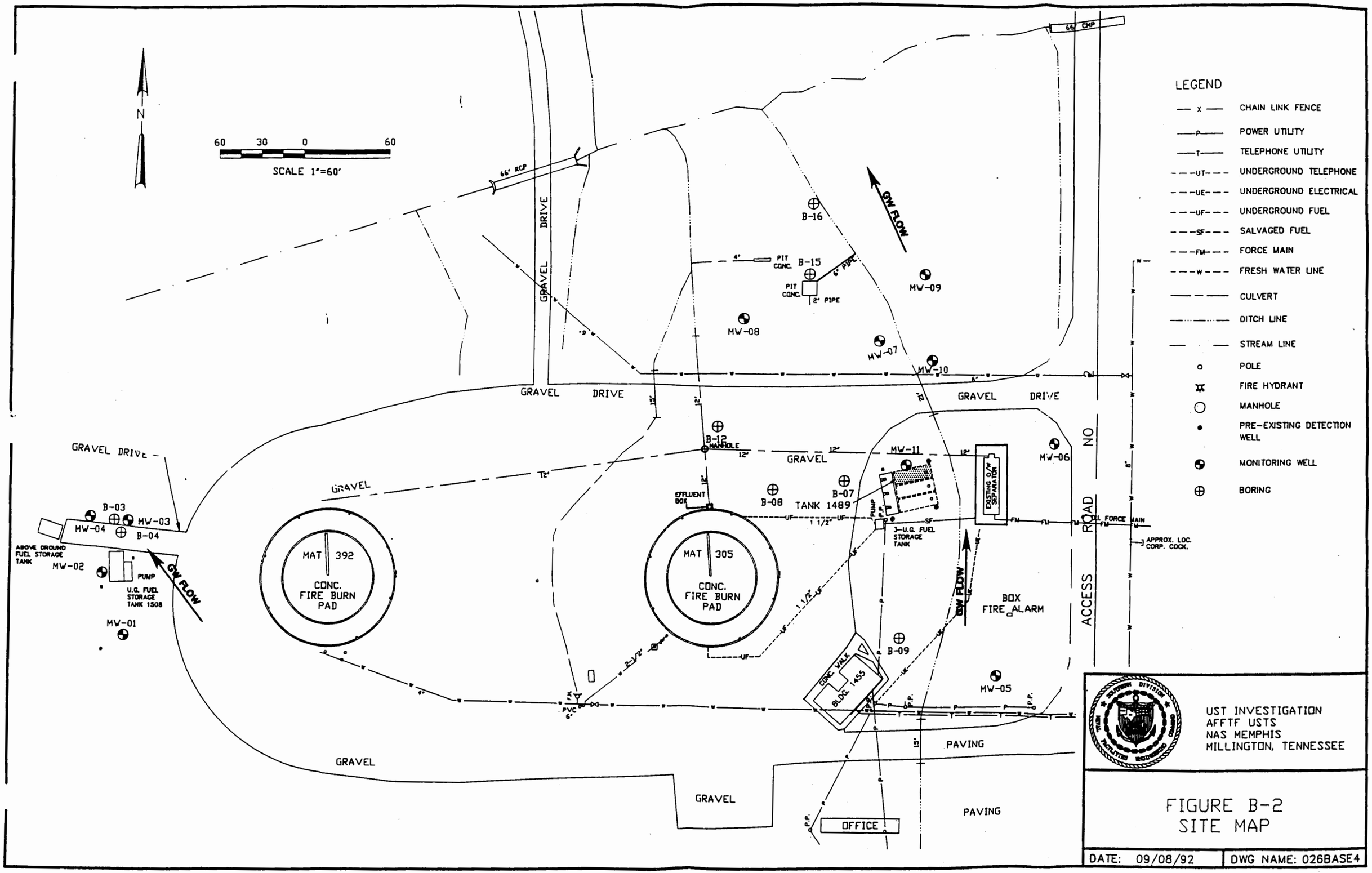




SWMU NO. 27 NORTHSIDE STP
FIGURE 7-27 LOCATION MAP

APPENDIX B

MISCELLANEOUS BORING LOGS



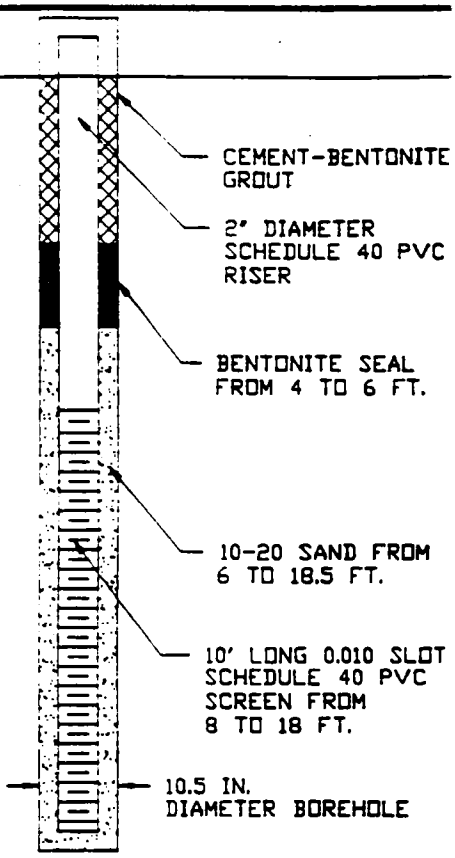
UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE B-2
SITE MAP

DATE: 09/08/92 | DWG NAME: 026BASE4

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
		MW01 0	1/2		0-0.5 LIGHT BROWM SAND AND SILT WITH ORGANICS AND ROOTS.
		MW01 2	1/2		0.5-2 DARK BROWN SILT AND CLAY WITH LAYERED TEXTURE. TIGHT,DRY.
		MW01 4	1/2		2-4 MOTTLED BROWN,LIGHT-BROWN,ORANGE-BROWN SILT AND CLAY WITH DARK ORGANIC SPECKS. TIGHT,DRY.
5		MW01 6	1/2		4-12 MOTTLED CLAY,SOME SILT BECOMING LIGHT GRAY/BROWN. TIGHT,MOIST.
		MW01 8	1/3	GRO, BTX	
10		MW01 10	1/3		● WATER AT 10-12 FT.
		MW01 12	1/3		12-18 HOMOGENOUS GRAY SILT. FIRM TO SOFT,WET
		MW01 14	1/5		
15		MW01 16	1/3		
					18-18.5 NO SAMPLE END OF BORING AT 18.5 FT.
20					
25					
30					

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW STEM AUGERS
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER

DATE OF COMPLETION: 06/22/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

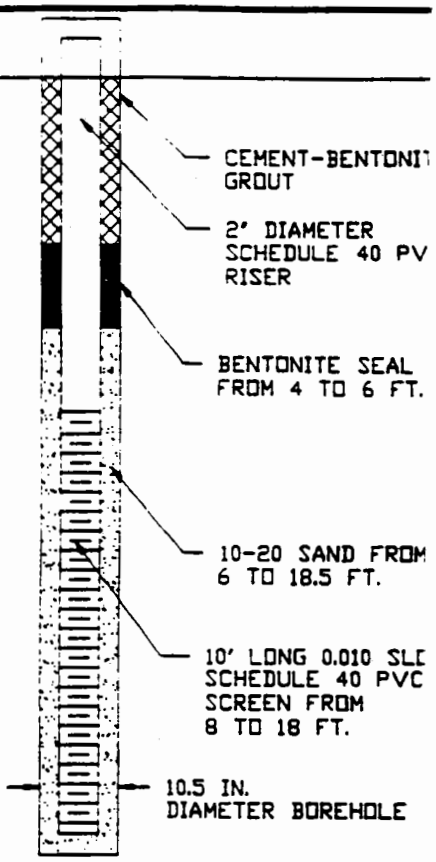
BORING B-01
MW-01

DATE: 08/08/92

DWG NAME: 026MW-01

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
0	MW02 0	1/11			0-0.5 LIGHT BROWN SAND AND SILT WITH ORGANICS AND ROOTS.
	MW02 2	28/25			0.5-2 MOTTLED BROWN, ORANGE-BROWN SILT AND CLAY. TIGHT,DRY.
	MW02 4	100/200			2-5 MOTTLED BROWN, ORANGE-BROWN, GREEN-GRAY SILT AND CLAY WITH FEW BLACK ORGANIC SPECKS. TIGHT,MOIST,WITH HYDROCARBON ODOR.
5	MW02 6	100/NH*		K, GRO, BTX RFI-SCAN	
	MW02 8	100/NH*			
	MW02 10	200/NH*		K, GRO, BTX	5-11.5 DARK GRAY HYDROCARBON-STAINED. SILT AND CLAY. TIGHT,SOFT,WET TO MOIST. STRONG HYDROCARBON ODOR.
10					● WATER AT 11.5 FT.
	MW02 12	200/200			11.5-12 BROWN SAND,SOME GRAVEL AND SILT. WET,LOOSE,NO APPARENT ODOR.
	MW02 14	10/14			12-12.5 GRAY, BROWN, ORANGE-BROWN SILT AND CLAY TIGHT,MOIST TO WET.
15	MW02 16	20/11			12.5-18 HOMOGENOUS GRAY SILT. FIRM, WET. -WITH A GRAVEL ISOLATE AT 15 FT.
					18-18.5 NO SAMPLE END OF BORING AT 18.5 FT.
20					
25					
30					* NH-NO 15 MINUTE HEADSPACE ANALYSIS.

WELL CONSTRUCTION DETAILS



DRILLER:

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.
SHELBY TUBE FOR PERMEABILITY SAMPLES.

DATE OF COMPLETION: 06/22/92 MONITORING WELL
06/27/92 SHELBY TUBE

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

BORING B-02
MW-02

DATE: 08/08/92

DWG NAME: 026MW-02

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	
		B03 0	5/5		0-17 BROWN SAND,SILT AND ORGANICS,SOME GRAVEL
					17-4 BROWN TO DARK BROWN SILT,LITTLE CLAY. TIGHT,DRY.
		B03 2	10/4		
		B03 4	5/4		4-6 MOTTLED LIGHT-BROWN,GRAY,ORANGE-BROWN SILT AND CLAY,WITH SOME BLACK ORGANIC SPECKS. LOOSE,WET.
5		B03 6	2/5		6-6.5 ORANGE-BROWN SILT AND GRAVEL. LOOSE,WET.
					6.5-8 MOTTLED LIGHT-BROWN,GRAY,ORANGE-BROWN SILT AND CLAY,WITH SOME BLACK ORGANIC SPECKS.
		B03 8	2/4	GRO, BTX	8-12 GRADING TO MOTTLED GRAY,ORANGE-BROWN SILT WITH SOME BLACK ORGANIC SPECKS.
10		B03 10	2/4		● WATER AT 10 FT.
					END OF BORING AT 12 FT.
15					
20					
25					
30					

DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
3.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/22/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

BORING B-03

DATE: 07/28/92

DWG NAME: 026B-03

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	
					GRAVEL ROAD BEDDING.
		B04 2	0/1		2-4 BROWN SILT,WITH MINOR BLACK ORGANIC SPECKS. TIGHT,DRY.
		B04 4	0/1		4-6 BROWN SILT AND CLAY,WITH MINOR BLACK ORGANIC SPECKS. TIGHT,DRY.
5		B04 6	0/4		6-7 LIGHT GRAY SILT AND CLAY,MOTTLED WITH ORANGE -BROWN PATCHES. TIGHT,DRY.
		B04 8	6/40	GRO, BTX	7-10 DARK GRAY CLAY, MOTTLED WITH ORANGE-BROWN PATCHES. TIGHT,DRY TO MOIST. -WITH HYDROCARBON ODOR AT 8-10 FT.
10		B04 10	5/5	GRO, BTX	10-11 DARK GRAY SILT AND CLAY,MOTTLED WITH ORANGE -BROWN PATCHES. TIGHT,MOIST,WITH HYDROCARON ODOR.
		B04 12	2/4	GRO, BTX	11-16 LIGHT GRAY SILT AND CLAY, MOTTLED WITH ORANGE-BROWN PATCHES. TIGHT,MOIST TO WET NO APPARENT ODOR.
		B04 14	2/3		● WATER AT 14 FT.
15		B04 16	1/2		16-19.5 MOTTLED GRAY,BROWN,ORANGE-BROWN SILT,SOME CLAY. TIGHT,WET.
		B04 18	3/2		19.5-20 GRAY UNIFORM SILT. FIRM,WET.
20					END OF BORING AT 20 FT.
25					
30					

DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
3.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/22/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

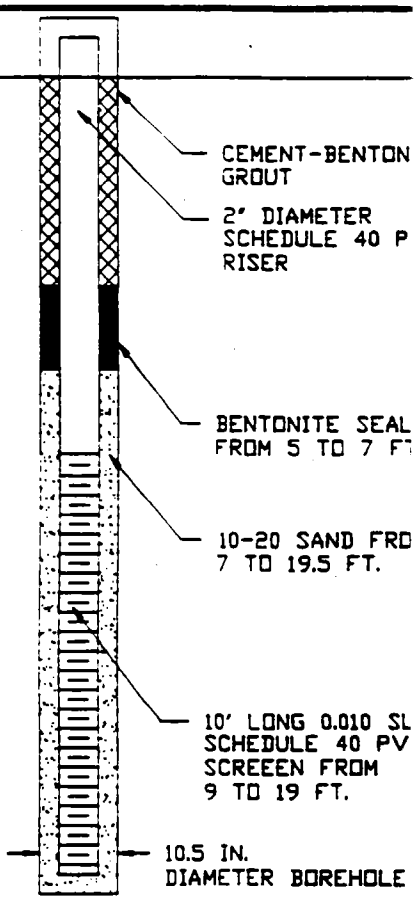
BORING B-04

DATE: 07/28/92

DWG NAME: 0268-04

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
		MW03 0	3/2		0-1 BROWN SAND,SILT AND ORGANICS,SOME GRAVEL. LOOSE,DRY.
		MW03 2	2/2		1-4 BROWN, ORANGE-BROWN SILT,SOME GRAVEL AND CLAY,BECOMING (AT 4 FT.) MOTTLED BROWN, ORANGE-BROWN SILT,LITTLE CLAY.
		MW03 4	1/2		4-7 GRAY-BROWN SILT,LITTLE CLAY,BECOMING (AT 4.5 FT.) GRAY SILT AND CLAY WITH ORANGE-BROWN MOTTLING AND BLACK ORGANIC SPECKS.
5		MW03 6	1/2		
		MW03 8	1/2		7-10 GRADING TO DARK-GRAY CLAY, LITTLE SILT, WITH ORANGE-BROWN MOTTLES AND BLACK ORGANIC SPECKS. VERY TIGHT,MOIST.
10		MW03 10	1/2	GRO, BTX	10-12 LIGHT GRAY SILT AND CLAY WITH ORANGE-BROWN MOTTLES AND BLACK ORGANIC SPECKS. TIGHT,MOIST TO WET.
		MW03 12	1/2		● WATER AT 12 FT. 12-17 MOTTLED GRAY,BROWN,ORANGE-BROWN SILT AND CLAY,WITH BLACK ORGANIC SPECKS. SOFT,WET.
		MW03 14	1/3		
15		MW03 16	1/4		
					17- 19 BECOMING MOTTLED LIGHT-GRAY, ORANGE-BROWN SILT,WITH SCATTERED BLACK ORGANIC SPECKS.
					19-19.5 NO SAMPLE END OF BORING AT 19.5 FT.
20					
25					
30					

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/23/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

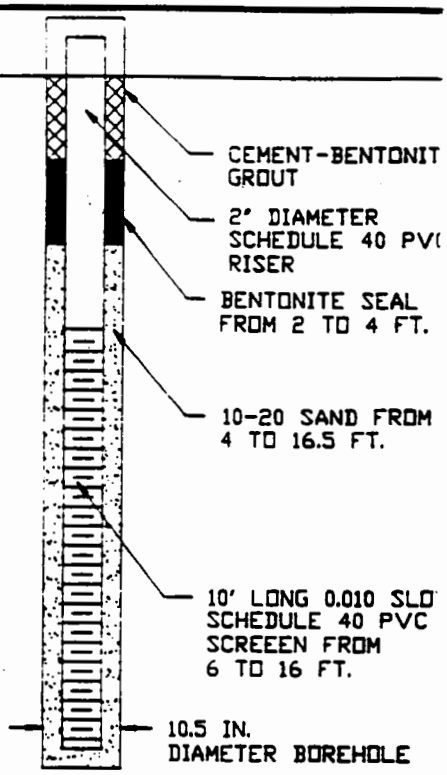
BORING B-05
MW-03

DATE: 08/08/92

DWG NAME: 026MW-03

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
		MW04 0	3/3		0-2 BROWN SAND, SILT AND ORGANICS; BECOMING (AT 1 FT.) BROWN, ORANGE SAND AND SILT,SOME GRAVEL. LOOSE TO TIGHT,DRY TO MOIST.
		MW04 2	2/4		2-4 LAYERED BROWN, LIGHT-BROWN SILT, SOME CLAY, WITH MINOR ORANGE-BROWN MOTTLES AND BLACK ORGANIC SPECKS; BECOMING (AT 3 FT.) LIGHT-BROWN,ORANGE-BROWN SILT AND CLAY. TIGHT, MOIST.
		MW04 4	2/4		
5		MW04 6	2/3		4-6 BECOMING LIGHT-BROWN TO GRAY CLAY, WITH ORANGE-BROWN MOTTLED ZONES AND BLACK TO BROWN-DARK RED ORGANIC SPECKS.
		MW04 8	1/3	GRO, BTX	6-10 BECOMING LIGHT BROWN TO GRAY SILT AND CLAY, WITH ORANGE-BROWN MOTTLING AND DARK BROWN TO DARK RED ORGANIC NODULES.
10		MW04 10	1/2		● WATER AT 10 FT.
		MW04 12	1/3		10-15.5 BECOMING GRAY SILT,SOME CLAY,WITH ORANGE-BROWN MOTTLING AND DARK BROWN TO DARK RED ORGANIC NODULES. TIGHT,WET.
		MW04 14	1/3		
15					15.5-16.5 BECOMING MOTTLED GRAY AND ORANGE-BROWN SILT AND CLAY. TIGHT,WET.
					16-16.5 NO SAMPLE END OF BORING AT 16.5 FT.
20					
25					
30					

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/23/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

BORING B-06
MW-04

DATE: 08/08/92

DWG NAME: 026MW-04

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	
		B07 0	1000 / 700		0-0.5 BROWN AND GRAY-BLACK SILT AND ASH,LITTLE SAND. LOOSE,DRY,HYDROCARBON ODOR.
		B07 2	1000 / 1000	RFI-SCAN, GRO, BTX	0.5-3.5 BROWN TO GRAY-BROWN SILT,SOME CLAY,ORGANICS AND ROOTS;BECOMING (AT 2 FT.) MOTTLED GRAY-BROWN,ORANGE-BROWN SILT,SOME CLAY WITH BLACK TO DARK-RED ORGANIC SPECKS AND SOME ROOTS. TIGHT,DRY,HYDROCARBON ODOR.
		B07 4	900 / 900		
5					
		B07 6	700 / 900		3.5-11 DARK GRAY-BROWN TO GRAY-GREEN-BROWN, HYDROCARBON STAINED SILT AND CLAY,WITH GRAY MOTTLED PATCHES. TIGHT,MOIST TO WET, HYDROCARBON ODOR.
		B07 8	300 / NH*	GRO, BTX	
10		B07 10	5 / 10		● WATER AT 10 FT.
					11-16 GRAY,DARK-GRAY SILT. FIRM,WET.
		B07 12	3 / 7		
		B07 14	2 / 5		
15					
		B07 16			END OF BORING AT 16 FT.
		B07 18			
20					
25					
30					

* NH-NO 15 MINUTE HEADSPACE ANALYSIS.

DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
3.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/23/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

BORING B-07

DATE: 07/28/92

DWG NAME: 026B-07

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	
	0	B08	20/30		0-0.5 COMPACTED SAND AND GRAVEL OVERLYING 1/2" THICK LAYER OF ASH.
	2	B08	4/25		0.5-2 BROWN SILT AND CLAY. COMPACT,DRY TO MOIST.
	4	B08	1000/1000	RFI-SCAN, GRO, BTX	2-5 MOTTLED BROWN,ORANGE-BROWN SILT,SOME CLAY, WITH DARK-BROWN,DARK-RED ORGANIC NODULES.
5	6	B08	200/200		5-11 DARK GREEN-GRAY,HYDROCARBON STAINED SILT AND CLAY, WITH FAINT LIGHT-GRAY AND ORANGE-BROWN MOTTLING. TIGHT,MOIST,CHEMICAL ODOR.
	8	B08	600/800		
10	10	B08	600/NH*	GRO, BTX, VOC	● WATER AT 11 FT.
					11-12 GRAY,DARK-GRAY SILT. WET.
					END OF BORING AT 12 FT.
15					
20					
25					
30					

* NH-NO 15 MINUTE HEADSPACE ANALYSIS.

DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
3.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/23/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

BORING B-08

DATE: 07/28/92

DWG NAME: 026B-08

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	
0		B09 0	40/30		0-1 BROWN SILT AND ORGANICS,SOME GRAVEL,LITTLE SAND)BECOMING (AT 1 FT.) MOTTLED BROWN, ORANGE-BROWN SILT,SOME ORGANICS.
		B09 2	20/55		2-4 DARK GRAY CLAY WITH SUBDUED ORANGE-BROWN, LIGHT-GRAY MOTTLING. TIGHT,MOIST.
5		B09 4	600/1100	RFI-SCAN, GRO, BTX	4-7 DARK GRAY CLAY,SOME SILT. TIGHT,MOIST, CHEMICAL ODOR.
		B09 6	500/600		7-12 BECOMING MOTTLED LIGHT-GRAY AND ORANGE-BROWN SILT,SOME CLAY,WITH SCATTERED BLACK ORGANIC SPECKS. TIGHT,MOIST TO WET.
		B09 8	20/20		
10		B09 10	6/2	GRO, BTX	● WATER AT 11 FT.
					END OF BORING AT 12 FT.
15					
20					
25					
30					

DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
3.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/24/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

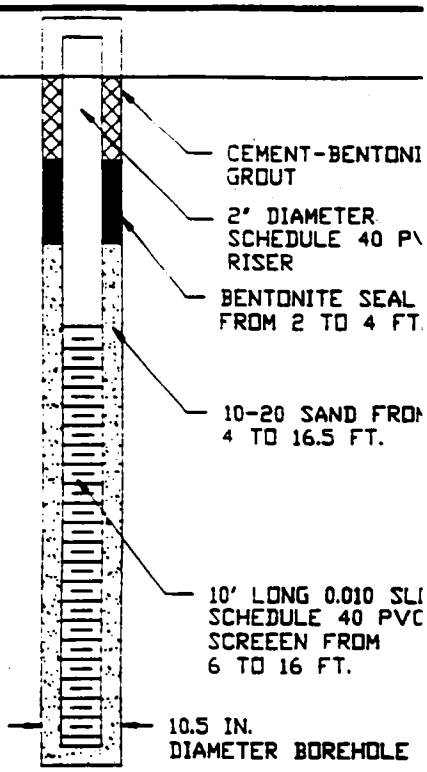
BORING B-09

DATE: 07/28/92

DWG NAME: 0268-09

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
		MW05 0	1/4		0-2 DARK BROWN SILT AND ORGANICS. 2-6 DARK BROWN CLAY,WITH INTERSPERSED ORANGE-BROWN NODULES. VERY TIGHT TO MOIST.
		MW05 2	2/2		
		MW05 4	1/3		
5		MW05 6	1/2		6-13 BECOMING MOTTLED BROWN-GRAY.ORANGE-BROWN SILT AND CLAY. TIGHT,MOIST TO WET.
		MW05 8	1/2	RFI-SCAN, BTX GRO, BTX	
10		MW05 10	1 / NH*		● WATER AT 10 FT.
		MW05 12	0/2		13-14.5 BECOMING DARK BROWN CLAY,LITTLE SILT, BECOMING DARK BROWN TO BLACK CLAY WITH ROOTS AND ORGANICS. VERY TIGHT.
		MW05 14	1/1		14.5-16.5 NO SAMPLE END OF BORING AT 16.5 FT.
15					
20					
25					
30					* NH-NO 15 MINUTE HEADSPACE ANALYSIS.

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/24/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

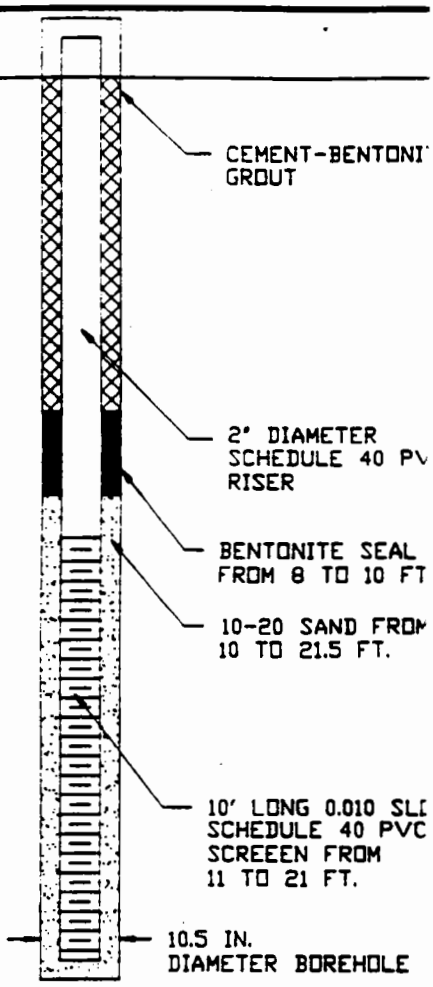
BORING B-10
MW-05

DATE: 08/08/92

DWG NAME: 026MW-05

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
0		MW06 0	1/3		0-2 BROWN SILT AND SAND, SOME GRAVEL AND ORGANICS. LOOSE, DRY.
		MW06 2	1/5		2-3.5 BROWN-GRAY SILT AND CLAY, SOME ORGANICS AND ROOTS. TIGHT, MOIST.
		MW06 4	200/400		3.5-7.5 BECOMING DARK GRAY, BLACK CLAY. PLIABLE TO HARD, MOIST TO WET TO MOIST. HYDROCARBON ODOR.
5		MW06 6	1500/NH*	RFI-SCAN, GRO, BTX	7.5-10.5 BECOMING DULL GREEN-GRAY, HYDROCARBON STAINED SILT AND CLAY WITH ORANGE-BROWN MOTTLING AND MINOR DARK BROWN-RED NODULES.
		MW06 8	400/500		10.5-11 DARK BROWN-GRAY CLAY, LITTLE SILT. PLIABLE, MOIST.
10		MW06 10	3/7	GRO, BTX	11-20 MOTTLED LIGHT-BROWN-GRAY AND ORANGE-BROWN SILT, SOME CLAY, WITH BLACK ORGANIC PATCHES. WET.
		MW06 12	3/1		● WATER AT 12 FT.
		MW06 14	1/1		
15		MW06 16	0/2		
		MW06 18	1/1		
20					20-21.5 NO SAMPLE. END OF BORING AT 21.5 FT.
25					
30					* NH-NO 15 MINUTE HEADSPACE ANALYSIS.

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/24/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

BORING B-11
MW-06

DATE: 07/29/92

DWG NAME: 026MW-06

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	
		B12 0	50 / NH*		0-1 TAN-BROWN SAND AND GRAVEL. LOOSE,DRY.
		B12 2	200 / NH*		1-2 DARK GREEN-GRAY SILT AND ASH,WITH A PIECE OF BLACK RUBBER-TAR-LIKE MATERIAL. TIGHT,DRY.
		B12 4	500 / 650	GRO, BTX	2-11 DARK GRAY-GREEN SILT AND CLAY,WITH SUBDUED LIGHT-GRAY AND ORANGE-BROWN MOTTLING. HYDROCARBON STAINED. TIGHT,MOIST.
5		B12 6	300 / 700		
		B12 8	500 / 850		
10		B12 10	500 / 750	GRO, BTX	● WATER AT 11 FT.
					11-12 DARK GRAY-GREEN SILT
					END OF BORING AT 12 FT.
15					
20					
25					
30					* NH-NO 15 MINUTE HEADSPACE ANALYSIS.

DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
3.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/24/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

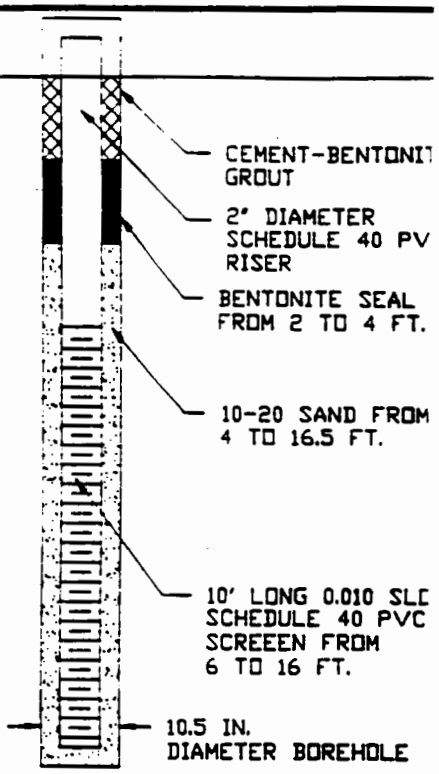
BORING B-12

DATE: 07/28/92

DWG NAME: 0268-12

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
		MW07 0	2/2		0-1 BROWN SILT AND ORGANICS, SOME CLAY AND ROOTS.
		MW07 2	200/700		1-3 DARK BROWN SILT AND CLAY WITH FAINT GRAY AND ORANGE-BROWN MOTTLING, AND BLACK ORGANIC SPECKS TO RUST-BROWN NODULES. TIGHT, MOIST.
		MW07 4	250/850	GRO, BTX	3-6 BECOMING GRAY-GREEN HYDROCARBON STAINED CLAY, WITH SUBDUED ORANGE-BROWN MOTTLING AND RUST-BROWN NODULES. VERY TIGHT, MOIST, HYDROCARBON ODOR.
5		MW07 6	50/400	GRO, BTX	6-9.5 BECOMING DARK GREEN-GRAY SILT AND CLAY. TIGHT, MOIST.
		MW07 8	1/5	GRO, BTX	9.5 BECOMING DARK BROWN CLAY. WET, VERY PLIABLE. ● WATER AT 9.5 FT.
10		MW07 10	2/5		
		MW07 12	2/2		10-16 MOTTLED LIGHT-BROWN, GRAY, ORANGE-BROWN SILT, WITH DARK-BROWN, RED-BLACK NODULES. FIRM, WET.
		MW07 14	1/2		
15					16-16.5 NO SAMPLE. END OF BORING AT 16.5 FT.
20					
25					
30					

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/25/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

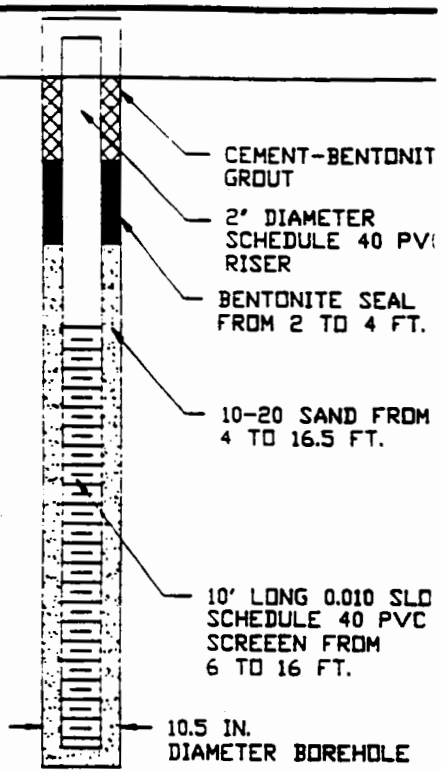
BORING B-13
MW-07

DATE: 08/08/92

DWG NAME: 026MW-07

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
		MW08 0	1/0		0-0.5 BROWN SILT, ORGANICS AND ROOTS 0.5-2 MOTTLED LIGHT-BROWN-GRAY, ORANGE-BROWN SILT, SOME CLAY AND ROOTS. DRY.
		MW08 2	1000/1100	GRO, BTX	2-10 DARK GREEN-GRAY SILT AND CLAY. HYDROCARBON-STAINED. TIGHT, MOIST TO WET. UNIDENTIFIED ODOR.
		MW08 4	1000/1100	VOC	
5		MW08 6	500/700		
		MW08 8	10/8	GRO, BTX	
					● WATER AT 9-10 FT.
10		MW08 10	7/0		10-13 BECOMING MOTTLED GRAY, ORANGE-BROWN SILT. FIRM, WET.
					13 THIN HORIZON (3") OF BLACK SILT.PASTE-LIKE,WET.
		MW08 12	200/20	VOC	13-15 MOTTLED GRAY, ORANGE-BROWN SILT;BECOMING RED -BROWN SILT WITH MINOR ORANGE-BROWN STREAKS.
		MW08 14	3/16		
15					15-16 UNIFORM GRAY SILT.
					16-16.5 NO SAMPLE. END OF BORING AT 16.5 FT.
20					
25					
30					

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/25/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

BORING B-14
MW-08

DATE: 08/08/92

DWG NAME: 026MW-08

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	
		B15 0	14/200		0-1? BROWN SILT AND ORGANICS. 1-7 DARK BROWN-BLACK SILT AND CLAY,HYDROCARBON STAINED. TIGHT,HARD.
		B15 2	1000/1100	RFI-SCAN.	
		B15 4	800/1100	GRO, BTX	
5		B15 6	700/100		7-8 BECOMING GREEN-GRAY SILT,POSSIBLY HYDRO-CARBON STAINED. FIRM,MOIST.
		B15 8	10/10	GRO, BTX	8-11 BECOMING MOTTLED GRAY,ORANGE-BROWN SILT AND CLAY. FIRM,MOIST.
10		B15 10	3/4	GRO, BTX	● WATER AT 11 FT. 11-11.5 DARK BROWN CLAY,SOME SILT. 11.5-12 GREEN-GRAY SILT AND CLAY. END OF BORING AT 12 FT.
15					
20					
25					
30					

DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
3.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/25/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

BORING B-15

DATE: 07/28/92

DWG NAME: 026B-15

DESCRIPTION OF SUBSURFACE MATERIALS

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	
		B16 0	1/1		0-1 BROWN,ORANGE-BROWN SILT,ORGANICS AND ROOTS.
		B16 2	1/0		1-4 DARK BROWN ORGANIC-RICH SILT AND CLAY; BECOMING (AT 2 FT.) DARK BROWN-BLACK ORGANIC-RICH CLAY. TIGHT TO VERY TIGHT,DRY.
		B16 4	1/1		4-6 BECOMING MOTTLED GRAY-GREEN,GRAY-BROWN, DARK-BROWN SILT AND CLAY.
5		B16 6	1/2		6-7.5 BECOMING GREEN-GRAY SILT,LITTLE CLAY. FIRM,WET.
		B16 8	1/1		7.5-10 BECOMING LIGHT-BROWN,GRAY-BROWN SILT AND CLAY. TIGHT,MOIST.
10		B16 10	1/1	GRO, BTX	10-12 BECOMING MOTTLED GRAY,ORANGE-BROWN SILT, SOME CLAY. TIGHT,MOIST.
					● WATER AT 11 FT.
					END OF BORING AT 12 FT.
15					
20					
25					
30					

DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
3.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/25/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

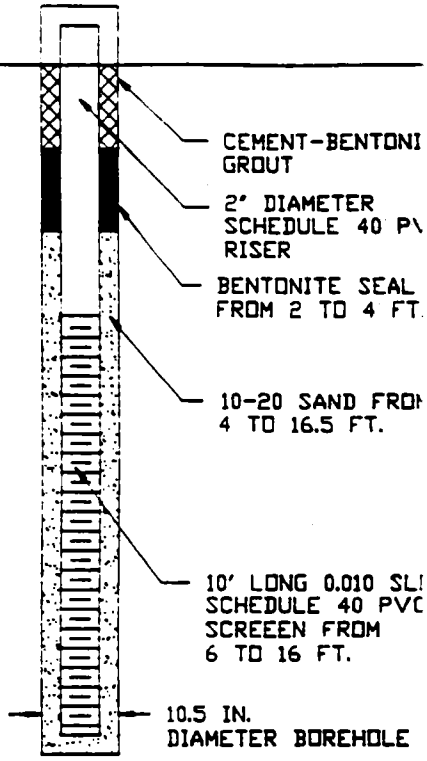
BORING B-16

DATE: 07/28/92

DWG NAME: 026B-16

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
		MW09 0	0/0		0-1.5 BROWN SILT,CLAY,ORGANICS AND ROOTS; BECOMING MOTTLED BROWN,ORANGE-BROWN SILT, CLAY AND ROOTS.
		MW09 2	0/0		1.5-4 BECOMING DARK BROWN CLAY,TURNING DARK BROWN-BLACK ORGANIC-RICH CLAY WITH SOME ROOTS,TIGHT,MOIST.
		MW09 4	0/0		
5					4-6 BECOMING GRAY SILT AND CLAY WITH FAINT ORANGE-BROWN INTERBEDS. TIGHT,MOIST.
		MW09 6	0/0		6-10 MOTTLED GRAY-BROWN,BLUE-GRAY SILT AND CLAY. BECOMING (AT 8 FT.) MOTTLED LIGHT-BROWN AND BLUE-GRAY. TIGHT,MOIST.
		MW09 8	0/0	GRO, BTX	
10		MW09 10	0/0		● WATER AT 9.5 FT.
					10-12 GRAY-BROWN SILT.
		MW09 12	0/0		12-16 MOTTLED GRAY,ORANGE-BROWN SILT,WITH MINOR BLACK TO DARK-RED NODULES OR PATCHES. FIRM,WET.
		MW09 14	0/0		
15					16-16.5 NO SAMPLE END OF BORING AT 16.5 FT.
20					
25					
30					

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/26/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

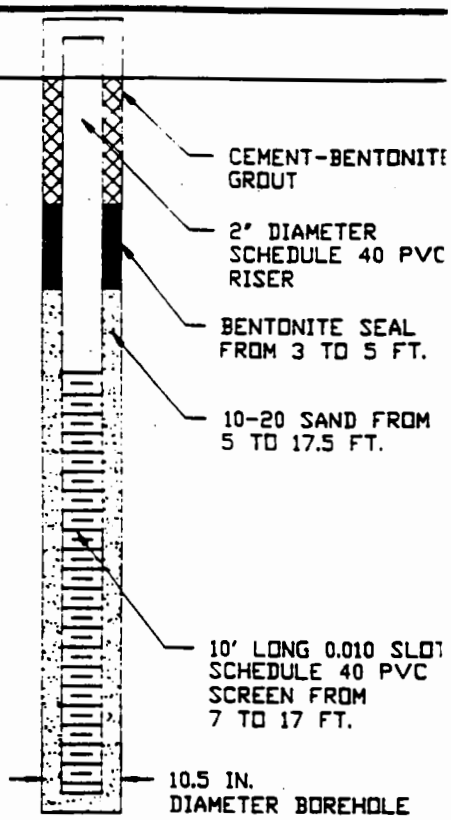
BORING B-17
MW-09

DATE: 08/08/92

DWG NAME: 026MW-09

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
		MW10 0	0/0		0-0.5 BROWN SILT,CLAY AND ORGANICS
		MW10 2	12/600	GRO, BTX	0.5-2 MOTTLED BROWN,GRAY-BROWN,ORANGE-BROWN SILT AND CLAY WITH MINOR BLACK ORGANIC NODULES. FIRM,MOIST.
		MW10 4	14/600		2-4 BECOMING DARK GRAY CLAY. TIGHT,MOIST, HYDORCARBON ODOR.
5		MW10 6	1/5	GRO, BTX	4-6 BECOMING DARK-GREEN-GRAY,HYDROCARBON STAINED SILT AND CLAY. TIGHT,MOIST,HYDROCARBON ODOR.
		MW10 8	1/0		6-8 GREEN-GRAY SILT AND CLAY.
10		MW10 10	1/0	GRO, BTX	8-10 MOTTLED GREEN-GRAY ORANGE-BROWN SILT AND CLAY.
		MW10 12	1/1		10-12 BECOMING GREEN-GRAY SILT. FIRM,MOIST.
		MW10 14	1/1		● WATER AT 12 FT.
15					12-16 MOTTLED GRAY-BROWN,ORANGE-BROWN SILT WITH BLACK TO RED NODULES OR PATCHES FIRM,WET.
					16-17.5 NO SAMPLE. END OF BORING AT 17.5 FT.
20					
25					
30					

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/26/92

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

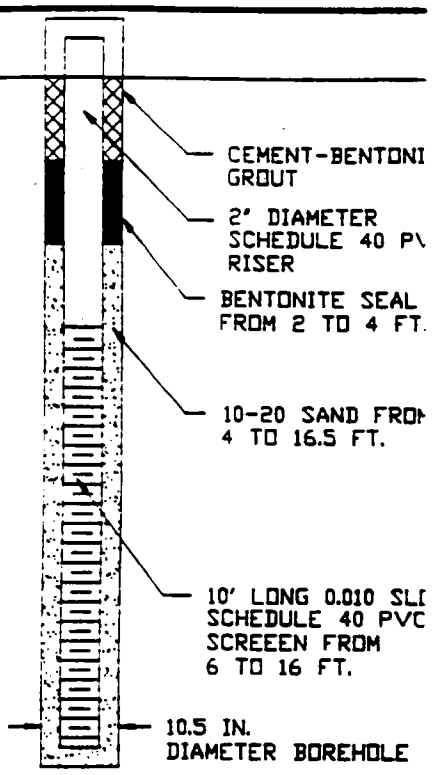
BORING B-18
MW-10

DATE: 07/29/92

DWG NAME: 026MW-10

DEPTH (FEET)	SAMPLE INTERVAL	SAMPLE NUMBER	PID (PPM) (INITIAL/15 MIN.)	LABORATORY ANALYSIS	DESCRIPTION OF SUBSURFACE MATERIALS
	MW11 0	13/10			0-1 SILT AND ORGANICS,SOME CLAY.
					1-2 INTERLAYERED BROWN,GRAY-BROWN,ORANGE-BROWN SILT AND CLAY,MINOR GRAVEL. TIGHT,MOIST.
	MW11 2	300/500			2-9 BECOMING DARK GREEN-GRAY,HYDROCARBON-STAINED SILT AND CLAY. TIGHT,MOIST,HYDROCARBON ODOR.
	MW11 4	1300/NH*		K GRO, BTX,	
5	MW11 6	500/1100		RFI-SCAN	
					● PERCHED WATER AT 7 FT.
	MW11 8	150/300			-WITH FAINT GRAY,ORANGE-BROWN MOTTLING FROM 7 TO 10 FT.
					9-11 MOTTLED GRAY,ORANGE-BROWN SILT. FIRM,MOIST.
10	MW11 10	20/80		K, GRO, BTX	11 THIN (3" THICK) HORIZON OF ORANGE-BROWN SILT AND CLAY. EXTREMELY TIGHT AND COMPACT, DRY.
	MW11 12	1/1			● WATER AT ~ 11.5 FT.
					11-16 GRAY UNIFORM SILT. FIRM,WET.
	MW11 14	0/0			
15					16-16.5 NO SAMPLE. END OF BORING AT 16.5 FT.
20					
25					
30					* NH-NO 15 MINUTE HEADSPACE ANALYSIS.

WELL CONSTRUCTION DETAILS



DRILLER: PROFESSIONAL SERVICE INDUSTRIES, INC.
4161 RIDGEMOOR AVENUE
MEMPHIS, TN. 38118

DRILLING AND SAMPLING METHOD:
6.25-INCH ID HOLLOW-STEM AUGERS.
2 FT. LONG, 2 IN. OD SPLIT BARREL SAMPLER.

DATE OF COMPLETION: 06/26/92-MONITORING WELL
06/27/92-SHELBY TUBE

ENVIRONMENTAL ASSESSMENT
UNDERGROUND STORAGE TANKS
AIRCRAFT FIRFIGHTING TRAINING FACILITY
NAS MEMPHIS, TN.

BORING B-19
MW-11

DATE: 08/08/92

DWG NAME: 026MW-11

APPENDIX C

SITE-SPECIFIC HEALTH AND SAFETY PLAN

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY NAVAL AIR STATION MEMPHIS, TENNESSEE

SITE-SPECIFIC HEALTH AND SAFETY PLAN SWMU 27 — NORTHSIDE SEWAGE TREATMENT PLANT

CTO-094
Contract Number:N62467-89-D-0318

Prepared for:

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

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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1.0 INTRODUCTION

A RCRA Facility Investigation (RFI) is being conducted at the Northside Sewage Treatment Plant (SWMU 27) located at the Naval Air Station Memphis (NAS Memphis), Millington, Tennessee. The purpose of the monitoring program is to assess the nature and extent of potential contamination at the site and to determine if additional action is required to maintain compliance with environmental regulations.

This Site-Specific Health and Safety Plan (SSHSP) is written for field operations to be conducted at SWMU 27. This plan is to be used in conjunction with the approved NAS Memphis Comprehensive Health and Safety Plan (CHASP). Copies of both this plan and the CHASP should be onsite during all field operations. The Navy project contract number with EnSafe/Allen & Hoshall (E/A&H) is N62467-89-D-0318, CTO-094.

Applicability

See CHASP Section 7.0.

Current Hazardous Waste and Emergency Response Operators (HAZWOPER) training certificates for E/A&H and U.S. Geological Survey (USGS) employees and all subcontractors anticipated to be conducting field work onsite will be filed onsite and available for review. Individuals whose certifications are not on file, or those who have a more recent certificate (have attended a refresher course), will provide the Site Supervisor with a copy of their certificate before being allowed to enter a work area.

Current OSHA refresher training certificates will be available onsite for all employees involved in field activities if their refresher course requirements come up for renewal before the project begins. All subcontractors, Navy oversight personnel, and any other site visitors must provide health and safety certification with appropriate refresher course documentation prior to site entry.

2.0 SITE CHARACTERIZATION

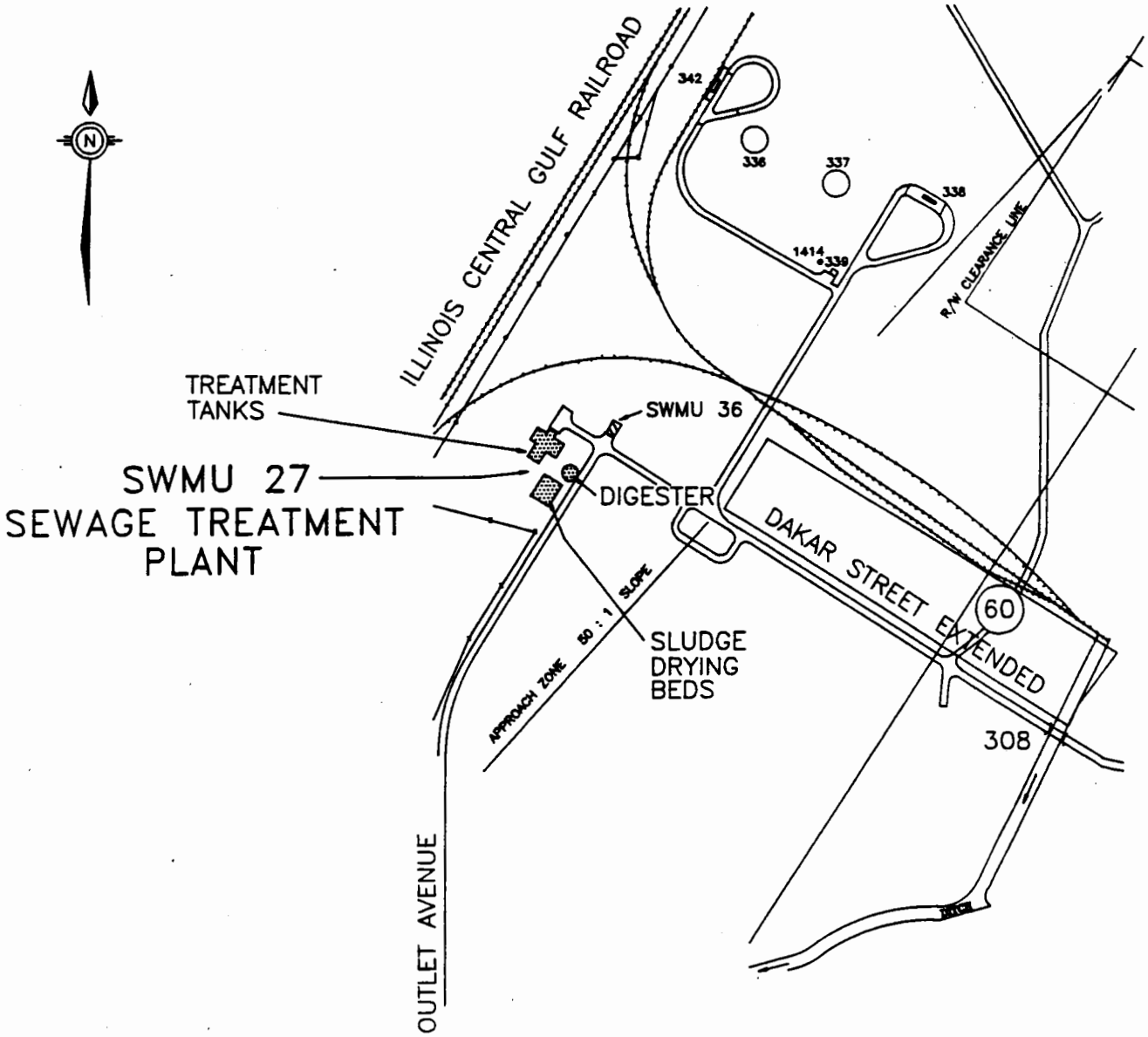
2.1 Site Description

SWMU 27 is the site of a former sewage treatment plant (STP) at the southwest corner of the NAS Memphis Northside at the end of Dakar Street Extended and Outlet Avenue. A vicinity map of SWMU 27 is provided in Figure 1. The STP was constructed in 1943 and included a digester tank (N-44), a control house, six treatment tanks (N-45) and four sludge drying beds (N-46).

There are numerous construction plans and sectional details of the STP dated 1942 available from the Public Works Department and all appropriate diagrams will be reviewed in detail prior to any invasive activity. Although this information will be helpful in locating proposed sampling locations, depths, etc., the dimensions and depths of the STP features, as derived from plan diagrams, may not reflect actual conditions at the site, because demolition activities may have considerably altered their condition.

There are conflicting dates as to when the STP was demolished — either in the mid-1970s or as late as 1984. There are also reports of the operations discontinuing between the late 1940s and early 1950s, suggesting less than 15 years of operation. The current condition of the site exhibits extensive site revegetation, both natural and anthropogenic, which, based on the maturity of the trees, is more likely the result of a 20-year period of natural regrowth.

A Visual Site Inspection (VSI) was conducted by E/A&H in January of 1995; when most of the vegetation was dormant. Although a previous VSI conducted in April of 1990 did not identify traces of the STP, the greater mobility and visibility allowed by sparse winter vegetation made a few remnants more evident. Indicating that some remnant foundations/structures may still exist beneath the top soil, a small exposed portion of a reinforced concrete surface was observed beneath approximately 4 to 6 inches of soil and detritus in the area of the former digester. On the western portion of the site, approximately 150 feet of a 3-foot wide, 6-inch thick concrete



500 0 500

SCALE FEET

RFI HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
FORMER NORTHSIDE SEWAGE TREATMENT PLANT
SWMU 27

DWG DATE: 01/18/95 | DWG NAME: 94HSP9

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walkway was exposed in several areas as well. In one such area, the top of an open ended, 12-inch diameter iron pipe was visible crossing beneath the walk. The walk was oriented east to west near the north edge of the N-45 and extended to the old railroad tracks which run along the western property line. Although still quite prominent, this feature was not recognized on the STP construction plans and its purpose is unknown.

Also discernable in the leaf litter south of the site was the large, octagonal concrete manhole/cap identified on the 1942 STP plans as "M.H. #3"; which apparently provides access to an 18-inch sewer discharge pipe and contains a 15-inch automatic flood gate.

The remainder of the site is overgrown, dominated by rows of planted pine trees with mixed deciduous trees and a thick understory. The dirt roadway to the east of the STP is still maintained to allow for occasional access. Beneath an inch of topsoil and high grass, the gravel drive to the north of the STP is also present. No other STP features were apparent during the 1995 VSI.

This remote area appears to be a site of minor incidents of past unauthorized dumping, as evidenced by construction debris and brush/mulch pile along the edges of Dakar Extended and Outlet Avenue. A site map is provided in Figure 2.

2.2 Work Areas

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

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ), and
- Support Zone (SZ).

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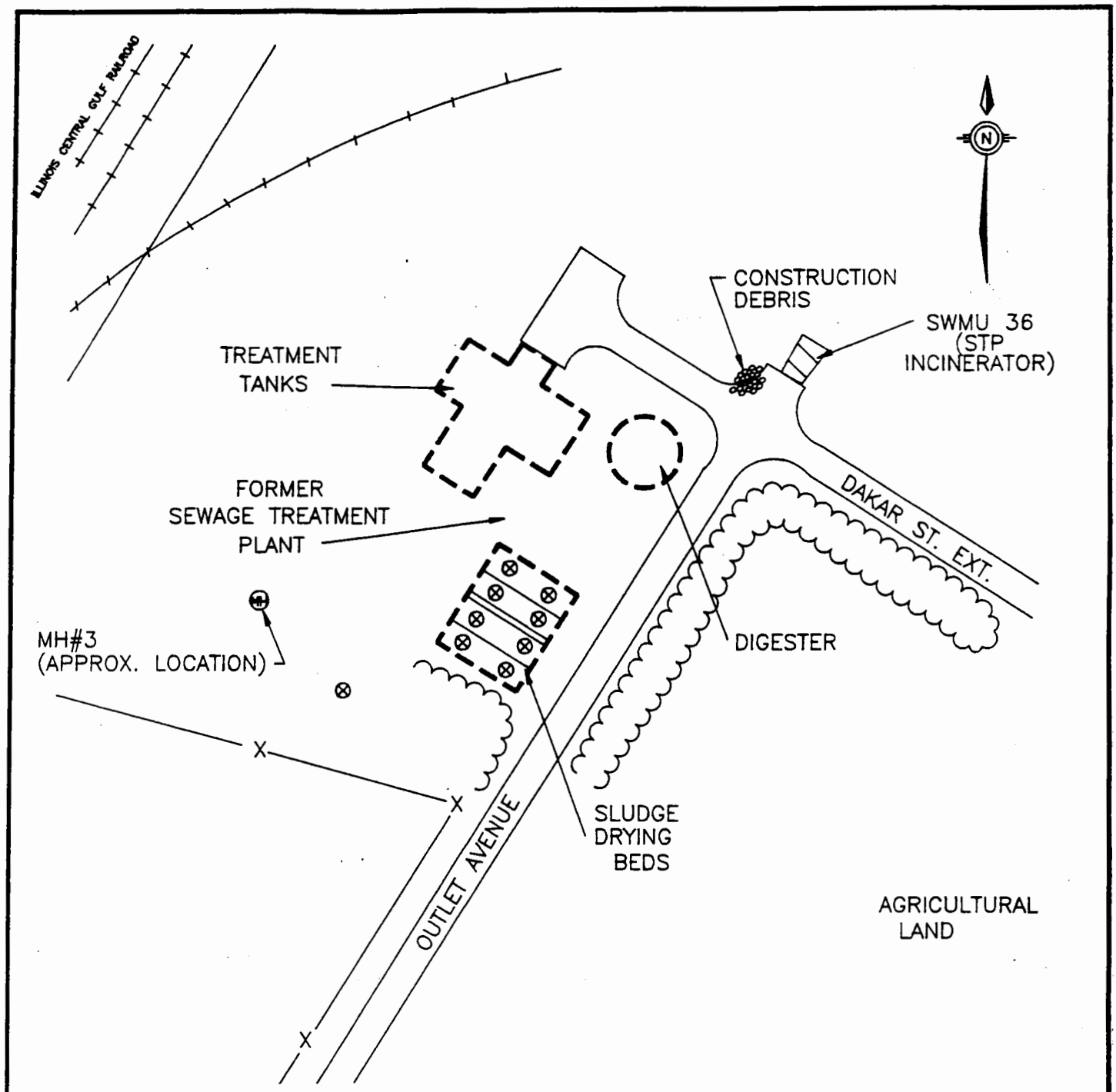

RFI HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
PROPOSED DPT SAMPLING LOCATIONS
NORTHSIDE
SEWAGE TREATMENT PLANT
SWMU 27

DWG DATE: 01/19/95 | DWG NAME: 94HSP10

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For a description of field activities to be conducted at the site and within each work area see the Site Investigation Plan (SIP).

2.3 Work Area Access

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

2.4 Site Map and Work Zones

The location of the site is shown in Figure 1, the vicinity map. A site map is shown in Figure 2. The EZ, CRZ, and SZ locations will be based on physical layout of the site, work task requirements, and current meteorological conditions. The EZ will be established using yellow caution tape.

3.0 SITE ACTIVITIES

Site activities will include Direct Push Technology (DPT) soil and groundwater sampling. Subsequent activities may include soil boring and monitoring well installation, well development, purging, and sampling as required. Field methods described in the *Comprehensive RFI Work Plan.*

4.0 CHEMICAL HAZARDS

The site history suggests a potential for exposure to chemicals. Table 4-1 lists exposure guidelines for potential site chemicals.

Table 4-1
Exposure Guidelines For Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	OSHA PEL[b] (ppm)	ACGIH TLV[c] (ppm)	NIOSH REL[d] (ppm)	Action Level[e] (ppm)	Flammable range (% by volume)
Toluene	40	100 150 STEL	50	100 150 STEL	25	1.3 to 7.1%
Acetone	100	750 1000 STEL	750 1000 STEL	250	125	2.5 to 13%
Lead	N.A.	0.05 mg/m^3	0.15 mg/m^3	< 0.1 mg/m^3	0.025 mg/m^3	N.A.
Kerosene	1	N.A.	N.A.	100 mg/m^3	50 mg/m^3	3 to 14%
Ethylbenzene	140	100 125 STEL	100 125 STEL	N.A.	50	1.0 to 6.7%
Benzene	4.68	1 5 STEL	0.1 Confirmed Human Carc.	0.1 1 STEL Potential Occupational Carcinogen	0.05	1.3 to 7.1%
Xylene	Not Listed	100 150 STEL	100 150 STEL	100 150 STEL	50	1.0 to 7.0%

Notes:

[a] Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values

[b] 29 CFR 1910.1000, Table Z-1-A. Limits For Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)

[c] 1990-1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienist. (STEL = Short Term Exposure Limit)

[d] National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, June 1990. (REL = Recommended Exposure Limit)

[e] Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50 percent of the PEL, TLV, or REL, whichever is lower.
N.A. = Substance information not available, or substance unlisted.

Material Safety Data Sheets (MSDS) for these materials are included in Attachment A.

5.0 OPERATIONS AND PHYSICAL HAZARDS

Physical hazards typically encountered during environmental investigations will be present at this site. These hazards include cold-related illnesses, uneven terrain, slippery surfaces, lifting, and use of heavy equipment. The Site Supervisor and Site Health and Safety Officer shall be aware of the potential for heat and/or cold stress and other weather-related illnesses, and as necessary, implement appropriate work regimens to minimize the likelihood of field personnel becoming ill or injured.

Heavy equipment and drill rig operations will be conducted in accordance with the procedures outlined in the CHASP, Attachment A, Drilling Safety Guide. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. If working in areas supporting habitat for poisonous snakes, personnel should wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

6.0 EMPLOYEE PROTECTION

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

6.1 Standard Safe Work Practices

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

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

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

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

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

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

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

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

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

6.2 NAS Memphis General Rules of Conduct

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

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

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

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

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

- Securing government tools in a personal or contractors tool box is forbidden.

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

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

- Compliance with posted signs and notices is required.

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

- Fighting or threatening bodily harm to another is forbidden.

- Defacing any government property is forbidden.

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

- All persons operating motor vehicles will obey all NAS Memphis traffic regulations.

6.3 Selection of Personal Protective Equipment

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

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

Field activities which disturb soils will be initiated in modified Level D protection except when stated otherwise in the SSHSP or when site conditions (e.g., sampling results from previous studies) indicate that modified Level D is inappropriate. Modified Level D protection consists of a hard hat, appropriate chemical-resistant gloves (vinyl or nitrile), eye protection, and chemical-resistant, steel-toed and shank boots. Work coveralls (full length sleeves and pants) will be worn if free product or contaminants identified as skin irritants are encountered. This

level of protection was selected because the levels of contamination detected in previous studies were low and free product was not detected.

PPE upgrades to Level C will be initiated if airborne concentrations exceed 2 ppm above the background concentration in the breathing zone or if the concentration of any contaminant exceeds 50 percent of the OSHA Permissible Exposure Limit (PEL). See Table 6-1 for the specific criteria for use and equipment for each level of protection.

Table 6-1
Level Of Protection And Criteria

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

Table 6-1
Level Of Protection And Criteria

Level of Protection	Criteria for Use	Equipment
Level C	• When airborne dust particles warrant respiratory protection • When work areas contain at least 19.5 percent oxygen	• Chemical resistant clothes, long sleeves, hood optional, one or two pieces • Full-face piece, air purifying respirator equipped with cartridges suitable for the hazard • Hard hat • Inner gloves and chemical resistant gloves • Steel-toe-and-shank boots • Coveralls and disposable outer boots
Level D	• When level B or C is not indicated • When airborne particles do not warrant respiratory protection • When work areas contain at least 19.5 percent oxygen	• Inner gloves and chemical-resistant gloves needed to handle soil or water samples • Steel-toe-and-shank boots • Hard hat (ANSI Z891-1969 standard) • Eye protection (ANSI Z87.1-1968) standard • Sunscreen (SPF 15 or greater) • Coveralls and disposable outer boots

Notes:

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

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

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

Level C protection will be selected when the types and concentrations of inseparable material are known, or reasonably assumed to be no greater than the protection factors associated with air-purifying respirators, and exposure to the unprotected areas of the body is unlikely to cause harm. Dust concentrations require Level C PPE, where the respirable fractions exceed the PEL of 5 mg/m3 or the total concentrations exceed the PEL of 15 mg/m3.

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

6.4 Air Monitoring

Site history and previous site work indicates that workers may potentially be exposed to low concentrations of numerous chemicals including VOCs, halogenated compounds, and combustible gases/vapors. Based on site history and existing sampling data, "worst case" contaminated areas will be identified before field activities begin.

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

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

If breathing zone levels exceed 2 ppm above background or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact both the Project Manager and the Project Health and Safety Officer. The Project Health and Safety Officer will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. (Typically, PPE will be upgraded to Level C assuming that cartridge respirators are appropriate, otherwise Level B.) See Table 6-1 for specific criteria for each protection level. Work shall not proceed until breathing zone levels return to background levels and it is reasonably anticipated that breathing zone samples will stay approximately at background levels, or the chemical constituent(s) are identified and appropriate PPE is donned.

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

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

6.5 Procedures and Equipment for Extreme Hot or Cold Weather Conditions

See CHASP Section 7.5.5.

Severe Weather Conditions

All field work shall immediately cease at the first sign of thunder or lightning. Field personnel shall perform emergency personal and equipment decontamination (see Section 6.6) and seek immediate shelter.

6.6 Personal Decontamination

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

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

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

6.6.1 Personal Decontamination Procedures

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

- Brushing heavily soiled boots and rinsing outer gloves and boots with soap and water.
- Removing outer gloves and depositing them in a labeled plastic-lined container.
- Remove outer chemical protective clothing.
- Wash and rinse inner gloves.
- Hard hats and eye protection should be washed thoroughly at the end of each work day with a soap and water solution.
- Disposable gloves and other disposable clothing will be disposed of in sealable bags and placed in a labeled 55-gallon drum for disposal at the site.
- All field personnel are to be instructed to shower as soon as possible after leaving the site.

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

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

6.6.2 Closure of the Personal Decontamination Station

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

6.7 Work Limitations

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional 8 hours of training in site management. All personnel must complete an 8-hour refresher training course on an annual basis in order to continue working at the site.

6.8 Exposure Evaluation

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

The content of the annual or termination examination will be the same as the baseline physical. A qualified physician will review the results of the annual examination and exposure data and request further tests or issue medical clearances as appropriate.

After any job-related injury or illness, there will be a medical examination to determine fitness for duty or any job restrictions. The Site Health and Safety Officer will review the results with the examining physician before releasing the employee for work. A similar examination will be performed if an employee has missed at least three days of work due to a non-job related injury or illness requiring medical attention. Medical records shall be maintained by the employer or the physician for at least 30 years following the termination of employment.

7.0 MEDICAL MONITORING PROGRAM

See CHASP Section 7.6.

8.0 AUTHORIZED PERSONNEL

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

• Principal-In-Charge	Dr. James Speakman (E/A&H)
• Task Order Manager/Project Manager	Mr. Lawson Anderson (E/A&H)
• Project Health & Safety Officer	Mr. Doug Petty (E/A&H)
• Site Supervisor	To Be Determined
• Site Health & Safety Officer	Mr. Matt Norton (E/A&H)
	Mr. Robert Smith (E/A&H)
	Mr. Ben Brantley (E/A&H)
• Engineer-in-Charge	Mr. Mark Taylor (SOUTHDIV)
• Naval Air Station Memphis Site Contact	Ms. Tonya Barker

8.1 Responsibilities of Site Supervisor

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

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

- Field staff have current HAZWOPER training.

- Field staff know who the Site Health and Safety Officer is.

- Field staff know the site-specific safety and health concerns.

- There is an adequate onsite supply of health and safety equipment.

- Field staff participate in the E/A&H Medical surveillance program (or in the case of the USGS or subcontractors, an equivalent program).

- Field staff attend safety and health "kick-off" orientation and other site safety briefings.

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

8.2 Responsibilities of Site Health and Safety Officer

The responsibilities of the Site Health and Safety Officer include:

- Providing the Site Supervisor technical input on site health and safety issues.

- Observing field personnel and reporting to the Site Supervisor on the effectiveness of the CHASP and SSHSP and whether field staff are utilizing proper work practices and decontamination procedures.

- Reporting significant safety violations to the Project Manager and/or Project Health and Safety Officer.

- Conducting safety briefings during field activities.

- Assuring that a copies of the CHASP and SSHSP are maintained onsite during all field activities.

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

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

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

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

8.3 Responsibilities of Onsite Field Staff

The health and safety responsibilities of field staff include:

- Being familiar with and complying with this CHASP and SSHSP.
- Attending site health and safety briefings and being aware of anticipated chemical, physical, and biological hazards and what to do when these hazards are encountered.
- Being properly trained on PPE to be used, safety work practices, decontamination procedures to be followed, and emergency procedures and communications.
- Utilizing required PPE including respiratory protective.

- Having up to date HAZWOPER training and providing the Site Supervisor with documentation that their training is current.

- Being an up to date participant in an acceptable medical surveillance program.

- Being fit-tested and physically capable of using a respirator and being in a position where using a respirator may be a requirement. Should the use of respiratory protection be required, field workers shall not have facial hair which intrudes into the sealing surface of the respirator.

- Using the buddy system when wearing respiratory protective equipment. When working in Level C or higher, a third person shall be at the work area. This person shall be suitably equipped to provide logistical and safety support to the entry team.

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

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

9.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations risk is minimized by establishing good work practices, staying alert, and using proper

PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

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

Contact	**Agency or Organization**	**Telephone**
Tonya Barker	NAS Memphis	(901) 873-5461/5462
Mark Taylor	SOUTHDIV EIC	(803) 743-0573
Law Enforcement	NAS Memphis Base Security	9-911
Fire Department	NAS Memphis	9-911
Ambulance Service	Naval Hospital, Millington Navy Road	(901) 873-5801/5802 or 9-911
Hospital	Methodist North Hospital 3960 Covington Pike	(901) 372-5211 or 9-911
Southern Poison Control Center	—	(901) 528-6048
Lawson Anderson	EnSafe/Allen & Hoshall	(901) 372-7962
Doug Petty	EnSafe/Allen & Hoshall	(901) 372-7962 (901) 362-0252

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

9.1 Site Resources

Cellular telephones or the telephone at the nearby Aircraft Firefighting Training Facility office trailer will be used for emergency use and communication/coordination with NAS Memphis. First aid and eye wash equipment will be available at the work area.

9.2 Emergency Procedures

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

The following emergency procedures should be followed:

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

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

- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the Site Health and Safety Officer to indicate possible routes for upwind escape.

- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the Site Health and

Safety Officer has evaluated the situation and provided the appropriate instructions to the field team.

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

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

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

Additional information on appropriate chemical exposure treatment methods will be provided through Material Safety Data Sheets (MSDS) in Attachment A.

10.0 FORMS

The following forms will be used to implement this Health and Safety Plan:

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

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

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

Attachment A

Material Safety Data Sheets

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 511 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: 2-BUTANONE

SYNONYMS: ACETONE, METHYL-; AETHYLMETHYLKETON (German); BUTANONE; BUTANONE 2 (French); ETHYL METHYL CETONE (French); ETHYLMETHYLKETON (Dutch); ETHYL METHYL KETONE; ETHYL METHYL KETONE (DOT); KETONE, ETHYL METHYL; MEETCO; METHYL ACETONE; METHYL ACETONE (DOT); METHYL ETHYL KETONE; METHYL ETHYL KETONE (DOT); METILETILCHETONE (Italian); METYLOETYLOKETON (Polish); 2-BUTANONE; MEK; BUTAN-2-ONE; KETONE, METHYL ETHYL; 2-OXOBUTANE; METHYL ETHYL KETONE (MEK)

CAS: 78-93-3 RTECS: EL6475000

FORMULA: C4H8O MOL WT: 72.12

WLN: 2V1

CHEMICAL CLASS: Ketone

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: clear colorless liquid with a fragrant, mint-like, moderately sharp odor

BOILING POINT:	352.72 K	79.5 C	175.2 F
MELTING POINT:	187.04 K	-86.2 C	-123 F
FLASH POINT:	267.4 K	-5.75 C	21.6 F
AUTO IGNITION:	788.7 K	515.5 C	960 F
CRITICAL TEMP:	535.7 K	262.55 C	504.59 F
CRITICAL PRESS:	4.15 kN/M2	40.9 atm	601 psia
HEAT OF VAP:	191 Btu/lb	106.07 cal/g	4.438x E5 J/kg
HEAT OF COMB:	-13480 Btu/lb	-7494 cal/g	-313x E5 J/kg

VAPOR PRESSURE: 71.2 mm Hg @ 20 C

UEL: 11.5 %

LEL: 1.8 %

IONIZATION POTENTIAL (eV): 6.7

VAPOR DENSITY: 2.42 (air=1)

EVAPORATION RATE: 7.12

SPECIFIC GRAVITY: 0.806 @ 20 C

DENSITY: 0.805 g/mL @ 20 C

WATER SOLUBILITY: 27%

INCOMPATIBILITIES: very strong oxidizers, chlorosulfonic acid, oleum, potassium-tert-butoxide, heat or flame, chloroform, hydrogen peroxide, nitric acid

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: NO REACTION Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS:	NOT PERTINENT Source: SAX
POLYMERIZATION POSSIBILITIES:	NOT PERTINENT Source: SAX
TOXIC FIRE GASES:	UNBURNED VAPORS
ODOR DETECTED AT (ppm):	10 ppm
ODOR DESCRIPTION:	Like acetone; pleasant; pungent Source:CHRIS
100 % ODOR DETECTION:	6.0 ppm

REGULATIONS

DOT hazard class:	3 FLAMMABLE LIQUID
DOT guide:	26
Identification number:	UN1193
DOT shipping name:	Ethyl methyl ketone [or] methyl ethyl ketone
Packing group:	II
Label(s) required:	FLAMMABLE LIQUID
Special provisions:	T8
Packaging exceptions:	173.150
Non bulk packaging:	173.202
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	5 L
Cargo aircraft only:	60 L
Vessel stowage:	B
Other stowage provisions:	
STCC NUMBER:	4909243
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	CAA '90 Listed
EPA WASTE NUMBER:	U159,D035,D001
CERCLA REF:	Y
RQ DESIGNATION:	D 5000 pounds (2270 kg) CERCLA
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin. Fire hazard: flammable.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Flammable liquid - Mailable as ORM-D
Mailability:	Domestic surface mail only
Max per parcel:	1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

2-BUTANONE [78-93-3]
ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
First Third Wastes List. 40 CFR 268.10. 54 FR 26594 (June 23, 1989)
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: human exposures to levels of 350 ppm caused irritation of the nose and throat. numbness in fingers, arms and legs accompanied by headache, nausea, vomiting and fainting have occurred after exposure to levels of 300-600 ppm. SKIN: contact with liquid or vapor at levels of 300-600 ppm caused severe irritation. liquid is absorbed readily and may cause numbing of fingers and arms. Eyes: exposure to levels of 200 ppm produced irritation. INGESTION: can cause

irritation of the mouth, throat and stomach, the severity of which will be dependent upon amount swallowed. symptoms of poisoning include nausea, vomiting, stomach pain and diarrhea. death can occur from ingestion of as little as 1 ounce.(NYDH)

LONG TERM TOXICITY: has been implicated in certain nervous disorders characterized by weakness, fatigue, heaviness in chest and numbness of hands and feet. these symptoms may develop after 1 year of exposure to vapor concentrations of 50-200 ppm. improvement is gradual and may take years after exposure is discontinued.(NYDH)

TARGET ORGANS: CNS, lungs. peripheral nervous system. eye irritation at 350 ppm.

SYMPTOMS: Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: 200 ppm Time weighted averages for 8-hour exposure
590 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 200ppm(590 mg/M3)
ACGIH STEL: STEL = 300 ppm

OSHA PEL: Transitional Limits:
PEL = 200 ppm(590mg/M3)
Final Rule Limits:
TWA = 200 ppm (590 mg/M3)
STEL = 300 ppm(885 mg/M3)

MAK INFORMATION: 200 ppm
590 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:100 ppm/5M JIHTAB 25,282,43
SENSE ORGANS
Nose
Other
SENSE ORGANS
Eye
Conjunctive irritation
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:2737 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2737 mg/kg
ihl-rat LC50:23500 mg/m3/8H
ipr-rat LD50:607 mg/kg
orl-mus LD50:4050 mg/kg
ihl-mus LC50:40 gm/m3/2H
ipr-mus LD50:616 mg/kg
skn-rbt LD50:6480 mg/kg
ipr-gpg LDLo:2 gm/kg
ihl-mam LC50:38 gm/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

eye-hmn 350 ppm
skn-rbt 500 mg/24H MOD
skn-rbt 402 mg/24H MLD
skn-rbt 13780 ug/24H open MLD
eye-rbt 80 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:3000 ppm/7H (6-15D preg) TXAPA9 28,452,74
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

ihl-rat TCLo:1000 ppm/7H (6-15D preg) TXAPA9 28,452,74
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Methyl ethyl ketone (MEK); CASRN 78-93-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Methyl ethyl ketone (MEK)
CASRN -- 78-93-3
Last Revised -- 12/01/89

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on no human carcinogenicity data and inadequate animal data.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. No data were available to assess the carcinogenic potential of methyl ethyl ketone by the oral or inhalation routes. In a skin carcinogenesis study, two groups of 10 male C3H/He mice received dermal applications of 50 mg of a solution containing 25 or 29% methyl ethyl ketone in 70% dodecylbenzene twice a week for 1 year. No skin tumors developed in the group of mice treated with 25% methyl ethyl ketone. After 27 weeks, a single skin tumor developed in 1 of 10 mice receiving 29% methyl ethyl ketone (Horton et al., 1965).

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Methyl ethyl ketone was not mutagenic for Salmonella typhimurium strains TA98, TA100, TA1535, or TA1537 with or without rat hepatic homogenates (Florin et al., 1980; Douglas et al., 1980). Methyl ethyl ketone induced aneuploidy in the diploid D61, M strain of Saccharomyces cerevisiae (Zimmermann et al., 1985). Low levels of methyl ethyl ketone combined with low levels of nocodazole (another inducer of aneuploidy), also produced significantly elevated levels of aneuploidy in the system (Mayer and Goin, 1987).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1985. Health and Environmental Effects Profile for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 1988. Updated Health Effects Assessment for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1988 Updated Health Effects Assessment for Methyl Ethyl Ketone has received Agency review.

Agency Work Group Review: 05/30/89

Verification Date: 05/30/89

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
organic canister or air pack; plastic gloves; goggles or face shield.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (2-BUTANONE)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
3000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen.
EYES: wash with plenty of water for at least 15 min. and call physician.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Alcohol foam, dry chemical, or carbon dioxide.
Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethyl methyl ketone [or] methyl ethyl ketone
DOT ID NUMBER: UN1193

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POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Fire or explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it

without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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---------- IDENTIFIERS ----------

CHEMTOX RECORD 1715 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: NAPHTHA, SOLVENT

SYNONYMS: AROMATIC SOLVENT; HI-FLASH NAPHTHAYETHYLEN; NAPHTA (DOT); NAPHTHA; NAPHTHA DISTILLATE (DOT); NAPHTHA, SOLVENT (DOT); PETROLEUM BENZIN; PETROLEUM DISTILLATES (NAPHTHA); PETROLEUM ETHER; PETROLEUM ETHER (DOT); PETROLEUM NAPHTHA (DOT)

CAS: 8030-30-6 RTECS: DE3030000

FORMULA: W99 MOL WT:

WLN: A10-15

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION:

BOILING POINT: NA

MELTING POINT: NA

FLASH POINT: Not available

AUTO IGNITION: Not available

VAPOR PRESSURE:

UEL: ~

LEL: ~

IONIZATION POTENTIAL (eV): 7.16 TO 7.46

VAPOR DENSITY: No data

EVAPORATION RATE: 5.53(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: No data

DENSITY:

WATER SOLUBILITY:

INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide:	27
Identification number:	UN1256
DOT shipping name:	Naphtha, [solvent]
Packing group:	II - III
Label(s) required:	FLAMMABLE LIQUID - FLAMMABLE LIQUID
Special provisions:	T8,T31■B1,T7,T30
Packaging exceptions:	173.150■150
Non bulk packaging:	173.202■203
Bulk packaging:	173.242■242
Quantity limitations-	
Passenger air/rail:	5 L■60 L
Cargo aircraft only:	60 L■220 L
Vessel stowage:	B■A
Other stowage provisions:	
STCC NUMBER:	4915241, 4910241
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D001
CERCLA REF:	Not listed
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Fire hazard: flammable.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE):	Unspecified
FLAMMABILITY (RED) :	Unspecified
REACTIVITY (YELLOW):	Unspecified
SPECIAL :	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
NAPHTHA, SOLVENT [8030-30-6]
New Jersey Right To Know Substance List. (December 1987)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: Source:

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: ppm
mG/M3

CARCINOGEN?: N STATUS: See below

CINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* ihl-hmn LCLo:3 pph/5M TABIA2 3,231,33

LD50 value: orl-rat LD50:>5 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>5 gm/kg
ihl-rat LCLo:1600 ppm/6H
ihl-mus LCLo:10600 mg/m3/6H
skn-rbt LD50:>3 gm/kg
ipr-mam LDLo:2500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (NAPHTHA, SOLVENT)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
2500 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
5000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
10000 ppm: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSHP
EYE: None given
SKIN: None given
INHALATION: None given
INGESTION: None given

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Naphtha, [solvent]
T ID NUMBER: UN1256

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POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate horities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 1513 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: KEROSENE

SYNONYMS: COAL OIL; KEROSINE; ILLUMINATING OIL; RANGE OIL; A FUEL OIL NO. 1; JET FUEL; JP-1

CAS: 8008-20-6 RTECS: NY9350000

FORMULA: CnH2n+2 MOL WT:

WLN:

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless watery liquid with a fuel oil odor; pale yellow or water white, mobile oily liquid

BOILING POINT:	448.16-598.16 K	175-325 C	347-617 F
MELTING POINT:	227.55 K	-45.6 C	-50.1 F
FLASH POINT:	310.92 K	37.77 C	99.9 F
AUTO IGNITION:	502 K	228.8 C	444 F

VAPOR PRESSURE: 2 mmHg @ 21 C

UEL: 5.0 %

LEL: 0.7 %

IONIZATION POTENTIAL (eV): 6.79

VAPOR DENSITY: 4.5 (air=1)

EVAPORATION RATE: 0.212138

SPECIFIC GRAVITY: 0.80 15C

DENSITY: 0.80 g/mL

WATER SOLUBILITY: INSOLUBLE

INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 1 ppm

ODOR DESCRIPTION: Fuel oil odor Source:CHRIS

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27

Identification number: UN1223

DOT shipping name: Kerosene
Packing group: III
Label(s) required: FLAMMABLE LIQUID
Special provisions: B1,T1
Packaging exceptions: 173.150
Non bulk packaging: 173.203
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 60 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: 4915171

CLEAN WATER ACT Sect.307: No
CLEAN WATER ACT Sect.311: No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: D001
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Chronic toxicity: mutagen.
Fire hazard: flammable.
Chronic toxicity: carcinogen

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Combustible liquid - Mailable as ORM-D
Mailability: Domestic service and air transportation shipper's declaration
Max per parcel: 1 GAL

NFPA CODES:
HEALTH HAZARD (BLUE): (0) No unusual health hazard.
FLAMMABILITY (RED) : (2) This material must be moderately heated before ignition will occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
KEROSENE [8008-20-6]

Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
nsylvania Hazardous Substance List
RA Hazardous Waste

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: does not evaporate fast enough to cause health effects except when heated or in enclosed spaces. headache, tiredness, stupor, dizziness, nausea, coma and death, may occur with increasing exposure. SKIN: if not promptly removed, may cause reddening, blisters, itching and an increased risk of infection. Eyes: irritation may occur. INGESTION: accidental ingestion of unknown amounts has caused irritation of mouth, throat and stomach, nausea, vomiting, rapid breathing, blue skin coloration, and convulsions. death may result from as little as 1 fluid ounce. inhalation into lungs following ingestion may result in bronchitis, chemical pneumonia, accumulation of fluid and blood in lungs, and death. as little as 1/30 oz. may be fatal in this way.(NYDH)

LONG TERM TOXICITY: absorption through skin is slow but repeated skin contact over many years has caused muscular weakness, anemia, changes in white blood cells, fever and death.(NYDH)

TARGET ORGANS:

SYMPTOMS: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL: 100 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC
to be probably carcinogenic to
humans with (usually) at least
limited human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:26 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:26 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
protective gloves; goggles or face sheild.

FIRST AID SOURCE: CHRIS Manual 1991
ASPIRATION: enforce bed rest; administer oxygen; call a doctor.
INGESTION: do NOT induce vomiting; call a doctor.
EYES: wash with plenty of water.
SKIN: wipe off and wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam, dry chemical, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Kerosene
ID NUMBER: UN1223

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POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 369 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: SULFURIC ACID

SYNONYMS: OIL OF VITRIOL; NORDHAUSEN ACID; DIPPING ACID; SPIRIT OF SULFUR; HYDROGEN SULFATE; SULPHURIC ACID; VITRIOL BROWN OIL

CAS: 7664-93-9 RTECS: WS5600000

FORMULA: H2SO4 MOL WT: 98.08

WLN: H2 S-O4

CHEMICAL CLASS: Non-oxidizing min. acid

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: odorless colorless oily liquid

BOILING POINT:	543.15 K	270 C	518 F
MELTING POINT:	275.93 K	2.7 C	37 F
FLASH POINT:	Not applicable		
AUTO IGNITION:	Not applicable		
VAPOR PRESSURE:	<0.001 MM		
UEL:	Not applicable		
LEL:	Not applicable		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	1.84 20C		
DENSITY:	1.84 g/cc or 17.112 lb/gal		
WATER SOLUBILITY:	MISCIBLE		
INCOMPATIBILITIES:	organics: chlorates, carbides, fulminates, picrates, metals		

REACTIVITY WITH WATER: REACTS VIOLENTLY WITH EVOLUTION OF HEAT. SPATTERING OCCURS WHEN WATER IS ADDED TO THE COMPOUND.

REACTIVITY WITH COMMON MATERIALS: EXTREMELY HAZARDOUS IN CONTACT WITH MANY MATERIALS, ESP METALS AND COMBUST. DILUTE ACID REACTS WITH MOST METALS, RELEASING HYDROGEN WHICH CAN FORM EXPLOSIVE MIXTURES WITH AIR IN CONFINED SPACES.

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: DILUTE WITH WATER, THEN NEUTRALIZE WITH LIME, LIMESTONE OR SODA ASH.

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): >1

ODOR DESCRIPTION: ODORLESS UNLESS HOT, THEN CHOKING.

	Source:CHRIS
100 % ODOR DETECTION:	No data

---------- REGULATIONS ----------

DOT hazard class:	8 CORROSIVE
DOT guide:	39
Identification number:	UN1830
DOT shipping name:	Sulfuric acid
Packing group:	II
Label(s) required:	CORROSIVE
Special provisions:	A3,A7,B3,B83,B84,N34,T9,T27
Packaging exceptions:	173.154
Non bulk packaging:	173.202
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	1 L
Cargo aircraft only:	30 L
Vessel stowage:	C
Other stowage provisions:	14

STCC NUMBER:	4930040
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	Yes
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D002
CERCLA REF:	Y
RQ DESIGNATION:	C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE:	1000 pounds
SARA Sect. 312 categories:	Acute toxicity: corrosive Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Not given
Mailability:	Nonmailable
Max per parcel:	0

NFPA CODES:

HEALTH HAZARD (BLUE): (3) Extremely hazardous to health. Full protection required. No skin surface should be exposed.

FLAMMABILITY (RED) : (0) This material does not readily burn.

REACTIVITY (YELLOW): (2) Normally unstable and readily undergoes violent change, but does not detonate.

SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
SARA Title III Extremely Hazardous Substance. Sections 302 and 304.
SULFURIC ACID [7664-93-9]
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: resp sys,eyes,skin,teeth,lungs, mucous membranes.

SYMPTOMS: EYE, NOSE, THROAT IRRIT; PULM EDEMA, BRON; EMPHYSEMA; CONJ; STOMATITIS, DENT EROSION; TRACHBRONC; SKIN, EYE, BURNS; DERM. EXTREMELY IRRITATING, CORROSIVE AND TOXIC TO TISSUE - WORKERS EXPOSED TO LOW CONCENTRATIONS OF VAPOR GRADUALLY LOSE SENSITIVITY TO IRRITATING ACTION - INHALATION OF CONCENTRATED VAPORS CAN CAUSE RAPID UNCONSCIOUSNESS WITH SERIOUS DAMAGE TO LUNG TISSUE - CAN CAUSE NECROSIS OF SKIN ACCOMPANIED BY SHOCK AND COLLAPSE - SEVERE EXPOSURE MAY CAUSE CHEMICAL PNEUMONITIS. Source: SAX

CONC IDLH: 80mg/M3

NIOSH REL: 1 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 1mg/M3
ACGIH STEL: STEL = 3 mg/M3

OSHA PEL: Transitional Limits:

PEL = 1mg/M3
Final Rule Limits:
TWA = 1 mg/M3

MAK INFORMATION: 1.5 calculated as total dust mG/M3

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:3 mg/m3/24W BJIMAG 18,63,61
MUSCULOSKELETAL
Changes in teeth and suporting structures

LD50 value: orl-rat LD50:2140 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2140 mg/kg
ihl-rat LC50:510 mg/m3/2H
ihl-mus LC50:320 mg/m3/2H
ihl-gpg LC50:18 mg/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rbt TCLo:20 mg/m3/7H (6-18D preg) JEHSDH 13,251,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
provide safety shower; eyewash fountain; safety goggles; face shield; approved respirator(self-contained or air-line); rubber safety shoes; rubber apron

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of liquid contact and repeated or prolonged vapor contact

WEAR EYE PROTECTION TO PREVENT:
Any possibility of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (SULFURIC ACID)
25 mg/M3: Any powered air-purifying respirator with a high efficiency particulate filter and an acid gas cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
50 mg/M3: Any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with a high-efficiency particulate filter. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted acid gas canister. / Any air-purifying respirator with a high-efficiency particulate filter.
[illegible] mg/M3: Any supplied-air respirator with a full facepiece and operated a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor and acid gas canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: water flush immed
INHALATION: art resp
INGESTION: water, no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material

from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Sulfuric acid
DOT ID NUMBER: UN1830

ERG93 GUIDE 39

POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if inhaled or swallowed.
Contact causes severe burns to skin and eyes.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
May ignite other combustible materials (wood, paper, oil, etc.).
Violent reaction with water.
Flammable/poisonous gases may accumulate in tanks and hopper cars.
Runoff to sewer may create fire or explosion hazard.
Material may be transported in a molten form.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection.
*Structural firefighters' protective clothing is not effective for these materials. Isolate the leak or spill area immediately for at least 150 feet in all directions. See the Table of Initial Isolation and Protective Action Distances. If you find the ID Number and the name of the material there, begin protective action. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300.
*FIRE
Do not get water inside container.
Small Fires: Dry chemical or CO2.
Large Fires: Flood fire area with water from a distance.
Do not get solid stream of water on spilled material. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk. Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. Use water spray to reduce vapor; do not put water directly on leak, spill area or inside container. Keep combustibles (wood, paper, oil, etc.) away from

spilled material.
Spills: Dike for later disposal; do not apply water unless directed to do so. Cleanup only under supervision of an expert.

FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 2264 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: OIL MIST, MINERAL

SYNONYMS: NUJOL ; MIST OF WHITE MINERAL OIL; CUTTING OIL; HEAT-TREATING OIL; HYDRAULIC OIL; CABLE OIL; LUBRICATING OIL

CAS: 8012-95-1 RTECS: XH7480000

FORMULA: W99 MOL WT: N.A.

WLN:

CHEMICAL CLASS: Paraffin

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: mist with an odor like burned lube oil

BOILING POINT:	633.15 K	360 C	680 F
MELTING POINT:	NA		
FLASH POINT:	408 K	134.85 C	274.7 F
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	2.2 mmHg @ 21 C		
UEL:	N.A.		
LEL:	N.A.		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	No data		
DENSITY:	0.83		
WATER SOLUBILITY:	INSOLUBLE		
INCOMPATIBILITIES:	none hazardous		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

REGULATIONS

DOT hazard class: Not given

DOT guide:

Identification number:

DOT shipping name:

Packing group:

Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Fire hazard: combustible.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OIL MIST, MINERAL [8012-95-1]
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

)RT TERM TOXICITY: ASPIRATION PNEUMONIA, CARCINOGEN OF SKIN AND SCROTUM.
** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: NONE REPORTED Source: NIOSHP

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = 5mg/M3
ACGIH STEL: STEL = 10 mg/M3

OSHA PEL: Transitional Limits:
PEL = 5mg/M3
Final Rule Limits:
TWA = 5 mg/M3

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below

(CINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:>24 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>24 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes wet.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (OIL MIST, MINERAL)
50 mg/M3: Any supplied-air respirator. / Any self-contained breathing apparatus. / Any air-purifying respirator with a high-efficiency particulate filter.
125 mg/M3: Any supplied-air respirator operated in a continuous flow mode. / Any powered air-purifying respirator with a high-efficiency particulate filter.
250 mg/M3: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. / Any supplied-air respirator with a tight-fitting facepiece operated in a continuous flow mode. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
2500 mg/M3: Any supplied-air respirator with a half-mask and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: None given
SKIN: soap wash
INHALATION: fresh air
INGESTION: None given

---------- INITIAL INCIDENT RESPONSE ----------

NO DOT Guide information for this compound.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 496 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYLENE GLYCOL

SYNONYMS: 1,2-ETHANEDIOL; 1,2-DIHYDROXYETHANE; 2-HYDROXYETHANOL; GLYCOL ALCOHOL; GLYCOL; EG

CAS: 107-21-1 RTECS: KW2975000

FORMULA: C2H6O2 MOL WT: 62.08

WLN: Q2Q

CHEMICAL CLASS: Alcohol

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: clear, colorless, slightly syrupy liquid.(nydh)

BOILING POINT:	470.15 K	197 C	386.6 F
MELTING POINT:	260.15 K	-13 C	8.6 F
FLASH POINT:	384.1 K	110.95 C	231.7 F
AUTO IGNITION:	673 K	399.8 C	751.8 F

VAPOR PRESSURE: .06 mm Hg @ 20 C

UEL: ~

LEL: 3.2 %

IONIZATION POTENTIAL (eV): 9.3

VAPOR DENSITY: 2.14 (air=1)

EVAPORATION RATE: 0.01(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 1.1135 @ 20 C

DENSITY: 1.113

WATER SOLUBILITY: > 100mg/mL @ 17 C

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: REACTS VIOLENTLY WITH CHLOROSULFURIC ACID, SULFURIC ACID AND OLEUM Source: CSDS

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Not pertinent

ODOR DESCRIPTION: Slight odor Source:CHRIS

100 % ODOR DETECTION: O.I @ 20 C = 3 ppm

REGULATIONS

DOT hazard class: Not given

DOT guide:

Identification number:
DOT shipping name:
Packing group:
Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (1) This material must be preheated before ignition can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
\ List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE GLYCOL [107-21-1]
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
SARA Section 313 Toxic Chemicals List
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: mild throat irritation resulted from exposures of 28 mg/m3. levels above 140 mg/m3 resulted in more marked irritation, with levels of more than 250 mg/m3 being unbreathable. these levels are only reached at elevated temperatures. SKIN: may cause mild irritation if not promptly removed. Eyes: accidental eye contact with concentrated ethylene glycol resulted in extreme swelling of the eye, cloudy vision and slow response to light. these symptoms lasted a month. INGESTION: may cause symptoms in the nervous system, heart, lungs and kidneys. earliest effects are usually felt in the nervous system between 1/2 to 12 hours after ingestion. symptoms from 1 liquid ounce may include nausea, vomiting, dizziness, loss of coordination and abdominal pain. large amounts may cause stupor, coma, convulsions and death. survival of this stage may lead to development of rapid heart beat, enlarged heart and fluid in the lungs which, too, can lead to death usually after 1 to 3 days. some individuals who drank 3 to 4 fluid ounces who survived both the above stages because of prompt medical treatment, later (3 to 17 days) died of kidney failure.(NYDH)

LONG TERM TOXICITY: occupational exposure to heated ethylene glycol has caused involuntary eye movement that may indicate nerve damage. some individuals also reported attacks of unconsciousness lasting 5 to 10 minutes which went away when they stopped working with ethylene glycol.(NYDH)

TARGET ORGANS: eyes, skin, resp system

SYMPTOMS: Inhalation of vapor is not hazardous. Ingestion causes stupor or coma, sometimes leading to fatal kidney injury. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = C 50ppm(C 127 mg/M3) VAPOR AND MIST
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
CEILING = 50 ppm (125 mg/M3)

MAK INFORMATION: 10 ppm
26 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-chd TDLo:5500 mg/kg PGMJAO 52,598,76
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Respiratory stimulation
KIDNEY,URETER,BLADDER
Other changes

orl-hmn LDLo:786 mg/kg EJTXAZ 9,373,76
BEHAVIORAL
Convulsions or effect on seizure threshold
BEHAVIORAL
Coma
GASTROINTESTINAL
Hypermotility,diarrhea

orl-hmn LDLo:398 mg/kg SMEZA5 26(2),48,83

BEHAVIORAL
Headache
GASTROINTESTINAL
Nausea or vomiting
LIVER
Other changes

ihl-hmn TCLo:10000 mg/m3 AGGHAR 5,1,33
SENSE ORGANS
Eye
Lacrimation
LUNGS, THORAX, OR RESPIRATION
Cough
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:4700 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4700 mg/kg
ihl-rat LC :>198 mg/m3
ipr-rat LD50:5010 mg/kg
scu-rat LD50:2800 mg/kg
ivn-rat LD50:3260 mg/kg
ims-rat LDLo:3300 mg/kg
unr-rat LD50:13 gm/kg
orl-mus LD50:7500 mg/kg
ipr-mus LD50:5614 mg/kg
scu-mus LDLo:2700 mg/kg
ivn-mus LD50:3 gm/kg
unr-mus LD50:8050 mg/kg
orl-dog LD50:5500 mg/kg
orl-cat LD50:1650 mg/kg
scu-cat LDLo:2000 mg/kg
skn-rbt LD50:9530 mg/kg
ipr-rbt LDLo:1 gm/kg
ivn-rbt LDLo:5 gm/kg
ims-rbt LDLo:5500 mg/kg
unr-rbt LD50:5017 mg/kg
orl-gpg LD50:6610 mg/kg
scu-gpg LDLo:5 gm/kg
unr-gpg LD50:11150 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:50 gm/kg (6-15D preg) TXAPA9 81,113,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Skin and skin appendages
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

orl-rat TDLo:8580 mg/kg (6-15D preg) CHYCDW 20,289,86
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:12500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:25 gm/kg (6-15D preg) NTIS** PB85-104594
MATERNAL EFFECTS
Uterus,cervix,vagina
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-rat TDLo:50 gm/kg (6-15D preg) NTIS** PB85-104594
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:7500 mg/kg (6-15D preg) TXAPA9 81,113,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:7500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:84 gm/kg (1-21D preg/21D post) TOXID9 4,136,84
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN

Delayed effects

orl-mus TDLo:88720 mg/kg (7-14D preg) EVHPAZ 57,141,84
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON NEWBORN
Stillbirth
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: CHRIS Manual 1991
INGESTION: induce vomiting and call a physician.
SKIN AND
EYES: flush with water.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Water fog, alcohol foam, carbon dioxide, or dry chemical. Note: Water or foam may cause frothing. CHRIS91

No DOT Guide information for this compound.
DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 247 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: LEAD

SYNONYMS: C.I. PIGMENT METAL 4; C.I. 77575; KS-4; LEAD FLAKE; LEAD S2; OLOW (Polish); SI; SO

CAS: 7439-92-1 RTECS: OF7525000

FORMULA: Pb MOL WT: 207.19

WLN: PB

CHEMICAL CLASS: Metal

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: bluish-grey, soft metal; heavy ductile, soft, gray solid

BOILING POINT:	2013 K	1739.8 C	3163.7 F
MELTING POINT:	600.6 K	327.4 C	621.4 F
FLASH POINT:	Not available		
AUTO IGNITION:	Not available		

VAPOR PRESSURE: 1mm @ 973 C

UEL: ~

LEL: ~

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 11.34

DENSITY: 11.34 g/mL @ 20 C

WATER SOLUBILITY: INSOLUBLE; DISSOLVES SLOWLY IN WATER CONTAINING A WEAK ACID

INCOMPATIBILITIES: strong ox, hydrogen peroxide, active metals, sodium, potassium, chlorine trifluoride, hydrogen peroxide, zirconium, disdium acetylide, oxidants

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: RELATIVELY IMPENETRABLE TO RADIATION

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: WHEN HEATED EMITS HIGHLY TOXIC FUMES; CAN REACT VIGOROUSLY WITH OXIDIZING MATERIALS

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

REGULATIONS

National Primary Ambient Air Quality Standards
1.5 ug/M3 maximum arithmetic mean averaged over a calendar year
National Secondary Ambient Air Quality Standards
same as primary standard

DOT hazard class:	6.1 POISON
DOT guide:	53
Identification number:	UN2291
DOT shipping name:	LEAD COMPOUNDS, SOLUBLE, N.O.S.
Packing group:	III
Label(s) required:	KEEP AWAY FROM FOOD
Special provisions:	
Packaging exceptions:	173.153
Non bulk packaging:	173.213
Bulk packaging:	173.240
Quantity limitations-	
Passenger air/rail:	100 KG
Cargo aircraft only:	200 KG
Vessel stowage:	A
Other stowage provisions:	

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:No
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): Treatment technique (12/07/92)
Maximum Contaminant Level Goals (MCLG): 0 mg/L (12/07/92)
CLEAN AIR ACT: CAA '90 By category and CAA '77 Sect 109
EPA WASTE NUMBER: D008
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Chronic toxicity: carcinogen
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-B
Mailability: Domestic service and air transportation; shipper's declaration
Max per parcel: 25 LBS; 5 LBS

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Developmental Toxin List
California Proposition 65 Female Reproductive Toxin List
California Proposition 65 Male Reproductive Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 109 National Ambient Air Quality Standards List
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
LEAD [7439-92-1]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a teratogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Specifically regulated substance. See 29 CFR 1910.1025
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: LASSITUDE, INSOMNIA, PALLOR, EYE GROUNDS, ANOREXIA, LOW-WEIGHT, MALNUTRITION, CONSTIPATION, ABDOMINAL PAIN, COLIC; HYPOTENSE, ANEMIA; GINGIVAL LEAD LINE; TREMBLING PARALYSIS WRIST. ** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS: gi,CNS,kidneys,blood,gingival tissue

SYMPTOMS: LASS, INSOM, PAL, EYE GROUNDS, ANOR, LOW-WT, MALNUT, CONSTI, ABDOM PAIN, COLIC; HYPOTENSE, ANEMIA, GINGIVAL LEAD LINE; TREM, PARA WRIST. METALLIC TASTE, INCREASED SALIVATION, PYORRHEA (FLOW OF MUCOUS). NEUROMUSCULAR: NUMBNESS AND TINGLING OF EXTREMITIES WITH SENSORY

DISTRUBANCE, EXTENSOR WEAKNESS OF WRISTS AND ANKLES, LOSS OF MUSCLE TONE, TREMOR INCREASED DEEP-TENDON REFLEXES, MUSCULAR CRAMPS AND ACHING, MUSCULAR ATROPHY. CNS: VISUAL DISTURBANCES, HEADACHE, NERVOUSNESS OF DEPRESSION, INSOMNIA, MENTAL CONFUSION, DELIRIUM. Source: NIOSHP, THIC

CONC IDLH: 700mg/M3

NIOSH REL: <0.1 mg/M3 Air level to be maintained so that worker blood level remains <0.06 mg/100 g of whole blood

ACGIH TLV: TLV = 0.15mg/M3 as LEAD
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = See 29 CFR 1910.1025 and 1926.62
50 ug/M3

MAK INFORMATION: 0.1 mG/M3
Substance with systemic effects, onset of effect over 2 hours: Peak = 10xMAK for 30 minutes, once per shift of 8 hours.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL
Hallucinations, distorted perceptions
BEHAVIORAL
Muscle weakness

LD50 value: No LD50 in RTECS 1992

IER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

ipr-rat LDLo:1 gm/kg
orl-pgn LDLo:160 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:790 mg/kg (multigenerations) AEHLAU 23,102,71
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-rat TDLo:1140 mg/kg (14D pre-21D post) PHMCAA 20,201,78
EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:520 mg/kg (7-22D preg/10D post) FEPRA7 37,394,78
EFFECTS ON NEWBORN

orl-rat TDLo:1100 mg/kg (1-22D preg) FEPRA7 37,895,78
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:10 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-rat TCLo:3 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON NEWBORN

orl-mus TDLo:1120 mg/kg (multigenerations) AEHLAU 23,102,71

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:6300 mg/kg (1-21D preg) EXPEAM 31,1312,75
EFFECTS ON FERTILITY
Female fertility index
EFFECTS ON FERTILITY
Pre-implantation mortility

orl-mus TDLo:300 mg/kg (1-2D preg) TXCYAC 6,129,76
EFFECTS ON FERTILITY
Other measures of fertility

orl-mus TDLo:4800 mg/kg (1-16D preg) BECTA6 18,271,77
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

orl-dom TDLo:662 mg/kg (1-21W preg) TXAPA9 25,466,73
EFFECTS ON NEWBORN
Behavioral

California Prop 65: Developmental toxin (02/27/87)
Female reproductive toxin (02/27/87)
Male reproductive toxin (02/27/87)
Acceptable intake level-inhalation .5 ugD (01/01/94)
Carcinogen (10/01/92)

---------- EPA's IRIS DATA SUMMARY ----------
Lead and compounds (inorganic); CASRN 7439-92-1 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Lead and compounds (inorganic)
CASRN -- 7439-92-1
Last Revised -- 05/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for

information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B2; probable human carcinogen

Basis -- Sufficient animal evidence. Ten rat bioassays and one mouse assay have shown statistically significant increases in renal tumors with dietary and subcutaneous exposure to several soluble lead salts. Animal assays provide reproducible results in several laboratories, in multiple rat strains with some evidence of multiple tumor sites. Short term studies show that lead affects gene expression. Human evidence is inadequate.

___II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. There are four epidemiologic studies of occupational cohorts exposed to lead and lead compounds. Two studies (Dingwall-Fordyce and Lane, 1963; Nelson et al., 1982) did not find any association between exposure and cancer mortality. Selevan et al. (1985), in their retrospective cohort mortality study of primary lead smelter workers, found a slight decrease in the total cancer mortality (SMR=95). Apparent excesses were observed for respiratory cancer (SMR=111, obs=41, p>0.05) and kidney cancer (SMR=204, obs=6, p>0.05). Cooper and Gaffey (1975) and Cooper (1985 update) performed a short mortality study of battery plant workers and lead smelter workers. They found statistically significant excesses for total cancer mortality (SMR=113, obs=344), stomach cancer (SMR=168, obs=34), and lung cancer (SMR=124, obs=109) in the battery plant workers. Although similar excesses were observed in the smelter workers, they were not statistically significant. Cooper and Gaffey (1975) felt it was possible that individual subjects were monitored primarily on the basis of obvious signs of lead exposure, while others who showed no symptoms of lead poisoning were not monitored.

All of the available studies lacked quantitative exposure information, as well as information on the possible contribution from smoking. All studies also included exposures to other metals such as arsenic, cadmium, and zinc for which no adjustment was done. The cancer excesses observed in the lung and stomach were relatively small (<200). There was no consistency of site among the various studies, and no study showed any dose-response relationship. Thus, the available human evidence is considered to be inadequate to refute or demonstrate any potential carcinogenicity for humans from lead exposure.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. The carcinogenic potential of lead salts (primarily phosphates and acetates) administered via the oral route or by injection has

been demonstrated in rats and mice by more than 10 investigators. The most characteristic cancer response is bilateral renal carcinoma. Rats given lead acetate or subacetate orally have developed gliomas, and lead subacetate also produced lung adenomas in mice after i.p. adminstration. Most of these investigations found a carcinogenic response only at the highest dose. The lead compounds tested in animals are almost all soluble salts. Metallic lead, lead oxide and lead tetralkyls have not been tested adequately. Studies of inhalation exposure have not been located in the literature.

Azar et al. (1973) administerd 10, 50, 100, and 500 ppm lead as lead acetate in dietary concentrations to 50 rats/sex/group for 2 years. Control rats (100/sex) received the basal laboratory diet. In a second 2-year feeding study, 20 rats/group were given diets containing 0, 1000, and 2000 ppm lead as lead acetate. No renal tumors were reported in the control groups or in treated animals of either sex receiving 10 to 100 ppm. Male rats fed 500, 1000, and 2000 ppm lead acetate had an increased renal tumor incidence of 5/50, 10/20, and 16/20, while 7/20 females in the 2000-ppm group developed renal tumors.

The Azar et al. (1973) study is limited by the lack of experimental detail. The possibility of environmental contamination from lead in the air or drinking water was not mentioned. The strains of rats used were not specified in the study, but the Health Effects Assessment for Lead (U.S. EPA, 1984) indicates the rats were Wistar strain. The weight gain at 1000 and 2000 ppm was reported to be depressed, but details were not given.

Kasprzak et al. (1985), in investigating the interaction of dietary calcium on lead carcinogenicity, fed 1% lead subacetate (8500 ppm Pb) to male Sprague-Dawley rats in the diet for 79 weeks. Of the rats surviving (29/30) in this treatment group beyond 58 weeks, 44.8% had renal tumors. Four rats had adenocarcinomas; the remainaing nine had adenomas. Bilateral tumors were noted. No renal tumors were noted among the controls.

As part of a study to determine interactions between sodium nitrite, ethyl urea and lead, male Sprague-Dawley rats were given lead acetate in their drinking water for 76 weeks (Koller et al., 1986). The concentration of lead was 2600 ppm. No kidney tumors were detected among the 10 control rats. Thirteen of 16 (81%) lead-treated rats had renal tubular carcinoma; three tumors were detected at 72 weeks and the remainder detected at the termination of the study.

Van Esch and Kroes (1969) fed basic lead acetate at 0, 0.1%, and 1.0% in the diet to 25 Swiss mice/sex/group for 2 years. No renal tumors developed in the control group, but 6/25 male mice of 0.1% basic lead acetate group had renal tumors (adenomas and carcinomas combined). In the 1.0% group, one female had a renal tumor. The authors thought that the low incidence in the 1.0% group was due to early mortality.

Hamsters given lead subacetate at 0.5% and 1% in the diet had no significant renal tumor response (Van Esch and Kroes, 1969).

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Lead acetate induces cell transformation in Syrian hamster embryo cells (Paolo et al., 1978) and also enhances the incidence of simian adenovirus induction. Lead oxide showed similar enhanced adenovirus induction (Casto et al., 1979).

Under certain conditions lead compounds are capable of inducing chromosomal aberrations in vivo and in tissue cultures. Grandjean et al. (1983) showed a relationship between SCE and lead exposure in exposed workers. Lead has been shown, in a number of DNA structure and function assays, to affect the molecular processes associated with the regulation of gene expression (U.S. EPA, 1986).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

Quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release, and excretion of lead. In addition, current knowledge of lead pharmacokinetics indicates that an estimate derived by standard procedures would not truly describe the potential risk. Thus, the Carcinogen Assessment Group recommends that a numerical estimate not be used.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1984. Health Effects Assessment for Lead. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/055. NTIS PB85-163996/AS.

U.S. EPA. 1986. Air Quality Criteria Document for Lead. Volumes III, IV.

Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC, for the Office of Air Quality Planning and Standards. EPA-600/8-83/028dF.

U.S. EPA. 1987. Preliminary review of the carcinogenic potential of lead associated with oral exposure. Prepared by the Office of Health and Environmental Assessment, Carcinogenic Assessment Group, Washington DC, for the Office of Drinking Water, Office of Solid Waste and the Office of Emergency and Remedial Response (Superfund). OHEA-C-267. Internal Review Draft.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The review of the carcinogenic potential of lead associated with oral exposure has received Agency review.

The 1986 Air Quality Criteria Document for Lead has received Agency and External Review.

Agency Work Group Review: 05/04/88

Verification Date: 05/04/88

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

William Pepelko / ORD -- (202)260-5898 / FTS 260-5898

James Cogliano / ORD -- (202)260-9243 / FTS 260-9243

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
At the end of each work shift.

** REMOVE CLOTHING:

Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114) OSHA (LEAD)
Not in excess of 0.5 mg/M3: Half-mask, air-purifying respirator equipped with high efficiency filters.
Not in excess of 2.5 mg/M3: Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 50 mg/M3: (1) Any powered, air-purifying respirator with high efficiency filters; or (2) Half-mask supplied-air respirator operated in positive-pressure mode.
Not in excess of 100 mg/M3: Supplied air respirator with full facepiece hood, or helmet or suit and operated in positive pressure mode.
Unknown concentration or Firefighting: Full facepiece, self-contained breathing apparatus operated in postive-pressure mode.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap flush promptly
INHALATION: art resp
INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: LEAD COMPOUNDS, SOLUBLE, N.O.S.
DOT ID NUMBER: UN2291

ERG93 GUIDE 53

POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if swallowed.
Inhalation of dust or mist may be poisonous.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water

pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 59 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: BENZENE

SYNONYMS: BENZOL; COAL TAR NAPHTHA; CYCLOHEXATRIENE; PHENYL HYDRIDE; PHENE; COAL NAPHTHA; PYROBENZOL

CAS: 71-43-2 RTECS: CY1400000

FORMULA: C6H6 MOL WT: 78.11

WLN: RH

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless to pale yellow watery liquid with a gasoline-like odor

BOILING POINT:	353.15 K	80 C	176 F
MELTING POINT:	278.71 K	5.5 C	42 F
FLASH POINT:	262 K	-11.15 C	11.9 F
AUTO IGNITION:	864.8 K	591.6 C	1097 F
CRITICAL TEMP:	562.1 K	288.95 C	552.11 F
CRITICAL PRESS:	4.89 kN/M2	48.2 atm	708 psia
HEAT OF VAP:	169 Btu/lb	93.85 cal/g	3.927x E5 J/kg
HEAT OF COMB:	-17460 Btu/lb	-9707 cal/g	-406x E5 J/kg

VAPOR PRESSURE: 75 mm @ 20 C

UEL: 7.1 %

LEL: 1.3 %

IONIZATION POTENTIAL (eV): 9.25

VAPOR DENSITY: 2.77 (air=1)

EVAPORATION RATE: 3.50(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.86-0.88 20 C

DENSITY: 0.8794 @ 20 C

WATER SOLUBILITY: 0.06%

INCOMPATIBILITIES: strong ox,chlorine,bromine with iron

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS(Br2, F2, CL2, CrO3, NaClO4, O2, O3), PERCHLORATES (AlCl3 +NaClO4), (H2SO4 & PERMANGANATES), K2O2, (AgClO4 & ACETIC ACID), Na2O2 Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: VAPOR IS HEAVIER THAN AIR AND MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.

ODOR DETECTED AT (ppm): 4.68 ppm
ODOR DESCRIPTION: odor; characteristic odor Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1114
DOT shipping name: Benzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T8
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:40

STCC NUMBER: 4908110

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.005 mg/L (01/09/89)
Maximum Contaminant Level Goals (MCLG): 0 mg/L (01/09/89)
CLEAN AIR ACT: CAA '90 Listed and CAA '77 Sect 109
EPA WASTE NUMBER: U019,D018,D001
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: carcinogen
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/89/209464/AS)
BENZENE [71-43-2]
California OSHA Carcinogens List.
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act Section 112 Hazardous Air Pollutants List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
National Toxicology Program (NTP) list of human carcinogens
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
New Jersey Right to Know Substance List. Listed as a mutagen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
OSHA Specifically regulated substance. See 29 CFR 1910.1028
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Suspected carcinogen (ACGIH). "Threshold Limit Values for 1992-1993"
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: benzene may produce both nerve and blood effects. irritation of the nose, throat and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). lung congestion may occur. nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness and slurred speech. at high levels, slowed breathing and death may result. death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes. SKIN: irritation may occur, with redness and blistering if not promptly removed. benzene is poorly absorbed. whole body exposure for 30 minutes has been reported with no health effects. Eyes: may cause severe irritation. INGESTION: may cause irritation of mouth, throat and stomach. symptoms are similar to those listed under inhalation. one tablespoon may cause collapse, bronchitis, pneumonia and death.(NYDH)

LONG TERM TOXICITY: may cause loss of appetite, nausea, weight loss, fatigue, muscle weakness, headache, dizziness, nervousness and irritability. mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. at levels between 100 and 200 ppm for periods of 6 months, or more, severe irreversible blood changes and damage to liver and heart may occur. temporary partial paralysis has been reported.(NYDH)

TARGET ORGANS: blood, CNS, skin, bone marrow, eyes, resp sys

SYMPTOMS: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: Potential occupational carcinogen 0.1 ppm Time weighted averages for 8-hour exposure 0.32 mg/M3 Time weighted averages for 8-hour exposure 1 ppm Ceiling exposures which shall at no time be exceeded 3.2 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 10ppm Suspected human carcinogen (A2)
ACGIH STEL: Suspected human carcinogen (A2)

OSHA PEL: Final Rule Limits:
TWA = 1 ppm
STEL = 5 ppm
CONSULT 29CFR 1910.1028

MAK INFORMATION: Danger of cutaneous absorption
Carcinogenic working material without MAK
Capable of inducing malignant tumors as shown by

experience with humans.
Substances which has been demonstrated to cause genetic damage in mammalian (including human) germ cells without proof of transmission.

CARCINOGEN?: Y STATUS: See below
REFERENCES:

HUMAN SUSPECTED IARC** 7,203,74
HUMAN SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 29,93,82
HUMAN POSITIVE IARC** 29,93,82
ANIMAL INDEFINITE IARC** 7,203,74

CARCINOGEN LISTS:

IARC: Carcinogen as defined by IARC as carcinogenic to humans, with sufficient epidemiological evidence.
MAK: Capable of inducing malignant tumors as shown by experience in humans.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as known to be carcinogenic, with evidence from human studies.
ACGIH: Carcinogen defined by ACGIH TLV Committee as a confirmed human carcinogen, recognized to have carcinogenic or cocarcinogenic potential.
OSHA: Cancer hazard

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* ihl-hmn LCLo:2 pph/5M TABIA2 3,231,33

* orl-man LDLo:50 mg/kg YAKUD5 22,883,80

* ihl-hmn LCLo:2000 ppm/5M YAKUD5 22,883,80

ihl-man TCLo:150 ppm/1Y-I BLUTA9 28,293,74
BLOOD
Other changes
NUTRITIONAL AND GROSS METABOLIC
Changes in:
Body temperature increase

ihl-hmn TCLo:100 ppm INMEAF 17,199,48
BEHAVIORAL
Somnolence(general depressed activity)
GASTROINTESTINAL
Nausea or vomiting

SKIN AND APPENDAGES
Skin - after systemic exposure
Dermatitis,other

ihl-hmn LCLo:65 mg/m3/5Y ARGEAR 44,145,74
BLOOD
Other changes

LD50 value: orl-rat LD50:930 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:930 mg/kg
ihl-rat LC50:10000 ppm/7H
ipr-rat LD50:2890 ug/kg
orl-mus LD50:4700 mg/kg
ihl-mus LC50:9980 ppm
ipr-mus LD50:340 mg/kg
orl-dog LDLo:2 gm/kg
ihl-dog LCLo:146000 mg/m3
ihl-cat LCLo:170000 mg/m3
ihl-rbt LCLo:45000 ppm/30M
skn-rbt LD50:>9400 mg/kg
ivn-rbt LDLo:88 mg/kg
skn-gpg LD50:>9400 mg/kg
ipr-gpg LDLo:527 mg/kg
scu-frg LDLo:1400 mg/kg
ihl-mam LCLo:20000 ppm/5M
ipr-mam LDLo:1500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:670 mg/m3/24H (15D pre/1-22D preg) HYSAAV 33(1-3),327,68
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:56600 ug/m3/24H (1-22D preg) HYSAAV 33(7-9),112,68
EFFECTS ON NEWBORN

ihl-rat TCLo:50 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:150 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON FERTILITY
Post-implantation mortality
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:12 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:6500 mg/kg (8-12D preg) TCMUD8 6,361,86
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-mus TCLo:500 ppm/7H (6-15D preg) AIHAAP 40,993,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:500 mg/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:5 ppm (6-15D preg) TXCYAC 42,171,86
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-mus TCLo:20 ppm/6H (6-15D preg) FAATDF 10,224,88
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ipr-mus TDLo:5 mg/kg (1D male) TPKVAL 15,30,79
EFFECTS ON FERTILITY
Pre-implantation mortility
EFFECTS ON EMBRYO OR FETUS
Fetal death

ipr-mus TDLo:219 mg/kg (14D preg) EMMUEG 18,1,91
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and

marrow)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Hapatobilinary system

scu-mus TDLo:1100 mg/kg (12D preg) TOXID9 1,125,81
EFFECTS ON EMBRYO OR FETUS
Other effects on embryo or fetus

scu-mus TDLo:7030 mg/kg (12-13D preg) SEIJBO 15,47,75
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ivn-mus TDLo:13200 ug/kg (13-16D preg) ICHUDW 4(6),24,82
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

par-mus TDLo:4 gm/kg (12D preg) NEZAAQ 25,438,70
EFFECTS ON NEWBORN
Weaning or lactation index(#alive at weaning per # alive at day 4)

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON FERTILITY
Abortion
EFFECTS ON EMBRYO OR FETUS
Fetal death

California Prop 65: Carcinogen (02/27/87)
No significant risk level 7. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------

Benzene; CASRN 71-43-2 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Benzene
CASRN -- 71-43-2
Last Revised -- 04/01/92

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood

that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- A; human carcinogen

Basis -- Several studies of increased incidence of nonlymphocytic leukemia from occupational exposure, increased incidence of neoplasia in rats and mice exposed by inhalation and gavage, and some supporting data form the basis for this classification.

II.A.2. HUMAN CARCINOGENICITY DATA

Aksoy et al. (1974) reported effects of benzene exposure among 28,500 Turkish workers employed in the shoe industry. Mean duration of employment was 9.7 years (1-15 year range) and mean age was 34.2 years. Peak exposure was reported to be 210-650 ppm. Twenty-six cases of leukemia and a total of 34 leukemias or preleukemias were observed, corresponding to an incidence of 13/100,000 (by comparison to 6/100,000 for the general population). A follow-up paper (Aksoy, 1980) reported eight additional cases of leukemia as well as evidence suggestive of increases in other malignancies.

In a retrospective cohort mortality study Infante et al. (1977a,b) examined leukemogenic effects of benzene exposure in 748 white males exposed while employed in the manufacturing of rubber products. Exposure occurred from 1940-1949, and vital statistics were obtained through 1975. A statistically significant increase (p less than or equal to 0.002) of leukemias was found by comparison to the general U.S. population. There was no evidence of solvent exposure other than benzene. Air concentrations were generally found to be below the recommended limits in effect during the study period.

In a subsequent retrospective cohort mortality study Rinsky et al. (1981) observed seven deaths from leukemia among 748 workers exposed to benzene and followed for at least 24 years (17,020 person-years). This increased incidence was statistically significant; standard mortality ratio (SMR) was 560. For the five leukemia deaths that occurred among workers with more than 5 years exposure, the SMR was 2100. Exposures (which ranged from 10-100 ppm

8-hour TWA) were described as less than the recommended standards for the time period of 1941-1969.

In an updated version of the Rinsky et al. (1981) study, the authors followed the same cohort to 12/31/81 (Rinsky et al., 1987). An in his earlier study, cumulative exposure was derived from historic air-sampling data or interpolated estimates based on exisitng data. Standardized mortality rates ranged from 109 at cumulative benzene exposures under 40 ppm-years and increased montonically to 6637 (6 cases) at 400 ppm-years or more. The authors found significantly elevated risks of leukemia at cumulative exposures less than the equivalent current standard for occupational exposure which is 10 ppm over a 40-year working lifetime.

Ott et al. (1978) observed three deaths from leukemia among 594 workers followed for at least 23 years in a retrospective cohort mortality study, but the increase was not statistically significant. Exposures ranged from <2 to >25 ppm 8-hour TWA.

Wong et al. (1983) reported on the mortality of male chemical workers who had been exposed to benzene for at least 6 months during the years 1946-1975. The study population of 4062 persons was drawn from seven chemical plants, and jobs were categorized as to peak exposure. Those with at least 3 days/week exposure (3036 subjects) were further categorizeed on the basis of an 8-hour TWA. The control subjects held jobs at the same plants for at least 6 months but were never subject to benzene exposure. Dose-dependent increases were seen in leukemia and lymphatic and hematopoietic cancer. The incidence of leukemia was responsible for the majority of the increase. It was noted that the significance of the increase is due largely to a less than expected incidence of neoplasia in the unexposed subjects.

Numerous other epidemiologic and case studies have reported an increased incidence or a causal relationship between leukemia and exposure to benzene (IARC, 1982).

___II.A.3. ANIMAL CARCINOGENICITY DATA

Both gavage and inhalation exposure of rodents to benzene have resulted in development of neoplasia. Maltoni and Scarnato (1979) and Maltoni et al. (1983) administered benzene by gavage at dose levels of 0, 50, 250, and 500 mg/kg bw to 30-40 Sprague-Dawley rats/sex for life. Dose-related increased incidences of mammary tumors were seen in females and of Zymbal gland carcinomas, oral cavity carcinomas and leukemias/lymphomas in both sexes.

In an NTP (1986) study, benzene was administered by gavage doses of 0, 50, 100, or 200 mg/kg bw to 50 F344/N rats/sex or 0, 25, 50, or 100 mg/kg bw to 50 B6C3F1 mice/sex. Treatment was 5 times/week for 103 weeks. Significantly increased incidences ($p<0.05$) of various neoplasic growths were seen in both sexes of both species. Both male and female rats and mice had increased incidence of carcinomas of the Zymbal gland. Male and female rats had oral cavity tumors, and males showed increased incidences of skin tumors. Mice of both sexes had increased incidence of lymphomas and lung tumors. Males were

observed to have harderian and preputial gland tumors and females had tumors of mammary gland and ovary. In general, the increased incidence was dose-related.

Slightly increased incidences of hematopoietic neoplasms were reported for male C57Bl mice exposed by inhalation to 300 ppm benzene 6 hours/day, 5 days/week for 488 days. There was no increase in tumor incidence in male AKR or CD-1 mice similarly exposed to 100 ppm or 100 or 300 ppm benzene, respectively. Likewise male Sprague-Dawley rats exposed by inhalation to 300 ppm benzene were not observed to have increased incidence of neoplasia (Snyder et al., 1981).

Maltoni et al. (1983) treated male and female Sprague-Dawley rats in the following manner. Starting at 13 weeks of age rats were exposed to 200 ppm benzene 4 hours/day, 5 days/week for 7 weeks; 200 ppm 7 hours/day, 5 days/week for 12 weeks; 300 ppm 7 hours/day, 5 days/week for 85 weeks. An 8-hour/day TWA for 5 days/week was calculated to be 241 ppm. A statistically significant increase was noted in hepatomas and carcinomas of the Zymbal gland.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Numerous investigators have found significant increases in chromosomal aberrations of bone marrow cells and peripheral lymphocytes from workers with exposure to benzene (IARC, 1982). Benzene also induced chromosomal aberrations in bone marrow cells from rabbits (Kissling and Speck, 1973), mice (Meyne and Legator, 1980) and rats (Anderson and Richardson, 1979). Several investigators have reported positive results for benzene in mouse micronucleus assays (Meyne and Legator, 1980). Benzene was not mutagenic in several bacterial and yeast systems, in the sex-linked recessive lethal mutation assay with Drosophila melanogaster or in mouse lymphoma cell forward mutation assay.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

___II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- 2.9E-2 per (mg/kg)/day

Drinking Water Unit Risk -- 8.3E-7 per (ug/L)

Extrapolation Method -- One-hit (pooled data)

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+2 ug/L

E-5 (1 in 100,000) 1E+1 ug/L
E-6 (1 in 1,000,000) 1E+0 ug/L

___II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

Tumor Type -- leukemia
Test Animals -- human
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

The slope factor was derived from human data for inhalation exposure (see dose-response data for inhalation quantitative estimate). The human respiratory rate was assumed to be 20 cu.m/day and the human drinking water intake was assumed to be 2 L/day. The fraction of the administered dose absorbed systemically via inhalation and via drinking water were assumed to be equal.

___II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study as described in the additional comments section for inhalation data.

The unit risk should not be used if the water concentration exceeds 1E+4 ug/L, since above this concentration the unit risk may not be appropriate.

___II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an adequate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2. Regression models give an estimate similar to the geometric mean.

The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate.

Risk estimates based on animal gavage studies are about 5 times higher than those derived from human data. Pharmacokinetic data which could impact risk assessment are currently being evaluated.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- 8.3E-6 per (ug/cu.m)

Extrapolation Method -- One-hit (pooled data)

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+1 ug/cu.m
E-5 (1 in 100,000)	1E+0 ug/cu.m
E-6 (1 in 1,000,000)	1E-1 ug/cu.m

II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- leukemia
Test Animals -- humans
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study. The Rinsky data used were from an updated tape which reports one more case of leukemia than was published in 1981. Equal weight was given to cumulative dose and weighted cumulative dose exposure categories as well as to relative and absolute risk model forms. The results of the Wong et al. (1983) study were incorporated by assuming that the ratio of the Rinsky-Ott-Wong studies to the Rinsky-Ott studies for the relative risk cumulative dose model was the same as for other model-exposure category combinations and multiplying this ratio by the Rinsky-Ott geometric mean. The age-specific U.S. death rates for 1978 (the most current year available) were used for background leukemia and total death rates. It should be noted that a recently published paper (Rinsky et al., 1987) reported yet another case of leukemia from the study population.

The unit risk should not be used if the air concentration exceeds 100 ug/cu.m, since above this concentration the unit risk may not be appropriate.

___II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an ade quate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2/ppm. Regression models give an estimate similar to the geometric mean.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Benzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office (Cincinnati, OH) and Carcinogen Assessment Group (Washington, DC), and the Environmental Research Labs (Corvalis, OR; Duluth, MN; Gulf Breeze, FL) for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-018.

U.S. EPA. 1985. Interim Quantitative Cancer Unit Risk Estimates Due to Inhalation of Benzene. Prepared by the Office of Health and Environmental Assessment, Carcinogen Assessment Group, Washington, DC for the Office of Air Quality Planning and Standards, Washington, DC.

U.S. EPA. 1987. Memorandum from J. Orme, HEB, CSD/ODW to C. Vogt, Criteria and Standards Division, ODW, June, 1987.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1985 Interim Evaluation was reviewed by the Carcinogen Assessment Group.

The 1987 memorandum is an internal document.

Agency Work Group Review: 03/05/87, 10/09/87

Verification Date: 10/09/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

D.L. Bayliss / ORD -- (202)260-5726 / FTS 260-5726

R. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
hydrocarbon vapor canister, supplied air or hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.

OSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly wash with soap when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BENZENE)
Less than or equal to 10 ppm: Half-mask air-purifying respirator with organic vapor cartridge.
Less than or equal to 50 ppm: Full facepiece respirator with organic vapor cartridges. / Full facepiece gas mask with chin style canister.
Less than or equal to 100 ppm: Full facepiece powered air-purifying respirator with organic vapor canister.

Less than or equal to 1000 ppm: Supplied air respirator with full facepiece in positive-pressure mode.
Greater than 1000 ppm or Unknown concentration: (1) Self-contained breathing apparatus with full face-piece in positive pressure mode. (2) Full facepiece positive-pressure supplied-air respirator with auxiliary self-contained air supply.
Escape : (1) Any organic vapor gas mask; or (2) Any self-contained breathing apparatus with full facepiece.
Firefighting : Any full facepiece self-contained breathing apparatus operated in positive pressure mode.

FIRST AID SOURCE: NIOSHP
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin.
EYES: flush with plenty of water until irritation subsides.
INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Dry chemical, foam, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Benzene
DOT ID NUMBER: UN1114

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 398 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: TOLUENE
SYNONYMS: TOLUOL; PHENYL METHANE; METHYL BENZENE; BENZENE, METHYL-
CAS: 108-88-3 RTECS: XS5250000
FORMULA: C7H8 MOL WT: 92
WLN: 1R
CHEMICAL CLASS:Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless watery liquid with a pleasant odor

BOILING POINT:	383.6 K	110.4 C	230.8 F
MELTING POINT:	178.00 K	-95.2 C	-139.3 F
FLASH POINT:	277.6 K	4.45 C	40 F
AUTO IGNITION:	809 K	535.8 C	996.6 F
CRITICAL TEMP:	591.8 K	318.65 C	605.57 F
CRITICAL PRESS:	4.108 kN/M2	40.5 atm	595 psia
HEAT OF VAP:	155 Btu/lb	86.08 cal/g	3.601x E5 J/kg
HEAT OF COMB:	-17430 Btu/lb	-9690 cal/g	-405x E5 J/kg

VAPOR PRESSURE: 36.7 mm @ 30 C
[illegible]L: 7.1 %
[illegible]: 1.3 %
IONIZATION POTENTIAL (eV): 8.82
VAPOR DENSITY: 3.14 (air=1)
EVAPORATION RATE: 2.00(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY: 0.867 @ 20 C
DENSITY: 0.867
WATER SOLUBILITY: 0.05%
INCOMPATIBILITIES: strong ox

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: No data
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): 40 PPM
ODOR DESCRIPTION: STRONG, PLEASANT Source:NYDH
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27
Identification number: UN1294
DOT shipping name: Toluene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909305

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 1 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 1 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U220,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

Fire hazard: flammable.
Chronic toxicity: carcinogen
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/90/198904/AS)
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Department of Health Services Drinking Water Action List.
California Proposition 65 Developmental Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
TOLUENE [108-88-3]
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 100 ppm exposure can cause dizziness, drowsiness and hallucinations. 100-200 ppm can cause depression. 200-500 ppm can cause headaches, nausea, loss of appetite, loss of energy, loss of coordination and coma. in addition to the above, death has resulted from exposure to 10,000 ppm for an unknown time. SKIN: can cause dryness and irritation. absorption may cause or increase the severity of

symptoms listed above. Eyes: can cause irritation at 300 ppm. INGESTION: can cause a burning sensation in the mouth and stomach, upper abdominal pain, cough, hoarseness, headache, nausea, loss of appetite, loss of energy, loss of coordination and coma.(NYDH)

LONG TERM TOXICITY: levels below 200 ppm may produce headache, tiredness and nausea. from 200 to 750 ppm symptoms may include insomnia, irritability, dizziness, some loss of memory, loss of appetite, a feeling of drunkeness and disturbed menstruation. levels up to 1,500 ppm may cause heart palpitations and loss of coordination. blood effects and anemia have been reported but are probably due to contamination by benzene. most of these effects area believed to go away when exposure stops.(NYDH)

TARGET ORGANS: CNS, liver, kidneys, skin, eyes

SYMPTOMS: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. Source: CHRIS

CONC IDLH: 2000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure
375 mg/M3 Time weighted averages for 8-hour exposure
200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 750 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 50ppm(188 mg/M3) Skin
ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 200 PPM; CEILING = 300 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 100 ppm (375 mg/M3)
STEL = 150 ppm(560 mg/M3)

MAK INFORMATION: 50 ppm
190 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 5xMAK for 30 minutes, 2 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:

IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-hmn TCLo:200 ppm JAMAAP 123,1106,43
BRAIN AND COVERINGS
Recordings from specific areas of CNS
BEHAVIORAL
Antipsychotic
BLOOD
Changes in bone marrow not included above

LD50 value: orl-rat LD50:636 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:636 mg/kg
ihl-rat LC50:>26700 ppm/1H
ipr-rat LD50:1332 mg/kg
ivn-rat LD50:1960 mg/kg
unr-rat LD50:6900 mg/kg
ihl-mus LC50:400 ppm/24H
ipr-mus LD50:59 mg/kg
scu-mus LD50:2250 mg/kg
unr-mus LD50:2 gm/kg
ihl-rbt LCLo:55000 ppm/40M
skn-rbt LD50:12124 mg/kg
ivn-rbt LDLo:130 mg/kg
ihl-gpg LCLo:1600 ppm
ipr-gpg LD50:500 mg/kg
scu-frg LDLo:920 mg/kg
ipr-mam LDLo:1750 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:1500 mg/m3/24H (1-8D preg) TXCYAC 11,55,78

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 mg/m3/24H (7-14D preg) FMORAO 28,286,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:800 mg/m3/6H (14-20D preg) BJMRDK 23,533,90
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON NEWBORN
Behavioral

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:15 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:30 gm/kg (6-15D preg) TJADAB 19,41A,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-mus TCLo:500 mg/m3/24H (6-13D preg) TXCYAC 11,55,78
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1000 ppm/6H (2-17D preg) TJEMDR 7,265,82
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:400 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
EFFECTS ON NEWBORN

ihl-mus TCLo:200 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Abortion

ihl-rbt TDLo:100 ppm/6H (6-18D preg) ARTODN 66,373,92
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Cardiovascular(circulatory)system

California Prop 65: Developmental toxin (01/01/91)
Acceptable intake level-inhalation 13000. ugD (01/01/94)
Acceptable intake level-oral intake 7000. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Toluene; CASRN 108-88-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Toluene
CASRN -- 108-88-3
Last Revised -- 08/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classified

Basis -- No human data and inadequate animal data. Toluene did not produce positive results in the majority of genotoxic assays.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

A chronic (106-week) bioassay of toluene in F344 rats of both sexes

reported no carcinogenic responses (CIIT, 1980). A total of 960 rats were exposed by inhalation for 6 hours/day, 5 days/week to toluene at 0, 30, 100, or 300 ppm. Groups of 20/sex/dose were sacrificed at 18 months. Gross and microscopic examination of tissues and organs identified no increase in neoplastic tissue or tumor masses among treated rats when compared with controls. The study is considered inadequate because the highest dose administered was well below the MTD for toluene and because of the high incidence of lesions and pathological changes in the control animals.

Several studies have examined the carcinogenicity of toluene following repeated dermal applications. Toluene (dose not reported) applied to shaved interscapular skin of 54 male mice (strains A/He, C3HeB, SWR) throughout their lifetime (3 times weekly) produced no carcinogenic response (Poel, 1963). One drop of toluene (about 6 mL) applied to the dorsal skin of 20 random-bred albino mice twice weekly for 50 weeks caused no skin papillomas or carcinomas after a 1-year latency period was allowed (Coombs et al., 1973). No increase in the incidence of skin or systemic tumors was demonstrated in male or female mice of three strains (CF, C3H, or CBaH) when toluene was applied to the back of 25 mice of each sex of each strain at 0.05-0.1 mL/mouse, twice weekly for 56 weeks (Doak et al., 1976). One skin papilloma and a single skin carcinoma were reported among a group of 30 mice treated dermally with one drop of 0.2% (w/v) solution toluene twice weekly, administered from droppers delivering 16-20 uL per drop for 72 weeks (Lijinsky and Garcia, 1972). It is not reported whether evaporation of toluene from the skin was prevented during these studies.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Toluene was found to be nonmutagenic in reverse mutation assays with S. typhimurium (Mortelmans and Riccio, 1980; Nestmann et al., 1980; Bos et al., 1981; Litton Bionetics, Inc., 1981; Snow et al., 1981) and E. coli (Mortelmans and Riccio, 1980), with and without metabolic activation. Toluene did not induce mitotic gene conversion (Litton Bionetics, Inc., 1981; Mortelmans and Riccio, 1980) or mitotic crossing over (Mortelmans and Riccio, 1980) in S. cerevisiae. Although Litton Bionetics, Inc. (1981) reported that toluene did not cause increased chromosomal aberrations in bone marrow cells, several Russian studies (Dobrokhotov, 1972; Lyapkalo, 1973) report toluene as effective in causing chromosal damage in bone marrow cells of rats. There was no evidence of chromosomal aberrations in blood lymphocytes of workers exposed to toluene only (Maki-Paakkanen et al., 1980; Forni et al., 1971), although a slight increase was noted in workers exposed to toluene and benzene (Forni et al., 1971; Funes-Craviota et al., 1977). This finding is supported by studies of cultured human lymphocytes exposed to toluene in vitro; no elevation of chromosomal aberrations or sister chromatid exchanges was observed (Gerner-Smidt and Friedrich, 1978).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Toluene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-408.

_II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The values in the 1987 Drinking Water Criteria Document for Toluene have received peer and administrative review.

Agency Work Group Review: 09/15/87

Verification Date: 09/15/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

Robert E. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TOLUENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor.

INGESTION: do NOT induce vomiting; call a doctor.
EYES: flush with water for at least 15 min.
SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Toluene
DOT ID NUMBER: UN1294

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive

fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 206 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYL BENZENE

SYNONYMS: AETHYLBENZOL (German); EB; ETHYLBENZEEN (Dutch); ETHYL BENZENE; ETHYL BENZENE (DOT); ETHYLBENZOL; ETILBENZENE (Italian); ETYLOBENZEN (Polish); NCI-C56393; PHENYLETHANE

CAS: 100-41-4 RTECS: DA0700000

FORMULA: C8H10 MOL WT: 106.18

WLN: 2R

CHEMICAL CLASS:Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless liquid with a sweet, gasoline-like odor.

BOILING POINT:	409.2 K	136 C	276.8 F
MELTING POINT:	178.15 K	-95 C	-139 F
FLASH POINT:	294.26 K	21.11 C	69.9 F
AUTO IGNITION:	733 K	459.8 C	859.8 F
CRITICAL TEMP:	617.1 K	343.95 C	651.11 F
CRITICAL PRESS:	3.61 kN/M2	35.5 atm	523 psia
HEAT OF VAP:	144 Btu/lb	79.97 cal/g	3.346x E5 J/kg
HEAT OF COMB:	-17780 Btu/lb	-9885 cal/g	-413x E5 J/kg

VAPOR PRESSURE: 10mm @ 25.9 C

UEL: 6.7 %

LEL: 1.0 %

IONIZATION POTENTIAL (eV): 8.76

VAPOR DENSITY: 3.7 (air=1)

EVAPORATION RATE: 0.84(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.867 20C

DENSITY: 0.866 g/mL @ 20 C

WATER SOLUBILITY: 0.015%

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 140

ODOR DESCRIPTION: AROMATIC Source:CHRIS

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1175
DOT shipping name: Ethylbenzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909163

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.7 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 0.7 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: D001
CERCLA REF: Y
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

GIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
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EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/19/87
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EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
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EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYL BENZENE [100-41-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 200 ppm for 30 minutes can cause irritation of the nose and throat, dizziness, difficult breathing and depression. very high levels can cause unconsciousness. SKIN: can cause irritation, inflammation, blisters and burns. Eyes: 200 ppm can cause irritation. higher levels can cause burning, tearing and injury. INGESTION: can cause headache, sleepiness and coma.(NYDH)

LONG TERM TOXICITY: may cause skin rash and irritation of eyes, nose and throat.(NYDH)

TARGET ORGANS: eyes, upper resp sys, skin, CNS

SYMPTOMS: Inhalation may cause irritation of nose, dizziness,

depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. Source: CHRIS

CONC IDLH: 2000PPM

NIOSH REL:

ACGIH TLV: TLV = 100ppm(434 mg/M3)
ACGIH STEL: STEL = 125 ppm(543 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 125 ppm(545 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:100 ppm/8H AIHAAP 31,206,70
SENSE ORGANS
Eye
Other
BEHAVIORAL
Sleep
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:3500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:3500 mg/kg
ihl-rat LCLo:4000 ppm/4H
ihl-mus LDLo:50 gm/m3/2H
ipr-mus LD50:2272 mg/kg
skn-rbt LD50:17800 mg/kg

ihl-gpg LCLo:10000 ppm

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 15 mg/24H open MLD
eye-rbt 100 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:97 ppm/7H (15D pre) NTIS** PB83-208074
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:985 ppm/7H (1-19D preg) NTIS** PB83-208074
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:96 ppm/7H (1-19D preg) NTIS** PB83-208074
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetal death
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:2400 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rbt TCLo:99 ppm/7H (1-18D preg) NTIS** PB83-208074
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Ethylbenzene; CASRN 100-41-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Ethylbenzene
CASRN -- 100-41-4

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- nonclassifiable due to lack of animal bioassays and human studies.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

None. NTP has plans to initiate bioassay. Metabolism and excretion studies at 3.5, 35 and 350 mg/kg are to be conducted as well.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The metabolic pathways for humans and rodents are different (Engstrom et al., 1984). Major metabolites in humans, mandelic acid and phenylglyoxylic acid, are minor metabolites in rats and rabbits (Kiese and Lenk, 1974). The major animal metabolites were not detected in the urine of exposed workers (Engstrom et al., 1984).

Ethylbenzene at 0.4 mg/plate was not mutagenic for Salmonella strains TA98, TA1535, TA1537 and TA1538 with or without Aroclor 1254 induced rat

liver homogenates (S9) (Nestmann et al., 1980). Ethylbenzene was shown to increase the mean number of sister chromatid exchanges in human whole blood lymphocyte culture at the highest dose examined without any metabolic activation system (Norppa and Vainio, 1983).

Dean et al. (1985) used a battery of short-term tests including bacterial mutation assays, mitotic gene conversion in Saccharomyces cerevisiae JD1 in the presence and absence of S9 and chromosomal damage in a cultured rat liver cell line. Ethylbenzene was not mutagenic in the range of concentrations tested (0.2, 2, 20, 50 and 200 ug/plate) for S. typhimurium TA98, TA100, TA1535, TA1537 and TA1538 or for Escherichia coli WP2 and WP2uvrA. Ethylbenzene also showed no response in the S. cerevisiae JD1 gene conversion assay. In contrast, ethylbenzene hydroperoxide showed positive responses with E. coli WP2 at 200 ug/plate in the presence of S9 and an equally significant response with the gene conversion system of yeast.

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-048. NTIS PB 81-117590.

U.S. EPA. 1984. Health Effects Assessment for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/008.

U.S. EPA. 1987. Drinking Water Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Ambient Water Quality Criteria Document and the Health Assessment Document have received Agency and external review. The Drinking Water Criteria Document has been extensively reviewed.

Agency Work Group Review: 10/07/87

Verification Date: 10/07/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Arthur S. Chiu / ORD -- (202)260-6764 / FTS 260-6764

Lynn Papa / ORD -- (513)569-7523 / FTS 684-7523

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
self-contained breathing apparatus; safety goggles.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (ETHYL BENZENE)
1000 ppm: Any powered air-purifying respirator with organic vapor

cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection. / Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration.
INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis.
SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam (most effective), water fog, carbon dioxide or dry chemical. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethylbenzene
DOT ID NUMBER: UN1175

ERG93 GUIDE 26

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies

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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 421 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: XYLENE

SYNONYMS: XYLENE (XYLOL); XYLOL; METHYL TOLUENE; BENZENE, DIMETHYL-; DIMETHYLBENZENE; NCI-C55232; VIOLET 3; XYLOL (DOT); SOCAL AQUATIC SOLVENT 3501

CAS: 1330-20-7 RTECS: ZE2100000

FORMULA: C8H10 MOL WT: 106.18

WLN: 1R X1

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless liquid with aromatic odor

BOILING POINT:	412 K	138.8 C	281.9 F
MELTING POINT:	247 K	-26.2 C	-15.1 F
FLASH POINT:	300.35-305.35 K	27.2-32.2 C	80.9-89.9 F
AUTO IGNITION:	736.45-802.05 K	463.3-528.9 C	866-984.1 F

VAPOR PRESSURE: 6.7 mm @ 21 C

UEL: 7 %

LEL: 1 %

IONIZATION POTENTIAL (eV): 8.56

VAPOR DENSITY: 3.7 (air=1)

EVAPORATION RATE: 0.77(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.861 20C

DENSITY: 0.861 g/cc or 8.0073 lb/gal

WATER SOLUBILITY: VERY SL SOL

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 0.05

ODOR DESCRIPTION: LIKE BENZENE; CHARACTERISTIC AROMATIC
Source:CHRIS

100 % ODOR DETECTION: 0.4-20 ppm

REGULATIONS

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27

Identification number: UN1307
DOT shipping name: XYLENES
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909350, 4909351

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 10 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 10 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U239,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
Chronic toxicity: carcinogen
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
lifornia Assembly Bill 1803 Well Monitoring Chemicals.
anadian Domestic Substances List
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
sconsin Air Toxics Control Regulation NR-445 (December 1988)
ENE [1330-20-7]

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: CNS, eyes, gi tract, blood, liver, kidneys, skin

SYMPTOMS: DIZZ, EXCITEMENT, DROW, INCO, STAGGERING GAIT, IRRIT EYES, NOSE, THROAT, CORNEAL VACUOLIZATION, ANOREXIA, NAU, VOMIT, ABDOM PAIN; DERM Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure 434 mg/M3 Time weighted averages for 8-hour exposure 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 868 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 100ppm(434 mg/M3)

ACGIH STEL: STEL = 150 ppm(651 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 150 ppm(655 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-man LCLo:10000 ppm/6H BMJOAE 3,442,70
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Cyanosis
BLOOD
Other changes

LD50 value: orl-rat LD50:4300 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4300 mg/kg
ihl-rat LC50:5000 ppm/4H
ipr-rat LD50:2459 mg/kg
scu-rat LD50:1700 mg/kg
ipr-mus LD50:1548 mg/kg
ivn-rbt LDLo:129 mg/kg
ihl-gpg LCLo:450 ppm
ipr-gpg LDLo:2 gm/kg
ipr-mam LDLo:2 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:250 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Other developmental abnormalities
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) PCBRD2 163B,295,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:20600 ug/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:31 mg/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:4000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN
Physical

ihl-mus TCLo:2000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1 gm/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------

Xylenes; CASRN 1330-20-7 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Xylenes
CASRN -- 1330-20-7
Last Revised -- 03/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- Orally administered technical xylene mixtures did not result in significant increases in incidences in tumor responses in rats or mice of both sexes.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. In an NTP (1986) study, 50 male and 50 female F344/N rats were treated by gavage with mixed xylenes in corn oil (60% m-xylene, 14% p-xylene, 9% o-xylene and 17% ethylbenzene) at dosages of 0, 250 or 500 mg/kg/day, 5 days/week for 103 weeks. Similarly, 50 male and 50 female B6C3F1 mice were treated with the same xylene mixture at dosages of 0, 500 or 1000 mg/kg/day. Animals were killed and examined histologically when moribund or after 104-105 weeks. An apparent dose-related increased mortality was observed in male rats, but this difference was statistically significant for the high dose group, only. No other differences in survival between dosage groups of either sex were observed. Interstitial cell tumors of the testes could not be attributed to administration of the test compound observed in male rats (43/50 control, 38/50 low-dose and 41/49 high-dose). NTP (1986) reported that there were no significant changes in the incidence of neoplastic or nonneoplastic lesions in either the rats or mice that could be considered related to the mixed xylene treatment, and concluded that under the conditions of these 2-year gavage studies, there was "no evidence of carcinogenicity" of xylene (mixed) for rats or mice of either sex at any dosage tested.

Maltoni et al. (1985), in a limited study, reported higher incidences (compared with controls) of malignant tumors in male and female Sprague-Dawley rats treated by gavage with xylene in olive oil at 500 mg/kg/day, 4 or 5 days/week for 104 weeks. This study did not report survival rates or specific tumor types; therefore, the results cannot be interpreted.

Berenblum (1941) reported that "undiluted" xylene applied at weekly intervals produced one tumor-bearing animal out of 40 after 25 weeks in skin-painting experiments in mice. No control groups were described. Pound (1970) reported negative results in initiation-promotion experiments with xylene as the initiator and croton oil as the promotor.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The frequency of sister chromatid exchanges and chromosomal aberrations were nearly identical between a group of 17 paint industry workers exposed to xylene and their respective referents (Haglund et al., 1980). In vitro, xylene caused no increase in the number of sister chromatid exchanges in human lymphocytes (Gerner-Smidt and Friedrich, 1978). Studies indicate that xylene isomers, technical grade xylene or mixed xylene are not mutagenic in tests with Salmonella typhimurium (Florin et al., 1980; NTP, 1986; Bos et al., 1981) nor in mutant reversion assays with Escherichia coli (McCarroll et al., 1981). Technical grade xylene, but not o- and m-xylene, was weakly mutagenic in Drosophila recessive lethal tests. Chromosomal aberrations were not increased in bone marrow cells of rats exposed to xylenes by inhalation (Donner et al., 1980).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Xylene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-416. Final.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Drinking Water Criteria Document for Xylene has received Agency and external review.

Agency Work Group Review: 12/02/87

Verification Date: 12/02/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Bruce Mintz / ODW -- (202)260-9569 / FTS 260-9569

W. Bruce Peirano / ORD -- (513)569-7540 / FTS 684-7540

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
)M THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (XYLENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with

running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: XYLENES
DOT ID NUMBER: UN1307

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames. Vapors may travel to a source of ignition and flash back. Container may explode in heat of fire. Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin. Vapors may cause dizziness or suffocation. Contact may irritate or burn skin and eyes. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 5249 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYLENE, TETRACHLORO-

SYNONYMS: ANKILOSTIN; ANTISOL 1; CARBON BICHLORIDE; CARBON DICHLORIDE; CZTEROCHLOROETYLEN (Polish); DIDAKENE; DOW-PER; ENT 1,860; ETHENE, TETRACHLORO-; ETHYLENE TETRACHLORIDE; FEDAL-UN; NCI-C04580; NEMA; PER; PERAWIN; PERC; PERCHLOORETHYLEEN, PER (Dutch); PERCHLOR; PERCHLORAETHYLEN, PER (German); PERCHLORETHYLENE; PERCHLORETHYLENE, PER (French); PERCHLOROETHYLENE; PERCLENE; PERCLOROETILENE (Italian); PERCOSOLVE; PERK; PERKLONE; PERSEC; TETLEN; TETRACAP; TETRACHLOORETHEEN (Dutch); TETRACHLORAETHEN (German); TETRACHLORETHYLENE; TETRACHLOROETHENE; TETRACHLOROETHYLENE; 1,1,2,2,-TETRACHLOROETHYLENE; TETRACHLOROETHYLENE (DOT); TETRACLOROETENE (Italian); TETRALENO; TETRALEX; TETRAVEC; TETROGUER; TETROPIL

CAS: 127-18-4 RTECS: KX3850000

FORMULA: C2Cl4 MOL WT: 165.82

WLN: GYGUYGG

CHEMICAL CLASS: FT

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless liquid, chloroform-like odor.

BOILING POINT:	394.2 K	121 C	249.8 F
MELTING POINT:	249.65 K	-23.5 C	-10.3 F
FLASH POINT:	Not available		
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	15.8MM @ 22C		
UEL:	~		
LEL:	~		
IONIZATION POTENTIAL (eV):	9.32		
VAPOR DENSITY:	No data		
EVAPORATION RATE:	2.59(n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.625 @20/4C		
DENSITY:	1.6311 @ 15/4C		
WATER SOLUBILITY:	QUITE SOLUBLE IN H2O(0.015G/ML @20C), IT IS MISCIBLE WITH MOST ORGANIC SOLVENTS AND OILS.		
INCOMPATIBILITIES:	strong oxidizers, chemically active metals, such as barium, lithium, beryllium, sodium		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	HCL AND PHOSGENE\CORROSIVE
ODOR DETECTED AT (ppm):	5 ppm
ODOR DESCRIPTION:	mildly sweet Source:CHRIS
100 % ODOR DETECTION:	No data

---------- REGULATIONS ----------

DOT hazard class:	6.1 POISON
DOT guide:	74
Identification number:	UN1897
DOT shipping name:	Tetrachloroethylene
Packing group:	III
Label(s) required:	KEEP AWAY FROM FOOD
Special provisions:	N36,T1
Packaging exceptions:	173.153
Non bulk packaging:	173.203
Bulk packaging:	173.241
Quantity limitations-	
Passenger air/rail:	60 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	40
STCC NUMBER:	4940355
CLEAN WATER ACT Sect.307:	Yes
CLEAN WATER ACT Sect.311:	No

National Primary Drinking Water Regulations
  Maximum Contaminant Levels (MCL): 0.005 mg/L (07/30/92)
  Maximum Contaminant Level Goals (MCLG): 0 mg/L (07/30/92)

CLEAN AIR ACT:	CAA '90 Listed
EPA WASTE NUMBER:	U210,D039
CERCLA REF:	Y
RQ DESIGNATION:	B 100 pounds (45.4 kg) CERCLA
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: carcinogen Chronic toxicity: adverse effect to target organ after long period of exposure. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-A
Mailability: Domestic service and air transportation; shipper's declaration
c per parcel: 10 GAL; 1 PT

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (0) This material does not readily burn.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/01/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE, TETRACHLORO- [127-18-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: exposures of 200 ppm for 1 hour can cause irritation of the nose, mouth and throat, dizziness,

headaches and lightheadedness; exposures of 1,000 ppm for 30 minutes can cause difficult breathing, weakness, loss of muscle control, irritability, tremors, convulsions, paralysis, coma, heart irregularities and death. SKIN: can cause dry, scaly skin, a mild to moderate burning sensation, redness and inflammation. Eyes: can cause burning and irritation. INGESTION: can cause nausea, vomiting, diarrhea, bloody stool, a reddening of face and neck, weakness and loss of muscle control.(NYDH)

LONG TERM TOXICITY: exposures over 200 ppm during weeks or months can cause irritation of the respiratory tract, nausea, headache, sleeplessness, abdominal pains, constipation, dizziness, increased perspiration, fatigue, skin infection, kidney and liver damage, fluid in the lungs and coma. most of these effects will disappear after exposure is stopped. tetrachloroethylene at high levels has caused cancer and birth defects in mice. whether it causes cancer in humans is unknown.(NYDH)

TARGET ORGANS: skin, mucous membrane, eyes, CNS, gastrointestinal tract. liver, kidneys.

SYMPTOMS: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury. Source: CHRIS

CONC IDLH: 500ppm

NIOSH REL: Potential occupational carcinogen --MINIMIZE EXPOSURE (Limit of quantitation 0.4 ppm)

ACGIH TLV: TLV = 25ppm(170 mg/M3) A3
ACGIH STEL: STEL = 100 ppm(685 mg/M3)»A3

OSHA PEL: Transitional Limits:
PEL = 100 PPM; CEILING = 200 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 25 ppm (170 mg/M3)

MAK INFORMATION: 50 ppm
345 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.
A compound which is justifiably suspected of having

carcinogenic potential.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: A compound which is justifiably suspected of having carcinogenic potential.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as reasonably anticipated to be carcinogenic, with limited evidence in humans or sufficient evidence in experimental animals.
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:96 ppm/7H NTIS** PB257-185
PERIPHERAL NERVE AND SENSATION
Local anesthetic
SENSE ORGANS
Eye
Conjunctive irritation
BEHAVIORAL
Hallucinations, distorted perceptions

orl-chd TDLo:545 mg/kg JTCTDW 23,103,85
BEHAVIORAL
Coma

LD50 value: orl-rat LD50:2629 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2629 mg/kg
ihl-rat LC50:34200 mg/m3/8H
ipr-rat LD50:4678 mg/kg
orl-mus LD50:8100 mg/kg
ihl-mus LC50:5200 ppm/4H
scu-mus LD50:65 gm/kg

orl-dog LDLo:4 gm/kg
ipr-dog LD50:2100 mg/kg
ivn-dog LDLo:85 mg/kg
orl-cat LDLo:4 gm/kg
orl-rbt LDLo:5 gm/kg
scu-rbt LDLo:2200 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 810 mg/24H SEV
eye-rbt 162 mg MLD

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:1000 ppm/24H (14D pre/1-22D preg) APTOD9 19,A21,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 ppm/24H (1-22D preg) APTOD9 19,A21,80
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:900 ppm/7H (7-13D preg) TJADAB 19,41A,79
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN

EFFECTS ON NEWBORN
Behavioral

ihl-rat TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

California Prop 65: Carcinogen (04/01/88)
No significant risk level 14. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Tetrachloroethylene; CASRN 127-18-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Tetrachloroethylene

s substance/agent has been evaluated by the U.S. EPA for evidence of human carcinogenic potential. This does not imply that this agent is necessarily a carcinogen. The evaluation for this chemical is under review by an inter-office Agency work group. A risk assessment summary will be included on IRIS when the review has been completed.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention.
INGESTION: induce vomiting only on physician's recommendation.
EYES AND
SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give

oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Tetrachloroethylene
DOT ID NUMBER: UN1897

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POTENTIAL HAZARDS

*HEALTH HAZARDS
Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Most vapors heavier than air.
*Air/vapor mixtures may explode when ignited.
Container may explode in heat of fire.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. Remove and isolate contaminated clothing at the site. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical or CO2.
Large Fires: Water spray, fog or regular foam.
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Small Liquid Spills: Take up with sand, earth or other noncombustible absorbent material.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

Use first aid treatment according to the nature of the injury.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 2191 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: CHLORODIPHENYL (54% CHLORINE)

SYNONYMS: AROCHLOR 1254; AROCLOR 1254; CHLORIERTE BIPHENYLE, CHLORGEHALT 54% (German); CHLORODIPHENYL (54% Cl); CLORODIFENILI, CLORO 54% (Italian); DIPHENYLE CHLORE, 54% DE CHLORE (French); NCI-C02664; POLYCHLORINATED BIPHENYL; PCB

CAS: 27323-18-8 RTECS: DV2063000

FORMULA: C12H5Cl3 (APPROX) MOL WT: 326

WLN:

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION:

BOILING POINT:	638.15 K	365 C	689 F
MELTING POINT:	283.15 K	10 C	50 F
FLASH POINT:	495 K	221.85 C	431.3 F
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	0.00006		
[illegible]:	~		
[illegible]:	~		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	No data		
DENSITY:			
WATER SOLUBILITY:	INSOLUBLE		
INCOMPATIBILITIES:	strong oxidizers		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 9 CLASS 9

DOT guide: 31

Identification number: UN2315

DOT shipping name:	POLYCHLORINATED BIPHENYLS
Packing group:	II
Label(s) required:	CLASS 9
Special provisions:	9, N61
Packaging exceptions:	173.155
Non bulk packaging:	173.202
Bulk packaging:	173.241
Quantity limitations-	
Passenger air/rail:	100 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	34

STCC NUMBER:	Not listed

CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	None
CERCLA REF:	Y
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Chronic toxicity: carcinogen Chronic toxicity: adverse effect to target organ after long period of exposure. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin (Prop 65).

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE):	Unspecified
FLAMMABILITY (RED) :	Unspecified
REACTIVITY (YELLOW):	Unspecified
SPECIAL :	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
CHLORODIPHENYL (54% CHLORINE) [27323-18-8]
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: skin, liver, kidneys

SYMPTOMS: IRRIT EYES, SKIN; ACNE-FORM DERM, JAUN; DARK URINE
Source: NIOSHP

CONC IDLH: 5MG/M3

NIOSH REL: Not given

ACGIH TLV: TLV = 0.5mg/M3 SKIN
ACGIH STEL: STEL = 1 mg/M3»SKIN

OSHA PEL: Transitional Limits:
PEL = 0.5mg/M3(SKIN)
Final Rule Limits:
TWA = 0.5 mg/M3(SKIN)

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below
REFERENCES:
HUMAN SUSPECTED IARC** 18,43,78
ANIMAL POSITIVE IARC** 7,261,74
ANIMAL POSITIVE IARC** 18,43,78

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

unr-rat LD50:2450 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated, and imme

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (CHLORODIPHENYL (54% CHLORINE))
Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash immed
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: POLYCHLORINATED BIPHENYLS
ID NUMBER: UN2315

ERG93 GUIDE 31

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Material may be transported hot.
*HEALTH HAZARDS
Contact may cause burns to skin and eyes.
Inhalation of asbestos dust may have a damaging effect on the lungs.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*Do not scatter spilled material with high-pressure water streams.
Dike fire control water for later disposal.
SPILL OR LEAK
Stop leak if you can do it without risk.
Avoid inhalation of asbestos dust.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
Cover powder spill with plastic sheet or tarp to minimize spreading.
*FIRST AID
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

Attachment B

Directions to Emergency Medical Facilities

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

The nearest hospital **and** the nearest facility capable of treating chemical burns are the same facility, which is located at Methodist North Hospital. Therefore, there is only one set of directions.

Nearest Hospital

Methodist North Hospital
3960 Covington Pike
Memphis, Tennessee

Emergency Room Telephone Number - (901) 372-5211

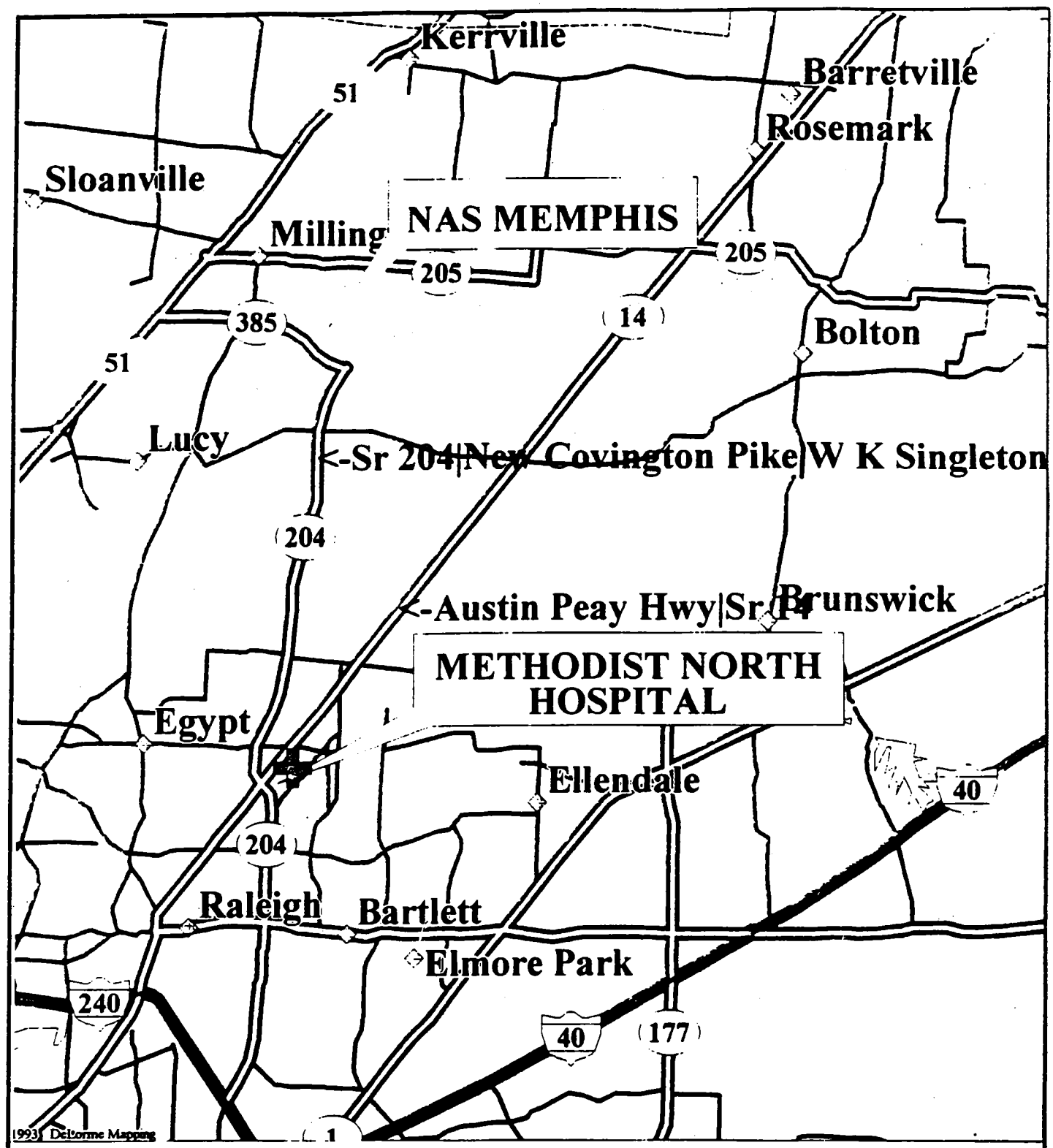
Directions to Methodist North Hospital from NAS Memphis Main Gate:

1) Exit site through South Gate (Singleton Parkway).

2) Continue on Singleton Parkway through the stop signs.

3) Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).

4) You will see the entrance to the emergency room 700 feet past this light on the left.



HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

DIRECTIONS TO THE HOSPITAL

DWG DATE: 10/04/94 | DWG NAME: BOARD

Attachment C

Health and Safety Plan Forms

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project site and returned to: EnSafe/Allen & Hoshall, Memphis, Tennessee.

Job No: 2151-094

Contract No: N62467-89-D-0318

Project: SWMU 27 — Northside Sewage Treatment Plant

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

_____

Signed

_____

Print Name

_____

Company

_____

Date

EMPLOYEE EXPOSURE HISTORY FORM

Employee:

Job Name: _____

Date(s) From/To: _____

Hours On Site: _____

Contaminants (Suspected/Reported):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions:

ACCIDENT REPORT FORM

SUPERVISOR'S REPORT OF ACCIDENT	DO NOT USE FOR MOTOR VEHICLE OR AIRCRAFT ACCIDENTS
TO	FROM TELEPHONE (Include area code)
NAME OF INJURED OR ILL WORKER AND COMPANY	
WORKER'S SOCIAL SECURITY NUMBER	

DATE OF ACCIDENT	TIME OF ACCIDENT	EXACT LOCATION OF ACCIDENT

NARRATIVE DESCRIPTION OF ACCIDENT

NATURE OF ILLNESS OR INJURY AND PART OF BODY INVOLVED	LOST TIME YES ☐ NO ☐

PROBABLE DISABILITY (Check one)

FATAL ☐	LOST WORK DAY WITH ____DAYS AWAY FROM WORK	LOST WORK DAY WITH ____DAYS OF RESTRICTED ACTIVITY	NO LOST WORK DAY ☐ FIRST-AID ONLY ☐

CORRECTIVE ACTION RECOMMENDED (By whom and by when)

NAME OF SUPERVISOR	TITLE
SIGNATURE	DATE

RFI WORK PLAN
NAS MEMPHIS

SITE INVESTIGATION PLAN
SWMU 62 — M-21 ARRESTING GEAR

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

Prepared for:

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

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long Term Environmental Action Navy (CLEAN) Program, the following Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Site Investigation Plan (SIP) has been prepared for a confirmatory sampling investigation at SWMU 62, the M-21 Arresting Gear, at the Naval Air Station (NAS) Memphis, Millington, Tennessee. The primary reference for this SIP is the *Comprehensive RFI Work Plan* (E/A&H, 1994).

2.0 ENVIRONMENTAL SETTING

SWMU 62 is the former location of a portable arresting gear mechanism (M-21) on the active runway 4-22. A vicinity map of SWMU 62 is provided in Figure 1. The gear, which was powered by a generator, was first used in 1985 for pilot training. The site presently consists of two empty, cement-lined, L-shaped containment pits on either side of the runway, believed to have once housed the arresting gear. A 6-inch diameter PVC drain line was installed in the pit on the west side of the runway to drain any potentially contaminated rainwater which might otherwise collect in the pit. This drain line led to a makeshift dry well approximately 90 feet to the west, as evidenced by a 4-foot diameter cement cap presently covering the well. No construction details were available for the well itself, but, according to Public Works personnel, it is constructed of three 55-gallon drums welded end-to-end, buried in a hole 12-foot deep, and sitting on a bed of gravel. The bottom drum was perforated to allow water to seep out. The residual contaminants from the arresting gear pit (hydraulic fluid, diesel fuel, and lube oil) would enter the drum unit and float on the heavier water, allowing for periodic removal. A second structure, similar to the cap covering the dry well, is approximately 30 feet south. This object is reportedly a pile of leftover cement. Site information obtained during the 1990 RCRA Facility Assessment is provided in Appendix A.

2.1 Topography and Drainage

This area has been disturbed by past activities and is generally level. The site drains southwest along a drainage swale which ultimately empties into the North Fork Creek.

2.2 Geologic and Hydrogeologic Information

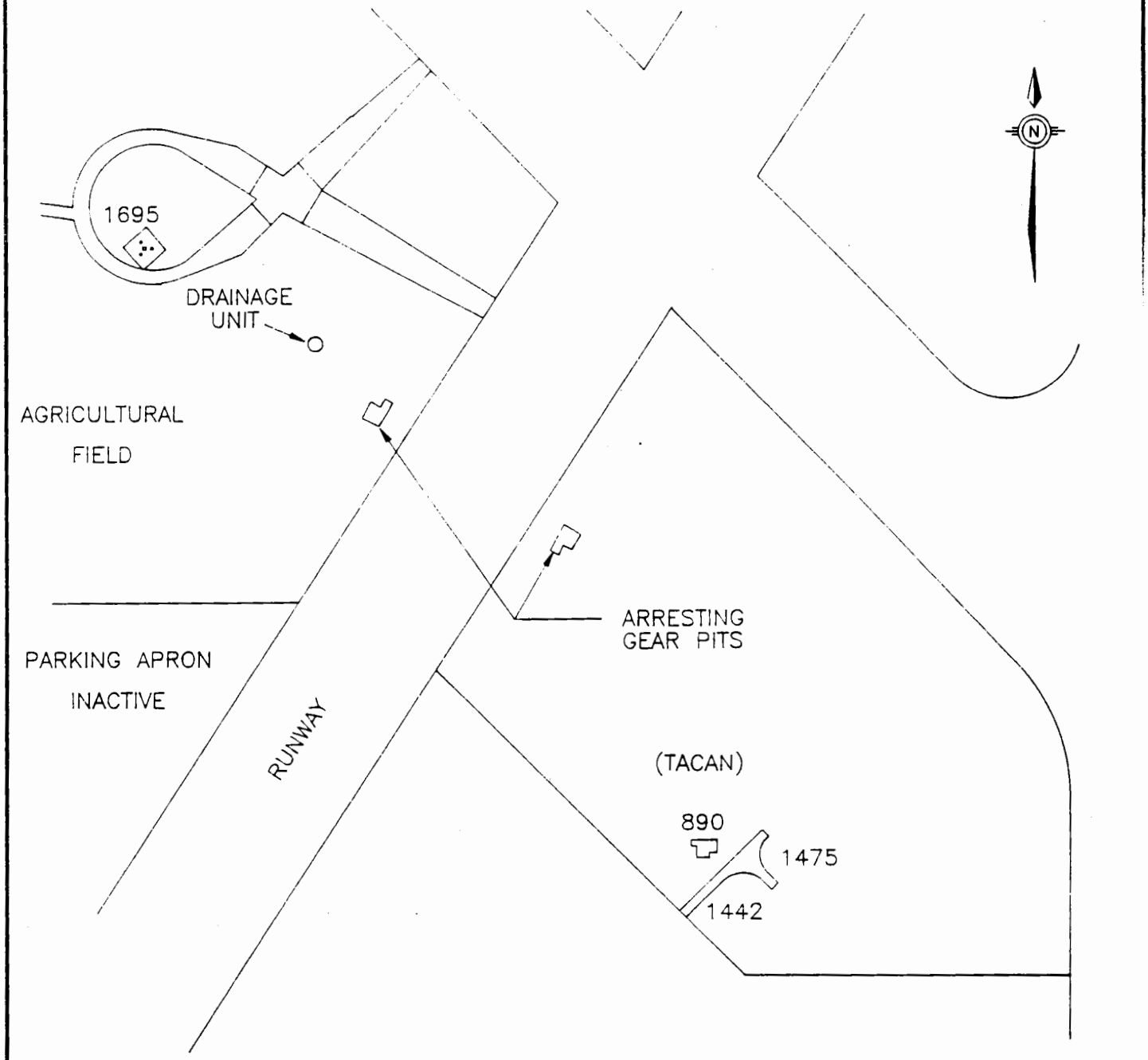
The regional and local hydrogeology are described in Sections 2.11 and 2.12, respectively, of the *Comprehensive RFI Work Plan.*

Previous Investigations

Site-specific subsurface soil information, collected while implementing the Interim Measures (IM) investigation at SWMU 1, the Fire Department Drill Area SOUTHDIV, USGS, E/A&H, March 1993), indicates the presence of low- to very low- permeability silts with varying degrees of clay extending at least 44 feet below ground surface (bgs). No permeability data for the surficial material exists for the site. Permeability data collected during an underground storage tank (UST) investigation at Building N-126 (E/A&H, September 1993) found an average hydraulic conductivity value of 4.5×10^{-7} centimeters per second (cm/sec) at a depth interval of 11 to 13 feet. N-126 is located approximately 2,000 feet south of the site. The Interim Measures investigation and associated boring logs are provided in Appendix B of this document.

Stratigraphic Test Borings

The USGS drilled stratigraphic test hole 2 approximately 700 feet west of the main runway in April 1994. This boring was advanced several feet into the top of the Cook Mountain Formation to better understand site lithologies prior to monitoring well installations. This test hole was visually logged by a field geologist during drilling and geophysically logged following completion. The stratigraphy and lithologies encountered are as follows:



200 0 200

SCALE FEET

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
M-21
ARRESTING GEAR
SWMU 62

DWG DATE: 01/19/95 | DWG NAME: 94AG62

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Loess: Approximately 45 feet of wind-blown silt deposits (loess). These materials were described as silt and clay.

Fluvial Deposits: Approximately 40 feet of fluvial deposits. These materials were described as sand and gravel.

Cockfield Formation: Approximately 85 feet of alternating sand, clay, and some lignite.

Cook Mountain Formation: The Cook Mountain Formation was characterized as a dense, blue-gray clay. It serves as the confining unit separating the upper lithologies from the Memphis aquifer. The terminating depth of the boring was 198 feet bgs, with the top of the Cook Mountain Formation encountered at approximately 180 feet bgs.

Shallow Groundwater

No groundwater monitoring wells are present at SWMU 62. A saturated zone was encountered in the test boring at 43 feet bgs during the IM investigation; however, a 20-foot rise in the water level in the borehole was experienced approximately 24 hours after completion. Depth to groundwater is expected to range between approximately 20 and 43 feet. Based on topography and the information contained in the conceptual model of the NAS Memphis hydrogeology (Section 2.12 of the *Comprehensive RFI Work Plan*), groundwater is presumed to flow southwesterly in the loess and fluvial deposits at SWMU 62.

2.3 Climatological Data

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

3.0 SOURCE CHARACTERIZATION

According to the 1990 RFA, the wastes associated with this arresting gear drainage structure include hydraulic fluid, lubricating oil and diesel fuel. Based on reported design features, it is likely that waste hydrocarbons leaked from the base drum or associated piping, contaminating surrounding soil and possibly shallow groundwater.

Field sampling will be performed to confirm or refute the presence of the anticipated site constituents as outlined in Section 4.3. If contamination is verified, the scope of the investigation will be expanded to meet the requirements of a RCRA Facility Investigation (RFI). Reference materials will be used to determine the physical, chemical, and migration or dispersal characteristics of any contaminants identified during the RFI as exceeding the appropriate action levels. The procedures and references used to determine these characteristics will be documented in the RFI report.

4.0 CHARACTERIZATION OF HAZARDOUS CONSTITUENT RELEASES

4.1 Previous Investigations

No known investigations of this site have been performed.

4.2 Data Gaps

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

- The potential for subsurface soil contamination in the loess.
- The potential for groundwater contamination in the loess.
- Status/impact from gear pits and dry well.

Concentrations of contaminants identified in soil and groundwater at SWMU 62 will be compared to background soil and groundwater concentrations to determine whether measured

values occur naturally or indicate contamination. Background concentrations will be determined from the five background monitoring well locations which have been installed across the base and from monitoring wells at other SWMUs. Groundwater samples collected from the background monitoring wells have been analyzed for full scan analysis (FSA) using the following methods:

- Volatile Organic Compounds (USEPA Method 8240)
- Semivolatile Organic Compounds (USEPA Method 8270)
- Total Petroleum Hydrocarbons (TPH, USEPA Method 418.1)
- Gasoline Range Organics (GRO) (TN Modified 8015/GRO)
- Diesel Range Organics (DRO) (TN Modified 8015/DRO)
- Chlorinated Pesticides/PCBs (USEPA Method 8080)
- Organophosphorus Pesticides (USEPA Method 8140)
- Chlorinated Herbicides (USEPA Method 8150)
- RCRA Part 264, Appendix IX Total Metals (USEPA Method 6010/7000 series)
- Total Cyanide (USEPA Method 9010)

4.3 Objective and Proposed Field Investigation

The objectives of the proposed field investigation are to fill the data gaps identified in Section 4.2 and to delineate the horizontal and vertical extent of any soil and groundwater contamination present at SWMU 62. The field sampling investigation will consist of two phases in which soil and groundwater samples will be collected as outlined below. All sample collection and processing will be in accordance with Section 4 of the *Comprehensive RFI Work Plan*.

The first phase will consist of a soil and groundwater screening investigation that will be conducted using Direct Push Technology (DPT), as well as hand auger and/or Geoprobe-type (or equivalent) samples. It is anticipated that a hand auger and/or Geoprobe (or equivalent) will

be used to collect shallow (< 3.0 feet bgs) samples and DPT to collect deeper samples. Results of the DPT investigation will be used to plan the placement of monitoring wells (and possibly soil borings) in the second phase of the investigation, if necessary.

4.3.1 DPT Phase

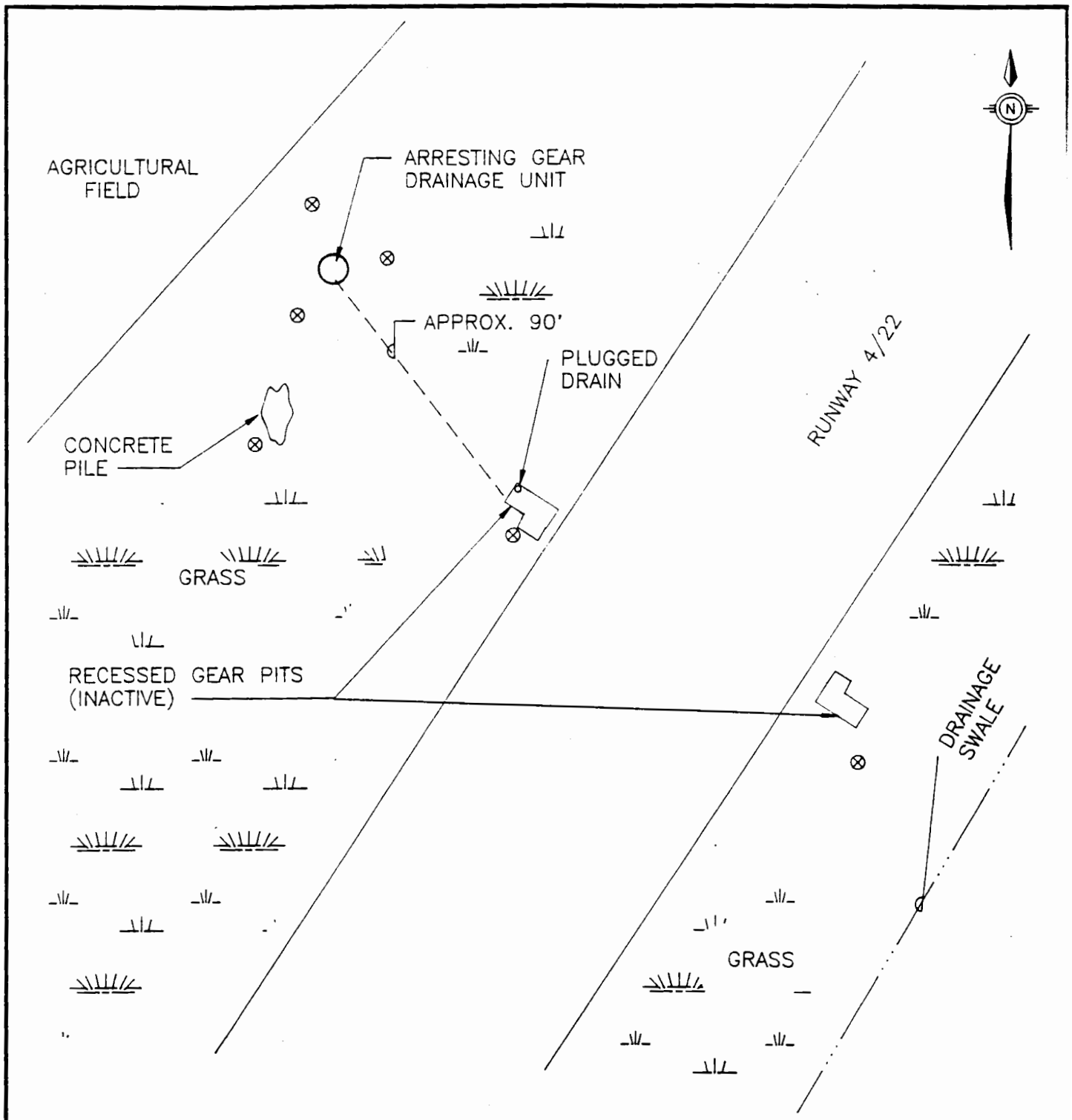
The proposed soil and groundwater investigation will initially consist of DPT sampling (Section 4.4.4.3 of the *Comprehensive RFI Work Plan*) to collect soil and groundwater samples for field analysis. A total of 6 initial sampling locations have been selected as shown in Figure 2. The location of the arresting gear drainage unit (dry well) has been estimated from verbal communication with personnel from the NAS Memphis Public Works Office and field observations of a 4-foot diameter cement cap covering the dry well.

Three soil and/or groundwater samples will be collected from each sampling point as outlined below:

1) One soil sample will be collected from the shallow soil interval. The shallow soil interval at the dry well is defined as 0 to 1 foot bgs. The shallow interval at the arresting gear pits is defined as 2 to 3 feet bgs (corresponding to the base of the pits).

2) One sample, either soil or groundwater, will be collected from the soil-water interface in the backfill soil or loess. Under optimum conditions, a groundwater sample will be collected. However, if a groundwater sample cannot be collected at this interval, a soil sample will be collected.

3) One groundwater sample will be collected from the top of the fluvial deposits.



LEGEND

⊗ DPT SAMPLING LOCATION

SCALE: NOT TO SCALE

RFI WORK PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
PROPOSED DPT SAMPLING LOCATION
M-21
ARRESTING GEAR
SWMU 62

DWG DATE: 01/19/95 | DWG NAME: 94M21G

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Field personnel may deviate from this strategy if field conditions or data (i.e., piezocone or gas chromatograph) suggest that additional or different intervals may be successfully sampled or yield more useful information. The investigatory area may then be expanded or concentrated, based on the results of the initial data. VOC analysis (USEPA Method 8021) of these samples will be performed in the field using a portable gas chromatograph (GC). At least 25 percent of the soil samples will be split for laboratory analysis for confirmatory purposes. Split samples submitted to the offsite laboratory will be analyzed for VOCs using USEPA Method 8240. Split sample selection will be determined in the field.

4.3.2 Soil Boring/Monitoring Well Phase

After the BCT reviews the analytical data from the DPT phase of the investigation, a second phase, consisting of installing and sampling soil borings and monitoring wells, may be implemented to better define the nature and extent of contamination. The number, placement, and depth of borings and monitoring wells will be determined using data from the DPT phase of this investigation. An addendum to this SIP describing the proposed drilling, sampling, and analytical strategies for the expanded investigation will be prepared and submitted to the BRAC Cleanup Team for review and comment, should a second phase be required.

4.3.3 Field Analytical Requirements

Field measurements at SWMU 62 will be conducted in accordance with Section 4.10.1 of the *Comprehensive RFI Work Plan*. Field measurements will include pH, temperature, specific conductivity, and groundwater level for monitoring wells, and organic vapor detection for soil samples and boreholes. Soil and groundwater samples collected during the DPT survey will be analyzed in the field with a portable GC at Level II Data Quality Objectives (DQO).

4.4 Sample Management

Sample management procedures will adhere to Sections 4.12 and 5.0 of the *Comprehensive RFI Work Plan*.

4.5 Sample Custody

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

4.6 Quality Assurance/Quality Control

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

4.7 Decontamination Procedures

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

4.8 Investigation-Derived Waste

Investigation-derived waste (IDW) will be handled as specified in Section 4.13 of the *Comprehensive RFI Work Plan.*

5.0 POTENTIAL RECEPTORS

SWMU 62 is approximately one mile west of the nearest offsite residence. The nearest NAS Memphis personnel are 2,000 feet to the southeast at a control tower area. Runoff from the SWMU flows southwest along a drainage swale, which transports the water to North Fork Creek, which may serve as a water and food source for various animals. Off base, the potential exists for contact by the general public due to unrestricted access to the drainage ways. According to base personnel, no fishing or swimming occurs in North Fork Creek or Big Creek, but children may play near these drainage ways.

Other potential receptors include two production wells (PW-1 and PW-2). PW-1 is approximately 1,750 feet south of SWMU 62, and PW-2 is approximately 2,500 feet southeast. Both production wells are screened in the Memphis Aquifer, with the Cook Mountain confining unit above the screened intervals. A more detailed analysis of potential receptors will be

conducted and presented in the RCRA Facility Investigation (RFI) report if contamination is found at SWMU 62.

6.0 QUALITY ASSURANCE PLAN

The Quality Assurance Plan (QAP) presented in Section 4.14 of the *Comprehensive RFI Work Plan* will be followed throughout the RFI at SWMU 62.

7.0 DATA MANAGEMENT PLAN

The Data Management Plan (DMP) presented in Section 5 of the *Comprehensive RFI Work Plan* will be followed during the RFI for SWMU 62.

8.0 HEALTH AND SAFETY PLAN

The Site-specific Health and Safety Plan for SWMU 62 is included in Appendix C of this document. The Comprehensive Health and Safety Plan is included in Section 7 of the *Comprehensive RFI Work Plan.*

9.0 REFERENCES

EnSafe/Allen & Hoshall (October 1994). *Comprehensive RFI Work Plan for Naval Air Station Memphis.* E/A&H: Memphis, Tennessee.

EnSafe/Allen & Hoshall (September 1993). *Environmental Assessment Report for Building N-126 USTs, Naval Air Station, Memphis Tennessee.* E/A&H: Memphis, Tennessee.

ERC/EDGe (September 1990). *RCRA Facility Assessment (RFA), NAS Memphis.* ERC/EDGe: Nashville, Tennessee.

Southern Division, United States Geological Society, EnSafe/Allen & Hoshall (March 1993). *Technical Memorandum — Interim Measures Field and Analytical Summary for SWMU 1.* E/A&H: Memphis Tennessee.

Southern Division Naval Facilities Engineering Command (May 1990). *Draft Final RCRA Facility Investigation Work Plan for Naval Air Station-Memphis.* SOUTHDIV: Charleston, South Carolina.

APPENDIX A

RFA SWMU DESCRIPTION

7.62 SWMU No. 62: M-21 ARRESTING GEAR

7.62 UNIT CHARACTERISTICS

7.62.1.1 TYPE OF UNIT

Inactive Arresting Gear drainage unit.

7.62.1.2 DESIGN FEATURES

There are two units on either side of the runway. Each one consists of a 6-inch plastic pipe drain to a containment structure. The containment structure involves three 55-gallon drums welded together (top of one drum to bottom of another), buried approximately twelve feet deep over pea gravel.

7.62.1.3 OPERATING PRACTICES (PAST AND PRESENT)

Rainwater and residual waste from the operation of arresting gear would drain from a 6-inch pipe drain into a containment structure. The containment structure's base 55-gallon drum included holes to allow water to seep out into the field (With water being heavier than the residual waste generated, the residual waste floated on the surface of the water and was periodically removed). The arresting gear drain was plugged on 17 December 1990. Presently, the arresting gear will continue to be used with the drain closed. Any rainwater and residual waste contained in the sealed concrete arresting gear containment pit will be pumped, tested, and disposed of properly.

7.62.1.4 PERIOD OF OPERATION

The period of operation is from the summer of 1985 to 17 December 1990.

7.62.1.5 AGE OF UNIT

The age of SWMU 62 is approximately 5 & 1/2 years.

7.62.1.6 LOCATION OF UNIT

This unit is located on Runway 04/22, North Side Complex (See Figure 7-62).

7.62.1.7 GENERAL PHYSICAL CONDITIONS

The condition of the underground drain pipe and 55-gallon drums is unknown. There is slightly stressed vegetation surrounding the unit.

7.62.1.8 CLOSURE METHOD

None.

7.62.2 WASTE CHARACTERISTICS

7.62.2.1 TYPE OF WASTES

Hydraulic fluid, lubricating oil, and diesel fuel.

7.62.2.2 MIGRATION CHARACTERISTICS

Wastes such as those previously characterized in this description are reasonably mobile in the environment. Surface infiltration of rain water can transport these wastes into the soil and ground water.

7.62.2.3 TOXICOLOGICAL CHARACTERISTICS

The contaminants of concern are used hydraulic fluid, lubricating oil, and diesel fuel. These contaminants may produce one or more of the following human health effects, depending on the type of exposure (chronic or acute), the route of entry (inhalation, ingestion, or skin absorption), and the dose received - slight to moderate eye irritation; dermal irritation with possible redness, edema, or drying of the skin; and acute-central nervous system depression. Studies with rodents have shown that petroleum distillates have caused kidney damage and kidney or liver tumors.

7.62.2.4 PHYSICAL/CHEMICAL CHARACTERISTICS

Waste hydrocarbons that may have leaked from the base drum could exist as waste-saturated soils or groundwater contaminants.

7.62.3 MIGRATION PATHWAYS

7.62.3.1 GEOLOGIC SETTING

See Section 3.2.

7.62.3.2 HYDROGEOLOGIC SETTING

See Section 3.3.

7.62.3.3 ATMOSPHERIC CONDITIONS

See Section 4.0

7.62.3.4 TOPOGRAPHIC CHARACTERISTICS

See Section 3.1 for general area characteristics. The surrounding area is generally level with surface drainage via manmade drainageways to the west.

7.62.3.5 PATHWAYS

AIR

No surface releases were evident. Therefore, it is felt that air is not a transport mechanism.

SOIL

Hazardous constituents of the waste oils/fuel at this location would be released into the soil mass after transporting through the pea gravel. Soil particle bonding, which naturally exists in the silt and clay type soils typical to this area, provide a strong attenuation for these potential contaminants. Minor releases from this system would most probably be trapped in the vadose soil zone until natural driving forces are exerted (surface water infiltration) to transport these substances to the groundwater surface.

SURFACE WATER/SEDIMENT

The field inspection revealed slightly stressed vegetation surrounding the unit. Therefore, contaminants could have been carried along the existing surface ditches.

GROUNDWATER

These contaminants are slightly soluble in water and would generally be transported down gradient with the flow of groundwater.

SUBSURFACE GAS

Limited migration of VOCs could have occurred but would be inconsequential as a pathway.

7.62.4 CONTAMINANT RELEASE IDENTIFICATION

7.62.4.1 PRIOR INSPECTION REPORTS

None available.

7.62.4.2 PUBLIC COMPLAINTS

None.

7.62.4.3 MONITORING/SAMPLING DATA

None.

7.62.4.4 EVIDENCE OF RELEASE

Slightly stressed vegetation.

7.62.5 EXPOSURE POTENTIAL

7.62.5.1 PROXIMITY TO AFFECTED POPULATION

This SWMU is located on an active runway remote from any affected population.

7.62.5.2 PROXIMITY TO SENSITIVE ENVIRONMENTS

The unit is distant from sensitive environments.

7.62.5.3 LIKELIHOOD OF MIGRATION TO POTENTIAL RECEPTORS

The most likely migration pathway from this unit would be seepage to the drainage ditch or groundwater transport.

7.62.6 DOCUMENTS REVIEWED

NAS Memphis historical records.

7.62.7 SUMMARIZED DATA GAP

7.62.7.1 SOIL

No data available.

7.62.7.2 GROUNDWATER

No data available.

7.62.7.3 SURFACE WATER/SEDIMENT

No data available.

7.62.7.4 AIR

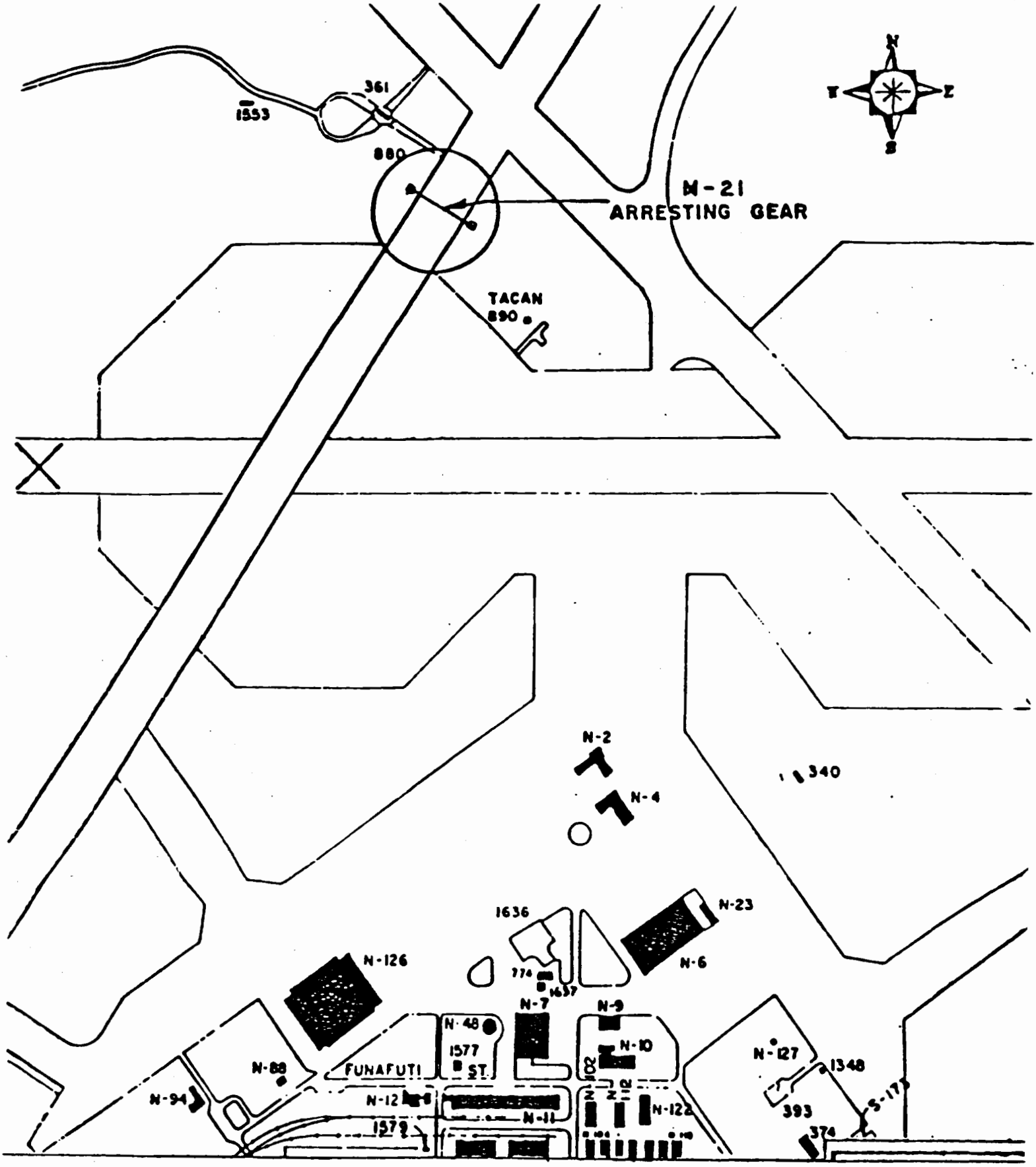
No data available.

7.62.7.5 SUBSURFACE GAS

No data available.

7.62.8 RECOMMENDED ACTIONS

This SWMU has been determined to require a RCRA Facility Investigation (preliminary sampling and analysis) by SOUTHDIV NAVFACENGCOM.



SWMU NO. 62 M-21 ARRESTING GEAR

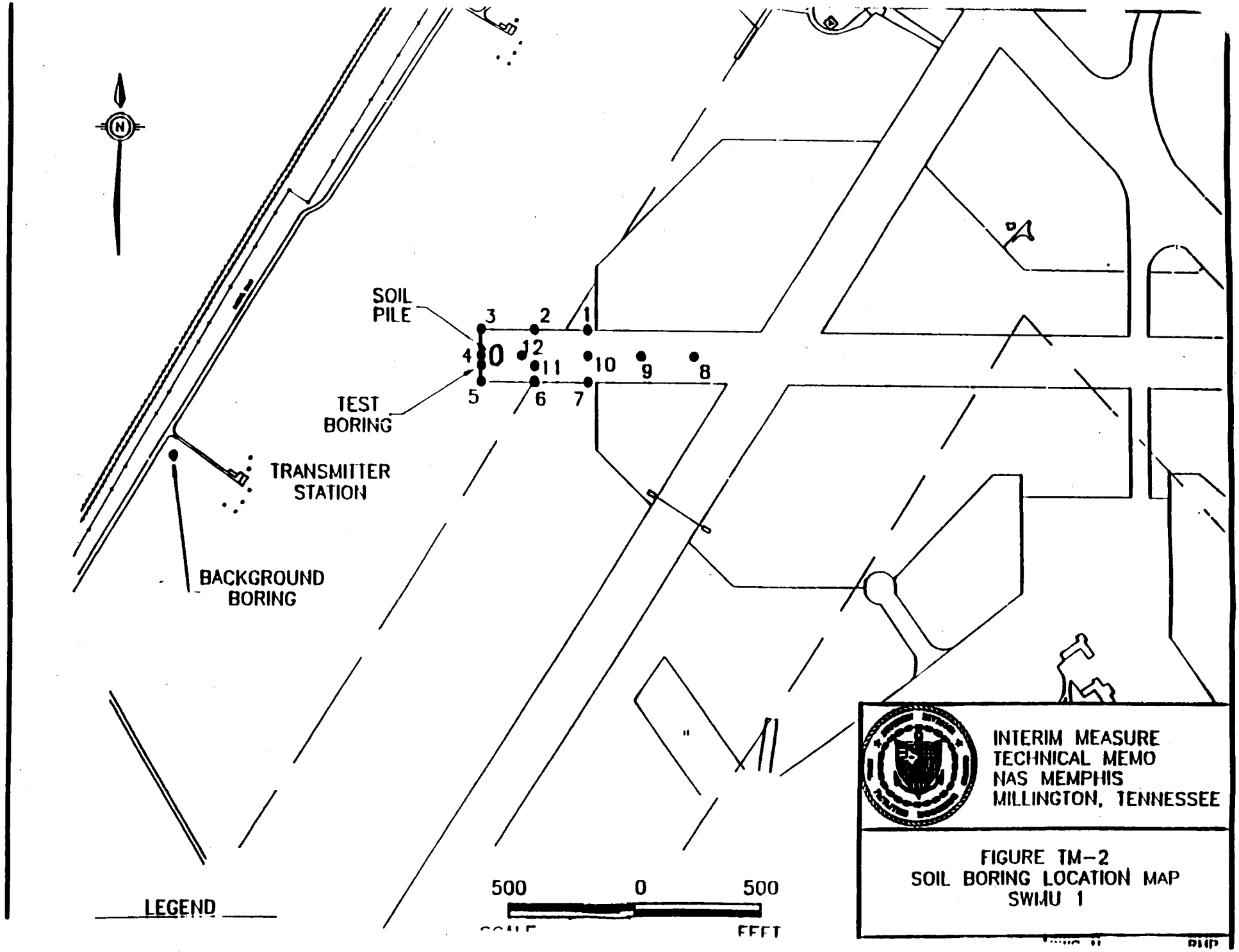
200 0

scale 1"=200'

FIGURE 7-62 LOCATION MAP

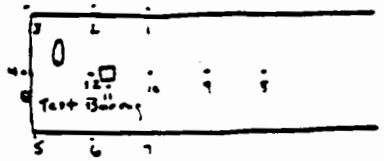
APPENDIX B

MISCELLANEOUS BORING LOGS


N
SOIL PILE
3
2
1
4
12
11
10
9
8
5
6
7
TEST BORING
TRANSMITTER STATION
BACKGROUND BORING
LEGEND
500
0
500
FEET
INTERIM MEASURE
TECHNICAL MEMO
NAS MEMPHIS
MILLINGTON, TENNESSEE
FIGURE TM-2
SOIL BORING LOCATION MAP
SWMU 1

LOCATION OF BORING

FDDA (Swmu-1)



All sites on a 100' grid spacing w/center @ #12; sites located by tape and compass

DATUM (and surface) ELEVATION 285'(T)

JOB NO.	CLIENT	LOCATION
FDDA	SOUTHDIV	NAS M

DRILLING METHOD: 4¼" ID HSA w/ [illegible]

SAMPLING METHOD: [illegible] SS Split Spoon

				BORING NO.
WATER LEVEL	N/A			SHEET 1 OF 1
TIME				DRILLING START / FINISH TIME
DATE				1403 / 1440
CASING DEPTH	✓			DATE / DATE 10/27 / 10/27

SURFACE CONDITIONS: Grassed strip @ 1400 - Slope is NE [illegible]

Site = 5' N of fence separating Comm & CoHon Lt. A [illegible]

under it Sandy silty gravel = 75% rock [illegible]

DRILLING CONTR U.S.G.S.

SAMPLER TYPE	BLOWS REQUIRED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/6" SAMPLER	VAPOR CONCENTRATION PPM	DEPTH IN FEET	SOIL GRAPH	
						0		0-2' - Sample contains organic matter from 0"-1": SLS [illegible]
SS	12/12	N/A	1/1.5'	27	0	1		From 1-3' SLS - contains organic matter - HNU read [illegible]
"	12/12	N/A	"	39	0	2		0 ppm ppm [illegible]
						3		1-3' silty sand fine to brown w/ small [illegible]
						4		roots to 12" and [illegible]
						5		[illegible]
SS	12/12	N/A	2/5.5'	9	0	6		3-4' Same as above w/ change to SLS w/ [illegible]
"	12/12	N/A	"	15	0	7		Some red brown [illegible]
						8		5-7' SLS w/ trace clay, frequent to little brown iron [illegible]
						9		oxide nodules & concretions, [illegible] moist, HNU read 0.0 ppm [illegible]
						10		Sample for BTEX not composited - all others composited
						11		Chromatograph attached = 639
						12		No [illegible] of [illegible]
						13		
						14		
						15		
						16		
						17		
						18		
						19		
						20		

BY J. Carmichael DATE 12/21/92 CHK BY ____

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-1 S

DATE: 02/17/92 | DWG NAME:

LOCATION OF BORING

See log for boring #1

JOB NO.	CLIENT	LOCATION
F00A	SOUTH DIV	NASM

DRILLING METHOD: 4¼" ID HSA w/ [illegible] bit

SAMPLING METHOD: 3" OD SS Split Spoon

BORING NO. 2

SHEET 1 OF 1

DRILLING START / FINISH

WATER LEVEL	N/A			
TIME				
DATE				
CASING DEPTH	V			

TIME: 1045 / 1145

DATE: 12/27 / 12/27

DATUM land surface ELEVATION 295'(T)

DRILLING CONTR U.S.G.S.

BY M. Carmichael

DATE 10/27/92 CHK BY

SAMPLER TYPE	BLOWS/6" ROCK RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT SAMPLER	WATER CONCENTRATION PPM	DEPTH IN FEET	SOIL GRAPH
						0	
SS	12/12	N/A	1/1-3'	27	0	1	
"	12/12	N/A	#1	31	0	2	
						3	
						4 To Cased	
SS	12	N/A	2/5-7'	13	0	5	
"	12	N/A	#2	18	0	6 To Sampler	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS: Stained material for 1550 [illegible] 265

[illegible] collected 12" from [illegible]

[illegible] N edge of trench - SVOC [illegible]

[illegible] ended [illegible] at 1550 at 70% weather - [illegible]

@ 730

1'-3' Silt [illegible]

[illegible]

SS

3-5' Silt [illegible]

moist bell [illegible]

5-7' Silt w/ some [illegible]

brown [illegible]

becomes more [illegible]

[illegible]

Sample void - SS

Samples for BTEX non-composited - all others composited

1 thru shoe of [illegible]

no evidence of contamination in boring

MS/MSD sample collected from 5-7' interval

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-2 Sa

DATE: 02/17/92

DWG NAME: C

LOCATION OF BORING

See log for boring #1

JOB NO.	CLIENT	LOCATION
FODA	SOUTHDIV	NASM

DRILLING METHOD 4¼" ID HSA w/ plug in bit

SAMPLING METHOD 2" OD SS Split Spoon

BORING NO. 3

SHEET 1 of 1

					DRILLING START	DRILLING FINISH
WATER LEVEL	N/A				TIME	TIME
TIME					1310	1355
DATE					DATE	DATE
CASING DEPTH					10/27	10/28

DATUM land surface ELEVATION 285'(T)

BORING CONTR U.S.G.S.

BY S. Cormier DATE 10/28/92 CHK BY

SAMPLER TYPE	SAMPLE RECOVERED / SAMPLE DRIVEN	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT SAMPLER	WATER CONDITIONS ENCOUNTERED	DEPTH IN FEET	SOIL GRAPH
						0	
SS	12/12	N/A	1 / 1-3'	60	0	1	
"	12/12	N/A	"	65	0	2	
						3	
						4	
						TO Boring	
SS	12/12	N/A	2 / 5-7'	12	0	5	
"	12/12	N/A	"	16	0	6	
						TO Sampled	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

Sample @ 1320

Sample @ 1350

SURFACE CONDITIONS Started boring @ Site #5 @ NW corner of runway ≈ 12' off runway pavement, runway end cotton field ≈ 100' W of SB-3, weather: sunny, breezy, ≈ 70°

0-1' Silt: mottled light tan-orange to brown, rooty, non-plastic, extremely hard, dry, general consistency broke into disks = ¼" to 1" in size, HNu reading 0 along entire sample while still in SS

1-3 3-4.5 Silt w/ trace clay, brown, moist, small balls on auger (≈ ¼" - ½")

4.5'-5' Silt w/ trace clay, lighter brown than above, trace moist small balls on auger (≈ ¼" - ½")

5-7' Silt w/ clay, mottled orange to tan to brown, non-staining and bromide to chloride, wet to the very bottom, plastic, moist, HNu reading 0 along entire sample while still in SS

Samples for BTEX non-composited - all others composited

Cuttings shoveled into drum ≈ 621

no evidence of contamination in boring

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-3

DATE: 02/17/92 | DWG NAME:

LOCATION OF BORING

See log for boring # 1

JOB NO.	CLIENT	LOCATION
F00A	SOUTHDIV	NASM

DRILLING METHOD: 4 1/4" ID HSA w/ plug in bit — BORING NO. 4

SAMPLING METHOD: 2" OD SS Split Spoon — SHEET 1 OF 1

DRILLING START / END:

WATER LEVEL	N/A				
TIME					1530 / 55
DATE					10/28 / 10/2
CASING DEPTH	▼				

DATUM land surface ELEVATION 295'(T)

SURFACE CONDITIONS: Started coring @ 1530: Site is ~ 9 W of center of W end of runway 28 Center Cross and center field ~ 150' S of SPC 3 (~ 40° N pilot boring for F00A: weather is sunny, breezy ~ 75°

DRILLING CONTR: U.S.G.I.

BY: J. Cermichael

DATE: 10/28/92 CHK BY:

SAMPLER TYPE	BLOWS PER 6" / RECOVERED	DEPTH OF CASING	SAMPLE NO. / DEPTH	BLOWS/FT SAMPLER	VAPOR CONCENTRATION (PPM)	DEPTH IN FEET	SOIL GRAPH	
						0		
SS	12/12	N/A	1 / 1-3'	14	0	1		1-3' Silt w/ some clay, mottled tan-brown, trace organic substance ~ 2" low plastic, moist, N recovered 0 ppm vapor range while still in SS
"	12/12	N/A	"	14	0	2		
						3		Cut 5' SS sample through clayey silt, moist, no ls cuttings
						4		
						TD Reached		
SS	12/12	N/A	2 / 5-7'	9	0	5		5-7' Silt w/ clay, mottled tan-brown, organic, clayballs & trace iron stains, stiff, low to med. plast, moist, HNu reading 0 ppm range while in SS
"	12/12	N/A	"	14	0	6		
						TD Reached		
						7		
						8		Samples for BTEX non-composited - all others composited
						9		
						0		Cuttings shoveled into drum #637
						1		
						2		no evidence of contamination in boring
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-4 S

DATE: 02/17/92 | DWG NAME:

LOCATION OF BORING

See log for boring #1

JOB NO.	CLIENT	LOCATION
F00A	SOUTHDIV	NAS M

DRILLING METHOD: 4¼" ID HSA w/ plug + bit — BORING NO. 5

SAMPLING METHOD: 3" OD SS Split Spoon — SHEET 1 of 1

DRILLING START / FINISH

WATER LEVEL	N/A				TIME	TIME
TIME	↓				0955	1015
DATE					DATE	DATE
CASING DEPTH	↓				12/28	12/28

DRILLING CONTR: U.S.G.S.

DATUM: land surface — ELEVATION: 285'(T)

SAMPLER TYPE	BLOWS/6" (SOIL DESCRIBED)	DEPTH OF CASING	SAMPLE NO. (SAMPLE DEPTH)	BLOWS/FT SAMPLER	WATER CONCENTRATION (PPM)	DEPTH IN FEET	SOIL GRAPH
						0	
SS	12/12	N/A	1 (0-3')	16	0	1	
"	12/12	N/A	"	24	0	2	
						3	
						4 TD Bored	
SS	12	N/A	2 (5-7')	6	0	5	
"	12	N/A	"	10	0	6 TD Sampled	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

Sample ID: 01-B-5 (0-3') Sample ID: 01-B-5 (5-7')

Buyer

SURFACE CONDITIONS: Started Drilling @ 0955 5 on 16 SW corner of old runway ~10'W of W edge of runway pc tween runway & access road - area covered by grass... and RFE analysis because of SW movement of aircraft... bore area @ 200' to the NE. weather is overcast showers of rain ~ 50°

0-3' - Silt, brown w/ trace fine silt. Loose, dry. Form color & texture. very little non-plastic dry. HNU reading 0 ppm. retrieve sample while still. SS. Dig bit and auger removed fr... From ground near surface of gravel apron about 100 ft... cover pavement... to 1'

3-3.5' - 5' grey silt w/ some clay. no ... boiling on auger

5-7' - Silt w/ clay, grey to ~6' BLS ... some gravel to the from 6-7' ... slight ... more clay ... some ... /81. moist from 6' ... possible organic material ... like FeO ...) from 6' to 7' ... low to mod plastic ... moist to moist. HNU reading 0 ppm ... sample while still in SS

Samples for VOCs non-composited - all others composited

Cuttings shoveled in area @ 1028

* Samples to be analyzed for RFE ... parameters

Duplicate of sample #2 collected

No evidence of contamination in zone

BY: V. Carmichael
DATE: 12/29/92 CHK BY: ____

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-5 samp

DATE: 02/17/92 | DWG NAME: C

LOCATION OF BORING

See log for boring #1

JOB NO.	CLIENT	LOCATION
FDDA	SOUTH DIV	NAS Mll

DRILLING METHOD: 4 1/4" ID HSA w/ auger bit — BORING NO. 6

SAMPLING METHOD: 3" OD SS Split Spoon — SHEET 1 of 1

DRILLING START / FINISH

							TIME	TIME
WATER LEVEL	N/A						1330	1355
TIME							DATE	DATE
DATE							12/20	12/2
CASING DEPTH	V							

DATUM — ELEVATION 235'(T)

SURFACE CONDITIONS: Started boring @ 1330 Site is sod. 90-100' E of SW5 clear 5 ft dia of grass between cattle mat and runway - edge - 6'+ 5 of runway. Weather is PC approx = 60°

DRILLING CONTR: U.S.G.S.

SAMPLER TYPE	SAMPLE RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT SAMPLER	VAPOR CONCENTRATION PPM	DEPTH IN FEET	SOIL GRAPH	
						0		
SS	12/12	N/A	1 / 1-3	10	0	1		1-2 S.lt w/ clay mottled tan to brown trace roots also coarse sample; water to wet stiff low plastic weight. HNU reading 0 also other same while split SS
"	12/12	N/A	"	18	0	2		
						3		3-4 - same as above
						4		4-5 clayey silt gray moist balls on auger
						5		5-7' clay w/ silt mottled light green to gray-tan stainless throughout, trace moist - firm to stiff. Wood plastic moist. HNU readings zero also other samples while split SS
SS	12/12	N/A	2 / 5-7	9	0	6		
"	12/12	N/A	"	9	0	7		
						8		Sampler for BTEX non-composited - all others composited
						9		Cuttings shoveled into drum @ 1326
						0		no evidence of contamination in boring
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

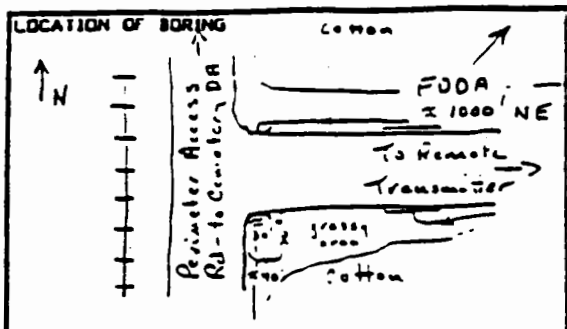
BY: D. Cormicle DATE: 12/23/91 CHK BY:

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for OI-B-6 so

DATE: 02/17/92 | DWG NAME:

LOCATION OF BORING



JOB NO.	CLIENT	LOCATION
FODA	SOUTHDIV	NASM

DRILLING METHOD: 4¼" ID HSA w/ pilot in bit — BORING NO.: BG

SAMPLING METHOD: 3" OD SS Split-Spoon — SHEET: 1 of 1

DRILLING: START / FINISH

						TIME	TIME
WATER LEVEL	N/A					1535	1600
TIME						DATE	DATE
DATE	↓					11/5	11/5
CASING DEPTH	↓						

DATUM: Land surface — ELEVATION:

DRILLING CONTR: U.S.G.S.

BY: V Carmichael — DATE: 11/5/92 — CHK BY: ____

SAMPLER TYPE	SAMPLE RECOVERED / SAMPLE ATTEMPTED	DEPTH OF CASING	SAMPLE DEPTH	BLOWS/FT SAMPLER	WATER CONCENTRATION (PPM)	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS: Started boring @ 1535 site is in SE corner of ground [illegible] loading in Area [illegible] perimeter Access Rd to Cemetery Disposal Area. Corner is ≈ 40' E of Rd. ≈ 75' S of road. Auger sampler & core barrel
	/		/			0		Cool breezy ≈ 45°
SS	12/12	N/A	1/1-3'	18	0	1		covered the 1' BLS in hole w/ dirt when w/ shovel
"	12/12	N/A	/	17	0	2		1-3' - silt w/ trace f sm to coarse f sm to coarse sand, moved due to groundwater & trace clay/mud; some roots; very stiff; sample compressed ≈ 55; brown w/ mottles of red 10R 5/6 & gray 10YR 5/1; used enamel spoon core to low plasticity due to slightly moist; UNu reading 0 ppm over entire sample while still ≈ 55
	/		/			3		
	/		/			4		3-5' - silt w/ trace clay, moved to lite brown; moist; pieces on augers
	/		/			TD Cored		
SS	12/12	N/A	2/5-7'	11	0	5		5-7 - silt w/ trace clay, moved downward to brown w/ [illegible] strong brown inclusions & roots; stiff; low plasticity; trace moist; UNu reading 0 ppm over entire sample while still ≈ 55
"	12/12	N/A	/	13	0	6		
	/		/			TD Sampled		
	/		/			7		
	/		/			8		Samples collected for RFI parameters
	/		/			9		Samples for VOCs non-composited - all others composited
	/		/			0		
	/		/			1		Cuttings shoveled back in hole
	/		/			2		no evidence of contamination in boring
	/		/			3		
	/		/			4		
	/		/			5		
	/		/			6		
	/		/			7		
	/		/			8		
	/		/			9		
	/		/			0		

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-BG soil

DATE: 02/17/92 | DWG NAME: [illegible]

LOCATION OF BORING

See log for boring #1

JOB NO.	CLIENT	LOCATION
FOOA	SOUTHDIV	NASM

DRILLING METHOD: 4 1/2" ID HSA w/ plug in b.o.

BORING NO. 7

SHEET 1 OF 1

SAMPLING METHOD: 3" OD SS Split Spoon

					DRILLING START	DRILLING FINISH
WATER LEVEL	N/A				TIME	TIME
TIME	↓				1620	1630
DATE					DATE	DATE
CASING DEPTH	↓				10/29	10/29

DATUM land surface ELEVATION 285'(T)

DRILLING CONTR U.S.G.S.

BY J. Cunningham DATE 10/29/92 CHK BY

SAMPLER TYPE	SOIL RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT SAMPLER	VOC CONCENTRATION (PPM)	DEPTH IN FEET	SOIL GRAPH
						0	
SS	12	N/A	1 (0-2')	22	0	1	
"	12	N/A	"	25	0	2	
						3	
						4	
SS	12	N/A	2 (5-7')	5	0	5	
"	12	N/A	"	8	0	6	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

SURFACE CONDITIONS: Steam boring N 1620: Side of SB #6 clear 5 ed. of driveway between comm. and runways 4' above 5' S of runway weather is PC breezy ≈ 65°

Sample @ 1620

Auger

Sample @ 1625

0-2' Silt trace clay: brown some roots, very soft low plastic, moist HNu reading 0 clay odor. Sample with split spoon - SS

2-5' Same as above more moist smell/stain soils auger

5-7' silt w/ clay mottled tan & brown some organic inclusions and iron stains: firm, low plastic silt moist, HNu reading 0 clay odor. Sample with split spoon SS

Samples for BTEX non-composited soil other minor

Cuttings shoveled into drum @ 623

no evidence of contamination in boring

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-7 s

DATE: 02/17/92 DWG NAME:

LOCATION OF BORING

See log for boring #1

JOB NO.	CLIENT	LOCATION
FDDA	SOUTH DIV	NAS M

DRILLING METHOD: 4¼" ID HSA w/ plug in bit

SAMPLING METHOD: 3" OD SS Split Spoon

BORING NO. 8

SHEET 1 OF 1

DRILLING START / FINISH

		TIME	TIME
WATER LEVEL	N/A	1025	135
TIME		DATE	DATE
DATE		11/3	11/3
CASING DEPTH	V		

DRILLING CONTR U.S.G.S.

DATUM land surface ELEVATION 285(T)

SURFACE CONDITIONS: Ground Water in 1025 : silt to 0 [illegible]
Location = 339' E of center of old Hangar 1 : drilling
Warm cloudy, weather is sunny, wind = 65°

SAMPLER TYPE	BLOWS/6"	DEPTH OF CASING	SAMPLE DEPTH	BLOWS/FT SAMPLER	VOA CONCENTRATION (PPM)	DEPTH IN FEET	SOIL GRAPH
						0	
SS	12/12	N/A	1'-3'	24	0	1	
"	12/12	N/A	"	36	0	2	
						3	
						4	
SS	12/12	N/A	5'-7'	9	0	5	
"	12/12	N/A	"	11	0	6	
						7	
						8	
						9	
						10	
						11	
						12	
						13	
						14	
						15	
						16	
						17	
						18	
						19	
						20	

Sample @ 1030

Sample @ 1045

Broke hole to remove w/ pick to ≈ 3' BLS before sampling to 1'

1'-3' - Silt w/ trace clay mottled grey to brown to brown yellow stiff to hard, low plastic, dry to slightly moist

Hnu reading 0 above ambient. Sample while still in SS

3-4.5' same as above

~4.5-5 silt w/ clay, grey, moist, bottom of auger

5-7' - silt w/ clay, grey, trace rock chips & organics (6 to 6'), stiff, low plastic, slightly moist. HNU reading 0 above ambient. Sample while still in SS

Samples for ISTER non-composited - all others composited

Cuttings shoveled into drum #625

no evidence of contamination in boring

BY V. Carmichael
DATE 11/3/92 CHK BY

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-8

DATE: 02/17/92 DWG NAME

LOCATION OF BORING

See log for boring #1

JOB NO.	CLIENT	LOCATION
FDOA	SOUTHDIV	NASM

DRILLING METHOD 4 1/4" ID HSA w/ 7 7/8" rock bit — BORING NO. 9

SAMPLING METHOD 3" OD SS Split Spoon — SHEET 1 of 1

					DRILLING START	DRILLING FINISH
WATER LEVEL	N/A				TIME	TIME
TIME	/				1400	1430
DATE	/				DATE	DATE
CASING DEPTH	N				11/3	11/3

DATUM land surface ELEVATION 275'(T)

DRILLING CONTR U.S.G.S

BY J. Carmichael DATE 11/3/92 CHK BY ____

SAMPLER TYPE	SAMPLE RECOVERED / SAMPLE ATTEMPTED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT SAMPLER	VAPOR CONCENTRATIONS PPM	DEPTH IN FEET	SOIL GRAPH
	/		/			0	
SS	12/12	N/A	1 / 1.3'-3'	50	0	1	
"	12/12	N/A	"	25	0	2	
	/		/			3	
	/		/			4	
SS	12/12	N/A	2 / 5'-7'	5	0	5	
"	12/12	N/A	"	8	0	6	
	/		/			7	
	/		/			8	
	/		/			9	
	/		/			0	
	/		/			1	
	/		/			2	
	/		/			3	
	/		/			4	
	/		/			5	
	/		/			6	
	/		/			7	
	/		/			8	
	/		/			9	
	/		/			0	

Augered @ 1400 to 10'

Sampled @ 1420 to 12'

TD Augered

TD Sampled

SURFACE CONDITIONS Started boring @ 1400. Site is on Comm... line at runway ≈ 100' W ... SB#9 asphalt = 8" thick... bore so hole covered ≈ 1.3' before collapse. [illegible] Sampl... weather is sunny, windy, ≈ 70°

1.3' - 2.0' - silt mottled orange-tan + brown; coarse hard; non-plastic; dry; trace debris ... SS 1/8" to 1/2" thick; @ ≈ 2.0' change → silt w/ trace clay; brown to tan; non to low plastic; moist; dry @ ≈ 3.0' change to silt w/ some clay - this material could possibly have residual asphalt contamination - HNu reading 0 also

≈ 3.0 - ≈ 3.7 - brown silt w/ clay; moist built in cuttings

≈ 3.7' - 4.5' - cuttings in brown silt w/ clay; moist; no...

5'-7' - 9.1' w/ clay; brown trace iron stains & ceramic increasing in content below ≈ 6' from tile pieces; moist; HNu reading 0 also; coffee grounds while bore in SS

Samples for BTEX non-composited - all others composited

Cuttings shoveled into on-site covered area - top marked "#1 - SB#9 Cuttings" w/ black marker

☆ no evidence of contamination in borehole however presence of thick layer of asphalt (≈9" thick) & rainwater standing in hole after was removed points to remaining could cause residual contamination in asphalt at this #1 removed from this boring

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-9 so...

DATE: 02/17/92 | DWG NAM...

LOCATION OF BORING

See log for boring #1

JOB NO.	CLIENT	LOCATION
FDDA	SOUTH DIV	NASM

DRILLING METHOD: 4 1/4" ID HSA w/ plug in bit — BORING NO. 10

SAMPLING METHOD: 3" OD SS Split Spoon — SHEET 1 of 1

					DRILLING START	DRILLING FIN
WATER LEVEL	N/A				TIME	TIME
TIME	↓				1615	1645
DATE	↓				DATE	DATE
CASING DEPTH	↓				11/3	11/3

DRILLING CONTR: U.S.G.S.

DATUM: land surface — ELEVATION: 295'(T)

SAMPLER TYPE	BLOWS/6" (SOIL SECURED)	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT SAMPLER	WATER CONCENTRATION (PPM)	DEPTH IN FEET	SOIL GRAPH
						0	
SS	12/12	N/A	1 / 1-3'	24	0	1	
"	12/12	N/A	"	21	0	2	
						3	
						4	
						TD Bored	
SS	12/12	N/A	2 / 5-7'	5	0	5	
"	12/12	N/A	"	5	0	6	
						TD Sampled	
						7	
						8	
						9	
						0	
						1	
						2	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

Sample @ 1620

Auger

Sample @ 1630

SURFACE CONDITIONS: Coarse sand & 1615 silt & clay; center of runway = 100' N of SB 881, and = 50' E/o E edge of old fire box. Drilling in hole made in concrete w/ a pick, asphalt = 5" thick; weather is cloudy, windy?

1'-3'- silt w/ some clay; Tan to brown; very stiff; low plastic; trace moist; changes to grey silt w/ clay @ 2'-2.3' BLS trace iron stain / oxidation in matrix; trace moist; HNu reading 0 ppm; center sample while in SS

3-5' Same as above

5-7' silt w/ some clay; trace to blue; trace iron staining & organic matter; firm; med plastic; moist; HNu reading 0 ppm; center sample while still in SS

Samples for BTEX non-preserved - all others preserved

Cuttings shoveled into an unnumbered drum - to be moved to 90-SB w/ paint & black marker

no evidence of contamination in boring

Samples from 5'-7' collected for duplicate matrix spike and matrix spike duplicates

BY: V. Carmichael
DATE: 11/3/92 CHK BY:

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-10

DATE: 02/17/92 | DWG NAME

LOCATION OF BORING

See log for boring #1

JOB NO.	CLIENT	LOCATION
FOCA	SOUTH DIV	NASM

DRILLING METHOD: 4¼" ID HSA w/ plug in bit

SAMPLING METHOD: 2" ID SS Split Spoon

BORING NO. 11

SHEET 1 of 1

		DRILLING START	DRILLING FINISH
WATER LEVEL	N/A	TIME	TIME
TIME	/	1040	1120
DATE	/	DATE	DATE
CASING DEPTH	▼	11/4	11/4

DRILLING CONTR: U.S.G.S.

DATUM: land surface ELEVATION: 295' (T)

BY: J Carmichael DATE: 11/4/92 CHK BY: ____

SURFACE CONDITIONS: Started boring @ 1145. Steps = 5' S of E edge of old fire box = ⊕ center of hose. Weather is overcast windy ≈ 50°. Rain last night. Sample #1 collected in ≈ 9" hole - chard thru asphalt & concrete & 4" rock

SAMPLER TYPE	BLOWS/6" (SAMPLE DEPTH)	RECOVERY (RQD)	DEPTH OF CASING	BLOWS/FT SAMPLER	VOA CONCENTRATION (PPM)	DEPTH IN FEET	SOIL GRAPH
						0	
SS	12/12	N/A	N/A	1/1.3'	26	0	
"	12/12	N/A	N/A	"	29	0	
						3	
						4	
SS	12/12	N/A	N/A	2/5.7'	7	0	
"	12/12	N/A	N/A	"	12	0	
						7	
						8	
						9	
SS	12/12	N/A	N/A	3/10.2'	17	0	
"	12/12	N/A	N/A	"	21	0	
						12	
						3	
						4	
						5	
						6	
						7	
						8	
						9	
						0	

Auger

Sample @ 1045

Auger

Sample @ 1055

Auger

Sample @ 1120

1-3'- silt w/ trace clay - tan to brown - very s-ff - non-plastic - dry - trace organics in lower 6"-9" - HNu reading 0 - clear native sample while still in SS

3-4.5' Same as above - some to grey silt w/ wet @ ≈ 4.5' BLS - slightly moist

4.5-7'- silt w/ clay - mottled grey to tan - some iron stains & organic inclusions - some roots - firm to stiff - low-plastic - slightly moist - HNu reading 0 - clear native sample while still in SS

7-10' @ ≈ 7' BLS change to tan silt w/ clay - slight moist - small balls in cores

10-12'- silt w/ some clay - mottled tan to brown w/ iron stains and organic inclusions throughout - very stiff - low plastic - slight moist - HNu reading 0 - clear native sample while still in SS

TD Reached

TD Samples

Samples for BTEX near composited - all others stored cool

Cuttings stored on unnumbered drum - top marked #92-011-SB - contains ~ black marker

no evidence of contam noted in note

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-11 Sa

DATE: 02/17/92

DWG NAME:

LOCATION OF BORING

See log for boring # 1

JOB NO.	CLIENT	LOCATION
FDDA	SOUTHDIV	NASM

DRILLING METHOD: 4 1/4" ID HSA w/ clay bit — BORING NO. 12

SAMPLING METHOD: 3" OD SS Split Spoon — SHEET 1 of 1

		DRILLING START	DRILLING FINISH
WATER LEVEL	N/A		
TIME		1520	1600
DATE		11/4	11/4
CASING DEPTH	↓		

DATUM land surface — ELEVATION 295' (T)

BORING CONTR. U.S.G.S.

BY V. Carmichael — DATE 11/4/92 — CHK BY — DATE

SURFACE CONDITIONS: Started boring @ 1520. Site is ≈ 6'W of old fire box. @ corner of box. 4" thick slab of asphalt w/ piece of 3" rebar sticking up 6" from NW corner. Sand & gravel beneath asphalt, weather is overcast & mild ≈ 50°

SAMPLER TYPE	RECOVERED / ATTEMPTED	DEPTH OF CASING	SAMPLE DEPTH	BLOWS/FT SAMPLER	VOA CONCENTRATION (PPM)	DEPTH IN FEET	SOIL GRAPH	
						0		
SS	12/12	N/A	1-3'	34	0	1		1-3' - silt - brown w/ trace of fine sand - non-plastic dry - UNV reading ≈ clean ambient sample while soil in SS - no evidence of contamination to 3' BLS
"	12/12	N/A	"	36	0	2		
						3		3-4' - Same as above becoming slightly moist - from 4' BLS becomes to grey silt w/ clay more moist balls on auger - no evidence of contamination in cuttings
auger						4		
SS	12/12	N/A	5-7'	7	0	5		5-7' Silt w/ clay some grey to olive green trace iron stain throughout the width of sample silt w/ clay ≈ 6" thick interval then becomes to iron stained grey silt w/ some clay interval stiff low to med plasticity moist UNV reading ≈ clean ambient sample while in SS
"	12/12	N/A	"	13	0	6		
auger						7		
						8		7-10' silt w/ some clay - brown to grey-brown, moist balls on auger
						9		
						TD Bored		
SS	12/12	N/A	10-12'	16	0	10		10-12' silt w/ trace clay mottled grey to tan to brown w/ iron staining & organic inclusions, very stiff, non to slight plasticity, moist UNV reading ≈ clean ambient sample while still in SS; upon removal ≈ 10 ppm, then increased crumbles into an almost powder consistency
"	12/12	N/A	"	24	0	11		
						TD Sampled		
						12		
						3		Samples from this boring collected for full RFI analysis
						4		Samples for VOCs were composited — all others composited
						5		Cuttings shoveled into drum # 496
						6		* no evidence of contamination in boring
						7		
						8		
						9		
						0		

INTERIM MEASURE
WORK PLAN
NAS MEMPHIS
MILLINGTON, TENNESSEE

Boring log for 01-B-12 S

DATE: 02/17/92 — DWG NAME:

APPENDIX C

SITE-SPECIFIC HEALTH AND SAFETY PLAN

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY
NAVAL AIR STATION
MEMPHIS, TENNESSEE

SITE-SPECIFIC HEALTH AND SAFETY PLAN
SWMU 62 — M-21 ARRESTING GEAR

CTO-094
Contract Number:N62467-89-D-0318

Prepared for:

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

Prepared by:

EnSafe/Allen & Hoshall
5720 Summer Trees Drive, Suite 8
Memphis, Tennessee 38134
(901) 383-9115

April 10, 1995

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Attachment B Directions to Emergency Medical Facilities
Attachment C Health and Safety Plan Forms

1.0 INTRODUCTION

A RCRA Facility Investigation (RFI) is being conducted at the M-21 Arresting Gear (SWMU 62) located at the Naval Air Station Memphis (NAS Memphis), Millington, Tennessee. The purpose of the monitoring program is to assess the nature and extent of potential contamination at the site and to determine if additional action is required to maintain compliance with environmental regulations.

This Site-Specific Health and Safety Plan (SSHSP) is written for field operations to be conducted at SWMU 62. This plan is to be used in conjunction with the approved NAS Memphis Comprehensive Health and Safety Plan (CHASP). Copies of both this plan and the CHASP should be onsite during all field operations. The Navy project contract number with EnSafe/Allen & Hoshall (E/A&H) is N62467-89-D-0318, CTO-094.

Applicability

See CHASP Section 7.0.

Current Hazardous Waste and Emergency Response Operators (HAZWOPER) training certificates for E/A&H and U.S. Geological Survey (USGS) employees and all subcontractors anticipated to be conducting field work onsite will be filed onsite and available for review. Individuals whose certifications are not on file, or those who have a more recent certificate (have attended a refresher course), will provide the Site Supervisor with a copy of their certificate before being allowed to enter a work area.

Current OSHA refresher training certificates will be available onsite for all employees involved in field activities if their refresher course requirements come up for renewal before the project begins. All subcontractors, Navy oversight personnel, and any other site visitors must provide health and safety certification with appropriate refresher course documentation prior to site entry.

2.0 SITE CHARACTERIZATION

2.1 Site Description

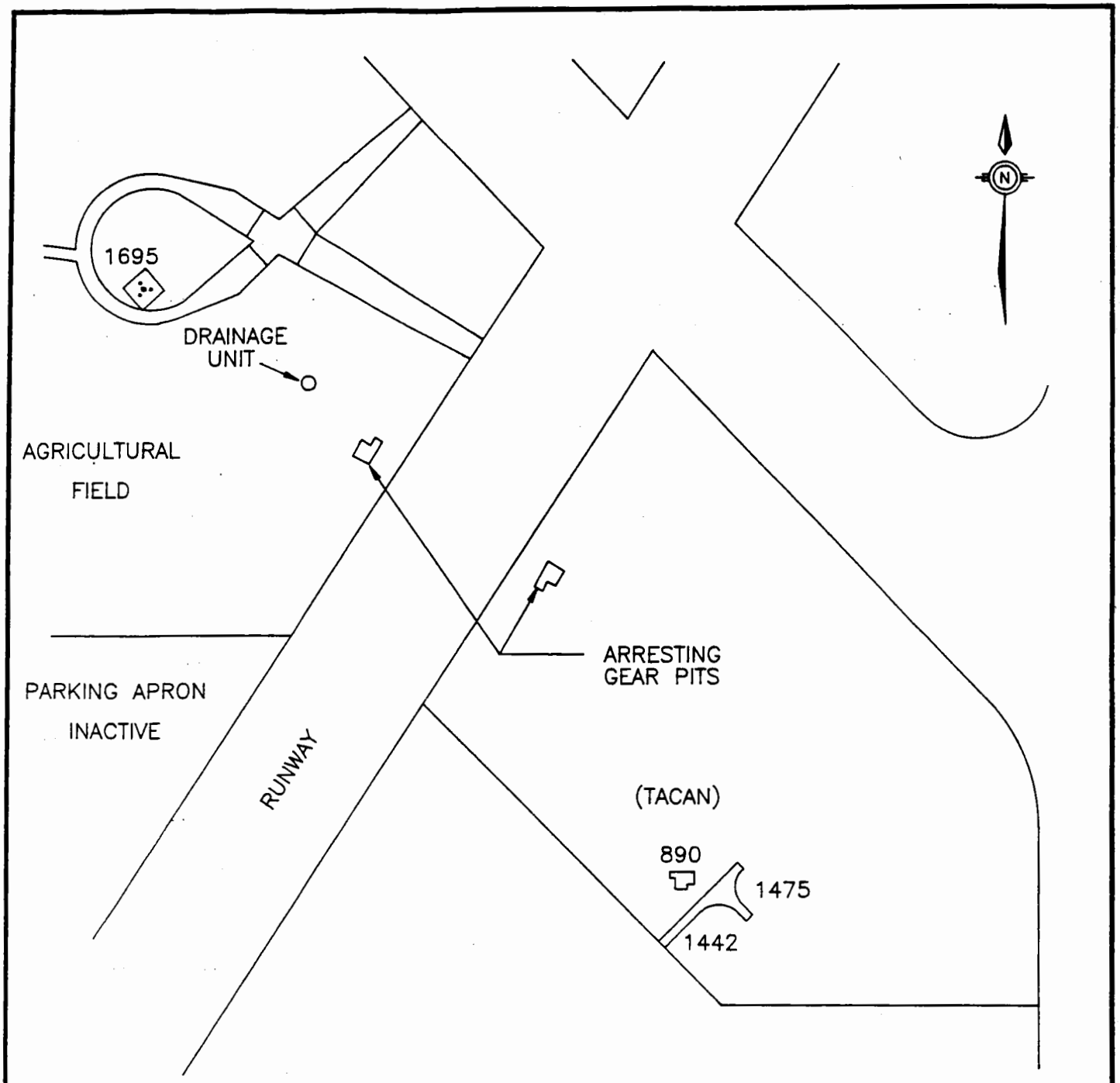
SWMU 62 is the former location of a portable arresting gear mechanism (M-21) on the active runway 4-22. A vicinity map of SWMU 62 is provided in Figure 1. The gear, which was powered by a generator, was first used in 1985 for pilot training. The site presently consists of two empty, cement-lined, L-shaped containment pits on either side of the runway, believed to once housed the arresting gear. A 6-inch diameter PVC drainline was reportedly installed in the pit on the west side of the runway to drain any potentially contaminated rainwater which might otherwise collect in the pit. This drainline led to a makeshift dry well approximately 90 feet to the west, as evidenced by a 4-foot diameter cement cap presently covering the well. No construction details were available for the well itself, but, according to Public Works personnel, it is constructed of three 55-gallon drums welded end-to-end, buried in a hole 12-foot deep, and sitting on a bed of gravel. The bottom drum was perforated to allow water to seep out. The residual contaminants from the arresting gear pit (hydraulic fluid, diesel fuel, and lube oil) would enter the drum unit and float on the heavier water, allowing for periodic removal. A second structure, similar to the cap covering the dry well, is approximately 30 feet south. This object is reportedly a pile of leftover cement. A site map is provided in Figure 2.

2.2 Work Areas

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

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ), and
- Support Zone (SZ).

For a description of field activities to be conducted at the site and within each work area see the Site Investigation Plan (SIP).



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SCALE FEET

RFI HEALTH & SAFTEY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 1
VICINITY MAP
M-21
ARRESTING GEAR
SWMU 62

DWG DATE: 01/19/95 | DWG NAME: 94HSP13

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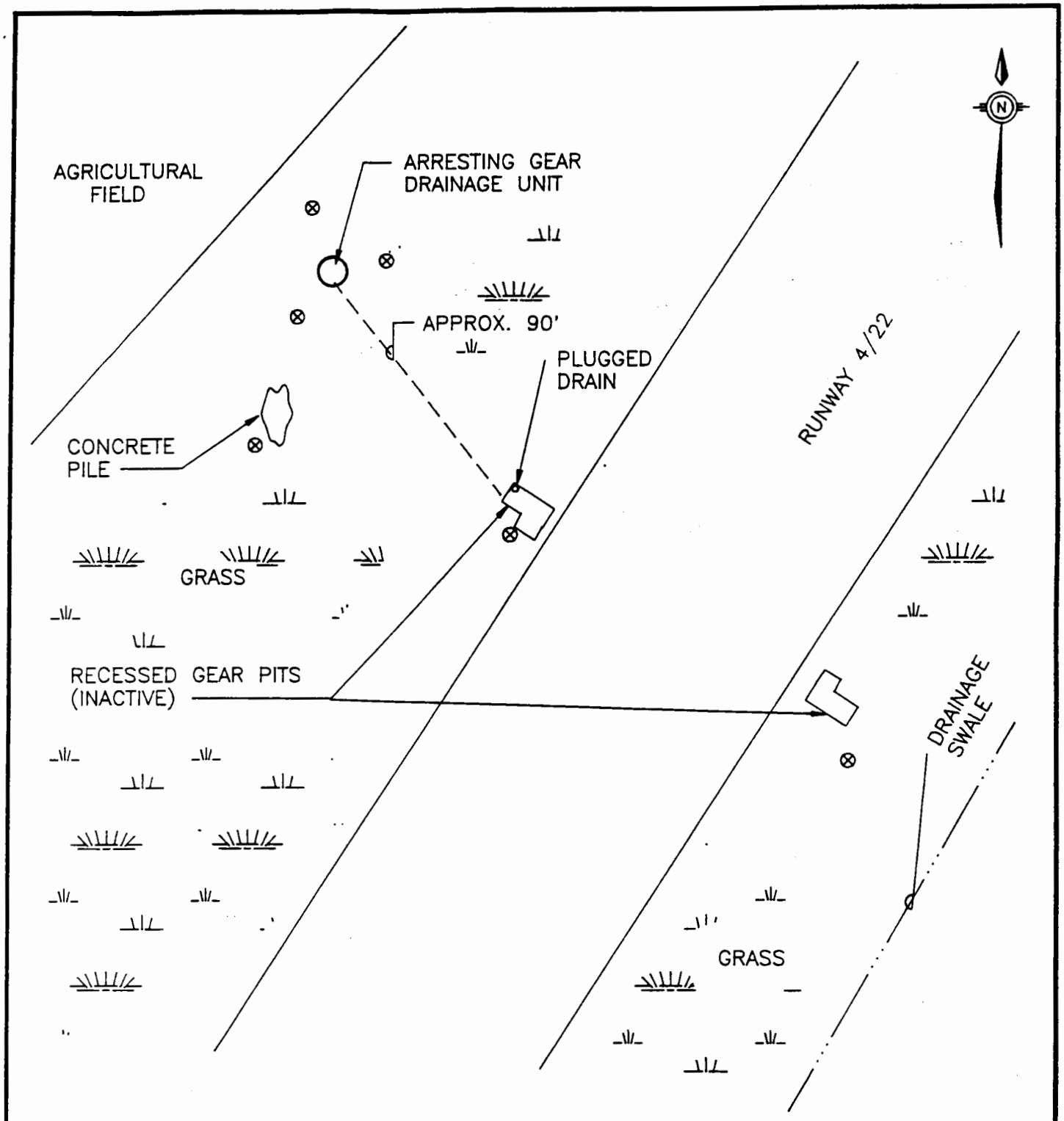

LEGEND

⊗ DPT SAMPLING LOCATION

SCALE: NOT TO SCALE

RFI HEALTH & SAFTEY PLAN
NAS MEMPHIS
MILLINGTON, TN

FIGURE 2
PROPOSED DPT SAMPLING LOCATION
M-21
ARRESTING GEAR
SWMU 62

DWG DATE: 01/19/95 | DWG NAME: 94HSP12

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2.3 Work Area Access

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

2.4 Site Map and Work Zones

The location of the site is shown in Figure 1, the site map. A vicinity map is shown in Figure 2. The EZ, CRZ, and SZ locations will be based on physical layout of the site, work task requirements, and current meteorological conditions. The EZ will be established using yellow caution tape.

3.0 SITE ACTIVITIES

Site activities will include Direct Push Technology (DPT) soil and groundwater sampling. Subsequent activities may include soil boring and monitoring well installation, well development, purging, and sampling as required. Field methods described in the *Comprehensive RFI Work Plan*.

4.0 CHEMICAL HAZARDS

The site history suggests a potential for exposure to chemicals. Table 4-1 lists exposure guidelines for potential site chemicals.

Table 4-1
Exposure Guidelines For Expected Site Chemical Hazards

Chemical Name	Odor[a] Threshold (ppm)	OSHA PEL[b] (ppm)	ACGIH TLV[c] (ppm)	NIOSH REL[d] (ppm)	Action Level[e] (ppm)	Flammable range (% by volume)
Toluene	40	100 150 STEL	50	100 150 STEL	25	1.3 to 7.1%
Hydraulic Fluid	N.A.	5 mg/m^3	5 mg/m^3 10 mg/m^3 STEL	N.A.	2.5 mg/m^3	N.A.
Diesel Fuel	N.A.	N.A.	N.A.	N.A.	N.A.	0.7 to 7.5%
Ethylbenzene	140	100 125 STEL	100 125 STEL	N.A.	50	1.0 to 6.7%
Benzene	4.68	1 5 STEL	0.1 Confirmed Human Carc.	0.1 1 STEL Potential Occupation al Carcinogen	0.05	1.3 to 7.1%
Xylene	Not Listed	100 150 STEL	100 150 STEL	100 150 STEL	50	1.0 to 7.0%

Notes:

[a] Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989, Range of All Reference Values
[b] 29 CFR 1910.1000, Table Z-1-A. Limits For Air Contaminants, as amended through 1/15/91. (PEL = Permissible Exposure Limit)
[c] 1990-1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference for Governmental Industrial Hygienist. (STEL = Short Term Exposure Limit)
[d] National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards, June 1990. (REL = Recommended Exposure Limit)
[e] Action Level is the exposure limit at which personnel will implement engineering controls or upgrade levels of personal protective equipment. The Action Level is based on 50 percent of the PEL, TLV, or REL, whichever is lower.
N.A. = Substance information not available, or substance unlisted.

Material Safety Data Sheets (MSDS) for these materials are included in Attachment A.

5.0 OPERATIONS AND PHYSICAL HAZARDS

Physical hazards typically encountered during environmental investigations will be present at this site. These hazards include cold-related illnesses, uneven terrain, slippery surfaces, lifting, and use of heavy equipment. The Site Supervisor and Site Health and Safety Officer shall be aware of the potential for heat and/or cold stress and other weather-related illnesses, and as necessary,

implement appropriate work regimens to minimize the likelihood of field personnel becoming ill or injured.

Heavy equipment and drill rig operations will be conducted in accordance with the procedures outlined in the CHASP, Attachment A, Drilling Safety Guide. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. If working in areas supporting habitat for poisonous snakes, personnel should wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

6.0 EMPLOYEE PROTECTION

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

6.1 Standard Safe Work Practices

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

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

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

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

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

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

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

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

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

6.2 NAS Memphis General Rules of Conduct

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

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

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

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

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

- Securing government tools in a personal or contractors tool box is forbidden.

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

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

- Compliance with posted signs and notices is required.

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

- Fighting or threatening bodily harm to another is forbidden.

- Defacing any government property is forbidden.

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

- All persons operating motor vehicles will obey all NAS Memphis traffic regulations.

6.3 Selection of Personal Protective Equipment

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

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

Field activities which disturb soils will be initiated in modified Level D protection except when stated otherwise in the SSHSP or when site conditions (e.g., sampling results from previous studies) indicate that modified Level D is inappropriate. Modified Level D protection consists of a hard hat, appropriate chemical-resistant gloves (vinyl or nitrile), eye protection, and chemical-resistant, steel-toed and shank boots. Work coveralls (full length sleeves and pants) will be worn if free product or contaminants identified as skin irritants are encountered. This

level of protection was selected because the levels of contamination detected in previous studies were low and free product was not detected.

PPE upgrades to Level C will be initiated if airborne concentrations exceed 2 ppm above the background concentration in the breathing zone or if the concentration of any contaminant exceeds 50 percent of the OSHA Permissible Exposure Limit (PEL). See Table 6-1 for the specific criteria for use and equipment for each level of protection.

Table 6-1
Level Of Protection And Criteria

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

Table 6-1
Level Of Protection And Criteria

Level of Protection	Criteria for Use	Equipment
Level C	• When airborne dust particles warrant respiratory protection • When work areas contain at least 19.5 percent oxygen	• Chemical resistant clothes, long sleeves, hood optional, one or two pieces • Full-face piece, air purifying respirator equipped with cartridges suitable for the hazard • Hard hat • Inner gloves and chemical resistant gloves • Steel-toe-and-shank boots • Coveralls and disposable outer boots
Level D	• When level B or C is not indicated • When airborne particles do not warrant respiratory protection • When work areas contain at least 19.5 percent oxygen	• Inner gloves and chemical-resistant gloves needed to handle soil or water samples • Steel-toe-and-shank boots • Hard hat (ANSI Z891-1969 standard) • Eye protection (ANSI Z87.1-1968) standard • Sunscreen (SPF 15 or greater) • Coveralls and disposable outer boots

Notes:

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

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

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

Level C protection will be selected when the types and concentrations of inseparable material are known, or reasonably assumed to be no greater than the protection factors associated with air-purifying respirators, and exposure to the unprotected areas of the body is unlikely to cause harm. Dust concentrations require Level C PPE, where the respirable fractions exceed the PEL of 5 mg/m3 or the total concentrations exceed the PEL of 15 mg/m3.

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

6.4 Air Monitoring

Site history and previous site work indicates that workers may potentially be exposed to low concentrations of numerous chemicals including VOCs, halogenated compounds, and combustible gases/vapors. Based on site history and existing sampling data, "worst case" contaminated areas will be identified before field activities begin.

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

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

If breathing zone levels exceed 2 ppm above background or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact both the Project Manager and the Project Health and Safety Officer. The Project Health and Safety Officer will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. (Typically, PPE will be upgraded to Level C assuming that cartridge respirators are appropriate, otherwise Level B.) See Table 6-1 for specific criteria for each protection level. Work shall not proceed until breathing zone levels return to background levels and it is reasonably anticipated that breathing zone samples will stay approximately at background levels, or the chemical constituent(s) are identified and appropriate PPE is donned.

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

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

6.5 Procedures and Equipment for Extreme Hot or Cold Weather Conditions

See CHASP Section 7.5.5.

Severe Weather Conditions

All field work shall immediately cease at the first sign of thunder or lightning. Field personnel shall perform emergency personal and equipment decontamination (see Section 6.6) and seek immediate shelter.

6.6 Personal Decontamination

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

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

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

6.6.1 Personal Decontamination Procedures

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

- Brushing heavily soiled boots and rinsing outer gloves and boots with soap and water.
- Removing outer gloves and depositing them in a labeled plastic-lined container.
- Remove outer chemical protective clothing.
- Wash and rinse inner gloves.
- Hard hats and eye protection should be washed thoroughly at the end of each work day with a soap and water solution.
- Disposable gloves and other disposable clothing will be disposed of in sealable bags and placed in a labeled 55-gallon drum for disposal at the site.
- All field personnel are to be instructed to shower as soon as possible after leaving the site.

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

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

6.6.2 Closure of the Personal Decontamination Station

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

6.7 Work Limitations

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional 8 hours of training in site management. All personnel must complete an 8-hour refresher training course on an annual basis in order to continue working at the site.

6.8 Exposure Evaluation

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

The content of the annual or termination examination will be the same as the baseline physical. A qualified physician will review the results of the annual examination and exposure data and request further tests or issue medical clearances as appropriate.

After any job-related injury or illness, there will be a medical examination to determine fitness for duty or any job restrictions. The Site Health and Safety Officer will review the results with the examining physician before releasing the employee for work. A similar examination will be performed if an employee has missed at least three days of work due to a non-job related injury or illness requiring medical attention. Medical records shall be maintained by the employer or the physician for at least 30 years following the termination of employment.

7.0 MEDICAL MONITORING PROGRAM

See CHASP Section 7.6.

8.0 AUTHORIZED PERSONNEL

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

• Principal-In-Charge	Dr. James Speakman (E/A&H)
• Task Order Manager/Project Manager	Mr. Lawson Anderson (E/A&H)
• Project Health & Safety Officer	Mr. Doug Petty (E/A&H)
• Site Supervisor	To Be Determined
• Site Health & Safety Officer	Mr. Matt Norton (E/A&H)
	Mr. Robert Smith (E/A&H)
	Mr. Ben Brantley (E/A&H)
• Engineer-in-Charge	Mr. Mark Taylor (SOUTHDIV)
• Naval Air Station Memphis Site Contact	Ms. Tonya Barker

8.1 Responsibilities of Site Supervisor

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

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

- Field staff have current HAZWOPER training.

- Field staff know who the Site Health and Safety Officer is.

- Field staff know the site-specific safety and health concerns.

- There is an adequate onsite supply of health and safety equipment.

- Field staff participate in the E/A&H Medical surveillance program (or in the case of the USGS or subcontractors, an equivalent program).

- Field staff attend safety and health "kick-off" orientation and other site safety briefings.

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

8.2 Responsibilities of Site Health and Safety Officer

The responsibilities of the Site Health and Safety Officer include:

- Providing the Site Supervisor technical input on site health and safety issues.

- Observing field personnel and reporting to the Site Supervisor on the effectiveness of the CHASP and SSHSP and whether field staff are utilizing proper work practices and decontamination procedures.

- Reporting significant safety violations to the Project Manager and/or Project Health and Safety Officer.

- Conducting safety briefings during field activities.

- Assuring that a copies of the CHASP and SSHSP are maintained onsite during all field activities.

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

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

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

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

8.3 Responsibilities of Onsite Field Staff

The health and safety responsibilities of field staff include:

- Being familiar with and complying with this CHASP and SSHSP.
- Attending site health and safety briefings and being aware of anticipated chemical, physical, and biological hazards and what to do when these hazards are encountered.
- Being properly trained on PPE to be used, safety work practices, decontamination procedures to be followed, and emergency procedures and communications.
- Utilizing required PPE including respiratory protective.

- Having up to date HAZWOPER training and providing the Site Supervisor with documentation that their training is current.

- Being an up to date participant in an acceptable medical surveillance program.

- Being fit-tested and physically capable of using a respirator and being in a position where using a respirator may be a requirement. Should the use of respiratory protection be required, field workers shall not have facial hair which intrudes into the sealing surface of the respirator.

- Using the buddy system when wearing respiratory protective equipment. When working in Level C or higher, a third person shall be at the work area. This person shall be suitably equipped to provide logistical and safety support to the entry team.

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

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

9.0 EMERGENCY INFORMATION

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations risk is minimized by establishing good work practices, staying alert, and using proper

PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

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

Contact	**Agency or Organization**	**Telephone**
Tonya Barker	NAS Memphis	(901) 873-5461/5462
Mark Taylor	SOUTHDIV EIC	(803) 743-0573
Law Enforcement	NAS Memphis Base Security	9-911
Fire Department	NAS Memphis	9-911
Ambulance Service	Naval Hospital, Millington Navy Road	(901) 873-5801/5802 or 9-911
Hospital	Methodist North Hospital 3960 Covington Pike	(901) 372-5211 or 9-911
Southern Poison Control Center	—	(901) 528-6048
Lawson Anderson	EnSafe/Allen & Hoshall	(901) 372-7962
Doug Petty	EnSafe/Allen & Hoshall	(901) 372-7962 (901) 362-0252

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

9.1 Site Resources

Cellular telephones or the telephone at the nearby Aircraft Firefighting Training Facility office trailer will be used for emergency use and communication/coordination with NAS Memphis. First aid and eye wash equipment will be available at the work area.

9.2 Emergency Procedures

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

The following emergency procedures should be followed:

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

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

- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the Site Health and Safety Officer to indicate possible routes for upwind escape.

- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the Site Health and

Safety Officer has evaluated the situation and provided the appropriate instructions to the field team.

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

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

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

Additional information on appropriate chemical exposure treatment methods will be provided through Material Safety Data Sheets (MSDS) in Attachment A.

10.0 FORMS

The following forms will be used to implement this Health and Safety Plan:

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

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

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

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ATTACHMENT A

MATERIAL SAFETY DATA SHEETS

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 511 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: 2-BUTANONE

SYNONYMS: ACETONE, METHYL-; AETHYLMETHYLKETON (German); BUTANONE; BUTANONE 2 (French); ETHYL METHYL CETONE (French); ETHYLMETHYLKETON (Dutch); ETHYL METHYL KETONE; ETHYL METHYL KETONE (DOT); KETONE, ETHYL METHYL; MEETCO; METHYL ACETONE; METHYL ACETONE (DOT); METHYL ETHYL KETONE; METHYL ETHYL KETONE (DOT); METILETILCHETONE (Italian); METYLOETYLOKETON (Polish); 2-BUTANONE; MEK; BUTAN-2-ONE; KETONE, METHYL ETHYL; 2-OXOBUTANE; METHYL ETHYL KETONE (MEK)

CAS: 78-93-3 RTECS: EL6475000

FORMULA: C4H8O MOL WT: 72.12

WLN: 2V1

CHEMICAL CLASS: Ketone

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: clear colorless liquid with a fragrant, mint-like, moderately sharp odor

BOILING POINT:	352.72 K	79.5 C	175.2 F
MELTING POINT:	187.04 K	-86.2 C	-123 F
FLASH POINT:	267.4 K	-5.75 C	21.6 F
AUTO IGNITION:	788.7 K	515.5 C	960 F
CRITICAL TEMP:	535.7 K	262.55 C	504.59 F
CRITICAL PRESS:	4.15 kN/M2	40.9 atm	601 psia
HEAT OF VAP:	191 Btu/lb	106.07 cal/g	4.438x E5 J/kg
HEAT OF COMB:	-13480 Btu/lb	-7494 cal/g	-313x E5 J/kg

VAPOR PRESSURE: 71.2 mm Hg @ 20 C

UEL: 11.5 %

LEL: 1.8 %

IONIZATION POTENTIAL (eV): 6.7

VAPOR DENSITY: 2.42 (air=1)

EVAPORATION RATE: 7.12

SPECIFIC GRAVITY: 0.806 @ 20 C

DENSITY: 0.805 g/mL @ 20 C

WATER SOLUBILITY: 27%

INCOMPATIBILITIES: very strong oxidizers, chlorosulfonic acid, oleum, potassium-tert-butoxide, heat or flame, chloroform, hydrogen peroxide, nitric acid

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: NO REACTION Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS:	NOT PERTINENT Source: SAX
POLYMERIZATION POSSIBILITIES:	NOT PERTINENT Source: SAX
TOXIC FIRE GASES:	UNBURNED VAPORS
ODOR DETECTED AT (ppm):	10 ppm
ODOR DESCRIPTION:	Like acetone; pleasant; pungent Source:CHRIS
100 % ODOR DETECTION:	6.0 ppm

---------- REGULATIONS ----------

DOT hazard class:	3 FLAMMABLE LIQUID
DOT guide:	26
Identification number:	UN1193
DOT shipping name:	Ethyl methyl ketone [or] methyl ethyl ketone
Packing group:	II
Label(s) required:	FLAMMABLE LIQUID
Special provisions:	T8
Packaging exceptions:	173.150
Non bulk packaging:	173.202
Bulk packaging:	173.242
Quantity limitations-	
Passenger air/rail:	5 L
Cargo aircraft only:	60 L
Vessel stowage:	B
Other stowage provisions:	
STCC NUMBER:	4909243
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	CAA '90 Listed
EPA WASTE NUMBER:	U159,D035,D001
CERCLA REF:	Y
RQ DESIGNATION:	D 5000 pounds (2270 kg) CERCLA
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Acute toxicity: Irritant Acute toxicity: adverse effect to target organs. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin. Fire hazard: flammable.
LISTED IN SARA Sect 313:	Yes
de minimus CONCENTRATION:	1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:

Hazard class:	Flammable liquid - Mailable as ORM-D
Mailability:	Domestic surface mail only
Max per parcel:	1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

2-BUTANONE [78-93-3]
ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
First Third Wastes List. 40 CFR 268.10. 54 FR 26594 (June 23, 1989)
Massachusetts Substance List.
Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: human exposures to levels of 350 ppm caused irritation of the nose and throat. numbness in fingers, arms and legs accompanied by headache, nausea, vomiting and fainting have occurred after exposure to levels of 300-600 ppm. SKIN: contact with liquid or vapor at levels of 300-600 ppm caused severe irritation. liquid is absorbed readily and may cause numbing of fingers and arms. Eyes: exposure to levels of 200 ppm produced irritation. INGESTION: can cause

irritation of the mouth, throat and stomach, the severity of which will be dependent upon amount swallowed. symptoms of poisoning include nausea, vomiting, stomach pain and diarrhea. death can occur from ingestion of as little as 1 ounce.(NYDH)

LONG TERM TOXICITY: has been implicated in certain nervous disorders characterized by weakness, fatigue, heaviness in chest and numbness of hands and feet. these symptoms may develop after 1 year of exposure to vapor concentrations of 50-200 ppm. improvement is gradual and may take years after exposure is discontinued.(NYDH)

TARGET ORGANS: CNS, lungs. peripheral nervous system. eye irritation at 350 ppm.

SYMPTOMS: Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: 200 ppm Time weighted averages for 8-hour exposure
590 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 200ppm(590 mg/M3)
ACGIH STEL: STEL = 300 ppm

OSHA PEL: Transitional Limits:
PEL = 200 ppm(590mg/M3)
Final Rule Limits:
TWA = 200 ppm (590 mg/M3)
STEL = 300 ppm(885 mg/M3)

MAK INFORMATION: 200 ppm
590 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:100 ppm/5M JIHTAB 25,282,43
SENSE ORGANS
Nose
Other
SENSE ORGANS
Eye
Conjunctive irritation
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:2737 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2737 mg/kg
ihl-rat LC50:23500 mg/m3/8H
ipr-rat LD50:607 mg/kg
orl-mus LD50:4050 mg/kg
ihl-mus LC50:40 gm/m3/2H
ipr-mus LD50:616 mg/kg
skn-rbt LD50:6480 mg/kg
ipr-gpg LDLo:2 gm/kg
ihl-mam LC50:38 gm/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

eye-hmn 350 ppm
skn-rbt 500 mg/24H MOD
skn-rbt 402 mg/24H MLD
skn-rbt 13780 ug/24H open MLD
eye-rbt 80 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:3000 ppm/7H (6-15D preg) TXAPA9 28,452,74
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

ihl-rat TCLo:1000 ppm/7H (6-15D preg) TXAPA9 28,452,74
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Methyl ethyl ketone (MEK); CASRN 78-93-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Methyl ethyl ketone (MEK)
CASRN -- 78-93-3
Last Revised -- 12/01/89

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity

Basis -- Based on no human carcinogenicity data and inadequate animal data.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. No data were available to assess the carcinogenic potential of methyl ethyl ketone by the oral or inhalation routes. In a skin carcinogenesis study, two groups of 10 male C3H/He mice received dermal applications of 50 mg of a solution containing 25 or 29% methyl ethyl ketone in 70% dodecylbenzene twice a week for 1 year. No skin tumors developed in the group of mice treated with 25% methyl ethyl ketone. After 27 weeks, a single skin tumor developed in 1 of 10 mice receiving 29% methyl ethyl ketone (Horton et al., 1965).

II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Methyl ethyl ketone was not mutagenic for Salmonella typhimurium strains TA98, TA100, TA1535, or TA1537 with or without rat hepatic homogenates (Florin et al., 1980; Douglas et al., 1980). Methyl ethyl ketone induced aneuploidy in the diploid D61, M strain of Saccharomyces cerevisiae (Zimmermann et al., 1985). Low levels of methyl ethyl ketone combined with low levels of nocodazole (another inducer of aneuploidy), also produced significantly elevated levels of aneuploidy in the system (Mayer and Goin, 1987).

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

None.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

None.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1985. Health and Environmental Effects Profile for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 1988. Updated Health Effects Assessment for Methyl Ethyl Ketone. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1988 Updated Health Effects Assessment for Methyl Ethyl Ketone has received Agency review.

Agency Work Group Review: 05/30/89

Verification Date: 05/30/89

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
organic canister or air pack; plastic gloves; goggles or face shield.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (2-BUTANONE)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
3000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen.
EYES: wash with plenty of water for at least 15 min. and call physician.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Alcohol foam, dry chemical, or carbon dioxide.
Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethyl methyl ketone [or] methyl ethyl ketone
DOT ID NUMBER: UN1193

ERG93 GUIDE 26

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
For explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it

without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk.

Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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---------- IDENTIFIERS ----------

CHEMTOX RECORD 1715 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: NAPHTHA, SOLVENT

SYNONYMS: AROMATIC SOLVENT; HI-FLASH NAPHTHAYETHYLEN; NAPHTA (DOT); NAPHTHA; NAPHTHA DISTILLATE (DOT); NAPHTHA, SOLVENT (DOT); PETROLEUM BENZIN; PETROLEUM DISTILLATES (NAPHTHA); PETROLEUM ETHER; PETROLEUM ETHER (DOT); PETROLEUM NAPHTHA (DOT)

CAS: 8030-30-6 RTECS: DE3030000

FORMULA: W99 MOL WT:

WLN: A10-15

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION:

BOILING POINT: NA

MELTING POINT: NA

FLASH POINT: Not available

AUTO IGNITION: Not available

VAPOR PRESSURE:

[illegible]: ~

: ~

IONIZATION POTENTIAL (eV): 7.16 TO 7.46

VAPOR DENSITY: No data

EVAPORATION RATE: 5.53(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: No data

DENSITY:

WATER SOLUBILITY:

INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide:	27
Identification number:	UN1256
DOT shipping name:	Naphtha, [solvent]
Packing group:	II - III
Label(s) required:	FLAMMABLE LIQUID - FLAMMABLE LIQUID
Special provisions:	T8,T31■B1,T7,T30
Packaging exceptions:	173.150■150
Non bulk packaging:	173.202■203
Bulk packaging:	173.242■242
Quantity limitations-	
Passenger air/rail:	5 L■60 L
Cargo aircraft only:	60 L■220 L
Vessel stowage:	B■A
Other stowage provisions:	
STCC NUMBER:	4915241, 4910241
CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	D001
CERCLA REF:	Not listed
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Fire hazard: flammable.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE):	Unspecified
FLAMMABILITY (RED) :	Unspecified
REACTIVITY (YELLOW):	Unspecified
SPECIAL :	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
NAPHTHA, SOLVENT [8030-30-6]
New Jersey Right To Know Substance List. (December 1987)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: Source:

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: ppm
mG/M3

CARCINOGEN?: N STATUS: See below

CINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* ihl-hmn LCLo:3 pph/5M TABIA2 3,231,33

LD50 value: orl-rat LD50:>5 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>5 gm/kg
ihl-rat LCLo:1600 ppm/6H
ihl-mus LCLo:10600 mg/m3/6H
skn-rbt LD50:>3 gm/kg
ipr-mam LDLo:2500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (NAPHTHA, SOLVENT)
1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
2500 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
5000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
10000 ppm: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSHP
EYE: None given
SKIN: None given
INHALATION: None given
INGESTION: None given

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Naphtha, [solvent]
ID NUMBER: UN1256

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 1513 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: KEROSENE
SYNONYMS: COAL OIL; KEROSINE; ILLUMINATING OIL; RANGE OIL; A FUEL OIL NO. 1; JET FUEL; JP-1
CAS: 8008-20-6 RTECS: NY9350000
FORMULA: CnH2n+2 MOL WT:
WLN:
CHEMICAL CLASS:

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless watery liquid with a fuel oil odor; pale yellow or water white, mobile oily liquid

BOILING POINT:	448.16-598.16 K	175-325 C	347-617 F
MELTING POINT:	227.55 K	-45.6 C	-50.1 F
FLASH POINT:	310.92 K	37.77 C	99.9 F
AUTO IGNITION:	502 K	228.8 C	444 F

VAPOR PRESSURE: 2 mmHg @ 21 C
UEL: 5.0 %
LEL: 0.7 %
IONIZATION POTENTIAL (eV): 6.79
VAPOR DENSITY: 4.5 (air=1)
EVAPORATION RATE: 0.212138
SPECIFIC GRAVITY: 0.80 15C
DENSITY: 0.80 g/mL
WATER SOLUBILITY: INSOLUBLE
INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): 1 ppm
ODOR DESCRIPTION: Fuel oil odor Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1223

DOT shipping name: Kerosene
Packing group: III
Label(s) required: FLAMMABLE LIQUID
Special provisions: B1,T1
Packaging exceptions: 173.150
Non bulk packaging: 173.203
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 60 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: 4915171

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: D001
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Chronic toxicity: mutagen.
Fire hazard: flammable.
Chronic toxicity: carcinogen

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Combustible liquid - Mailable as ORM-D
Mailability: Domestic service and air transportation shipper's declaration
Max per parcel: 1 GAL

NFPA CODES:
HEALTH HAZARD (BLUE): (0) No unusual health hazard.
FLAMMABILITY (RED) : (2) This material must be moderately heated before ignition will occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

Canadian Domestic Substances List
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
KEROSENE [8008-20-6]

Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: does not evaporate fast enough to cause health effects except when heated or in enclosed spaces. headache, tiredness, stupor, dizziness, nausea, coma and death, may occur with increasing exposure. SKIN: if not promptly removed, may cause reddening, blisters, itching and an increased risk of infection. Eyes: irritation may occur. INGESTION: accidental ingestion of unknown amounts has caused irritation of mouth, throat and stomach, nausea, vomiting, rapid breathing, blue skin coloration, and convulsions. death may result from as little as 1 fluid ounce. inhalation into lungs following ingestion may result in bronchitis, chemical pneumonia, accumulation of fluid and blood in lungs, and death. as little as 1/30 oz. may be fatal in this way. (NYDH)

LONG TERM TOXICITY: absorption through skin is slow but repeated skin contact over many years has caused muscular weakness, anemia, changes in white blood cells, fever and death. (NYDH)

TARGET ORGANS:

SYMPTOMS: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL: 100 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: Not listed
ACGIH STEL: Not listed

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC
to be probably carcinogenic to
humans with (usually) at least
limited human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:26 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:26 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
protective gloves; goggles or face sheild.

FIRST AID SOURCE: CHRIS Manual 1991
ASPIRATION: enforce bed rest; administer oxygen; call a doctor.
INGESTION: do NOT induce vomiting; call a doctor.
EYES: wash with plenty of water.
SKIN: wipe off and wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam, dry chemical, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Kerosene
T ID NUMBER: UN1223

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate horities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 369 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: SULFURIC ACID

SYNONYMS: OIL OF VITRIOL; NORDHAUSEN ACID; DIPPING ACID; SPIRIT OF SULFUR; HYDROGEN SULFATE; SULPHURIC ACID; VITRIOL BROWN OIL

CAS: 7664-93-9 RTECS: WS5600000

FORMULA: H2SO4 MOL WT: 98.08

WLN: H2 S-O4

CHEMICAL CLASS: Non-oxidizing min. acid

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: odorless colorless oily liquid

BOILING POINT:	543.15 K	270 C	518 F
MELTING POINT:	275.93 K	2.7 C	37 F
FLASH POINT:	Not applicable		
AUTO IGNITION:	Not applicable		
VAPOR PRESSURE:	<0.001 MM		
UEL:	Not applicable		
LEL:	Not applicable		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	1.84 20C		
DENSITY:	1.84 g/cc or 17.112 lb/gal		
WATER SOLUBILITY:	MISCIBLE		
INCOMPATIBILITIES:	organics: chlorates, carbides, fulminates, picrates, metals		

REACTIVITY WITH WATER: REACTS VIOLENTLY WITH EVOLUTION OF HEAT. SPATTERING OCCURS WHEN WATER IS ADDED TO THE COMPOUND.

REACTIVITY WITH COMMON MATERIALS: EXTREMELY HAZARDOUS IN CONTACT WITH MANY MATERIALS, ESP METALS AND COMBUST. DILUTE ACID REACTS WITH MOST METALS, RELEASING HYDROGEN WHICH CAN FORM EXPLOSIVE MIXTURES WITH AIR IN CONFINED SPACES.

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: DILUTE WITH WATER, THEN NEUTRALIZE WITH LIME, LIMESTONE OR SODA ASH.

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): >1

ODOR DESCRIPTION: ODORLESS UNLESS HOT, THEN CHOKING.

Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 8 CORROSIVE
DOT guide: 39
Identification number: UN1830
DOT shipping name: Sulfuric acid
Packing group: II
Label(s) required: CORROSIVE
Special provisions: A3,A7,B3,B83,B84,N34,T9,T27
Packaging exceptions: 173.154
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 1 L
Cargo aircraft only: 30 L
Vessel stowage: C
Other stowage provisions:14

STCC NUMBER: 4930040

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: D002
CERCLA REF: Y
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: 1000 pounds
SARA Sect. 312
categories:
Acute toxicity: corrosive
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:
HEALTH HAZARD (BLUE): (3) Extremely hazardous to health. Full protection required. No skin surface should be exposed.
FLAMMABILITY (RED) : (0) This material does not readily burn.
REACTIVITY (YELLOW): (2) Normally unstable and readily undergoes violent change, but does not detonate.

SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
SARA Title III Extremely Hazardous Substance. Sections 302 and 304.
SULFURIC ACID [7664-93-9]
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: resp sys,eyes,skin,teeth,lungs, mucous membranes.

SYMPTOMS: EYE, NOSE, THROAT IRRIT; PULM EDEMA, BRON; EMPHYSEMA; CONJ; STOMATITIS, DENT EROSION; TRACHBRONC; SKIN, EYE, BURNS; DERM. EXTREMELY IRRITATING, CORROSIVE AND TOXIC TO TISSUE - WORKERS EXPOSED TO LOW CONCENTRATIONS OF VAPOR GRADUALLY LOSE SENSITIVITY TO IRRITATING ACTION - INHALATION OF CONCENTRATED VAPORS CAN CAUSE RAPID UNCONSCIOUSNESS WITH SERIOUS DAMAGE TO LUNG TISSUE - CAN CAUSE NECROSIS OF SKIN ACCOMPANIED BY SHOCK AND COLLAPSE - SEVERE EXPOSURE MAY CAUSE CHEMICAL PNEUMONITIS. Source: SAX

CONC IDLH: 80mg/M3

NIOSH REL: 1 mg/M3 Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 1mg/M3
ACGIH STEL: STEL = 3 mg/M3

OSHA PEL: Transitional Limits:

PEL = 1mg/M3
Final Rule Limits:
TWA = 1 mg/M3

MAK INFORMATION: 1.5 calculated as total dust mG/M3

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:3 mg/m3/24W BJIMAG 18,63,61
MUSCULOSKELETAL
Changes in teeth and suporting structures

LD50 value: orl-rat LD50:2140 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2140 mg/kg
ihl-rat LC50:510 mg/m3/2H
ihl-mus LC50:320 mg/m3/2H
ihl-gpg LC50:18 mg/m3

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rbt TCLo:20 mg/m3/7H (6-18D preg) JEHSDH 13,251,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
provide safety shower; eyewash fountain; safety goggles; face shield; approved respirator(self-contained or air-line); rubber safety shoes; rubber apron

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of liquid contact and repeated or prolonged vapor contact

WEAR EYE PROTECTION TO PREVENT:
Any possibility of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (SULFURIC ACID)
25 mg/M3: Any powered air-purifying respirator with a high efficiency particulate filter and an acid gas cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.
50 mg/M3: Any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with a high-efficiency particulate filter. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted acid gas canister. / Any air-purifying respirator with a high-efficiency particulate filter.
^^ mg/M3: Any supplied-air respirator with a full facepiece and operated a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor and acid gas canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: water flush immed
INHALATION: art resp
INGESTION: water, no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material

from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Sulfuric acid
DOT ID NUMBER: UN1830

ERG93 GUIDE 39

POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if inhaled or swallowed.
Contact causes severe burns to skin and eyes.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
May ignite other combustible materials (wood, paper, oil, etc.).
Violent reaction with water.
Flammable/poisonous gases may accumulate in tanks and hopper cars.
Runoff to sewer may create fire or explosion hazard.
Material may be transported in a molten form.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection.
*Structural firefighters' protective clothing is not effective for these materials. Isolate the leak or spill area immediately for at least 150 feet in all directions. See the Table of Initial Isolation and Protective Action Distances. If you find the ID Number and the name of the material there, begin protective action. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300.
*FIRE
Do not get water inside container.
Small Fires: Dry chemical or CO2.
Large Fires: Flood fire area with water from a distance.
Do not get solid stream of water on spilled material. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk. Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire. Use water spray to reduce vapor; do not put water directly on leak, spill area or inside container. Keep combustibles (wood, paper, oil, etc.) away from

spilled material.
Spills: Dike for later disposal; do not apply water unless directed to do so. Cleanup only under supervision of an expert.

FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Speed in removing material from skin is of extreme importance. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 2264 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: OIL MIST, MINERAL

SYNONYMS: NUJOL ; MIST OF WHITE MINERAL OIL; CUTTING OIL; HEAT-TREATING OIL; HYDRAULIC OIL; CABLE OIL; LUBRICATING OIL

CAS: 8012-95-1 RTECS: XH7480000

FORMULA: W99 MOL WT: N.A.

WLN:

CHEMICAL CLASS:Paraffin

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: mist with an odor like burned lube oil

BOILING POINT: 633.15 K 360 C 680 F

MELTING POINT: NA

FLASH POINT: 408 K 134.85 C 274.7 F

AUTO IGNITION: Not available

VAPOR PRESSURE: 2.2 mmHg @ 21 C

UEL: N.A.

LEL: N.A.

VAPOR DENSITY: No data

SPECIFIC GRAVITY: No data

DENSITY: 0.83

WATER SOLUBILITY: INSOLUBLE

INCOMPATIBILITIES: none hazardous

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: Not given

DOT guide:

Identification number:

DOT shipping name:

Packing group:

Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: Not listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Fire hazard: combustible.

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified
FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OIL MIST, MINERAL [8012-95-1]
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

)RT TERM TOXICITY: ASPIRATION PNEUMONIA, CARCINOGEN OF SKIN AND SCROTUM.
** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: NONE REPORTED Source: NIOSHP

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = 5mg/M3
ACGIH STEL: STEL = 10 mg/M3

OSHA PEL: Transitional Limits:
PEL = 5mg/M3
Final Rule Limits:
TWA = 5 mg/M3

MAK INFORMATION: Not listed

CARCINOGEN?: N STATUS: See below

.CINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:>24 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:>24 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes wet.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (OIL MIST, MINERAL)
50 mg/M3: Any supplied-air respirator. / Any self-contained breathing apparatus. / Any air-purifying respirator with a high-efficiency particulate filter.
125 mg/M3: Any supplied-air respirator operated in a continuous flow mode. / Any powered air-purifying respirator with a high-efficiency particulate filter.
250 mg/M3: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. / Any supplied-air respirator with a tight-fitting facepiece operated in a continuous flow mode. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.
2500 mg/M3: Any supplied-air respirator with a half-mask and operated in a pressure-demand or other positive pressure mode.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: None given
SKIN: soap wash
INHALATION: fresh air
INGESTION: None given

---------- INITIAL INCIDENT RESPONSE ----------

No DOT Guide information for this compound.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 496 LAST UPDATE OF THIS RECORD: 06/03/93
NAME: ETHYLENE GLYCOL
SYNONYMS: 1,2-ETHANEDIOL; 1,2-DIHYDROXYETHANE; 2-HYDROXYETHANOL; GLYCOL ALCOHOL; GLYCOL; EG
CAS: 107-21-1 RTECS: KW2975000
FORMULA: C2H6O2 MOL WT: 62.08
WLN: Q2Q
CHEMICAL CLASS: Alcohol

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: clear, colorless, slightly syrupy liquid.(nydh)

BOILING POINT:	470.15 K	197 C	386.6 F
MELTING POINT:	260.15 K	-13 C	8.6 F
FLASH POINT:	384.1 K	110.95 C	231.7 F
AUTO IGNITION:	673 K	399.8 C	751.8 F

VAPOR PRESSURE: .06 mm Hg @ 20 C
UEL: ~
LEL: 3.2 %
IONIZATION POTENTIAL (eV): 9.3
VAPOR DENSITY: 2.14 (air=1)
EVAPORATION RATE: 0.01(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY: 1.1135 @ 20 C
DENSITY: 1.113
WATER SOLUBILITY: > 100mg/mL @ 17 C
INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity
REACTIVITY WITH COMMON MATERIALS: REACTS VIOLENTLY WITH CHLOROSULFURIC ACID, SULFURIC ACID AND OLEUM Source: CSDS
STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
ODOR DETECTED AT (ppm): Not pertinent
ODOR DESCRIPTION: Slight odor Source:CHRIS
100 % ODOR DETECTION: O.I @ 20 C = 3 ppm

---------- REGULATIONS ----------

DOT hazard class: Not given
DOT guide:

Identification number:
DOT shipping name:
Packing group:
Label(s) required:
Special provisions:
Packaging exceptions: 173.
Non bulk packaging: 173.
Bulk packaging: 173.
Quantity limitations-
Passenger air/rail:
Cargo aircraft only:
Vessel stowage:
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: None
CERCLA REF: Not listed
RQ DESIGNATION: Not listed
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:
HEALTH HAZARD (BLUE): (1) Slightly hazardous to health. As a precaution wear self-contained breathing apparatus.
FLAMMABILITY (RED) : (1) This material must be preheated before ignition can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
\ List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE GLYCOL [107-21-1]
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
SARA Section 313 Toxic Chemicals List
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: mild throat irritation resulted from exposures of 28 mg/m3. levels above 140 mg/m3 resulted in more marked irritation, with levels of more than 250 mg/m3 being unbreathable. these levels are only reached at elevated temperatures. SKIN: may cause mild irritation if not promptly removed. Eyes: accidental eye contact with concentrated ethylene glycol resulted in extreme swelling of the eye, cloudy vision and slow response to light. these symptoms lasted a month. INGESTION: may cause symptoms in the nervous system, heart, lungs and kidneys. earliest effects are usually felt in the nervous system between 1/2 to 12 hours after ingestion. symptoms from 1 liquid ounce may include nausea, vomiting, dizziness, loss of coordination and abdominal pain. large amounts may cause stupor, coma, convulsions and death. survival of this stage may lead to development of rapid heart beat, enlarged heart and fluid in the lungs which, too, can lead to death usually after 1 to 3 days. some individuals who drank 3 to 4 fluid ounces who survived both the above stages because of prompt medical treatment, later (3 to 17 days) died of kidney failure.(NYDH)

LONG TERM TOXICITY: occupational exposure to heated ethylene glycol has caused involuntary eye movement that may indicate nerve damage. some individuals also reported attacks of unconsciousness lasting 5 to 10 minutes which went away when they stopped working with ethylene glycol.(NYDH)

TARGET ORGANS: eyes, skin, resp system

SYMPTOMS: Inhalation of vapor is not hazardous. Ingestion causes stupor or coma, sometimes leading to fatal kidney injury. Source: CHRIS

CONC IDLH: Nonegiven

NIOSH REL:

ACGIH TLV: TLV = C 50ppm(C 127 mg/M3) VAPOR AND MIST
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
CEILING = 50 ppm (125 mg/M3)

MAK INFORMATION: 10 ppm
26 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-chd TDLo:5500 mg/kg PGMJAO 52,598,76
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Respiratory stimulation
KIDNEY,URETER,BLADDER
Other changes

orl-hmn LDLo:786 mg/kg EJTXAZ 9,373,76
BEHAVIORAL
Convulsions or effect on seizure threshold
BEHAVIORAL
Coma
GASTROINTESTINAL
Hypermotility,diarrhea

orl-hmn LDLo:398 mg/kg SMEZA5 26(2),48,83

BEHAVIORAL
Headache
GASTROINTESTINAL
Nausea or vomiting
LIVER
Other changes

ihl-hmn TCLo:10000 mg/m3 AGGHAR 5,1,33
SENSE ORGANS
Eye
Lacrimation
LUNGS, THORAX, OR RESPIRATION
Cough
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:4700 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4700 mg/kg
ihl-rat LC :>198 mg/m3
ipr-rat LD50:5010 mg/kg
scu-rat LD50:2800 mg/kg
ivn-rat LD50:3260 mg/kg
ims-rat LDLo:3300 mg/kg
unr-rat LD50:13 gm/kg
orl-mus LD50:7500 mg/kg
ipr-mus LD50:5614 mg/kg
scu-mus LDLo:2700 mg/kg
ivn-mus LD50:3 gm/kg
unr-mus LD50:8050 mg/kg
orl-dog LD50:5500 mg/kg
orl-cat LD50:1650 mg/kg
scu-cat LDLo:2000 mg/kg
skn-rbt LD50:9530 mg/kg
ipr-rbt LDLo:1 gm/kg
ivn-rbt LDLo:5 gm/kg
ims-rbt LDLo:5500 mg/kg
unr-rbt LD50:5017 mg/kg
orl-gpg LD50:6610 mg/kg
scu-gpg LDLo:5 gm/kg
unr-gpg LD50:11150 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:50 gm/kg (6-15D preg) TXAPA9 81,113,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Skin and skin appendages
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

orl-rat TDLo:8580 mg/kg (6-15D preg) CHYCDW 20,289,86
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:12500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-rat TDLo:25 gm/kg (6-15D preg) NTIS** PB85-104594
MATERNAL EFFECTS
Uterus,cervix,vagina
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-rat TDLo:50 gm/kg (6-15D preg) NTIS** PB85-104594
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:7500 mg/kg (6-15D preg) TXAPA9 81,113,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:7500 mg/kg (6-15D preg) TJADAB 29(2),52A,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:84 gm/kg (1-21D preg/21D post) TOXID9 4,136,84
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN

Delayed effects

orl-mus TDLo:88720 mg/kg (7-14D preg) EVHPAZ 57,141,84
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON NEWBORN
Stillbirth
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: CHRIS Manual 1991
INGESTION: induce vomiting and call a physician.
SKIN AND
EYES: flush with water.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Water fog, alcohol foam, carbon dioxide, or dry chemical. Note: Water or foam may cause frothing. CHRIS91

No DOT Guide information for this compound.
DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 247 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: LEAD

SYNONYMS: C.I. PIGMENT METAL 4; C.I. 77575; KS-4; LEAD FLAKE; LEAD S2; OLOW (Polish); SI; SO

CAS: 7439-92-1 RTECS: OF7525000

FORMULA: Pb MOL WT: 207.19

WLN: PB

CHEMICAL CLASS: Metal

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: bluish-grey, soft metal; heavy ductile, soft, gray solid

BOILING POINT:	2013 K	1739.8 C	3163.7 F
MELTING POINT:	600.6 K	327.4 C	621.4 F
FLASH POINT:	Not available		
AUTO IGNITION:	Not available		

VAPOR PRESSURE: 1mm @ 973 C

UEL: ~

LEL: ~

VAPOR DENSITY: No data

SPECIFIC GRAVITY: 11.34

DENSITY: 11.34 g/mL @ 20 C

WATER SOLUBILITY: INSOLUBLE; DISSOLVES SLOWLY IN WATER CONTAINING A WEAK ACID

INCOMPATIBILITIES: strong ox, hydrogen peroxide, active metals, sodium, potassium, chlorine trifluoride, hydrogen peroxide, zirconium, disdium acetylide, oxidants

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: RELATIVELY IMPENETRABLE TO RADIATION

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: WHEN HEATED EMITS HIGHLY TOXIC FUMES; CAN REACT VIGOROUSLY WITH OXIDIZING MATERIALS

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

REGULATIONS

National Primary Ambient Air Quality Standards
1.5 ug/M3 maximum arithmetic mean averaged over a calendar year
National Secondary Ambient Air Quality Standards
same as primary standard

DOT hazard class: 6.1 POISON
DOT guide: 53
Identification number: UN2291
DOT shipping name: LEAD COMPOUNDS, SOLUBLE, N.O.S.
Packing group: III
Label(s) required: KEEP AWAY FROM FOOD
Special provisions:
Packaging exceptions: 173.153
Non bulk packaging: 173.213
Bulk packaging: 173.240
Quantity limitations-
Passenger air/rail: 100 KG
Cargo aircraft only: 200 KG
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:No
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): Treatment technique (12/07/92)
Maximum Contaminant Level Goals (MCLG): 0 mg/L (12/07/92)
CLEAN AIR ACT: CAA '90 By category and CAA '77 Sect 109
EPA WASTE NUMBER: D008
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Chronic toxicity: carcinogen
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-B
Mailability: Domestic service and air transportation; shipper's declaration
Max per parcel: 25 LBS; 5 LBS

NFPA CODES:
HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified
REACTIVITY (YELLOW): Unspecified
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
California Proposition 65 Developmental Toxin List
California Proposition 65 Female Reproductive Toxin List
California Proposition 65 Male Reproductive Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 109 National Ambient Air Quality Standards List
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
LEAD [7439-92-1]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a teratogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Specifically regulated substance. See 29 CFR 1910.1025
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: LASSITUDE, INSOMNIA, PALLOR, EYE GROUNDS, ANOREXIA, LOW-WEIGHT, MALNUTRITION, CONSTIPATION, ABDOMINAL PAIN, COLIC; HYPOTENSE, ANEMIA; GINGIVAL LEAD LINE; TREMBLING PARALYSIS WRIST. ** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS: gi,CNS,kidneys,blood,gingival tissue

SYMPTOMS: LASS, INSOM, PAL, EYE GROUNDS, ANOR, LOW-WT, MALNUT, CONSTI, ABDOM PAIN, COLIC; HYPOTENSE, ANEMIA, GINGIVAL LEAD LINE; TREM, PARA WRIST. METALLIC TASTE, INCREASED SALIVATION, PYORRHEA (FLOW OF MUCOUS). NEUROMUSCULAR: NUMBNESS AND TINGLING OF EXTREMITIES WITH SENSORY

DISTRUBANCE, EXTENSOR WEAKNESS OF WRISTS AND ANKLES, LOSS OF MUSCLE TONE, TREMOR INCREASED DEEP-TENDON REFLEXES, MUSCULAR CRAMPS AND ACHING, MUSCULAR ATROPHY. CNS: VISUAL DISTURBANCES, HEADACHE, NERVOUSNESS OF DEPRESSION, INSOMNIA, MENTAL CONFUSION, DELIRIUM. Source: NIOSHP, THIC

CONC IDLH: 700mg/M3

NIOSH REL: <0.1 mg/M3 Air level to be maintained so that worker blood level remains <0.06 mg/100 g of whole blood

ACGIH TLV: TLV = 0.15mg/M3 as LEAD
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = See 29 CFR 1910.1025 and 1926.62
50 ug/M3

MAK INFORMATION: 0.1 mG/M3
Substance with systemic effects, onset of effect over 2 hours: Peak = 10xMAK for 30 minutes, once per shift of 8 hours.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:
IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL
Hallucinations, distorted perceptions
BEHAVIORAL
Muscle weakness

LD50 value: No LD50 in RTECS 1992

!ER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

ipr-rat LDLo:1 gm/kg
orl-pgn LDLo:160 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
orl-rat TDLo:790 mg/kg (multigenerations) AEHLAU 23,102,71
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-rat TDLo:1140 mg/kg (14D pre-21D post) PHMCAA 20,201,78
EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:520 mg/kg (7-22D preg/10D post) FEPRA7 37,394,78
EFFECTS ON NEWBORN

orl-rat TDLo:1100 mg/kg (1-22D preg) FEPRA7 37,895,78
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:10 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-rat TCLo:3 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON NEWBORN

orl-mus TDLo:1120 mg/kg (multigenerations) AEHLAU 23,102,71

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:6300 mg/kg (1-21D preg) EXPEAM 31,1312,75
EFFECTS ON FERTILITY
Female fertility index
EFFECTS ON FERTILITY
Pre-implantation mortility

orl-mus TDLo:300 mg/kg (1-2D preg) TXCYAC 6,129,76
EFFECTS ON FERTILITY
Other measures of fertility

orl-mus TDLo:4800 mg/kg (1-16D preg) BECTA6 18,271,77
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

orl-dom TDLo:662 mg/kg (1-21W preg) TXAPA9 25,466,73
EFFECTS ON NEWBORN
Behavioral

California Prop 65: Developmental toxin (02/27/87)
Female reproductive toxin (02/27/87)
Male reproductive toxin (02/27/87)
Acceptable intake level-inhalation .5 ugD (01/01/94)
Carcinogen (10/01/92)

---------- EPA's IRIS DATA SUMMARY ----------
Lead and compounds (inorganic); CASRN 7439-92-1 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Lead and compounds (inorganic)
CASRN -- 7439-92-1
Last Revised -- 05/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for

information on long-term toxic effects other than carcinogenicity.

II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- B2; probable human carcinogen

Basis -- Sufficient animal evidence. Ten rat bioassays and one mouse assay have shown statistically significant increases in renal tumors with dietary and subcutaneous exposure to several soluble lead salts. Animal assays provide reproducible results in several laboratories, in multiple rat strains with some evidence of multiple tumor sites. Short term studies show that lead affects gene expression. Human evidence is inadequate.

___II.A.2. HUMAN CARCINOGENICITY DATA

Inadequate. There are four epidemiologic studies of occupational cohorts exposed to lead and lead compounds. Two studies (Dingwall-Fordyce and Lane, 1963; Nelson et al., 1982) did not find any association between exposure and cancer mortality. Selevan et al. (1985), in their retrospective cohort mortality study of primary lead smelter workers, found a slight decrease in the total cancer mortality (SMR=95). Apparent excesses were observed for respiratory cancer (SMR=111, obs=41, p>0.05) and kidney cancer (SMR=204, obs=6, p>0.05). Cooper and Gaffey (1975) and Cooper (1985 update) performed a short mortality study of battery plant workers and lead smelter workers. They found statistically significant excesses for total cancer mortality (SMR=113, obs=344), stomach cancer (SMR=168, obs=34), and lung cancer (SMR=124, obs=109) in the battery plant workers. Although similar excesses were observed in the smelter workers, they were not statistically significant. Cooper and Gaffey (1975) felt it was possible that individual subjects were monitored primarily on the basis of obvious signs of lead exposure, while others who showed no symptoms of lead poisoning were not monitored.

All of the available studies lacked quantitative exposure information, as well as information on the possible contribution from smoking. All studies also included exposures to other metals such as arsenic, cadmium, and zinc for which no adjustment was done. The cancer excesses observed in the lung and stomach were relatively small (<200). There was no consistency of site among the various studies, and no study showed any dose-response relationship. Thus, the available human evidence is considered to be inadequate to refute or demonstrate any potential carcinogenicity for humans from lead exposure.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Sufficient. The carcinogenic potential of lead salts (primarily phosphates and acetates) administered via the oral route or by injection has

been demonstrated in rats and mice by more than 10 investigators. The most characteristic cancer response is bilateral renal carcinoma. Rats given lead acetate or subacetate orally have developed gliomas, and lead subacetate also produced lung adenomas in mice after i.p. adminstration. Most of these investigations found a carcinogenic response only at the highest dose. The lead compounds tested in animals are almost all soluble salts. Metallic lead, lead oxide and lead tetralkyls have not been tested adequately. Studies of inhalation exposure have not been located in the literature.

Azar et al. (1973) administerd 10, 50, 100, and 500 ppm lead as lead acetate in dietary concentrations to 50 rats/sex/group for 2 years. Control rats (100/sex) received the basal laboratory diet. In a second 2-year feeding study, 20 rats/group were given diets containing 0, 1000, and 2000 ppm lead as lead acetate. No renal tumors were reported in the control groups or in treated animals of either sex receiving 10 to 100 ppm. Male rats fed 500, 1000, and 2000 ppm lead acetate had an increased renal tumor incidence of 5/50, 10/20, and 16/20, while 7/20 females in the 2000-ppm group developed renal tumors.

The Azar et al. (1973) study is limited by the lack of experimental detail. The possibility of environmental contamination from lead in the air or drinking water was not mentioned. The strains of rats used were not specified in the study, but the Health Effects Assessment for Lead (U.S. EPA, 1984) indicates the rats were Wistar strain. The weight gain at 1000 and 2000 ppm was reported to be depressed, but details were not given.

Kasprzak et al. (1985), in investigating the interaction of dietary calcium on lead carcinogenicity, fed 1% lead subacetate (8500 ppm Pb) to male Sprague-Dawley rats in the diet for 79 weeks. Of the rats surviving (29/30) in this treatment group beyond 58 weeks, 44.8% had renal tumors. Four rats had adenocarcinomas; the remainaing nine had adenomas. Bilateral tumors were noted. No renal tumors were noted among the controls.

As part of a study to determine interactions between sodium nitrite, ethyl urea and lead, male Sprague-Dawley rats were given lead acetate in their drinking water for 76 weeks (Koller et al., 1986). The concentration of lead was 2600 ppm. No kidney tumors were detected among the 10 control rats. Thirteen of 16 (81%) lead-treated rats had renal tubular carcinoma; three tumors were detected at 72 weeks and the remainder detected at the termination of the study.

Van Esch and Kroes (1969) fed basic lead acetate at 0, 0.1%, and 1.0% in the diet to 25 Swiss mice/sex/group for 2 years. No renal tumors developed in the control group, but 6/25 male mice of 0.1% basic lead acetate group had renal tumors (adenomas and carcinomas combined). In the 1.0% group, one female had a renal tumor. The authors thought that the low incidence in the 1.0% group was due to early mortality.

Hamsters given lead subacetate at 0.5% and 1% in the diet had no significant renal tumor response (Van Esch and Kroes, 1969).

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Lead acetate induces cell transformation in Syrian hamster embryo cells (Paolo et al., 1978) and also enhances the incidence of simian adenovirus induction. Lead oxide showed similar enhanced adenovirus induction (Casto et al., 1979).

Under certain conditions lead compounds are capable of inducing chromosomal aberrations in vivo and in tissue cultures. Grandjean et al. (1983) showed a relationship between SCE and lead exposure in exposed workers. Lead has been shown, in a number of DNA structure and function assays, to affect the molecular processes associated with the regulation of gene expression (U.S. EPA, 1986).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

Quantifying lead's cancer risk involves many uncertainties, some of which may be unique to lead. Age, health, nutritional state, body burden, and exposure duration influence the absorption, release, and excretion of lead. In addition, current knowledge of lead pharmacokinetics indicates that an estimate derived by standard procedures would not truly describe the potential risk. Thus, the Carcinogen Assessment Group recommends that a numerical estimate not be used.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1984. Health Effects Assessment for Lead. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH, for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/055. NTIS PB85-163996/AS.

U.S. EPA. 1986. Air Quality Criteria Document for Lead. Volumes III, IV.

Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC, for the Office of Air Quality Planning and Standards. EPA-600/8-83/028dF.

U.S. EPA. 1987. Preliminary review of the carcinogenic potential of lead associated with oral exposure. Prepared by the Office of Health and Environmental Assessment, Carcinogenic Assessment Group, Washington DC, for the Office of Drinking Water, Office of Solid Waste and the Office of Emergency and Remedial Response (Superfund). OHEA-C-267. Internal Review Draft.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The review of the carcinogenic potential of lead associated with oral exposure has received Agency review.

The 1986 Air Quality Criteria Document for Lead has received Agency and External Review.

Agency Work Group Review: 05/04/88

Verification Date: 05/04/88

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

William Pepelko / ORD -- (202)260-5898 / FTS 260-5898

James Cogliano / ORD -- (202)260-9243 / FTS 260-9243

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
At the end of each work shift.

** REMOVE CLOTHING:

Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (LEAD)
Not in excess of 0.5 mg/M3: Half-mask, air-purifying respirator equipped with high efficiency filters.
Not in excess of 2.5 mg/M3: Full facepiece air-purifying respirator equipped with high-efficiency filters.
Not in excess of 50 mg/M3: (1) Any powered, air-purifying respirator with high efficiency filters; or (2) Half-mask supplied-air respirator operated in positive-pressure mode.
Not in excess of 100 mg/M3: Supplied air respirator with full facepiece hood, or helmet or suit and operated in positive pressure mode.
Unknown concentration or Firefighting: Full facepiece, self-contained breathing apparatus operated in postive-pressure mode.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap flush promptly
INHALATION: art resp
INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: LEAD COMPOUNDS, SOLUBLE, N.O.S.
DOT ID NUMBER: UN2291

ERG93 GUIDE 53

POTENTIAL HAZARDS

*HEALTH HAZARDS
Poisonous if swallowed.
Inhalation of dust or mist may be poisonous.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water

pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*SPILL OR LEAK
Do not touch or walk through spilled material; stop leak if you can do it without risk.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 59 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: BENZENE

SYNONYMS: BENZOL; COAL TAR NAPHTHA; CYCLOHEXATRIENE; PHENYL HYDRIDE; PHENE; COAL NAPHTHA; PYROBENZOL

CAS: 71-43-2 RTECS: CY1400000

FORMULA: C6H6 MOL WT: 78.11

WLN: RH

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless to pale yellow watery liquid with a gasoline-like odor

BOILING POINT:	353.15 K	80 C	176 F
MELTING POINT:	278.71 K	5.5 C	42 F
FLASH POINT:	262 K	-11.15 C	11.9 F
AUTO IGNITION:	864.8 K	591.6 C	1097 F
CRITICAL TEMP:	562.1 K	288.95 C	552.11 F
CRITICAL PRESS:	4.89 kN/M2	48.2 atm	708 psia
HEAT OF VAP:	169 Btu/lb	93.85 cal/g	3.927x E5 J/kg
HEAT OF COMB:	-17460 Btu/lb	-9707 cal/g	-406x E5 J/kg

VAPOR PRESSURE: 75 mm @ 20 C

UEL: 7.1 %

LEL: 1.3 %

IONIZATION POTENTIAL (eV): 9.25

VAPOR DENSITY: 2.77 (air=1)

EVAPORATION RATE: 3.50(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.86-0.88 20 C

DENSITY: 0.8794 @ 20 C

WATER SOLUBILITY: 0.06%

INCOMPATIBILITIES: strong ox,chlorine,bromine with iron

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS(Br2, F2, CL2, CrO3, NaClO4, O2, O3), PERCHLORATES (AlCl3 +NaClO4), (H2SO4 & PERMANGANATES), K2O2, (AgClO4 & ACETIC ACID), Na2O2 Source: SAX

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: VAPOR IS HEAVIER THAN AIR AND MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.

ODOR DETECTED AT (ppm): 4.68 ppm
ODOR DESCRIPTION: odor; characteristic odor Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1114
DOT shipping name: Benzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T8
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:40

STCC NUMBER: 4908110

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.005 mg/L (01/09/89)
Maximum Contaminant Level Goals (MCLG): 0 mg/L (01/09/89)
CLEAN AIR ACT: CAA '90 Listed and CAA '77 Sect 109
EPA WASTE NUMBER: U019,D018,D001
CERCLA REF: Y
RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: carcinogen
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/89/209464/AS)
BENZENE [71-43-2]
California OSHA Carcinogens List.
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act Section 112 Hazardous Air Pollutants List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
National Toxicology Program (NTP) list of human carcinogens
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
New Jersey Right to Know Substance List. Listed as a mutagen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
OSHA Specifically regulated substance. See 29 CFR 1910.1028
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Suspected carcinogen (ACGIH). "Threshold Limit Values for 1992-1993"
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: benzene may produce both nerve and blood effects. irritation of the nose, throat and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). lung congestion may occur. nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness and slurred speech. at high levels, slowed breathing and death may result. death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes. SKIN: irritation may occur, with redness and blistering if not promptly removed. benzene is poorly absorbed. whole body exposure for 30 minutes has been reported with no health effects. Eyes: may cause severe irritation. INGESTION: may cause irritation of mouth, throat and stomach. symptoms are similar to those listed under inhalation. one tablespoon may cause collapse, bronchitis, pneumonia and death.(NYDH)

LONG TERM TOXICITY: may cause loss of appetite, nausea, weight loss, fatigue, muscle weakness, headache, dizziness, nervousness and irritability. mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. at levels between 100 and 200 ppm for periods of 6 months, or more, severe irreversible blood changes and damage to liver and heart may occur. temporary partial paralysis has been reported.(NYDH)

TARGET ORGANS: blood, CNS, skin, bone marrow, eyes, resp sys

SYMPTOMS: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: Potential occupational carcinogen 0.1 ppm Time weighted averages for 8-hour exposure 0.32 mg/M3 Time weighted averages for 8-hour exposure 1 ppm Ceiling exposures which shall at no time be exceeded 3.2 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 10ppm Suspected human carcinogen (A2)
ACGIH STEL: Suspected human carcinogen (A2)

OSHA PEL: Final Rule Limits:
TWA = 1 ppm
STEL = 5 ppm
CONSULT 29CFR 1910.1028

MAK INFORMATION: Danger of cutaneous absorption
Carcinogenic working material without MAK
Capable of inducing malignant tumors as shown by

experience with humans.
Substances which has been demonstrated to cause genetic damage in mammalian (including human) germ cells without proof of transmission.

CARCINOGEN?: Y STATUS: See below
REFERENCES:

HUMAN SUSPECTED IARC** 7,203,74
HUMAN SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 29,93,82
HUMAN POSITIVE IARC** 29,93,82
ANIMAL INDEFINITE IARC** 7,203,74

CARCINOGEN LISTS:

IARC: Carcinogen as defined by IARC as carcinogenic to humans, with sufficient epidemiological evidence.
MAK: Capable of inducing malignant tumors as shown by experience in humans.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as known to be carcinogenic, with evidence from human studies.
ACGIH: Carcinogen defined by ACGIH TLV Committee as a confirmed human carcinogen, recognized to have carcinogenic or cocarcinogenic potential.
OSHA: Cancer hazard

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* ihl-hmn LCLo:2 pph/5M TABIA2 3,231,33

* orl-man LDLo:50 mg/kg YAKUD5 22,883,80

* ihl-hmn LCLo:2000 ppm/5M YAKUD5 22,883,80

ihl-man TCLo:150 ppm/1Y-I BLUTA9 28,293,74
BLOOD
Other changes
NUTRITIONAL AND GROSS METABOLIC
Changes in:
Body temperature increase

ihl-hmn TCLo:100 ppm INMEAF 17,199,48
BEHAVIORAL
Somnolence(general depressed activity)
GASTROINTESTINAL
Nausea or vomiting

SKIN AND APPENDAGES
Skin - after systemic exposure
Dermatitis,other

ihl-hmn LCLo:65 mg/m3/5Y ARGEAR 44,145,74
BLOOD
Other changes

LD50 value: orl-rat LD50:930 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:930 mg/kg
ihl-rat LC50:10000 ppm/7H
ipr-rat LD50:2890 ug/kg
orl-mus LD50:4700 mg/kg
ihl-mus LC50:9980 ppm
ipr-mus LD50:340 mg/kg
orl-dog LDLo:2 gm/kg
ihl-dog LCLo:146000 mg/m3
ihl-cat LCLo:170000 mg/m3
ihl-rbt LCLo:45000 ppm/30M
skn-rbt LD50:>9400 mg/kg
ivn-rbt LDLo:88 mg/kg
skn-gpg LD50:>9400 mg/kg
ipr-gpg LDLo:527 mg/kg
scu-frg LDLo:1400 mg/kg
ihl-mam LCLo:20000 ppm/5M
ipr-mam LDLo:1500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:670 mg/m3/24H (15D pre/1-22D preg) HYSAAV 33(1-3),327,68
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:56600 ug/m3/24H (1-22D preg) HYSAAV 33(7-9),112,68
EFFECTS ON NEWBORN

ihl-rat TCLo:50 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:150 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON FERTILITY
Post-implantation mortality
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:12 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:6500 mg/kg (8-12D preg) TCMUD8 6,361,86
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-mus TCLo:500 ppm/7H (6-15D preg) AIHAAP 40,993,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:500 mg/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:5 ppm (6-15D preg) TXCYAC 42,171,86
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-mus TCLo:20 ppm/6H (6-15D preg) FAATDF 10,224,88
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ipr-mus TDLo:5 mg/kg (1D male) TPKVAL 15,30,79
EFFECTS ON FERTILITY
Pre-implantation mortility
EFFECTS ON EMBRYO OR FETUS
Fetal death

ipr-mus TDLo:219 mg/kg (14D preg) EMMUEG 18,1,91
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and

marrow)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Hapatobilinary system

scu-mus TDLo:1100 mg/kg (12D preg) TOXID9 1,125,81
EFFECTS ON EMBRYO OR FETUS
Other effects on embryo or fetus

scu-mus TDLo:7030 mg/kg (12-13D preg) SEIJBO 15,47,75
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ivn-mus TDLo:13200 ug/kg (13-16D preg) ICHUDW 4(6),24,82
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)

par-mus TDLo:4 gm/kg (12D preg) NEZAAQ 25,438,70
EFFECTS ON NEWBORN
Weaning or lactation index(#alive at weaning per # alive at day 4)

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON FERTILITY
Abortion
EFFECTS ON EMBRYO OR FETUS
Fetal death

California Prop 65: Carcinogen (02/27/87)
No significant risk level 7. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------

Benzene; CASRN 71-43-2 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Benzene
CASRN -- 71-43-2
Last Revised -- 04/01/92

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood

that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- A; human carcinogen

Basis -- Several studies of increased incidence of nonlymphocytic leukemia from occupational exposure, increased incidence of neoplasia in rats and mice exposed by inhalation and gavage, and some supporting data form the basis for this classification.

___II.A.2. HUMAN CARCINOGENICITY DATA

Aksoy et al. (1974) reported effects of benzene exposure among 28,500 Turkish workers employed in the shoe industry. Mean duration of employment was 9.7 years (1-15 year range) and mean age was 34.2 years. Peak exposure was reported to be 210-650 ppm. Twenty-six cases of leukemia and a total of 34 leukemias or preleukemias were observed, corresponding to an incidence of 13/100,000 (by comparison to 6/100,000 for the general population). A follow-up paper (Aksoy, 1980) reported eight additional cases of leukemia as well as evidence suggestive of increases in other malignancies.

In a retrospective cohort mortality study Infante et al. (1977a,b) examined leukemogenic effects of benzene exposure in 748 white males exposed while employed in the manufacturing of rubber products. Exposure occurred from 1940-1949, and vital statistics were obtained through 1975. A statistically significant increase (p less than or equal to 0.002) of leukemias was found by comparison to the general U.S. population. There was no evidence of solvent exposure other than benzene. Air concentrations were generally found to be below the recommended limits in effect during the study period.

In a subsequent retrospective cohort mortality study Rinsky et al. (1981) observed seven deaths from leukemia among 748 workers exposed to benzene and followed for at least 24 years (17,020 person-years). This increased incidence was statistically significant; standard mortality ratio (SMR) was 560. For the five leukemia deaths that occurred among workers with more than 5 years exposure, the SMR was 2100. Exposures (which ranged from 10-100 ppm

8-hour TWA) were described as less than the recommended standards for the time period of 1941-1969.

In an updated version of the Rinsky et al. (1981) study, the authors followed the same cohort to 12/31/81 (Rinsky et al., 1987). An in his earliei study, cumulative exposure was derived from historic air-sampling data or interpolated estimates based on exisitng data. Standardized mortality rates ranged from 109 at cumulative benzene exposures under 40 ppm-years and increased montonically to 6637 (6 cases) at 400 ppm-years or more. The authors found significantly elevated risks of leukemia at cumulative exposures less than the equivalent current standard for occupational exposure which is 10 ppm over a 40-year working lifetime.

Ott et al. (1978) observed three deaths from leukemia among 594 workers followed for at least 23 years in a retrospective cohort mortality study, but the increase was not statistically significant. Exposures ranged from <2 to >25 ppm 8-hour TWA.

Wong et al. (1983) reported on the mortality of male chemical workers who had been exposed to benzene for at least 6 months during the years 1946-1975. The study population of 4062 persons was drawn from seven chemical plants, and jobs were categorized as to peak exposure. Those with at least 3 days/week exposure (3036 subjects) were further categorizeed on the basis of an 8-hour TWA. The control subjects held jobs at the same plants for at least 6 months but were never subject to benzene exposure. Dose-dependent increases were seen in leukemia and lymphatic and hematopoietic cancer. The incidence of leukemia was responsible for the majority of the increase. It was noted that the significance of the increase is due largely to a less than expected incidence of neoplasia in the unexposed subjects.

Numerous other epidemiologic and case studies have reported an increased incidence or a causal relationship between leukemia and exposure to benzene (IARC, 1982).

___II.A.3. ANIMAL CARCINOGENICITY DATA

Both gavage and inhalation exposure of rodents to benzene have resulted in development of neoplasia. Maltoni and Scarnato (1979) and Maltoni et al. (1983) administered benzene by gavage at dose levels of 0, 50, 250, and 500 mg/kg bw to 30-40 Sprague-Dawley rats/sex for life. Dose-related increased incidences of mammary tumors were seen in females and of Zymbal gland carcinomas, oral cavity carcinomas and leukemias/lymphomas in both sexes.

In an NTP (1986) study, benzene was administered by gavage doses of 0, 50, 100, or 200 mg/kg bw to 50 F344/N rats/sex or 0, 25, 50, or 100 mg/kg bw to 50 B6C3F1 mice/sex. Treatment was 5 times/week for 103 weeks. Significantly increased incidences ($p<0.05$) of various neoplasic growths were seen in both sexes of both species. Both male and female rats and mice had increased incidence of carcinomas of the Zymbal gland. Male and female rats had oral cavity tumors, and males showed increased incidences of skin tumors. Mice of both sexes had increased incidence of lymphomas and lung tumors. Males were

observed to have harderian and preputial gland tumors and females had tumors of mammary gland and ovary. In general, the increased incidence was dose-related.

Slightly increased incidences of hematopoietic neoplasms were reported for male C57Bl mice exposed by inhalation to 300 ppm benzene 6 hours/day, 5 days/week for 488 days. There was no increase in tumor incidence in male AKR or CD-1 mice similarly exposed to 100 ppm or 100 or 300 ppm benzene, respectively. Likewise male Sprague-Dawley rats exposed by inhalation to 300 ppm benzene were not observed to have increased incidence of neoplasia (Snyder et al., 1981).

Maltoni et al. (1983) treated male and female Sprague-Dawley rats in the following manner. Starting at 13 weeks of age rats were exposed to 200 ppm benzene 4 hours/day, 5 days/week for 7 weeks; 200 ppm 7 hours/day, 5 days/week for 12 weeks; 300 ppm 7 hours/day, 5 days/week for 85 weeks. An 8-hour/day TWA for 5 days/week was calculated to be 241 ppm. A statistically significant increase was noted in hepatomas and carcinomas of the Zymbal gland.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Numerous investigators have found significant increases in chromosomal aberrations of bone marrow cells and peripheral lymphocytes from workers with exposure to benzene (IARC, 1982). Benzene also induced chromosomal aberrations in bone marrow cells from rabbits (Kissling and Speck, 1973), mice (Meyne and Legator, 1980) and rats (Anderson and Richardson, 1979). Several investigators have reported positive results for benzene in mouse micronucleus assays (Meyne and Legator, 1980). Benzene was not mutagenic in several bacterial and yeast systems, in the sex-linked recessive lethal mutation assay with Drosophila melanogaster or in mouse lymphoma cell forward mutation assay.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

___II.B.1. SUMMARY OF RISK ESTIMATES

Oral Slope Factor -- 2.9E-2 per (mg/kg)/day

Drinking Water Unit Risk -- 8.3E-7 per (ug/L)

Extrapolation Method -- One-hit (pooled data)

Drinking Water Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+2 ug/L

E-5 (1 in 100,000) 1E+1 ug/L
E-6 (1 in 1,000,000) 1E+0 ug/L

___II.B.2. DOSE-RESPONSE DATA (CARCINOGENICITY, ORAL EXPOSURE)

Tumor Type -- leukemia
Test Animals -- human
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

The slope factor was derived from human data for inhalation exposure (see dose-response data for inhalation quantitative estimate). The human respiratory rate was assumed to be 20 cu.m/day and the human drinking water intake was assumed to be 2 L/day. The fraction of the administered dose absorbed systemically via inhalation and via drinking water were assumed to be equal.

___II.B.3. ADDITIONAL COMMENTS (CARCINOGENICITY, ORAL EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study as described in the additional comments section for inhalation data.

The unit risk should not be used if the water concentration exceeds 1E+4 ug/L, since above this concentration the unit risk may not be appropriate.

___II.B.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, ORAL EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an adequate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2. Regression models give an estimate similar to the geometric mean.

The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate.

Risk estimates based on animal gavage studies are about 5 times higher than those derived from human data. Pharmacokinetic data which could impact the risk assessment are currently being evaluated.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

II.C.1. SUMMARY OF RISK ESTIMATES

Inhalation Unit Risk -- 8.3E-6 per (ug/cu.m)

Extrapolation Method -- One-hit (pooled data)

Air Concentrations at Specified Risk Levels:

Risk Level	Concentration
E-4 (1 in 10,000)	1E+1 ug/cu.m
E-5 (1 in 100,000)	1E+0 ug/cu.m
E-6 (1 in 1,000,000)	1E-1 ug/cu.m

II.C.2. DOSE-RESPONSE DATA FOR CARCINOGENICITY, INHALATION EXPOSURE

Tumor Type -- leukemia
Test Animals -- humans
Route -- inhalation, occupational exposure
Reference -- Rinsky et al., 1981; Ott et al., 1978; Wong et al., 1983

II.C.3. ADDITIONAL COMMENTS (CARCINOGENICITY, INHALATION EXPOSURE)

The unit risk estimate is the geometric mean of four ML point estimates using pooled data from the Rinsky et al. (1981) and Ott et al. (1978) studies, which was then adjusted for the results of the Wong et al. (1983) study. The Rinsky data used were from an updated tape which reports one more case of leukemia than was published in 1981. Equal weight was given to cumulative dose and weighted cumulative dose exposure categories as well as to relative and absolute risk model forms. The results of the Wong et al. (1983) study were incorporated by assuming that the ratio of the Rinsky-Ott-Wong studies to the Rinsky-Ott studies for the relative risk cumulative dose model was the same as for other model-exposure category combinations and multiplying this ratio by the Rinsky-Ott geometric mean. The age-specific U.S. death rates for 1978 (the most current year available) were used for background leukemia and total death rates. It should be noted that a recently published paper (Rinsky et al., 1987) reported yet another case of leukemia from the study population.

The unit risk should not be used if the air concentration exceeds 100 ug/cu.m, since above this concentration the unit risk may not be appropriate.

___II.C.4. DISCUSSION OF CONFIDENCE (CARCINOGENICITY, INHALATION EXPOSURE)

The pooled cohorts were sufficiently large and were followed for an ade quate time period. The increases in leukemias were statistically significant and dose-related in one of the studies. Wong et al. (1983) disagrees that exposures reported in Rinsky et al. (1981) were within the recommended standards. For the five leukemia deaths in persons with 5 or more years exposure, the author notes that mean exposure levels (range 15-70 ppm) exceeded the recommended standard (25 ppm) in 75% of the work locations sampled. The risk estimate above based on reconsideration of the Rinsky et al. (1981) and Ott et al. (1978) studies is very similar to that of 2.4E-2/ppm (cited in U.S. EPA, 1980) based on Infante et al. (1977a,b), Ott et al. (1978) and Aksoy et al. (1974). It was felt by the authors of U.S. EPA (1985) that the exposure assessment provided by Aksoy was too imprecise to warrant inclusion in the current risk estimate. A total of 21 unit risk estimates were prepared using 6 models and various combinations of the epidemiologic data. These range over slightly more than one order of magnitude. A geometric mean of these estimates is 2.7E-2/ppm. Regression models give an estimate similar to the geometric mean.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Benzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office (Cincinnati, OH) and Carcinogen Assessment Group (Washington, DC), and the Environmental Research Labs (Corvalis, OR; Duluth, MN; Gulf Breeze, FL) for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-018.

U.S. EPA. 1985. Interim Quantitative Cancer Unit Risk Estimates Due to Inhalation of Benzene. Prepared by the Office of Health and Environmental Assessment, Carcinogen Assessment Group, Washington, DC for the Office of Air Quality Planning and Standards, Washington, DC.

U.S. EPA. 1987. Memorandum from J. Orme, HEB, CSD/ODW to C. Vogt, Criteria and Standards Division, ODW, June, 1987.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The 1985 Interim Evaluation was reviewed by the Carcinogen Assessment Group.

The 1987 memorandum is an internal document.

Agency Work Group Review: 03/05/87, 10/09/87

Verification Date: 10/09/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

D.L. Bayliss / ORD -- (202)260-5726 / FTS 260-5726

R. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
hydrocarbon vapor canister, supplied air or hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly wash with soap when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BENZENE)
Less than or equal to 10 ppm: Half-mask air-purifying respirator with organic vapor cartridge.
Less than or equal to 50 ppm: Full facepiece respirator with organic vapor cartridges. / Full facepiece gas mask with chin style canister.
Less than or equal to 100 ppm: Full facepiece powered air-purifying respirator with organic vapor canister.

Less than or equal to 1000 ppm: Supplied air respirator with full facepiece in positive-pressure mode.
Greater than 1000 ppm or Unknown concentration: (1) Self-contained breathing apparatus with full face-piece in positive pressure mode. (2) Full facepiece positive-pressure supplied-air respirator with auxiliary self-contained air supply.
Escape : (1) Any organic vapor gas mask; or (2) Any self-contained breathing apparatus with full facepiece.
Firefighting : Any full facepiece self-contained breathing apparatus operated in positive pressure mode.

FIRST AID SOURCE: NIOSHP
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin.
EYES: flush with plenty of water until irritation subsides.
INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Dry chemical, foam, or carbon dioxide. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Benzene
DOT ID NUMBER: UN1114

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.

*FIRE

Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 398 LAST UPDATE OF THIS RECORD: 06/03/93

NAME:	TOLUENE		
SYNONYMS:	TOLUOL; PHENYL METHANE; METHYL BENZENE; BENZENE, METHYL-		
CAS:	108-88-3	RTECS:	XS5250000
FORMULA:	C7H8	MOL WT:	92
WLN:	1R		
CHEMICAL CLASS:	Aromatic hydrocarbon		

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless watery liquid with a pleasant odor

BOILING POINT:	383.6 K	110.4 C	230.8 F
MELTING POINT:	178.00 K	-95.2 C	-139.3 F
FLASH POINT:	277.6 K	4.45 C	40 F
AUTO IGNITION:	809 K	535.8 C	996.6 F
CRITICAL TEMP:	591.8 K	318.65 C	605.57 F
CRITICAL PRESS:	4.108 kN/M2	40.5 atm	595 psia
HEAT OF VAP:	155 Btu/lb	86.08 cal/g	3.601x E5 J/kg
HEAT OF COMB:	-17430 Btu/lb	-9690 cal/g	-405x E5 J/kg

VAPOR PRESSURE:	36.7 mm @ 30 C
[illegible]L:	7.1 %
[illegible]:	1.3 %
IONIZATION POTENTIAL (eV):	8.82
VAPOR DENSITY:	3.14 (air=1)
EVAPORATION RATE:	2.00(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY:	0.867 @ 20 C
DENSITY:	0.867
WATER SOLUBILITY:	0.05%
INCOMPATIBILITIES:	strong ox
REACTIVITY WITH WATER:	No data on water reactivity
REACTIVITY WITH COMMON MATERIALS:	No data
STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):	40 PPM
ODOR DESCRIPTION:	STRONG, PLEASANT Source:NYDH
100 % ODOR DETECTION:	No data

REGULATIONS

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27
Identification number: UN1294
DOT shipping name: Toluene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909305

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 1 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 1 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U220,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

Fire hazard: flammable.
Chronic toxicity: carcinogen
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
ATSDR Toxicology Profile available (NTIS** PB/90/198904/AS)
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Department of Health Services Drinking Water Action List.
California Proposition 65 Developmental Toxin List
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 10/04/82
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
TOLUENE [108-88-3]
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 100 ppm exposure can cause dizziness, drowsiness and hallucinations. 100-200 ppm can cause depression. 200-500 ppm can cause headaches, nausea, loss of appetite, loss of energy, loss of coordination and coma. in addition to the above, death has resulted from exposure to 10,000 ppm for an unknown time. SKIN: can cause dryness and irritation. absorption may cause or increase the severity of

symptoms listed above. Eyes: can cause irritation at 300 ppm. INGESTION: can cause a burning sensation in the mouth and stomach, upper abdominal pain, cough, hoarseness, headache, nausea, loss of appetite, loss of energy, loss of coordination and coma.(NYDH)

LONG TERM TOXICITY: levels below 200 ppm may produce headache, tiredness and nausea. from 200 to 750 ppm symptoms may include insomnia, irritability, dizziness, some loss of memory, loss of appetite, a feeling of drunkeness and disturbed menstruation. levels up to 1,500 ppm may cause heart palpitations and loss of coordination. blood effects and anemia have been reported but are probably due to contamination by benzene. most of these effects area believed to go away when exposure stops.(NYDH)

TARGET ORGANS: CNS, liver, kidneys, skin, eyes

SYMPTOMS: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. Source: CHRIS

CONC IDLH: 2000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure
375 mg/M3 Time weighted averages for 8-hour exposure
200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 750 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 50ppm(188 mg/M3) Skin
ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 200 PPM; CEILING = 300 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 100 ppm (375 mg/M3)
STEL = 150 ppm(560 mg/M3)

MAK INFORMATION: 50 ppm
190 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 5xMAK for 30 minutes, 2 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

RCINOGEN LISTS:

IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-hmn TCLo:200 ppm JAMAAP 123,1106,43
BRAIN AND COVERINGS
Recordings from specific areas of CNS
BEHAVIORAL
Antipsychotic
BLOOD
Changes in bone marrow not included above

LD50 value: orl-rat LD50:636 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:636 mg/kg
ihl-rat LC50:>26700 ppm/1H
ipr-rat LD50:1332 mg/kg
ivn-rat LD50:1960 mg/kg
unr-rat LD50:6900 mg/kg
ihl-mus LC50:400 ppm/24H
ipr-mus LD50:59 mg/kg
scu-mus LD50:2250 mg/kg
unr-mus LD50:2 gm/kg
ihl-rbt LCLo:55000 ppm/40M
skn-rbt LD50:12124 mg/kg
ivn-rbt LDLo:130 mg/kg
ihl-gpg LCLo:1600 ppm
ipr-gpg LD50:500 mg/kg
scu-frg LDLo:920 mg/kg
ipr-mam LDLo:1750 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:1500 mg/m3/24H (1-8D preg) TXCYAC 11,55,78

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 mg/m3/24H (7-14D preg) FMORAO 28,286,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:800 mg/m3/6H (14-20D preg) BJMRDK 23,533,90
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON NEWBORN
Behavioral

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:15 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:30 gm/kg (6-15D preg) TJADAB 19,41A,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-mus TCLo:500 mg/m3/24H (6-13D preg) TXCYAC 11,55,78
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1000 ppm/6H (2-17D preg) TJEMDR 7,265,82
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:400 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
EFFECTS ON NEWBORN

ihl-mus TCLo:200 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

ihl-rbt TCLo:1 gm/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Abortion

ihl-rbt TDLo:100 ppm/6H (6-18D preg) ARTODN 66,373,92
SPECIFIC DEVELOPMENTAL ABNORMALITIES

Cardiovascular(circulatory)system

California Prop 65: Developmental toxin (01/01/91)
Acceptable intake level-inhalation 13000. ugD (01/01/94)
Acceptable intake level-oral intake 7000. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Toluene; CASRN 108-88-3 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Toluene
CASRN -- 108-88-3
Last Revised -- 08/01/90

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classified

Basis -- No human data and inadequate animal data. Toluene did not produce positive results in the majority of genotoxic assays.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

A chronic (106-week) bioassay of toluene in F344 rats of both sexes

reported no carcinogenic responses (CIIT, 1980). A total of 960 rats were exposed by inhalation for 6 hours/day, 5 days/week to toluene at 0, 30, 100, or 300 ppm. Groups of 20/sex/dose were sacrificed at 18 months. Gross and microscopic examination of tissues and organs identified no increase in neoplastic tissue or tumor masses among treated rats when compared with controls. The study is considered inadequate because the highest dose administered was well below the MTD for toluene and because of the high incidence of lesions and pathological changes in the control animals.

Several studies have examined the carcinogenicity of toluene following repeated dermal applications. Toluene (dose not reported) applied to shaved interscapular skin of 54 male mice (strains A/He, C3HeB, SWR) throughout their lifetime (3 times weekly) produced no carcinogenic response (Poel, 1963). One drop of toluene (about 6 mL) applied to the dorsal skin of 20 random-bred albino mice twice weekly for 50 weeks caused no skin papillomas or carcinomas after a 1-year latency period was allowed (Coombs et al., 1973). No increase in the incidence of skin or systemic tumors was demonstrated in male or female mice of three strains (CF, C3H, or CBaH) when toluene was applied to the back of 25 mice of each sex of each strain at 0.05-0.1 mL/mouse, twice weekly for 56 weeks (Doak et al., 1976). One skin papilloma and a single skin carcinoma were reported among a group of 30 mice treated dermally with one drop of 0.2% (w/v) solution toluene twice weekly, administered from droppers delivering 16-20 uL per drop for 72 weeks (Lijinsky and Garcia, 1972). It is not reported whether evaporation of toluene from the skin was prevented during these studies.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Toluene was found to be nonmutagenic in reverse mutation assays with S. typhimurium (Mortelmans and Riccio, 1980; Nestmann et al., 1980; Bos et al., 1981; Litton Bionetics, Inc., 1981; Snow et al., 1981) and E. coli (Mortelmans and Riccio, 1980), with and without metabolic activation. Toluene did not induce mitotic gene conversion (Litton Bionetics, Inc., 1981; Mortelmans and Riccio, 1980) or mitotic crossing over (Mortelmans and Riccio, 1980) in S. cerevisiae. Although Litton Bionetics, Inc. (1981) reported that toluene did not cause increased chromosomal aberrations in bone marrow cells, several Russian studies (Dobrokhotov, 1972; Lyapkalo, 1973) report toluene as effective in causing chromosal damage in bone marrow cells of rats. There was no evidence of chromosomal aberrations in blood lymphocytes of workers exposed to toluene only (Maki-Paakkanen et al., 1980; Forni et al., 1971), although a slight increase was noted in workers exposed to toluene and benzene (Forni et al., 1971; Funes-Craviota et al., 1977). This finding is supported by studies of cultured human lymphocytes exposed to toluene in vitro; no elevation of chromosomal aberrations or sister chromatid exchanges was observed (Gerner-Smidt and Friedrich, 1978).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Toluene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-408.

_II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The values in the 1987 Drinking Water Criteria Document for Toluene have received peer and administrative review.

Agency Work Group Review: 09/15/87

Verification Date: 09/15/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Dharm V. Singh / ORD -- (202)260-5958 / FTS 260-5958

Robert E. McGaughy / ORD -- (202)260-5898 / FTS 260-5898

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes wet.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TOLUENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:
Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor.

INGESTION: do NOT induce vomiting; call a doctor.
EYES: flush with water for at least 15 min.
SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Toluene
DOT ID NUMBER: UN1294

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive

fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 206 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYL BENZENE

SYNONYMS: AETHYLBENZOL (German); EB; ETHYLBENZEEN (Dutch); ETHYL BENZENE; ETHYL BENZENE (DOT); ETHYLBENZOL; ETILBENZENE (Italian); ETYLOBENZEN (Polish); NCI-C56393; PHENYLETHANE

CAS: 100-41-4 RTECS: DA0700000

FORMULA: C8H10 MOL WT: 106.18

WLN: 2R

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless liquid with a sweet, gasoline-like odor.

BOILING POINT:	409.2 K	136 C	276.8 F
MELTING POINT:	178.15 K	-95 C	-139 F
FLASH POINT:	294.26 K	21.11 C	69.9 F
AUTO IGNITION:	733 K	459.8 C	859.8 F
CRITICAL TEMP:	617.1 K	343.95 C	651.11 F
CRITICAL PRESS:	3.61 kN/M2	35.5 atm	523 psia
HEAT OF VAP:	144 Btu/lb	79.97 cal/g	3.346x E5 J/kg
HEAT OF COMB:	-17780 Btu/lb	-9885 cal/g	-413x E5 J/kg

VAPOR PRESSURE:	10mm @ 25.9 C
UEL:	6.7 %
LEL:	1.0 %
IONIZATION POTENTIAL (eV):	8.76
VAPOR DENSITY:	3.7 (air=1)
EVAPORATION RATE:	0.84(n-BUTYL ACETATE=1)
SPECIFIC GRAVITY:	0.867 20C
DENSITY:	0.866 g/mL @ 20 C
WATER SOLUBILITY:	0.015%
INCOMPATIBILITIES:	strong oxidizers
REACTIVITY WITH WATER:	No data on water reactivity
REACTIVITY WITH COMMON MATERIALS:	OXIDIZING MATERIALS Source: SAX
STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data
TOXIC FIRE GASES:	None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):	140
ODOR DESCRIPTION:	AROMATIC Source:CHRIS
100 % ODOR DETECTION:	No data

REGULATIONS

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1175
DOT shipping name: Ethylbenzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909163

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.7 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 0.7 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: D001
CERCLA REF: Y
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic surface mail only
Max per parcel: 1 QT METAL; 1 PT OTHER

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ɜIH TLV list "Threshold Limit Values for 1992-1993"
ᴄalifornia Assembly Bill 1803 Well Monitoring Chemicals.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 11/19/82
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/19/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYL BENZENE [100-41-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
ɹnsylvania Hazardous Substance List
ꓤA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: 200 ppm for 30 minutes can cause irritation of the nose and throat, dizziness, difficult breathing and depression. very high levels can cause unconsciousness. SKIN: can cause irritation, inflammation, blisters and burns. Eyes: 200 ppm can cause irritation. higher levels can cause burning, tearing and injury. INGESTION: can cause headache, sleepiness and coma.(NYDH)

LONG TERM TOXICITY: may cause skin rash and irritation of eyes, nose and throat.(NYDH)

TARGET ORGANS: eyes, upper resp sys, skin, CNS

SYMPTOMS: Inhalation may cause irritation of nose, dizziness,

depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. Source: CHRIS

CONC IDLH: 2000PPM

NIOSH REL:

ACGIH TLV: TLV = 100ppm(434 mg/M3)
ACGIH STEL: STEL = 125 ppm(543 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 125 ppm(545 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Local irritant: Peak = 2xMAK for 5 minutes, 8 times per shift.
Danger of cutaneous absorption

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
ihl-hmn TCLo:100 ppm/8H AIHAAP 31,206,70
SENSE ORGANS
Eye
Other
BEHAVIORAL
Sleep
LUNGS, THORAX, OR RESPIRATION
Other changes

LD50 value: orl-rat LD50:3500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:3500 mg/kg
ihl-rat LCLo:4000 ppm/4H
ihl-mus LDLo:50 gm/m3/2H
ipr-mus LD50:2272 mg/kg
skn-rbt LD50:17800 mg/kg

ihl-gpg LCLo:10000 ppm

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 15 mg/24H open MLD
eye-rbt 100 mg

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:97 ppm/7H (15D pre) NTIS** PB83-208074
EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:985 ppm/7H (1-19D preg) NTIS** PB83-208074
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:96 ppm/7H (1-19D preg) NTIS** PB83-208074
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetal death
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:2400 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rbt TCLo:99 ppm/7H (1-18D preg) NTIS** PB83-208074
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before birth)

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------
Ethylbenzene; CASRN 100-41-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Ethylbenzene
CASRN -- 100-41-4

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- nonclassifiable due to lack of animal bioassays and human studies.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

None. NTP has plans to initiate bioassay. Metabolism and excretion studies at 3.5, 35 and 350 mg/kg are to be conducted as well.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The metabolic pathways for humans and rodents are different (Engstrom et al., 1984). Major metabolites in humans, mandelic acid and phenylglyoxylic acid, are minor metabolites in rats and rabbits (Kiese and Lenk, 1974). The major animal metabolites were not detected in the urine of exposed workers (Engstrom et al., 1984).

Ethylbenzene at 0.4 mg/plate was not mutagenic for Salmonella strains TA98, TA1535, TA1537 and TA1538 with or without Aroclor 1254 induced rat

liver homogenates (S9) (Nestmann et al., 1980). Ethylbenzene was shown to increase the mean number of sister chromatid exchanges in human whole blood lymphocyte culture at the highest dose examined without any metabolic activation system (Norppa and Vainio, 1983).

Dean et al. (1985) used a battery of short-term tests including bacterial mutation assays, mitotic gene conversion in Saccharomyces cerevisiae JD1 in the presence and absence of S9 and chromosomal damage in a cultured rat liver cell line. Ethylbenzene was not mutagenic in the range of concentrations tested (0.2, 2, 20, 50 and 200 ug/plate) for S. typhimurium TA98, TA100, TA1535, TA1537 and TA1538 or for Escherichia coli WP2 and WP2uvrA. Ethylbenzene also showed no response in the S. cerevisiae JD1 gene conversion assay. In contrast, ethylbenzene hydroperoxide showed positive responses with E. coli WP2 at 200 ug/plate in the presence of S9 and an equally significant response with the gene conversion system of yeast.

II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

II.D.1. EPA DOCUMENTATION

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Water Regulations and Standards, Washington, DC. EPA 440/5-80-048. NTIS PB 81-117590.

U.S. EPA. 1984. Health Effects Assessment for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-86/008.

U.S. EPA. 1987. Drinking Water Criteria Document for Ethylbenzene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Ambient Water Quality Criteria Document and the Health Assessment Document have received Agency and external review. The Drinking Water Criteria Document has been extensively reviewed.

Agency Work Group Review: 10/07/87

Verification Date: 10/07/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Arthur S. Chiu / ORD -- (202)260-6764 / FTS 260-6764

Lynn Papa / ORD -- (513)569-7523 / FTS 684-7523

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:
self-contained breathing apparatus; safety goggles.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (ETHYL BENZENE)
1000 ppm: Any powered air-purifying respirator with organic vapor

cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / / self-contained breathing apparatus. * Substance reported to cause eye ..ritation or damage may require eye protection. / Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection.
2000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration.
INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis.
SKIN AND
EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

FIRE EXTINGUISHMENT: Foam (most effective), water fog, carbon dioxide or dry chemical. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Ethylbenzene
DOT ID NUMBER: UN1175

ERG93 GUIDE 26

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may give off poisonous gases and cause water pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or alcohol-resistant foam. Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane. Large Fires: Water spray, fog or alcohol-resistant foam. Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies

or omissions within this database, or in any of its printed or displayed output forms.

CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 421 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: XYLENE

SYNONYMS: XYLENE (XYLOL); XYLOL; METHYL TOLUENE; BENZENE, DIMETHYL-; DIMETHYLBENZENE; NCI-C55232; VIOLET 3; XYLOL (DOT); SOCAL AQUATIC SOLVENT 3501

CAS: 1330-20-7 RTECS: ZE2100000

FORMULA: C8H10 MOL WT: 106.18

WLN: 1R X1

CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless liquid with aromatic odor

BOILING POINT:	412 K	138.8 C	281.9 F
MELTING POINT:	247 K	-26.2 C	-15.1 F
FLASH POINT:	300.35-305.35 K	27.2-32.2 C	80.9-89.9 F
AUTO IGNITION:	736.45-802.05 K	463.3-528.9 C	866-984.1 F

VAPOR PRESSURE: 6.7 mm @ 21 C

UEL: 7 %

LEL: 1 %

IONIZATION POTENTIAL (eV): 8.56

VAPOR DENSITY: 3.7 (air=1)

EVAPORATION RATE: 0.77(n-BUTYL ACETATE=1)

SPECIFIC GRAVITY: 0.861 20C

DENSITY: 0.861 g/cc or 8.0073 lb/gal

WATER SOLUBILITY: VERY SL SOL

INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): 0.05

ODOR DESCRIPTION: LIKE BENZENE; CHARACTERISTIC AROMATIC
Source:CHRIS

100 % ODOR DETECTION: 0.4-20 ppm

REGULATIONS

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 27

Identification number: UN1307
DOT shipping name: XYLENES
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 173.150
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 5 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:

STCC NUMBER: 4909350, 4909351

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 10 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 10 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U239,D001
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: reproductive toxin.
Fire hazard: flammable.
Chronic toxicity: carcinogen
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: Not given
Mailability: Nonmailable
Max per parcel: 0

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (3) This material can be ignited under almost all temperature conditions.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
lifornia Assembly Bill 1803 Well Monitoring Chemicals.
anadian Domestic Substances List
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 311 Hazardous Chemicals List.
DOT Hazardous Materials Table. 49 CFR 172.101
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
isconsin Air Toxics Control Regulation NR-445 (December 1988)
ENE [1330-20-7]

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: CNS, eyes, gi tract, blood, liver, kidneys, skin

SYMPTOMS: DIZZ, EXCITEMENT, DROW, INCO, STAGGERING GAIT, IRRIT EYES, NOSE, THROAT, CORNEAL VACUOLIZATION, ANOREXIA, NAU, VOMIT, ABDOM PAIN; DERM Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: 100 ppm Time weighted averages for 8-hour exposure 434 mg/M3 Time weighted averages for 8-hour exposure 200 ppm Ceiling exposures which shall at no time be exceeded(10-MIN) 868 mg/M3 Ceiling exposures which shall at no time be exceeded(10-MIN)

ACGIH TLV: TLV = 100ppm(434 mg/M3)

ACGIH STEL: STEL = 150 ppm(651 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 100 ppm(435mg/M3)
Final Rule Limits:
TWA = 100 ppm (435 mg/M3)
STEL = 150 ppm(655 mg/M3)

MAK INFORMATION: 100 ppm
440 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.

CARCINOGEN?: N STATUS: See below

CARCINOGEN LISTS:
IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)
* orl-hmn LDLo:50 mg/kg YAKUD5 22,883,80

ihl-man LCLo:10000 ppm/6H BMJOAE 3,442,70
BEHAVIORAL
General anesthetic
LUNGS, THORAX, OR RESPIRATION
Cyanosis
BLOOD
Other changes

LD50 value: orl-rat LD50:4300 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:4300 mg/kg
ihl-rat LC50:5000 ppm/4H
ipr-rat LD50:2459 mg/kg
scu-rat LD50:1700 mg/kg
ipr-mus LD50:1548 mg/kg
ivn-rbt LDLo:129 mg/kg
ihl-gpg LCLo:450 ppm
ipr-gpg LDLo:2 gm/kg
ipr-mam LDLo:2 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

ihl-rat TCLo:250 mg/m3/24H (7-15D preg) ATSUDG 8,425,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-rat TCLo:50 mg/m3/6H (1-21D preg) JHEMA2 27,337,83
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Other developmental abnormalities
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:600 mg/m3/24H (7-15D preg) PCBRD2 163B,295,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:20600 ug/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

orl-mus TDLo:31 mg/kg (6-15D preg) JTEHD6 9,97,82
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:4000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)
EFFECTS ON NEWBORN
Physical

ihl-mus TCLo:2000 ppm/6H (6-12D preg) TJADAB 28,22A,83
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1 gm/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

California Prop 65: Not listed

---------- EPA's IRIS DATA SUMMARY ----------

Xylenes; CASRN 1330-20-7 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Xylenes
CASRN -- 1330-20-7
Last Revised -- 03/01/91

Section II provides information on three aspects of the carcinogenic risk assessment for the agent in question; the U.S. EPA classification, and quantitative estimates of risk from oral exposure and from inhalation exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. Background Document 2 (Service Code 5) provides details on the rationale and methods used to derive the carcinogenicity values found in IRIS. Users are referred to Section I for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- Orally administered technical xylene mixtures did not result in significant increases in incidences in tumor responses in rats or mice of both sexes.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. In an NTP (1986) study, 50 male and 50 female F344/N rats were treated by gavage with mixed xylenes in corn oil (60% m-xylene, 14% p-xylene, 9% o-xylene and 17% ethylbenzene) at dosages of 0, 250 or 500 mg/kg/day, 5 days/week for 103 weeks. Similarly, 50 male and 50 female B6C3F1 mice were treated with the same xylene mixture at dosages of 0, 500 or 1000 mg/kg/day. Animals were killed and examined histologically when moribund or after 104-105 weeks. An apparent dose-related increased mortality was observed in male rats, but this difference was statistically significant for the high dose group, only. No other differences in survival between dosage groups of either sex were observed. Interstitial cell tumors of the testes could not be attributed to administration of the test compound observed in male rats (43/50 control, 38/50 low-dose and 41/49 high-dose). NTP (1986) reported that there were no significant changes in the incidence of neoplastic or nonneoplastic lesions in either the rats or mice that could be considered related to the mixed xylene treatment, and concluded that under the conditions of these 2-year gavage studies, there was "no evidence of carcinogenicity" of xylene (mixed) for rats or mice of either sex at any dosage tested.

Maltoni et al. (1985), in a limited study, reported higher incidences (compared with controls) of malignant tumors in male and female Sprague-Dawley rats treated by gavage with xylene in olive oil at 500 mg/kg/day, 4 or 5 ys/week for 104 weeks. This study did not report survival rates or specific mor types; therefore, the results cannot be interpreted.

Berenblum (1941) reported that "undiluted" xylene applied at weekly intervals produced one tumor-bearing animal out of 40 after 25 weeks in skin-painting experiments in mice. No control groups were described. Pound (1970) reported negative results in initiation-promotion experiments with xylene as the initiator and croton oil as the promotor.

___II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

The frequency of sister chromatid exchanges and chromosomal aberrations were nearly identical between a group of 17 paint industry workers exposed to xylene and their respective referents (Haglund et al., 1980). In vitro, xylene caused no increase in the number of sister chromatid exchanges in human lymphocytes (Gerner-Smidt and Friedrich, 1978). Studies indicate that xylene isomers, technical grade xylene or mixed xylene are not mutagenic in tests with Salmonella typhimurium (Florin et al., 1980; NTP, 1986; Bos et al., 1981) nor in mutant reversion assays with Escherichia coli (McCarroll et al., 1981). Technical grade xylene, but not o- and m-xylene, was weakly mutagenic in Drosophila recessive lethal tests. Chromosomal aberrations were not increased in bone marrow cells of rats exposed to xylenes by inhalation (Donner et al., 1980).

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EXPOSURE

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSESSMENT)

___II.D.1. EPA DOCUMENTATION

U.S. EPA. 1987. Drinking Water Criteria Document for Xylene. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Drinking Water, Washington, DC. ECAO-CIN-416. Final.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

The Drinking Water Criteria Document for Xylene has received Agency and external review.

Agency Work Group Review: 12/02/87

Verification Date: 12/02/87

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Bruce Mintz / ODW -- (202)260-9569 / FTS 260-9569

W. Bruce Peirano / ORD -- (513)569-7540 / FTS 684-7540

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
)M THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (XYLENE)
1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation damage may require eye protection. / Any supplied-air respirator. *)stance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.
EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with

running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: XYLENES
DOT ID NUMBER: UN1307

ERG93 GUIDE 27

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Flammable/combustible material; may be ignited by heat, sparks or flames.
Vapors may travel to a source of ignition and flash back.
Container may explode in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.
Runoff to sewer may create fire or explosion hazard.
Material may be transported hot.
*HEALTH HAZARDS
May be poisonous if inhaled or absorbed through skin.
Vapors may cause dizziness or suffocation.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use unmanned hose holder or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area. Stop leak if you can do it without risk. Water spray may reduce vapor; but it may not prevent ignition in closed spaces.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID

Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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---------- IDENTIFIERS ----------

CHEMTOX RECORD 5249 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: ETHYLENE, TETRACHLORO-

SYNONYMS: ANKILOSTIN; ANTISOL 1; CARBON BICHLORIDE; CARBON DICHLORIDE; CZTEROCHLOROETYLEN (Polish); DIDAKENE; DOW-PER; ENT 1,860; ETHENE, TETRACHLORO-; ETHYLENE TETRACHLORIDE; FEDAL-UN; NCI-C04580; NEMA; PER; PERAWIN; PERC; PERCHLOORETHYLEEN, PER (Dutch); PERCHLOR; PERCHLORAETHYLEN, PER (German); PERCHLORETHYLENE; PERCHLORETHYLENE, PER (French); PERCHLOROETHYLENE; PERCLENE; PERCLOROETILENE (Italian); PERCOSOLVE; PERK; PERKLONE; PERSEC; TETLEN; TETRACAP; TETRACHLOORETHEEN (Dutch); TETRACHLORAETHEN (German); TETRACHLORETHYLENE; TETRACHLOROETHENE; TETRACHLOROETHYLENE; 1,1,2,2,-TETRACHLOROETHYLENE; TETRACHLOROETHYLENE (DOT); TETRACLOROETENE (Italian); TETRALENO; TETRALEX; TETRAVEC; TETROGUER; TETROPIL

CAS: 127-18-4 RTECS: KX3850000

FORMULA: C2Cl4 MOL WT: 165.82

WLN: GYGUYGG

CHEMICAL CLASS: FT

See other identifiers listed below under Regulations.

---------- PROPERTIES ----------

PHYSICAL DESCRIPTION: colorless liquid, chloroform-like odor.

BOILING POINT:	394.2 K	121 C	249.8 F
MELTING POINT:	249.65 K	-23.5 C	-10.3 F
FLASH POINT:	Not available		
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	15.8MM @ 22C		
UEL:	~		
LEL:	~		
IONIZATION POTENTIAL (eV):	9.32		
VAPOR DENSITY:	No data		
EVAPORATION RATE:	2.59(n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.625 @20/4C		
DENSITY:	1.6311 @ 15/4C		
WATER SOLUBILITY:	QUITE SOLUBLE IN H2O(0.015G/ML @20C), IT IS MISCIBLE WITH MOST ORGANIC SOLVENTS AND OILS.		
INCOMPATIBILITIES:	strong oxidizers, chemically active metals, such as barium, lithium, beryllium, sodium		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: HCL AND PHOSGENE\CORROSIVE
ODOR DETECTED AT (ppm): 5 ppm
ODOR DESCRIPTION: mildly sweet Source:CHRIS
100 % ODOR DETECTION: No data

---------- REGULATIONS ----------

DOT hazard class: 6.1 POISON
DOT guide: 74
Identification number: UN1897
DOT shipping name: Tetrachloroethylene
Packing group: III
Label(s) required: KEEP AWAY FROM FOOD
Special provisions: N36,T1
Packaging exceptions: 173.153
Non bulk packaging: 173.203
Bulk packaging: 173.241
Quantity limitations-
Passenger air/rail: 60 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions:40

STCC NUMBER: 4940355

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:No
National Primary Drinking Water Regulations
Maximum Contaminant Levels (MCL): 0.005 mg/L (07/30/92)
Maximum Contaminant Level Goals (MCLG): 0 mg/L (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U210,D039
CERCLA REF: Y
RQ DESIGNATION: B 100 pounds (45.4 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:
Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: carcinogen
Chronic toxicity: adverse effect to target organ after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.
LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 0.1 percent

UNITED STATED POSTAL SERVICE MAILABILITY:
Hazard class: ORM-A
Mailability: Domestic service and air transportation; shipper's declaration
: per parcel: 10 GAL; 1 PT

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with self-contained breathing apparatus.
FLAMMABILITY (RED) : (0) This material does not readily burn.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
California Assembly Bill 1803 Well Monitoring Chemicals.
California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.
California Assembly Bill 1807 Toxic Air Contaminants.
Canadian Domestic Substances List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol 122.
Clean Air Act Section 111 List.
Clean Air Act of November 15, 1990. List of pollutants.
Clean Water Act Section 307 Priority Pollutants
DOT Hazardous Materials Table. 49 CFR 172.101
EPA Carcinogen Assessment Group List
EPA List of VOC chemicals from 40 CFR 60.489
EPA TSCA 8(d) Health and Safety Data Rule - effective date 06/01/87
EPA TSCA Chemical Inventory List 1986
EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
ETHYLENE, TETRACHLORO- [127-18-4]
Massachusetts Substance List.
New Jersey DEQ100 list for release reporting.
New Jersey Right To Know Substance List. (December 1987)
New Jersey Right to Know Substance List. Listed as a carcinogen.
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Constituents for Ground Water Monitoring. Ap'dx IX to 40 CFR 264
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 313 Toxic Chemicals List
Superfund/CERCLA RQ list. Table 302.4 in 54 FR 50968 (December 11, 1989)
Washington State Discarded Chemical Products List, November 17, 1989
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: INHALATION: exposures of 200 ppm for 1 hour can cause irritation of the nose, mouth and throat, dizziness,

headaches and lightheadedness; exposures of 1,000 ppm for 30 minutes can cause difficult breathing, weakness, loss of muscle control, irritability, tremors, convulsions, paralysis, coma, heart irregularities and death. SKIN: can cause dry, scaly skin, a mild to moderate burning sensation, redness and inflammation. Eyes: can cause burning and irritation. INGESTION: can cause nausea, vomiting, diarrhea, bloody stool, a reddening of face and neck, weakness and loss of muscle control.(NYDH)

LONG TERM TOXICITY: exposures over 200 ppm during weeks or months can cause irritation of the respiratory tract, nausea, headache, sleeplessness, abdominal pains, constipation, dizziness, increased perspiration, fatigue, skin infection, kidney and liver damage, fluid in the lungs and coma. most of these effects will disappear after exposure is stopped. tetrachloroethylene at high levels has caused cancer and birth defects in mice. whether it causes cancer in humans is unknown.(NYDH)

TARGET ORGANS: skin, mucous membrane, eyes, CNS, gastrointestinal tract. liver, kidneys.

SYMPTOMS: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury. Source: CHRIS

CONC IDLH: 500ppm

NIOSH REL: Potential occupational carcinogen --MINIMIZE EXPOSURE (Limit of quantitation 0.4 ppm)

ACGIH TLV: TLV = 25ppm(170 mg/M3) A3
ACGIH STEL: STEL = 100 ppm(685 mg/M3)»A3

OSHA PEL: Transitional Limits:
PEL = 100 PPM; CEILING = 200 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 25 ppm (170 mg/M3)

MAK INFORMATION: 50 ppm
345 mG/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 2xMAK for 30 minutes, 4 times per shift of 8 hours.
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.
A compound which is justifiably suspected of having

carcinogenic potential.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: A compound which is justifiably suspected of having carcinogenic potential.
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Carcinogen defined by NTP as reasonably anticipated to be carcinogenic, with limited evidence in humans or sufficient evidence in experimental animals.
ACGIH: Animal carcinogen. The chemical is carcinogenic in experimental animals at a relatively high dose, by routes or administration, at sites, or histological types, or by mechanisms that are not considered relevant to worker exposure.
OSHA: Not listed

HAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-hmn TCLo:96 ppm/7H NTIS** PB257-185
PERIPHERAL NERVE AND SENSATION
Local anesthetic
SENSE ORGANS
Eye
Conjunctive irritation
BEHAVIORAL
Hallucinations, distorted perceptions

orl-chd TDLo:545 mg/kg JTCTDW 23,103,85
BEHAVIORAL
Coma

LD50 value: orl-rat LD50:2629 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

orl-rat LD50:2629 mg/kg
ihl-rat LC50:34200 mg/m3/8H
ipr-rat LD50:4678 mg/kg
orl-mus LD50:8100 mg/kg
ihl-mus LC50:5200 ppm/4H
scu-mus LD50:65 gm/kg

orl-dog LDLo:4 gm/kg
ipr-dog LD50:2100 mg/kg
ivn-dog LDLo:85 mg/kg
orl-cat LDLo:4 gm/kg
orl-rbt LDLo:5 gm/kg
scu-rbt LDLo:2200 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

skn-rbt 810 mg/24H SEV
eye-rbt 162 mg MLD

Reproductive toxicity (1992 RTECS):
This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)
ihl-rat TCLo:1000 ppm/24H (14D pre/1-22D preg) APTOD9 19,A21,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:1000 ppm/24H (1-22D preg) APTOD9 19,A21,80
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:900 ppm/7H (7-13D preg) TJADAB 19,41A,79
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN

EFFECTS ON NEWBORN
Behavioral

ihl-rat TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON FERTILITY
Post-implantation mortality

ihl-mus TCLo:300 ppm/7H (6-15D preg) TXAPA9 32,84,75
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

California Prop 65: Carcinogen (04/01/88)
No significant risk level 14. ugD (01/01/94)

---------- EPA's IRIS DATA SUMMARY ----------
Tetrachloroethylene; CASRN 127-18-4 (04/01/92)

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- Tetrachloroethylene

This substance/agent has been evaluated by the U.S. EPA for evidence of human carcinogenic potential. This does not imply that this agent is necessarily a carcinogen. The evaluation for this chemical is under review by an inter-office Agency work group. A risk assessment summary will be included on IRIS when the review has been completed.

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.

** REFERENCE: NIOSH

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: if illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention.
INGESTION: induce vomiting only on physician's recommendation.
EYES AND
SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give

oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site. Use first aid treatment according to the nature of the injury.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Tetrachloroethylene
DOT ID NUMBER: UN1897

ERG93 GUIDE 74

POTENTIAL HAZARDS

*HEALTH HAZARDS
Vapors may cause dizziness or suffocation.
Exposure in an enclosed area may be very harmful.
Contact may irritate or burn skin and eyes.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.
*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Most vapors heavier than air.
*Air/vapor mixtures may explode when ignited.
Container may explode in heat of fire.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. *Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire. Remove and isolate contaminated clothing at the site. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical or CO2.
Large Fires: Water spray, fog or regular foam.
Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.
*SPILL OR LEAK
Shut off ignition sources; no flares, smoking or flames in hazard area.
Stop leak if you can do it without risk.
Small Liquid Spills: Take up with sand, earth or other noncombustible absorbent material.
Large Spills: Dike far ahead of liquid spill for later disposal.
*FIRST AID
Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

Use first aid treatment according to the nature of the injury.

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CHEMTOX DATA

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IDENTIFIERS

CHEMTOX RECORD 2191 LAST UPDATE OF THIS RECORD: 06/03/93

NAME: CHLORODIPHENYL (54% CHLORINE)

SYNONYMS: AROCHLOR 1254; AROCLOR 1254; CHLORIERTE BIPHENYLE, CHLORGEHALT 54% (German); CHLORODIPHENYL (54% Cl); CLORODIFENILI, CLORO 54% (Italian); DIPHENYLE CHLORE, 54% DE CHLORE (French); NCI-C02664; POLYCHLORINATED BIPHENYL; PCB

CAS: 27323-18-8 RTECS: DV2063000

FORMULA: C12H5Cl3 (APPROX) MOL WT: 326

WLN:

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION:

BOILING POINT:	638.15 K	365 C	689 F
MELTING POINT:	283.15 K	10 C	50 F
FLASH POINT:	495 K	221.85 C	431.3 F
AUTO IGNITION:	Not available		
VAPOR PRESSURE:	0.00006		
[illegible]:	~		
[illegible]:	~		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	No data		
DENSITY:			
WATER SOLUBILITY:	INSOLUBLE		
INCOMPATIBILITIES:	strong oxidizers		

REACTIVITY WITH WATER: No data on water reactivity

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors

ODOR DETECTED AT (ppm): Unknown

ODOR DESCRIPTION: No data

100 % ODOR DETECTION: No data

REGULATIONS

DOT hazard class: 9 CLASS 9

DOT guide: 31

Identification number: UN2315

DOT shipping name:	POLYCHLORINATED BIPHENYLS
Packing group:	II
Label(s) required:	CLASS 9
Special provisions:	9, N61
Packaging exceptions:	173.155
Non bulk packaging:	173.202
Bulk packaging:	173.241
Quantity limitations-	
Passenger air/rail:	100 L
Cargo aircraft only:	220 L
Vessel stowage:	A
Other stowage provisions:	34

STCC NUMBER:	Not listed

CLEAN WATER ACT Sect.307:	No
CLEAN WATER ACT Sect.311:	No
CLEAN AIR ACT:	Not listed
EPA WASTE NUMBER:	None
CERCLA REF:	Y
RQ DESIGNATION:	Not listed
SARA TPQ VALUE:	Not listed
SARA Sect. 312 categories:	Chronic toxicity: carcinogen Chronic toxicity: adverse effect to target organ after long period of exposure. Chronic toxicity: mutagen. Chronic toxicity: reproductive toxin (Prop 65).

UNITED STATED POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE):	Unspecified
FLAMMABILITY (RED) :	Unspecified
REACTIVITY (YELLOW):	Unspecified
SPECIAL :	Unspecified

---------- SUMMARY OF REGULATORY LISTS THIS SUBSTANCE APPEARS ON ----------

ACGIH TLV list "Threshold Limit Values for 1992-1993"
CHLORODIPHENYL (54% CHLORINE) [27323-18-8]
DOT Hazardous Materials Table. 49 CFR 172.101
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.

---------- TOXICITY DATA ----------

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: skin, liver, kidneys

SYMPTOMS: IRRIT EYES, SKIN; ACNE-FORM DERM, JAUN; DARK URINE
Source: NIOSHP

CONC IDLH: 5MG/M3

NIOSH REL: Not given

ACGIH TLV: TLV = 0.5mg/M3 SKIN
ACGIH STEL: STEL = 1 mg/M3»SKIN

OSHA PEL: Transitional Limits:
PEL = 0.5mg/M3(SKIN)
Final Rule Limits:
TWA = 0.5 mg/M3(SKIN)

MAK INFORMATION: Not listed

RCINOGEN?: N STATUS: See below
FERENCES:
HUMAN SUSPECTED IARC** 18,43,78
ANIMAL POSITIVE IARC** 7,261,74
ANIMAL POSITIVE IARC** 18,43,78

CARCINOGEN LISTS:
IARC: Not listed
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1992)

unr-rat LD50:2450 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1992)

Reproductive toxicity (1992 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

California Prop 65: Not listed

---------- PROTECTION AND FIRST AID ----------

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Any possibility of skin contact.

** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:
Immediately when skin becomes contaminated.

** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated, and imme

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (CHLORODIPHENYL (54% CHLORINE))
Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH
EYE: irr immed
SKIN: soap wash immed
INHALATION: art resp
INGESTION: ipecac, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

---------- INITIAL INCIDENT RESPONSE ----------

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: POLYCHLORINATED BIPHENYLS
ID NUMBER: UN2315

ERG93 GUIDE 31

POTENTIAL HAZARDS

*FIRE OR EXPLOSION
Some of these materials may burn, but none of them ignites readily.
Material may be transported hot.
*HEALTH HAZARDS
Contact may cause burns to skin and eyes.
Inhalation of asbestos dust may have a damaging effect on the lungs.
Fire may produce irritating or poisonous gases.
Runoff from fire control or dilution water may cause pollution.

EMERGENCY ACTION

Keep unnecessary people away; isolate hazard area and deny entry.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, CALL CHEMTREC AT 1-800-424-9300. If water pollution occurs, notify the appropriate authorities.
*FIRE
Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
*Do not scatter spilled material with high-pressure water streams.
Dike fire control water for later disposal.
SPILL OR LEAK
Stop leak if you can do it without risk.
Avoid inhalation of asbestos dust.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
Cover powder spill with plastic sheet or tarp to minimize spreading.
*FIRST AID
In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement.
The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

ATTACHMENT B

DIRECTIONS TO EMERGENCY MEDICAL FACILITIES

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

The nearest hospital **and** the nearest facility capable of treating chemical burns are the same facility, which is located at Methodist North Hospital. Therefore, there is only one set of directions.

Nearest Hospital

Methodist North Hospital
3960 Covington Pike
Memphis, Tennessee

Emergency Room Telephone Number - (901) 372-5211

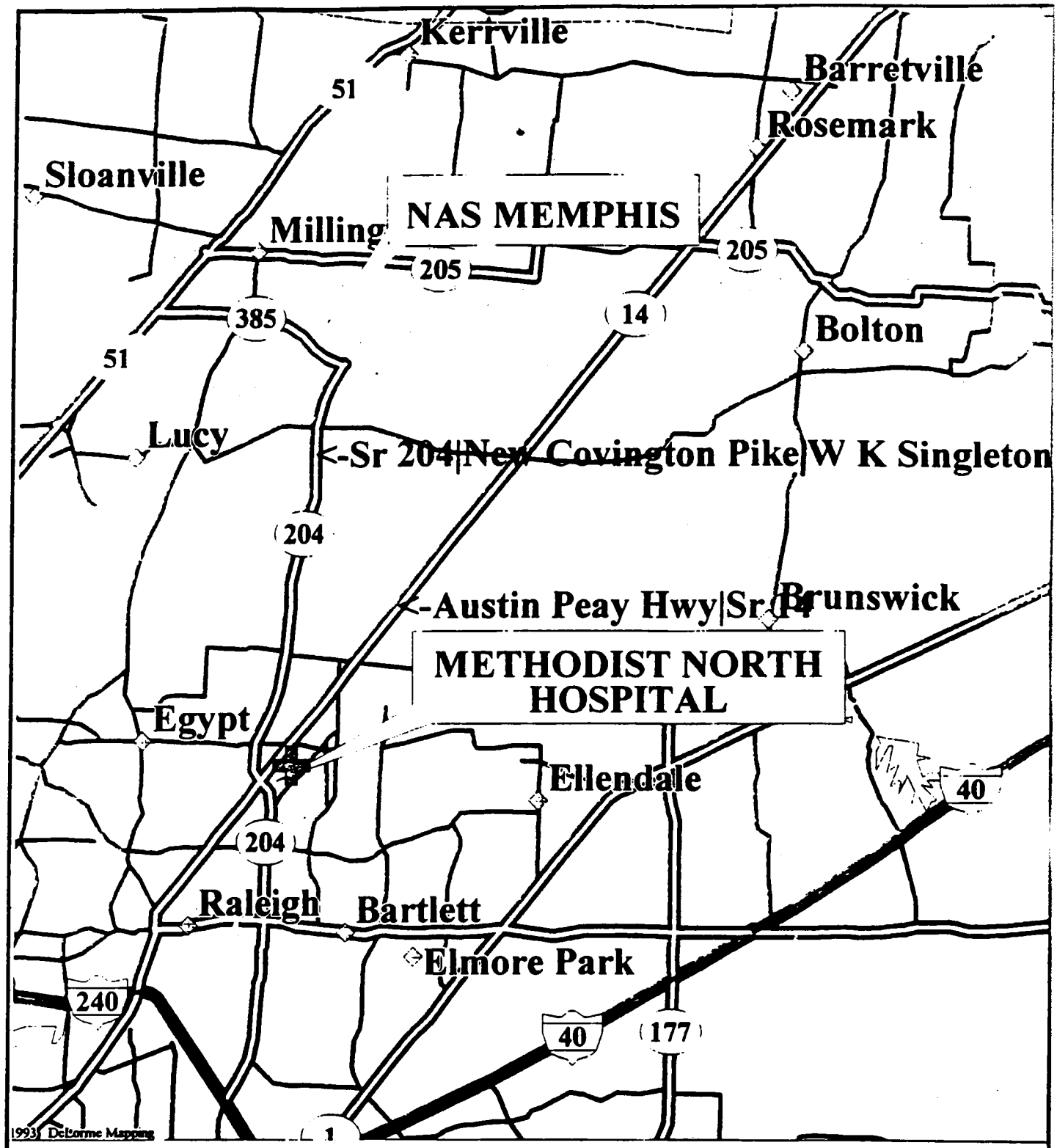
Directions to Methodist North Hospital from NAS Memphis Main Gate:

1) Exit site through South Gate (Singleton Parkway).

2) Continue on Singleton Parkway through the stop signs.

3) Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).

4) You will see the entrance to the emergency room 700 feet past this light on the left.



HEALTH & SAFETY PLAN
NAS MEMPHIS
MILLINGTON, TN

DIRECTIONS TO THE HOSPITAL

DWG DATE: 10/04/94 | DWG NAME: BOARD

ATTACHMENT C

HEALTH AND SAFETY PLAN FORMS

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project site and returned to: EnSafe/Allen & Hoshall, Memphis, Tennessee.

Job No: 2151-094

Contract No: N62467-89-D-0318

Project: SWMU 62 — M-21 Arresting Gear

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

_____

Signed

_____

Print Name

_____

Company

_____

Date

EMPLOYEE EXPOSURE HISTORY FORM

Employee:

Job Name: _____

Date(s) From/To: _____

Hours On Site: _____

Contaminants (Suspected/Reported):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions: