

**FINAL — OVAL ACTION WORDS
FOR NAVAL AIR STATION PENSACOLA
SITE 39
OAK GROVE CAMPGROUND
PENSACOLA, FLORIDA**

N00204.AR.000787
NAS PENSACOLA
5090.3a



Prepared for:

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (———
NAVAL SUPPORT ACTIVITY
NAVAL AIR STATION
PENSACOLA, FLORIDA**

CONTRACT N62467-89-0318/CTO-072



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September 21, 1994

**Release of this document requires prior notification of the Commanding Officer of the
Naval Air Station, Pensacola, Florida.**

Report Documentation Page

1a. Report Security Classification Unclassified		1b. Restrictive Marking N/A										
2a. Security Classification Authority NIA		3. Distribution/Availability of Report See Cover Letters										
2b. Declassification/Downgrading Schedule N/A												
		6. Monitoring Organization Report Number(s) NIA										
6a. Name of Performing Organization EnSafe/Allen & Hoshall	6b. Office symbol (if applicable) E/A&H	7a. Name of Monitoring Organization Naval Air Station Pensacola										
6c. Address (City, State, and ZIP Code)		7b. Address (City, State and Zip Code) Pensacola, Florida										
8a. Name of Funding/Sponsoring Organization SOUTHNAVFACENGCOM	8b. Office symbol (if applicable) NIA	9. Procurement Instrument Identification Number N62467-89-D0318/072										
ZIP 2166 Eagle Drive P.O. Box 10068 Charleston, South Carolina 29411		10. Source of Funding Numbers <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Program Element No.</th> <th style="width: 25%;">Project No.</th> <th style="width: 25%;">Task No.</th> <th style="width: 25%;">Work Unit Accession No.</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		Program Element No.	Project No.	Task No.	Work Unit Accession No.					
Program Element No.	Project No.	Task No.	Work Unit Accession No.									
11. Title (Include Security Classification) Final Removal Action Work Plan for Naval Air Station Pensacola Site 39, Oak Grove Campground, Pensacola, Florida												
12. Personal Author(s) Caldwell, Brian, (P.G. #1330, Florida Exp. Data July 31, 1999); Keethler, Michael												
13a. Type of Report Final	13b. Time Covered From 01/01/94 To 09/21/94	14. Date of Report (Year, Month, Day) 1994 September 21	16. Page Count 123									
16. Supplementary Notation N/A												
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Field</th> <th style="width: 25%;">Group</th> <th style="width: 25%;">Sub-Group</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>			Field	Group	Sub-Group							18. Subject Terms (Continue on reverse if necessary end identify by block number)
Field	Group	Sub-Group										

19. Abstract

EnSafe/Allen & Hoshall (E/A&H) performed an RI of Site 39 during May and June 1993. During this investigation, soil and groundwater samples were collected and analyzed to delineate the sources, nature, magnitude, and extent of any soil and groundwater contamination.

Staining at the site is limited to the uppermost foot of soil. Laboratory results from this investigation indicated low (0 to 200 ppb) to moderate (200 to 5,000 ppb) concentrations of semivolatile compounds within the stained area. Concentrations of heavy metals exceeding NAS Pensacola-specific reference concentrations included barium, cadmium, chromium, lead, and mercury.

Groundwater analytical results indicate the soil is not impacting groundwater with appreciable amounts of organic contaminants. The volatile organic compounds (VOCs) tetrachloroethene and 1,1-dichloroethane were the only organic compounds present in groundwater. Inorganic compounds exceeding their respective NAS Pensacola-specific reference concentrations were antimony, arsenic, vanadium, and calcium; except for calcium, they were measured only in the intermediate depth wells.

Based on the detected concentrations in soil and groundwater, an removal action of the soil was proposed for the stained area. This work plan details the removal of contaminated soil at Site 39 south of Oak Grove Campground.

The removal action goal is to mitigate potential risk to human health and the environment by removing and disposing of the contaminated soil. This work plan has been based on data provided by the Navy and gathered by E/A&H during assessment and reconnaissance. This work plan includes a detailed scope of work for removal activities, a detailed sampling and analysis plan (SAP), and a site-specific health and safety plan (HASP). The removal has been termed a time critical removal to respond to recently received analytical results and available funding.

<p>20. Distribution/Availability of Abstract <input checked="" type="checkbox"/> Unclassified/Unlimited <input type="checkbox"/> Same as Rept <input type="checkbox"/> DTIC Users</p>	<p>21. Abstract Security Classification NIA</p>	
<p>22a. Name of Responsible Individual William Hill</p>	<p>22b. Telephone (Include Area Code) (803) 743-0324</p>	<p>22c. office Symbol</p>

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List of Acronyms

The following list contains many of the acronyms, initials, abbreviations, and units of measure used in this report.

$\mu\text{g/kg}$	Micrograms per kilogram
AR	Administrative Record
ASTM	American Society for Testing and Materials
bls	Below land surface
CGI	Combustible Gas Indicator
CHASP	Comprehensive Health and Safety Plan
CLEAN	Comprehensive, Long-Term Environmental Action Navy
CLP	Contract Laboratory Program
CSAP	Comprehensive Sampling and Analysis Plan
CTO	Contract Task Order
DOT	Department of Transportation
DQO	Data Quality Objective
E/A&H	EnSafe/Allen & Hoshall
E&E	Ecology & Environment, Inc.
FDEP	Florida Department of Environmental Protection, formerly FDER
FDER	Florida Department of Environmental Regulation, now FDEP
HASP	Health and Safety Plan
IWTP	Industrial Wastewater Treatment Plant
mg/kg	milligrams per kilogram
MINIRAM	respirable dust monitor
NAS	Naval Air Station
ND	Not Detected
NEESA	Naval Energy and Environmental Support Activity
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbon
PID	Photoionization Detector
ppb	Parts per billion
PPE	Personal Protective Equipment
ppm	parts per million
PWC	Public Works Center
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SOP/QAM	standard Operating Procedure/Quality Assurance Manual
SOUTHNAVFACENGCOM	Southern Division, Naval Facilities Engineering Command

SSO
TAL
TCE
TCL
TCLP
USEPA
vocs
yd³

Site Safety Officer
Target *Analyte* List
Trichloroethene
Target Compound List
Toxicity Characteristic Leaching Procedure
United States Environmental Protection Agency
Volatile Organic Compounds
Cubic yards

FOREWORD

The purpose of this Removal Action Work Plan is to address the removal of soil within the stained area at Site 39 including confirmatory sampling to ensure removal of all soil exhibiting contamination and backfilling with clean fill material. This removal is time critical and is scheduled to occur between the submittal of the draft and draft final Remedial Investigation (RI) reports for this site. In accordance with an agreement between Region IV of the U.S. Environmental Protection Agency, Florida Department of Environmental Protection, and the U.S. Navy, and in lieu of a formal feasibility study report, the activities outlined in this plan, and their consequent physical and analytical results will be reported in the draft final RI report for Site 39.

EXECUTIVE SUMMARY

EnSafe/Allen & Hoshall (E/A&H) performed an RI of Site 39 during May and June 1993. During this investigation, soil and groundwater samples were collected and analyzed to delineate the sources, nature, magnitude, and extent of any soil and groundwater contamination.

Staining at the site is limited to the uppermost foot of soil. Laboratory results from this investigation indicated low (0 to 200 ppb) to moderate (200 to 5,000 ppb) concentrations of semivolatile compounds within the stained area. Concentrations of heavy metals exceeding NAS Pensacola-specific reference concentrations included barium, cadmium, chromium, lead, and mercury.

Groundwater analytical results indicate the soil is not impacting groundwater with appreciable amounts of organic contaminants. The volatile organic compounds (VOCs) tetrachloroethene and 1,1-dichloroethane were the only organic compounds present in groundwater. Inorganic compounds exceeding their respective NAS Pensacola-specific reference concentrations were antimony, arsenic, vanadium, and calcium; except for calcium, they were measured only in the intermediate depth wells.

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The removal action goal is to mitigate potential risk to human health and the environment by removing and disposing of the contaminated soil. This work plan has been based on data provided by the Navy and gathered by E/A&H during assessment and reconnaissance. This work plan includes a detailed scope of work for removal activities, a detailed sampling and analysis plan (SAP), and a site-specific health and safety plan (HASP). The removal has been termed a time critical removal to respond to recently received analytical results and available funding.

10 INTRODUCTION

The Department of the Navy, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) has placed a **Contract Task** order (CTO-072) for a Removal Action Work Plan prepared by EnSafe/Allen & Hoshall (E/A&H) for Site 39 at the Naval Air Station (NAS) Pensacola in Pensacola, Escambia County, Florida. This work plan details the [time critical] removal of contaminated soil at Site 39, south of Oak Grove Campground.

The removal action goal is to mitigate potential risk to human health and the environment by removing and disposing of the contaminated soil. This work plan has been based on data provided by the Navy and gathered by E/A&H during assessment and reconnaissance in early 1994. This work plan includes a detailed scope of work for removal activities, a detailed sampling and analysis plan (SAP), and a site-specific health and safety plan (HASP).

E/A&H anticipates NAS Pensacola Public Works Center (PWC) providing the personnel, equipment, and material necessary to construct road and staging areas, to excavate and remove contaminated soil, and to backfill. E/A&H will assist as necessary in scheduling and implementing field activities, overseeing field activities, obtaining equipment and supplies, and attending to health and safety concerns. E/A&H will administer the HASP to onsite field personnel, provide field monitoring equipment and conduct air monitoring, collect soil samples and waste characterization samples, and assist PWC personnel with coordinating the disposal of soil, liquid, and construction debris generated by field activities.

1.1 Site Description

NAS Pensacola is located on the Gulf Coast lowlands of a peninsula bounded by Pensacola Bay to the south and east and Bayou Grande to the north. Site 39 is in the southwestern portion of NAS Pensacola, approximately 2,500 feet south of Forrest Sherman Field and 520 feet northwest

[Bold items enclosed in brackets denote changes to the first draft of document.]

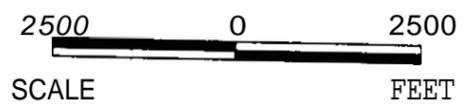
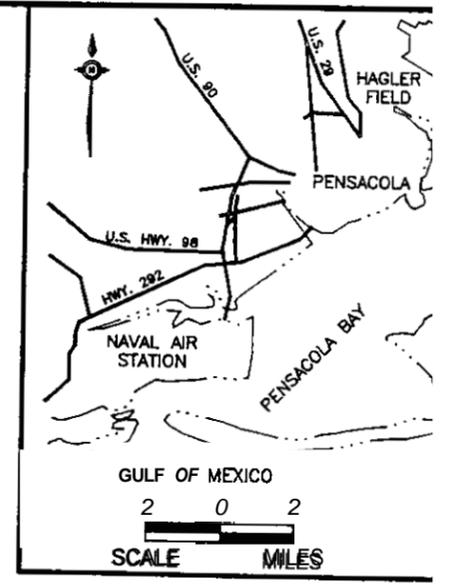
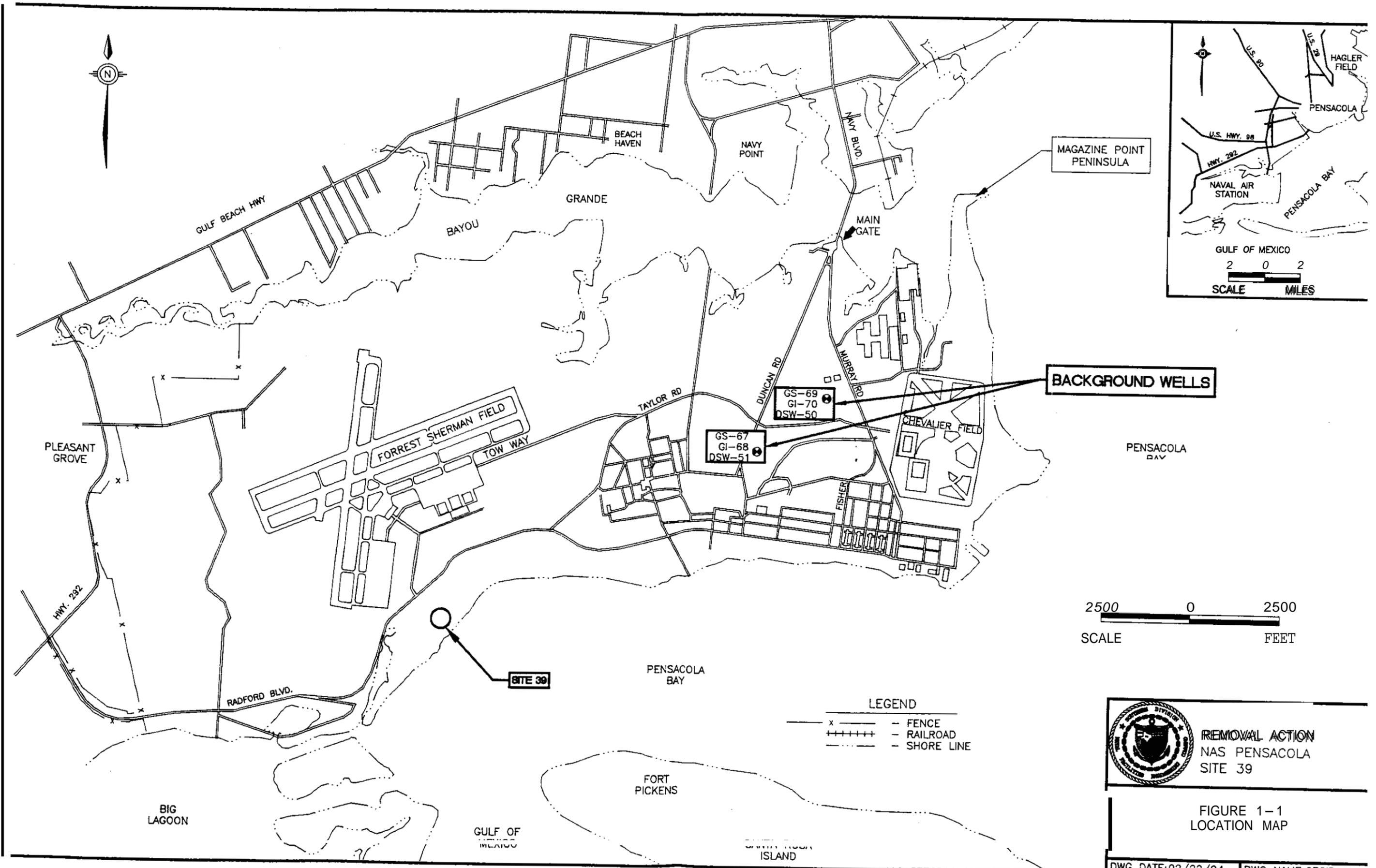
of the Pensacola Bay shoreline, as shown in Figure 1-1. The site is a clearing with sandy soil covered by grass and brush and surrounded by trees. As shown in Figure 1-2, Site 39 is approximately 200 feet south of the Oak Grove trailer campground.

Site 39 consists of a circular area approximately 300 feet in diameter littered with broken brick, concrete, tile, glass, coal, and nails. Within this area lies a zone of darkly stained soil and stressed vegetation measuring approximately 60' x 80'. A lesser-stained area approximately 130' x 200' with sparse vegetation surrounds this area.

The subsurface stratigraphy at Site 39 is consistent with previous studies conducted at NAS Pensacola. A poorly graded fine- to medium-grained quartz sand was encountered at the surface to depths of approximately 43 to 45 feet below land surface (bls). The base of the surficial zone is underlain by a low-permeability zone consisting of either soft blue/gray clay or a green silty clay. Three intermediate depth borings indicate the top of the low permeability zone at depths of 43 to 45 feet bls and continuous beneath the site area. Thickness of this unit across NAS Pensacola varies between 12 and 17 feet. The extremely low hydraulic conductivity characteristic of the clay layer and its laterally continuous nature beneath the site suggest an extremely low potential for groundwater movement through the clay and into the underlying main producing zone. Measured groundwater elevations indicate the water table between 3 and 7 feet bls.

1.2 Site Background and Previous Studies

The following sections provide a site history and summarize past studies of Site 39.



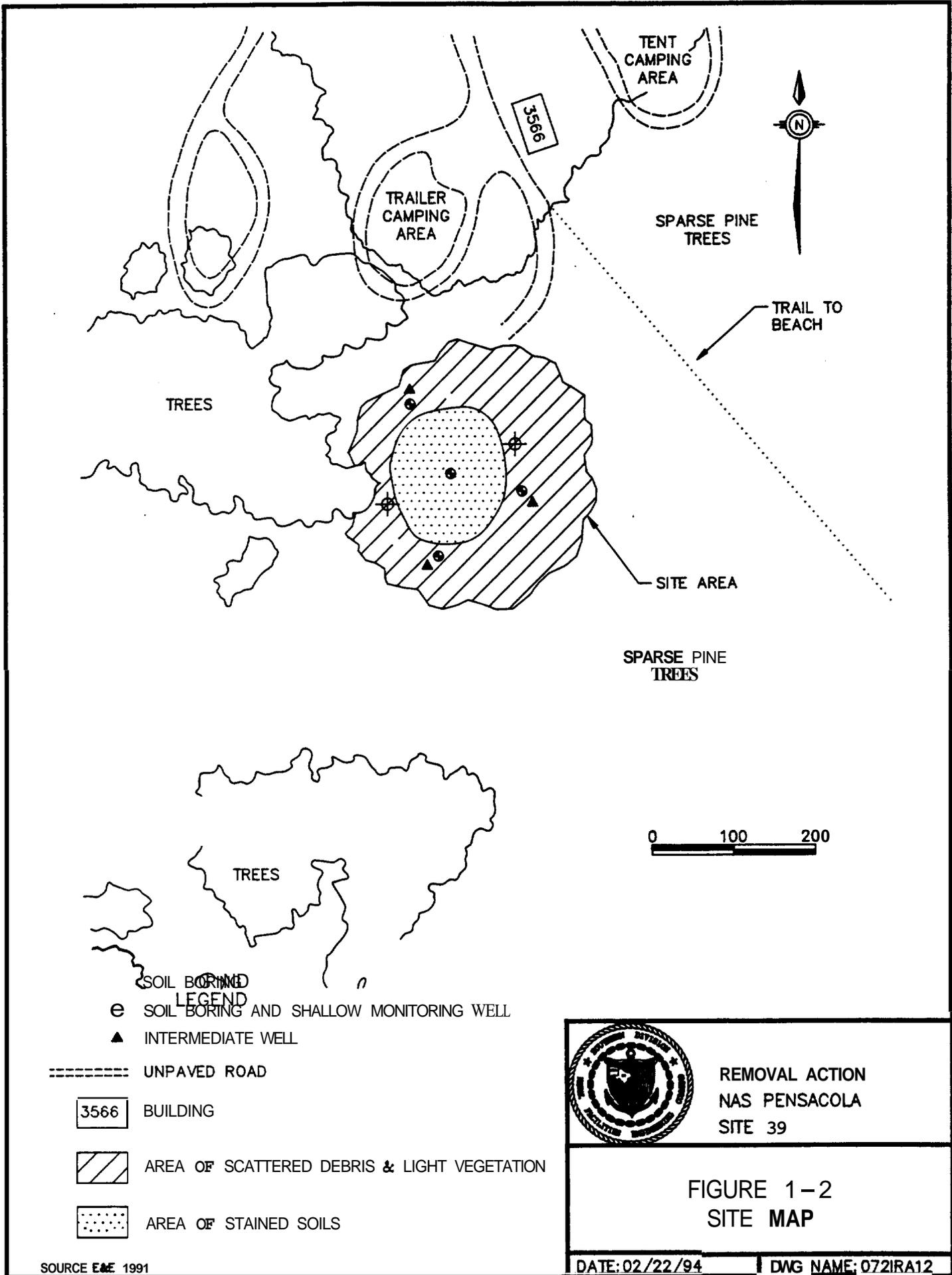
LEGEND

- x -	- FENCE
- + + + + -	- RAILROAD
- - - - -	- SHORE LINE

REMOVAL ACTION
NAS PENSACOLA
SITE 39

FIGURE 1-1
LOCATION MAP

DWG DATE: 02/22/94 | DWG NAME: 0721PA11



SOURCE E&E 1991

DATE: 02/22/94

DWG NAME: 072IRA12

1.2.1 Historical Land Use

Little is known about the history of Site 39 and there **are** no records **concerning** the **source(s)** of the debris and stained soil **[there]**. At one time a boiler-powered sawmill **was** reportedly located in the vicinity of Site 39; however **this** fact could **not** be **confirmed** (Ecology & Environment **[E&E]** 1992). **Mr.** Ron Joyner, of Facilities Management **at** NAS Pensacola, stated there had not **been** a sawmill at Site 39. Instead, the site was a **disposal area** for debris from the demolition of Building 29. **Mr.** Joyner said the **stained area** may have **been caused** by campers dumping **used** motor oil **on** the ground. **Mr.** Jim Tucker, **caretaker** for the Lighthouse Point **Oak Grove Rental**, stated railroad ties were **once** believed to have **been** stockpiled **[there]**.

1.2.2 Previous Investigations

In the spring of 1990, campers reported stained **soil** with a hydrocarbon odor south of the campground. NAS Facilities Management personnel collected two grab samples at **0 to 7 inches** bls from the stained soil area at Site 39. The samples were **analyzed** for **U.S.** Environmental Protection Agency (USEPA) hazardous wastes F001 through F005 (solvents), total recoverable petroleum hydrocarbons (TRPHs), and polychlorinated biphenyls (PCBs). **According** to analytical results, the following were detected:

TRPH	9,834 parts per million (ppm)
methanol	9,390 parts per billion (ppb)
tetrachloroethylene	70 ppb
toluene	40 ppb
xylene	60 ppb

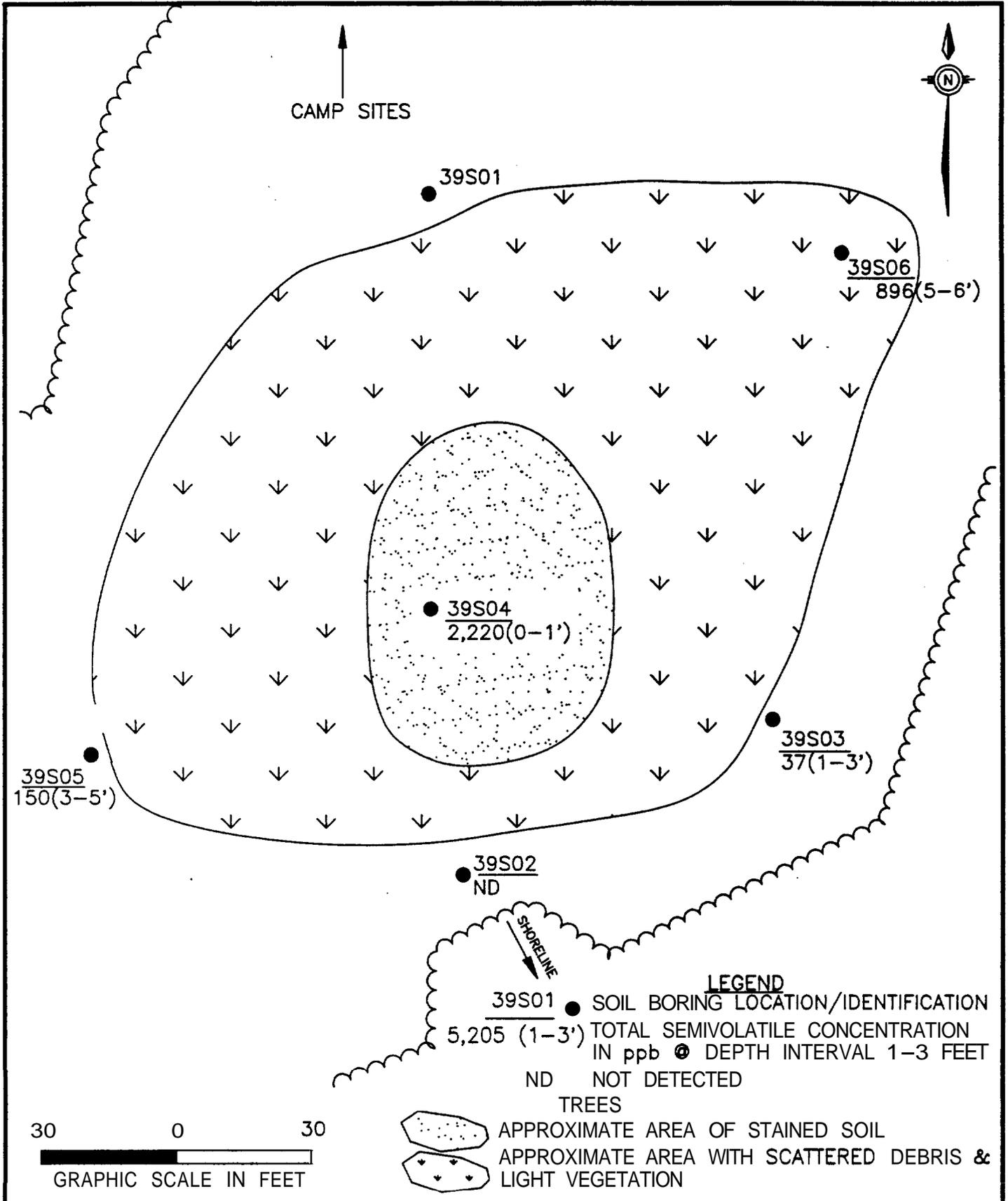
PCBs were not present at concentrations above **method** detection limits in **the** samples (E&E 1992). In December 1992, as **preliminary** work for Site 39's remedial investigation (RI), E/A&H conducted a soil-gas survey at Site 39. The results of the soil-gas analyses yielded no

detectable concentrations of VOCs within the stained soil area; one sample point approximately 100 feet north-northeast of the stained soil area yielded tetrachlorethene at a concentration of 1.2 ppb. These are the only sampling events/investigations conducted at Site 39 before the RI in May 1993 by E/A&H.

1.2.3 E/A&H Assessment Activities and Site Reconnaissance

E/A&H performed an RI of Site 39 during May and June 1993. During this investigation, soil and groundwater samples were collected and analyzed to delineate the sources, nature, and extent of any soil and groundwater contamination. The stained soil at the site is limited vertically to the uppermost foot of soil. Laboratory results from this investigation indicated low (0 to 200 ppb) to moderate (200 to 5,000 ppb) concentrations of semivolatile compounds within the stained area. Pyrene, which is commonly found in wood preservatives and waste oil, was the dominant semivolatile present. Low concentrations of volatiles were also found within the stained areas, specifically trichloroethane and toluene at total concentrations of less than 2 ppb. Concentrations of heavy metals exceeding NAS Pensacola-specific [reference concentrations] included barium, cadmium, chromium, lead and mercury. Figures 1-3, 1-4, and 1-5 present the parameters of concern detected in site soil during the RI. The risk assessment of these analytical results concluded that site soil does not pose a significant risk to human health or the environment under a recreation use. However, the combination of detected parameters would pose a risk, should future use of the site be residential.

Groundwater analytical results indicate soil is not impacting groundwater with appreciable amounts of organic contaminants. The VOCs tetrachloroethene and 1,1-dichloroethane were the only organic compounds present in groundwater. These VOCs were detected only in the shallow monitoring wells, and the highest concentrations (2 and 3 ppb, respectively) were measured

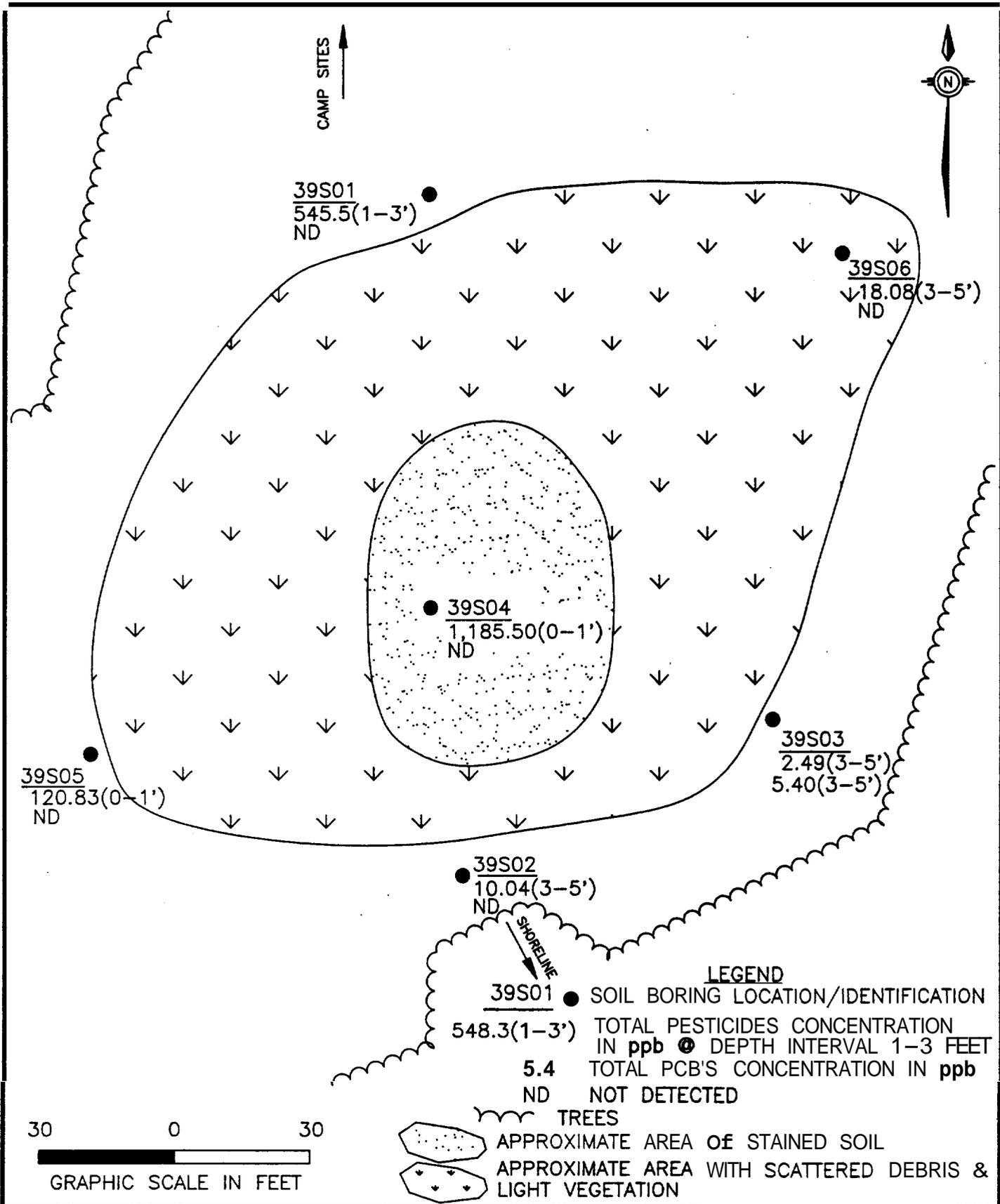


REMOVAL ACTION
SITE 39
NAS PENSACOLA

FIGURE 1-3
MEASURED TOTAL SEMIVOLATILE
COMPOUNDS IN SOIL

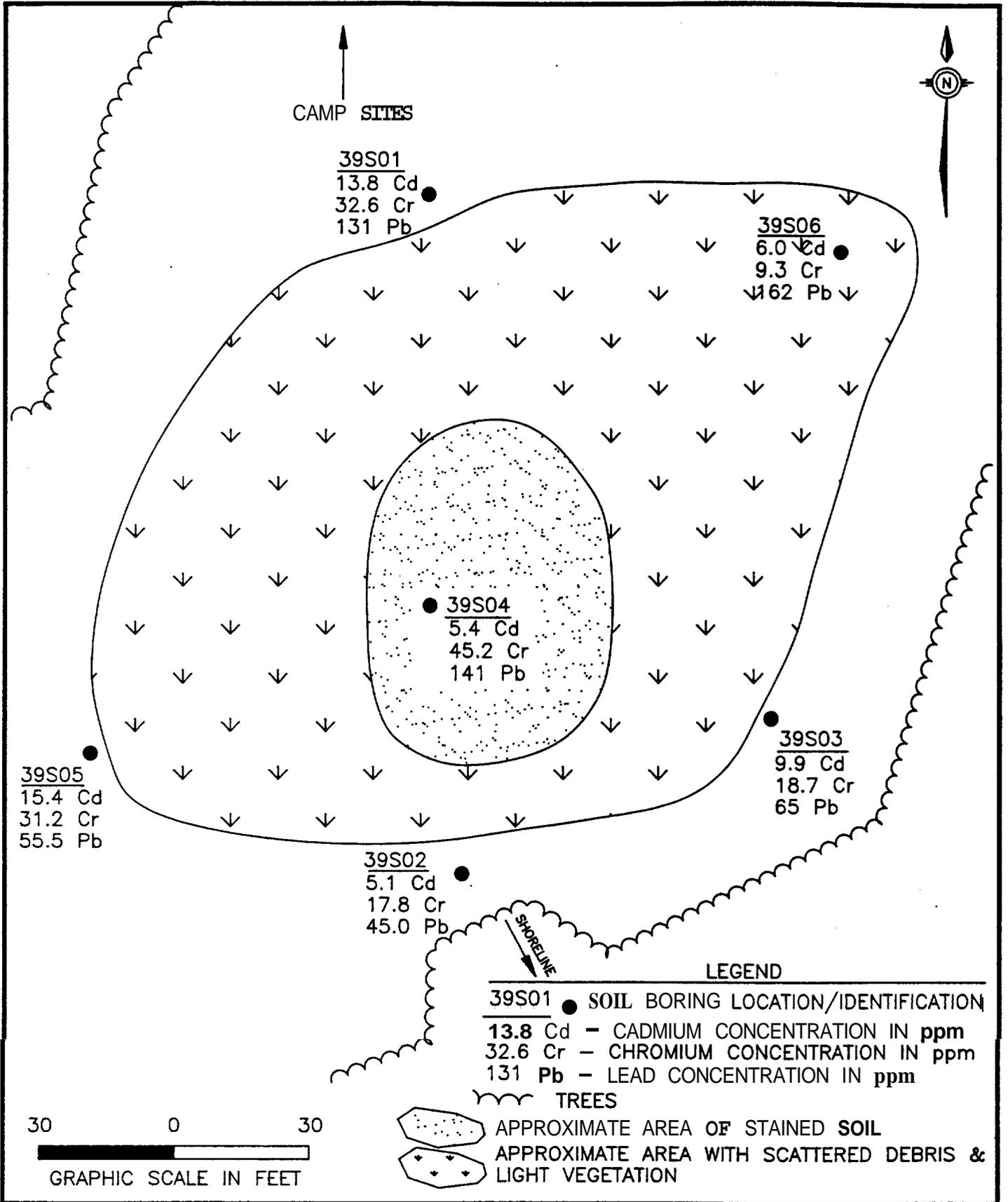
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DWG NAME: 072IRA13




 REMOVAL ACTION
 SITE 39
 NAS PENSACOLA

FIGURE 1-4
 GREATEST MEASURED TOTAL PESTICIDES
 AND PCB'S IN SOIL
 DWG DATE: 02/22/94 DWG NAME: 072IRA14



REMOVAL ACTION
SITE 39
NAS PENSACOLA

FIGURE 1-5
GREATEST MEASURED METAL
CONCENTRATIONS IN SOIL

DWG DATE: 01/10/94

DWG NAME: 072IRA15

downgradient from the **stained soil**. Inorganic compounds exceeding their respective **NAS** Pensacola-specific [reference] concentrations were antimony, **arsenic**, **vanadium**, and calcium; except for calcium, they were measured **only** in **the** intermediate depth wells. Elevated metals concentrations in groundwater **may** at least **partially be** attributed to the **partitioning** of metals onto suspended particulate matter, **especially** in the **intermediate depth wells**, which remained turbid following development and purging.

It was concluded the stained **soil** is currently the **source** of VOCs in groundwater, and could be a future **source** of groundwater contamination at the site. While **natural** biodegradation will eventually **reduce** contaminants in **soil** and lessen their **potential** for leaching into the groundwater, [removing] the upper foot of **soil** in the **stained** area was recommended to mitigate the potential for further groundwater contamination.

2.0 SCOPE OF WORK

The following sections detail the activities to occur during the removal activities. They include:

- **Plan** field activities, review **historical data**, and schedule personnel and equipment.
- Review the applicable portions of the Comprehensive Health and **Safety Plan** (CHASP [E/A&H 1993a]), the Comprehensive Sampling and Analysis **Plan** (CSAP [E/A&H 1993b]), the site-specific HASP, and the site-specific **SAP** with field personnel.
- Construct a road, staging platform, and construct bermed decontamination area
- [Abandon **shallow monitoring well in center of site, and resample all monitoring wells** at Site 39].
- Excavate and containerize **soil** from Site 39.
- Collect [at least **four**] **discrete** or composite **soil** samples from the excavated area for analytical **testing**.
- Collect one composite **soil** sample from the backfill material for analytical testing.

(Bold items enclosed in brackets denote changes to the **first draft of document**.)

- e Backfill the excavated **area** and replant vegetation, if necessary.
- e Remove the temporary **road** and staging area.
- Assist **PWC** in coordinating waste **disposal** (**soil** and decontamination fluids) resulting from field activities.
- e **Write** a removal action section for the final RI report, summarizing field activities and the results of analytical testing of **this [removal action]**.

E/A&H anticipates PWC **will** provide the material and personnel to **construct** a road, excavate contaminated **soil**, and dispose of investigation-derived waste. E/A&H will **assist** PWC as necessary, collect **soil** and waste characterization samples, and **report** on the removal activities.

2.1 Pre-Removal Activities

Activities to be conducted before removing the **soil are** discussed in the following **sections**. Specific tasks include attending an orientation meeting and constructing a roadway and **staging area**.

2.1.1 Orientation Meeting

Before performing any field activities at **NAS Pensacola**, **E/A&H** personnel will attend an orientation meeting to summarize general requirements **as well as** site-specific requirements for sampling and documentation. General discussion will include the locations of the Naval Air Station in Pensacola, the site office trailer, subject site, designated decontamination **areas**, and the temporary road and staging **area** to be constructed. Sampling requirements to be **discussed will** include general sampling protocol, the **Unified Soil** Classification System, the sample-numbering system, quality assurance/quality control (QA/QC) sampling requirements, and sample packaging. Documentation requirements to be **discussed** will include **the** use of field forms, field logbooks, and photographic documentation. **A** checklist of requirements and an

[Bold items **enclosed in brackets** denote changes to the first draft of document.]

acceptance form indicating these items have been reviewed by *H I M* personnel will be maintained at E/A&H **NAS** Pensacola field trailer. Appendix **A** contains a copy of the checklist/acceptance form.

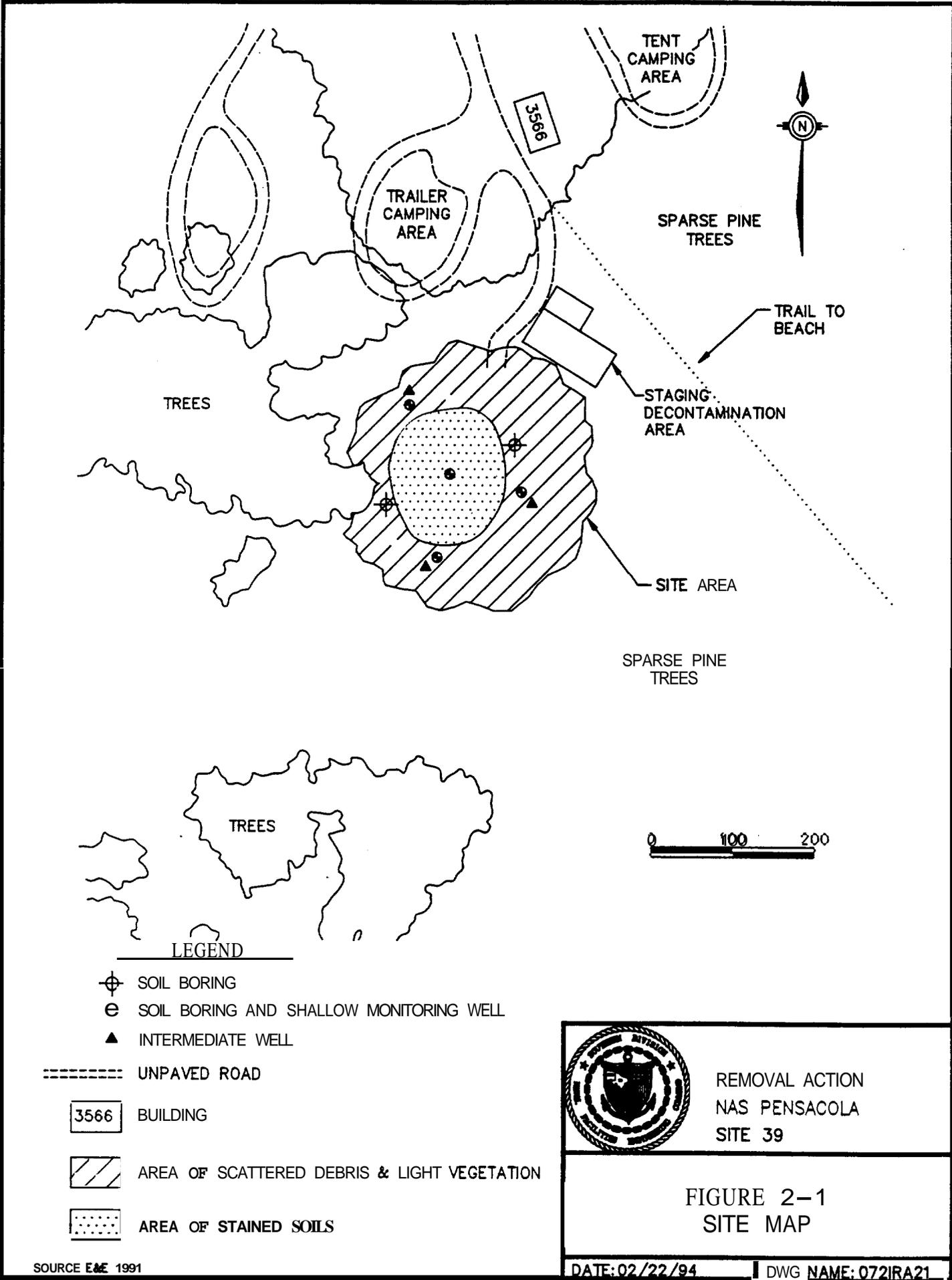
The site **safety** officer (**SSO**) will review the **CHASP** and **HASP (Appendix B)** with the **E/A&H** personnel **before** they conduct field activities. In addition, each day, the **SSO** will conduct a "tailgate safety meeting" to convey the anticipated hazards potentially encountered. **All** E/A&H employees and Navy personnel who will be working **at** the site will be **required to** sign a compliance agreement form acknowledging they **are** familiar with the plan and **agree** to abide by its guidelines. The **HASP (Appendix B)** contains a copy of the compliance agreement form.

2.1.2 Roadway and Staging Area Construction

Due to the loose sandy conditions **at** the site, it is anticipated a temporary road and staging area will need **to** be constructed to facilitate handling of materials and equipment (*see* Figure 2-1). E/A&H will clearly mark the road and staging **area** with stakes and **flags** before **construction** begins. The road will exit the campground road and terminate at **the staging area**. The staging **area** will contain equipment storage, waste container storage and temporary decontamination areas.

2.2 Removal Activities

Several activities will be conducted during the removal of the excavated **soil**. Specific tasks include air monitoring and **soil** excavation.



LEGEND

- ⊕ SOIL BORING
- e SOIL BORING AND SHALLOW MONITORING WELL
- ▲ INTERMEDIATE WELL
- UNPAVED ROAD
- 3566 BUILDING
- ▨ AREA OF SCATTERED DEBRIS & LIGHT VEGETATION
- ⋯ AREA OF STAINED SOILS



REMOVAL ACTION
 NAS PENSACOLA
 SITE 39

FIGURE 2-1
 SITE MAP

SOURCE E&E 1991

DATE: 02/22/94

DWG NAME: 072IRA21

2.2.1 Air Monitoring

Air will be monitored by the site **safety** officer, with a photoionization detector (PID), combustible gas indicator (**CGI**) and respirable dust monitor (MINIRAM). The **readings** and locations of **all air** sampling will be recorded in the field logbook. It will be determined **at this** time, **based** on respirable dust monitor readings, if dust needs to be **suppressed** by wetting. **Specific air** monitoring procedures are discussed in **Section 6.2** of the **HASP** (Appendix B).

2.2.2 Soil Excavation

Soil excavation, which will remove the **top 1** foot of **soil** from the site, will **start** at the center of the stained **soil** and proceed **outward**. **Soil** will be removed **until no** more stained **soil** is evident and the area where vegetation is **growing** normally is reached. **This area** is approximately 130' x 200' and should contain approximately 960 cubic **yards** (yd³) of contaminated **soil**.

E/A&H anticipates the excavation **can be** done with a large **backhoe or** trackhoe. **As** the soil is excavated, it will **be** loaded directly into 20 yd³ roll-on/roll-off containers.

[2.3 Resampling and Abandonment of Monitoring **wells**

All wells at Site 39 are to be resampled using peristaltic pumps for low-flow purging and sampling. The turbidity will be checked during purging and sampling with a Horiba U-10 water quality meter. Prior to the removal action, a drilling subcontractor will abandon the shallow monitoring well in the center of the stained soil area according to Rule 17-532.440, F.A.C.]

2.4 Post-Removal Activities

Several activities will be conducted after the removal of the contaminated soil including **soil** sampling/field screening, backfill **soil** sampling/backfilling the excavation, removing the construction materials, **disposing** of used **personal** protective equipment (**PPE**) and disposable sampling equipment, and preparing a section for the **RI report**.

2.4.1 Soil Sampling and Field Screening

E/A&H will collect at least four discrete **soil** samples from the excavated **area** for laboratory analysis. The locations will **be** selected to ensure samples representative of the site. The exact number will be determined in the field based upon the excavation's dimensions. The samples will be submitted to a Naval Energy and Environmental **Support** Activity (**NEESA**)-approved laboratory for target analyte list/target compound list (**TAL/TCL**) **analyses according to** Contract Laboratory **Program** (**CLP**) protocol. The results of this analysis **will be** included in the draft final **RI** for this site (**see** foreword to **this** work plan).

2.4.2 Sample Backfill Soil and Backfill the Excavation

The excavated **area** will be backfilled with clean sandy **soil**. Before backfilling, **E/A&H will** collect one composite **soil** sample from the **backfill** for analysis by a **NEESA**-approved laboratory for **TAL/TCL** parameters according to **CLP** protocol. The sample is being collected to verify the soil backfill does not contain excessive contaminant concentrations potentially detrimental to the site. The excavation will then be backfilled, and the **area** may **be** seeded or planted as necessary. The backfill samples will **be taken as** early in the project **as possible so** results **can be** obtained in a timely manner **to** limit delays in the schedule.

[**Bold items enclosed in brackets denote changes to the first draft of document.**]

2.4.3 Remove Construction Materials

After removal and backfilling, the decontamination station will be disassembled **and** the plastic sheeting and other waste containerized with the **used PPE**. The roadway, staging **area**, **and** any debris or trash associated with field activities will be removed. The **area** will be left **as** close as possible to its natural state.

2.4.4 Dispose of PPE and Disposable Sampling Equipment

Used **PPE** and disposable sampling equipment such **as** plastic sheeting will be placed in 55-gallon Department of Transportation (DOT)-approved drums for **disposal** by the Navy. Each drum will be labeled with the site number, waste category, and date of collection. Navy personnel will transport drums to a waste storage facility until they **can** be **disposed** of properly. Information pertaining to these drums will **be** entered on a drum-tracking log.

2.4.5 Prepare a Removal Action Section of the RI

A section of the RI will be completed after field activities **are** complete and analytical results have been received to address the following:

- e Field activities including a photographic **record** of activities.
- Analytical test results for [**confirmation samples collected**] following removal.
- e A site **diagram** showing the features of the site **during** the removal action. The **diagram** will include the location the excavation, soil sample locations, the temporary **road** and staging area, and decontamination **area**.
- e Disposal manifests (if available at the time of **report**), and a **description** of the fate of water generated during the removal action.

3.0 HEALTH AND SAFETY PLAN

A site-specific Health and Safety **Plan** for field **operations** is included as Appendix B. **This site-specific** plan is to be **used** with the approved **NAS Pensacola CHASP**. **Copies** of both plans will be onsite during field operations.

4.0 SAMPLING AND ANALYSIS PLAN

This **section** outlines **specific** protocols to be followed in completing the removal **action**, as well as quality goals for each field screening and **analytical** method. Sample collection, **handling**, preparation, and shipping methods are also discussed.

4.1 Project Description

The removal of the upper 1 foot of **soil** over an approximately 2,600 square feet (**ft²**) area **will** be conducted at Site 39. **[At least]** four **soil** samples representative of **soil** remaining below the excavation **will** be collected **[for confirmation of contaminant removal]**.

4.2 Field Sampling Plan

The sampling procedures will be in **accordance** with the **CSAP** for **NAS Pensacola (E/A&H 1993b)** and the **USEPA Region IV Standard Operating Procedures and Quality Assurance Manual (SOP/QAM) (USEPA 1991)**.

[For planning, at least four soil samples representative of soil remaining below the excavation will be collected for confirmation of contaminant removal. In addition, to ensure "clean" status, a composite sample will be collected of the backfill material. All samples collected will be submitted for TAL/TCL analyses using CLP protocol. All sampling and analyses will be performed under Data Quality Objective IV procedures.]

(Bold items enclosed in brackets denote changes to the first draft of document.)

The number of samples may be modified based on field **screening readings** and field observations. The Navy will be apprised of any changes **in** the number collected, and the USEPA and the **Florida** Department of Environmental **Protection** (FDEP) will be notified.

The preferred order of sample collection will be: VOCs, extractable organics, (including pesticides, herbicides, and polychlorinated biphenyls), **total metals**, cyanide, **and** inorganics.

After excavation, E/A&H will collect four **soil** samples for TAL/TCL parameter analyses from 0 to 1 foot beneath the excavation site. The locations will be selected to provide a representative sample according to **Resource** Conservation and Recovery Act (RCRA) **SW 846** analysis. Samples **will** be collected using a stainless steel hand auger.

soil sampling procedures:

1. Don personal protective clothing and equipment **as required** in the site-specific **HASP** (Appendix **B**).
2. **Place** clean plastic sheeting on the ground surface of the sample collection point to contain decontaminated sampling equipment.
3. **Begin** augering to the depth **required** for sampling.
4. Make detailed notes about the geologic features of **the** soil on a field boring log.
5. Stop drilling at the top of the **specified** or selected **depth** (i.e., 1 foot below excavation).
6. Collect sample.
 - Without homogenizing, immediately **place** the **VOC** sample **into** the appropriate container. **Fill** the container so there is zero headspace.
 - **Place** the remaining volume into a stainless steel bowl. **Mix** the sample **until** thoroughly homogenized and place **into** appropriate **containers**. Label the samples **and** preserve to 4 degrees **Centigrade** (°C).

[Bold items enclosed in brackets denote changes to the first draft of document.]

- Record the sample identification number, **depth** from which the sample was collected, and **analyses** required in the field logbook and **on** the appropriate field forms.
7. Upon completion of the sampling, **decontaminate** all equipment in accordance with Section 4.6.

4.3 Sample Identification, Containers, and Preservatives

The following sections detail the sample identification system, sample containers, and sample preservation.

4.3.1 Sample Identification

Sample designation will follow the guidelines **established** in Section 12 of the CSAP. **Soil** samples will be labeled according to site, media sampled, and unique number. Each sample designation will be five to eight characters. The first two **characters** will represent the **site** identification number at **NAS** Pensacola (for this project it will be, "39" representing Site 39). The third character represents the sample **matrix**. "S" will represent a **soil** sample. The fourth and **fifth** numbers represent the matrix serial identification number, a unique location number assigned to the sample. The sixth, seventh, and eighth characters represent the sample-specific identification number, which will **be** the deepest sample **depth**, rounded to the nearest foot. For example, a **soil** sample collected from the 0- to 1-foot interval below grade at location 06 at Site **39**, would be "39806001." The sixth, seventh, and eighth characters will **also** designate **QA** samples with the sixth digit designating the **type** of **quality** assurance sample or material blank (such as "E" for "equipment rinsate **blank**," and the seventh and eighth digit differentiating between **QA** samples.

4.3.2 Sample Containers and Preservatives

The appropriate number of pre-cleaned sample containers, preservatives, and trip blank samples will be obtained from a NEESA-approved CLP laboratory before sampling. All glass containers must have Teflon-lined caps.

Samples will be chemically preserved in accordance with guidelines presented in Section 4.2.7 of the USEPA SOP/QAM and Section 12.2 of the CSAP. All samples requiring chemical preservation shall be preserved immediately upon collection in the field.

4.4 Field and Laboratory Quality Control Checks

QC checks to be followed are contained in the Quality Assurance Plan in Section 15 of the CSAP. Field QC checks will include:

- One field blank per week during the excavation. The field blank will consist of the American Society for Testing and Materials (ASTM) Type III water used for decontamination, and will be collected in the field at the staging area.
- One equipment Msate blank per day soil sampling occurs.
- One temperature blank per cooler.
- One duplicate soil sample for the event.
- For soil samples, a sufficient volume for matrix spike and matrix spike duplicate analyses by doubling the volume collected at a sample point to be determined in the field.

4.5 Sample Packaging, Labeling, and Chain-of-Custody Forms

Sample packaging, labeling, and custody documentation will proceed as outlined in Section 12 of the CSAP.

4.6 Decontamination **Procedures**

Decontamination procedures for **sampling** equipment will be performed in accordance with Appendix **B**, Section **B-8** of the USEPA SOP/QAM and **Section 11** of the **CSAP** with the following exceptions. The detergent used for **this** project will be Liquinox, which contains powerful chelating agents to bind and **remove trace metals** from **sampling equipment**. When available, hot water will be used for field decontamination. Field reagent grade water will meet the specifications of ASTM **Type III** water (**D 1193-77** re-approved **1983**, federal **test method** number: 7916), which provides deionized, filtered, and organic **free** water for field **use**. The steam cleaner/high pressure hot water washer will be capable of generating adequate pressure and producing hot water and/or steam.

The decontamination **area** will be lined with heavy-duty plastic sheeting and designed to promote surface runoff into a catch basin. The catch basin will be constructed of wood and lined with plastic to contain the waste/rinse water until it **can be containerized in 55-gallon drums**. **All** equipment will be cleaned on saw-horses or racks above the plastic sheeting. Decontamination fluid will be pumped from the catch basin in labeled 55-gallon DOT-approved storage drums. PWC will be responsible for transporting and disposing of drummed decontamination fluids **this** project generates. E/A&H anticipate the decontamination fluids **can be processed through NAS Pensacola's Industrial Wastewater Treatment Plant (IWTP)**.

The following procedures will be followed to **reduce the risk** of cross-contamination during decontamination. **A new pair** of disposable outer gloves will be donned before handling sampling equipment during decontamination. Only Teflon, **glass**, or stainless-steel spray bottles/pressurized containers will be used to apply decontamination **rinsates**.

[Bold items enclosed in brackets denote changes to the first draft of document.]

Non-sampling equipment such as the trackhoe will be decontaminated with high-pressure **steam**. If necessary, the equipment will be scrubbed with a **laboratory-grade** detergent and clean water wash **solution**. The equipment will be rinsed with clean water **as necessary**.

Sampling equipment to be decontaminated includes a hand auger, stainless-steel **bowls**, and utensils **used to** homogenize samples.

Equipment Decontamination:

1. **Don** protective gloves.
2. Wash and scrub equipment with a laboratory-grade detergent and clean water wash solution or decontaminate with high-pressure **steam**.
3. Rinse with clean water.
4. Rinse with **ASTM Type III** water.
5. **Rinse** twice with pesticide-grade isopropyl alcohol.
6. Rinse with **ASTM Type III** water.
7. Air dry.
8. Wrap in aluminum foil or plastic sheeting for storage if **the equipment is to be stored or transported**.

Personal decontamination procedures **are outlined** in the site-specific **HASP** in Appendix B.

4.7 Calibration Procedures and Frequency

The instrument(s) **used** for field parameters will be calibrated daily. Calibration and standardizing procedures are in Section 10 of the CSAP.

5.0 QUALITY ASSURANCE PLAN

The Quality Assurance Plan in Section 15 of the CSAP will be **used** during this removal action.

6.0 DATA MANAGEMENT PLAN

Data management includes documenting field activities, **validating analytical data, and preparing reports, and other data related to this project such as meeting summaries, telephone conversation logs, illustrations, computations, and engineering data.** Section 14 of the CSAP contains the data management guidelines to be followed during this project.

7.0 COMMUNITY RELATIONS PLAN

The Navy shall comply with the community relations **aspects** of this removal action as applicable. The designated spokesperson **shall be** the Public Affairs Officer for **NAS Pensacola, SOUTHNAVFACENGCOM,** with the assistance of and in **coordination** with **NAS Pensacola,** shall develop **and generate an Administrative Record (AR),** publish a notice of availability of the AR within 60 days of the **start** of this removal action. After providing a **45-day** comment period, a written **response** to significant comments for inclusion in the record will be generated.

8.0 SCHEDULE

E/A&H estimates the proposed removal action activities outlined in this document **can be performed** in approximately **14** weeks from authorization **to proceed.** An itemized time schedule is presented as Figure 8-1. **[The time schedule presented is an estimate of the duration of field activities. The May 1, 1994 start date may vary depending on the availability of PWC.]**

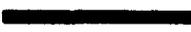
Figure 8-1

Removal Action Plan Site 39 NAS Pensacola

ID	Name	Duration	Scheduled Start	May					June				July				August					
				4/24	5/1	5/8	5/15	5/22	5/29	6/5	6/12	6/19	6/26	7/3	7/10	7/17	7/24	7/31	8/7	8/14	8/21	8/28
1	Mobilization/Meeting	1w	5/1/94 8:00am		■																	
2	Road/Staging Area Constructio	2w	5/8/94 8:00am			■	■															
3	Soil Excavation/Sampling	1w	5/22/94 8:00am					■														
4	Data Validation	5w	5/29/94 8:00am						■	■	■	■	■									
5	Disposal of Waste	1w	7/3/94 8:00am											■								
6	Clean Site	2w	7/10/94 8:00am												■	■						
7	Report Preparation	2w	7/24/94 8:00am														■	■				

Project:
Date: 3/2/94

Critical 
Noncritical 

Progress 
Milestone 

Summary 
Rolled Up 

9.0 REFERENCES

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U.S. Environmental Protection Agency. (1986a). *Test Methods for Evaluating Solid Waste, Volume 11, SW-846*. U.S. Environmental Protection Agency.

[Bold items enclosed in brackets denote changes to the first draft of document.]

10.0 FLORIDA PROFESSIONAL GEOLOGIST SEAL

I have read and approve of the Removal Action Work Plan for Site 39, **Oak** Grove Campground and *seal* it in accordance with Chapter 492 of the **Florida Statutes**. In sealing **this** document, I certify that the geological information contained in it is true **to** the best of **my** knowledge and that the geological methods and procedures included in **this** plan are consistent with currently accepted geological practices.

Name: Brian E. Caldwell
License Number: 1330
State: Florida
Expiration Date: July 31, 1996

B E Caldwell

Brian E. Caldwell

9-19-94

Date

Appendix A
Orientation Meeting Checklist/Acceptance Form

Appendix B
Site-Specific Health and Safety Plan

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List of Acronyms

The following list **contains** many of the **acronyms**, initials, abbreviations, and **units** of measure **used** in this report.

ACGIH	American Conference of Governmental Industrial Hygienists
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CHASP	Comprehensive Health and Safety Plan
CSAP	Comprehensive Sampling and Analysis Plan
DOD	Department of Defense
E/A&H	EnSafe/Allen & Hoshall
FDEP	Florida Department of Environmental Protection
HASP	Health and Safety Plan
IDLH	Immediately Dangerous to Life and Health
IWTP	Industrial Wastewater Treatment Plant
LEL	Lower Explosive Limit
mg/m ³	milligrams per cubic meter
MINIRAM	Respirable dust monitor
MSDS	Material Safety Data Sheets
NAS	Naval Air Station
NEESA	Naval Energy and Environmental Support Activity
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OU 10	Operable Unit 10
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	parts per million
PWC	Public Works Center
REL	Recommended Exposure Limit
SAP	Sampling and Analysis Plan
SPF	Sun Protection Factor
STEL	Short Term Exposure Limits
TCE	Trichloroethylene
TLV	Threshold Limit Value
vocs	Volatile Organic Compounds

1.0 INTRODUCTION

This Health and Safety Plan (**HASP**) is written for the removal **action** field operations to be conducted at Site 39 located at the Naval **Air Station (NAS)** Pensacola, Florida. This plan is to be used with the approved **NAS Pensacola Comprehensive Health and Safety Plan (CHASP)**. Copies of both plans should be on site during all field Operations. The Navy project contract number with EnSafe/Allen & Hoshall (**E/A&H**) is N62467-89-D-0318 CTO-072. The goal of the removal action is to mitigate potential **risk** to human health and the environment by removing and disposing of the contaminated **soils**.

Applicability

The provisions of **this plan** are mandatory for all **E/A&H** personnel, personnel under contract to **E/A&H**, Department of Defense (**DOD**) personnel, and **DOD** contractors and subcontractors engaged in the removal action **who will** be **exposed** or have the potential to be **exposed** to on site hazardous substances. **All** personnel **will** operate **in accordance** with the most current requirements of 29 **Code** of Federal Regulations (CFR) 1910.120, **Standards for Hazardous Waste Workers and Emergency Responders**. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or **safety** hazards: **training** as described in 120(e), medical surveillance **as** described in 120(f), and personal protective equipment described in 120(g). All field personnel assigned to field activities for the project must read **this plan** and sign the plan acceptance form before the **start** of site activities. At a **minimum**, all provisions of the **E/A&H** corporate health and safety plan **will be** followed.

E/A&H will suspend site work and **will** instruct personnel to evacuate the area under the following conditions: If inadequate safety precautions are taken by the subcontractor, visitors, or **NAS Pensacola Public Works Commission (PWC)** personnel and contractors/subcontractors, or **if** it is believed that the subcontractor, visitors, or **PWC** oversight personnel are or may be exposed to an immediate health **hazard**.

Health and **safety** training certificates for all **E/A&H** employees who Visit the **site** will be on file and available for review in the field trailer. Current Occupational **Safety** and Health Administration (**OSHA**) refresher training certificates **will** be available onsite for **all** employees involved in field activities whose refresher **course** requirements come up for **renewal** before the project **begins**. All subcontractors, Navy personnel, and any other site **visitors** must provide health and **safety** certification with appropriate refresher **course** documentation before site entry and comply with the health and safety requirements of **this HASP**.

At least one E/A&H employee certified in CPR and first aid will be onsite during all site activities.

2.0 SITE CHARACTERIZATION

2.1 Work Areas

See CHASP page 2-1.

2.2 Work Area Access

See CHASP page 2-2.

2.3 Site Map and Work Zones

A vicinity map (Figure 1-1) and a site map (Figure 1-2) showing the location of the **base area** and subject site, respectively, *can* be found in Section 1 of the work plan. **The exclusion area, decontamination comdor, and support area** location will be based on **existing** physical conditions such as location of utilities, roads, and site security **assets**.

2.4 Site Description

NAS Pensacola is located on the Gulf Coast lowlands of a **peninsula bounded** by Pensacola Bay to the south and **east** and Bayou Grande to the **north**. Site 39 is in the **southwestern** portion of **NAS Pensacola**, approximately **2,500** feet **south** of **Forrest** Sherman Field and **520** feet northwest

of the Pensacola Bay shoreline, as shown in Figure 1-1 of the Removal Action Work Plan. The site is a clearing with sandy soil covered by grass and brush which is surrounded by trees and is approximately 200 feet south of the Oak Grove trailer campground.

Site 39 consists of a circular area approximately 300 feet in diameter littered with broken brick, concrete, tile, glass, coal, and nails. Within this area lies a zone of darkly stained soil and stressed vegetation measuring approximately 60' x 80'. A lesser-stained area approximately 130' x 200' with sparse vegetation surrounds this area.

Little is known about the history of Site 39 and there are no records concerning the source(s) of the debris and stained soil at the site. At one time a boiler-powered sawmill was reportedly located in the vicinity of Site 39; however this fact could not be confirmed (Ecology & Environment [E&E 1992]). Mr. Ron Joyner, Facilities Management NAS Pensacola, stated that there had not been a sawmill at Site 39. Instead, the site was a disposal area for debris from the demolition of Building 29. Mr. Joyner said the stained area may have been caused by campers dumping used motor oil on the ground. Mr. Jim Tucker, caretaker for the Lighthouse Point Oak Grove Rental, stated railroad ties were possibly stockpiled at the site.

3.0 SITE ACTIVITIES

The following sections detail the activities to occur during the removal action.

- Plan field activities, review historical data, and schedule personnel and equipment.
- Review the applicable portions of the CHASP, this HASP, the Comprehensive Sampling and Analysis Plan (CSAP), and the site-specific Sampling and Analysis Plan (SAP) with field personnel.
- Construct a road, staging platform, and a bermed decontamination area.
- Excavate and containerize soil from Site 39.
- Collect up to five composite soil samples from the excavated area for analytical testing.
- Collect one composite soil sample from the backfill material for analytical testing.

- Backfill the excavated area and replant vegetation, if necessary.
- e Remove the temporary road and staging area.
- Assist PWC in coordinating waste disposal (soil and decontamination fluids) resulting from field activities.
- e Prepare a removal action section for the final RI report, summarizing field activities and the results of analytical testing of this IRA.

4.0 CHEMICAL HAZARDS

Previous sampling operations have shown potential for exposure to numerous chemicals. Table 4-1 lists exposure guidelines for expected site chemicals. Material Safety Data Sheets (MSDS) for these materials are available in Attachment A.

Table 4-1 Exposure Guidelines for Expected Site Chemical Hazards						
Chemical Name	Odor ^(a) Threshold (ppm)	OSHA PEL ^(b)	ACGIH TLV ^(c)	NIOSH REL ^(d)	Auto-ignition Temp. (°F)	Flammable range (% by volume)
Methanol	100 ppm	200 ppm 260 ppm STEL "Skin"	200 ppm 250 ppm STEL "Skin"	200 ppm 260 ppm STEL "Skin"	867	6.0 to 36.5%
Benzene	4.68 ppm	1 ppm 6 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm Potential Occupational Carcinogen	1096	1.3 to 7.1%
Ethylbenzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	860	1.0 to 6.7%
Tetrachloroethylene	N.A.	25 ppm	25 ppm 100 ppm STEL	Confirmed Human Carcinogen	N.A.	N.A.
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	996.5	1.3 to 7.1%
Xylene	N.A.	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	N.A.	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
- = 29 CFR 1910.1000, Table Z-1-A. Limits For Air Contaminants, as amended through 1/15/91.
- = 1990 - 1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH
- = NIOSH Pocket Guide to Chemical Hazards, June 1990.
- N.A. = Substance information not available, or substance unlisted.

5.0 OPERATIONS AND PHYSICAL HAZARDS

Heavy equipment operations (i.e., backhoe, **bulldozer**) will be conducted **in** accordance with the procedures outlined in the **NAS Pensacola CHASP Appendix B, *Drilling Safety Guide***. Operators of the heavy equipment will be responsible for the **contaminated soil** excavation. When **working** in areas that support habitat for poisonous **snakes**, personnel **must** wear protective chaps made of heavy material designed to prevent snake bites. **Additional care** should be taken to avoid **fire** ants. **Benadryl** will be provided in each first-aid kit for **fire** ant bites.

6.0 EMPLOYEE PROTECTION

See CHASP page 6-1.

6.1 Personal Protective Equipment (PPE)

Field activities which disturb soils will be initiated **in** modified Level **D protection**. Modified Level D protection consists of work coveralls (**full length sleeves and pants**), hard hat, appropriate chemical-resistant **latex** inner and nitrile outer gloves (vinyl and nitrile), eye protection, **ear** protection (where applicable), **snake** chaps (where applicable), and chemical-resistant, **steel-toed-and-shank** boots. **This** level of protection was **chosen because** the levels of contamination detected by previous studies were generally low and **free** product **has** not been detected. **Sunscreen with** a sun protection **factor (SPF) of 15 or greater** will also be provided.

During sampling activities, air **will be** monitored for volatile **organic** compounds (**VOCs**) and dust particle concentrations using continuous-reading instruments. **Based** on previous history, the most **contaminated** areas **will be identified before field activities begin**. The **initial screening** for **VOCs** of the contaminated **soil** excavation location **will be performed** using an photoionization detector (**PID**). **If VOCs are detected** during the excavation, a complete **scan** of the location using appropriate **colorimetric tubes** will be **performed to** determine the chemical constituents. From that point forward, a detectable level of **VOCs** in the breathing **zone** above background **will** result in a stand-down and initiation of **additional** monitoring of the breathing zone via colorimetric tubes. **Work will** not proceed until the breathing **zone** levels **or** until the chemical constituent is determined and appropriate PPE is assured. **Additional** PPE upgrades to Level **C** **will** be initiated **if** airborne concentrations exceed **5** ppm above the background concentrations in the breathing zone, or if concentrations of any **contaminant** exceeding **50** percent of the **OSHA** Permissible Exposure Limit (**PEL**) are encountered. **See** Table 6-1 for specific criteria for each level of protection.

Table 6-1 Level of Protection and Criteria		
Level of Protection	Criteria for Use	Equipment
Level A	<ul style="list-style-type: none"> • When atmospheres are "immediately dangerous to life and health" (IDLH in the NIOSH/OSHA Pocket Guide to Chemical Hazards or other guider.) • When known atmospheres or potential situations would affect the skin or eye or be absorbed into the body through these surfaces. Consult standard reference 6 to obtain concentrations hazardous to skin, eye or mucous membranes. • Potential situations include those where immersion may occur, vapors may be generated or splashing may occur through site activities. • Where atmospheres are oxygen deficient with the conditions above. • When the type(s) and or potential concentration of toxic substances are not known. 	<ul style="list-style-type: none"> • Positive pressure-demand full-facepiece, self-contained breathing apparatus or positive-pressure 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, work over fully encapsulating suit
Level B	<ul style="list-style-type: none"> • When work areas contain less than 19.5 percent oxygen • When vinyl chloride is present in the breathing zone 	<ul style="list-style-type: none"> • Chemical resistant cloth, long sleeves, hooded, one or two piece • Full-faced positive-pressure 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 with disposable outer boot covers
Level C	<ul style="list-style-type: none"> • When airborne dust particles warrant respiratory protection • When work areas contain at least 19.5 percent oxygen 	<ul style="list-style-type: none"> • Chemical resistant cloth, long sleeves, hood optional, one or two piece • Full-facepiece, air purifying respirator equipped with cartridges suitable for the hazard • Hard hat • Inner gloves and chemical resistant gloves • Steel-toe-and-shank boots • Coveralls and disposable outer boots

Table 6-1 Level of Protection and Criteria		
Level of Protection	Criteria for Use	Equipment
Level D	<ul style="list-style-type: none"> • When level B or C is not indicated • When airborne particles do not warrant respiratory protection • When work areas contain at least 19.5 percent oxygen 	<ul style="list-style-type: none"> • Inner gloves and chemical-resistant gloves needed to handle soil or water samples • Steel-toe-and-shank boots • Hard hat (ANSI 2891-1969 standard) • Eye protection (ANSI Z87.1-1968 standard) • Sunscreen (SPF 16 or greater) • Optional: coveralls and disposable outer boots

Not:

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

Contradictions 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 6 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.

Selection of Personal Protective Equipment

See CHASP page 6-6.

6.2 Air Monitoring

A **PID**, combustible **gas** indicator (CGI), and respirable dust **monitor** (MINIRAM) will be used to monitor **air** during **soil** excavation and removal. The **PID** will be field calibrated to measure VOCs relative to a 100 **ppm** isobutylene standard. The CGI will be field calibrated to measure flammable gases relative to a 23 percent **LEL** methane standard.

Background (ambient) PID and dust particle concentration readings **in the** breathing zone will be collected before each day's field activities **begin**. **PID**, CGI, and dust particle concentrations will be read continuously. These values will be recorded in the field logbook. The air monitoring measurements **will be posted** at the office trailer for personnel review.

Field technicians will be instructed to **report** any unusual **odors** or **soil** discolorations. Each instrument will be **calibrated** daily before site activities **begin** and checked for proper operation throughout the day. Before calibration, at the end of each work **day**, each instrument will be checked to ensure that it is free from surface contamination.

6.3 Procedures and Equipment for Extreme Weather Conditions

See CHASP page 6-8.

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 6.4) and seek immediate shelter.

6.4 Personal Decontamination

See CHASP page 6-11.

6.5 Work Limitations

See CHASP page 6-12.

6.6 Exposure Evaluation

See CHASP page 6-13.

7.0 MEDICAL MONITORING PROGRAM

See CHASP page 7-1.

8.0 AUTHORIZED PERSONNEL

See CHASP page 8-1.

9.0 EMERGENCY INFORMATION

See CHASP page 9-1.

9.1 Site Resources

Cellular telephones will be used for emergency use and communication/coordination with NAS Pensacola. A first-aid kit, eye-wash equipment, and copies of this ~~Health~~ and Safety Plan will be available at each work area.

9.2 Emergency Procedures

See CHASP page 9-2.

Additional information on appropriate chemical exposure treatment methods will be available at the work site through the MSDSs. Directions to the nearest medical facility capable of providing

general emergency medical assistance and treat chemical burns are provided in Attachment B of this HASP .

10.0 FORMS

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

- e Plan Acceptance Form
- e Plan Feedback Form
- Exposure History Form

The Plan Acceptance Form will be filed out by all employees working on the site before site activities begin. The Plan Feedback Form will be filled out by the Site ~~Health~~ and Safety Officer and any other on-site 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. 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 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 1351.4 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-BUTYLACETATE=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 STATES 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 -----

TLV list "Threshold Limit Values for 1992-1993"

- California Assembly Bill 1803 Well Monitoring Chemicals.
- Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part 11, 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 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 [100-41-41
- 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
- RCRA 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)
- 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

IDLH: 2000PPM

NIOSH REL:

ACGIH TLV: TLV = 100ppm(435 mg/M3)
ACGIH STEL: STEL = 125 ppm(545 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 (7-20Dpreg) 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)

11. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name .. Ethylbenzene
CASRN .. 100-41-4
Last Revised .. 08/01/91

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 -- 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 (CARCINOGENICITYASSESSMENT)

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 (CARCINOGENICITYASSESSMENT)

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 (gasmask) 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 (gasmask) 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

ERG90

* POTENTIAL HAZARDS *

GUIDE 26

*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.

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 CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. If water pollution occurs, notify the appropriate authorities.

***FIRE**

Small Fires: Dry chemical, CO₂ or Halon, water spray or alcohol-resistant foam.

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 vapors; 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, 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
 NAME: XYLENE
 SYNONYMS: XYLENE (XYLOL); XYLOL; METHYL TOLUENE; BENZENE, DIMETHYL-;
 DIMETHYLBENZENE; NCI-C55232; VIOLET 3; XYLOL (DOT); SOLCAL
 CAS: AQUATIC SOLVENT 3501
 FORMULA: C8H10
 WLN: 1R X1
 CHEMICAL CLASS: Aromatic hydrocarbon

LAST UPDATE OF THIS RECORD: 06/03/93

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 1357.6-1475.6 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
P--king group: 11
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 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.

LISTED IN SARA Sect 313: Yes
de minimus CONCENTRATION: 1.0 percent

UNITED STATES 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"
 Californi Assembly Bill 1803 Well Monitoring Chemicals.
 an Air Act Section 111 List.
 an 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 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(435 mg/M3)
 ACGIH STEL: STEL = 150 ppm(655 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 listed
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

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:2000 mg/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**) ATSDG 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 (1-21Dpreg) 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 (7-15Dpreg) 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 (6-15Dpreg) 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 (6-15Dpreg) JTEHD6 9,97,82

EFFECTS ON FERTILITY

Post-implantation mortality

ihl-mus TCLo:4000 ppm/6H (6-12Dpreg) TJADAB 28,22A,83

EFFECTS ON NEWBORN

Growth statistics(e.g.,reduced weight gain)

EFFECTS ON NEWBORN

Physical

ihl-mus TCLo:2000 ppm/6H (6-12Dpreg) TJADAB 28,22A,83

EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1 gm/m³/12H (6-15Dpreg) 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 (7-20Dpreg) 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)

11. 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.

11.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

11.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.

11.A.2. HUMAN CARCINOGENICITY DATA

None.

11.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* (Florinet 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. 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

LEAK 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 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 direction if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. 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 of 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 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	1588.6 F
CRITICAL TEMP:	562.1 K	288.95 C	552.11 F
CRITICAL PRESS:	4.89 kN/M ²	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
 : 7.1 %
 LEL: 1.3 %
 IONIZATION POTENTIAL (eV): 9.25
 VAPOR DENSITY: 2.77 (air=1)
 EVAPORATION RATE: 3.50 (n-BUTYLACETATE=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
% ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27

Identification number: UN1114
DOT shipping name: Benzene

(after shipping description):

Packing group: 11
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 STATES 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.
California Proposition 65 Carcinogen List
Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part 11, 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 TSCA Chemical Inventory List 1986
6 TSCA Chemical Inventory List 1989
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 (3,000ppm 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.

CARCINOGEN?:
REFERENCES:

Y STATUS: See below

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 suspected
carcinogen, based on either
limited epidemiological evidence or
demonstration of carcinogenicity
in experimental animals.
, 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

IRITATION 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 (7-14Dpreg) 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 (7-14Dpreg) 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 (6-15Dpreg) 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 (6-15Dpreg) 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 (6-15Dpreg) 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 mortality

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

Hepatobiliary 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 (12-13Dpreg) 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 (13-16Dpreg) 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 (7-20Dpreg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON FERTILITY
Abortion
EFFECTS ON EMBRYO OR FETUS
Fetal death

California Prop 65: 02/27/87 on list as CARCINOGEN
No significant risk level 7 ug/day

----- EPA's IRIS DATA SUMMARY -----
Benzene; CASRN 71-43-2 (04/01/92)

11. 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 9.7 years (1-15 year range) and mean age was 34.2 years. Peak exposure 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). In his earlier study, cumulative exposure was derived from historic air-sampling data or interpolated estimates based on existing data. Standardized mortality rates ranged from 109 at cumulative benzene exposures under 40 ppm-years and increased monotonically 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 categorized 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 neoplastic 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 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 in *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

11.8.2. 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 -- $3.3E-6$ 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.

@I .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 (Corvallis, 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.

Move 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

ERG90

* POTENTIAL HAZARDS *

GUIDE 27

*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 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 direction if tank, rail car or tank truck is involved in fire.
CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. 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 of 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** **1488.2 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**
 VAPOR: **7.1 %**
 LIQUID: **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
Shipping name: Toluene
Hazard class: 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

Hazard 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.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES 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.

----- 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 Ingredient Disclosure List. **20/01/88** Canada Gazette part 11, 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 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)

3 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 drunkenness 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 are 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: 100 ppm
380 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.
Risk of damage to the developing embryo or fetus must be considered probable. Damage cannot be excluded even when the 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-hmn LDLo:50 mg/kg YAKUDS 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 (7-14Dpreg) FMORAO
28,286,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:800 mg/m3/6H (14-20Dpreg) 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 (6-15Dpreg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:15 gm/kg (6-15Dpreg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:30 gm/kg (6-15Dpreg) TJADAB 19,41A,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)

ihl-mus TCLo:500 mg/m3/24H (6-13Dpreg) TXCYAC 11,55,78
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1000 ppm/6H (2-17Dpreg) TJEMDR 7,265,82
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:400 ppm/7H (7-16Dpreg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
EFFECTS ON NEWBORN

ihl-mus TCLo:200 ppm/7H (7-16Dpreg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

ihl-rbt TCLo:1 gm/m3/24H (7-20Dpreg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Abortion

ihl-rbt TDLo:100 ppm/6H (6-18Dpreg) ARTODN 66,373,92
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Cardiovascular(circulatory) system

California Prop 65: 01/01/91 on list as DEVELOPMENTAL toxin
Acceptable intake level 7000 ug/day

----- EPA's IRIS DATA SUMMARY -----

Toluene; CASRN 108-88-3 (04/01/92)

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 chromosomal 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.:
self-contained breathing apparatus with full facepiece and operated 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. Cover 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

ERG90

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.

*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 direction if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. 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 of 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 1611

LAST UPDATE OF THIS RECORD: 06/03/93

NAME: METHANOL
 SYNONYMS: ALCOOL METHYLIQUE (French); ALCOOL METILICO (Italian);
 CARBINOL; COLONIAL SPIRIT; COLUMBIAN SPIRIT; **COLUMBIAN**
 SPIRITS (DOT); METHANOL (DOT); METANOLO (Italian); METHYL
 ALCOHOL; METHYL ALCOHOL (DOT); METHYLOL; METHYLALKOHOL
 (German); METHYL HYDROXIDE; METYLOWY ALKOHOL (Polish);
 MONOHYDROXYMETHANE; PYROXYLIC SPIRIT; WOOD ALCOHOL; **WOOD**
 NAPHTHA; WOOD SPIRIT
 CAS: 67-56-1 RTECS: PC1400000
 FORMULA: CH40 MOL WT: 32.05
 WLN: Q1
 CHEMICAL CLASS: Alcohol

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: clear, colorless, flammable, poisonous liquid with
slight alcoholic odor

BOILING POINT:	337.65 K	64.5 C	148.1 F
MELTING POINT:	175.38 K	-97.8 C	-144 F
FLASH POINT:	288.65 K	15.5 C	59.9 F
① IGNITION:	737.15 K	464 C	1358.8 F
VAPOR PRESSURE:	92 mm @ 20 C		
UEL:	36.5%		
LEL:	6.0%		
IONIZATION POTENTIAL (eV):	10.84		
VAPOR DENSITY:	1.11 (air=1)		
EVAPORATION RATE:	2.10 (n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	0.792 20C		
DENSITY:	.7915 g/mL @ 20 C		
WATER SOLUBILITY:	MISCIBLE		
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): 100 ppm
 ODOR DESCRIPTION: faintly sweet; characteristic pungent
Source: CHRIS
 100 % ODOR DETECTION: No data

----- REGULATIONS -----

hazard class: 3 FLAMMABLE LIQUID
DOT guide: 28
Identification number: UN1230
DOT shipping name: Methanol, (or) methyl alcohol
Packing group: II
Label(s) required: FLAMMABLE LIQUID, POISON
Special provisions: T8
Packaging exceptions: 173.None
Non bulk packaging: 173.202
Bulk packaging: 173.242
Quantity limitations-
Passenger air/rail: 1 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions 40

STCC NUMBER: 4909230

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U154,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 STATES POSTAL SERVICE MAILABILITY:
Hazard class: Flammable liquid - Mailable as ORM-D
Mailability: Domestic service and air transportations
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 -----

ACGIH TLV list "Threshold Limit Values for 1992-1993"

California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part 11, 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 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)

METHANOL [67-56-1]

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.

OSHA Process Safety Rule chemical with a TQ. Effective May 26, 1992

Pennsylvania Hazardous Substance List

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)

TSCA Chemical Hazard Information Profile (CHIP) available - dated 07/11/77

Washington State Discarded Chemical Products List, November 17, 1989

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

SHORT TERM TOXICITY: INHALATION: below 500 ppm symptoms are rarely felt. can cause headache, vomiting, irritation of the nose and throat, dilation of the pupils, feeling of intoxication, loss of muscle coordination, excessive sweating, bronchitis and convulsions. very high exposures may result in stupor, cramps and visual difficulties such as spotted vision, sensitivity to light, eye tenderness and blindness. recovery is not always complete and symptoms may recur without additional exposure. SKIN: can cause dry and cracked skin, irritation and reddening. skin absorption can be enough to contribute to symptoms described under inhalation. Eyes: can cause irritation of eye. INGESTION: symptoms are similar to those under inhalation, plus damage to liver, kidneys and heart. nerve damage may occur causing loss of coordination and blindness. recovery is not always complete. death may occur. usual fatal dose is about 100-250 ml. but death from ingestion has occurred from as little as 30 ml (about one ounce). (NYDH)

LONG TERM TOXICITY: exposure to low levels may cause many of the symptoms

listed above. because methyl alcohol is slowly eliminated from body, repeated low exposures may build up to high levels causing severe symptoms. recovery is not always complete. methanol has been found to cause changes in the genetic material of some test animals. whether it does in humans is unknown. (NYDH)

TARGET ORGANS: eyes, skin, CNS, gi

SYMPTOMS: Exposure to excessive vapor causes eye irritation, head-ache, fatigue and drowsiness. High concentrations can produce central nervous system depression and optic nerve damage. 50,000 ppm will probably cause death in 1 to 2 hrs. Can be absorbed through skin. Swallowing may cause death or eye damage. Source: CHRIS

CONC IDLH: 25000ppm

NIOSH REL: 200 ppm Time weighted averages for 8-hour exposure
262 mg/M3 Time weighted averages for 8-hour exposure
800 ppm Ceiling exposures which shall at no time be exceeded
1048 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 200ppm SKIN
ACGIH STEL: STEL = 250 ppm»SKIN

OSHA PEL: Transitional Limits:
PEL = 200 ppm (260mg/M3) (SKIN)
Final Rule Limits:
TWA = 200 ppm (260 mg/M3) (SKIN)
STEL = 250 ppm (325 mg/M3) (SKIN)

MAK INFORMATION: 200 ppm
260 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.
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)

orl-man LDLo:6422 mg/kg CMAJAX 128,14,83
BRAIN **AND** COVERINGS
Changes in circulation(hemorrhage,thrombosis,etc.)
LUNGS, THORAX, OR RESPIRATION
Dyspnea
GASTROINTESTINAL
Nausea or vomiting

orl-man TDLo:3429 mg/kg AMSVAZ 212,5,82
SENSE ORGANS
Eye
Visual field changes

orl-hmn LDLo:428 mg/kg NPIRI* 1,74,74
BEHAVIORAL
Headache
LUNGS, THORAX, OR RESPIRATION
Other changes

orl-hmn LDLo:143 mg/kg 34ZIAG -,382,69
SENSE ORGANS
Eye
Optic nerve neuropathy
LUNGS, THORAX, OR RESPIRATION
Dyspnea
GASTROINTESTINAL
Nausea or vomiting

orl-wmn TDLo:4 gm/kg AMSVAZ 212,5,82
SENSE ORGANS
Eye
Visual field changes
LUNGS, THORAX, OR RESPIRATION
Dyspnea
GASTROINTESTINAL
Nausea or vomiting

ihl-hmn TCLo:86000 mg/m3 AGGHAR 5,1,33
SENSE ORGANS
Eye
Lacrimation
LUNGS, THORAX, OR RESPIRATION
Cough
LUNGS, THORAX, OR RESPIRATION
Other changes

ihl-hmn TCLo:300 ppm NPIRI* 1,74,74
SENSE ORGANS
Eye
Visual field changes
BEHAVIORAL
Headache
LUNGS, THORAX, OR RESPIRATION

Other changes

LD50 value orl-rat LD50:5628 mg/ kg

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

orl-rat LD50:5628 mg/kg
ihl-rat LC50:64000 ppm/4H
ipr-rat LD50:7529 mg/kg
ivn-rat LD50:2131 mg/kg
orl-mus LD50:7300 mg/kg
ihl-mus LCLo:50 gm/m3/2H
ipr-mus LD50:10765 mg/kg
scu-mus LD50:9800 mg/kg
ivn-mus LD50:4710 mg/kg
orl-dog LDLo:7500 mg/kg
orl-mky LD50:7 gm/kg
ihl-mky LCLo:1000 ppm
skn-mky LDLo:393 mg/kg
ihl-cat LCLo:44 gm/m3/6H
ivn-cat LDLo:4641 mg/kg
orl-rbt LD50:14200 mg/kg
skn-rbt LD50:15800 mg/kg
ipr-rbt LD50:1826 mg/kg
ivn-rbt LD50:8907 mg/kg
ipr-gpg LD50:3556 mg/kg
ipr-ham LD50:8555 mg/kg
par-frg LDLo:59 gm/kg

IRITATION DATA: (Source: NIOSH RTECS 1992)

eye-hmn 5 ppm
skn-rbt 500 mg/24H MOD
eye-rbt 40 mg MOD

Reproductive toxicity (1992 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1992 RTECS)

orl-rat TDLo:7500 mg/kg (17-19D preg) TJADAB 33,259,86

EFFECTS ON NEWBORN

Behavioral

orl-rat TDLo:35295 mg/kg (1-15D preg) ONGZAC
22(1),71,91

EFFECTS ON FERTILITY

Female fertility index

EFFECTS ON FERTILITY

Pre-implantation mortality

EFFECTS ON FERTILITY

Post-implantation mortality

orl-rat TDLo:35295 mg/kg (1-15D preg) ONGZAC
22(1),71,91

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON NEWBORN

ihl-rat TCLo:20000 ppm/7H (1-22Dpreg) TJADAB
29(2),48A,84

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Cardiovascular (circulatory) system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

ihl-rat TCLo:20000 ppm/7H (7-15Dpreg) FAATDF 5,727,85

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Endocrine system

ihl-rat TCLo:10000 ppm/7H (7-15Dpreg) FAATDF 5,727,85

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-mus TCLo:1500 ppm/6H (7-9D preg) TOXID9 12,101,92

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Central nervous system

California Prop 65: Not listed

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

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

approved canister mask for high vapor concentrations; safety goggles;
rubber gloves.

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

FIRST AID SOURCE: CHRIS Manual 1991

Move victim from exposure and apply artificial respiration if breathing has ceased.

INGESTION: induce vomiting, then give 2 teaspoons of baking soda in glass of water; call a physician.

SKIN OR

EYES: flush with water for 15 min.

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. Remove and isolate contaminated clothing and shoes at the site. Keep victim quiet and maintain normal body temperature. Effects may be delayed; keep victim under observation.

..... 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: Methanol, [or] methyl alcohol

DOT ID NUMBER: UN1230

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* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Poisonous; may be fatal if inhaled, swallowed or absorbed through skin. Contact may cause burns to skin and eyes. Runoff from fire control or dilution water may cause pollution.

*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 and poison hazard indoors, outdoors, or in sewers. Runoff to sewer may create fire or explosion hazard.

* 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 chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection. Structural firefighter's protective clothing is not effective for these

materials.

Isolate for 1/2 mile in all directions if tank, rail car or tank truck is involved in fire.

CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE.

***FIRE**

Small Fires: Dry chemical, CO₂, water spray or alcohol-resistant foam.

Large Fires: Water spray, fog or alcohol-resistant foam.

Move container from fire area if you can do it without risk.

Dike fire-control water for later disposal; do not scatter the material.

Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks.

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.

Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire.

Do not touch or walk through spilled material; 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 container 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 skin or eyes with running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

Keep victim quiet and maintain normal body temperature.

Effects may be delayed; keep victim under observation.

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.

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 STATES 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.
California Proposition 65 Carcinogen 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
DOT Marine Pollutant. Proposed list. 57 FR 3854, Jan 31, 1992
EPA Carcinogen Assessment Group List
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 = 50ppm
ACGIH STEL: STEL = 200 ppm

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: Not listed
OSHA: Not listed

HUMAN 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: 04/01/88 on list as CARCINOGEN

No significant risk level 14 ug/day

----- EPA's IRIS DATA SUMMARY -----
Tetrachloroethylene; CASRN 127-18-4 (04/01/92)

_11. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name .. Tetrachloroethylene

CASRN -- 127-18-4

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 -----

DOT SHIPPING NAME: Tetrachloroethylene
ID NUMBER: UN1897

ERG90

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 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 CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE.
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.

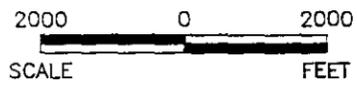
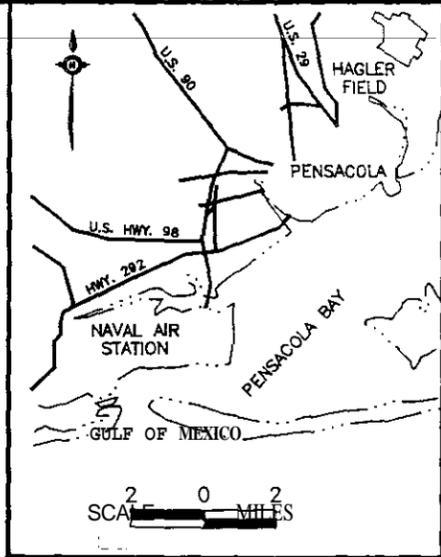
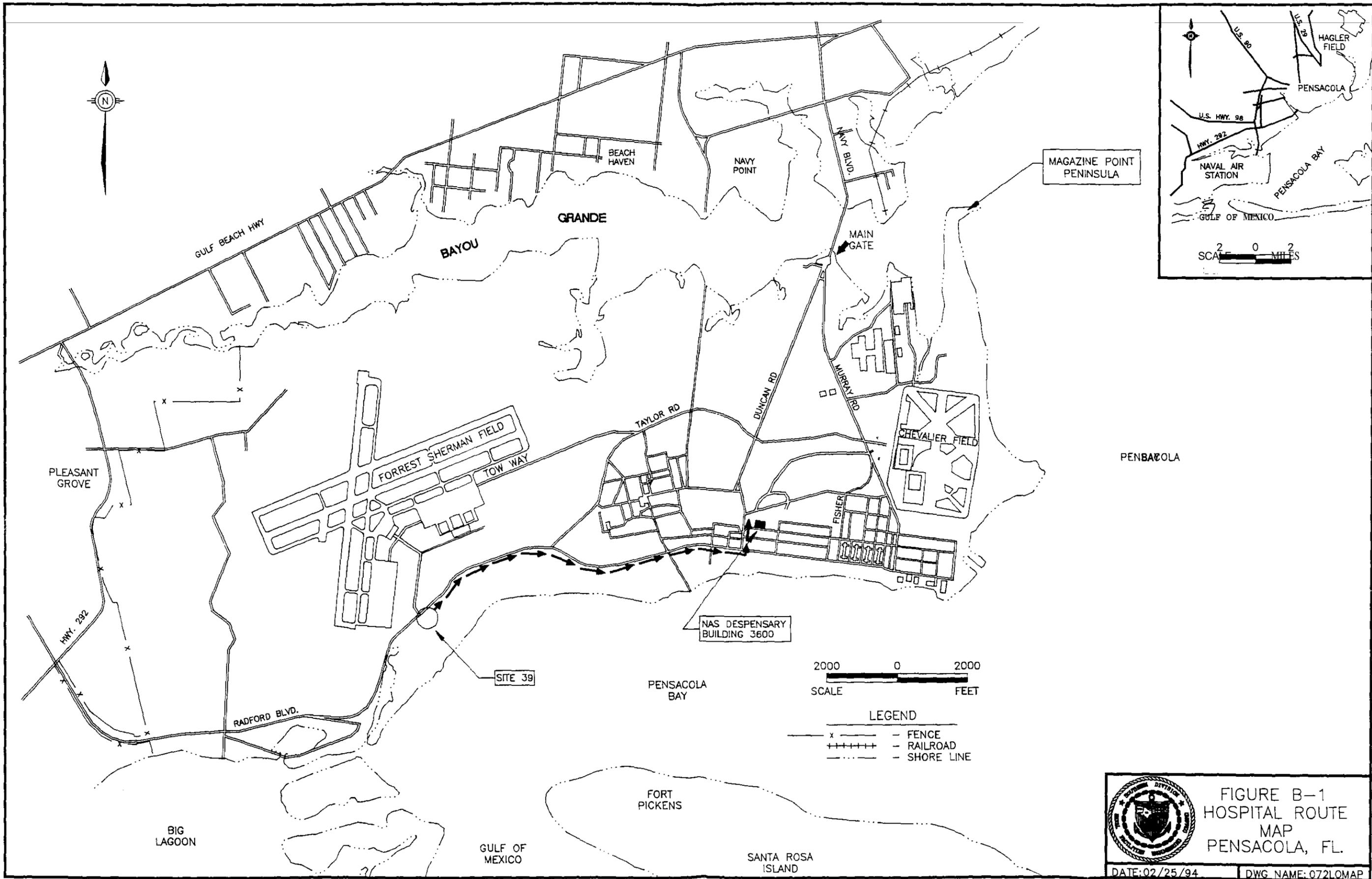
DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS 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 MEDICAL FACILITIES

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

The nearest hospital and the nearest facility capable of treating chemical burns are located in the NAS Pensacola Dispensary Building.

**Nearest Hospital
NAS Pensacola Dispensary Building
3600 Turner street
NAS Pensacola, Florida
Emergency Number: (904) 452-3333**



LEGEND

- x -	- FENCE
- + + + + + -	- RAILROAD
- - - - -	- SHORE LINE



**FIGURE B-1
HOSPITAL ROUTE
MAP
PENSACOLA, FL.**

DATE: 02/25/94 DWG NAME: 07210MAP

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: 00590030

Contract No: N62467-89-D-0318

Project: Removal Action — Site 39

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 Onsite: _____

Contaminants (Suspected/Reported):

(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions:
