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NAS CORPUS CHRISTI
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FACILITY INVESTIGATION WORK PLAN REVISION 1 NAS CORPUS CHRISTI TX
8/17/1992
ENSAFE

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**NAS CORPUS CHRISTI
FI WORK PLAN
REVISION: 01**

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1.0 INTRODUCTION

The following is a facility investigation work plan (FIWP) for the Naval Air Station (NAS) at Corpus Christi, Texas. This FIWP has been prepared by EnSafe/Allen & Hoshall under the direction of the Naval Facilities Engineering Command, Southern Division and references contract No. N62467-89-D-0318 dated December 21, 1990. This work plan summarizes the proposed investigations to delineate the extent of contamination at Solid Waste Management Units (SWMUs) #1, 3, and 4.

1.1 Facility Description and Project Background

NAS Corpus Christi is located approximately 3 miles south of Corpus Christi, Texas, within the Encinal Peninsula. A site vicinity map is included in Figure 1.1. The three sites included in this investigation are the Defense Property Disposal Office (DPDO) landfill (Site 1), the Corpus Christi Army Depot (CCAD) landfill (Site 3), and the Aircraft Fire Fighting Training area (Site 4). Historically Sites 1 and 3 have been used as liquid waste disposal facilities for organic solvents, sulfuric and hydrochloric acid, paint remover, and thinner. Estimated quantities of disposal reportedly ranged between 2,000 and 5,000 gallons per week. General solid/municipal waste generated by the CCAD and Corpus Christi NAS was also disposed of at these sites. Extensive investigations have been conducted on both of these sites with most emphasis on the CCAD landfill. A Preliminary Report has been submitted by EnSafe/Allen & Hoshall (dated June 26, 1992) with this work plan describing the current site conditions and details of previous investigations regarding releases of hazardous constituents.

The fire fighting training area (Site 4) is located immediately south of the CCAD landfill and overlying a once active non-hazardous waste landfill. Prior to 1973, this area was unlined and fuel was dispensed directly on the ground. A clay lined berm was constructed in 1973 and this site has remained active today. Previous investigations have not specifically addressed hazardous constituents at the fire fighting training area.

Figure 1.1 General Site Vicinity Map

1.2 Project Objectives

The objectives of this investigation are to determine the nature and extent of contaminants at the sites so that remedial alternatives can be developed. This will be accomplished by site-specific investigations which will be conducted for each individual site. The site investigations conducted at Sites 1 and 3 will concentrate on areas of the sites which have not been previously addressed.

2.0 SITE INVESTIGATIONS

The following sections describe the site-specific investigations that will be conducted to further determine the extent of hazardous constituents at the CCAD and DPDO landfills described previously in the Preliminary Report. The facility investigation will also include a soil and groundwater sampling plan of the Aircraft Fire Fighting Training area (Site 4), located immediately adjacent to the southern portion of Site 3. A map of the site showing all areas to be investigated can be found in Figure 2.1. Each site description (Sections 2.3 through 2.5) include brief details of the site layout, history, and a brief discussion of the approach and sampling rationale for characterizing the nature of contamination. Details regarding previous groundwater investigations at Sites 1 and 3 can be found in Section 4 of the Preliminary Report (EnSafe/Allen & Hoshall, 1992). Upon written approval of the Work Plan, field activities will proceed according to the schedule in Figure 2.2 and are further described below.

2.1 Groundwater Monitoring Plan

There are currently 27 monitoring wells at Sites 1 and 3. Groundwater investigations have shown low-level BNAs, VOCs, and metal concentrations throughout the surficial aquifer of Sites 1 and 3. Trace levels of PCBs have also been detected in isolated areas of both sites. Concentrations have been shown to be highest toward site centers and lessening or not detected near the landfill perimeters. All existing monitoring wells are screened within the surficial aquifer and vary in depth between 13 and 26 feet below grade. Recent groundwater sampling activities (Groundwater Sampling Report; EnSafe/Allen & Hoshall, July 1992), found VOC concentrations extensive across Sites 1 and 3, specifically benzene. Benzene isopach maps from past and recent groundwater sampling events are shown in Figures 2.3 and 2.4. Boring logs from previous groundwater investigations have shown laterally homogeneous soil types exist within and outside the landfill perimeters (shown in Figure 3.4) indicating the landfills are hydraulically connected with the surrounding areas. Figures 2.3 and 2.4 indicate benzene concentrations above the MCL are present outside the CCAD landfill perimeter.

Figure 2.1 Site Map, Well Locations — Current and Proposed

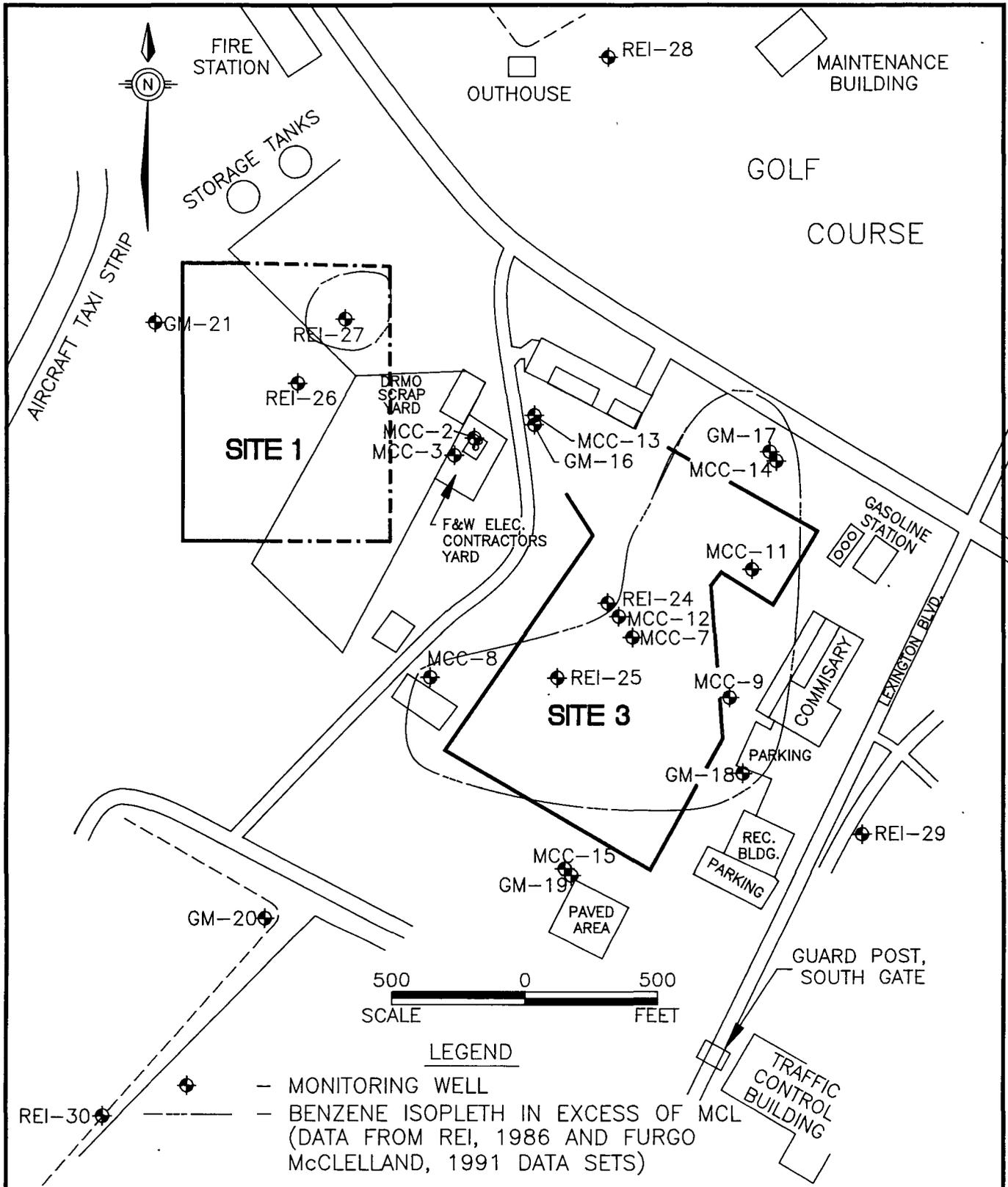
TASK	MONTHS FOLLOWING NOTICE TO PROCEED											
	1	2	3	4	5	6	7	8	9	10	11	12
ARRANGING SUBCONTRACTORS	■											
GEOPHYSICAL SURVEY		■										
DATA REDUCTION			■									
DRILLING/SOIL SAMPLING			■	■								
WELL DEVELOPMENT/ GROUNDWATER SAMPLING				■	■							
LABORATORY ANALYSIS					■	■						
REVIEW DATA/QAQC						■	■					
DRAFT REPORT							■	■	■			
DRAFT FINAL REPORT										■	■	
FINAL REPORT												■



FI WORKPLAN
NAVAL AIR STATION
CORPUS CHRISTI

FIGURE 2.2
FACILITY INVESTIGATION
SCHEDULE

DWG DATE: 08/11/92 | DWG NAME: 041SCHED



NOTE: WELL LOCATIONS ARE APPROXIMATE.

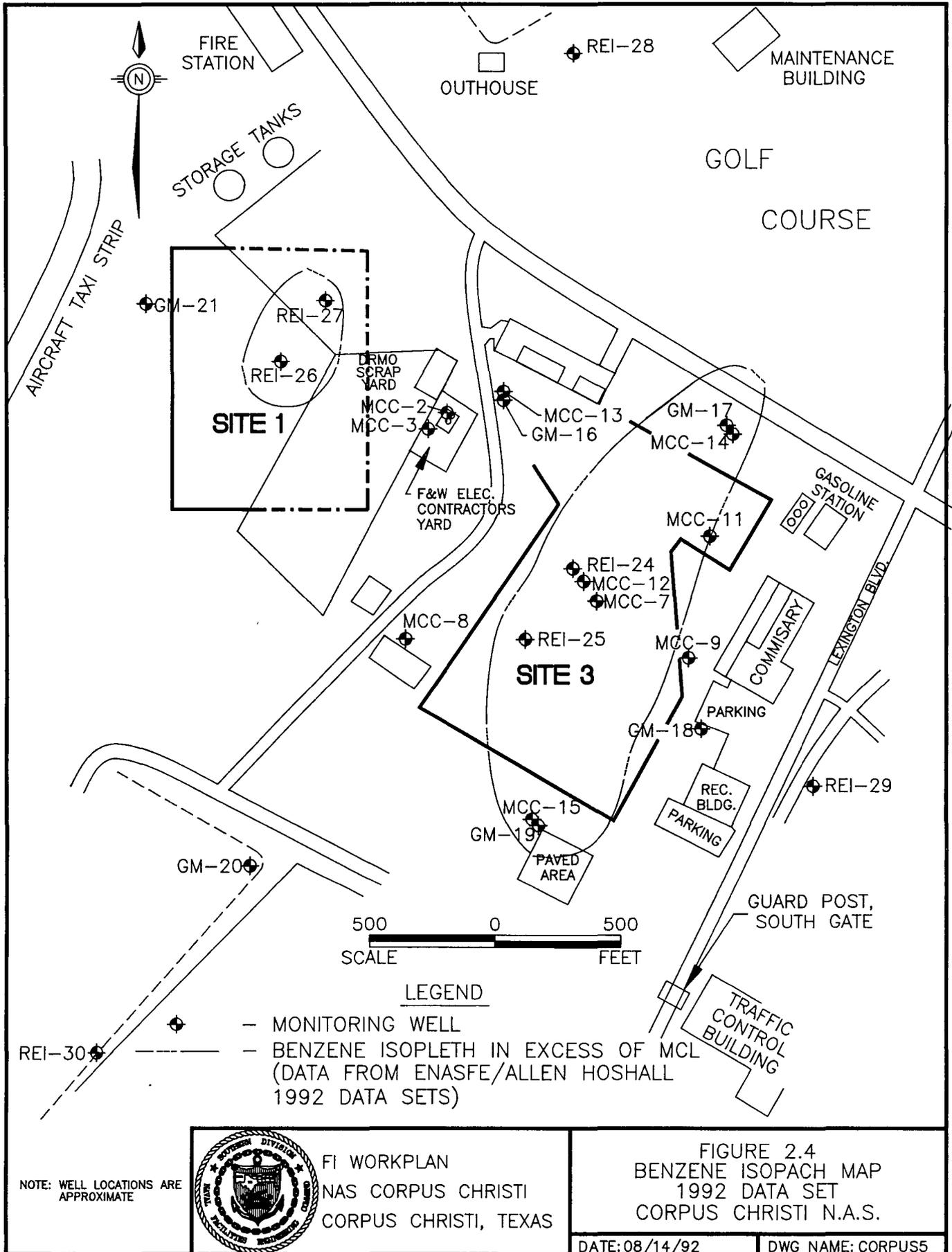


FI WORKPLAN
 NAS CORPUS CHRISTI
 CORPUS CHRISTI, TEXAS

FIGURE 2.3
 BENZENE ISOPACH MAP
 1986-1990 DATA SETS
 CORPUS CHRISTI N.A.S.

DATE: 08/14/92

DWG NAME: CORPUS4



NOTE: WELL LOCATIONS ARE APPROXIMATE



FI WORKPLAN
 NAS CORPUS CHRISTI
 CORPUS CHRISTI, TEXAS

FIGURE 2.4
 BENZENE ISOPACH MAP
 1992 DATA SET
 CORPUS CHRISTI N.A.S.

DATE: 08/14/92

DWG NAME: CORPUS5

The facility groundwater monitoring plan includes the installation of 11 additional monitoring wells screened into the surficial aquifer and six Type III monitoring wells (as described in Section 3.7 of this Work Plan) screened in the confined aquifer underlying Sites 1, 3, and 4. Two of the proposed 11 monitoring wells will be screened at the top of the clay confining unit in order to determine the absence or presence of any dense non-aqueous phase liquids (DNAPLs). The well locations will be placed in areas where past sampling episodes identified trace levels of vinyl chloride and trichloroethene (TCE) in the upper portion of the surficial aquifer. The remaining nine wells will screen the upper portion of the surficial aquifer in order to delineate the extent of leachate which has extended beyond the CCAD and DPDO landfill boundaries.

Following well installation, all newly constructed and current monitoring wells will be surveyed to determine casing elevations relative to horizontal and vertical data. Upon completion of the survey, groundwater level measurements will be taken at each well and the groundwater flow direction at each site will be determined and compared to previous data. The wells will be allowed to stabilize at least 72 hours after installation before samples are collected.

Prior to groundwater sampling, the presence of any DNAPLs will be further determined and measured with an oil-water interface probe. Five monitoring wells (REI-24, REI-26 through 29) currently exist within the CCAD and DPPO landfills with screened intervals extending near the top of the underlying aquitard. These wells in addition to the two proposed wells should provide an indication as to whether DNAPLs are present at the bottom of the surficial aquifer. If DNAPLs are detected at the bottom of the aquifer, an attempt will be made to sample them using a double check valve bailer. If significant DNAPL concentrations are detected in the proposed wells outlying the landfills, then the monitoring wells will be paired with a deeper monitoring well screened at the top of the aquitard.

A determination of the groundwater velocity will be conducted across the three sites. With the benefit of hydraulic conductivities previously calculated (REI, 1986) at the CCAD and DPPO landfills, and the hydraulic gradient which will be calculated during this investigation, the groundwater velocity will be determined across the three sites through the following method:

$$V = (K dh)/(n dl)$$

where V = groundwater velocity
K = hydraulic conductivity
dh/dl = hydraulic gradient
n = porosity

The location of existing monitoring wells and the proposed location of the additional monitoring wells, can be found on the site map in Figure 2.1. The criteria and justification for monitoring well locations at Sites 1, 3, and 4 will be described in more detail in Sections 2.3 through 2.5. A description of monitoring well installation procedures is discussed in Section 3.7 of this work plan.

2.2 Soil Sampling Plan

Subsurface soil samples collected at the DPDO and CCAD landfills identified minor to non-detectable VOC and BNA concentrations. The most significant soil contamination identified to date appears to be in the vicinity of monitoring well REI-24 (shown in Figure 2.1) where oil and grease concentrations of 27,000 mg/kg have been measured. A floating hydrocarbon layer was identified in this vicinity and a soil gas survey, calibrated to this floating hydrocarbon layer, found two soil gas plumes (Figure 4, Preliminary Report; Ensafe/Allen & Hoshall, June 1992), both within the CCAD landfill perimeter. Soil samples collected within the CCAD landfill were also analyzed for PCBs. No PCB concentrations were detected in the analyzed soil samples. Total metal concentrations, specifically lead and chromium, were detected within the clay layer

underlying the surficial aquifer. However, these metals were found to be non-leaching when the standard EP Toxicity Extraction was performed (REI, 1986).

The soil sampling plan for Sites 1 and 3 will not include any additional borings outside the proposed monitoring well borings. A detailed description of each sampling technique employed for this investigation is provided in Section 3.6 of this work plan. A minimum of one soil sample will be collected from each boring for laboratory analysis, unless otherwise warranted. A soil sample will be collected at the soil-water interface and from any samples exhibiting elevated organic vapor readings or other signs of contamination (discoloration, unusual odor, and staining). All samples will be collected in accordance with the outlined procedures unless unforeseen sight conditions warrant otherwise. Any variation will be properly noted in the dedicated field logbook. The soil sampling plan for Site 4 will be discussed in Section 2.5.

2.3 Site 3 — Corpus Christi Army Depot (CCAD) Landfill

The CCAD Landfill was reportedly active between 1960 and 1972. Remnants today of the former seepage pits and trenches used for disposal are seen in several NE-SW trending mounds within the landfill. A site map of the CCAD landfill is included in Figure 2.1. Sixteen monitoring wells are present at Site 3 and previous investigations found a floating petroleum hydrocarbon layer within the central portion of the site, specifically at monitoring wells REI-24 and MCC-12 (shown in Figure 2.1). Recent sampling activities (Groundwater Sampling Report; EnSafe/Allen & Hoshall, June 1992) found VOC concentrations most elevated in this vicinity as well, exceeding the applicable MCL in five monitoring wells. Previous studies also found PCBs in excess of the MCL (REI, 1986) in one monitoring well (REI-24). Total metal concentrations in excess of MCLs were found extensively throughout the site, largely aluminum, antimony, cadmium, iron, lead, and manganese. Elevated metal concentrations however, are believed to be attributed to excessive suspended solid content and are not representative of actual dissolved metal concentrations. Also detected were low BNA concentrations throughout the site;

however, measured concentrations have been below the applicable MCLs (Groundwater Sampling Report; Ensafe/Allen & Hoshall, June 1992). Compound-specific VOC and BNA contamination is significantly heterogeneous across Site 3 which may be attributed to the former disposal trenches being filled with a low permeable medium and in essence containing the liquid waste in the vicinity of the original pits.

Field work for this site will concentrate on the surficial aquifer in the outlying areas of the landfill and the underlying confined aquifer. Due to the variety of identified compounds within the landfill, soil and groundwater samples collected from this site will be analyzed for the following:

- PCBs
- Metals (Total and Filtered)
- Volatile Organic Compounds
- Base/Neutral/Acid Extractables

Analytical methodologies are listed in Table 3.1 of the quality assurance plan.

Groundwater

Considering the abundance of monitoring wells within Site 3, no additional monitoring wells are proposed for the actual landfill interior. However, because the unconfined aquifer appears hydraulically connected with areas outside the landfill, three monitoring wells installed into the surficial aquifer are proposed along the outer perimeter of the site where current well coverage is non-existent and the extent of groundwater contaminants has not been determined. Two shallow monitoring wells are proposed north and northeast of Site 3 and one monitoring well south of Site 3. A fourth monitoring well is proposed to be screened at the bottom of the surficial aquifer adjacent to MCC-9. Past sampling episodes (Furgo-McClelland, 1991) of this well identified vinyl chloride and TCE concentrations above the applicable MCL. All proposed

and existing monitoring wells within the CCAD landfill will be sampled. Proposed well locations are depicted in Figure 2.1.

Recent sampling of monitoring well MCC-15, located near the southern boundary of the landfill, found benzene concentrations above the applicable MCL in addition to aluminum, iron and manganese concentrations. Trace levels of BNAs were also detected in this well. Monitoring wells are currently present approximately 800 feet east (REI-29) and west (GM-20) of this well. No monitoring wells are located south of this well. Considering the current well coverage and the southeastward groundwater flow direction beneath this portion of the site, one monitoring well is proposed approximately 200 feet south of MCC-15.

Recent sampling of GM-17, located within the northern portion of the landfill, found benzene, aluminum, iron, and manganese concentrations above the applicable MCLs. Trace levels of BNAs were also detected in this monitoring well. The closest northernmost monitoring well is approximately 1200 feet northwest of GM-17 and a north-northeastward groundwater flow direction exists in this portion of the site. Monitoring wells are proposed approximately 300 feet north and northeast of GM-17. With the proposed monitoring wells and the benefit of the existing monitoring wells, the extent of contaminant leachate in the shallow aquifer outside the landfill should be well delineated. All Type II monitoring wells will be constructed as described in Section 3.7 of this work plan.

No previously reported investigations have addressed contamination in the confined aquifer beneath Site 3. Three deep monitoring wells are proposed at Site 3 to determine whether the underlying confined aquifer has been impacted. Considering the high volume of liquid waste reportedly disposed (2,000 to 5,000 gallons/week) at this site and the relatively low contaminant concentrations within the unconfined aquifer, assessment of the confined aquifer warrants further investigation.

To minimize the potential for cross contamination from the surficial aquifer, deep monitoring wells will be placed near the periphery of the site where groundwater contaminants are minimal or not present. One deep Type III monitoring well is proposed for the southernmost portion of Site 3, in the vicinity of monitoring well MCC-15. Additional deep monitoring wells are proposed off the southwest corner of Site 3 (adjacent to monitoring well MCC-8) and near the northeast portion of the landfill (adjacent to MCC-11). Details regarding construction of Type III monitoring wells are discussed in Section 3.7 of this work plan.

Soil

Soil samples will be collected from all soil borings made during the installation of the monitoring wells according to the procedures outlined in Section 3.6. A minimum of one soil sample will be collected from each monitoring well boring for laboratory analysis, unless otherwise warranted, as described in Section 2.2 of this work plan.

2.4 Site 1 — Defense Property Disposal Office (DPDO) Landfill

The DPDO landfill reportedly operated between 1949 and the early 1960s. Site 1 encompasses approximately 13 acres and is located 400 feet west-northwest of the CCAD landfill. A site map of the DPDO landfill is included in Figure 2.1. Releases to groundwater in the shallow aquifer of Site 1 have been confirmed in prior studies and recent sampling activities and are discussed in detail in Section 4 of the Preliminary Report and the Sampling Report prepared by EnSafe/Allen & Hoshall. Previous investigations at Site 1 identified the following constituents in groundwater exceeding the applicable MCLs: VOCs in three of six monitoring wells, PCBs in one well, and unfiltered metal concentrations in all wells. Trace levels of BNAs were also detected within the DPDO landfill.

Field work for this site will also concentrate on the surficial aquifer in the outlying areas of the landfill and the underlying confined aquifer. Soil and groundwater samples collected from this site will be analyzed for the following:

- PCBs
- Metals (Total and Filtered)
- Volatile Organic Compounds
- Base/Neutral/Acid Extractables

Groundwater

Proposed for the DPDO landfill (Site 1) are three additional shallow wells installed into the unconfined aquifer (north, south, and west of the landfill boundary), a fourth well screening the lower portion of the surficial aquifer, and three deep (Type III) monitoring wells installed into the confined aquifer. All proposed and existing monitoring wells within the DPDO landfill will be sampled. Proposed well locations for the landfill can be found on the site map in Figure 2.1.

Wells are currently located in the central portion of the landfill and along the eastern and western perimeters of the site. Groundwater recently sampled at monitoring well REI-26 had measurable benzene, aluminum, iron, and manganese concentrations above the applicable MCLs. The groundwater mounding effect beneath Site 3 results in a westward groundwater flow direction within this portion of the site. Currently there are no existing monitoring wells west of REI-26. Two shallow monitoring wells are proposed west and southwest approximately 400 feet from REI-26, just outside the landfill boundary. An additional monitoring well, located approximately 400 feet north of this well, is also proposed due to the lack of well coverage and the observed northwestward groundwater flow direction in this area. The proposed well locations in addition to the current well configuration should provide an accurate representation of the groundwater integrity surrounding the DPDO landfill.

The fourth shallow monitoring well is proposed adjacent to MCC-3 where recent sampling activities indicate the presence of TCE and vinyl chloride above the applicable MCLs. The intent of this well is to also determine the absence or presence of DNAPLs in this vicinity and the groundwater integrity within the lower portion of the surficial aquifer.

A Type III monitoring well is proposed adjacent to MCC-2, adjacent to the eastern portion of Site 1, and two Type III monitoring wells are proposed north and west of the site, paired with the proposed shallow monitoring wells in these areas. These locations have been chosen on the basis of either recent sampling activities which indicate no measurable contaminants above the MCL in the surficial aquifer or their locations fall on the perimeters of the landfill boundary where groundwater contaminants are suspected to be minimal. The Type III monitoring wells will be constructed according to the procedures discussed in Section 3.7. The proposed monitoring wells will be installed and sampled according to the same procedures discussed in Section 3.7 of this work plan.

Soil

Soil samples will be collected from all the soil borings made during the installation of the monitoring wells according to the procedures outlined in Section 3.6 of this work plan. A minimum of one soil sample will be collected from each monitoring well, unless otherwise warranted, as described in Section 2.2 of this work plan.

2.5 Site 4 — Aircraft Fire Fighting Training Area

The Aircraft Fire Fighting Training area is located adjacent to the southern portion of the CCAD landfill (Site 3) and is overlying a once active non-hazardous waste landfill. This area is reportedly active today as a fire fighting training area. A clay liner and berm were reportedly added in 1973, prior to which fuel was discharged directly on the ground. The major

contamination threat at this site is from hazardous materials spilled or deposited before being burned.

A geophysical survey consisting of a detailed electromagnetic (EM) conductivity and/or magnetometer survey will be conducted over the site prior to drilling activities. The objectives of the survey are to locate any buried disposal areas within the site which may compromise the safety of the field personnel or impede progress during drilling. Additional information which may be gathered from the survey (possible contaminant plumes, drums, etc.) will be utilized for optimal boring/monitoring well locations.

Soil and groundwater samples from this site will be analyzed for the following:

- Metals (Total and Filtered)
- Volatile Organic Compounds
- Base/Neutral/Acid Extractables

Groundwater

A hydrogeologic assessment of Site 4 will initially be conducted by installing three shallow groundwater monitoring wells around the fire fighting training area. Boring/monitoring well locations are subject to change pending the findings of the geophysical survey. The currently proposed boring and well locations can be found in Figure 2.1. If analytical results indicate that the fire training area has impacted the groundwater, the groundwater monitoring network will be expanded by installing additional wells outside the site. The number of additional wells will be sufficient to characterize the horizontal extent of contamination. The proposed monitoring wells will be installed and sampled according to the procedures discussed in Section 3.7 of this work plan.

Soils

Soil contamination resulting from activities at this site will be investigated by collecting shallow soil samples with a stainless steel auger device. The fire fighting training area will be divided into six equivalent sections. Within each section a random location will be chosen unless there is evidence of obvious surface contamination. In this case, the location will be situated within the contaminated area. From each sample location, three soil horizons will be sampled. The soil horizons are 0 to 12 inches, 12 to 24 inches, and 24 to 36 inches. Any soil samples collected with a 6-inch auger bucket will be composited into one sample. Two soil samples will be collected from each monitoring well boring for laboratory analysis. One soil sample will be collected from the sample exhibiting the most elevated organic vapor reading and an additional soil sample will be collected above the soil/water interface.

In order to collect soil samples, the integrity of the clay liner will have to be breached. After the samples have been collected, the auger holes will be filled with a bentonite seal consisting of bentonite pellets (0.25 inch to 0.50 inch). The bentonite seal will be allowed to hydrate with ASTM Type II water for at least 24 hours at which time a cement-bentonite plug will be set flush with the surface level.

If significant near-surface soil contamination is found in the sediments beneath the clay liner, the sampling grid will be expanded outside the fire training area to delineate the horizontal extent of contamination within the horizon that contamination is found. From this data, a concentration isopleth map can be drawn delineating the areal extent of contamination in the near surface soils that has resulted from activities at the site.

3.0 QUALITY ASSURANCE PLAN

This section describes project organization and objectives, functional activities and quality assurance and quality control measures intended to achieve data quality goals of the Facility Investigation to be performed by EnSafe/Allen & Hoshall at NAS Corpus Christi, Texas.

This document is intended to fulfill requirements for ensuring that all work be conducted in accordance with quality assurance/quality control protocols and field procedural protocols for environmental monitoring and measurement data as established in:

- *Standard Operating Procedures and Quality Assurance Manual*, February 1991 Environmental Compliance Branch, US EPA Region IV-ESD, Athens, Georgia 1991. (hereafter referred to as 'EPA SOP/QAM')
- Naval Energy and Environmental Support Activity (NEESA), 1988 *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*, (NEESA 20.2-047B). Port Hueneme, California.
- Naval Energy and Environmental Support Activity, 1985, *Ground-Water Monitoring Guide*, (NEESA 20.2-031A). Port Hueneme, California.
- Southern Division Naval Facilities Engineering Command (SOUTHDIV), 1989, *Guidelines for Groundwater Monitoring Well Installation*. Charleston, South Carolina.

These regulations are referenced in specific sections of this document (where applicable).

3.1 Project Organization and Responsibilities

Overall responsibility for projects conducted in accordance with NEESA regulations will be vested in NEESA (or its approved representatives). Therefore, project coordination responsibilities lie with the SOUTHDIV, engineer-in-charge (EIC). The following discussion describes the components of the project chain-of-command as established in NEESA 20.2-047B.

3.1.1 Oversight

Project oversight is organized along the following lines of authority.

3.1.2 Navy Energy and Environmental Support Activity (NEESA)

NEESA is responsible for ensuring that the quality of laboratory analyses performed during the various steps of CLEAN is acceptable. NEESA is also responsible for managing the NEESA Contract Representative (NCR).

3.1.3 Engineering Field Division

The EIC at the EFD provides the site information and history, provides logistical assistance, specifies the sites requiring investigation and reviews results and recommendations. Mr. Ed Lohr, SOUTHDIV, Naval Facilities Engineering Command, Charleston, South Carolina, serves as the EIC for this project. The EIC is responsible for coordinating procurement, finance, and reporting; for ensuring that all documents are reviewed by the NCR; for communicating comments from the NCR and other technical reviewers to the subcontractors; and for ensuring that the subcontractors address all the comments submitted and take appropriate corrective actions.

3.1.4 NEESA Contract Representative

The NCR is responsible for ensuring that each project has the appropriate overall QA. The NCR reviews laboratory QA plans and work plans, submits performance sample data, provides

field and laboratory audits, and reviews data from the site. The questions from subcontractors and the EIC regarding specific field and laboratory QC practices are directed to the NCR. The NCR also provides evaluation of referee samples. The NCR for this project will be determined prior to initialization of the field investigation.

3.1.5 State or Local Oversight

This work plan will be submitted to the TWC and EPA Region VI for review and approval. Field activities and meetings will be coordinated with these agencies as required.

3.2 Project Quality Assurance Objectives

In general, quality assurance objectives of the project are to assess and document the precision, accuracy, representativeness, completeness, and comparability of all sampling and analysis performed. Quality criteria are set herein to assure suitability for the intended use of data obtained during the project. The following discussion presents the project-specific level of effort for Quality Assurance (QA) and data quality objectives.

QA objectives of analytical parameters for soil and groundwater will be as stipulated in the respective analytical methods, and as determined by the analytical laboratories historical data quality evaluation for these methods. The laboratory selection process will ensure that laboratory method QA/QC standards are appropriate to meet goals for the intended data uses. Upon selection of the contract laboratory for this activity, the laboratory's QAP will be submitted for inclusion as Appendix A. The analytical data obtained from this investigation will be used to determine the extent of various constituents in the soil and groundwater at Sites 1,3 and 4 of NAS Corpus Christi. The following sections will discuss the quality assurance objectives specific to this project and its goals.

3.2.1 Precision and Accuracy

Quality assurance precision and accuracy goals for analytical methods are presented in Table 3.1 and are discussed in Section 3.14. Methods of assessing precision and accuracy of the field measurements are presented in Table 3.2 and discussed in Section 3.14 of this document.

3.2.2 Representativeness

The goal of this inspection is to assess the extent of soil, sediment and groundwater contamination, if any, and to determine the most appropriate remedial option. By properly collecting soil and groundwater monitoring well samples, and measuring well parameters in accordance with EPA SOP/QAM protocol; the samples collected during the facility investigations will be representative of the areas of concern.

3.2.3 Completeness

Completeness goals of field measurements reflect the ability to resample all existing and planned wells, and subsequent sample collection for groundwater quality criteria defined in the QA Plan (QAP). The completeness goals do take into consideration unavoidable non-attainment of QA goals which may occur over the course of the investigation. Efforts will be made, however, to maintain soil, sediment and groundwater data completeness levels above the 90 percent level, when possible.

3.2.4 Comparability

Comparability is assured through the use by field technicians and the laboratory of established methods of sampling and analysis as specified in the EPA SOP/QAM as well as other accepted guidance documents. These methods are discussed in the project work plan as specified.

**TABLE 3.1
 ANALYTICAL QUALITY ASSURANCE GOALS**

Measurement Parameter	References	Matrix	Precision* (%)	Accuracy* % Recovery	Completeness (%)
Volatile Organic Compounds	CLP	Soil	± 35	± 40	90
		Water	± 25	± 40	90
Semivolatile Organic Compounds	CLP	Soil	± 35	± 40	90
		Water	± 25	± 40	90
PCBs	CLP	Soil	± 35	± 40	90
		Water	± 25	± 40	90
Total Petroleum Hydrocarbons	EPA Method 418.1	Soil	± 35	± 55	90
		Water	± 35	± 55	90
Volatile Organic Compound (Methyl-tertbutyl ether)	EPA Method 8010/8020	Soil	± 35	± 50	90
		Water	± 35	± 50	90
Total Metals	CLP	Soil	± 35	± 45	90
		Water	± 35	± 55	90

Notes:

- * - Precision and accuracy goals are subject to change based upon specific method data history for the analytical laboratory chosen.

TABLE 3.2 FIELD MEASUREMENTS					
Measurements Parameter	Reference	Matrix	Precision (%)	Accuracy % Recovery	Completeness (%)
pH	EPA 150.1 ^a	Water	± 0.05 pH	± 0.2 pH	90
Temperature	EPA 170.1 ^a	Water	± 0.1° C	± 0.2° C	90
Specific Conductivity	EPA 120.1 ^a	Water	± 10%	± 10µmhos/cm (< 1000µmhos/cm) ± 100µmhos/cm (> 1000µmhos/cm)	90
Static Water Level	SOP ^b	Water	± 0.01 in.	± 0.005 in.	90
PID/OVA	SOP ^c	Air	± 10 ppm	± 20 ppm	90
Well Survey Points	SOP ^d	Spatial	± 5%	± 0.1 feet	90
	SOP ^d	Vertical	± 0.05 feet	± 0.01 feet	90

Notes:

- ^a - Methods for Chemical Analysis of Water and Wastes, EPA-600/4/79-020, Revised March 1983.
 - ^b - Manufacturer's SOP for static water level measurement.
 - ^c - Manufacturer's SOP for operation of Photovac TIP II or HNu.
 - ^d - Standard Land Surveying Methods as employed by a State of Texas Registered Land Surveyor.
- OVA = Organic Vapor Analyzer
 PID = Photoionization Detector

3.3 Field Measurements

QA objectives for parameters to be measured in the field by sampling personnel are presented in Table 3.2. Field measurements will include pH, temperature, specific conductance, static groundwater level, well survey points and organic vapor analyzer (OVA)/photoionization detector (PID) readings in accordance with the Environmental Compliance Branch, *Standard Operating Procedures and Quality Assurance Manual's* Section 6.3 — Specific Quality Control Procedures.

3.4 Investigation Performance

The following individuals or firms will be responsible for the implementation of all work plan activities.

3.4.1 Engineering Subcontractor

EnSafe/Allen & Hoshall will serve as the engineering subcontractor for this project. As the engineering subcontractor, EnSafe/Allen & Hoshall is responsible for designing and implementing all pertaining FI activities.

3.4.2 Analytical Laboratory

The analytical laboratory (or laboratories) will be employed by EnSafe/Allen & Hoshall and must adhere to the laboratory requirements as specified in NEESA 20.2-047B and/or other QA and method requirements as specified. The laboratories are required to prepare and submit a laboratory Quality Assurance Plan, to analyze and submit the results of proficiency testing, to submit to an onsite inspection, and to correct any deficiencies cited during the inspection.

The laboratories are required to identify a laboratory QA coordinator (LQAC) responsible for overall quality assurance. The LQACs must not be responsible for schedule, costs, or personnel other than QA assistants. It is preferred that the LQACs report to the laboratory director. The

LQACs must have the authority to stop work on projects if QC problems arise which affect the quality of the data produced.

In addition to conforming to all NEESA regulations, all work shall be performed in a manner consistent with:

- The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended.
- The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Title 40 Code of Federal Regulations (CFR), Part 300, as amended.
- Other appropriate federal, state, and local guidelines, rules, regulations, and criteria (where applicable).

3.5 Sampling and Analysis for Contamination Levels

The general sampling procedures are as described in the following sections of this document. The proposed sampling locations were chosen from available historical data, to be representative of the on-site contamination areas. The locations of the soil borings and monitoring wells are also designed to furnish a determination of the extent of any contamination plumes onsite. The proposed field sampling plan (FSP) is based upon available information obtained from the previous investigations at the facility.

The purpose of the FSP is to outline a feasible means of sample collection for analysis. The FSP was written partially based on the following objectives:

- To determine the lateral extent of contamination in the surficial aquifer previously identified at Sites 1 and 3, and determine whether contamination is present in the underlying confined aquifer.

- Additionally, to collect sufficient data related to the soils and hydrogeology characteristics on the facility to assess the mobility, routes, receptors and impact of any contamination.
- To collect sufficient information on possible and feasible remedial alternatives.

3.6 Soil Sampling and Quality Assurance Considerations

During the FI, soil samples will be collected for chemical analysis from a number of areas at NAS Corpus Christi. Collection of soil/sludge samples will be accomplished by a variety of methods including soil test borings, hand auger borings and monitoring well borings. Variations in the protocols may be necessary due to site conditions.

Soil borings will be used to collect subsurface samples which are deep (usually deeper than 3 to 5 feet) or where conditions prevent the use of a hand auger. Each boring will be installed using hollow-stem auger techniques. Soil specimens will be collected ahead of the augers by use of a decontaminated standard 2-inch by 24-inch split spoon sampler. The device is lowered through the center of the hollow-stem auger or down the drill hole. At the desired sampling depth, a standard 140-pound hammer is dropped over a length of 30 inches to drive the split spoon a distance of 18 to 24 inches. The split spoon may also be pushed hydraulically, where soil density will allow. The spoon is then removed from the hole, detached from the drilling rod and carefully opened by the site geologist.

No soil boring will extend beyond the saturated zone unless the boring is to be converted to a monitoring well. Boreholes extended beyond the surficial aquifer will have sampling proceed continuously to a depth of 20 feet, followed with 5-foot sampling intervals until the terminal depth of the boring is reached. Data from previous investigations indicate that the top of the

uppermost aquifer is less than 4 feet below the existing grade, (Resource Engineers Inc., 1986; Geraghty and Miller Inc., 1985). Depth to the confined aquifer is not known at this time.

All collected soil samples will be screened with an OVA/PID after collection from the sampler. If a sample segment is detected with a high volatile measurement, the sample will be submitted for volatile organics analysis (VOAs). Otherwise, only one lot of samples from the soil/water interface per boring will be collected for all analytical parameters. Samples for VOAs are to be extracted first and immediately from the sampling device and placed into the appropriate containers. The remaining sample will be placed in a stainless steel mixing bowl and homogenized using a stainless steel spoon or spatula. Sample aliquots will be obtained from the homogenized soil/sludge and contained for all other required analytical parameters. Refer to Section 3.10 for the recommended container and preservation requirements.

Individual soil samples will be monitored using the headspace technique to assist in locating contaminated zones or areas. The headspace screening process will involve the placement of a representative soil sample into a container (approximately three-quarters full). The container will be covered and the sample allowed to reach ambient temperature. With the tip of the instrument probe, the resultant meter readings will be taken and noted in the field logbook. Every possible effort will be made to minimize vapor loss from the container during the headspace OVA/PID measurements. (Note: during the drilling operations, an OVA or PID will be used to monitor organic vapors in the breathing zone and near the auger cuttings).

Additional samples will be collected for laboratory analysis when at least one of the following conditions exist:

- Visual changes in soil lithology are observed or evidence of soil contamination is present.

- When an OVA/PID measurement exceeds a concentration above background levels (for additional volatile samples only).
- Or where site history indicates the probable existence of some non-volatile contamination.

All field observations and soil descriptions are to be entered into a dedicated field logbook and a boring log with indelible black ink. Soil descriptions are to include color, texture, grain size, staining, odor and will be documented in accordance with the Unified Soil Classification System. An example of the boring log to be used for this project is illustrated in Figure 3.1. Soil borings which are not converted to monitoring wells will be immediately backfilled with a cement-bentonite grout mixture consisting of one 95-lbs bag of Portland Type I cement mix and 3 to 4 percent of pure bentonite powder (percent by weight) per 7 gallons of water. The procedure will be accomplished by pumping the mixture through a tremie pipe starting at the bottom of the boring. Grouting will proceed from the bottom of the boring to the surface in one continuous operation.

3.7 Groundwater Sampling & Quality Assurance Considerations

Groundwater samples will be collected from monitoring wells in accordance with the NEESA *Ground-Water Monitoring Guide*, (20.2-031A) Chapter 7 — Groundwater Sampling. Every possible effort will be made to begin well sampling at a site with either the upgradient (clean) well or wells which are known or believed to be clean. Sampling will then proceed to wells of assumed increasing contamination, ending with the well of highest assumed contamination. This procedure will help to minimize the potential for cross contamination of wells, especially false positives in clean wells due to insufficient decontamination of field sampling equipment. Also prior to contact of any samples and/or sampling equipment, disposable latex gloves will be worn and a new pair of disposable gloves will be donned prior to each sampling activity.



FIGURE 3.1
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JOB NO.	CLIENT	LOCATION
DRILLING METHOD:		BORING NO.
SAMPLING METHOD:		SHEET OF

DRILLING CONTR _____

BY _____
 DATE _____

CHK BY _____

LOCATION OF BORING							DRILLING	
DATUM							START TIME	
ELEVATION							FINISH TIME	
							DATE	
							DATE	
							CASING DEPTH	
							SURFACE CONDITIONS:	
SAMPLER TYPE	INCHES DRIVEN INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. DEPTH	BLOWS/FT SAMPLER	VAPOR CONCENTRATIONS (PPM)	DEPTH IN FEET	SOIL GRAPH	
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

Well Installation:

Each monitoring well will be drilled using a 4.25 to 10.25-inch inner diameter hollow stem augers utilizing the techniques described above for soil borings. The total depth of each well will vary depending on site conditions. Nine of the proposed 11 monitoring wells will be screened from approximately 2 feet above the water table to 8 feet below. These wells will typically include a 10-foot, 2-inch ID, schedule 40 PVC screen attached to a corresponding section of schedule 40 PVC riser. The pipe and screen will be inserted through the auger to the prescribed depth. Wells screening the lower portion of the surficial aquifer will be constructed of the same materials and will include a 5-foot screened interval and the corresponding section will be riser. Filter pack of silica sand will be installed 2 feet above the screened interval. Once the sand is emplaced, a minimum of a 2-foot bentonite pellet seal will be placed above the sand pack. The hydration time for the bentonite seal will be a minimum of two hours or meet the manufacturer's specifications. Both the sand pack and bentonite seal will be installed in increments of 2 feet or less, with the augers withdrawn in similar increments. Following installation of the bentonite seal, the augers will be withdrawn and the remaining annular space will be grouted using a 5 percent \pm 1 percent, bentonite and neat cement mixture.

Figure 3.2 illustrates a lithologic cross-section of the sediments beneath NAS Corpus Christi along lines A-A' and B-B' delineated on the site map. Figure 3.2 is an approximation of the lithologic sequence below NAS Corpus Christi based on information collected from previous investigations (Resource Engineers Inc., 1986). Figure 3.2 also depicts the approximate locations of Sites 1, 3 and 4 with relation to the surface plot. It should be noted that all monitoring wells are screened in the uppermost surficial aquifer and a confining clay unit (Beaumont Formation) appears to underlie Sites 1, 3 and 4.

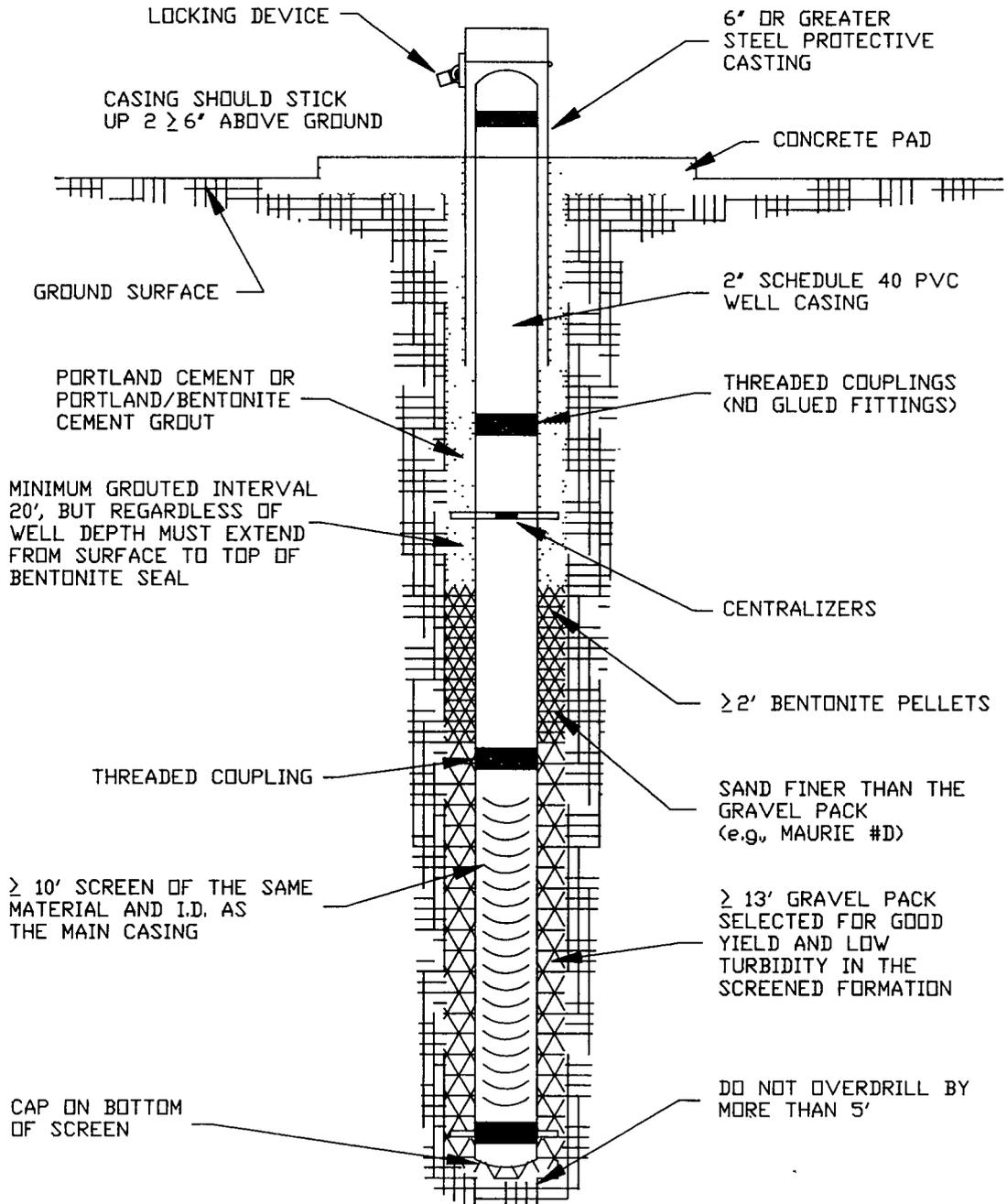
Figure 3.2 Lithologic cross section

Monitoring wells installed in the unconfined aquifer at NAS Corpus Christi will most likely encounter groundwater before reaching the contact of the underlying confining unit and can be installed as Type II monitoring wells, as illustrated in Figure 3.3.

Monitoring wells which are installed into the confined aquifer underlying the site will have an outer protective casing set through the unconfined shallow aquifer and into the confining clay unit and can be described as Type III monitoring wells as illustrated in Figure 3.4. Stratigraphic information to determine the terminal depth of the casing will be provided from the drilling and sampling operations. A section of 10-inch diameter schedule 40 PVC casing pipe will be lowered to the bottom of the hole and centered. A cement-bentonite grout mixture will be pumped by a tremie pipe into the annular space between the casing sides and the hole. This mixture will be pressure grouted through a threaded-joint tremie pipe from the bottom of the hole to the surface. The grout will be allowed to cure for a minimum of 24 hours, following which the borehole will be advanced with a 4.25-inch inner diameter auger to a point at least 5-feet into the confined aquifer. The well will be installed and completed through the annulus of the casing and the borehole. If the clay confining unit extends 25 feet beyond the bottom of the casing and the confined aquifer is not encountered within this depth, then the borehole will be terminated and tremie grouted from the bottom of the borehole to the top of the casing.

To facilitate groundwater sampling approximately 2.5 feet of well pipe will remain above ground surface at each of the well sites. To protect the wells and ensure their integrity, a steel protective casing with a locking cover will be set over the well pipe by a concrete pad (3' x 4' x 6" ASTM 150), at ground level. For wells located in areas of high vehicular traffic, steel protective posts (4" diameter, 6' length, 1/4" thickness and concrete filled ASTM A120) will be installed surrounding the well. The well sign, and if determined necessary by the EIC, the protective posts will be painted using a high visibility yellow epoxy paint (AASHTO M220).

TYPICAL ILLUSTRATION OF MINIMUM SPECIFICATIONS
FOR MONITORING WELL CONSTRUCTION

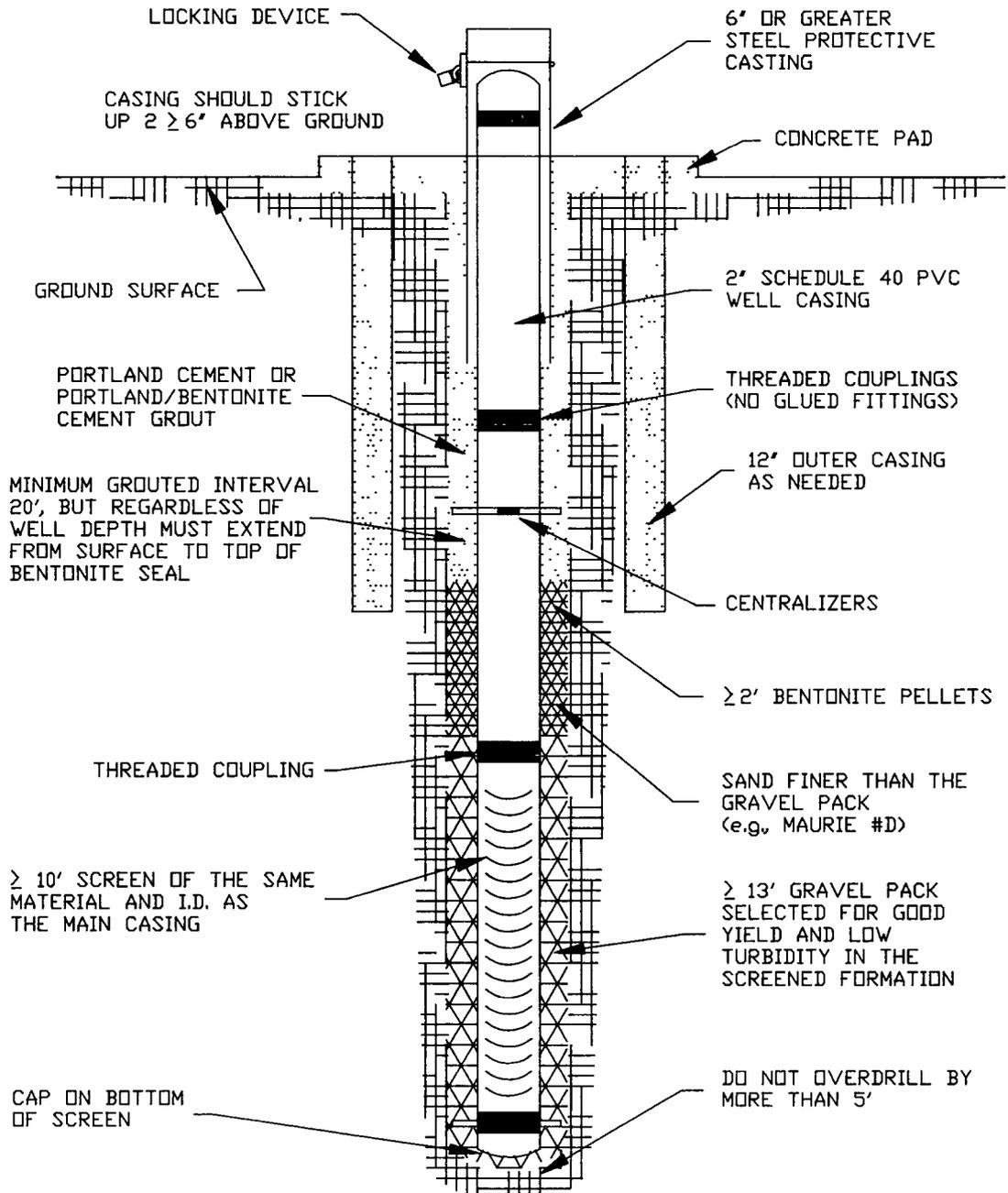


FI WORKPLAN
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

FIGURE 3.3
TYPE II
MONITORING WELL DESIGN

DATE: 08/14/92 DWG NAME: 042MWEL1

TYPICAL ILLUSTRATION OF MINIMUM SPECIFICATIONS
FOR MONITORING WELL CONSTRUCTION



FI WORKPLAN
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

FIGURE 3.4
TYPE III
MONITORING WELL DESIGN

DATE: 08/14/92

DWG NAME: 042MWEL2

Well Development:

Each well will be fully developed to ensure it is functioning properly. Well development will be completed by either bailing or pumping techniques. Bailing is performed with a Teflon-coated single check valve bailer which is manually lowered into the well, filled with water, and then retrieved. Pumping may be completed with a hand pump or electrical submersible pump. During the development process, pH, temperature and conductivity will be measured. Each well will be considered developed when pH, temperature, conductivity have stabilized and the water is relatively free of silt and fine particles. Conditions for stabilized measurements were defined with guidance from the EPA's Environmental Compliance Branch, *Standard Operating Procedures and Quality Assurance Manual*, Section 6.3 — Specific Quality Control Procedures.

Duplicate field analytical results should meet the following criteria:

Temperature	=	within $\pm 1.0^{\circ}\text{C}$
pH	=	within ± 0.5 standard unit
Conductivity	=	within $\pm 10\%$ from the duplicate

Field measurements were previously outlined in Table 3.2. Static groundwater levels will be measured in each monitoring well 24 hours following development. Well gauging will consist of measuring the depth to water and depth to free-floating product (if present) using a decontaminated oil and water interface probe. The measurements will be made to an accuracy of one-hundredth of a foot. The well depth will be measured using a decontaminated weighted steel tape with an accuracy of at least one-hundredth of a foot. All readings will be made at a clearly marked reference point at the top of each well casing. Each well reference point will be surveyed to a common datum and/or mean sea level to allow construction of a groundwater surface contour map.

Well Purging/Sampling:

The monitoring well sampling procedure begins with placement of a clean plastic sheet or aluminum foil around the wellhead before purging and sampling to provide an area where equipment can be placed temporarily without risk of further contamination to the surrounding.

An OVA or PID reading is to be taken at each wellhead immediately after removal of the well cap to inspect for volatile vapors. Static well water levels will then be measured with an electronic water level meter or an oil/water interface probe. Water level measurements and the description of any free floating products observed will be recorded in the project field logbook.

Each well will be purged of stagnant water to ensure that the well is functioning properly and that representative groundwater samples are obtained. A minimum of three casing volumes will be purged from each well, in accordance with the NEESA *Ground-Water Monitoring Guide*, Chapter 7 — Groundwater Sampling. The volume of water in the well casing will be calculated prior to purging by subtracting the depth to water from the total depth of the casing and multiplying by the appropriate factor as shown in the following equation:

$$V = (\text{Total depth} - \text{depth to water}) \times (0.17 \text{ for } 2" \text{ wells})$$

where V represents the volume in gallons per foot.

Wells will be considered purged following at least three purged well volumes and when the pH, temperature and conductivity readings have stabilized (values within 10 percent of the mean) for three consecutive readings as defined earlier under well development.

A decontaminated sampling cup will be used to collect a sample for field analyses of pH, temperature and specific conductivity. These results will be immediately recorded on the monitoring well sampling log sheet and in the sampler's field logbook.

For deep wells, contact with formation waters will be minimized by slowly withdrawing the pump from the water column during the last step of purging. Withdrawing the pump slowly will tend to remove any groundwater from the well which has contacted the exterior of the pump and or tubing/piping. Following this procedure, an additional well volume will be removed from the well using a Teflon bailer (or other applicable sampling device) before sampling procedures begin.

Note: Purged waters will be retained onsite in 55-gallon drums until the regulatory status of the water has been determined in accordance with the Southern Division Naval Facilities Engineering Command, *Guidelines for Groundwater Monitoring Well Installations*, Part 3, Section 3-4 and RCRA Hazardous Waste Regulations.

Sampling shall be performed immediately after purging requirements have been satisfied. All groundwater samples will be retrieved using decontaminated Teflon bailers. New, braided nylon rope with Teflon-coated stainless steel lead lines will be used to lower the bailer, and the rope is not reused following sampling of the well. If a well has recovered insufficiently (i.e. less than one bailer length), note the fact in the field logbook and immediately make this fact aware to the E/A&H Site Manager and/or Site Geologist.

The water samples collected with a bailer will be poured directly from the bailer into the appropriate pre-labeled containers. Ice and water placed in sealable plastic bags or blue ice is used to provide temperature preservation at 4°C. All sample bottles from a specific well will be placed within a sample cooler or in similar devices.

All duplicate samples will be taken from successively collected bailers. All split samples will be taken successively from the same bailer. However, if one bailer does not contain enough water to fill both sample bottles, one-half of the bailer will be poured into one sample container

and one-half into the other. Another bailer of water will then be collected, and the sample containers filled in the same manner.

Aliquots for volatile organic analysis will always be retrieved first. The vials will be immediately labeled and ID numbers recorded in the field logbook. Detailed volatile sampling instructions, in accordance with the EPA's Environmental Compliance Branch, *Standard Operating Procedures and Quality Assurance Manual*, Section 4.2.11 — Purgeable Organic Compound Sampling, are provided below.

Detailed VOA sampling instructions:

A minimum of three 40 ml septum vials will be filled for volatile organic constituents. The screw caps for the vials contain a Teflon-lined silicone disk to prevent contamination of the sample by the cap. The vials will be pre-preserved and the disks will be placed in the caps by the laboratory prior to the beginning of the sampling program. The Teflon side will be in contact with the sample. The VOA 40-ml vials will be completely filled (zero headspace) to prevent volatilization of constituents. Extreme caution will be exercised when filling a vial to avoid any turbulence which could also produce volatilization.

1. The sample will be carefully poured or received down the side of the vial to minimize turbulence. As a rule, it is best to gently pour the last few drops into the vial so that surface tension holds the water in a convex meniscus.
2. The cap with the Teflon-coated septum is then applied and some overflow is lost, but air space should be completely eliminated in the bottle.
3. After capping, the bottle will be turned upside down to check for the presence of any air bubbles. If any air bubbles are observed, the entire sampling procedure must be repeated.

3.8 Equipment Decontamination

All equipment used in the collection of soil or groundwater samples (e.g. hand augers, split spoon samplers, sampling rods, hollow-stem auger flights, bailers.) will be properly decontaminated prior to the initiation of onsite activities as described below.

Decontamination of all augers and downhole equipment (e.g. auger flights, sampling rods) will be performed between each boring through:

1. steam cleaning
2. detergent wash, using a brush to remove any particulate matter and surface film
3. a potable water rinse

The detergent must be a standard brand of phosphate-free detergent, such as Liquinox. All soil sampling equipment, such as the split spoons and hand augers, will be decontaminated between samples by:

1. a pressure steam wash
2. detergent wash, using a brush to remove any particulate matter or surface film
3. potable water rinse
4. a pesticide-grade isopropanol rinse
5. a final deionized water rinse

All non-dedicated groundwater sampling equipment, such as bailers and the water level indicators, will be decontaminated between samples by:

- 1) a potable water/detergent wash, (Liquinox)
- 2) a potable water rinse
- 3) a pesticide-grade isopropanol rinse
- 4) a final deionized water rinse

After decontamination, equipment will be wrapped in clean aluminum foil for transport to each investigation area. This procedure will be followed to minimize the potential for cross-contamination of soil samples. Disposable gloves will be worn during all sampling steps which require handling of samples and sampling equipment.

3.9 Documentation

All soil samples will be documented in accordance with NEESA 20.2-031A, Chapter 6 — Monitoring Well Data Record Requirements. Sampling personnel will use bound, ruled or gridded logbooks with sequentially numbered and waterproof pages for activity documentation pertaining to the investigation. These logbooks will be the master reference document for all site activities and accomplishments. These records will also document all visual observations, calculations, weather conditions and equipment calibrations. The logbooks are accountable documents that will be properly maintained and retained as part of the project files.

Each logbook must have labeled on the front cover the project name:

NAS Corpus Christi, Texas (CTO #022)

EnSafe/Allen & Hoshall

Sampler's Name

start date and end date

Labeling must be done with indelible blank ink

3.10 Sample Containers, Labelling, Preservation and Identification

Pre-cleaned sample containers will be provided by the laboratory. E/A&H will receive the containers from a laboratory that has followed NEESA 20.2-047B, Chapter 3.5 — Sample Container Cleaning Procedures (including applicable EPA protocol) for approved sample containers and the containers will remain in the custody of E/A&H. Samples will be placed inside sealable air/water tight plastic bags to protect the entire sample shipment. This precaution

is taken to prevent cross-contamination from melted ice and/or from samples due to container breakages.

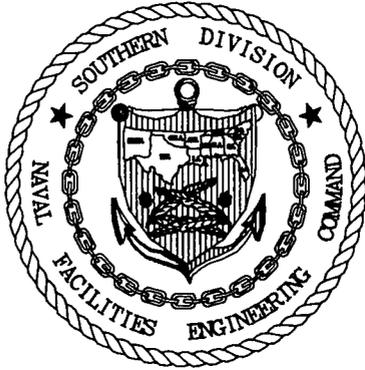
Labels will be affixed to each sample filled container by adhesives or adhesive tapes. Labels will include the following information: sample identification, collection time and date, sample preservation, sampler identification and the required analytical methods. Sample tags will be used at the sampler's discretion. Figure 3.5 is an example of the front of a sample tag that will be used in this investigation. The front of the label is identical to the back. Sample containers, preservation methods, and holding times are summarized for each method in Table 3.3.

3.10.1 Sample Chain-of-Custody

EnSafe/Allen & Hoshall will follow chain-of-custody (COC) procedures in accordance with NEESA 20.2-047B, Chapter 3.8, and corporate standard operating procedures for chain-of-custody. EnSafe/Allen & Hoshall will use chain-of-custody forms, as illustrated in Figure 3.6, for transferring sample shipments to the laboratory. The same information documented on the COC will also be kept in a project field logbook.

Upon transfer of custody, the chain-of-custody form will be signed by a EnSafe/Allen & Hoshall field sampling representative, who will note the date and time the samples were relinquished. Because common carriers will not sign chain-of-custody forms, the chain-of-custody records will be sealed within each shipping container. As an additional chain-of-custody safeguard, each shipping container will be provided with a custody seal, signed and dated by the E/A&H field sampling team leader. The custody seals, illustrated in Figure 3.7, will ensure that the shipping container are not opened until received by the laboratory.

FRONT



NAVY CLEAN

ENSAFE/ALLEN & HOSHALL

*5720 SUMMER TREES DR. SUITE 8
MEMPHIS, TENNESSEE 38134*

BACK

ENSAFE/ALLEN & HOSHALL

(901) 383-9115

SITE:

SAMPLE NUMBER:

PRESERVATIVES:

ANALYSIS:

DATE:

TIME:

SAMPLER:



FI WORKPLAN
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

FIGURE 3.5
SAMPLE TAG

DATE: 08/14/92

DWG NAME: 042CLTAG

**TABLE 3.3
 SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES**

Analytical Method	Sample Matrix	Container Size/ Material	Sample Preservation	Holding Time
EPA Method 418.1 - Total Petroleum Hydrocarbon	Soil	8 oz. Glass Jar	Chill, 4°C	28 days until analysis
	Water	One Liter Glass Jar	Chill, 4°C pH < 2, H ₂ SO ₄	28 days until analysis
CLP-Volatile Organic Compounds	Soil	8 oz. Glass Jar with Teflon-lined septa	Chill, 4°C	10 days until analysis
	Water	(3) 40 ml. vials with Teflon-lined septa	Chill, 4°C pH < 2, HCl	10 days until analysis
CLP-Semivolatile Organic Compounds	Soil	8 oz. Glass Jar with Teflon-lined septa	Chill, 4°C	Extract within 10 days, Analyze within 40 days
	Water	(2) One Liter Amber Glass Jars	Chill, 4°C	Extract within 5 days, Analyze within 40 days
CLP-PCBs	Soil	8 oz. Glass Jar	Chill, 4°C	Extract within 7 days (10 days for CLP), Analyze within 40 days
	Water	2.5 Liter Amber Glass Jar (1 liter for CLP)	Chill, 4°C, pH between 5 & 9	Extract within 7 days (5 days for CLP), Analyze within 40 days
CLP-Total Metals	Soil	8 oz. Glass Jar	Chill, 4°C	180 days until analysis
	Water	1 liter Polyethylene or Glass Container	pH < 2 HNO ₃ , Chill 4°C	180 days until analysis
EPA Method 8010/8020 Volatile Organic Compounds	Water	(3) 40 ml VOA Vials with Teflon-lined septa	Chill 4°C	Analyze within 14 days
	Soil	8 oz. Glass jar with Teflon-lined septa	Chill 4°C	Analyze within 14 days

Note: For soil matrices, samples required for multiple analyses may be obtained from multiple 8 ounce jars or a single 32 ounce jar. CLP analysis holding times begin at the Validated Time of Sample Receipt (VTSR) by the laboratory. Non-CLP analyses holding times begin from the time of collection.



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ENSAFE/ALLEN HOSHALL

ENSAFE/ALLEN & HOSHALL
5720 Summer Trees Dr. Suite 8
Memphis, Tennessee 38134
(901) 383-9115

OFFICIAL SAMPLE SEAL

SAMPLE #

DATE:

SIGNATURE:

PRINT NAME & TITLE:



FI WORKPLAN
NAS CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

FIGURE 3.7
CUSTODY SEAL

DATE: 08/14/92

DWG NAME: 042SECSL

All chain-of-custody forms received by the laboratory must be signed and dated by the laboratory sample custodian and returned to EnSafe/Allen & Hoshall following receipt, or as part of the data reporting package.

The field sampling team will take measures to ensure that samples are delivered to the analytical laboratory within 24 hours from the time of collection. Under no circumstances can samples be delivered to the laboratory more than 48 hours subsequent to collection. Samples will be delivered via overnight courier to the analytical laboratory.

3.10.2 Sample Designation System

Tracking a sample and maintaining certain information about the sample from the time of collection to the final analytical data package will be achieved in the sample identification. The sample identification will include the following information:

- site name
- sample matrix
- QC sample type
- well or boring location number
- sample interval/depth (when applicable)

The NAS Corpus Christi FI will use a specific prefix, ASC, as the sample identification number. The prefix will be separated from the sample identification number with a backslash; for example ASC\12345678. The analytical laboratory will not utilize the site-specific prefix.

The eight-digit format will require that site designation, sample matrix, sample location, QC sample type, and sampling method/depth are coded and defined in the following format:

1 2 3 4 5 6 7 8

The first three digits, (1,2 and 3), will signify the sample origin. These digits are alphanumeric and were created with some mnemonic device for the true name of the site. The first digit is an alphabetical letter in order to facilitate data processing.

Examples are given below:

Site #4 — S04

Background #1 — B01

The type of installation will be represented by digits 4, 5 and 6. Designations for a well or boring installations will be made by using a "W" or a "B" respectively in the fourth digit, followed by the two-digit sample location identifier. The sample location identifier is a number assigned to the specific well or boring.

The seventh and eighth digits are matrix-dependent and will either represent sample depth in number of feet for soil samples or unique sample identifiers for water samples. Duplicate samples will have the same sample identification but will have the letter D in the eight digit.

Examples:

A) ASC-S04-B09-15 represents a soil sample from SITE 4, boring # 9 at a depth of 15 feet

B) ASC-S03-W07-05 represents the fifth groundwater sample collected from well #7 at site #3

C) ASC-S03-W07-5D represents a duplicate of the sample in example B.

All sample identification information will also be documented in the sampler's field logbook, especially essential information which cannot be incorporated in the sample number.

Quality assessment samples are used to assess the precision and accuracy of the sampling and analyses. These types of samples will replace the fourth-digit (well or boring designation) when applicable. Digit 4 will represent the type of Quality Control (QC) sample, followed by the month and day it was collected as digits 5,6,7 and 8. Samples required to meet this data quality objective are given below with their appropriate code.

Quality Assessment Sample Codes:

- F - field blank This will be followed by a four-digit date where the first two digits indicate the month and the second two digits indicate the day, (ex: August 14 would be written as 0814).

- R - rinse blank This would be followed by a four-digit date where the first two digits indicate the month and the second two digits indicate the day.

- T - trip blank This would be followed by a four-digit date where the first two digits indicate the month and the second two digits indicate the day.

For example, ASC-W06-F1025 is the sample identifier for the field blank collected at SWMU 6 on October 25.

3.11 Calibration Procedures and Frequency

EnSafe/Allen & Hoshall will oversee calibration of field measuring equipment such as the pH meter, thermometer, specific conductivity meter in accordance to the Environmental Compliance Branch, *Standard Operating Procedures and Quality Assurance Manual*, Section 6.3 — Specific Quality Control Procedures. Field equipment for which SOPs are not in force will be calibrated

and operated in accordance with the manufacturer's recommendations. At a minimum, all field instruments will be calibrated or checked at the beginning and end of each work day.

3.12 Analytical Procedures

This investigation will utilize the following analytical procedures.

3.12.1 Field Analyses

The boreholes for soil borings and monitoring wells will be monitored during drilling with a PID or OVA for volatile organic compounds. Static water level measurements will be taken on all monitoring wells developed, allowing adequate time for well recharge. The wells will be checked with a PID or OVA prior to sampling to detect volatile organic vapors.

Monitoring well casings will be surveyed for spatial and horizontal orientation by a State of Texas registered land surveyor. The survey measurements will be recorded relative to the USGS NAD '83. All field measurements will be recorded in a dedicated field logbook and/or appropriate EnSafe/Allen & Hoshall field activity log (i.e. boring log, well construction log).

3.12.2 Laboratory Analyses

Soil and water samples collected during the course of this investigation will be analyzed by the EPA/CLP methods listed in Table 3.1. Appropriate laboratory analytical work will be performed under the EPA CLP SOW for Organics and Inorganics Analysis and applicable NEESA Level C QC requirements. The listed soil and water analyses were chosen in order to assess the nature and extent of potential contaminants in these media to meet the requirements of the FI scope of work.

3.13 Data Reduction, Validation and Reporting

Laboratory procedures for data reduction, validation, and reporting will be conducted according to standard operating procedures as dictated by the requirements of NEESA 20.2-047B, Chapters 7 — Analytical Methods and 8 — Maintaining Laboratory Approval. The specific procedures for data reduction, validation, and reporting are outlined in the following:

Level C QA/QC as dictated in the NEESA *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*, 20.2-047B

US EPA *Contract Laboratory Program, Statement of Work for Organics Analysis*, March 1990, OLMO1.0

US EPA *Contract Laboratory Program, Statement of Work for Inorganics Analysis*, 1990, ILMO2.0

The NCR-approved laboratory QAP

Required internal QC checks and data validation procedures are described in Section 3.14.4.

EnSafe/Allen & Hoshall's use of the laboratory will be accomplished by a services agreement. The contract will specify the scope of services to be performed by the laboratory, the specific analytical quality assurance requirements to be met, and the information to be developed and reported.

3.14 Field and Laboratory Quality Control Checks

Internal laboratory control checks used by the laboratory will be conducted in the laboratory by its staff. E/A&H will conduct internal quality control checks of sampling procedures and laboratory analyses. These checks will consist of preparation and submittal of sampler rinsate blanks, trip blanks, field blanks, and field duplicates for analysis, and an evaluation of the laboratory analytical package. Data validation guidelines presented in *EPA CLP National Functional Guidelines for Organic and Inorganic Review* and in NEESA 20.2-031A, Chapter

7.3.2, will be followed in evaluating reported data (for analysis which these guidelines apply). Exceptions will be made for any wet chemistry methods employed because specific data validation guidelines are not provided for these methods. The ability of data will be determined by evaluating the data packages with respect to these criteria.

The types and frequency of blank and other control check samples will be dictated by the level of QC selected for each project by the Navy EIC. The required control check sample frequencies are outlined in NEESA 20.2-047B, *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*. For Level C QC, quality control measures can be discussed for sampling and analysis as follows.

3.14.1 Field Data Quality

All field work will be conducted and/or supervised by E/A&H personnel in order to ensure that proper procedures are followed. Field records will be kept of all activities that take place during the investigation and these records will be maintained at the E/A&H office in Memphis, Tennessee. These records will include any obstacles that may be encountered during the investigation.

Field samples will be collected per the procedures outlined in field sampling sections of this QAP (Sections 3.4-3.7). Precision will be assessed by evaluating the results of duplicate and matrix spike duplicate samples, and accuracy will be assessed by evaluating the analyses of field blanks, trip blanks, laboratory matrix and surrogate spikes, and laboratory reagent blanks and blank spike samples. The collection frequencies for quality control sample collection are summarized in Table 3.4.

TABLE 3.4 QUALITY CONTROL SAMPLE COLLECTION FREQUENCIES		
Quality Control Sample	Frequency of Collection	Additional Sample Volumes Required
Trip Blank (volatiles only)	One per sample shipping cooler containing samples to be analyzed for volatiles	(3) 40 ml. glass vials with Teflon-lined septa
Rinsate Blank	One per day per media (to be analyzed every other day unless contaminants are identified)	A
Field Blank	Two per groundwater sampling event (potable and Deionized water)	A
Duplicates	One per 10 water and/or soil samples collected	A,B
Matrix Spike/Matrix Spike Duplicate Samples	One per 20 water and/or soil samples collected; matrix is to be the same sample used for duplicate analysis	A

Notes:

- ^A - Adequate sample quantities should be collected to perform all aqueous analytical methods required for the area of investigation.
- ^B - An identical set of containers and sample quantities should be provided for each soil or water duplicate.

3.14.2 Analytical Data Quality

Analytical data quality is assured through the use of NEESA guidelines for QA/QC as set forth in NEESA 20.2-047B (where appropriate). The guidelines include analysis and evaluation of matrix spikes.

Matrix spike samples that are prepared by the laboratory are useful in assessing the accuracy of the analytical method and can detect matrix effects in which other sample components interfere with the analysis of the contaminant of concern. The method of measuring analytical accuracy is percent recovery. Analysis of matrix spike duplicates will provide a basis for determining the method-precision specific to the matrix under investigation. Precision is measured as relative percent difference (%) between duplicate analyses. Analytical matrix spikes and matrix spike duplicates will be performed at a rate of one per sample batch (20 samples maximum) per matrix.

Surrogate spikes are also used to determine the accuracy of the analytical method with respect to the matrix under investigation. Surrogate spike compounds are similar in chemical nature to the target compounds, but would not be expected in affected media (i.e. radioisotopically labelled compounds, etc.). These compounds are introduced into each sample prior to analysis. By comparing the reported results for these compounds with the quantities introduced, a percent recovery can be determined. This percent recovery data is subsequently used to assess the accuracy of results for target compounds within each specific sample. Surrogate spike analyses will be performed on each sample analyzed for organic parameters.

The choice of compounds to be used for matrix and surrogate spike is generally stipulated by the analytical method employed.

3.14.3 Field Data Package

The field data package will include all logbooks, field records and measurements obtained at a site by EnSafe/Allen & Hoshall personnel in accordance with NEESA 20.2-047B, Chapter 7.2 — Deliverables and NEESA 20.2-031A, Chapter 6 — Monitoring Well Data Record Requirements.

The package, including all field records and measurements obtained at the activity by EnSafe/Allen & Hoshall sampling personnel, is validated by conducting the following:

- A review of field data compiled on water and soil sampling logs for completeness. Failure in this area may result in the data being invalidated for litigation or regulatory purposes.
- A verification that field blanks, sampler rinsate blanks, and trip blanks were properly prepared, identified and analyzed. Failure in this area may compromise the analytical data package and result in some data being considered qualitative or invalid.
- A check on field analyses for equipment calibration and condition. Failure in this area may result in the field measurements being invalidated.
- A review of chain-of-custody forms for proper completion, signatures of field personnel and the laboratory sample custodian, and dates. Failure in this area may result in the data being invalidated for litigation or regulatory purposes.

The field data package will be reviewed by the project QA Manager for completeness and accuracy using the checklist in Appendix B as a general guidance.

3.14.4 Analytical Data Package

Validation of the analytical data package will be performed by the EnSafe/Allen & Hoshall project QA Manager (not before completion of field data validation) prior to submittal to the NCR. EnSafe/Allen & Hoshall will perform data validation independently of the data review by the laboratory which will be consistent with the level of effort specified in NEESA 20.2-047B (and specific to the laboratory(ies) QC level applied). The validation steps will be performed by applying guidelines presented in NEESA 20.2-047B, Chapter 7.3.1 — Level C Data Validation Guidelines, and where applicable, the EPA *Laboratory Data Validation Functional Guidelines for Evaluating Organics and Inorganics Analyses*, Technical Directive Document No. HQ-8410-01, and EPA precision and accuracy statements for the analytical methods employed. The Analytical Data Validation Checklist in Appendix B will be used as general guidance for Level C data validation. All NEESA Level C data produced during the FI will be validated in the manner described above.

The analytical data package validation procedures include:

- Comparison of the data package to the reporting level requirements designated for the project, to confirm completeness.
- Comparison of sampling dates, sample extraction dates and analysis dates to check that samples were extracted and/or analyzed within the proper holding times. Failure in this area may render the data unusable.
- Review of analytical methods and required detection limits to verify that they agree with the QAP and the laboratory contract. Non-compliance in this area without reasonable justification (i.e. severe interferences) may render the data unusable.

- Field and laboratory blanks will be reviewed to evaluate possible contamination sources. The preparation techniques and frequencies, and the analytical results (if appropriate) will be considered. All internal laboratory QC sample results will also be reviewed as provided for in NEESA 20.2-047B, Chapter 7.3.2.
- Evaluation of all blanks must confirm freedom from contamination at the specified detection limit. All blank contaminants must be explained or the data applicable to those blanks labelled suspect and sufficient only for qualitative purposes.

3.14.5 Data Classification

The data will be classified by the project QA manager based upon the level of reportables and the result of evaluating the field and analytical data packages. The ability of collected data will be evaluated using the above-outlined guidelines. Should data validation identify unusable data or data of questionable reliability, data qualifiers will be assigned to each affected datum utilizing the USEPA CLP qualifiers. Subsequent use of qualified data will be restricted and when used, the uncertainty associated with the data will be documented.

As with the laboratory data validation, the classification of data is based on specifically defined criteria. Samples are evaluated by matrix against the specific class criteria and judged as acceptable, provisional, or unacceptable. The explanation of the judging criteria is as follows:

A - Acceptable: All criteria have been successfully met for all samples.

P - Provisional: Some samples have not fully met the criteria but the information is obtainable.

U - Unacceptable: Criteria has not been met with any samples and is not obtainable. This data may not be classified for use unless sufficient other data criteria have been met and scientific judgment indicate the data may be useful if classified.

N - Not Applicable.

Data will be classified using the Data Classification Summary Checklist in Appendix B as guidance. A report of the results of the data validation will be submitted to the Project Manager

3.15 Performance and System Audits

Audits will be performed before and during the work to evaluate the capability and performance of the entire system of measurement and reporting. The following are parameters included in the system: experimental design, sampling or data collection, analysis, and attendant quality control activities.

3.15.1 Field System Audits

The Site Project Manager is responsible for evaluating the performance of field personnel and general field operations and progress. The Site Project Manager will observe the performance of the field personnel in operation during each type of activity. The E/A&H Site Project Manager will be onsite throughout the duration of field activities, and will continually assess the proficiency of each field sampling team member to ensure compliance with the QAP protocol. Where applicable, these audits will also ensure that field operations are being conducted in accordance with NEESA guidelines.

3.15.2 Laboratory Systems Audit

A laboratory systems audit is routinely conducted at least annually by the E/A&H QA staff members. These audits examine the methodology and assure that systems and operational capability are maintained. The audits also verify that quality control measures being followed as specified in the laboratory written Standard Operating Procedures (SOP) and Quality Assurance Plans (QAP). The Systems Audit Checklist used by the EPA CLP forms the procedural basis for conducting these audits.

Laboratory initiated audits will be conducted in accordance with guidelines set forth in NEESA 20.2-047B, and the laboratory QA plan as approved by the NCR. Under NEESA 20.2-047B guidelines, the project NCR is also responsible for laboratory inspections to ensure compliance with NEESA laboratory requirements.

3.15.3 Performance Evaluation Audits

A performance evaluation (PE) audit is performed to evaluate a laboratory's ability to obtain an accurate and precise result in an analysis of a known check sample by a specific analytical method. Following the analytical data validation, a performance evaluation audit of the laboratory may be conducted by E/A&H. This audit may be conducted if it is determined that the quality assurance data provided are outside acceptance criteria control limits. PE audits may include a review of all raw data developed by the laboratory and not reported (laboratory non-reportables) and the submission of blind spiked check samples for the analysis of the parameters in question. These check samples may be submitted disguised as field samples, in which case, the laboratory will not know the purpose of the samples; or the samples may be obvious (known) check samples (EPA or National Bureau of Standards traceable).

PE audits also may be conducted by reviewing the laboratory's results from "round-robin" certification testing and/or EPA Contract Laboratory Program (CLP) evaluation samples. An

additional component of PE audits includes the review and evaluation of raw data generated from the analysis of PE samples and actual field samples that may be in question.

3.15.4 Regulatory Audits

It is understood that EnSafe/Allen & Hoshall field personnel and subcontract laboratories are also subject to quality assurance audits by the EPA and the NCR. The NCR (under NEESA guidelines) will conduct laboratory inspections prior to approval for certification in participation with any NEESA project and will provide performance samples to the laboratory for approval purposes.

3.16 Preventative Maintenance

The sampling equipment employed by E/A&H during an investigation that may require preventive maintenance will be checked for proper operation before and after each use on a daily basis. These checks will be conducted at the beginning and end of each day. Any replacements or repairs will be made as needed in accordance with manufacturer's instructions. Critical spare parts, maintenance tools and/or replacement instruments will be carried to the site. Equipment or instruments potentially requiring preventive maintenance are listed in Table 3.5 along with the preventive maintenance requirements for each. All laboratory preventive maintenance will be conducted in accordance with their NEESA-approved QAP and SOP manual.

3.17 Specific Routine Procedures used to Assess Data Precision, Accuracy and Completeness

Precision is an estimate of the reproducibility of a method and is estimated by several statistical tests: the standard deviation of the error distribution, the coefficient of variation and the relative percent difference between replicate (duplicate) samples. EnSafe/Allen & Hoshall will determine the precision of a method by analyzing replicate data.

**TABLE 3.5
 PREVENTIVE MAINTENANCE FOR FIELD EQUIPMENT**

	Each Use	Quarterly
Conductivity Meters	Meter probes are cleaned before and after each with distilled or deionized water. Before and after each use (daily) the instrument should be checked with a commercial conductivity standard for proper calibration. Checked battery for proper charge.	The instrument is inspected on a quarterly basis, whether used during the quarter or not. The inspection consists of a general examination of the electrical system (including batteries) and a calibration check. Instruments not functioning properly are shipped to the manufacturer for repair and calibration.
pH Meters	<p>Before each use (daily), the probe should be checked for any mechanical and electrical failures. The electrode bulb should be complete filling with electrolyte solution.</p> <p>At the beginning and end of any sampling day, the pH meter must be calibrated using two standard pH buffers. The battery is checked for proper charge.</p>	<p>The instrument is inspected on a quarterly basis whether or not it has been used.</p> <p>The inspection consists of a general examination of the probe, wire, electrical system (battery check) and a calibration check.</p> <p>Any malfunctioning equipment is returned to the manufacturer for repair and recalibration.</p>
Thermometers	All thermometers should have been initially calibrated against a National Bureau of Standards (NBS) certified thermometer or one traceable to one. Before each use make a visual inspection for no breakages. After use, rinse with deionized or distilled water.	Bi-annually Make a visual inspection for breakages. Should be checked against an NBS certified thermometer for accuracy.
OVA	Clean lamp and ion chamber before and after each use (WARNING: do not use water or any miscible solvents on the lamp). Clean the exterior subsequent to each use. Perform a calibration check and calibrate, if necessary.	As per Manufacturer's recommendations Clean lamp and ion chamber (WARNING: do not use water or any miscible solvents on the lamp). Calibrate as per manufacturer's recommendations and instructions.
PID	Check battery and if necessary, recharge. Clean the exterior of the instrument after each use with a damp cloth or with mild soap and water. Calibrate before use and perform calibration checks periodically.	As per Manufacturer's recommendations Calibrate as per manufacturer's instructions. Clean UV lamp, replace dust filter and clean exterior with a damp cloth or using mild soap and water. Recharge battery.

Note Due to varying instrument types, different maintenance requirements will be applied

Precision is then defined by the coefficient of variation (CV), which expresses the standard deviation as a percentage of the mean. Relative percent difference, an indicator of CV, will serve as a quality criterion for classification of data resulting from this investigation. Specific statistical comparison of duplicate samples (field and laboratory), as a measure of precision evaluating both sample collection procedures and laboratory instrument performance, may be accomplished by first comparing the obtained duplicate results with the published EPA criteria for method precision (relative percent difference).

The accuracy of a method is an estimate of the difference between the true value and the determined mean value. Specific statistical comparison of percent recovery values reported by the laboratory as a measure of method accuracy will be compared with the published EPA criteria for the accuracy of an individual method.

Data completeness will be expressed both as the percentage of total tests conducted and required in the scope of work that are deemed valid. Methods for assessing data precision, accuracy, and completeness by the laboratory will be outlined in the NEESA-approved laboratory QAP.

Records of calibration and maintenance activities for each piece of equipment are contained in logbooks assigned to the equipment. Preventive maintenance to be performed by the analytical laboratory will be in accordance with laboratory SOPs as established in an NCR-approved QA plan.

3.18 Corrective Action

During the course of any investigation, field personnel are responsible for seeing that field instruments and equipment are functioning properly and that work progresses satisfactorily. The field personnel are also responsible for ensuring performance of routine preventive maintenance and quality control procedures, thereby ensuring collection of valid field data. If a problem is

detected by the field personnel, the project manager shall be notified immediately, at which time problem correction will begin. Similarly, if a problem is identified during a routine audit by the project QA manager, the regulatory QA manager, or NCR, an immediate investigation will be undertaken and the corrective action deemed necessary will be taken as early as possible. All detected problems or variations from the proposed Work Plan will be documented in the field logbook and also on a Field Change Request Form, as illustrated in Figure 3.8.

Examples of potentially out-of-control situations include field instrument breakdown, mislabelling or loss of samples, inadvertent contamination of samples, or circumstances which preclude performance of field activities in accordance with the QAP (or other work plan documents). If an out-of-control event occurs, field sampling personnel shall make appropriate contacts and document any remedial efforts taken to bring field activities under control. All variances or changes from QAP guidance are subject to approval by the EnSafe/Allen & Hoshall site project manager or his/her designated representative. If circumstances arise which require substantive changes in the protocols, methods, or techniques outlined in the work plan (and QAP), the EIC will be contacted and all alterations will be documented and implemented with the EIC's written consent. A detailed description of the out-of-control event and remedial actions will be entered into the field logbook along with justification for the same.

If corrective action is required by the analytical laboratory, it should be conducted in accordance with the laboratory's NCR-approved QA plan following guidelines provided in NEESA 20.2 - 047B, Chapter 4.5 — Out-of-Control Events.

3.19 Quality Assurance Reports to Management

Quality assurance reports will be submitted to EnSafe/Allen & Hoshall management and SOUTHDIV in accordance with the following sections.

FIGURE 3.8



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FIELD CHANGE REQUEST

E/AH PROJECT NO. _____ FIELD CHANGE NO. _____

TO _____ LOCATION _____ DATE _____

DESCRIPTION: _____

REASON FOR CHANGE: _____

RECOMMENDED DISPOSITION: _____

FIELD MANAGER (SIGNATURE) _____ DATE _____

DISPOSITION: _____

SITE MANAGER _____ DATE _____

DISTRIBUTION: E/A & H PROJECT MANAGER _____ OTHERS AS REQUIRED _____

QUALITY ASSURANCE MANAGER _____

NAVY EIC _____

FIELD MANAGER _____

3.19.1 Internal Reports

The EnSafe/Allen & Hoshall QA manager will provide status reports to the project manager during the course of the project.

The reports address the following as applicable:

- Quality assurance activities and quality of collected data.
- Equipment and calibration and preventive maintenance activities.
- Results of data precision and accuracy calculations.
- Evaluation of data completeness.
- QA problems and recommended and/or implemented corrective actions. Results of corrective action taken.
- QA performance and system audit findings.

The laboratory is required to submit a monthly QC progress report to the NCR. The contents of the monthly report will be as outlined in NEESA 20.2-047B, Chapter 8 — Maintaining Laboratory Approval, and the NEESA-approved laboratory QAP.

3.19.2 Reports to NEESA and TWC

EnSafe/Allen & Hoshall will provide a data quality assurance summary within the draft Facility Investigation report for submittal to NEESA. A draft FI must be submitted to the SOUTH DIV EIC within **90 days** after the end of the field investigation. A draft final FI report, to be reviewed by the EPA and the TWC, will be submitted within **45 days**, and the final FI report is due within **45 days** of the approval of the draft.

4.0 SITE HEALTH AND SAFETY PLAN

4.1 Introduction

This Health and Safety Plan is written for field operations to be conducted at sites 1, 3, and 4 at the Naval Air Station Corpus Christi, Texas. The Navy project contract number with EnSafe/Allen & Hoshall is N62467-89-D-0318. The monitoring program is being conducted to assess the nature and extent of contamination at the site such that future remedial activities can be developed.

Applicability

The provisions of this plan are mandatory for all onsite personnel engaged in the environmental assessment who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 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. Subcontractors will hold EnSafe/Allen & Hoshall (E/A&H) harmless from, and indemnify it against all liability in the case of any injury. At a minimum, all provisions of the E/A&H health and safety plan will be followed.

E/A&H will suspend the site work and will instruct the subcontractor to evacuate the area under the following conditions. If inadequate safety precautions are taken by the subcontractor or DOD oversight personnel or if it is believed that the subcontractor or DOD oversight personnel are or may be exposed to an immediate health hazard.

Health and Safety training certificates for all EnSafe/Allen & Hoshall (E/A&H) employees who may visit the site are provided in Appendix C. Current OSHA refresher training certificates will

be available on site for all employees involved in field activities whose refresher course requirements come up for renewal before the project begins. All subcontractors, DOD oversight personnel, and any other site visitors must provide Health and Safety certification with appropriate refresher course documentation prior to site entry.

4.2 Site Characterization

4.2.1 Work Areas

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

- The exclusion zone.
- The contamination reduction zone.
- The support zone.

The **exclusion zone** will be located so that the area between the decontamination station and the work area entrances will be included. The contamination reduction zone will include the decontamination station and the support zone will be located beyond the contamination reduction zone. Only authorized personnel with a minimum of 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the exclusion and contamination reduction zones.

The exclusion zone is the area known or suspected of being contaminated with hazardous substances. The exclusion zone will be defined locally but is suggested to be within 20 feet of either side or the rear of the drill rig. All personnel within the exclusion zone must use the prescribed level of personal protection. A checkpoint will be established at the edge of the exclusion zone to regulate the flow of personnel and equipment in and out of the area. All personnel crossing the hotline into the exclusion zone must use the buddy system.

The person entering the exclusion zone must be accompanied by a person who is able to:

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

Additionally, at least one person shall remain outside the exclusion zone and have available at least the same level of personal protective equipment (PPE) as the buddies who are entering the exclusion zone. The person outside the exclusion zone will act as the safety observer and perform the security duties described in the section labeled Work Area Access/Egress of this section.

The contamination reduction zone serves as a buffer between the exclusion zone and the support zone and is intended to prevent the spread of contaminants from the work areas. All decontamination procedures will be conducted in this area. Personnel will leave the support zone and enter the contamination reduction zone through a controlled access point. They must wear the prescribed PPE. Exiting the contamination reduction zone requires the removal of all contaminants through compliance with established decontamination procedures.

The support zone is the outermost area and is considered a non-contaminated or clean area. The support area will be equipped with an appropriate first-aid station and equipment to perform gross decontamination of equipment.

4.2.2 Work Area Access

All personnel entering the site exclusion zone must:

1. Check in with the E/A&H Field Project Manager or representative.
2. Provide the shift supervisor with the following information:
 - The names of individuals entering the site work area.

- Destination in the site work area.
 - Activity to be performed at that location.
 - Duration of the planned activity.
3. The Field Project Manager will inform persons entering the site work area of the location of other activities taking place during the scheduled entry. If the Field Project Manager determines it is not safe for the scheduled entry, he or she can reschedule the entry or stop all other activities to perform the specific task.
 4. When leaving the site work area, proceed directly to the decontamination station and check out with the Field Project Manager or his representative. All exits from the site work area must be made through the contamination reduction zone.
 5. Perform all necessary decontamination before leaving the contamination reduction zone.

4.2.3 Site Map and Work Zones

The specific locations of the work zones are shown on Figure 2.1, Location Map. The limit of the exclusion area and location and limit of the decontamination corridor and support area will be based on existing physical assets such as location of utilities, roads, and security assets (See Section 3.2.1).

4.3 Site Activities

The activities to be performed during the investigation include the drilling and sampling of 6 soil borings and the installation of nine shallow groundwater monitoring wells and six deep wells. Subsequent activities will include well purging, development, and sampling as required.

Boring/well installations and associated field work descriptions were provided in the Quality Assurance Plan by E/A&H.

4.4 Chemical Hazards

Previous sampling operations reveal the potential for exposure to numerous chemical substances. Table 4.1 lists exposure guidelines for the expected site chemicals. Listed below are the potential chemical hazards posed by these materials and safety data associated with them.

Benzene is considered a human carcinogen by NIOSH (among others). As a result, all appropriate precautions should be taken to avoid or at the very least, limit exposure to benzene. Signs and symptoms of exposure include: dizziness; weakness; euphoria; headache; nausea; vomiting; tightness of the chest; staggering; and with more severe exposure, blurred vision; tremors; shallow and rapid respiration; ventricular irregularities; paralysis; and unconsciousness.

Toluene is considered a moderate health hazard by the NFPA. Symptoms of exposure include: dizziness; exhilaration; and confusion at lower acute exposure levels, and incoordination; ataxia; unconsciousness; and death (eventually) may occur at high level acute exposures.

1,2-Dichlorobenzene (o-Dichlorobenzene) is considered a slight health hazard by NFPA. Short exposure at high concentrations may result in depression of the CNS. Vapors are irritating to eyes, nose and throat. May cause burning pain in stomach, nausea, vomiting and diarrhea if ingested. Prolonged exposures may result in liver and kidney damage.

1,4-Dichlorobenzene is considered a moderate health hazard by NFPA. Signs of exposure include irritation of the eyes and upper respiratory tract; CNS depression; nausea, vomiting, diarrhea, and a burning pain in the stomach resulting from ingestion; and liver and kidney damage. Prolonged exposure may result in irritation of the skin.

**TABLE 4.1
 EXPOSURE GUIDELINES FOR EXPECTED SITE CHEMICAL HAZARDS**

Chemical Name	Odor Threshold (ppm)	OSHA PEL (ppm) *	ACGIH TLV (ppm) ^b	NIOSH REL (ppm) *	Auto-ignition Temp.	Flammable range (% by volume)
Benzene	4.68 ppm	1 ppm (5ppm STEL)	10 ppm Suspect Human Carc.	Potential Occupational Carc.	1096 F	1.3 to 7.1%
Toluene	40 ppm	100 ppm (150ppm STEL)	100 ppm	100 ppm	996.5 F	1.3 to 7.1%
Trichloroethylene	N.A.	50 ppm (200ppm STEL)	50 ppm (200ppm STEL)	25 ppm Potential Occupational Carc.	770 F	11 to 41%
Vinyl Chloride	N.A.	1 ppm (5ppm Ceiling)	5 ppm Confirmed Occupational Carc.	Potential Occupational Carc.	881 F	3.6 to 33%
Carbon Disulfide	N.A.	4 ppm (12ppm Ceiling) Skin	10 ppm Skin	1 ppm 10 ppm Ceiling	212 F	1.3 to 50%
Chlorobenzene	N.A.	75 ppm	10 ppm	Not Listed	1184 F	1.3 to 9.6%
Ethyl Benzene	N.A.	100 ppm (125ppm STEL)	100 ppm (125ppm STEL)	Not Listed	860 F	1.0 to 6.7%
1,4-Dichlorobenzene	N.A.	75 ppm (110ppm STEL)	75 ppm (110ppm STEL)	Potential Occupational Carc.	N.A.	N.A.
1,2-Dichlorobenzene	N.A.	50 ppm Ceiling	50 ppm Ceiling Skin	Not Listed	1198 F	2.2 to 9.2%
Naphthalene	0.3 ppm	10 ppm (15ppm STEL)	10 ppm (15ppm STEL)	Not Listed	978 F	0.9 to 5.9%

**TABLE 4.1
 EXPOSURE GUIDELINES FOR EXPECTED SITE CHEMICAL HAZARDS**

Chemical Name	Odor Threshold (ppm)	OSHA PEL (ppm) *	ACGIH TLV (ppm) ^b	NIOSH REL (ppm) *	Auto-ignition Temp.	Flammable range (% by volume)
Di-n-Butylphthalate	N.A.	5 mg/m ³	5 mg/m ³	Not Listed	N.A.	N.A.
Bromoform	N.A.	0.5 ppm Skin	0.5 ppm Skin	Not Listed	N.A.	N.A.
1,2-Dichloroethene	N.A.	1 ppm (2ppm STEL)	10 ppm (15ppm STEL)	1 ppm 2 ppm Ceiling Potential Occupational Carc.	775 F	6.2 to 15%
Polychlorinatedbiphenyls (PCBs)	N.A.	Not Listed	2 ppm STEL	Not Listed	N.A.	N.A.
Lead	N.A.	0.05 mg/m ³	0.05 mg/m ³	0.1 mg/m ³	N.A.	N.A.
Chromium	N.A.	1 mg/m ³	0.5 mg/m ³	Not Listed	N.A.	N.A.
Cadmium	N.A.	0.6 mg/m ³ Ceiling	0.5 mg/m ³	Potential Occupational Carc.	N.A.	N.A.
Arsenic	N.A.	0.01 mg/m ³	0.2 mg/m ³	.002 mg/m ³ Ceiling Potential Occupational Carc.	N.A.	N.A.

Notes:

- * 29 CFR 1910.1000, Table Z-1-A. Limits For Air Contaminants, as amended through 1/15/91.
 - ^b 1990 - 1991 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH
 - ° NIOSH Pocket Guide to Chemical Hazards, September 1985
- NA = Substance information not available, or substance unlisted.

Cadmium exposures may produce symptoms of nose and throat irritation, chest pain, sweating, chills, dyspnea, weakness, nausea, vomiting, diarrhea, abdominal cramps, and possible death. Prolonged exposures may result in loss of smell, nose ulceration, dyspnea, emphysema, kidney damage, and mild anemia.

Chromium dust exposure may cause irritation of the nose, throat, lungs, and eyes. Skin contact may result in irritation. Ingestion may produce mouth and throat irritation.

Lead exposure may result in insomnia, eye grounds, anorexia, low-weight, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, and trembling paralysis wrist (wrist-drop).

Arsenic is considered a human carcinogen by NIOSH (among others). As a result, all appropriate precautions should be taken to avoid or at the very least, limit exposure to arsenic. Signs and symptoms of exposure include: coughing; dyspnea; chest pains; irritation to skin and mucous membranes; fever; insomnia; liver swelling; melanosis; disturbed heart function; facial edema; and death.

Vinyl Chloride is considered a moderate health hazard by NFPA and a human carcinogen by NIOSH (among others). As a result, all appropriate precautions should be taken to avoid or at the very least, limit exposure to vinyl chloride. Signs and symptoms of exposure include: drowsiness; abdominal pains; numbness and tingling in fingers and toes; pains in joints; coughing; sneezing; irritability; and loss of appetite and weight. Contact with liquid may cause frostbite; contact with vapor may cause irritation and rash. Vinyl Chloride may be readily absorbed through the skin. Prolonged exposure may cause skin to become thickened and stiff with coarse, whitish patches; liver and spleen damage may occur.

1,2-Dichloroethane (Ethylene Dichloride) is considered a moderate health hazard by NFPA and a human carcinogen by NIOSH (among others). As a result, all appropriate precautions should be taken to avoid or at the very least, limit exposure to 1,2-Dichloroethane. Signs and symptoms of exposure include: dizziness; nausea; vomiting; weakness; headaches; abdominal cramps; liver and kidney damage; fluid build up in the lungs; coma; and death. Ingestion of 2 ounces has resulted in nausea, faintness, drowsiness, difficult breathing, pale skin, internal bleeding, kidney damage, and death due to respiratory failure.

Trichloroethylene is considered a moderate health hazard by NFPA and a human carcinogen by NIOSH. As a result, all appropriate precautions should be taken to avoid or at the very least, limit exposure to trichloroethylene. Signs and symptoms of exposure include: headache, drowsiness; nausea; vomiting; dizziness; unconsciousness; and death. May be absorbed through the skin and cause irritation, burning, or redness. Ingestion may result in abdominal pain, unconsciousness, liver or kidney damage, and death. Prolonged exposures may cause nervous exhaustion, sensitivity to alcohol, numbness in the fingers, and change in heart rate.

Carbon Disulfide is considered a moderate health hazard by NFPA. Signs and symptoms of exposure include sleep disturbances, fatigue, loss of appetite, nausea, diarrhea, depression, and extreme irritability. May be absorbed through the skin causing or increasing symptoms listed above. Ingestion may result in loss of coordination, tremors, hallucinations, coma, and death.

Chlorobenzene is considered a moderate health hazard and a severe flammability hazard by NFPA. Symptoms of exposure include coughing, headache, loss of consciousness, loss of coordination, coma, and death. May be irritating to the skin.

Ethylbenzene is considered a moderate health hazard and a severe flammability hazard by NFPA. Symptoms of exposure include irritation of the nose and throat, dizziness, difficult breathing, depression, and unconsciousness. Skin contact may result in irritation, inflammation, blisters, and burns. Ingestion of ethylbenzene may produce headaches, drowsiness, and coma.

Naphthalene is considered a moderate health and flammability hazard by NFPA. Signs and symptoms of exposure include headache, excessive sweating and vomiting. Skin contact may result in irritation. Ingestion may result in nausea, vomiting, abdominal pain, and irritation of the bladder.

Bromoform is considered an extreme health hazard by NFPA. As a result, all appropriate precautions should be taken to avoid or at the very least, limit exposure to bromoform. Signs and symptoms of exposure include irritation of the nose and throat, tearing, reddening of the face, dizziness, and death. May be readily absorbed through the skin to produce symptoms listed above. Ingestion may result in burning of the mouth and throat, headache, dizziness, difficult breathing, unconsciousness, and death.

Polychlorinatedbiphenyls (PCBs) is considered a human carcinogen by NIOSH, IARC, and NTP. As a result, all appropriate precautions should be taken to avoid or at the very least, limit exposure to PCBs.

Material Safety Data Sheets (MSDS) for the materials listed above are included in Appendix D.

4.4.1 Heavy Equipment Operations

Heavy equipment and drill rig operations will be conducted in accordance with the EnSafe Corporate *Health & Safety Manual*. (Appendix E).

4.4.2 Physical Hazards During Operations

Personnel conducting drill rig operations shall keep clear of all moving parts. Loose clothing shall not be worn to prevent entanglement with the drill rig. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. When working in areas that support habitat for poisonous snakes, personnel shall wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

4.5 Employee Protection

Employee protection for this project includes standard safe work practices, personal protective equipment, procedures and equipment for extreme weather conditions, work limitations, and exposure evaluation.

4.5.1 Standard Safe Work Practices

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- No contact lenses will be worn in work areas while invasive actions are conducted.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided.
Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit, or place equipment on drums, containers, or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals.
Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless

specifically approved by a qualified physician. Consumption of alcoholic beverages shall be avoided during operations.

- Due to the possible presence of overhead power lines, adequate side and overhead clearance should be maintained to insure that the drill rig boom does not touch or pass close to any overhead lines.
- Due to the possible presence of underground utilities (including electric, natural gas, water, sewer, telephone, etc.), the activity and local utility representatives should be contacted and requested to identify all lines at the ground surface using characteristic spray paint or labeled stakes. A 3-yard buffer zone should be maintained during all subsurface investigations.
- Due to the flammable properties of the potential chemical hazards, all spark or ignition sources should be bonded and/or grounded or mitigated before soil boring advancement or other site activities begin.

4.5.2 NAS Corpus Christi General Rules of Conduct

- Liquor, firearms, cameras, narcotics, tape recorders, and other contraband items are not permitted on the premises.
- Any violation of local, state, or federal laws, or conduct which is outside the generally accepted moral standards of the community is prohibited.
- Violation of the Espionage Act, willfully hindering or limiting production or sabotage is not permitted.
- Willfully damaging or destroying property, or removing government records is forbidden.
- Misappropriation or unauthorized altering of any government records is forbidden.
- Securing government tools in a personal or contractors tool box is forbidden.
- Gambling in any form, selling tickets, articles, taking orders, soliciting subscriptions, taking up collections, etc. is forbidden.

- Doing personal work in government shop or office, using government property or material for unauthorized purposes, or using government telephones for unnecessary or unauthorized local or long distance telephone calls is forbidden.
- Compliance with posted signs and notices is required.
- Boisterousness and noisy or offensive work habits, abusive language, or any verbal, written, symbolic, or other communicative expression which tends to disrupt the work of others or morale is forbidden.
- Fighting or threatening bodily harm to another is forbidden.
- Defacing any government property is forbidden.
- Wearing shorts of any type and/or offensive logos, pictures, or phrases on clothing is forbidden. Shirts, shoes and pants or slacks or coverall-type garments will be worn at all times on government property.
- All persons operating motor vehicles will obey all NAS Corpus Christi traffic regulations.

4.5.3 Personal Protective Equipment (PPE)

Field activities which disturb soils will be initiated in Level D protection. Level D protection consists of work coveralls (full length sleeves and pants), hard hat, appropriate chemical resistant gloves, eye protection, and chemical resistant, steel toed and shank boots. This level of protection was chosen because petroleum contamination present at this site presents a significant skin absorption hazard.

Air monitoring for volatile organic compounds will be performed continuously during all sampling activities. Instruments will be continuous reading and intrinsically safe. Additional PPE upgrades to Level C will be initiated if airborne concentrations warrant respiratory protection. Level B will be initiated if concentrations of any contaminant exceeding 50 percent of the OSHA Permissible Exposure Limit (PEL) are encountered. See Table 4.2 for the specific criteria for use and equipment for each level of protection.

**TABLE 4.2
 LEVEL OF PROTECTION AND CRITERIA**

Level of Protection	Criteria for Use	Equipment
Level A	<ul style="list-style-type: none"> • When atmospheres are "immediately dangerous to life and health" (IDLH in the NIOSH/OSHA Pocket Guide to Chemical Hazards or other guides.) • When known atmospheres or potential situations exist that would affect the skin or eyes or be absorbed into the body through these surfaces. Consult standard references to obtain concentrations hazardous to skin, eyes or mucous membranes. • Potential situations include those where immersion may occur, vapors may be generated or splashing may occur through site activities. • Where atmospheres are oxygen 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-demand supplied air respirator with escape SCBA • Totally-encapsulating chemical protective suite • Chemical-resistant inner and outer gloves • Steel toe and shank chemical resistant boots • Hard hat under suit • Two-way radios worn inside suit • Optionally: 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 concentrations of any contaminant exceed 50% of PEL 	<ul style="list-style-type: none"> • Chemical resistant clothes, long sleeves, hooded, one or two pieces • 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 • Optionally: coveralls and disposable outer boots
Level C	<ul style="list-style-type: none"> • When airborne particulates (dust) warrant respiratory protection • When work areas contain at least 19.5 percent oxygen 	<ul style="list-style-type: none"> • Chemical resistant clothes, long sleeves, hood optional, one or two pieces • Full-faced piece, air purifying respirator equipped with cartridges suitable for the hazard • Hard hat • Inner gloves and chemical resistant gloves • Steel toe and shank boots • Coveralls and disposable outer boots
Level D	<ul style="list-style-type: none"> • When level B or C is not indicated • When airborne particulates do not warrant respiratory protection • When work areas contain at least 19.5 percent oxygen 	<ul style="list-style-type: none"> • Inner gloves and chemical-resistant gloves needed to handle soil or water samples • Steel toe and shank boots • Hard hat (ANSI Z891-1969 standard) • Eye protection (ANSI Z87.1-1968) standard • Optionally: coveralls and disposable outer boots

Notes:

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

Contraindications for use of Level A:

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

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

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

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

Selection of Personal Protective Equipment

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

The appropriate level of protection will be determined before the initial entry based on the best available information. Subsequent information, (e.g., sampling results and site observations), may require changes in the original level selected.

The levels of personal protection were determined by the USEPA and are to be used in selecting equipment for onsite activities. The levels are designated as Level A, B, C, and D. They correspond with the work areas in the exclusion zone and are consistent with the levels of protection described in Appendix E of OSHA 1910.120.

Chemical-Protective Clothing (CPC)

Chemical-protective clothing is available in a variety of materials that offer a range of protection against different chemicals. The most appropriate material depends on the chemicals present and the tasks to be accomplished. Ideally, the material resists permeation, degradation, and penetration. Permeation is the process by which a chemical dissolves in and/or moves through a protective clothing material on a molecular level. Degradation is the loss of or change in the fabric's chemical resistance or physical properties due to exposure to chemicals, use or ambient conditions (e.g. sunlight). Penetration is the movement of chemicals through zippers, stitched seams or imperfections (e.g. pinholes) in a protective clothing material.

Selection of chemical-protective clothing is a complex task and should be performed by personnel with training and experience. Under all conditions, clothing is selected by evaluating the performance characteristics of the clothing against the requirements and limitations of the site and task-specific conditions. If possible, representative garments should be inspected before purchase and their use and performance discussed with someone who has experience with the clothing under consideration. In all cases, the employer is responsible for ensuring that the personal protective clothing (and all PPE) necessary to protect employees from injury or illness that may result from exposure to hazards at the work site is adequate and of safe design and construction for the work to be performed (see OSHA Standard 29 CFR Part 1910.132 — 1910.137).

Permeation and Degradation

The selection of chemical-protective clothing (CPC) depends greatly upon the type and physical state of the contaminants. This information is determined during site characterization. After the chemicals have been identified, available sources should be consulted to identify materials that are resistant to permeation and degradation by the known chemicals. One excellent reference, *Guidelines for the Selection of Chemical-Protective Clothing*, (ACGIH, 1985), provides a matrix of clothing material recommendations for approximately 300 chemicals based on an evaluation of permeation and degradation data from independent tests, vendor literature, and raw material suppliers. Charts indicating the resistance of various clothing materials to permeation and degradation are also available from manufacturers and other sources. It is important to note, however, that no material protects against all chemicals and combinations of chemicals, and that no currently available material is an effective barrier to any prolonged chemical exposure.

In reviewing vendor literature, it is important to be aware that the data provided are of limited value. For example, the quality of vendor test methods is inconsistent. Vendors often rely on the raw material manufacturers for data rather than conducting their own tests, and the data may not be updated. In addition, vendor data cannot address the wide variety of uses and challenges to which CPC may be subjected. Most vendors strongly emphasize this point in the descriptive text that accompanies their data.

Another factor to bear in mind when selecting CPC is that the rate of permeation is a function of several factors, including clothing material type and thickness, manufacturing method, the concentrations of the hazardous substances, temperature, pressure, humidity, the solubility of the chemical in the clothing material, and the diffusion coefficient of the permeating chemical in the clothing material. Thus permeation rates and breakthrough time may vary depending on these conditions. Breakthrough time is the time from initial exposure until hazardous material is detectable on the inside of the CPC.

Most hazardous wastes are mixtures for which specific data are not available to help make a good CPC selection. Due to a lack of testing, only limited permeation data for multi-component liquids are currently available.

Mixtures of chemicals can be significantly more aggressive towards CPC materials than can any single component. Even small amounts of a rapidly permeating chemical may provide a pathway that accelerates the permeation of other chemicals. Formal research is being conducted on these effects. NIOSH is currently developing methods for evaluating CPC materials against mixtures of chemicals and unknowns in the field. For hazardous waste site operations, CPC should be selected that offers the widest range of protection against the chemicals expected onsite. Vendors are now providing CPC material composed of two or even three different materials laminated together that provide the best features of each material.

Heat Transfer Characteristics

The heat transfer characteristics of CPC may be an important factor in selection. Since most chemical-protective clothing is virtually impermeable to moisture, evaporative cooling is limited. The thermal insulation value, called the *clo* value, of chemical-protective clothing is a measure of the capacity of CPC to dissipate heat loss through means other than evaporation. The larger the *clo* value, the greater the insulating properties of the garment and, consequently, the lower the heat transfer. Given other equivalent protective properties, clothing with the lowest *clo* value should be selected in hot environments or for high work rates. Unfortunately, *clo* values for clothing are rarely available at present.

General Measures

A primary goal of E/A&H is the prevention of all occupationally related injuries and illnesses. The following practices are presented as general precautionary measures for

reducing the risks associated with hazardous waste and spill operations. Failure to adhere to the measures will result in disciplinary action.

Personal Protection

- Be familiar with and knowledgeable about standard operating safety procedures.
- Be familiar with, knowledgeable about, and adhere to instructions in site safety plan.
- Identify and arrange for emergency medical assistance. The location, telephone number and transportation capabilities of the nearest emergency medical facilities should be known. For particularly hazardous operations, onsite medical facility alerted.
- Consider fatigue, heat stress and other environmental factors influencing efficiency of personnel.

4.5.4 Procedures and Equipment for Extreme Weather Conditions

Field activities for this investigation are scheduled to last approximately 2 weeks. The seasonal climate can be expected to be hot. Heat stress will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot weather can cause physical discomfort, loss of efficiency and personal injury.

Heat Stress

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

Heat stress is the metabolic and environmental heat to which an individual is exposed. The manifestations of heat strain are the adjustments made by an individual in response to the

stress. The three most important categories of heat-induced illness are: heat exhaustion, heat cramps, and heat stroke. These disorders can occur when the normal responses to increased sweat production are not adequate to meet the needs for body heat loss or when the temperature regulating mechanisms fail to function properly.

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

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

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

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

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

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

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

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

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

Additional treatment:

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

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

To reduce the potential for heat strokes:

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

Additional Measures

In extremely warm weather, the Site Health and Safety Officer may also require these additional measures:

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

4.5.5 Work Limitations

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

4.5.6 Exposure Evaluation

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

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

4.6 Monitoring Requirements

Air monitoring will be accomplished using an HNu (or similar) photoionization detector (PID) and a MSA 361 combustible gas indicator (CGI) during all borings and ground water well installations. The PID will be field calibrated to measure volatile organic compounds relative to benzene using an isobutylene standard gas. Background (ambient) PID and CGI readings in the breathing zone will be collected before each day's field activities begin. This value will be recorded in the field log book. If volatile organic compounds concentrations (in the breathing zone) exceed background (ambient) readings by five ppm or more, or CGI readings exceed 20% of the LEL, field activities will immediately cease. Upon cessation of

site activities, the Field Project Manager must contact the Health and Safety Officer. The Health and Safety Officer will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary including upgraded personal protective equipment requirements, revised work schedules, and revised decontamination procedures.

Field technicians will be made aware that they must report any unusual odors or soil discolorations. Each instrument shall be calibrated daily before site activities begin and operated checks during the day. At the end of each work day and before to calibration, each instrument shall be checked to ensure that it is free from surface contamination.

4.6.1 Medical Monitoring Program

All EnSafe/Allen & Hoshall personnel who enter hazardous waste/spill sites or have the potential for exposure to hazardous materials from these sites must participate in the EnSafe/Allen & Hoshall Medical Monitoring Program. The program is conducted by the Ensafe/Allen & Hoshall's company doctor with the company Health and Safety Officer. The purpose of the program is to identify any pre-existing illnesses or problems that would put an employee at unusual risk from certain exposures or respirators, and to monitor and evaluate exposure-related events where workers are involved in the handling of hazardous materials. Project managers should consult with the Health and Safety Officer and/or the company doctor concerning the scope of work and known or anticipated chemical hazards associated with each project.

EnSafe/Allen & Hoshall maintains the right to exclude certain individuals from particular jobs based on reports from the company doctor. The program will be reviewed on an annual basis to determine its effectiveness.

The company doctor has been employed as an independent contractor to provide medical monitoring for EnSafe/Allen & Hoshall.

The doctor is responsible for the following aspects of the medical monitoring program:

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

Preplacement Examinations

Each E/A&H employee will be given a preplacement examination to identify any preexisting illness or problem that would put the employee at an unusual risk from certain exposures; to assure that each employee can safely use negative pressure respirators; and to develop a data base to assess any exposure related events detected during periodic medical monitoring.

Data accumulation will include variables such as age, sex, race, smoking, prior employment history, and other conditions that might bear upon the occurrence of subsequent events once employment begins.

The preplacement examination includes:

- Occupational history including previous chemical and carcinogenic exposures.
- Medical history including demographic data, family history, personal habits, past medical history and a current symptomatic review of systems.
- Fertility history.
- Physical examination, stressing examination of the neurologic, cardio-pulmonary, musculoskeletal and dermatological systems.
- Physiological parameters including blood pressure and visual acuity testing.
- Pulmonary function testing including FVC, FEV₁ and FEV₂₅₋₇₅.

- Electrocardiogram.
- PA and lateral chest X-ray.
- A multi-chemistry panel including tests of kidney and liver function.
- Red blood cell cholinesterase.
- Audiogram.

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

Periodic and Exit Examinations

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

- Updated occupational and medical history
- Physical examination, stressing examination of the neurologic, cardio-pulmonary, musculoskeletal and dermatological systems
- Pulmonary function testing including FVC, FEV1 and FEV 25-75
- Multi-chemistry panel including tests of kidney and liver function
- Urinalysis

The company doctor will review the results of annual examination and exposure data, and request further tests or issue medical clearances as appropriate.

An examination will also be administered when an employee leaves the company. The company doctor will be consulted for the contents of the exam, except when the employee has had an exam within 6 months or when there has been no site work since the last examination.

Return-to-Work Examinations

After any job-related injury or illness, a medical examination is required to determine fitness for duty or to identify any job restrictions. The medical examiner will review the results of this back-to-work examination with Company doctor before releasing the employee for work. A similar examination will be performed if an employee has missed at least 3 days of work due to a non-job-related injury requiring medical attention.

Confidentiality

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

4.7 Decontamination

A decontamination zone will be established and will include one area for sampling equipment and one area for personnel decontamination (if necessary).

4.7.1 Personnel Decontamination

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

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

Decontamination procedures will be conducted at the lunch break and at the end of each work day.

If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

4.7.2 Closure of the Personnel Decontamination Station

Decontamination and rinse solutions (soap and water solutions) from sampling tool decontamination will be collected in 55-gallon drums. All washtubs, pails, buckets, etc. will be washed, rinsed and dried at the end of each workday.

All contaminated soils produced during decontamination activities will be collected in 55-gallon drums along with drill cuttings, waste decontamination solutions, and any disposable gloves and clothing produced during site activities. All drums will be labeled by E/A&H personnel for final disposal by the Navy.

4.8 Authorized Personnel

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

- EnSafe/Allen & Hoshall Principal-In-Charge— Dr. James Speakman
- EnSafe/Allen & Hoshall Task Order Manager— Mr. Jeff Bennett
- EnSafe/Allen & Hoshall Field Project Manager— Mr. Ben Brantley
- EnSafe/Allen & Hoshall Field Geologist— Mr. Ben Brantley
- EnSafe/Allen & Hoshall Site Health & Safety Officer— Mr. Doug Petty
- SOUTHDIV, Engineer-in-Charge— Mr. Ed Lohr
- Naval Air Station Corpus Christi Site Contact— Dilip Shaw
- Drilling Subcontractor— To Be Determined
- Laboratory Subcontractor— To Be Determined

4.8.1 Responsibilities of EnSafe/Allen & Hoshall Field Project Manager

The Project Manager will direct the site investigation and operation. The Project Manager has the primary responsibility for assuring that all personnel are aware of:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on the site
- Use of personal protection equipment and assuring that the equipment is available
- Work practices by which the employee can minimize risks from hazards
- Safe use of engineering controls and equipment on the site
- Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards
- Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

The Project Manager is also responsible for assuring that all employees have received at least 40 hours of health and safety instruction, off the site, and actual field experience under the

direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training.

The Project Manager also monitors the performance of personnel to ensure that mandatory health and safety procedures are being performed and corrects any performances that do not comply with the Health and Safety Plan. (Copies of health and safety training certificates must be available for review by the EnSafe/Allen & Hoshall Project Manager and Site Safety Officer.)

Additional responsibilities extend to ensuring that all field personnel employed on the site are covered by a medical surveillance program as required by 29 CFR 1910.120(f):

- Consulting with the Health and Safety Officer and/or other personnel
- Preparation and submittal of any and all project reports— includes progress, accident, incident, contractual, etc.
- Monitoring personnel decontamination to ensure that all personnel are complying with the established decontamination procedures.

4.8.2 Responsibilities of EnSafe/Allen & Hoshall Site Health and Safety Officer

The EnSafe/Allen & Hoshall Health and Safety Officer has the primary responsibility for:

- Assuring that a copy of the Health and Safety Plan is maintained onsite during all field activities.
- Advising the Field Project Manager on all health and safety related matters involved at the site.
- Directing and ensuring that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.
- Ensuring that the field personnel observe the appropriate work zones and decontamination procedures.

- Reporting any safety violations to the Project Manager.
- Conducting safety briefings during field activities.

The Site Health and Safety Officer will be a person trained in safety and industrial hygiene. After the project begins and the Site Health and Safety Officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of the Site Health and Safety Officer.

The person responsible for daily health and safety will be trained to use the air monitoring equipment, interpret the data collected with the instruments, and be familiar with symptoms of heat stress and cold exposure and the location and use of safety equipment onsite. He will also be familiar with this health and safety plan.

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

4.8.3 Responsibilities of Onsite Field Personnel

All onsite field personnel will be responsible for the following:

- All personnel going onsite must be thoroughly briefed on anticipated hazards and trained on equipment to be worn, safety procedures to be followed, emergency procedures and communications.
- Required respiratory protective devices and clothing must be worn by all personnel going into areas designated for wearing protective equipment.
- Personnel must be fit-tested before using respirators.

- No facial hair which intrudes on the sealing surface of the respirator is allowed on personnel.
- Personnel on site must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.
- Visual contact must be maintained between pairs onsite and site safety personnel. Field personnel should remain close together to assist each other during emergencies.
- All field personnel should make use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.
- Personnel should practice unfamiliar operations prior to doing the actual procedure in the field.
- Field personnel shall be familiar with the physical characteristics of the site, including:
 - wind direction in relation to contamination zones
 - accessibility to associates, equipment and vehicles
 - communications
 - operation zones
 - site access
 - nearest water sources
- The number of personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.
- Procedures for leaving a contaminated area must be planned and implemented before going onsite in accordance with the Site Health and Safety Plan.
- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Modifications must be approved by the Site Health and Safety Officer.

4.9 Emergency Information

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure or fire may occur and must be anticipated. If any situation or unplanned occurrence requires outside or support service, Dilip Shaw, NAS Corpus Christi site contact, will be informed and the appropriate contact from the following list will be made:

Contact	Agency or Organization	Telephone
Dilip Shaw	Naval Air Station Corpus Christi	(512) 939-3776
Ed Lohr	SOUTHDIV Engineer-in-Charge	(803) 743-0355
Law Enforcement	NAS Corpus Christi Base Security	(512) 939-2480
Fire Department	NAS Corpus Christi	(512) 939-3333
Ambulance Service	NAS Corpus Christi Base Hospital	(512) 939-2424 (512) 939-2735
Poison Control Center		(512) 881-4559
Jeff Bennett	EnSafe/Allen & Hoshall 5724 Summer Trees Drive Memphis, TN 38134	(901) 372-7962
Doug Petty	EnSafe/Allen & Hoshall 5724 Summer Trees Drive Memphis, TN 38134	(901) 372-7962

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

4.9.1 Site Resources

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

4.10 Emergency Procedures

If an emergency develops onsite, the procedures listed here are to be immediately followed:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the Site Safety Officer.
- If any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the Site Safety Officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the Site Safety Officer to indicate possible routes for upwind escape.
- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the Safety Officer has evaluated the situation and provided the appropriate instructions to the field team.
- If an accident occurs, the Project Manager is to complete an accident report form for submittal to the managing principal-in-charge of the project.
- If a member of the field crew suffers a personal injury, the Site Health and Safety Officer will call **(512) 939-2424** (serious injury) to alert appropriate emergency

response agencies or administer on-site first aid (minor injury) as the situation dictates. An Accident Report Form will be completed for any such incident.

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

Directions to the nearest emergency medical facility capable of providing general emergency medical assistance and treating chemical burns are provided in Appendix F.

Additional information on appropriate chemical exposure treatment methods is provided in MSDS in Appendix D.

4.11 Forms

The following forms will be used in implementing this Health and Safety Plan:

Plan Acceptance Form

Plan Feedback Form

Exposure History Form

The Plan Acceptance Form will be filled out by all employees working on the site prior to commencement of site activities. The Plan Feedback Form will be filled out by the Site Safety Officer and any other onsite employee who wishes to fill one out. The Exposure History Form will be completed by both the Field Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in Appendix G.

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

APPENDIX A

Reserved for the Chosen Laboratory's Quality Assurance Plan

APPENDIX B

Data Validation Checklist

FIELD DATA VALIDATION CHECKLIST

Project Name: _____
Project Number: _____
Sample Identification: _____
Sampling Team: _____
Analyzing Laboratory: _____
Analyses Performed: _____
Sample Matrix: _____
QA Reporting Level: _____

REPORTING REQUIREMENTS

<u>FIELD DATA PACKAGE DOCUMENTATION</u>	<u>YES</u>	<u>NO</u>	<u>NOT REQUIRED</u>
1. Field (water and soil sample logs completed properly and signed			
2. Sampling dates noted			
3. Sampling team indicated			
4. Sample identification traceable to location collected			
5. Sample location provided			
6. Sample depth for soils indicated			
7. Collection technique (bailer, pump etc.)			
8. Field preparation techniques and sample type indicated (grab, composite)			
9. Sample container type described			
10. Sample container type proper for analysis			
11. Preservation methods indicated			
12. Chain-of-custody form completed			
13. Proper analytical methods requested			
14. Proper number and type of field QC samples were collected (blanks, replicates, splits, etc.)			
15. Field equipment was properly calibrated before use and results documented.			

COMMENTS: _____

FIELD DOCUMENTATION IS COMPLETE: _____
QA Officer

ANALYTICAL DATA VALIDATION CHECKLIST

Project Name: _____
Project Number: _____
Sample Identification: _____
Sampling Team: _____
Analyzing Laboratory: _____
Analyses Performed: _____
Sample Matrix: _____
QA Reporting Level: _____

REPORTING REQUIREMENTS
ANALYTICAL DATA PACKAGE DOCUMENTATION
LEVEL A (QUALITATIVE)

Section I: General Information

NOT
YES NO REQUIRED

1. Sample results complete
2. Proper parameters analyzed
3. Method of analysis reported
4. Detection limits of analysis reported
5. Master tracking list provided
6. Sample collection date provided
7. Sample received date provided
8. Sample preparation/extraction date provided
9. Sample analysis date provided
10. Copy of Chain-of-Custody form signed by the lab sample custodian
11. A narrative summary of QA or sample problems is provided

COMMENTS: _____

Section II: Inorganic Analyses

YES NO NOT
REQUIRED

1. Results of ICVS and CCVS, %R, expected values
2. Results of Digested LCS (may be called QC Check sample), %R and expected value
3. Results of undigested QC Check sample, %R, Source (Lot No. and manufacturer)
4. Results of method blanks
5. Results of interference check sample (ICS) and expected value (ICP only)
6. Results of a dilution check sample and expected value (ICP only)
7. Results of laboratory duplicate analysis and %RSD or RPD and control
8. Results of Matrix spike (digested spike) analysis, amount spiked, %R and control limits
9. Results of analytical (post-digested) spike analysis, amount spiked, %R, and control limits (furnace AAS only)

COMMENTS: _____

Documentation

Section III: Organic Analyses

YES NO NOT
REQUIRED

A. GAS CHROMATOGRAPHY (NO MASS SPEC)

1. Results of water blanks (VOA),
Extraction blanks, and/or trip blanks
2. Results of latest independent QC
check samples, expected value %R
and source (Lot No. and manufacturer
3. Results of analysis of reagent water
spike, expected value %R, control
limits
4. Results of reagent water spike
duplicate, expected value, %R,
RPD and control limits
5. Results of matrix spikes, amount
spiked, %R and control limit
6. Results of matrix spike duplicates,
amount spiked, %R, RPD or %RSD and
control limit
7. Results of laboratory duplicates
(if performed), RPD or %RSD and
control limit
8. Results of surrogate spikes, %R,
control limits

COMMENTS: _____

Documentation

	<u>YES</u>	<u>NO</u>	<u>NOT REQUIRED</u>
B. <u>GAS CHROMATOGRAPHY/MASS SPECTROMETER</u>			
1. Verification statement acknowledging tuning with BFB or DF TPP that indicates compliance with acceptance criteria			
2. Results of continuing calibration standards (SPCC and CCC), expected value			
3. Results of water blanks, extraction (method) blanks, and trip blanks.			
4. Results of analysis of reagent water spike, expected value, %R, control limits			
5. Results of reagent water spike duplicate, expected value, %R, RPD, and control limits			
6. Results of matrix spikes analysis, amount spiked, %R, and control limits			
7. Results of matrix spike duplicate analysis amount spiked, %R, RPD or %RSD and control limits			
8. Results of surrogate spike analysis, %R, control limits			
9. Results of latest Independent QC check samples (EPA or NBS traceable) analyzed expected value, and source (Lot No. and manufacturer)			
10. Results of blank spike analysis for matrix spike or matrix spike duplicate parameters not meeting recovery requirements			

COMMENTS: _____

QUANTITATIVE STATISTICAL SIGNIFICANCE
LEVEL B (QUANTITATIVE)

DATA EVALUATION

PASS FAIL NOT APP

1. Samples were properly collected
 2. Samples were properly preserved
 3. Field measurements of pH and specific conductance are consistent with historical data
 4. Samples were analyzed by the proper methods
 5. Sample extracted within holding time
 6. Sample analyzed within holding time
 7. Required detection limits were employed by the laboratory
 8. Results of Sampler rinsate blanks were contaminant free or less than five times the detection limit
 9. Sampler rinsate blanks were not contaminant free and field blanks were analyzed properly
 10. Field blanks were contaminant free
 11. Field blanks were not contaminant free and trip blanks were properly analyzed
 12. Trip blanks were contaminant free
 13. Trip blanks were not contaminant free
 14. Laboratory blanks (method blanks, extraction blanks, water blanks) are contaminant free
 15. Blanks summary (conclusions reached): _____
-

QUANTITATIVE STATISTICAL SIGNIFICANCE (Continued)
LEVEL B (QUANTITATIVE)

DATA EVALUATION

PASS FAIL NOT APP

16. RPD of field replicates is less
 than 25% for water matrices and less
 than 40% for soil matrices or the
 difference can be explained

COMMENTS: _____

INORGANIC ANALYSES

PASS FAIL NA

1. ICVS and CCVD %R within control limits
2. LCS %R within control limits
3. QC Check Sample %R within control limits and source given
4. Laboratory blanks acceptable
5. Interference Check sample within control limits (ICP only)
6. Dilution Check sample within control limits (ICP only)
7. RPD for laboratory duplicate within allowable limits
8. Matrix spike %R within control limits
9. Analytical post digested spike within control limits (furnace AAS only)

COMMENTS: _____

ORGANIC ANALYSES

PASS FAIL NA

1. Laboratory blanks are acceptable
2. QC check samples %R were within control limits and source given
3. GC/MS properly tuned with BFB or DFTPP
4. GC/MS continuing calibration (SPCC and CCC) standards within acceptable control limits
5. Matrix spikes or reagent water spikes %R within control limits
6. Matrix spike duplicates %R within control limits
7. RPD of matrix spike duplicate or reagent water spike duplicate was within control limits
8. Surrogate spikes within control limits
9. Laboratory duplicates have acceptable RPD

COMMENTS: _____

**DATA VALIDATION QUALIFIER CODES
FOR ORGANIC ANALYSES**

The analytical data validation level is (check one):

EXPLANATION: _____

FINAL CONCLUSION: _____

VALIDATION PERFORMED BY: _____

REPORTING QUALIFIERS:

- U code:** Indicates that compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g., 10U) based on necessary concentration/dilution actions. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

- J code:** Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g., 10J) >

- C code:** This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides > 19 bg.yk in the final extract should be confirmed by GC/MS.

- B code:** This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probably blank contamination and warns the data user to take appropriate action.

- E code:** Indicates a value estimated or not reported due to the presence of interference. Explanatory note included on cover page.

- R code:** Indicates spike sample recovery is not within control limits.

- s code:** Indicates value determined by Method of Standard Addition.

REPORTING QUALIFIERS: (Continued)

- * code:** Indicated duplicate analysis is not within control limits.

- + code:** Indicates the correlation coefficient for method of standard addition is less than 0.995.

- Other:** Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report.

DATA CLASSIFICATION SUMMARY CHECKLIST

Class A Criteria

Matrix: Ground Water

To be classified for Class A use, the data must meet the following criteria:

Criteria	Evaluation Result
1. Sampling dates were recorded;	
2. Signatures of Sampling Team on each water sample log or soil sample log;	
3. Sampling locations were clearly designated and described;	
4. Sampling depth increment for soils was recorded;	
5. Sample collection technique was described on water sample log or soil sample log;	
6. Field preparation techniques were clearly described where applicable;	
7. Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	
8. Shipping bill of lading or constant surveillance documentation is available;	
9. The laboratory sample preparation or extraction date is recorded and available;	
10. The laboratory sample analysis date is recorded and available;	

Class A Criteria (continued)

Criteria	Evaluation Result
11. The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratories approved SOP;	
12. The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	
13. The laboratory analytical detection limits or limits of quantitation (LCQ) are given in lab reports and are adequate for project objectives;	
14. Field records include: <ul style="list-style-type: none">● Soil/sediment log sheets● Water sampling log sheets● QC field checklist● Field instrument calibration logs● Master bound log book with sequentially numbered pages● Daily log book● Chain-of-custody forms	
15. All applicable records described above were properly created and are on file;	
16. Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level).	

Remarks:

Conclusion:

DATA CLASSIFICATION SUMMARY CHECKLIST

Class B Criteria

Matrix: Ground Water

To be classified for Class B use, the data must meet the following criteria:

Criteria	Evaluation Result
A. <u>Data Validation Result</u>	
1. Samples of this matrix have not been flagged J or R during data validation;	
2. All samples of this matrix have been classified as Level A data;	
B. <u>Quantitative Statistical Significance</u>	
1. Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	
2. Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	
3. All laboratory procedures were referenced to approved EPA methods and were contained in an approved SOP manual;	
4. Analytical QC data was available to demonstrate proper instrument calibration;	
5. Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	
6. Laboratory reagent (method) blanks were analyzed at frequency of at least 1 per 20 samples;	
7. Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	

Class B Criteria (continued)

Criteria	Evaluation Result
8. Laboratory matrix spikes and matrix spike duplicates were analyzed at a frequency of at least 1 per 20 samples;	
9. Field replicates if required were analyzed at a frequency of at least 1 per 10 samples;	
10. Field blanks were submitted at a frequency of at least 1 per 20 samples;	
11. One trip blank was submitted for VOCs analysis with each cooler;	
12. Field split samples if required were analyzed at a frequency of at least 1 per 20 samples per matrix;	
13. Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	
14. If required for the project, the laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	
15. The laboratories participated in round-robin testing program by WPA or other accrediting agency;	
16. Quality control limits were consistent with or exceed the limits established by the EPA for all methods of analysis or the EPA CLP;	
17. All samples submitted were analyzed for the requested parameters.	

Class B Criteria (continued)

Criteria	Evaluation Result
C. <u>Custody and Document Control</u>	
1. Field custody of all samples was noted in a bound field log book;	
2. Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	
3. Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	
4. Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	
5. Field notebooks, log sheets, log books, checklists, reports, data validations, and custody documents are stored in a secure repository or under the control of a document custodian;	
6. All records, forms log books, etc., are filled out completely in indelible ink without alterations except as initialed;	
7. All sample log sheets have been signed by the sample collector;	
8. Field log book sheets signed by the field sample custodian.	
D. <u>Sample Representativeness</u>	
1. Compatibility exists between field and laboratory measurements or incompatibilities have been suitably explained;	

Class B Criteria (continued)

Criteria	Evaluation Result
2. Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	
3. Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	
4. Proper sample containers were used for the parameters analyzed;	
5. Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	
6. The sample site selection criteria are consistent with the objectives of the investigation and will provide the required data.	

Remarks:

Conclusion:

APPENDIX C

HEALTH AND SAFETY TRAINING CERTIFICATES

CERTIFICATE OF ATTENDANCE

**HAZARDOUS WASTE FIELD INVESTIGATION
HEALTH AND SAFETY TRAINING**

8 - Hour Refresher Training

Jeff Bennett

August 22, 1991

Complies with 29 CFR 1910.120(e)

Rick Barlow

Instructor - Rick Barlow

EN SAFE®

Environmental and Safety Designs, Inc.



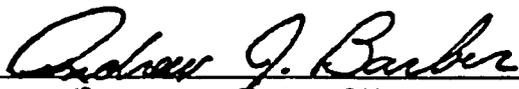
Certificate of Completion

Presented To

Jeff Bennett

October 16~20, 1989

In Recognition of Having Successfully Completed
the Prescribed Course of Study for
Hazardous Waste Site Activities
40-Hour Initial
Health and Safety Training



Corporate Safety Manager
Geraghty & Miller, Inc.



Regional Health and Safety Manager
Geraghty & Miller, Inc.



Certificate of Completion

Presented To

David W. Fuehrer

In Recognition of Having Successfully Completed
the Prescribed Course of Study for

**Hazardous Waste Site Activities
40-Hour Initial Health and Safety Training**

Orlando, Florida

March 5-9, 1990

Richard Miller

President
American Ecology Services, Inc.

Kevin J. Tomaly

Course Director
Geraghty & Miller, Inc.

Professional Service Industries, Inc.

It is to certify that

has successfully completed the required training



PSI Annual Refresher Course
Date August 16, 1991
Certificate No. OH-309
Instructor [Signature]

PSI OSHA 29 CFR 1910.120
Certificate of
3-Day Field Training
Date October 11, 1990
[Signature]
Director of Training

APPENDIX D
MATERIAL SAFETY DATA SHEETS

ODOR DESCRIPTION: odor; characteristic odor Source:CHRIS
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1114
DOT shipping name: Benzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T8
Packaging exceptions: 150
Non bulk packaging: 202
Bulk packaging: 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/mL»(01/09/89)

Maximum Contaminant Level Goals (MCLG): 0 mg/mL»(01/09/89)

CLEAN AIR ACT: CAA '90 Listed and CAA '77 Sect 109

EPA WASTE NUMBER: U019,D018

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

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

SHORT TERM TOXICITY: INHALATION: benzene may produce both nerve and blood effects. irritation of the nose, throat and lungs may occur (3,000 ppm may be tolerated for only 30 to 60 minutes). lung congestion may occur. nerve effects may include an exaggerated feeling of well-being, excitement, headache, dizziness and slurred speech. at high levels, slowed breathing and death may result. death has occurred at 20,000 ppm for 5 to 10 minutes, or 7,500 ppm for 30 minutes. SKIN: irritation may occur, with redness and blistering if not promptly removed. benzene is poorly absorbed. whole body exposure for 30 minutes has been reported with no health effects. Eyes: may cause severe irritation. INGESTION: may cause irritation of mouth, throat and stomach. symptoms are similar to those listed under inhalation. one tablespoon may cause collapse, bronchitis, pneumonia and death. (NYDH)

LONG TERM TOXICITY: may cause loss of appetite, nausea, weight loss, fatigue, muscle weakness, headache, dizziness, nervousness and irritability. mild anemia has been reported from exposures of 25 ppm for several years and 100 ppm for 3 months. at levels between 100 and 200 ppm for periods of 6 months, or more, severe irreversible blood changes and damage to liver and heart may occur. temporary partial paralysis has been reported. (NYDH)

TARGET ORGANS: blood, CNS, skin, bone marrow, eyes, resp sys

SYMPTOMS: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death. Source: CHRIS

CONC IDLH: 3000ppm

NIOSH REL: Potential occupational carcinogen 0.1 ppm Time weighted averages for 8-hour exposure 0.32 mg/M3 Time weighted averages for 8-hour exposure 1 ppm Ceiling exposures which shall at no time be exceeded 3.2 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 10 ppm 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?: Y STATUS: See below
REFERENCES:

HUMAN SUSPECTED IARC** 7,203,74
HUMAN SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 28,151,82
ANIMAL SUSPECTED IARC** 29,93,82
HUMAN POSITIVE IARC** 29,93,82
ANIMAL INDEFINITE IARC** 7,203,74

CARCINOGEN LISTS:

IARC: Carcinogen as defined by
IARC as carcinogenic to humans,
with sufficient epidemiological
evidence.
MAK: Capable of inducing malignant
tumors as shown by experience in
humans.
NIOSH: Carcinogen defined by NIOSH
with no further categorization.
NTP: Carcinogen defined by NTP as
known to be carcinogenic, with
evidence from human studies.
ACGIH: Carcinogen defined by ACGIH
TLV Committee as a 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 1991)

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
ivn-rbt LDLo:88 mg/kg
ipr-gpg LDLo:527 mg/kg
scu-frg LDLo:1400 mg/kg
ihl-mam LCLo:20000 ppm/5M
ipr-mam LDLo:1500 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

ihl-rat TCLo:670 mg/m3/24H (15D pre/1-22D preg) HYSAAV
33(1-3),327,68

EFFECTS ON FERTILITY
Female fertility index

ihl-rat TCLo:56600 ug/m3/24H (1-22D preg) HYSAAV
33(7-9),112,68

EFFECTS ON NEWBORN

ihl-rat TCLo:50 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON EMBRYO OR FETUS

Extra embryonic features(e.g.,placenta,umbilical
cord)

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

ihl-rat TCLo:150 ppm/24H (7-14D preg) JHEMA2 24,363,80
EFFECTS ON FERTILITY

Post-implantation mortality

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Musculoskeletal system

orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:12 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON FERTILITY
Post-implantation mortality

orl-mus TDLo:6500 mg/kg (8-12D preg) TCMUD8 6,361,86
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-mus TCLo:500 ppm/7H (6-15D preg) AIHAAP 40,993,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:500 mg/m3/12H (6-15D preg) ATSUDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLo:5 ppm (6-15D preg) TXCYAC 42,171,86
EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic material)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ihl-mus TCLo:20 ppm/6H (6-15D preg) FAATDF 10,224,88
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and marrow)

ipr-mus TDLo:5 mg/kg (1D male) TPKVAL 15,30,79
EFFECTS ON FERTILITY
Pre-implantation mortality
EFFECTS ON EMBRYO OR FETUS
Fetal death

scu-mus TDLo:1100 mg/kg (12D preg) TOXID9 1,125,81
EFFECTS ON EMBRYO OR FETUS
Other effects on embryo or fetus

scu-mus TDLo:7030 mg/kg (12-13D preg) SEIJBO 15,47,75
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical cord)
EFFECTS ON EMBRYO OR FETUS

Fetotoxicity (except death, e.g., stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ivn-mus TDLo: 13200 ug/kg (13-16D preg) ICHUDW
4(6), 24, 82
EFFECTS ON EMBRYO OR FETUS
Cytological changes (including somatic cell genetic
material)

par-mus TDLo: 4 gm/kg (12D preg) NEZAAQ 25,438,70
EFFECTS ON NEWBORN
Weaning or lactation index (#alive at weaning per #
alive at day 4)

ihl-rbt TCLo: 1 gm/m³/24H (7-20D preg) ATSUDG 8,425,85
EFFECTS ON FERTILITY
Post-implantation mortality
EFFECTS ON FERTILITY
Abortion
EFFECTS ON EMBRYO OR FETUS
Fetal death

NO SIGNIFICANT
RISK LEVEL (Ca P65): 20 micrograms/day

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

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

hydrocarbon vapor canister, supplied air or hose mask;
hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face
splash shield; hydrocarbon-insoluble apron such as neoprene.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

- ** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.
- ** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.
- ** EXPOSED PERSONNEL SHOULD WASH:
Promptly wash with soap when skin becomes contaminated.
- ** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability
- ** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BENZENE)

Less than or equal to 10 ppm: Half-mask air-purifying respirator with
organic vapor cartridge.

Less than or equal to 50 ppm: Full facepiece respirator with organic

vapor cartridges. / Full facepiece gas mask with chin style canister.
Less than or equal to 100 ppm: Full facepiece powered air-purifying respirator with organic vapor canister.
Less than or equal to 1000 ppm: Supplied air respirator with full facepiece in positive-pressure mode.
Greater than 1000 ppm or Unknown concentration: (1) Self-contained breathing apparatus with full face-piece in positive pressure mode. (2) Full facepiece positive-pressure supplied-air respirator with auxiliary self-contained air supply.
Escape : (1) Any organic vapor gas mask; or (2) Any self-contained breathing apparatus with full facepiece.
Firefighting : Any full facepiece self-contained breathing apparatus operated in positive pressure mode.

FIRST AID SOURCE: NIOSHP
EYE: irr immed
SKIN: soap wash promptly
INHALATION: art resp
INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991
SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin.
EYES: flush with plenty of water until irritation subsides.
INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.

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

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

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

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Benzene
DOT ID NUMBER: UN1114

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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.

DOT shipping name: Toluene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 150
Non bulk packaging: 202
Bulk packaging: 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/mL» (07/30/92)
Maximum Contaminant Level Goals (MCLG): 1 mg/mL» (07/30/92)
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U220
CERCLA REF: Not listed
RQ DESIGNATION: C 1000 pounds (454 kg) CERCLA
SARA TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: Irritant
Acute toxicity: adverse effect to target organs.
Chronic toxicity: adverse effect to target organ
after long period of exposure.
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

Fire hazard: flammable.

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

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

SHORT TERM TOXICITY: INHALATION: 100 ppm exposure can cause dizziness, drowsiness and hallucinations. 100-200 ppm can cause depression. 200-500 ppm can cause headaches, nausea, loss of appetite, loss of energy, loss of coordination and coma. in addition to the above, death has resulted from exposure to 10,000 ppm for an unknown time. SKIN: can cause dryness and irritation. absorption may cause or increase the severity of symptoms listed above. Eyes: can cause irritation at 300 ppm. INGESTION: can cause a burning sensation in the mouth and stomach, upper abdominal pain, cough, hoarseness, headache, nausea, loss of appetite, loss of energy, loss of coordination and coma.(NYDH)

LONG TERM TOXICITY: levels below 200 ppm may produce headache, tiredness and nausea. from 200 to 750 ppm symptoms may include insomnia, irritability, dizziness, some loss of memory, loss of appetite, a feeling of 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 = 100 ppm(375 mg/M3)
ACGIH STEL: STEL = 150 ppm(560 mg/M3)

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 YAKUD5 22,883,80

ihl-hmn TCLo:200 ppm JAMAAP 123,1106,43
BRAIN AND COVERINGS
Recordings from specific areas of CNS
BEHAVIORAL
Antipsychotic
BLOOD

Changes in bone marrow not included above

LD50 value: orl-rat LD50:636 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

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 LD50:2000 mg/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 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

- ihl-rat TCLo:1500 mg/m3/24H (1-8D preg) TXCYAC 11,55,78
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
- ihl-rat TCLo:1000 mg/m3/24H (7-14D preg) FMORAO
28,286,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
- ihl-rat TCLo:100 ppm (51W male) SAIGBL 13,501,71
PATERNAL EFFECTS
Testes,epididymis,sperm duct
- orl-mus TDLo:9 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetal death
- orl-mus TDLo:15 gm/kg (6-15D preg) TJADAB 19,41A,79
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
- orl-mus TDLo:30 gm/kg (6-15D preg) TJADAB 19,41A,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
- ihl-mus TCLo:500 mg/m3/24H (6-13D preg) TXCYAC 11,55,78
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
- ihl-mus TCLo:1000 ppm/6H (2-17D preg) TJEMDR 7,265,82
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
- ihl-mus TCLo:400 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
EFFECTS ON NEWBORN
- ihl-mus TCLo:200 ppm/7H (7-16D preg) FAATDF 6,145,86
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

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

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:

Repeated or prolonged skin contact.

**** WEAR EYE PROTECTION TO PREVENT:**

Reasonable probability of eye contact.

**** EXPOSED PERSONNEL SHOULD WASH:**

Promptly when skin becomes wet.

**** REMOVE CLOTHING:**

Immediately remove any clothing that becomes wet to avoid any flammability

**** REFERENCE: NIOSH**

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TOLUENE)

1000 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection.

2000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece. / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH

EYE: irr immed

SKIN: soap wash promptly

INHALATION: art resp

INGESTION: no vomit

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor.

INGESTION: do NOT induce vomiting; call a doctor.

EYES: flush with water for at least 15 min.

SKIN: wipe off, wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air and call emergency medical care; if not

breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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

FIRE EXTINGUISHMENT: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. Note: Water may be ineffective CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Toluene

DOT ID NUMBER: UN1294

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.

Packing group: III
Label(s) required: KEEP AWAY FROM FOOD
Special provisions: N36,T1
Packaging exceptions: 153
Non bulk packaging: 203
Bulk packaging: 241
Quantity limitations-
Passenger air/rail: 60 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions:40,M2

STCC NUMBER: 4941771

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.005 mg/mL» (01/09/89)

Maximum Contaminant Level Goals (MCLG): 0 mg/mL» (01/09/89)

CLEAN-AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U228,D040

CERCLA REF: Not listed

RQ DESIGNATION: B 100 pounds (45.4 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Acute toxicity: Toxic. LD50 > 50 and <= 500
mg/kg (oral rat).

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.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: ORM-A

Mailability: Domestic service and air transportation; shipper's declaration

Max 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) : (1) This material must be preheated before ignition
can occur.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: INHALATION: headache, sleepiness, nausea, vomiting,

dizziness and coughing have been felt around 100 ppm. unconsciousness can result at 3,000 ppm. exposure to 8,000 ppm can cause death. SKIN: can be absorbed through skin. may cause irritation, burning or redness. Eyes: may cause irritation, burning or watering. INGESTION: can cause drunkenness, vomiting, diarrhea or abdominal pain. unconsciousness, liver or kidney damage, vision distortion and death have been reported at large doses. (NYDH)

LONG TERM TOXICITY: contact with levels near 100 ppm can cause giddiness, nervous exhaustion, increased sensitivity to alcohol including redness in the face (trichloroethylene blush), the ability to become addicted to the vapor, as well as effects of acute exposure listed above. higher levels can alter one's heart rate. repeated contact with hands can cause excessive dryness, cracking, burning, loss of sense of touch or temporary paralysis of fingers. most of these effects seem to go away after exposure has stopped. trichloroethylene is considered a cancer suspect agent because high levels cause liver cancer in mice. whether it causes cancer in humans is unknown. (NYDH)

TARGET ORGANS: eyes, skin, nose, throat, resp. system, heart, liver, kidneys, CNS.

SYMPTOMS: INHALATION: symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and finally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION: symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: slightly irritating sensation and lachrymation. Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL: Potential occupational carcinogen 25 ppm Time weighted averages for 8-hour exposure

ACGIH TLV: TLV = 50 ppm

ACGIH STEL: STEL = 200 ppm

OSHA PEL: Final Rule Limits:
TWA = 50 ppm (270 mg/M3)
STEL = 200 ppm(1080 mg/M3)

MAK INFORMATION: 50 ppm
270 mg/M3
Substance with systemic effects, onset of effect less than or equal to 2 hrs: Peak = 5xMAK for 30 minutes, 2 times per shift of 8 hours.
There is no reason to fear a risk of damage to the

developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below
REFERENCES:

ANIMAL SUSPECTED IARC** 20,545,79
ANIMAL POSITIVE IARC** 11,263,76
HUMAN INDEFINITE IARC** 20,545,79

CARCINOGEN LISTS:

IARC: Not classified as to human carcinogenicity or probably not carcinogenic to humans.
MAK: Not listed
NIOSH: Carcinogen defined by NIOSH with no further categorization.
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* orl-hmn LDLo:7 gm/kg ARTODN 35,295,76

orl-man TDLo:2143 mg/kg 34ZIAG -,602,69
GASTROINTESTINAL
Other changes

ihl-hmn TCLo:6900 mg/m3/10M AHBAAM 116,131,36
BEHAVIORAL
Somnolence (general depressed activity)
BEHAVIORAL
Hallucinations, distorted perceptions

ihl-hmn TCLo:160 ppm/83M AIHAAP 23,167,62
BEHAVIORAL
Hallucinations, distorted perceptions

ihl-hmn TDLo:812 mg/kg BMJOAE 2,689,45
BEHAVIORAL
Somnolence (general depressed activity)
GASTROINTESTINAL
Other changes
LIVER
Jaundice, other or unclassified

ihl-man TCLo:110 ppm/8H BJIMAG 28,293,71
SENSE ORGANS
Eye
Other
BEHAVIORAL
Hallucinations, distorted perceptions

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

ihl-rat LCLo:8000 ppm/4H
ipr-rat LD50:1282 mg/kg
orl-mus LD50:2402 mg/kg
ihl-mus LC50:8450 ppm/4H
scu-mus LD50:16 gm/kg
ivn-mus LD50:33900 ug/kg
ipr-dog LD50:1900 mg/kg
scu-dog LDLo:150 mg/kg
ivn-dog LDLo:150 mg/kg
orl-cat LDLo:5864 mg/kg
ihl-cat LCLo:32500 mg/m3/2H
orl-rbt LDLo:7330 mg/kg
ihl-rbt LCLo:11000 ppm
scu-rbt LDLo:1800 mg/kg
ihl-gpg LCLo:37200 ppm/40M

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

orl-rat TDLo:2688 mg/kg (1-22D preg/21D post) TOXID9
4,179,84

EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:36 gm/kg (15D pre/1-21D preg) TXCYAC
32,229,84

EFFECTS ON NEWBORN
Weaning or lactation index(#alive at weaning per #
alive at day 4)

orl-rat TDLo:1140 mg/kg (14D pre-21D post) BRREAP
488,403,89

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Central nervous system

ihl-rat TCLo:1800 ppm/24H (1-20D preg) APTOD9 19,A22,80

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Other developmental abnormalities

ihl-rat TCLo:100 ppm/4H (6-22D preg) JPHYA7 276,24P,78

EFFECTS ON FERTILITY

Post-implantation mortality

EFFECTS ON EMBRYO OR FETUS

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

ihl-rat TCLo:1800 ppm/6H (1-20D preg) TXCYAC 14,153,79

SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

ihl-rat TCLO:100 ppm/4H (8-21D preg) BJANAD 54,337,82
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-mus TCLO:100 ppm/7H (5D male) NTIS** PB82-185075
PATERNAL EFFECTS
Spermatogenesis

NO SIGNIFICANT
RISK LEVEL(Ca P65): 60 micrograms/day

----- 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:
Promptly remove non-impervious clothing that becomes wet.
- ** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (TRICHLOROETHYLENE)

Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH

EYE: irr immed

SKIN: soap wash promptly

INHALATION: art resp

INGESTION: ipecac, vomit

FIRST AID SOURCE: CHRIS Manual 1991

Do NOT administer adrenalin or epinephrine; get medical attention for all cases of overexposure.

INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen.
INGESTION: have victim drink water and induce vomiting; repeat three times; then give 1 tablespoon epsom salts in water.
EYES: flush thoroughly with water.
SKIN: wash thoroughly with soap and warm water.

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

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

FIRE EXTINGUISHMENT: Water fog. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Trichloroethylene
DOT ID NUMBER: UN1710

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.

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CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 419 LAST UPDATE OF THIS RECORD: 06/03/92
 NAME: VINYL CHLORIDE
 SYNONYMS: CHLOROETHYLENE; VINYL CHLOROIDE; CHLOROETHEN;
 CHLOROETHYLENE; CHLORURE DE VINYLE (FRENCH); CHLORO DI
 VINYLE (ITALIAN); ETHYLENE MONOCHLORIDE; MONOCHLOROETHENE;
 MONOCHLOROETHYLENE (DOT); VINYL CHLORIDE MONOMER; VINYL C
 MONOMER; WINYLU CHLORED (POLISH); VCM; VCL
 CAS: 75-01-4 RTECS: KU9625000
 FORMULA: C2H3Cl MOL WT: 62.50
 WLN: G1U1
 CHEMICAL CLASS: Vinyl halide

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless liquified compressed sag with a sweet odor
 BOILING POINT: 259.4 K -13.8 C 7.2 F
 MELTING POINT: 119.4 K -153.8 C -244.8 F
 FLASH POINT: 194 K -79.2 C -110.5 F
 AUTO IGNITION: 745 K 471.8 C 881.3 F
 CRITICAL TEMP: 431.6 K 158.45 C 317.21 F
 CRITICAL PRESS: 5.34 kN/M2 52.6 atm 773 psia
 HEAT OF VAP: 160 Btu/lb 88.85 cal/g 3.718x E5 J/kg
 HEAT OF COMB: -8136 Btu/lb -4523 cal/g -189x E5 J/kg
 VAPOR PRESSURE: 2600 mm @ 25
 UEL: 33 %
 LEL: 3.6 %
 IONIZATION POTENTIAL (eV): 7.57
 VAPOR DENSITY: 2.2 (air=1) (air=1)
 SPECIFIC GRAVITY: 0.969 @ -13C
 DENSITY: 0.969 g/cc or 9.0117 lb/gal
 WATER SOLUBILITY: insol
 INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity
 REACTIVITY WITH COMMON MATERIALS: No data
 STABILITY DURING TRANSPORT: No Data
 NEUTRALIZING AGENTS: No data
 POLYMERIZATION POSSIBILITIES: POLYMERIZES IN PRESENCE OF AIR,
 SUNLIGHT, OR HEAT UNLESS STABILIZED BY
 INHIBITORS.

TOXIC FIRE GASES: HCl and unburned toxic vapors
 ODOR DETECTED AT (ppm): 260 ppm
 ODOR DESCRIPTION: Pleasant, sweet Source: CHRIS
 100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 2.1 FLAMMABLE GAS
DOT guide: 17
Identification number: UN1086
DOT shipping name: Vinyl chloride, inhibited
Packing group:
Label(s) required: FLAMMABLE GAS
Special provisions: B44
Packaging exceptions: 306
Non bulk packaging: 304
Bulk packaging: 314, 315
Quantity limitations-
Passenger air/rail: Forbidden
Cargo aircraft only: 150 kg
Vessel stowage: B
Other stowage provisions:40

STCC NUMBER: 4905792

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.002 mg/mL»(01/09/89)

Maximum Contaminant Level Goals (MCLG): 0 mg/mL»(01/09/89)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U043,D043

CERCLA REF: Not listed

RQ DESIGNATION: X 1 pound (0.454 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

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.

Fire hazard: flammable.

Sudden pressure: compressed gases.

Reactive hazard: unstable/reactive.

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) : (4) This material forms readily ignitable mixtures
in air.

REACTIVITY (YELLOW): (1) Normally stable, but may become unstable at
elevated temperature and pressures.

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: INHALATION: exposure at 8,000 ppm for 5 minutes can cause a feeling of intoxication, tiredness, drowsiness, abdominal pain, numbness and tingling in fingers and toes, pains in joints, coughing, sneezing, irritability and loss of appetite and weight. SKIN: contact with liquid may cause frostbite; contact with vapor may cause irritation and rash. absorption is possible through the skin. Eyes: can cause severe and immediate irritation. INGESTION: none found.(NYDH)

LONG TERM TOXICITY: may cause club-like swelling and shortening of finger tips. skin may become thickened and stiff with coarse, whitish patches. bones and joints of arms and legs may suffer damage. liver and spleen damage may occur. not all symptoms disappear after exposure stops. vinyl chloride has caused liver cancer in occupationally exposed individuals.(NYDH)

TARGET ORGANS: skin, eyes, mucous membranes, nervous system, liver, kidneys.

SYMPTOMS: INHALATION: high concentrations cause dizziness, anesthesia, lung irritation. SKIN: may cause frostbite; phenol inhibitor may be absorbed through skin if large amounts of liquid evaporate. Source: CHRIS

CONC IDLH: Unknown

NIOSH REL: Potential occupational carcinogen (use 1910.1017)

ACGIH TLV: TLV = 5 ppm Confirmed human carcinogen (A1)
ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = 1 ppm
CEILING = 5 ppm
CONSULT 29CFR 1910.1017

MAK INFORMATION: Carcinogenic working material without MAK
Capable of inducing malignant tumors as shown by experience with humans.

CARCINOGEN?: Y STATUS: See below

REFERENCES:
HUMAN POSITIVE IARC** 19,377,79
ANIMAL POSITIVE IARC** 7,291,74
HUMAN SUSPECTED IARC** 7,291,74
ANIMAL POSITIVE IARC** 19,377,79
HUMAN POSITIVE IARC** 28,151,82

CARCINOGEN LISTS:

- IARC: Carcinogen as defined by IARC as carcinogenic to humans, with sufficient epidemiological evidence.
- MAK: Capable of inducing malignant tumors as shown by experience in humans.
- NIOSH: Carcinogen defined by NIOSH with no further categorization.
- NTP: Carcinogen defined by NTP as known to be carcinogenic, with evidence from human studies.
- ACGIH: Carcinogen defined by ACGIH TLV Committee as a confirmed human carcinogen, recognized to have carcinogenic or cocarcinogenic potential.
- OSHA: Cancer suspect

LD50 value: orl-rat LD50:500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

- orl-rat LD50:500 mg/kg
- ihl-rat LC50:18 pph/15M
- ihl-mam LCLo:200 ppm/18M

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

- ihl-man TCLo:30 mg/m³ (5Y male) GTPZAB 24(5),28,80

- PATERNAL EFFECTS
- Spermatogenesis

- ihl-rat TCLo:100 ppm/6H (26W male) EESADV 10,281,85

- PATERNAL EFFECTS
- Testes, epididymis, sperm duct

- ihl-rat TCLo:500 ppm/7H (6-15D preg) TXAPA9 33,134,75

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

- ihl-rat TCLo:1500 ppm/24H (1-9D preg) TXCYAC 11,45,78

- EFFECTS ON FERTILITY
- Post-implantation mortality

- ihl-rat TCLo:500 ppm/7H (6-15D preg) EVHPAZ 41,171,81

- EFFECTS ON EMBRYO OR FETUS

Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:250 ppm/6H (55D pre) JTEHD6 3,965,77
EFFECTS ON FERTILITY
Female fertility index

ihl-mus TCLo:30000 ppm/6H (5D male) EVHPAZ 21,71,77
EFFECTS ON FERTILITY
Pre-implantation mortality

ihl-mus TCLo:500 ppm/7H (6-15D preg) EVHPAZ 41,171,81
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

NO SIGNIFICANT

RISK LEVEL(Ca P65): 0.3 micrograms/day

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

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (VINYL CHLORIDE)

Unknown, or above 3600 ppm: Open-circuit, self-contained breathing apparatus, pressure demand type, with full facepiece.

Not over 3600 ppm: Combination type C supplied air respirator, pressure demand type, with full or half facepiece, and auxiliary self-contained air supply; or

Not over 1000 ppm: Combination type, supplied air respirator continuous flow type, with full or half facepiece, and auxiliary self-contained air supply. / Type C, Supplied air respirator, continuous flow type, with full or half facepiece, helmet or hood.

Not over 100 ppm: (A) Combination type C supplied air respirator demand type; with full facepiece, and auxiliary self-contained air supply; or (B) Open-circuit self-contained breathing apparatus with full facepiece, in demand mode; or (C) Type C supplied air respirator, demand type, with full facepiece.

Not over 25 ppm: (A) A powered air-purifying respirator with hood, helmet, full or half facepiece, and a canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm, or (B) Gas mask, front- or back-mounted canister which provides a service life of at least 4 hours for concentrations of vinyl chloride up to 25 ppm.

Not over 10 ppm: (A) Combination type C supplied-air respirator, demand type, with half facepiece, and auxiliary self-contained air supply; or (B) Type C supplied-air respirator, demand type, with half facepiece; or (C) Any chemical cartridge respirator with an organic vapor cartridge which provides a service life of at least 1 hour for concentrations of vinyl chloride up to 10 ppm.

FIRST AID SOURCE: CT HCDB
EYE: None given
SKIN: None given
INHALATION: move to fresh air, keep quiet and warm, call doctor,
artificial respirator.
INGESTION: None given

FIRST AID SOURCE: CHRIS Manual 1991
INHALATION: remove patient to fresh air and keep him quiet and warm; call
a doctor; give artificial respiration if breathing stops.
EYES AND
SKIN: flush with plenty of water for at least 15 min.; for eyes, get
medical attention; remove contaminated clothing.

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 frostbite, thaw frosted parts with water. Keep victim
quiet and maintain normal body temperature.

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

FIRE EXTINGUISHMENT: For small fires use dry chemical or carbon dioxide.
For large fires stop flow of gas. Cool exposed
containers with water. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport
Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Vinyl chloride, inhibited
DOT ID NUMBER: UN1086

ERG90 GUIDE 17

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Extremely flammable.
May be ignited by heat, sparks and flames.
Vapors may travel to a source of ignition and flash back.
Container may explode violently in heat of fire.
Vapor explosion hazard indoors, outdoors or in sewers.

*HEALTH HAZARDS

May be poisonous if inhaled.
Contact may cause burns to skin and eyes.
Vapors may cause dizziness or suffocation.
Contact with liquid may cause frostbite.
Fire may produce irritating or poisonous gases.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind, out of low areas, and ventilate closed spaces before
entering.
Positive pressure self-contained breathing apparatus (SCBA) and
structural firefighters' protective clothing will provide limited

protection.

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

CALL CHEMTREC AT 1-800-424-9300 AS SOON AS POSSIBLE, especially if there is no local hazardous team available.

***FIRE**

Let tank, tank car or tank truck burn unless leak can be stopped; with smaller tanks or cylinders, extinguish/isolate from other flammables.

Small Fires: Dry chemical or CO2.

Large Fires: Water spray, fog or regular foam.

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

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.

Cool container with water using unmanned device until well after fire is out.

***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.

Isolate area until gas has dispersed.

***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 frostbite, thaw frosted parts with water.

Keep victim quiet and maintain normal body temperature.

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CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 98 LAST UPDATE OF THIS RECORD: 06/03/92

NAME: CARBON DISULFIDE

SYNONYMS: CARBON BISULFIDE; CARBON BISULFIDE (DOT); CARBON BISULPHIDE; CARBON DISULFIDE (DOT); CARBON DISULPHIDE; CARBONE (SUFURE DE) (French); CARBONIO (SOLFURO DI) (Italian); CARBON SULFIDE; DITHIOCARBONIC ANHYDRIDE; KOHLENDISULFID (SCHWEFELKOHLENSTOFF) (German); KOOLSTOFDISULFIDE (ZWAVELKOOLSTOF) (Dutch); NCI-C04591; SCHWEFELKOHLENSTOFF (German); SULPHOCARBONIC ANHYDRIDE; WEEVILTOX; WEGLA DWUSIARCZEK (Polish)

CAS: 75-15-0 RTECS: FF6650000

FORMULA: CS2 MOL WT: 76.13

WLN: C S2

CHEMICAL CLASS:

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless to yellow watery liquid with a rotten egg to sweet odor.

BOILING POINT:	319.27 K	46.1 C	115 F
MELTING POINT:	161.49 K	-111.7 C	-169 F
FLASH POINT:	243 K	-30.2 C	-22.3 F
AUTO IGNITION:	373 K	99.8 C	211.7 F
CRITICAL TEMP:	546 K	272.85 C	523.13 F
CRITICAL PRESS:	7.7 kN/M2	75.9 atm	1115 psia
HEAT OF VAP:	153 Btu/lb	84.97 cal/g	3.555x E5 J/kg
HEAT OF COMB:	-5814 Btu/lb	-3232 cal/g	-135x E5 J/kg
VAPOR PRESSURE:	360 mm @ 25 C		
UEL:	50 %		
LEL:	1.3 %		
IONIZATION POTENTIAL (eV):	10.06		
VAPOR DENSITY:	2.6 (air=1)		
EVAPORATION RATE:	10.90 (n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.26 20C		
DENSITY:	1.266		
WATER SOLUBILITY:	0.2% @ 20 C		
INCOMPATIBILITIES:	strong oxidizers active metals like sodium potassium zinc azides organic amines		

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): 0.21 ppm
ODOR DESCRIPTION: like that of decaying cabbage
Source:CHRIS
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 28
Identification number: UN1131
DOT shipping name: Carbon disulfide
Packing group: I
Label(s) required: FLAMMABLE LIQUID, POISON
Special provisions: B16,T18,T26,T29
Packaging exceptions: None
Non bulk packaging: 201
Bulk packaging: 243
Quantity limitations-
Passenger air/rail: Forbidden
Cargo aircraft only: Forbidden
Vessel stowage: D
Other stowage provisions:18,40,115,M2

STCC NUMBER: 4908125

CLEAN WATER ACT Sect.307:No
CLEAN WATER ACT Sect.311:Yes
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: P022
CERCLA REF: Y
RQ DESIGNATION: B 100 pounds (45.4 kg) CERCLA
SARA TPQ VALUE: 10000 pounds
SARA Sect. 312
categories:

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.

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

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

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

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

SHORT TERM TOXICITY: INHALATION: exposure to 11 ppm may cause headaches and dizziness. sleep disturbances, fatigue, nervousness, loss of appetite, and weight loss have resulted from exposure up to 186 ppm. other symptoms may include sore throat, nausea, vomiting, abdominal pain, diarrhea, drowsiness, dullness, lowered blood pressure, depression, and extreme irritability. exposure to 4800 ppm for 30 minutes may cause death. SKIN: concentrated vapors may cause irritation, dryness, and cracking. contact with liquid may cause blistering and chemical burns. may be absorbed through the skin causing or increasing the severity of symptoms described above. Eyes: liquid or high concentrations of vapor may cause irritation, burns, redness and blurred vision. INGESTION: may cause symptoms listed above under "inhalation", as well as weakness, weak pulse, palpitations, loss of coordination, tremors, paralysis, hallucinations and coma. death may occur. (NYDH)

LONG TERM TOXICITY: may cause symptoms listed above as well as insomnia, defective memory and impotence. animal studies have shown adverse reproductive effects; whether it does so in humans is unknown. nerve damage, unsteady gait, speech impairment, damage to the liver, kidney and heart may result. psychological and behavioral changes including uncontrollable anger and suicidal tendencies may also occur. (NYDH)

TARGET ORGANS: CNS, pns, cvs, eyes, kidneys, liver, skin

SYMPTOMS: ACUTE EXPOSURE: mild to moderate irritation of skin, eyes, and mucous membranes from liquid or concentrated vapors; headache, garlicky breath, nausea, vomiting, diarrhea (even after vapor exposures), and occasionally abdominal pain; weak pulse, palpitations; fatigue, weakness in the legs, unsteady gait, vertigo; mania, hallucinations of sight, hearing, taste, and smell in acute, massive vapor exposures; central nervous depression with respiratory paralysis; death may occur during coma or after a convulsion. Source: CHRIS

CONC IDLH: 500PPM

NIOSH REL: 1 ppm Time weighted averages for 8-hour exposure 3 mg/M3 Time weighted averages for 8-hour exposure 10 ppm Ceiling exposures which shall at no time be exceeded 30 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 10 ppm(30 mg/M3) Skin
ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 20 PPM; CEILING = 30 PPM; 30 MINUTE MAXIMUM PEAK ABOVE
Final Rule Limits:
TWA = 4 ppm (12 mg/M3) (SKIN)
STEL = 12 ppm(36 mg/M3) (SKIN)

MAK INFORMATION: 10 ppm
30 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
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)
* ihl-hmn LCLo:4000 ppm/30M 29ZWAE -,118,68
* ihl-hmn LCLo:2000 ppm/5M TABIA2 3,231,33

LD50 value: orl-rat LD50:3188 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-rat LD50:3188 mg/kg
ihl-rat LC50:25 gm/m3/2H
orl-mus LD50:2780 mg/kg
ihl-mus LC50:10 gm/m3/2H
orl-rbt LD50:2550 mg/kg
orl-gpg LD50:2125 mg/kg
ipr-gpg LDLo:400 mg/kg
ihl-mam LCLo:2000 ppm/5M

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

ihl-man TCLo:40 mg/m3 (91W male) MELAAD 60,566,69
PATERNAL EFFECTS
Spermatogenesis

orl-rat TDLo:2 gm/kg (6-15D preg) TOXID9 4,86,84
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rat TCLo:200 mg/m3/24H (1-21D preg) KHZDAN
21,257,78
EFFECTS ON FERTILITY
Pre-implantation mortality

ihl-rat TCLo:10 mg/m3/8H (1-22D preg) ATSUDG 4,252,80
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Eye,ear
EFFECTS ON NEWBORN ---
Viability index(# alive at day 4 per # born alive)

ihl-rat TCLo:100 mg/m3/8H (1-22D preg) TOLED5 2,129,78
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:100 mg/m3/8H (1-21D preg) TJADAB 14,374,76
EFFECTS ON EMBRYO OR FETUS
Fetal death
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Craniofacial(including nose and tongue)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Homeostatis

ihl-rat TCLo:30 ug/m3/8H (1-22D preg) ATSUDG 4,252,80
EFFECTS ON NEWBORN
Behavioral

ihl-rat TCLo:600 ppm/6H (50D male) TXAPA9 73,275,84
PATERNAL EFFECTS
Spermatogenesis
PATERNAL EFFECTS
Prostate,seminal vessel,Cowper's gland,accessory
glands,urethra

ihl-mus TCLo:2000 mg/m3/2H (1-21D preg) BEXBAN
68,1158,69
EFFECTS ON FERTILITY
Pre-implantation mortality
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before
birth)

orl-rbt TDLo:350 mg/kg (6-19D preg) TOXID9 4,86,84
EFFECTS ON FERTILITY
Post-implantation mortality

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

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

only self-contained breathing mask with full face, approved by u. s. bur. mines, is recommended. if the vapor concentration exceeds 2% by volume or is unknown, supplied-air respiratory equipment of appropriate design with full face masks should be used by all persons entering contaminated area. masks should be used only for emergency situations & should be located accordingly. almost any type of industrial clothing is satisfactory. splashes of small quantity are not harmful to fabrics, and evaporation from clothing is quite rapid. clothing should, however, be removed and skin washed with water. goggles should be used when there is any danger of cs₂ splashes or spray.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:

Reasonable probability of 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 (CARBON DISULFIDE)

10 ppm: Any chemical cartridge respirator with organic vapor cartridge(s). / Any supplied-air respirator. / Any self-contained breathing apparatus.

25 ppm: Any supplied-air respirator operated in a continuous flow mode. / Any powered air-purifying respirator with organic vapor cartridge(s).

50 ppm: Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). / Any powered air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s). / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.

500 ppm: Any supplied-air respirator with a half-mask and operated in a pressure-demand or other positive pressure mode.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:

Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove victim promptly from contaminated area. Administer oxygen and artificial respiration if needed.

SKIN CONTACT: wash affected areas with copious quantities of water.

INGESTION: induce vomiting and follow with gastric lavage and saline cathartics.

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: Dry chemical, carbon dioxide, or foam. Note: Water may be ineffective on fire. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Carbon disulfide

DOT ID NUMBER: UN1131

ERG90

GUIDE 28

* 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.

CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 101 LAST UPDATE OF THIS RECORD: 06/03/92
 NAME: CHLOROBENZENE
 SYNONYMS: MONOCHLOROBENZENE; CHLOROBENZOL; PHENYL CHLORIDE; MCB;
 BENZENE, CHLORO-; BENZENE CHLORIDE; PHENYLCHLORIDE;
 CHLOORBENZEEN (DUTCH); CHLORBENZEN; CHLOROBENZOL;
 CHLOROBENZEN (POLISH); MONOCHLOORBENZEEN (DUTCH);
 MONOCHLORBENZENE; MONOCHLORBENZOL (GERMAN); NCI-C54886
 CAS: 108-90-7 RTECS: CZ0175000
 FORMULA: C6H5Cl MOL WT: 112.56
 WLN: GR
 CHEMICAL CLASS: FT

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless, watery liquid with a sweet, almond odor.

BOILING POINT:	405.0 K	131.8 C	269.3 F
MELTING POINT:	227.4 K	-45.8 C	-50.4 F
FLASH POINT:	302 K	28.8 C	83.9 F
AUTO IGNITION:	913 K	639.8 C	1183.7 F
CRITICAL TEMP:	632 K	358.85 C	677.93 F
CRITICAL PRESS:	4.52 kN/M2	44.5 atm	654 psia
HEAT OF VAP:	135 Btu/lb	74.97 cal/g	3.137x E5 J/kg
HEAT OF COMB:	-12000 Btu/lb	-6671 cal/g	-279x E5 J/kg
VAPOR PRESSURE:	.0156		
UEL:	9.6 %		
LEL:	1.3 %		
IONIZATION POTENTIAL (eV):	9.07		
VAPOR DENSITY:	No data		
EVAPORATION RATE:	1.15 (n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.11 20C		
DENSITY:	1.107		
WATER SOLUBILITY:	0.1%		
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): 0.21 ppm
 ODOR DESCRIPTION: like; aromatic Source:CHRIS
 100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 27
Identification number: UN1134
DOT shipping name: Chlorobenzene
Packing group: III
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 150
Non bulk packaging: 203
Bulk packaging: 241
Quantity limitations-
Passenger air/rail: 60 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: 4909153

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:Yes

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.1 mg/mL» (07/30/92)

Maximum Contaminant Level Goals (MCLG): 0.1 mg/mL» (07/30/92)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U037,D021

CERCLA REF: Y

RQ DESIGNATION: B 100 pounds (45.4 kg) CERCLA

SARA TPQ VALUE: Not listed

SARA Sect. 312

categories:

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.

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: INHALATION: irritation occurs at 200 ppm. may cause coughing, headache, dizziness, loss of consciousness, twitching of extremities, incoordination, coma and death. SKIN: liquid may cause irritation. Eyes: may be irritating at 200 ppm. INGESTION: no known cases of occupational exposure. accidental ingestion by a child has resulted in pallor and coma.(NYDH)

LONG TERM TOXICITY: prolonged skin contact may cause burns and inflammation. animal studies suggest liver, kidney and lung damage may occur.(NYDH)

TARGET ORGANS: resp sys, eyes, skin, CNS, liver

SYMPTOMS: Irritating to skin, eyes and mucous membranes. Repeated exposure of skin may cause dermatitis due to defatting action. Chronic inhalation of vapors or mist may result in damage to-lungs, liver, and kidneys. Acute vapor exposures can cause symptoms ranging from coughing to transient anesthesia and central nervous system depression. Source: CHRIS

CONC IDLH: 2400PPM

NIOSH REL:

ACGIH TLV: TLV = 10 ppm(46 mg/M3)

ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 75 ppm(350mg/M3)
Final Rule Limits:
TWA = 75 ppm (350 mg/M3)

MAK INFORMATION: 50 ppm
230 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.

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

LD50 value: orl-rat LD50:2290 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-rat LD50:2290 mg/kg
ihl-rat LCLo:9000 ppm
ipr-rat LDLo:7400 mg/kg
scu-rat LD50:1110 mg/kg
orl-mus LD50:2300 mg/kg
ihl-mus LCLo:15 gm/m3
ipr-mus LD50:515 mg/kg
orl-rbt LD50:2250 mg/kg
orl-gpg LD50:2250 mg/kg
ipr-gpg LDLo:4100 mg/kg
unr-mam LD50:2300 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

ihl-rat TCLo:75 ppm/6H (6-15D preg) TXAPA9 76,365,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ihl-rat TCLo:210 ppm/6H (6-15D preg) TXAPA9 76,365,84
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Hepatobiliary system

ihl-rbt TCLo:590 ppm/6H (6-18D preg) TXAPA9 76,365,84
EFFECTS ON FERTILITY
Post-implantation mortality

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

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

organic vapor-acid gas respirator where appropriate; neoprene or vinyl gloves; chemical safety spectacles, plus face-shield where appropriate; rubber footwear; apron or impervious clothing for splash protection; hard hat.

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:

Immediately 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)
OSHA (CHLOROBENZENE)

1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).

1875 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.

2400 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

Get medical attention for all eye exposures and any serious over-exposures. Treat the symptoms.

INHALATION: remove to clean air; administer oxygen as needed.

INGESTION: dilute by drinking water; if vomiting occurs, administer more water. Administer saline laxative.

EYES: flush thoroughly with water.

SKIN: remove contaminated clothing, wash exposed area with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

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

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

FIRE EXTINGUISHMENT: Carbon dioxide, dry chemical, foam or water spray.
CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Chlorobenzene

DOT ID NUMBER: UN1134

* 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.

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----- IDENTIFIERS -----

CHEMTOX RECORD 206 LAST UPDATE OF THIS RECORD: 06/03/92
 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 21.1 C 69.9 F
 AUTO IGNITION: 733 K 459.8 C 859.7 F
 CRITICAL TEMP: 617.1 K 343.95 C 651.11 F
 CRITICAL PRESS: 3.61 kN/M2 35.5 atm 523 psia
 HEAT OF VAP: 144 Btu/lb 79.97 cal/g 3.346x E5 J/kg
 HEAT OF COMB: -17780 Btu/lb -9885 cal/g -413x E5 J/kg
 VAPOR PRESSURE: 10mm @ 25.9 C
 UEL: 6.7 %
 LEL: 1.0 %
 IONIZATION POTENTIAL (eV): 8.76
 VAPOR DENSITY: 3.7 (air=1)
 EVAPORATION RATE: 0.84 (n-BUTYL ACETATE=1)
 SPECIFIC GRAVITY: 0.867 20C
 DENSITY: 0.866 g/mL @ 20 C
 WATER SOLUBILITY: 0.015%
 INCOMPATIBILITIES: strong oxidizers

REACTIVITY WITH WATER: No data on water reactivity
 REACTIVITY WITH COMMON MATERIALS: OXIDIZING MATERIALS Source: SAX
 STABILITY DURING TRANSPORT: No Data
 NEUTRALIZING AGENTS: No data
 POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible
 unburned vapors
 ODOR DETECTED AT (ppm): 140
 ODOR DESCRIPTION: AROMATIC Source: CHRIS
 100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID

DOT guide: 26
Identification number: UN1175
DOT shipping name: Ethylbenzene
Packing group: II
Label(s) required: FLAMMABLE LIQUID
Special provisions: T1
Packaging exceptions: 150
Non bulk packaging: 202
Bulk packaging: 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/mL» (07/30/92)

Maximum Contaminant Level Goals (MCLG): 0.7 mg/mL» (07/30/92)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: None

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

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

SHORT TERM TOXICITY: INHALATION: 200 ppm for 30 minutes can cause

irritation of the nose and throat, dizziness, difficult breathing and depression. very high levels can cause unconsciousness. SKIN: can cause irritation, inflammation, blisters and burns. Eyes: 200 ppm can cause irritation. higher levels can cause burning, tearing and injury. INGESTION: can cause headache, sleepiness and coma. (NYDH)

LONG TERM TOXICITY: may cause skin rash and irritation of eyes, nose and throat. (NYDH)

TARGET ORGANS: eyes, upper resp sys, skin, CNS

SYMPTOMS: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. Source: CHRIS

CONC IDLH: 2000PPM

NIOSH REL:

ACGIH TLV: TLV = 100 ppm(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 1991)

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 1991)

skn-rbt 15 mg/24H open MLD
eye-rbt 100 mg

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 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) ATSDG 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) ATSDG
8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

ihl-rbt TCLo:99 ppm/7H (1-18D preg) NTIS** PB83-208074
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before
birth)

ihl-rbt TCLo:500 mg/m3/24H (7-20D preg) ATSDG 8,425,85
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

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

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

self-contained breathing apparatus; safety goggles.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

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

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

** EXPOSED PERSONNEL SHOULD WASH:
Promptly when skin becomes contaminated.

** REMOVE CLOTHING:
Immediately remove any clothing that becomes wet to avoid any flammability

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (ETHYL BENZENE)

1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator. * Substance reported to cause eye irritation or damage may require eye protection. / Any self-contained breathing apparatus. * Substance reported to cause eye irritation or damage may require eye protection. / Any chemical cartridge respirator with organic vapor cartridge(s). * Substance reported to cause eye irritation or damage may require eye protection.

2000 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration.

INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis.

SKIN AND

EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.

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

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

FIRE EXTINGUISHMENT: Foam (most effective), water fog, carbon dioxide or dry chemical. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Ethylbenzene
DOT ID NUMBER: UN1175

ERG90

GUIDE 26

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

*HEALTH HAZARDS

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

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.

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----- IDENTIFIERS -----

CHEMTOX RECORD 2204 LAST UPDATE OF THIS RECORD: 06/03/92

NAME: p-DICHLOROBENZENE

SYNONYMS: p-CHLOROPHENYL CHLORIDE; p-DICHLOROBENZEEN (Dutch);
 1,4-DICHLOROBENZEEN (Dutch); p-DICHLOROBENZOL (German);
 1,4-DICHLOR-BENZOL (German); DI-CHLORICIDE;
 p-DICHLOROBENZENE; 1,4-DICHLOROBENZENE; p-DICHLOROBENZOL;
 DICHLOROBENZENE, PARA, SOLID; 1,4-DICHLOROBENZENE
 (Italian); p-DICHLOROBENZENE (Italian); EVOLA; NCI-C54955;
 PARACIDE; PARA CRYSTALS; PARADI; PARADICHLOROBENZENE;
 PARADICHLOROBENZOL; PARADOW; PARAMOTH; PARANUGGETS;
 PARAZENE; PDB; PDCB; PERSIA-PERAZOL; SANTOCHLOR; BENZENE,
 1,4-DICHLORO-; DICHLOROCIDE; ;

CAS: 106-46-7 RTECS: CZ4550000

FORMULA: C6H4Cl2 MOL WT: 147.00

WLN: GR DG

CHEMICAL CLASS: TT

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless to white crystals with a mothball-like odor

BOILING POINT:	447.04 K	173.8 C	345 F
MELTING POINT:	325.93 K	52.7 C	127 F
FLASH POINT:	338 K	64.8 C	148.7 F
AUTO IGNITION:	NA		
VAPOR PRESSURE:	0.4mm @ 25 C		
UEL:	NA		
LEL:	NA		
IONIZATION POTENTIAL (eV):	8.94		
VAPOR DENSITY:	5.08 (air=1)		
SPECIFIC GRAVITY:	1.458 20C		
DENSITY:	1.4581 g/mL @ 20.5 C		
WATER SOLUBILITY:	0.008%		
INCOMPATIBILITIES:	none hazardous		

REACTIVITY WITH WATER: PRACTICALLY INSOLUBLE Source: MI

REACTIVITY WITH COMMON MATERIALS: CAN REACT VIGOROUSLY WITH OXIDIZING
 MATERIALS; SOLUBLE IN ALCOHOL, ETHER,
 BENZENE, CHLOROFORM, CARBON DISULFIDE
 Source: MI

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: TOXIC DECOMPOSITION GASES

ODOR DETECTED AT (ppm): 15-30 ppm

ODOR DESCRIPTION: Aromatic (like mothballs) Source: CHRIS

100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 6.1 POISON
DOT guide: 58
Identification number: UN1592
DOT shipping name: p-Dichlorobenzene
Packing group: III
Label(s) required: KEEP AWAY FROM FOOD
Special provisions:
Packaging exceptions: 153
Non bulk packaging: 213
Bulk packaging: 240
Quantity limitations-
Passenger air/rail: 100 kg
Cargo aircraft only: 200 kg
Vessel stowage: A
Other stowage provisions:M2

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.075 mg/mL>(01/09/89)

Maximum Contaminant Level Goals (MCLG): 0.075 mg/mL>(01/09/89)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U072,D027

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

Max per parcel: 70 LBS; 5 LBS

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified

REACTIVITY (YELLOW): Unspecified

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: INHALATION: sudden high exposures (80 ppm - 160 ppm) to dust or fumes can cause headache, dizziness and hyperactivity. continued inhalation may lead to nose, throat and lung irritation and congestion. liver and kidney damage from continued episodes of short term exposure can develop but are reversible if exposure is discontinued. exposure to concentrations over 160 ppm are unbreathable and extremely irritating to nose and throat. SKIN: solid para-dichlorobenzene has a negligible irritating action on uncovered skin. warm fumes or strong solutions may cause irritation of skin but exposure has to be for a prolonged period and at high concentrations. presents no hazard from absorption through skin. Eyes: exposures to particle or vapor concentrations of 50 to 80 ppm may cause extreme irritation, pain and excessive tearing. INGESTION: nausea, vomiting, stomach pain and diarrhea may occur rapidly. liver and kidney damage is likely but usually disappear once exposure is stopped. (NYDH)

LONG TERM TOXICITY: exposure to levels above 45 ppm over an 8 hour period has led to irritation of the eyes and nose. exposure to fumes for prolonged periods of time can result in weakness, dizziness, possibly vomiting and weight loss. liver damage may develop. lung irritation from the fume can give rise to lung congestion, cough and shallow breathing. (NYDH)

TARGET ORGANS: liver, respiratory system, eyes, kidneys, skin. »»2

SYMPTOMS: INHALATION: irritation of upper respiratory tract; over-exposure may cause depression and injury to liver and kidney. EYE CONTACT: pain and mild irritation. Source: CHRIS

CONC IDLH: 1000PPM

NIOSH REL: Potential occupational carcinogen

ACGIH TLV: TLV = 75 ppm

ACGIH STEL: STEL = 110 ppm

OSHA PEL: Transitional Limits:
PEL = 75 ppm(450mg/M3)
Final Rule Limits:
TWA = 75 ppm (450 mg/M3)
STEL = 110 ppm(675 mg/M3)

MAK INFORMATION: 75 ppm
450 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.

CARCINOGEN?: Y STATUS: See below
REFERENCES:

HUMAN INDEFINITE IARC** 7,231,74
ANIMAL INDEFINITE IARC** 7,231,74
HUMAN INDEFINITE IARC** 29,213,82

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: 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)
orl-hmn TDLo:300 mg/kg PCOC** -,851,66
SENSE ORGANS

Eye
Other

LUNGS, THORAX, OR RESPIRATION

Other changes
GASTROINTESTINAL

Hypermotility,diarrhea

* orl-hmn LDLo:857 mg/kg 34ZIAG -,210,69

* unr-hmn LDLo:357 mg/kg YKYUA6 31,1499,80

LD50 value: orl-rat LD50:500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-rat LD50:500 mg/kg
skn-rat LD50:>6 gm/kg
ipr-rat LD50:2562 mg/kg
orl-mus LD50:2950 mg/kg
ipr-mus LD50:2 gm/kg
scu-mus LD50:5145 mg/kg
orl-rbt LD50:2830 mg/kg
skn-rbt LD50:>2 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

eye-hmn 80 ppm

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

orl-rat TDLo:7500 mg/kg (6-15D preg) BECTA6 37,164,86

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Musculoskeletal system

orl-rat TDLo:10 gm/kg (6-15D preg) BECTA6 37,164,86

EFFECTS ON EMBRYO OR FETUS

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

NO SIGNIFICANT

RISK LEVEL(Ca P65): 20 micrograms/day

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

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

full face mask fitted with organic vapor canister for concentrations over 75 ppm; clean protective clothing; eye protection.

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR APPROPRIATE EQUIPMENT TO PREVENT:

Repeated or prolonged skin contact.

** WEAR EYE PROTECTION TO PREVENT:

Reasonable probability of eye contact.

** EXPOSED PERSONNEL SHOULD WASH:

At the end of each work shift when there was a reasonable probability of co

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)

OSHA (p-DICHLOROBENZENE)

1000 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: if any ill effects develop, remove patient to fresh air and get medical attention. If breathing stops, give artificial respiration.

EYES: flush with plenty of water and get medical attention if ill effects develop.

SKIN AND

INGESTION: no problem likely.

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. Effects should disappear after individual has been exposed to fresh air for approximately 10 minutes.

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

FIRE EXTINGUISHMENT: Water, foam, carbon dioxide or dry chemical. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: p-Dichlorobenzene

DOT ID NUMBER: UN1592

ERG58

GUIDE 58

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Inhalation of vapor or dust is extremely irritating

May cause burning of eyes and flow of tears.

May cause coughing, difficult breathing and nausea.

Brief exposure effects last only a few minutes.

Exposure in an enclosed area may be very harmful.

Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind, out of low areas, and ventilate closed spaces before entering.

Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection.

Structural firefighter's protective clothing is not effective for these materials.

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.

***SPILL OR LEAK**

Do not touch spilled material; stop leak if you can do it without risk. Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire.

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 skin or eyes with running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

Effects should disappear after individual has been exposed to fresh air for approximately 10 minutes.

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CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 2203 LAST UPDATE OF THIS RECORD: 06/03/92
 NAME: o-DICHLOROBENZENE
 SYNONYMS: BENZENE, 1,2-DICHLORO-; CHLOROBEN; CHLORODEN; CLOROBEN;
 DCB; o-DICHLOROBENZENE; o-DICHLOR BENZOL;
 o-DICHLOROBENZENE; 1,2-DICHLOROBENZENE; DICHLOROBENZENE,
 ORTHO, LIQUID; DILANTIN DB; DILATIN DB; DIZENE; DOWTHERM
 E; NCI-C54944; ODB; ODCB; ORTHODICHLOROBENZENE;
 ORTHODICHLOROBENZOL; SPECIAL TERMITE FLUID; TERMITKIL;
 O-DICHLOROBENZOL; O-DICHLOROBENZENE
 CAS: 95-50-1 RTECS: CZ4500000
 FORMULA: C6H4Cl2 MOL WT: 147
 WLN: GR BG
 CHEMICAL CLASS:ST

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless to pale yellow liquid with a pleasant,
 aromatic odor

BOILING POINT:	453.5 K	180.3 C	356.6 F
MELTING POINT:	256.00 K	-17.2 C	1.1 F
FLASH POINT:	339 K	65.8 C	150.5 F
AUTO IGNITION:	920.92 K	647.7 C	1197.9 F
VAPOR PRESSURE:	1mm @ 20 C		
UEL:	9.2 %		
LEL:	2.2 %		
IONIZATION POTENTIAL (eV):	9.06		
VAPOR DENSITY:	5.05 (air=1)		
EVAPORATION RATE:	0.165(n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.3059 @ 20 C		
DENSITY:	1.307@20C		
WATER SOLUBILITY:	0.015%		
INCOMPATIBILITIES:	strong oxidizers hot aluminum or aluminum alloys		

REACTIVITY WITH WATER: PRACTICALLY INSOLUBLE IN WATER Source:
 MI

REACTIVITY WITH COMMON MATERIALS: MISCIBLE WITH ALCOHOL, ETHER, BENZENE
 Source: MI

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): 50 ppm

ODOR DESCRIPTION: Aromatic; characteristic Source:CHRIS

100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 6.1 POISON
DOT guide: 58
Identification number: UN1591
DOT shipping name: o-DICHLOROBENZENE
Packing group: III
Label(s) required: KEEP AWAY FROM FOOD
Special provisions: T7
Packaging exceptions: 153
Non bulk packaging: 203
Bulk packaging: 241
Quantity limitations-
Passenger air/rail: 60 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.6 mg/mL (07/30/92)

Maximum Contaminant Level Goals (MCLG): 0.6 mg/mL (07/30/92)

CLEAN AIR ACT: Not listed

EPA WASTE NUMBER: U070

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: adverse effect to target organ
after long period of exposure.

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: ORM-A

Mailability: Domestic service and air transportation; shipper's declaration

Max per parcel: 70 LBS; 1 PT

NFPA CODES:

HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with
self-contained breathing apparatus.

FLAMMABILITY (RED) : (2) This material must be moderately heated before
ignition will occur.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: INHALATION: levels of 50 ppm and above have caused irritation to the nose and eyes. higher, unknown levels have caused headache, nausea, vomiting, drowsiness, incoordination, unconsciousness and death. in animal studies, nerve, liver and kidney damage was also noticed. SKIN: may cause irritation, reddening, swelling and sores in sensitive individuals. Eyes: may cause irritation and cataracts. INGESTION: may cause symptoms similar to inhalation. (NYDH)

LONG TERM TOXICITY: prolonged or repeated exposures may cause skin burns, blood changes and injury to the liver, kidney and lungs. (NYDH)

TARGET ORGANS: skin, eyes, mucous membranes, liver, kidney, CNS

SYMPTOMS: Chronic inhalation of mist or vapors may result in damage to lungs, liver, and kidneys. Acute vapor exposure can cause symptoms ranging from coughing to central nervous system depression and transient anesthesia. Irritating to skin, eyes, and mucous membranes. May cause dermatitis. Source: CHRIS

CONC IDLH: 1000ppm

NIOSH REL:

ACGIH TLV: TLV = 50 ppm CEILING - SKIN
ACGIH STEL: CEILING - SKIN

OSHA PEL: Transitional Limits:
PEL = (C)50 ppm((C)300mg/M3)
Final Rule Limits:
CEILING = 50 ppm (300 mg/M3)

MAK INFORMATION: 50 ppm
300 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
There is no reason to fear a risk of damage to the developing embryo or fetus when MAK values are adhered to.

CARCINOGEN?: N STATUS: See below

REFERENCES: HUMAN INDEFINITE IARC** 7,231,74
ANIMAL INDEFINITE IARC** 7,231,74
HUMAN INDEFINITE IARC** 29,213,82

CARCINOGEN LISTS:

IARC: Not classified as to human
carcinogenicity or probably not
carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

LD50 value: orl-rat LD50:500 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-rat LD50:500 mg/kg
ihl-rat LCLo:821 ppm/7H
ipr-rat LD50:840 mg/kg
scu-rat LD50:5 gm/kg
orl-mus LD50:4386 mg/kg
ipr-mus LD50:1228 mg/kg
ivn-mus LDLo:400 mg/kg
orl-rbt LD50:500 mg/kg
ivn-rbt LDLo:250 mg/kg
orl-gpg LDLo:2 gm/kg
ihl-gpg LCLo:800 ppm/24H

IRRITATION DATA: (Source: NIOSH RTECS 1991)

eye-rbt 100 mg/30S rns MLD

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

ihl-rat TCLo:200 ppm/6H (6-15D preg) FAATDF 5,190,85
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

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

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

organic vapor-acid gas respirator; neoprene or vinyl gloves; chemical safety spectacles, face shield, rubber footwear, apron, protective clothing.

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**

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)

OSHA (o-DICHLOROBENZENE)

1000 ppm: Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed. / Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).

1250 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed.

1700 ppm: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece. / Any supplied-air respirator with a full facepiece.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:

Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove victim to fresh air, keep him quiet and warm, and call a physician promptly.

INGESTION: no known antidote; treat symptomatically; induce vomiting and get medical attention promptly.

EYES AND

SKIN: flush with plenty of water; get medical attention for eyes; remove contaminated clothing and wash 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 skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. Effects should disappear after individual has been exposed to fresh air for approximately 10 minutes.

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

FIRE EXTINGUISHMENT: Water, foam, dry chemical, or carbon dioxide. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport
formation - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: o-DICHLOROBENZENE

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Inhalation of vapor or dust is extremely irritating
May cause burning of eyes and flow of tears.
May cause coughing, difficult breathing and nausea.
Brief exposure effects last only a few minutes.
Exposure in an enclosed area may be very harmful.
Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind, out of low areas, and ventilate closed spaces before
entering.

Positive pressure self-contained breathing apparatus (SCBA) and chemical
protective clothing which is specifically recommended by the shipper
or manufacturer may be worn. It may provide little or no thermal
protection.

Structural firefighter's protective clothing is not effective for these
materials.

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

IRE

Small Fires: Dry chemical, CO₂, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

*SPILL OR LEAK

Do not touch spilled material; stop leak if you can do it without risk.
Fully-encapsulating, vapor-protective clothing should be worn for spills
and leaks with no fire.

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 skin or eyes with
running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

Effects should disappear after individual has been exposed to fresh
air for approximately 10 minutes.

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CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 282 LAST UPDATE OF THIS RECORD: 06/03/92
 NAME: NAPHTHALENE
 SYNONYMS: WHITE TAR; NAPHTHALIN; CAMPHOR TAR; MOTH BALLS; NCI-c52904
 CAS: 91-20-3 RTECS: QJ0525000
 FORMULA: C10H8 MOL WT: 128.18
 WLN: L66J
 CHEMICAL CLASS: Aromatic hydrocarbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: colorless to brown solid or molten solid with an odor
 of mothballs. white-crystalline volatile flakes.

BOILING POINT:	491.0 K	217.8 C	424.1 F
MELTING POINT:	353.2 K	80 C	176 F
FLASH POINT:	352 K	78.8 C	173.9 F
AUTO IGNITION:	799 K	525.8 C	978.5 F
CRITICAL TEMP:	748.4 K	475.25 C	887.45 F
CRITICAL PRESS:	4.05 kN/M2	39.9 atm	586 psia
HEAT OF VAP:	145 Btu/lb	80.52 cal/g	3.369x E5 J/kg
HEAT OF COMB:	-16720 Btu/lb	-9295 cal/g	-389x E5 J/kg
VAPOR PRESSURE:	1mm @ 52.6 C		
UEL:	5.9 %		
LEL:	0.9 %		
IONIZATION POTENTIAL (eV):	8.14		
VAPOR DENSITY:	4.42 (air=1)		
EVAPORATION RATE:	NA(n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.145 @ 20C		
DENSITY:	1.145 g/mL @ 20 C		
WATER SOLUBILITY:	0.003%		
INCOMPATIBILITIES:	strong oxidizers. incompatible with dinitrogen pentoxide. reacts violently with chlorine trioxide.		

REACTIVITY WITH WATER: MOLTEN NAPHTHALENE SPATTERS AND FOAMS IN CONTACT WITH WATER. NO CHEMICAL REACTION IS INVOLVED.

REACTIVITY WITH COMMON MATERIALS: SOLUBLE IN ALCOHOL, BENZENE, ETHER, CARBON TETRACHLORIDE, CARBON DISULFIDE, HYDRONAPHTHALENES, FIXED AND VOLATILE OILS. Source: SAX Source: MI

STABILITY DURING TRANSPORT: No Data

NEUTRALIZING AGENTS: No data

POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: TOXIC VAPORS IN A FIRE

OR DETECTED AT (ppm): 0.03 PPM

OR DESCRIPTION: MOTHBALL-LIKE Source: NYDH

100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 4.1 FLAMMABLE SOLID
DOT guide: 32
Identification number: UN1334
DOT shipping name: Naphthalene, crude [or] refined
Packing group: III
Label(s) required: FLAMMABLE SOLID
Special provisions: A1
Packaging exceptions: 151
Non bulk packaging: 213
Bulk packaging: 240
Quantity limitations-
Passenger air/rail: 25 kg
Cargo aircraft only: 100 kg
Vessel stowage: A
Other stowage provisions:M2

STCC NUMBER: 4940360, 4940361

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:Yes
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U165
CERCLA REF: Y
PC DESIGNATION: B 100 pounds (45.4 kg) CERCLA
A 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: ORM-A
Mailability: Domestic service and air transportation; shipper's declaration
Max per parcel: 25 LBS; 5 LBS

NFPA CODES:
HEALTH HAZARD (BLUE): (2) Hazardous to health. Area may be entered with
self-contained breathing apparatus.
FLAMMABILITY (RED) : (2) This material must be moderately heated before
ignition will occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

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

SHORT TERM TOXICITY: INHALATION: levels above 10 ppm may cause headache, nausea, excessive sweating and vomiting. SKIN: may cause irritation. if hypersensitive to naphthalene, severe irritation may occur. Eyes: levels above 15 ppm may cause irritation. direct contact may cause severe irritation, injury to the cornea and a blurring of vision. INGESTION: ingestion of 1/2 gram (1/60 ounce) may cause nausea, vomiting, abdominal pain, irritation of the bladder, and brown or black coloration of the urine. the symptoms usually disappear after a few days. animal studies indicate that the probable lethal dose for an adult is 5 to 15 grams (1/16 to 1/2 ounce). (NYDH)

LONG TERM TOXICITY: repeated ingestion of 1/2 gram doses may cause clouding of the eye. inhalation of levels above 10 ppm may cause headache, nausea, vomiting and a feeling of general discomfort. chronic skin problems are rare, except in cases of hypersensitivity. (NYDH)

TARGET ORGANS: eyes, blood, liver, kidneys, skin, rbc, CNS

SYMPTOMS: Vapors or fumes are irritating to eyes, nose, and throat and may cause headaches, dizziness, nausea, etc. Solid may be irritating to skin. Source: CHRIS

C IDLH: 500PPM

NIOSH REL:

ACGIH TLV: TLV = 10 ppm(50 mg/M3)
ACGIH STEL: STEL = 15 ppm(75 mg/M3)

OSHA PEL: Transitional Limits:
PEL = 10 ppm(50mg/M3)
Final Rule Limits:
TWA = 10 ppm (50 mg/M3)
STEL = 15 ppm(75 mg/M3)

MAK INFORMATION: 10 ppm
50 mG/M3

CARCINOGEN?: N STATUS: See below

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

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

* orl-chd LDLo:100 mg/kg 28ZRAQ -,228,60

* unr-hmn LDLo:29 mg/kg YKYUA6 31,1499,80

LD50 value: orl-rat LD50:490 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-rat LD50:490 mg/kg
skn-rat LD50:>2500 mg/kg
orl-mus LD50:533 mg/kg
ipr-mus LD50:150 mg/kg
scu-mus LD50:969 mg/kg
ivn-mus LD50:100 mg/kg
orl-dog LDLo:400 mg/kg
orl-cat LDLo:1 gm/kg
orl-rbt LDLo:3 gm/kg
orl-gpg LD50:1200 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

ipr-rat TDLo:5925 mg/kg (1-15D preg) TXAPA9 48,A35,79
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Cardiovascular(circulatory) system

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

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

u. s. bureau of mines approved organic vapor canister unit (usbm type b);
rubber gloves; chemical safety goggles; face shield; coveralls and/or
rubber apron; rubber shoes or boots.

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.

WORK CLOTHING SHOULD BE CHANGED DAILY:

If there is any reasonable possibility that the clothing may be contaminate

**** REMOVE CLOTHING:**

Promptly remove non-impervious clothing that becomes contaminated.

REFERENCE: NIOSH

**RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (NAPHTHALENE)**

100 ppm: Any chemical cartridge respirator with organic vapor cartridge(s) in combination with a dust and mist filter. * 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.

250 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection. / Any powered air-purifying respirator with organic vapor cartridge(s) in combination with a dust and mist filter. * Substance reported to cause eye irritation or damage may require eye protection.

500 ppm: Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). / Any air-purifying respirator with a high-efficiency particulate filter. / Any supplied-air respirator with a full facepiece. / Any self-contained breathing apparatus with a full facepiece.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister having a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: remove to fresh air.

SKIN OR

EYES: flush immediately with plenty of water for at least 15 min.; remove contaminated clothing immediately; call a physician.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Removal of solidified molten material from skin requires medical assistance. Remove and isolate contaminated clothing and shoes at the site.

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

FIRE EXTINGUISHMENT: Water fog, carbon dioxide, dry chemical, or foam.
CHRIS91

Department of Transportation Guide to Hazardous Materials Transport

Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Naphthalene, crude [or] refined
ID NUMBER: UN1334

ERG90

GUIDE 32

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

May burn rapidly with flare-burning effect.

*HEALTH HAZARDS

Fire may produce irritating or poisonous gases.

Contact may cause burns to skin and eyes.

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.

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

*FIRE

Small Fires: Dry chemical, sand, earth, 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.

Magnesium Fires: Use dry sand, Met-L-X R powder or G-1 graphite powder.

*SPILL OR LEAK

Shut off ignition sources; no flares, smoking or flames in hazard area.

Do not touch or walk through spilled material.

Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Large Spills: Wet down with water and dike for later disposal.

*FIRST AID

Move victim to fresh air; call emergency medical care.

In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes.

Removal of solidified molten material from skin requires medical assistance.

Remove and isolate contaminated clothing and shoes at the site.

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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 154 LAST UPDATE OF THIS RECORD: 06/03/92
 NAME: DIBUTYL PHTHALATE
 SYNONYMS: o-BENZENEDICARBOXYLIC ACID, DIBUTYL ESTER;
 BENZENE-o-DICARBOXYLIC ACID DI-n-BUTYL ESTER; CELLUFLEX
 DPB; DBP; DIBUTYL 1,2-BENZENEDICARBOXYLATE; DIBUTYL
 PHTHALATE; DI-n-BUTYL PHTHALATE; ELAOL; HEXAPLAS M/B;
 PALATINOL C; POLYCIZER DBP; PX 104; STAFLEX DBP; WITCIZER
 300; 1,2-BENZENEDICARBOXYLIC ACID, DIBUTYL ESTER;
 DI-N-BUTYL PHTHALATE; N-BUTYL PHTHALATE; PHTHALIC ACID
 DIBUTYL ESTER
 CAS: 84-74-2 RTECS: TI0875000
 FORMULA: C16H22O4 MOL WT: 278.38
 WLN: 4OVR BVO2
 CHEMICAL CLASS: Ester

See other identifiers listed below under Regulations.

PROPERTIES

PHYSICAL DESCRIPTION: colorless, oily liquid

BOILING POINT:	613 K	339.8 C	643.7 F
MELTING POINT:	238 K	-35.2 C	-31.3 F
FLASH POINT:	444 K	170.8 C	339.5 F
AUTO IGNITION:	NA		
CRITICAL TEMP:	773 K	499.85 C	931.73 F
CRITICAL PRESS:	1.7 kN/M2	16.7 atm	246 psia
HEAT OF COMB:	-13300 Btu/lb	-7394 cal/g	-309x E5 J/kg
VAPOR PRESSURE:	1.1 mm @ 150 C		
UEL:	NA		
LEL:	NA		
VAPOR DENSITY:	9.58 (air=1)		
EVAPORATION RATE:	<0.005(n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.9484		
DENSITY:	1.043		
WATER SOLUBILITY:	400 mg/l @25 C		
INCOMPATIBILITIES:	violent reaction with chlorine nitrates strong oxidizers strong acids or strong alkalies; chlorine		

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

OR DETECTED AT (ppm): Data not available
 OR DESCRIPTION: aromatic Source:CHRIS

100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 9 CLASS 9
DOT guide: 31
Identification number: UN3082
DOT shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S.
Packing group: III
Label(s) required: CLASS 9
Special provisions: 8, T1
Packaging exceptions: 155
Non bulk packaging: 203
Bulk packaging: 241
Quantity limitations-
Passenger air/rail: NONE
Cargo aircraft only: NONE
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes
CLEAN WATER ACT Sect.311:No
CLEAN AIR ACT: CAA '90 Listed
EPA WASTE NUMBER: U069
CERCLA REF: Y
P^h DESIGNATION: A 10 pounds (4.54 kg) CERCLA
A TPQ VALUE: Not listed
SARA Sect. 312
categories:

Acute toxicity: Irritant
Chronic toxicity: mutagen.
Chronic toxicity: reproductive toxin.

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

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE): (0) No unusual health hazard.
FLAMMABILITY (RED) : (1) This material must be preheated before ignition
can occur.
REACTIVITY (YELLOW): (0) Stable even under fire conditions.
SPECIAL : Unspecified

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

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: Vapors from very hot material may irritate eyes and produce headache, drowsiness, and convulsions. Source: CHRIS

CONC IDLH: Unknown

NIOSH REL:

ACGIH TLV: TLV = 5 mg/M3
ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 5mg/M3
Final Rule Limits:
TWA = 5 mg/M3

MAK INFORMATION: Not listed

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 TDLo:140 mg/kg SMWOAS 84,1243,54
BEHAVIORAL
Hallucinations, distorted perceptions
GASTROINTESTINAL
Nausea or vomiting
KIDNEY, URETER, BLADDER
Other changes

LD50 value: orl-rat LD50:8 gm/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-rat LD50:8 gm/kg
ihl-rat LC50:4250 mg/m3
skn-rat LDLo:6 gm/kg
ipr-rat LD50:3050 mg/kg
ims-rat LD50:>8 gm/kg
orl-mus LD50:5289 mg/kg
ihl-mus LC50:25 gm/m3/2H
ipr-mus LD50:3570 mg/kg
scu-mus LD50:20800 mg/kg

ivn-mus LD50:720 mg/kg
skn-rbt LD50:>20 gm/kg
orl-gpg LD50:10 gm/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

orl-rat TDLo:8400 mg/kg (7D male) TXAPA9 53,35,80
PATERNAL EFFECTS
Testes,epididymis,sperm duct

orl-rat TDLo:2520 mg/kg (1-21D preg) TXAPA9 26,253,73
EFFECTS ON EMBRYO OR FETUS
Extra embryonic features(e.g.,placenta,umbilical
cord)

orl-rat TDLo:12600 mg/kg (1-21D preg) TXAPA9 26,253,73
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-rat TDLo:16800 mg/kg (7D male) NFGZAD 28,159,82
PATERNAL EFFECTS
Testes,epididymis,sperm duct
PATERNAL EFFECTS
Prostate,seminal vessel,Cowper's gland,accessory
glands,urethra

ipr-rat TDLo:1017 mg/kg (5-15D preg) JPMSAE 61,51,72
EFFECTS ON FERTILITY
Post-implantation mortality

ipr-rat TDLo:305 mg/kg (5-15D preg) JPMSAE 61,51,72
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Musculoskeletal system

ipr-rat TDLo:6 gm/kg (3-9D preg) EVHPAZ 3,91,73
EFFECTS ON NEWBORN
Weaning or lactation index(#alive at weaning per #
alive at day 4)

orl-mus TDLo:7200 mg/kg (1-18D preg) OEKSDJ 8,29,77
EFFECTS ON FERTILITY
Pre-implantation mortality
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before
birth)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Central nervous system

orl-mus TDLo:8640 mg/kg (1-18D preg) EVHPAZ 45,65,82
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:20 gm/kg (6-13D preg) TCMUD8 7,29,87
EFFECTS ON FERTILITY
Litter size(# fetuses per litter;measured before
birth)

orl-mus TDLo:16800 mg/kg (7D male) TOLED5 5,413,80
PATERNAL EFFECTS
Testes,epididymis,sperm duct
PATERNAL EFFECTS
Other effects on male

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

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
(DIBUTYL PHTHALATE)

FIRST AID SOURCE: CHRIS Manual 1991
Remove to fresh air. Wash affected skin areas with water. Flush eyes with
water.

ST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running
water for at least 15 minutes. Wash skin with soap and water. Remove and
isolate contaminated clothing and shoes at the site.

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

FIRE EXTINGUISHMENT: Dry powder, carbon dioxide, foam. Note: Water or
foam may cause frothing. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport
Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, LIQUID, N.O.S.
DOT ID NUMBER: UN3082

ERG90

GUIDE 31

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

*HEALTH HAZARDS

Contact may cause burns to 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. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. 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.
Do not scatter spilled material with high-pressure water streams.
Dike fire-control water for later disposal.

***SPILL OR LEAK**

Stop leak if you can do it without risk.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
Cover powder spill with plastic sheet or tarp to minimize spreading.

***FIRST AID**

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 471 LAST UPDATE OF THIS RECORD: 06/03/92
 NAME: BROMOFORM
 SYNONYMS: TRIBROMOMETHANE; METHANE,TRIBROMO; BROMPFORMIO; METHENYL
 TRIBROMIDE; TRIBROMMETHAAN (DUTCH); TRIBROMMETHAN;
 TRIBROMOMETHANE
 CAS: 75-25-2 RTECS: PB5600000
 FORMULA: CHBr3 MOL WT: 252.77
 WLN: EYEE
 CHEMICAL CLASS:Halogenated h-carbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: heavy liquid; acquires yellow color with gradual
 decomposition; chloroform odor; sweetish taste
 BOILING POINT: 422.5 K 149.3 C 300.8 F
 MELTING POINT: 264.7 K -8.5 C 16.7 F
 FLASH POINT: NA NA NA
 AUTO IGNITION: NA
 VAPOR PRESSURE: .00710*298
 VAPOR DENSITY: NA
 IONIZATION POTENTIAL (eV): 10.51
 VAPOR DENSITY: 8.7 (air=1)
 SPECIFIC GRAVITY: 2.890 @ 20 C
 DENSITY: 2.89 g/mL
 WATER SOLUBILITY: 0.1%
 INCOMPATIBILITIES: chemically active metals; sodium
 potassium; calcium powdered aluminum;
 zinc; magnesium strong caustics
 caustic alkalies
 REACTIVITY WITH WATER: No data on water reactivity
 REACTIVITY WITH COMMON MATERIALS: AIR AND LIGHT ACCELERATE DECOMPOSITION
 Source: MI
 STABILITY DURING TRANSPORT: No Data
 NEUTRALIZING AGENTS: No data
 POLYMERIZATION POSSIBILITIES: No data
 TOXIC FIRE GASES: EXTREMELY HAZARDOUS DECOMPOSITION
 PRODUCTS ■CSDS; FUMES OF HYDROGEN
 BROMIDE ■SAX
 ODOR DETECTED AT (ppm): 1-6 mg/m3
 ODOR DESCRIPTION: Sweetish, chloroform-like Source:CHRIS
 100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 6.1 POISON
DOT guide: 58
Identification number: UN2515
Shipping name: Bromoform
Packing group: III
Label(s) required: KEEP AWAY FROM FOOD
Special provisions: T7
Packaging exceptions: 153
Non bulk packaging: 203
Bulk packaging: 241
Quantity limitations-
Passenger air/rail: 60 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions: 12,40,48,M2

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.10 mg/mL (11/29/81)

Maximum Contaminant Level Goals (MCLG): Not specified

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U225

CERCLA REF: Y

RQ DESIGNATION: B 100 pounds (45.4 kg) CERCLA

SARA TPQ VALUE: Not listed

A Sect. 312

categories:

Acute toxicity: Toxic. LD50 > 50 and <= 500
mg/kg (oral rat).

Chronic toxicity: adverse effect to target organ
after long period of exposure.

Chronic toxicity: mutagen.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 1.0 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Not given

NFPA CODES:

HEALTH HAZARD (BLUE): (4) Full protection will not be adequate unless
designed specifically for this chemical. DO NOT
ENTER AREA!

FLAMMABILITY (RED) : (0) This material does not readily burn.

REACTIVITY (YELLOW): (0) Stable even under fire conditions.

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: INHALATION: can cause irritation to the nose and throat, tearing, reddening of the face, dizziness, and death. exposure of dogs to 7000 ppm for 8 minutes caused death. SKIN: can be absorbed. large quantities can lead to symptoms listed under ingestion. Eyes: can cause irritation and tearing. INGESTION: causes burning of mouth and throat. can cause headache, dizziness, disorientation, slurred speech, difficulty breathing, tremors and unconsciousness. the estimated dose is 1/3 ounce for a 150 pound adult. (NYDH)

LONG TERM TOXICITY: can cause liver damage. has caused cancer in laboratory animals; whether it does so in humans is unknown. (NYDH)

TARGET ORGANS: eyes, skin, liver, CNS

SYMPTOMS: Harmful if inhaled, swallowed, contacts skin or eyes or is absorbed through skin. It is a lachrymator, respiratory irritant, a narcotic and an hepatotoxin. Prolonged exposure may cause dermatitis. Inhalation causes irritation of nose and throat; provokes the flow of tears and saliva and reddening of the face. Ingestion may cause dizziness, disorientation and slurred speech, unconsciousness and death. Source: CHRIS

CONC IDLH: Unknown

NIOSH REL:

ACGIH TLV: TLV = 0.5 ppm(5 mg/M3) SKIN
ACGIH STEL: SKIN

OSHA PEL: Transitional Limits:
PEL = 0.5 ppm(5mg/M3) (SKIN)
Final Rule Limits:
TWA = 0.5 ppm (5 mg/M3) (SKIN)

MAK INFORMATION: Not listed

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:143 mg/kg 34ZIAG -,141,69

LD50 value: orl-rat LD50:1147 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

 orl-rat LD50:1147 mg/kg
 ihl-rat LCLo:45 gm/m3/4H
 ipr-rat LD50:414 mg/kg
 scu-rat LD50:2040 mg/kg
 orl-mus LD50:1400 mg/kg
 ipr-mus LD50:1274 mg/kg
 scu-mus LD50:1820 mg/kg
 scu-rbt LDLo:410 mg/kg
 ihl-mam LC50:12100 mg/m3

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

 This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

----- 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

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (BROMOFORM)

12.5 ppm: Any supplied-air respirator operated in a continuous flow mode. * Substance causes eye irritation or damage; eye protection needed. / Any powered air-purifying respirator with organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed.
25 ppm: Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s). / Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any self-contained breathing apparatus with a full facepiece.

/ Any supplied-air respirator with a full facepiece. / Any powered air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s). * Substance causes eye irritation or damage; eye protection needed.

1000 ppm: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.:

Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSHP CSDS

EYE: irr immed. remove contacts. flush well with water or normal saline for 20-30 min. seek medical attention.

SKIN: soap wash promptly. flood contacted areas with water. use soap. remove contaminated clothing under sink and isolate to prevent further contamination.

INHALATION: art resp. leave contaminated area immediately; breathe fresh air. proper respiratory protection must be supplied to any rescuers. if coughing, difficult breathing or any other symptoms develop, seek medical attention at once, even if symptoms develop many hours after exposure.

INGESTION: ipecac, vomit. if convulsions are not present, give a glass or 2 of milk or water to dilute the substance. assure that the person's airway is unobstructed and contact a hospital or poison control center immediately for advice on whether or not to induce vomiting.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: Move victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

EYES OR

SKIN: Flush with running water for at least 15 min.; hold eyelids open if necessary. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

INGESTION: If victim is conscious, have victim take syrup of ipecac to induce vomiting.

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. Effects should disappear after individual has been exposed to fresh air for approximately 10 minutes.

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

Department of Transportation Guide to Hazardous Materials Transport
Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Bromoform
DOT ID NUMBER: UN2515

58

GUIDE 58

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Inhalation of vapor or dust is extremely irritating
May cause burning of eyes and flow of tears.
May cause coughing, difficult breathing and nausea.
Brief exposure effects last only a few minutes.
Exposure in an enclosed area may be very harmful.
Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.
Stay upwind, out of low areas, and ventilate closed spaces before entering.

Positive pressure self-contained breathing apparatus (SCBA) and chemical protective clothing which is specifically recommended by the shipper or manufacturer may be worn. It may provide little or no thermal protection.

Structural firefighter's protective clothing is not effective for these materials.

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.

*SPILL OR LEAK

Do not touch spilled material; stop leak if you can do it without risk.
Fully-encapsulating, vapor-protective clothing should be worn for spills and leaks with no fire.

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 skin or eyes with running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

Effects should disappear after individual has been exposed to fresh air for approximately 10 minutes.

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CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 210 LAST UPDATE OF THIS RECORD: 06/03/92

NAME: ETHYLENE DICHLORIDE

SYNONYMS: AETHYLENCHLORID (German); 1,2-BICHLOROETHANE; BICHLORURE
 D'ETHYLENE (French); BORER SOL; BROCID; CHLORURE
 D'ETHYLENE (French); CLORURO DI ETHENE (Italian);
 DESTRUOL BORER-SOL; 1,2-DICHLOROETHAAN (Dutch);
 1,2-DICHLOR-AETHAN (German); DICHLOREMULSION;
 1,2-DICHLORETHANE; DI-CHLOR-MULSION; DICHLORO-1,2-ETHANE
 (French); alpha,beta-DICHLOROETHANE; sym-DICHLOROETHANE;
 1,2-DICHLOROETHANE; DICHLOROETHYLENE; 1,2-DICLOROETANO
 (Italian); DUTCH LIQUID; DUTCH OIL; EDC; ENT 1,656; ETHANE
 DICHLORIDE; ETHYLEENDICHLORIDE (Dutch); ETHYLENE CHLORIDE;
 ETHYLENE DICHLORIDE; ETHYLENE DICHLORIDE (DOT);
 1,2-ETHYLENE DICHLORIDE; FREON 150; GLYCOL DICHLORIDE;
 NCI-C00511; ETHANE, 1,2-DICHLORO-

CAS: 107-06-2 RTECS: KI0525000

FORMULA: C2H4Cl2 MOL WT: 98.96

WLN: G2G

CHEMICAL CLASS: FT

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: clear liquid with a sweet odor like chloroform

BOILING POINT:	356.7 K	83.5 C	182.3 F
MELTING POINT:	237.75 K	-35.4 C	-31.8 F
FLASH POINT:	288.7 K	15.5 C	59.9 F
AUTO IGNITION:	685.92 K	412.7 C	774.9 F
CRITICAL TEMP:	561 K	287.85 C	550.13 F
CRITICAL PRESS:	5.1 kN/M2	50.2 atm	738 psia
HEAT OF VAP:	138 Btu/lb	76.64 cal/g	3.206x E5 J/kg
HEAT OF COMB:	-3400 Btu/lb	-1890 cal/g	-79x E5 J/kg
VAPOR PRESSURE:	44MM @ 10 C		
UEL:	15.6 %		
LEL:	6.2 %		
IONIZATION POTENTIAL (eV):	10.5		
VAPOR DENSITY:	3.4 (air=1)		
EVAPORATION RATE:	5.05 (n-BUTYL ACETATE=1)		
SPECIFIC GRAVITY:	1.2569		
DENSITY:	1.256		
WATER SOLUBILITY:	0.8%		
INCOMPATIBILITIES:	strong oxidizers strong caustics chemically active metals such as aluminum or magnesium powder sodium potassium		

ACTIVITY WITH WATER: N/R - SINKS IN WATER

REACTIVITY WITH COMMON MATERIALS: No data

STABILITY DURING TRANSPORT: No Data
NEUTRALIZING AGENTS: No data
POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: TOXIC AND IRRITATING HYDROGEN CHLORIDE
AND PHOSGENE GASES
ODOR DETECTED AT (ppm): 100 ppm
ODOR DESCRIPTION: ether-like Source:CHRIS
100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 3 FLAMMABLE LIQUID
DOT guide: 26
Identification number: UN1184
DOT shipping name: Ethylene dichloride
Packing group: II
Label(s) required: FLAMMABLE LIQUID, POISON
Special provisions: T14
Packaging exceptions: None
Non bulk packaging: 202
Bulk packaging: 243
Quantity limitations-
Passenger air/rail: 1 L
Cargo aircraft only: 60 L
Vessel stowage: B
Other stowage provisions:40,M2

CC NUMBER: 4909166

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.005 mg/mL (01/09/89)

Maximum Contaminant Level Goals (MCLG): 0 mg/mL (01/09/89)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: U077,D028

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: Flammable liquid - Mailable as ORM-D

Mailability: Domestic surface mail only
Max per parcel: 1 GAL

HAZARD 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

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

SHORT TERM TOXICITY: INHALATION: levels of 10 to 30 ppm may cause dizziness, nausea, and vomiting. levels up to 50 ppm may cause weakness, trembling, headaches, abdominal cramps, liver and kidney damage, and fluid build up in lungs. may cause coma and death at high levels. SKIN: prolonged contact may cause irritation and skin rashes. Eyes: may cause redness, pain, and blurred vision. vapor can damage the cornea. INGESTION: ingestion of 2 ounces has resulted in nausea, vomiting, faintness, drowsiness, difficulty breathing, pale skin, internal bleeding, kidney damage, and death due to respiratory failure. other possible symptoms may include abdominal spasms, severe headache, lethargy, lowered blood pressure, diarrhea, shock, physical collapse, and coma. (NYDH)

LONG TERM TOXICITY: may cause eye, nose and throat irritation, nausea, vomiting, loss of appetite, nerve damage, liver and kidney damage. this substance has been determined to cause cancer in laboratory animals. whether it does so in humans is not known. (NYDH)

TARGET ORGANS: kidneys, liver, eyes, skin, CNS

SYMPTOMS: Inhalation of vapors causes nausea, drunkenness, depression. Contact of liquid with eyes may produce corneal injury. Prolonged contact with skin may cause a burn. Source: CHRIS

CONC IDLH: 1000PPM

NIOSH REL: Potential occupational carcinogen 1 ppm Time weighted averages for 8-hour exposure 4 mg/M3 Time weighted averages for 8-hour exposure 2 ppm Ceiling exposures which shall at no time be exceeded 8 mg/M3 Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 10 ppm(40 mg/M3)
ACGIH STEL: STEL = 15 ppm(60 mg/M3)

OSHA PEL: Transitional Limits:

PEL = 50 PPM; CEILING = 100 PPM; MAXIMUM PEAK ABOVE CEILING
Final Rule Limits:
TWA = 1 ppm (4 mg/M3)
STEL = 2 ppm(8 mg/M3)

MAK INFORMATION: Carcinogenic working material without MAK
In the Commission's view, an animal carcinogen.

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: An animal carcinogen.
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

MAN TOXICITY DATA: (Source: NIOSH RTECS)

ihl-man TCLo:4000 ppm/1H PCOC** -,500,66
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL
Coma
GASTROINTESTINAL
Nausea or vomiting

orl-hmn LDLo:286 mg/kg CLCEAL 86,203,47
GASTROINTESTINAL
Ulceration or bleeding from stomach
GASTROINTESTINAL
Nausea or vomiting
LIVER
Fatty liver degeneration

orl-hmn TDLo:428 mg/kg SOMEAU 22(10),132,58
BEHAVIORAL
Somnolence(general depressed activity)
LUNGS, THORAX, OR RESPIRATION
Cough
GASTROINTESTINAL
Nausea or vomiting

orl-man TDLo:892 mg/kg WILEAR 28,983,75
GASTROINTESTINAL
Hypermotility,diarrhea

GASTROINTESTINAL

Nausea or vomiting

LIVER

Jaundice, other or unclassified

LD50 value: orl-rat LD50:670 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-rat LD50:670 mg/kg
ihl-rat LC50:1000 ppm/7H
ipr-rat LD50:807 mg/kg
scu-rat LD50:1 gm/kg
orl-mus LD50:489 mg/kg
ihl-mus LCLo:5 gm/m3/2H
ipr-mus LD50:470 mg/kg
scu-mus LDLo:380 mg/kg
orl-dog LD50:5700 mg/kg
ivn-dog LDLo:175 mg/kg
ihl-mky LC50:3000 ppm/7H
orl-rbt LD50:860 mg/kg
ihl-rbt LCLo:3000 ppm/7H
skn-rbt LD50:2800 mg/kg
scu-rbt LDLo:1200 mg/kg
ihl-pig LCLo:3000 ppm/7H
ihl-gpg LCLo:1500 ppm/7H
ipr-gpg LDLo:600 mg/kg

IRITATION DATA: (Source: NIOSH RTECS 1991)

skn-rbt 625 mg open MLD
eye-rbt 63 mg SEV

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

ihl-rat TCLo:300 ppm/7H (6-15D preg) BANRDU 5,149,80
EFFECTS ON FERTILITY
Post-implantation mortality

NO SIGNIFICANT

RISK LEVEL(Ca P65): 10 micrograms/day

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

PROTECTION SUGGESTED

FROM THE CHRIS MANUAL:

clean, body-covering clothes & safety glasses with side shields.
respiratory protection: up to 50 ppm, none; 50 ppm to 2%, full face mask
& canister; greater than 2%, self-contained breathing apparatus.

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 (ETHYLENE DICHLORIDE)

Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: CHRIS Manual 1991

INHALATION: if victim is overcome, remove him to fresh air, keep him quiet and warm, and get medical attention immediately; if breathing stops, give artificial respiration.

GESTION: induce vomiting; call a physician; treat the symptoms.

EYES: flush immediately with copious amounts of flowing water for at least 15 min.

SKIN: remove clothing and wash skin thoroughly with soap and water; 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, carbon dioxide, dry chemical. Note: Water may be ineffective. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Ethylene dichloride

DOT ID NUMBER: UN1184

ERG90

GUIDE 26

* POTENTIAL HAZARDS *

> FIRE OR EXPLOSION

Flammable/combustible material; may be ignited by heat, sparks or flames.

Vapors may travel to a source of ignition and flash back.

Container may explode in heat of fire.

Vapor explosion hazard indoors, outdoors or in sewers.

Runoff to sewer may create fire or explosion hazard.

***HEALTH HAZARDS**

May be poisonous if inhaled or absorbed through skin.

Vapors may cause dizziness or suffocation.

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.

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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 323 LAST UPDATE OF THIS RECORD: 06/03/92
 NAME: POLYCHLORINATED BIPHENYL(S) (PCBS)
 SYNONYMS: AROCLOR; AROCLOR 1221; AROCLOR 1232; AROCLOR 1242; AROCLOR 1248; AROCLOR 1254; AROCLOR 1260; AROCLOR 1262; AROCLOR 1268; AROCLOR 2565; AROCLOR 4465; BIPHENYL, POLYCHLORO-; CHLOPHEN; CHLOREXTOL; CHLORINATED BIPHENYL; CHLORINATED DIPHENYL; CHLORINATED DIPHENYLENE; CHLORO BIPHENYL; CHLORO 1,1-BIPHENYL; CLOPHEN; DYKANOL; FENCLOR; INERTEEN; KANECHLOR; KANECHLOR 300; KANECHLOR 400; KANECHLOR 500; MONTAR; NOFLAMOL; PCB; PCBs; PHENOCHLOR; PHENOCLOR; POLYCHLORINATED BIPHENYL; POLYCHLOROBIPHENYL; PYRALENE; PYRANOL; SANTOTHERM; SANTOTHERM FR; SOVOL; THERMINOL FR-1
 CAS: 1336-36-3 RTECS: TQ1350000
 FORMULA: MOL WT:
 WLN: -
 CHEMICAL CLASS: Halogenated h-carbon

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: light yellow oily liquid or white solid powder with a weak odor

BOILING POINT: NA
 MELTING POINT: NA
 FLASH POINT: 468.15 K 195 C 383 F
 AUTO IGNITION: NA
 VAPOR PRESSURE:
 UEL: na
 LEL: na
 VAPOR DENSITY: No data
 SPECIFIC GRAVITY: 1.3 - 1.8@ 20C
 DENSITY: 1.3 g/cc or 12.09 lb/gal
 WATER SOLUBILITY:
 INCOMPATIBILITIES:

REACTIVITY WITH WATER: No data on water reactivity
 REACTIVITY WITH COMMON MATERIALS: No data
 STABILITY DURING TRANSPORT: No Data
 NEUTRALIZING AGENTS: No data
 POLYMERIZATION POSSIBILITIES: No data

TOXIC FIRE GASES: None reported other than possible unburned vapors
 ODOR DETECTED AT (ppm): Data not available
 ODOR DESCRIPTION: Practically odorless Source:CHRIS
 100 % ODOR DETECTION: No data

----- REGULATIONS -----

DOT hazard class: 9 CLASS 9
" guide: 31
Identification number: UN2315
DOT shipping name: Polychlorinated biphenyls
Packing group: II
Label(s) required: CLASS 9
Special provisions: 9
Packaging exceptions: 155
Non bulk packaging: 202
Bulk packaging: 240
Quantity limitations-
Passenger air/rail: 100 L
Cargo aircraft only: 220 L
Vessel stowage: A
Other stowage provisions: 34, M1

STCC NUMBER: 4961666

CLEAN WATER ACT Sect.307: No

CLEAN WATER ACT Sect.311: Yes

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.0005 mg/mL (07/30/92)

Maximum Contaminant Level Goals (MCLG): 0 mg/mL (07/30/92)

CLEAN AIR ACT: CAA '90 Listed

EPA WASTE NUMBER: None

CERCLA REF: Y

PO DESIGNATION: X 1 pound (0.454 kg) CERCLA

LA TPQ VALUE: Not listed

SARA Sect. 312

categories:

Chronic toxicity: carcinogen

Chronic toxicity: adverse effect to target organ
after long period of exposure.

Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Not given

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified

REACTIVITY (YELLOW): Unspecified

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: Unknown

LONG TERM TOXICITY: unknown

TARGET ORGANS: skin, liver

SYMPTOMS: Acne from skin contact. Source: CHRIS

CONC IDLH: Unknown

NIOSH REL: Not given

ACGIH TLV: Not listed

ACGIH STEL: STEL = 2 ppm

OSHA PEL: Not in Table Z-1-A

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be probably carcinogenic to humans with (usually) at least limited human evidence.

MAK: Not listed

NIOSH: 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

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-mus LD50:1900 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

orl-rat TDLo:400 mg/kg (6-15D preg) FAATDF 11,440,88
EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:420 mg/kg (21D post) FAATDF 11,440,88
EFFECTS ON NEWBORN

Behavioral

orl-rat TDLo:247 mg/kg (60D pre-22D post) FAATDF
15,457,90
EFFECTS ON NEWBORN
Behavioral

ipr-rat TDLo:700 mg/kg (14D pre) FAATDF 11,440,88
EFFECTS ON NEWBORN
Behavioral

orl-mam TDLo:325 mg/kg (30D pre/1-36D preg) AMBOCX
6,239,77
EFFECTS ON NEWBORN
Stillbirth
EFFECTS ON NEWBORN
Live birth index(# fetuses per liter)
EFFECTS ON NEWBORN
Viability index(# alive at day 4 per # born alive)

NO SIGNIFICANT

RISK LEVEL(Ca P65): N0.09 micrograms/day

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

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

FIRST AID SOURCE: CHRIS Manual 1991
SKIN: wash with soap and water.

FIRST AID SOURCE: DOT Emergency Response Guide 1990.
In case of contact with material, immediately flush eyes with running
water for at least 15 minutes. Wash skin with soap and water. Remove and
isolate contaminated clothing and shoes at the site.

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

FIRE EXTINGUISHMENT: Water, foam, dry chemical, or carbon dioxide. CHRIS91

US Department of Transportation Guide to Hazardous Materials Transport
Information - Publication DOT 5800.5 (1990).
DOT SHIPPING NAME: Polychlorinated biphenyls
DOT ID NUMBER: UN2315

ERG90

GUIDE 31

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

ALTH HAZARDS

Contact may cause burns to 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.
Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.
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.
Do not scatter spilled material with high-pressure water streams.
Dike fire-control water for later disposal.

*SPILL OR LEAK

Stop leak if you can do it without risk.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
Cover powder spill with plastic sheet or tarp to minimize spreading.

*FIRST AID

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.

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National Secondary Ambient Air Quality Standards
same as primary standard

JT hazard class: 6.1 POISON
DOT guide: 53
Identification number: UN2291
DOT shipping name: LEAD COMPOUNDS, SOLUBLE, N.O.S.
Packing group: II
Label(s) required: POISON
Special provisions:
Packaging exceptions: 153
Non bulk packaging: 213
Bulk packaging: 240
Quantity limitations-
Passenger air/rail: 100 KG
Cargo aircraft only: 200 KG
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.05 mg/mL»(12/07/92)

Maximum Contaminant Level Goals (MCLG): 0 mg/mL»(12/07/92)

CLEAN AIR ACT: CAA '90 By category and CAA '77 Sect 109

RCRA WASTE NUMBER: D008

RCRA REF: Y

RQ DESIGNATION: X 1 pound (0.454 kg) CERCLA for pieces of
solid metal with diameter less than 100
micrometers (0.004 inches).

SARA TPQ VALUE: Not listed

SARA Sect. 312
categories:

Chronic toxicity: carcinogen

Chronic toxicity: adverse effect to target organ
after long period of exposure.

Chronic toxicity: mutagen.

Chronic toxicity: reproductive toxin.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Hazard class: ORM-B

Mailability: Domestic service and air transportation; shipper's declaration

Max per parcel: 25 LBS; 5 LBS

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified

REACTIVITY (YELLOW): Unspecified

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: LASSITUDE, INSOMNIA, PALLOR, EYE GROUND, ANOREXIA, LOW-WEIGHT, MALNUTRITION, CONSTIPATION, ABDOMINAL PAIN, COLIC; HYPOTENSE, ANEMIA; GINGIVAL LEAD LINE; TREMBLING PARALYSIS WRIST. ** Source: 2

LONG TERM TOXICITY: unknown

TARGET ORGANS: gi,CNS,kidneys,blood,gingival tissue

SYMPTOMS: LASS, INSOM, PAL, EYE GROUND, ANOR, LOW-WT, MALNUT, CONSTI, ABDOM PAIN, COLIC; HYPOTENSE, ANEMIA, GINGIVAL LEAD LINE; TREM, PARA WRIST. METALLIC TASTE, INCREASED SALIVATION, PYORRHEA (FLOW OF MUCOUS). NEUROMUSCULAR: NUMBNESS AND TINGLING OF EXTREMITIES WITH SENSORY DISTURBANCE, EXTENSOR WEAKNESS OF WRISTS AND ANKLES, LOSS OF MUSCLE TONE, TREMOR INCREASED DEEP-TENDON REFLEXES, MUSCULAR CRAMPS AND ACHING, MUSCULAR ATROPHY. CNS: VISUAL DISTURBANCES, HEADACHE, NERVOUSNESS OF DEPRESSION, INSOMNIA, MENTAL CONFUSION, DELIRIUM. Source: NIOSHP, THIC

CONC IDLH: 700mg/M3

NIOSH REL: <0.1 mg/M3 Air level to be maintained so that worker blood level remains <0.06 mg/100 g of whole blood

ACGIH TLV: TLV = 0.15 mg/M3

ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = See 29 CFR 1910.1025
50 ug/M3

MAK INFORMATION: 0.1 mg/M3
Substance with systemic effects, onset of effect over 2 hours: Peak = 10xMAK for 30 minutes, once per shift of 8 hours.

CARCINOGEN?: Y STATUS: See below

CARCINOGEN LISTS:
IARC: Carcinogen defined by IARC to be possibly carcinogenic to humans, but having (usually) no human evidence.
MAK: Not listed
NIOSH: Not listed
NTP: Not listed
ACGIH: Not listed
OSHA: Not listed

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

orl-wmn TDLo:450 mg/kg/6Y JAMAAP 237,2627,77
PERIPHERAL NERVE AND SENSATION
Flaccid paralysis without anesthesia
BEHAVIORAL
Hallucinations, distorted perceptions
BEHAVIORAL
Muscle weakness

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

i pr-rat LDLo:1 gm/kg
orl-pgn LDLo:160 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

orl-rat TDLo:790 mg/kg (multigenerations) AEHLAU
23,102,71

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

orl-rat TDLo:1140 mg/kg (14D pre-21D post) PHMCAA
20,201,78

EFFECTS ON NEWBORN
Behavioral

orl-rat TDLo:520 mg/kg (7-22D preg/10D post) FEPRA7
37,394,78

EFFECTS ON NEWBORN

orl-rat TDLo:1100 mg/kg (1-22D preg) FEPRA7 37,895,78
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and
marrow)

EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ihl-rat TCLo:10 mg/m3/24H (1-21D preg) ZHPMAT
165,294,77

EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Blood and lymphatic systems(including spleen and
marrow)

ihl-rat TCLo:3 mg/m3/24H (1-21D preg) ZHPMAT 165,294,77
EFFECTS ON NEWBORN

orl-mus TDLo:1120 mg/kg (multigenerations) AEHLAU
23,102,71

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

orl-mus TDLo:6300 mg/kg (1-21D preg) EXPEAM 31,1312,75

EFFECTS ON FERTILITY
Female fertility index
EFFECTS ON FERTILITY
Pre-implantation mortility

orl-mus TDLo:300 mg/kg (1-2D preg) TXCYAC 6,129,76

EFFECTS ON FERTILITY
Other measures of fertility

orl-mus TDLo:4800 mg/kg (1-16D preg) BECTA6 18,271,77

EFFECTS ON EMBRYO OR FETUS
Cytological changes(including somatic cell genetic
material)

orl-dom TDLo:662 mg/kg (1-21W preg) TXAPA9 25,466,73

EFFECTS ON NEWBORN
Behavioral

NO SIGNIFICANT
RISK LEVEL(Ca P65): E0.5 micrograms/day

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

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

- ** WEAR APPROPRIATE EQUIPMENT TO PREVENT:
Repeated or prolonged skin contact.
- ** WEAR EYE PROTECTION TO PREVENT:
Reasonable probability of eye contact.
- ** EXPOSED PERSONNEL SHOULD WASH:
At the end of each work shift.
- ** REMOVE CLOTHING:
Promptly remove non-impervious clothing that becomes contaminated.
- ** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
HA (LEAD)

Not in excess of 0.5 mg/M3: Half-mask, air-purifying respirator equipped with high efficiency filters.

Not in excess of 2.5 mg/M3: Full facepiece air-purifying respirator equipped with high-efficiency filters.

Not in excess of 50 mg/M3: (1) Any powered, air-purifying respirator with high efficiency filters; or (2) Half-mask supplied-air respirator operated in positive-pressure mode.

Not in excess of 100 mg/M3: Supplied air respirator with full facepiece hood, or helmet or suit and operated in positive pressure mode.

Unknown concentration or Firefighting: Full facepiece, self-contained breathing apparatus operated in positive-pressure mode.

FIRST AID SOURCE: NIOSH

EYE: irr immed

SKIN: soap flush promptly

INHALATION: art resp

INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

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

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: LEAD COMPOUNDS, SOLUBLE, N.O.S.

DOT ID NUMBER: UN2291

ERG90 GUIDE 53

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Poisonous if swallowed.

Inhalation of dust poisonous.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

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

IRE

Small Fires: Dry chemical, CO2, water spray or regular foam.

Large Fires: Water spray, fog or regular foam.

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

PILL OR LEAK

Do not touch or walk through spilled material; stop leak if you can do it without risk.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Small Dry Spills: With clean shovel place material into clean, dry container and cover; move containers from spill area.

Large Spills: Dike far ahead of liquid spill for later disposal.

***FIRST AID**

Move victim to fresh air; call emergency medical care.

In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 116
 NAME: CHROMIUM
 SYNONYMS:
 CAS: 7440-47-3
 FORMULA: Cr
 WLN: CR
 CHEMICAL CLASS: Metal

LAST UPDATE OF THIS RECORD: 06/03/92

RTECS: GB4200000
 MOL WT: 51.996

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION: steel-gray metal or silver metal powder. (nydh)

BOILING POINT:	2915 K	-2641.8 C	4787.3 F
MELTING POINT:	2173 K	1899.8 C	3451.7 F
FLASH POINT:	NA		
AUTO IGNITION:	NA		
VAPOR PRESSURE:			
UEL:	NA		
LEL:	NA		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	No data		
DENSITY:	7.200		
WATER SOLUBILITY:			
INCOMPATIBILITIES:	strong oxidizers		
REACTIVITY WITH WATER:	No data on water reactivity		
REACTIVITY WITH COMMON MATERIALS:	No data		
STABILITY DURING TRANSPORT:	No Data		
NEUTRALIZING AGENTS:	No data		
POLYMERIZATION POSSIBILITIES:	No data		
TOXIC FIRE GASES:	None reported other than possible unburned vapors		
ODOR DETECTED AT (ppm):	Unknown		
ODOR DESCRIPTION:	NONE Source: NYDH		
100 % ODOR DETECTION:	No data		

----- REGULATIONS -----

DOT hazard class: 9 CLASS 9
 DOT guide: 31
 Identification number: UN3077
 DOT shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.
 Packing group: III
 Label(s) required: CLASS 9
 Special provisions: 8, B54
 Packaging exceptions: 155
 On bulk packaging: 213

Bulk packaging: 240
Quantity limitations-
passenger air/rail: NONE
cargo aircraft only: NONE
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.1 mg/mL» (07/30/92)

Maximum Contaminant Level Goals (MCLG): 0.1 mg/mL» (07/30/92)

CLEAN AIR ACT: CAA '90 By category

EPA WASTE NUMBER: D007

CERCLA REF: Y

RQ DESIGNATION: D 5000 pounds (2270 kg) CERCLA for pieces of
solid metal with diameter less than 100
micrometers (0.004 inches).

SARA TPQ VALUE: Not listed

SARA Sect. 312
categories:

Chronic toxicity: carcinogen

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:
Not given

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified

REACTIVITY (YELLOW): Unspecified

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: INHALATION: dust may cause irritation of the nose,
throat and lungs. SKIN: dust may cause irritation.
Eyes: dust may cause irritation. INGESTION: dust may
cause irritation of the mouth and throat. (NYDH)

LONG TERM TOXICITY: no information found on exposure to chromium metal.
see specific chromium compounds. (NYDH)

TARGET ORGANS:

SYMPTOMS: HISTOLOGIC FIBROSIS OF LUNGS Source: NIOSHP

NC IDLH: Unknown

NIOSH REL:

ACGIH TLV: TLV = 0.5 mg/M3
ACGIH STEL: Not listed

OSHA PEL: Transitional Limits:
PEL = 1mg/M3
Final Rule Limits:
TWA = 1 mg/M3

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

REFERENCES:
ANIMAL SUSPECTED IARC** 2,100,73
ANIMAL INDEFINITE IARC** 23,205,80

CARCINOGEN LISTS:

IARC: Not classified as to human
carcinogenicity or probably not
carcinogenic to humans.
MAK: Not listed
NIOSH: Not listed
NTP: Carcinogen defined by NTP as
known to be carcinogenic, with
evidence from human studies.
ACGIH: Not listed
OSHA: Not listed

LD50 value: No LD50 in RTECS 1992

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

unr-rat LD50:27500 ug/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical has no known mammalian reproductive toxicity.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

----- 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

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (CHROMIUM)

2.5 mg/M3: Any dust and mist respirator except single-use respirators. * Substance reported to cause eye irritation or damage may require eye protection.

5 mg/M3: Any dust and mist respirator except single-use and quarter-mask respirators. * 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.

12.5 mg/M3: Any powered air-purifying respirator with a dust and mist filter. * Substance reported to cause eye irritation or damage may require eye protection. / Any supplied-air respirator operated in a continuous flow mode. * Substance reported to cause eye irritation or damage may require eye protection.

25 mg/M3: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any powered air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter. * 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.

250 mg/M3: Any supplied-air respirator with a full facepiece and operated in a pressure-demand or other positive pressure mode.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS.: Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH

EYE: irr immed

SKIN: soap wash

INHALATION: art resp

INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.

DOT ID NUMBER: UN3077

ERG90

GUIDE 31

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

*HEALTH HAZARDS

Contact may cause burns to 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. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. 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.

Do not scatter spilled material with high-pressure water streams.

Dike fire-control water for later disposal.

*SPILL OR LEAK

Stop leak if you can do it without risk.

Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills: Dike far ahead of liquid spill for later disposal.

Cover powder spill with plastic sheet or tarp to minimize spreading.

*FIRST AID

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.

Remove and isolate contaminated clothing and shoes at the site.

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CHEMTOX DATA

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----- IDENTIFIERS -----

CHEMTOX RECORD 84
 NAME: CADMIUM
 SYNONYMS: NONE
 CAS: 7440-43-9
 FORMULA: Cd
 WLN: .CD
 CHEMICAL CLASS: Metal

LAST UPDATE OF THIS RECORD: 06/03/92
 RTECS: EU9800000
 MOL WT: 112.40

See other identifiers listed below under Regulations.

----- PROPERTIES -----

PHYSICAL DESCRIPTION:

BOILING POINT:	1040 K	-766.8 C	1412.3 F
MELTING POINT:	593.9 K	320.7 C	609.3 F
FLASH POINT:	NA		
AUTO IGNITION:	NA		
VAPOR PRESSURE:			
UEL:	NA		
LEL:	NA		
VAPOR DENSITY:	No data		
SPECIFIC GRAVITY:	No data		
DENSITY:	8.64		
WATER SOLUBILITY:			
INCOMPATIBILITIES:	strong oxidizerselemental sulfur selenium tellurium		

REACTIVITY WITH WATER:	No data on water reactivity
REACTIVITY WITH COMMON MATERIALS:	No data
STABILITY DURING TRANSPORT:	No Data
NEUTRALIZING AGENTS:	No data
POLYMERIZATION POSSIBILITIES:	No data

TOXIC FIRE GASES:	None reported other than possible unburned vapors
ODOR DETECTED AT (ppm):	Unknown
ODOR DESCRIPTION:	No data
100 % ODOR DETECTION:	No data

----- REGULATIONS -----

DOT hazard class:	9 CLASS 9
DOT guide:	31
Identification number:	UN3077
DOT shipping name:	ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.
Packing group:	III
Label(s) required:	CLASS 9
Special provisions:	8, B54
Packaging exceptions:	155

Non bulk packaging: 213
Bulk packaging: 240
Quantity limitations-
passenger air/rail: NONE
Cargo aircraft only: NONE
Vessel stowage: A
Other stowage provisions:

STCC NUMBER: Not listed

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.005 mg/mL» (07/30/92)

Maximum Contaminant Level Goals (MCLG): 0.005 mg/mL» (07/30/92)

CLEAN AIR ACT: CAA '90 By category

EPA WASTE NUMBER: D006

CERCLA REF: Y

RQ DESIGNATION: A 10 pounds (4.54 kg) CERCLA for pieces of
solid metal with diameter less than 100
micrometers (0.004 inches).

SARA TPQ VALUE: Not listed

SARA Sect. 312
categories:

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.
Fire hazard: flammable.

LISTED IN SARA Sect 313: Yes

de minimus CONCENTRATION: 0.1 percent

UNITED STATES POSTAL SERVICE MAILABILITY:

Not given

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified

REACTIVITY (YELLOW): Unspecified

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: IRRITANT TO NOSE AND THROAT, COUGH, CHEST PAIN,
SWEATING, CHILLS, DYSPNEA, WEAKNESS, NAUSEA, VOMITING,
DIARRHEA, ABDOMINAL CRAMPS AND POSSIBLE DEATH. **
Source: 1

LONG TERM TOXICITY: loss of smell, nose ulceration, dyspnea, emphysema,

kidney damage and mild anemia. ** source: 1

TARGET ORGANS: resp sys,lungs,kidneys,prostate,blood

SYMPTOMS: PULM EDEMA, CYPS, COUGH, TIGHT CHEST, SUBS PAIN; HEAD, CHILLS, MUSCLE ACHE; NAU, DIAR ANOSMIA, EMPHY; PROTEINURIA, ANEMIA Source: NIOSHP

CONC IDLH: 50mg/M3asdust,9mg/M3asfume

NIOSH REL: Potential occupational carcinogen --LOWEST FEASIBLE (LOQ 0.01 mg/M3)

ACGIH TLV: TLV = DUST 0.05 mg/M3 as CADMIUM
ACGIH STEL: as CADMIUM

OSHA PEL: Transitional Limits:
PEL = (FUME) 0.1 MG/M3, (DUST) 0.2 MG/M3; CEILING = (FUME)
Final Rule Limits:
TWA = (FUME) 0.1 MG/M3;- (DUST) 0.2 mg/M3
CEILING = (FUME) 0.3 MG/M3; (DUST) 0.6 mg/M3

MAK INFORMATION: Carcinogenic working material without MAK
In the Commission's view, an animal carcinogen.

CARCINOGEN?: Y STATUS: See below

REFERENCES: ANIMAL POSITIVE IARC** 2,74,73
ANIMAL POSITIVE IARC** 11,39,76

CARCINOGEN LISTS:

IARC: Carcinogen defined by IARC to be probably carcinogenic to humans with (usually) at least limited human evidence.

MAK: An animal carcinogen.

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-man TCLO:88 ug/m3/8.6Y AEHLAU 28,147,74
KIDNEY, URETER, BLADDER
Proteinuria

ihl-hmn LCLO:39 mg/m3/20M AIHAAP 31,180,70
CARDIAC
Other changes

VASCULAR
Thrombosis distant from injection
site(except brain,heart)
LUNGS, THORAX, OR RESPIRATION
Respiratory depression

LD50 value: orl-rat LD50:225 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-rat LD50:225 mg/kg
ihl-rat LC50:25 mg/m3/30M
ipr-rat LD50:4 mg/kg
scu-rat LD50:9 mg/kg
ivn-rat LD50:1800 ug/kg
unr-rat LD50:1140 mg/kg
orl-mus LD50:890 mg/kg
ihl-mus LCLo:170 mg/m3
ipr-mus LD50:5700 ug/kg
unr-mus LD50:890 mg/kg
orl-rbt LDLo:70 mg/kg
scu-rbt LDLo:6 mg/kg
ivn-rbt LDLo:5 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

orl-rat TDLo:155 mg/kg (13W male/13W pre-3W preg)
BECTA6 20,96,78

EFFECTS ON NEWBORN

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

EFFECTS ON NEWBORN

Behavioral

orl-rat TDLo:220 mg/kg (1-22D preg) TOLED5 11,233,82

EFFECTS ON EMBRYO OR FETUS

Other effects on embryo or fetus

orl-rat TDLo:21500 ug/kg (multigenerations) ENVRAL
22,466,80

EFFECTS ON FERTILITY

Pre-implantation mortality

EFFECTS ON NEWBORN

Germ cell effects(in offspring)

orl-rat TDLo:23 mg/kg (1-22D preg) PSEBAA 158,614,78

SPECIFIC DEVELOPMENTAL ABNORMALITIES

Blood and lymphatic systems(including spleen and
marrow)

ipr-rat TDLo:1124 ug/kg (1D male) TXAPA9 41,194,77

PATERNAL EFFECTS
Spermatogenesis

scu-rat TDLo:250 ug/kg (19D preg) APTOD9 19,A122,80
EFFECTS ON NEWBORN

ivn-rat TDLo:1250 ug/kg (14D preg) JJATDK 1,264,81
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Body wall
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Urogenital system

ivn-rat TDLo:1250 ug/kg (9D preg) JJATDK 1,264,81
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Central nervous system
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Eye,ear

ivn-rat TDLo:8 mg/kg (8-15D preg) JJATDK 1,264,81
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)

orl-mus TDLo:448 mg/kg (multigenerations) AEHLAU
23,102,71
EFFECTS ON EMBRYO OR FETUS
Fetotoxicity(except death,e.g.,stunted fetus)
EFFECTS ON EMBRYO OR FETUS
Fetal death

orl-mus TDLo:1700 mg/kg (8-12D preg) TCMUD8 6,361,86
EFFECTS ON NEWBORN
Viability index(# alive at day 4 per # born alive)
EFFECTS ON NEWBORN
Growth statistics(e.g.,reduced weight gain)

ipr-mus TDLo:1686 ug/kg (7D preg) TJADAB 28,39A,83
SPECIFIC DEVELOPMENTAL ABNORMALITIES
Central nervous system

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

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

NIOSH POCKET GUIDE TO CHEMICAL HAZARDS:

** WEAR EYE PROTECTION TO PREVENT:

** EXPOSED PERSONNEL SHOULD WASH:

At the end of each work shift when there was a reasonable probability of c

* WORK CLOTHING SHOULD BE CHANGED DAILY:

If there is any possibility that the clothing may be contaminated.

* THE FOLLOWING EQUIPMENT SHOULD BE MADE AVAILABLE:
Eyewash.

** REFERENCE: NIOSH

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
NIOSH (CADMIUM)

Greater at any detectable concentration. : Any self-contained breathing apparatus with full facepiece and operated in a pressure-demand or other positive pressure mode. / Any supplied-air respirator with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter. / Any appropriate escape-type self-contained breathing apparatus.

FIRST AID SOURCE: NIOSH

EYE: irr immed

SKIN: soap wash

INHALATION: art resp

INGESTION: water, vomit

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.

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

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.

DOT ID NUMBER: UN3077

ERG90

GUIDE 31

* POTENTIAL HAZARDS *

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

*HEALTH HAZARDS

Contact may cause burns to 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.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

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

IRE

Small Fires: Dry chemical, CO2, water spray or regular foam.
Large Fires: Water spray, fog or regular foam.
Move container from fire area if you can do it without risk.
Do not scatter spilled material with high-pressure water streams.
Dike fire-control water for later disposal.

***SPILL OR LEAK**

Stop leak if you can do it without risk.
Small Dry Spills: With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.
Large Spills: Dike far ahead of liquid spill for later disposal.
Cover powder spill with plastic sheet or tarp to minimize spreading.

***FIRST AID**

In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water.
Remove and isolate contaminated clothing and shoes at the site.

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ODOR DESCRIPTION:
100 % ODOR DETECTION:

GARLIC Source:Unspecified
No data

----- REGULATIONS -----

DOT hazard class: 6.1 POISON
DOT guide: 53
Identification number: UN1558
DOT shipping name: Arsenic
Packing group: II
Label(s) required: POISON
Special provisions:
Packaging exceptions: None
Non bulk packaging: 212
Bulk packaging: 242
Quantity limitations-
Passenger air/rail: 25 kg
Cargo aircraft only: 100 kg
Vessel stowage: A
Other stowage provisions:M2

STCC NUMBER: 4923207

CLEAN WATER ACT Sect.307:Yes

CLEAN WATER ACT Sect.311:No

National Primary Drinking Water Regulations

Maximum Contaminant Levels (MCL): 0.05 mg/mL (12/24/75)

Maximum Contaminant Level Goals (MCLG): Not specified

CLEAN AIR ACT: CAA '90 By category

EPA WASTE NUMBER: D004

CERCLA REF: Y

RQ DESIGNATION: X 1 pound (0.454 kg) CERCLA for pieces of
solid metal with diameter less than 100
micrometers (0.004 inches).

SARA TPQ VALUE: Not listed

SARA Sect. 312
categories:

Chronic toxicity: carcinogen

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: Poison, Class B - Mailable as ORM-D

Mailability: Domestic service and air transportation shipper's declaration

Max per parcel: 8 OZ

NFPA CODES:

HEALTH HAZARD (BLUE): Unspecified

FLAMMABILITY (RED) : Unspecified

REACTIVITY (YELLOW): Unspecified

SPECIAL : Unspecified

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

SHORT TERM TOXICITY: COUGHING, DYSPNEA, CHEST PAINS, IRRITATION TO SKIN AND MUCOUS MEMBRANES, FEVER, INSOMNIA, ANOREXIA, LIVER SWELLING, MELANOSIS, DISTURBED HEART FUNCTION AND FACIAL EDEMA. ** Source: 15

LONG TERM TOXICITY: unknown

TARGET ORGANS:

SYMPTOMS: NAUSEA, VOMITING, DIARRHEA, DEATH Source:

CONC IDLH: 100mg/M3

NIOSH REL: Potential occupational carcinogen 0.002 mg/M3
Ceiling exposures which shall at no time be exceeded

ACGIH TLV: TLV = 0.2 mg/M3

ACGIH STEL: Not listed

OSHA PEL: Final Rule Limits:
TWA = 0.01 mg/M3
CONSULT 29CFR 1910.1018

MAK INFORMATION: Not listed

CARCINOGEN?: Y STATUS: See below

REFERENCES: HUMAN POSITIVE IARC** 23,39,80
INDEFINITE IARC** 2,48,73

CARCINOGEN LISTS:

IARC: Carcinogen as defined by
IARC as carcinogenic to humans,
with sufficient epidemiological
evidence.

MAK: Not listed

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: Not listed

OSHA: Cancer hazard

HUMAN TOXICITY DATA: (Source: NIOSH RTECS)

orl-man TDLo:7857 mg/kg/55Y CMAJAX 120,168,79

GASTROINTESTINAL

Changes on structure or function of esophagus

BLOOD

Hemorrhage

SKIN AND APPENDAGES

Skin - after systemic exposure

Dermatitis, other

LD50 value: orl-rat LD50:763 mg/ kg

OTHER SPECIES TOXICITY DATA: (Source: NIOSH RTECS 1991)

orl-rat LD50:763 mg/kg
ipr-rat LD50:13390 ug/kg
orl-mus LD50:145 mg/kg
ipr-mus LD50:46200 ug/kg
scu-rbt LDLo:300 mg/kg
ipr-gpg LDLo:10 mg/kg
scu-gpg LDLo:300 mg/kg

IRRITATION DATA: (Source: NIOSH RTECS 1991)

Reproductive toxicity (1991 RTECS):

This chemical is a mammalian reproductive toxin.

REPRODUCTIVE TOXICITY DATA (1991 RTECS)

orl-rat TDLo:605 ug/kg (35W pre) GISAAA 42(8),30,77
EFFECTS ON FERTILITY
Pre-implantation mortality
EFFECTS ON FERTILITY
Post-implantation mortality

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

PROTECTION SUGGESTED
FROM THE CHRIS MANUAL:

RECOMMENDED RESPIRATION PROTECTION Source: NIOSH POCKET GUIDE (85-114)
OSHA (ARSENIC)

Unknown concentration or Greater than 20000 ug/M3 (20 mg/M3) or
Firefighting: Any full facepiece self-contained breathing apparatus
operated in positive pressure mode.
Not greater than 20000 ug/M3 (20 mg/M3): Supplied air respirator with
full facepiece hood, or helmet or suit and operated in positive pressure
mode.
Not greater than 10000 ug/M3 (10 mg/M3): (A) Powered air-purifying
respirators in all inlet face coverings with high efficiency filters.1
(B) Half-mask supplied air respirators operated in positive pressure
mode.
Not greater than 500 ug/M3: (A) Full facepiece air-purifying respirator
equipped with high-efficiency filter.1 (B) Any full facepiece supplied
air respirator. (C) Any full facepiece self-contained breathing
apparatus.
Not greater than 100 ug/M3: (A) Half-mask air-purifying respirator
equipped with high-efficiency filter.1 (B) Any half-mask supplied air
respirator.

FIRST AID SOURCE: THIC
EYE: irrigate eyes with water.

SKIN: wash contaminated areas of body with soap and water.

INHALATION: None given

INGESTION: None given

FIRST AID SOURCE: DOT Emergency Response Guide 1990.

Move victim to fresh air; call emergency medical care. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site.

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

US Department of Transportation Guide to Hazardous Materials Transport Information - Publication DOT 5800.5 (1990).

DOT SHIPPING NAME: Arsenic

DOT ID NUMBER: UN1558

ERG90

GUIDE 53

* POTENTIAL HAZARDS *

*HEALTH HAZARDS

Poisonous if swallowed.

Inhalation of dust poisonous.

Fire may produce irritating or poisonous gases.

Runoff from fire control or dilution water may cause pollution.

*FIRE OR EXPLOSION

Some of these materials may burn, but none of them ignites readily.

* EMERGENCY ACTION *

Keep unnecessary people away; isolate hazard area and deny entry.

Stay upwind; keep out of low areas.

Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection.

CALL 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.

*SPILL OR LEAK

Do not touch or walk through spilled material; stop leak if you can do it without risk.

Small Spills: Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Small Dry Spills: With clean shovel place material into clean, dry container and cover; move containers from spill area.

Large Spills: Dike far ahead of liquid spill for later disposal.

*FIRST AID

Move victim to fresh air; call emergency medical care.

In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes.

Remove and isolate contaminated clothing and shoes at the site.

DISCLAIMER: The data shown above on this chemical represents a best effort on the part of the compilers of the CHEMTOX database to obtain useful, accurate, and factual data. The use of these data shall be in accordance with the guidelines and limitations of the user's CHEMTOX license agreement. The COMPILERS of the CHEMTOX database shall not be held liable for inaccuracies or omissions within this database, or in any of its printed or displayed output forms.

APPENDIX E

ENSAFE CORPORATE *HEALTH AND SAFETY MANUAL*

DRILLING SAFETY GUIDE

Drilling Safety Guide

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

Drill Rig Safety Supervisor

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

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

Drill Rig Personnel Protective Equipment

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

- hard hat
- safety shoes with steel toe and steel shank (or equivalent)
- gloves
- safety glasses with side shields
- close fitting but comfortable clothes
- hearing protection

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

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

Additional protective equipment may be required by the site specific health and safety plan.

Drill Rig Housekeeping

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

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

Maintenance Safety

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

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

Safe Use of Hand Tools

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

- When using a hammer, wear safety glasses and require all others around you to wear safety glasses.
- When using a chisel, wear safety glasses and require all others around you to wear safety glasses.
- Keep all tools cleaned and stored in an orderly manner.
- Use wrenches on nuts, not pliers.
- Use screwdrivers with blades that fit the screw slot.
- When using a wrench on a tight nut, use some penetrating oil and use the largest wrench available that fits the nut. When possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands when possible and with both feet firmly placed. Don't push or pull with one or both feet on the drill rig or the side of a mud pit or some other blocking-off device. Always assume that you may lose your footing. Check the place where you may fall for sharp objects.

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

Safety During Drilling Operations

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

Working on Derrick Platforms

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

Working on the Ground

- Workers on the ground must avoid going under elevated platforms.
- Terminate drilling operations and if possible lower the mast during an electrical storm.
- Overhead and buried utilities must be located and marked on all boring location plans and boring assignment sheets.
- When there are overhead electrical power lines at or near a drilling site or project, consider all wire to be charged and dangerous.
- Watch for sagging power lines before entering a site. Do not lift power lines to gain entry. Call the utility to have them lift the power lines or to deenergize the power.
- Operations adjacent to overhead lines are prohibited unless one of the following conditions is satisfied:
 - Power has been shut off and positive means taken to prevent the lines from being energized.
 - Equipment, or any part, does not have the capability of coming within the following minimum clearance from energized overhead lines, or the equipment has been positioned and blocked to assure no part, including cables can come within the following minimum clearances:

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

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

Wire Rope Safety

- All wire ropes and fittings will be visually inspected at least once a week for abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper reeving, jamming, crushing, bird caging, kinking, core protrusion, and damage to lifting hardware.
- Wire ropes must be replaced when inspection indicates excessive damage. The Wire Rope User's Manual may be used as a guide for determining excessive damage.
- Wire ropes that have not been used for a period of a month or more will be thoroughly inspected before being returned to service.
- All manufactured and end fittings and connections must be installed according to the manufacturer's specifications.
- Swivel bearings on ball-bearing type hoisting swivels must be inspected and lubricated daily to ensure that the swivel rotates freely under load.
- Do not drill through or rotate drill through a slipping device, do not hoist more than 10 feet of the drill rod column above the top of the last (mast), do not hoist a rod column with loose tool joints, and do not make up, tighten, or loosen tool hoists while the rod column is being supported by a rod slipping device.
- Do not attempt to brake the fall of a drill rod column with your hands or by increasing tension on the rod slipping device.
- Wire ropes must be properly matched with each sheave. The sheave will pinch wire rope that is too large. Wire rope that is too small will groove the sheave. Once a sheave is grooved, it will severely pinch and damage larger sized wire rope.
- Use tool handling hoists only for vertical lifting of tools. Do not use tool handling hoists to pull on objects away from the drill rig.
- All hoisting hooks will be equipped with safety latches.
- When tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the tools directly to the feed mechanism of the drill. Do not use hydraulic leveling jacks for added pull for the hoist line or the feed mechanism of the drill.
- Minimize shock loading of a wire rope; apply loads smoothly and steadily.
- Avoid sudden loading in cold weather.
- Never use frozen ropes.
- Protect wire rope from sharp corners or edges.
- Replace faulty guides and rollers.
- Replace worn sheaves or worn sheave bearings.
- Know the safe working load of the equipment and tackle. Never exceed safe working limits.
- Periodically inspect clutches and brakes of hoists.
- Always wear gloves when handling wire ropes.
- Do not guide wire rope onto hoist drums with your hands.
- After installation of a new wire rope, the first lift must be a light load to allow the wire rope to adjust.
- Never leave a load suspended when the hoist is unattended.
- Never use a hoist line to ride up the mast.

Cathead and Rope Hoist Safety

- Keep the cathead clean and free of rust and oil and/or grease. The cathead must be cleaned with a wire brush when it becomes rusty.
- Check the cathead for rope wear grooves. If a rope groove forms that is deeper than $\frac{1}{8}$ inch, the cathead must be replaced.
- Always start work with a clean, dry, sound rope. A wet or oily rope may grab the cathead and cause drill tools or other items to be rapidly hoisted to the top of the mast. If the rope grabs the cathead or otherwise becomes tangled in the drum, release the rope and sound the alarm for all personnel to clear the area rapidly.
- The rope must not be permitted to contact chemicals.
- Never wrap the rope from a cathead around a hand, wrist, arm, foot, ankle, leg, or any other body part.
- Attach the hammer to the rope using a knot that will not slip such as a bowline.
- A minimum of 18 inches must be maintained between the operating hand and the cathead drum when driving samplers, casing, or other tools. Be aware that the rope advances toward the cathead with each hammer blow as the sampler or other drilling tool advances into the ground. Loosen grip on the rope as the hammer falls. Maintaining a tight grip on the rope increases the chances of being pulled into the cathead.
- Do not use a rope that is longer than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not leave a cathead unattended with the rope wrapped on the drum.
- Position all other hoist lines to prevent contact with the operating cathead rope.
- The cathead operator must be on a level surface with good, firm footing conditions.

Auger Safety

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

- Never reach behind or around a rotating auger.
- Use a long-handle shovel to move auger cuttings away from the auger.
- Augers will be cleaned only when the drill rig is in neutral and the augers have stopped rotating.

Rotary and Core Drilling Safety

- Water swivels and hoist plugs must be lubricated and checked for frozen bearings before use.
- Drill rod chuck jaws must be checked periodically and replaced as necessary.
- The weight of the drill rod string and other expected hoist loads must not exceed the hoist and sheaves capacities.
- Only the operator of the drill rig will brake or set a manual chuck to ensure that rotation of the chuck will not occur prior to removing the wrench from the chuck.
- The drill rod chuck jaws will not be used to brake drill rods during lowering into the hole.
- Drill rods will not be held or lowered into the hole with pipe wrenches.
- Do not attempt to grab falling drill rods with hands or wrenches.
- In the event of a plugged bit or other circulation blockage, the high pressure in the piping and hose between the pump and the obstruction must be relieved or bled down prior to breaking the first tool joint.
- Use a rubber or other suitable rod wiper to clean rods during removal from the hole. Do not use hands to clean drilling fluids from the drill rods.
- Do not lean unsecured drill rods against the mast.

APPENDIX F

DIRECTIONS TO EMERGENCY MEDICAL FACILITIES

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

HOSPITAL

**NAVAL HOSPITAL
LEXINGTON DRIVE
NAS CORPUS CHRISTI, TEXAS
EMERGENCY NUMBER: (512) 939-2424 or 939-2735**

**DIRECTIONS TO THE NEAREST HOSPITAL
CAPABLE OF TREATING CHEMICAL EXPOSURES**

HOSPITAL

**SPOHN HOSPITAL
THIRD STREET
CORPUS CHRISTI, TEXAS
EMERGENCY NUMBER: (512) 881-3811 or 911**

From the North Gate:

Take Ocean Drive and Turn Left on Ayers Street. Proceed for two blocks and turn right on Third Street. The Emergency Entrance will be on the right.

APPENDIX G
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 work site and returned to, EnSafe/Allen & Hoshall, Memphis, Tennessee.

Job No: 2151-042

Contract No: N62467-89-D-0318

Project: FACILITY INVESTIGATION - Sites 1, 3, and 4

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

Signed

Print Name

Company

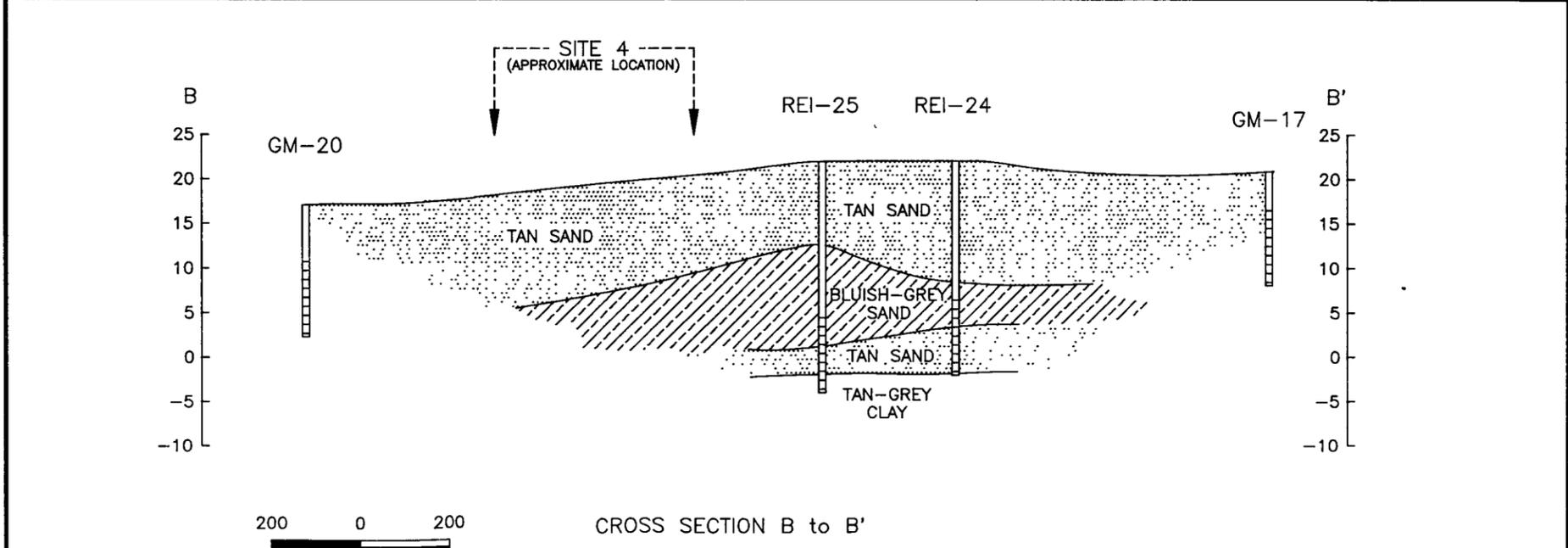
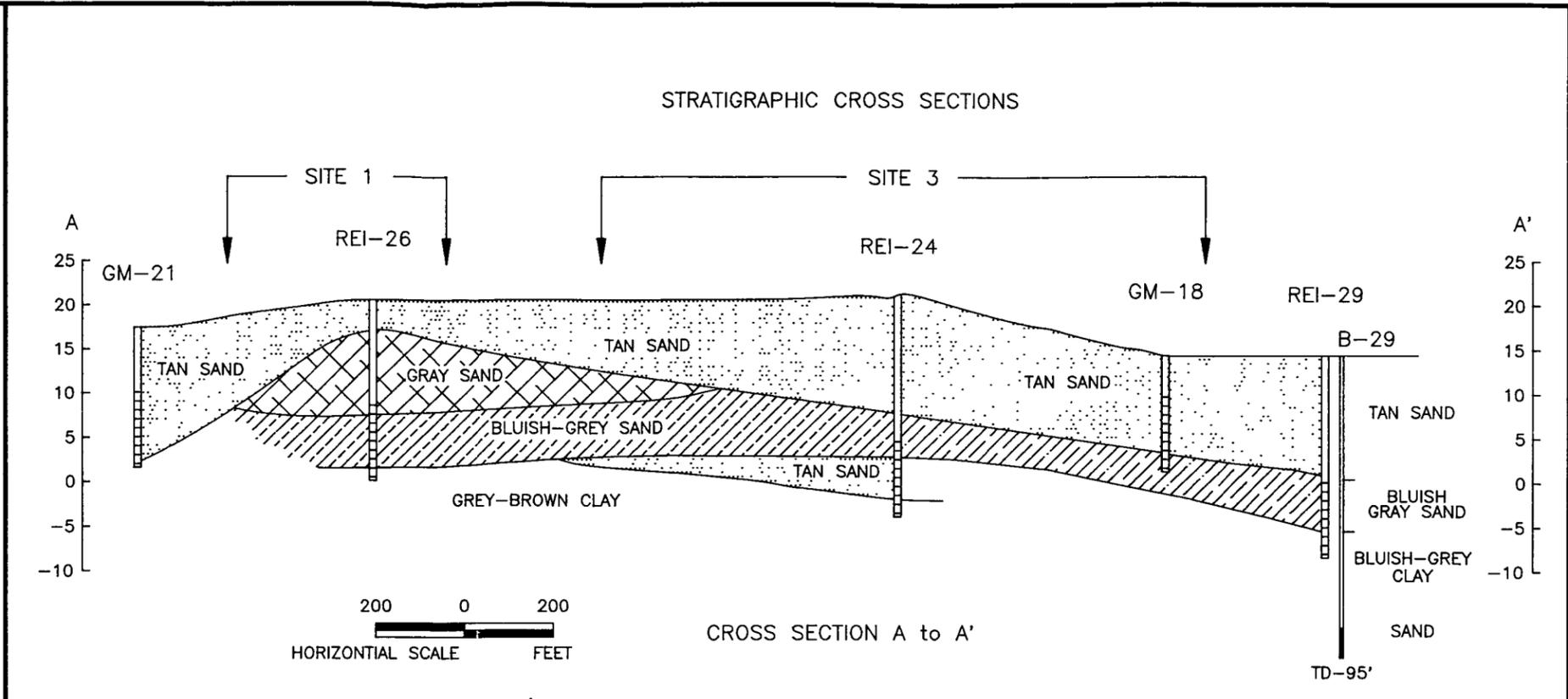
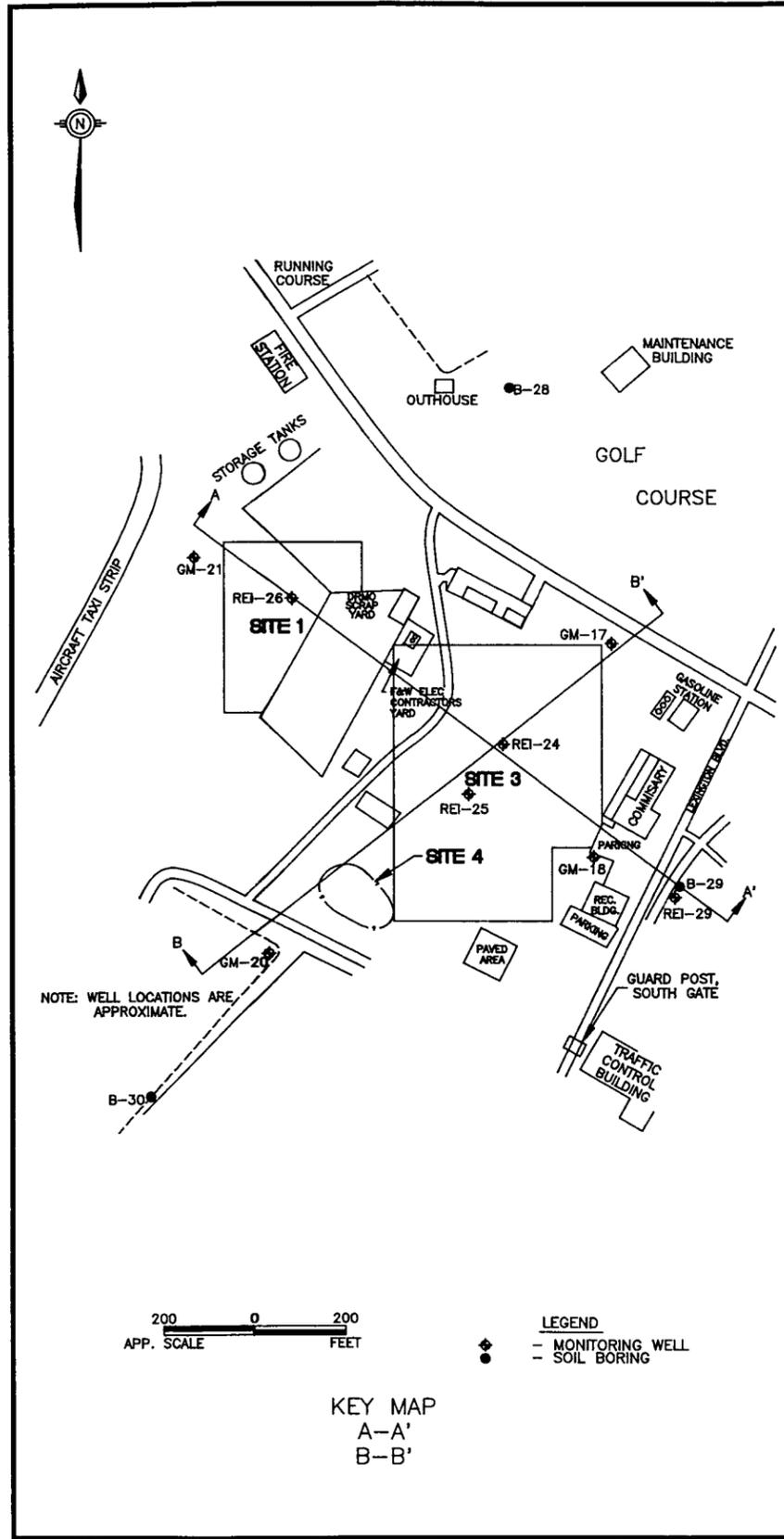
Date

PLAN FEEDBACK FORM

Problems with plan requirements

Unexpected situations encountered:

Recommendations for revisions:



(FROM RESOURCE ENGINEERS, INC., 1986)

FI WORKPLAN
 NAS CORPUS CHRISTI
 CORPUS CHRISTI, TEXAS

FIGURE 3.2
 SITE LITHOLOGIC
 CROSS SECTION
 CORPUS CHRISTI N.A.S.

DATE: 08/14/92 DWG NAME: CORPUS3