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PLAN VOLUME 3 OF 3 NAS WHITING FIELD FL
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REMEDIAL INVESTIGATION/FEASIBILITY STUDY
PLANNING DOCUMENT

NAVAL AIR STATION WHITING FIELD

MILTON, FLORIDA

UIC: N60508

VOLUME III

DATA MANAGEMENT PLAN
HEALTH AND SAFETY PLAN

JUNE 1990

Contract N62467-88-C-0382

Prepared by:

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Prepared for:

Southern Division Naval Facilities
Engineering Command, P.O. Box 10068
Charleston, South Carolina 29411-0068
Ted Campbell, Engineer in Charge

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FINAL

REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

VOLUME III. DATA MANAGEMENT PLAN
NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA

UIC: N60508

PREPARED FOR

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA 29411-0068

CONTRACT NO. N62467-88-C-0382

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JUNE 1990

1.0 INTRODUCTION

This Data Management Plan outlines the procedures to be followed for the inventory, control, storage, retrieval, evaluation, and presentation of data collected during the remedial investigation (RI) being conducted at NAS Whiting Field. During the performance of the RI, a variety of technical data will be generated by several groups for use in the evaluation of site conditions and remedial alternatives. The procedures contained in this plan are designed so that the integrity of data collected is maintained for subsequent use. Project tracking data (e.g., schedules, progress reports, financial reports) will be maintained to monitor, manage, and document the progress of the RI.

1.1 General Guidelines Completed or revised documents shall be submitted as soon as possible for the Program Files.

All working drafts, review notes, and peer review comments for the Program Deliverables should be discarded once the document has been submitted for final review.

When documents are received in the Program Files the following actions shall be performed by the Document Control Officer.

1. Inspect all documents submitted to ensure satisfactory legibility for reproduction and microfiche, stable (i.e., not easily smudged) images, and proper file identification.
2. File the documents in the appropriate folder, marked clearly with the filing index and program designation.
3. Each Work Assignment and Procurement file will contain an applicable checklist as shown in Attachment A thru D (Appendix A). The checklist must be prominently placed in the front of each file and must be maintained and updated as documents are received.

The following security control measures shall be instituted and enforced at all Program File locations.

1. At each Program File location an Authorized Access List must be prominently displayed listing those individuals who are authorized unescorted access to the file area. (Unauthorized personnel require an authorized escort).
2. Make certain that the security of the files is maintained by use of locks and/or surveillance. All documents leaving the file area should have a signed Out-Card filed before the documents are removed.
3. Documents identified as Confidential Business Information or Proprietary must be maintained in file cabinets located separate from other documents. Limited Authorized Access Lists should be prominently displayed on the cabinet with access determine by the Project Manager and or the Technical Director.

4. Documents which are identified as Confidential Business Information or Proprietary should be stamped as such on each page of the document and are not to be copied.
5. When transporting Confidential Business Information or Proprietary Material from the file area to a work station the material should be enclosed in a Confidential Envelope.
6. Confidential Business Information or Proprietary Material, when not in use at the work station, should be locked in the person's desk.

When a document is to be removed from a file location, the following checkout procedure shall be performed by the Document Control Officer.

1. Make certain that the requestor is authorized to remove documents.
2. Assure that an entry is made on an Out-Card noting the document identification, the name of the requestor, and the removal date.
3. Remove the document and insert an Out-Card in its place.
4. When the document is returned, examine it for completeness and ensure that it is still in good condition before removing and updating the Out-Card and replacing the document in the file.
5. On a routine basis examine the Out-Cards to ensure that documents have not been checked out for more than 1 month.

2.0 ORGANIZATION

The Engineering Contractor will have overall responsibility for the management and direction of the RI and will subcontract for drilling, laboratory analyses, cone penetrometer explorations, and monitoring well survey. Project files containing data will be maintained by the Contractor and each of the subcontractors at their offices. A set of project files will also be established at the field office at NAS Whiting Field where copies of all field related data will be stored.

All laboratory documentation will be filed in project files at the subcontract laboratory in accordance with the laboratory system described later. Laboratory documentation (e.g., chromatograms, spike results) will be maintained for purposes of verifying analytical data collected during the RI. Summary reporting of data results and quality control will be sent to the field office for the on-site project files.

3.0 FIELD DATA/PHYSICAL DATA

All incoming field logs, data, and reports will initially be logged and dated by the Engineering Contractor. All information generated from field activities will be documented on appropriate forms including the following logs:

- Sample/Core Log
- Daily Field Log
- Drilling/Installation of Well Logs
- Location Sketches
- Water Level/Pumping Test Records
- Materials Log
- Well Construction Specifications
- Telephone Logs

Incoming documents will be date-stamped and filed. Copies of all data logs showing borings, wells, physical data, etc., will be copied and delivered to the on-site office location for filing. Copies of other data will be distributed based on project staff request as approved by the Project Manager or Technical Director. Copies of final summarized reports prepared by the Contractor will be distributed to NAS Whiting Field, Southern Division, Florida Department of Environmental Regulation (FDER); the U.S. Environmental Protection Agency (USEPA); and others, as requested by Southern Division.

As discussed in the Quality Assurance Program Plan, field logs for sampling activities and field measurements have been established. These records will detail sample collection information required for the project. Field sampling records will include information on sample location, number, parameters, data, sampler or analyst initials, etc. These records will be maintained in the on-site project files as reference for all sampling activities. Copies of these records will be forwarded to the Contractor's office.

Finally, a daily log of activities will be maintained by the on-site Field Operations Leader detailing major activities performed each day. Decision making process will be documented and problem recognition and resolution will be noted. This log will be maintained at the on-site office.

4.0 LABORATORY DATA

All of the data and records generated for NAS Whiting Field samples, once completed, will be kept in a common, secured area under the supervision of the Document Control Officer and the Project Manager. Ultimately, all data generated and data transmitted are the responsibility of the Program Manager. Data handling procedures for the NAS Whiting Field RI/FS will follow the same basic approach as all other data except that the paper flow will be more rigorous and complete, in that both project management summary data files and raw data files will be stored in one location.

Raw data will be submitted to a senior chemist for checking and preparing the data summary sheets. The data will then go to quality assurance for verification and the summary sheets will go to the Technical Director for review and transmittal. Raw data will be filed in chemistry files, QC data in QC files, and summary data with corresponding QC will be kept in project files.

For the NAS Whiting Field RI/FS, all data and records will go to the Project Manager and be checked and held in a common file. Data will be calculated with an initial QC data check by the analyst. Senior chemists will check the data and records, and then the entire set will be sent to the Document Control Officer. All data and records will then be reviewed by the Document Control Officer and appropriately filed. The Project Manager will work with the Document Control Officer on coordinating data packages. Summary data packages will be transmitted to appropriate groups upon approval of the Project Manager.

A record of sample shipments, receipt of analytical results, submittal of preliminary results for QA/QC review, completion of QA/QC review, and evaluation of the QC package will be maintained to ensure that only final and approved analytical data are used in the site analysis. In some instances, the use of preliminary data will be warranted to prepared internal review documents, begin data analysis while minimizing lost time for the turnaround of QA/QC comments, and continue narrowing remedial action alternatives. Preliminary data will be considered unofficial, however, and preliminary data used in analyses will be updated upon receipt of official QA/QC comments and changes. Sample results will not be incorporated in the site characterization report unless accompanied by QA/QC comments.

The DQOs stated on each task involving sample analysis will specify whether the information is validated with qualifiers or not and will specify which qualifiers can invalidate the use of certain data. Acceptability of data quality will not be established until the review QA/QC package accompanies the analytical data.

4.1 FILING SYSTEM - FILE NUMBER INITIATION. All data and record sets will be organized in the files by set number. The set file will be activated with the receipt by the Document Control Officer of a sample log-in sheet from the custodian with each new set number shown. A file folder(s) will be started by the Document Control Officer for each new set shown on the log-in sheet. These file folders will then be used to house all records and information concerning a particular set. Documents within the file are arranged by document type for each set folder.

All documents received during the course of work on the project will be serialized with a unique document control number which ultimately will be referenced to the inventory. The document control number will consist of the set number, project number, and a four-digit serial number. The document control number will be assigned by the Document Control Officer. Each document that is stored in the file will be listed in the inventory for the file with its identifying number(s).

All files will be stored in a file cabinet in the office area. The file will be clearly identified as NAS Whiting Field files. Keys to the file will be in the possession of the Project Manager, Document Control Officer, and Technical

Director. Anytime a file set is removed from a cabinet, an Out-Card will be filled out and signed. This record of file access and use will become part of the permanent set file record. The file structure, as recommended by the USEPA (1988) is presented in Figure 4-1.

4.2 FILE MAINTENANCE AND AUDIT. As stated in the introduction, all records and data for each set will be sent to the Document Control Officer. Each file will ultimately contain all the information listed in the inventory. Each of these documents is transmitted by a supervisor, as listed next to each item on the inventory, to the Document Control Officer. Data and records transmitted are to be completely tabulated and filled in per instructions in the various instrument SOP's or sample receipt SOP. Final quality control checks will be made by the Quality Assurance Officer.

The Document Control Officer will be responsible for filing all information in the project files. The Document Control Officer will coordinate with the project manager on the assembly of data packages scheduled for submittal. Following completion of the project, the entire project file will be audited and the final inventory verified by the Document Control Officer. The Document Control Officer will also verify the completeness of all records and close the file.

5.0 DATA IDENTIFICATION

All of the sampling locations at the NAS Whiting Field sites will have a unique letter-number system to identify its location. The following system will be used:

- o Site. WHF-XX where "XX" refers to a particular site (i.e., 01 through 18), to a production well (i.e., S2, W3, etc.), or to a stream sampling station (i.e., STA1, STA2, etc.).
- o Sample Type. The sample type identification code will be in the third character field of the sample number, i.e., WHF-03-XX. The following are sample type identifiers;

MW - Monitoring Well	SD - Sediment
RW - Residential Well	SW - Surface Water
WP - Well Point	AR - Air (residential)
SL - Surface Soils	BN - Benthos
SS - Subsurface Soils	FB - Field Blank
SG - Soil Gas	TB - Trip Blank
	EB - ESD Blank

- o Sample Location. Will be indicated by a number that corresponds to the sample collection location and will be used in combination with the sample type. For example, sample WHF-02-SW-3 is a surface water sample collected at location 3 as shown on an Exploration Plan for Site 2.

FIGURE 4-1
FILE STRUCTURE
RI/FS WORK PLAN
NAS WHITING FIELD, FLORIDA

Congressional Inquiries and Hearings:

- o Correspondence
- o Transcripts
- o Testimony
- o Published Hearing Records

Remedial Response:

- o Discovery
 - Initial Investigation Reports
 - Preliminary Assessment Report
 - Site Inspection Report
 - Hazard Ranking System Data

Remedial Planning:

- Correspondence
- Work Plans for RI/FS
- RI/FS Reports
- Health and Safety Plan
- QA/QC Plan
- Record of Decisions/Responsiveness Summary

Remedial Implementation:

- Remedial Design Reports
- Permits
- Contractor Work Plans and Progress Reports
- Corps of Engineers Agreements, Reports and Correspondence

State and other Agency Coordination:

- Correspondence
- Cooperative Agreement/Superfund State Contract
- State Quarterly Reports
- Status of State Assurances
- Interagency Agreements
- Memorandum of Understanding with the State

FIGURE 4-1 (Cont.)
FILE STRUCTURE
RI/FS WORK PLAN
NAS WHITING FIELD, FLORIDA

Community Relations:

- Interviews
- Correspondence
- Community Relations Plan
- List of People to Contact, e.g., local officials, civic leaders, environmental groups
- Meeting Summaries
- Press Releases
- News Clippings
- Fact Sheets
- Comments and Responses
- Transcripts
- Summary of Proposed Plan
- Responsiveness Summary

Imagery:

- o Photographs
- o Illustrations
- o Other graphics

Enforcement:

- o Status Reports
- o Cross-Reference to any confidential enforcement files and the person to contact
- o Corresponds
- o Administrative Orders

Contracts:

- o Site-specific Contracts
- o Procurement packages
- o Contract Status Notifications
- o List of Contractors

- o Sample Number. For circumstances where multiple samples will be collected from the same location, each sample will be consecutively numbered. For example, WHF-02-SW-3-01 and WHF-02-SW-3-02 are surface water samples collected at the same location but at different times. For soil borings, the number designating the boring location will be followed by a sample depth range in parenthesis. A sample collected at WHF-02-SS-01 from a depth of 4-5 feet would be designated:

WHF-02-SS-01(4-5)-1

For duplicates, a letter designation will be used for the duplicate sample. For example, the duplicate of WHF-02-SS-01(4-5)-1 will be:

WHF-02-SS-01(4-5)A-1

If a duplicate is taken at that point again, the number would become:

WHF-02-SS-01(4-5)A-2

Spiked samples provided by the laboratory will be assigned a two-letter code associated with the media of the spiked sample or the media of the samples the spike will accompany. The location code used for spiked samples will be "00." For example, a spiked sample of water sent by the laboratory to accompany a group of monitor well samples would be assigned:

WHF-02-MW-00-1

These numbers will be on each sampling log and sample bottle label. The number will allow for cross-reference to field notes in the log and will also identify the type of sample matrix for the laboratory. Each sample container label will list a project number, sampling date, sampler initials, parameter group, and preservative, in addition to the sample identification. All of this information will cross-reference to the chain of custody information on the custody form. Once the sample arrives at the laboratory, a unique laboratory identification number will be assigned. Once analyses are complete, the final data sheets will show both the sample identification and laboratory identification plus any other pertinent information. This system will provide a complete tracking system for uniquely identifying each sample collected and analyzed in the laboratory.

6.0 DATA REDUCTION/DISPLAY

The reduction of field and analytical data will consist of summarizing water level measurements, soil boring logs, well logs, field parameters, and analytical results. These summaries will be presented in the forms of tables, illustrations and graphs. Original field data generated during soil borings and well installation will be stored at the Contractor's office as described previously. Original data collected by the field staff will be stored at the field office.

Chemical data and some physical data will be stored and managed using a data management system (e.g., dBASE III Plus. Data entry will be by a designated person(s), so that access to the data base will be limited. The system will be

capable of various sorting routines so that data can be sorted by well, location, parameter, etc. The program will also be capable of statistical evaluations by expansion of the programming.

Finally, graphical presentation of the data and site conditions will be included in the final report. Sampling locations, boundaries, plume definition, etc., will be placed on site maps based upon the data. Water level contours, geologic cross sections, horizontal and vertical concentration profiles will be plotted.

The Contractor may use its own format in the body of the final report. However, in the appendices (which contain sample and blank data) a spreadsheet type of format will be used, or the CLP forms for reporting samples and equipment, trip, field, and method blanks will be used. The spreadsheet format will allow for more samples per page and for more information on blanks and their association with samples. The spreadsheet format is not meant to be a rigid form. The information listed in Figure 6-1 must be present. The contractor may add other information which will assist in review. For calibration, tuning, spikes, surrogates, and duplicates, the current CLP forms are required for data presentation.

FIGURE 6-1
 DATA FORMAT FINAL REPORT
 RI/FS WORK PLAN
 NAS WHITING FIELD, FLORIDA

Sample Number	J25019	JS5020
Date Sampled	03/18/87	11-25-87
Sample Prep. Date	11/25/87	11/25/87
Sample Analysis Date	11/26/87	11/26/87
Sample Numbers of Associated Analytes, Field, Trip, and Equipment Blanks	J4455667	L4455667

	Detection Limit	Sample	Results
<u>VOLATILE ORGANIC COMPOUNDS (ug/kg)</u>			
Tetrachloroethane	5	50	50
Chlorobenzene	5		
<u>SEMIVOLATILE ORGANIC COMPOUNDS (ug/kg)</u>			
Bis(2-Ethylhexyl) Phthalate	330		750
2-Methylnaphthalene	330		2500
<u>INORGANIC COMPOUNDS (mg/kg)</u>			
Lead	10	360	25
<u>HYDROCARBONS (2)</u>			
Petroleum Hydrocarbon	1	0.611	0.268
Oil and Grease	1		
Sample Results			
Analyte			

Source: Oak Ridge Gaseous Diffusion Plant (1988)

APPENDIX A
CHECKLISTS
WORK ASSIGNMENT FILE INDEX

WORK ASSIGNMENT FILE INDEX/CHECKLIST
RI/FS ASSIGNMENT

Indicate Present
In File w/Document
Date

1.1 Project Initiation/Closeout

Work Assignment Form(s)

Statement of Work

Work Assignment Amendment

Work Assignment Completion Report

Other

1.2 Quality Assurance

Field Audits

Field Audits Responses

Field Change Requests (FCR)

Relevant Correspondence

Trend Analysis

1.3 Background Data

Previous Investigative Reports

Photographs/Historical Imagery

Site Background Data (Geology, Soils, Land Use,
Ecology, etc.)

Depositions

Newspaper Articles

Surveys/Maps

Relevant Correspondence

Other

1.4 Project Planning

Work Plan Memorandum/Work Assignment
Acknowledgement Letter

Kick Off Meeting Notes

Site Visit/Meeting

Easements/ Permit Requirements

Site Reconnaissance & Limited Sampling

Site Survey/Topo Map/Review of Existing
Aerial Photos

RI/FS Brainstorming Relevant Information

Preliminary Remedial Alternatives Identifications

Preliminary Risk Assessment

Expedited Response Alternatives Screening

Applicable, Relevant, and Appropriate Regulations
Determination

RI Scoping Data

Draft Work Plan

Final Work Plan

Draft Field Operations Plan

Final Field Operations Plan

Relevant Correspondence

1.5 Community Relations

On-Site Interviews

Draft Community Relations Plan

Final Community Relations Plan

Fact Sheets

Records of Telephone Conversations

1.6 Field Investigation

Field Log Books

Relevant Field Data

Site Survey/Topo Mapping

Field Screening/Analysis

1.7 Sample Analysis/Validation

CLP Analysis

Non-CLP Analysis

Data Validation

Physical Parameter Testing

Relevant Correspondence

1.8 Data Evaluation

Data Reduction and Tabulation

Data Interpretation Reports

Environmental Fate and Transport
Modeling/Evaluation

Relevant Correspondence

1.9 Assessment of Risks

Environmental Assessment

Endangered Assessment

Modeling Specific to Risk Assessment

Relevant Correspondence

1.10 Treatability Study/Pilot Testing

Equipment Operation and Testing

Sample Analysis and Validation

Treatability Study Reports

Relevant Correspondence

1.11 Remedial Investigation Reports

Draft RI Report _____

Final RI Report _____

Relevant Correspondence _____

1.12 Remedial Alternatives Screening

Listing of Remedial Alternatives _____

Evaluation of Alternatives on Screening Criteria _____

Report on Technical Memorandum _____

Relevant Correspondence _____

1.13 Remedial Alternative Evaluation

Technical Evaluation of Each Alternative _____

Public Health Evaluation of Each Alternative _____

Environmental Evaluation of Each Alternative _____

Institutional Evaluation of Each Alternative _____

Cost Evaluation of Each Alternative _____

Comparison of Alternatives _____

Relevant Correspondence _____

1.14 Feasibility Study Report

Draft FS Report _____

Final FS Report _____

Relevant Correspondence _____

1.15 Post RI/FS Support

Predesign Report _____

Responsiveness Summary _____

FS Addendum _____

ROD _____

Relevant Correspondence _____

WORK ASSIGNMENT FILE INDEX/CHECKLIST
REMEDIAL DESIGN

Indicate Present
In file w/Document
 Date

1.1 Project Initiation/Closeout

Work Assignment Form(s)

Statement of Work

Work Assignment Amendment

Work Assignment Completion Report

Other

1.2 Quality Assurance

Field Audits

Field Audits Responses

Field Change Requests

Relevant Correspondence

Trend Analysis

1.3 Background Data

Previous Investigative Reports

Photographs/Historical Imagery

Site Background Data (Geology, Soils, Land Use,
Ecology, etc.)

Depositions

Newspaper Articles

Surveys/Maps

Relevant Correspondence

Other

1.4 Project Planning

ROD _____

Draft Work Plan _____

Final Work Plan _____

Draft Field Operations Plan _____

Final Field Operations Plan _____

Predesign Meeting Notes _____

Site Visits/Surveys Data _____

Relevant Correspondence _____

1.5 Field Data Acquisition/Sample Analysis

Field Log Books _____

Relevant Field Data _____

Site Survey/Topo Mapping _____

Field Screening/Analysis _____

CLP Analysis _____

Non-CLP Analysis _____

Data Validation _____

Physical Parameter Testing _____

Relevant Correspondence _____

1.6 Treatability Study/Pilot Testing

Equipment Operation and Testing _____

Sample Analysis and Validation _____

Treatability Study Reports _____

Relevant Correspondence _____

1.7 Data Evaluation

Data Reduction and Tabulation _____

Data Interpretation Reports _____

Environmental Fate and Transport
Modeling/Evaluation _____

Relevant Correspondence _____

1.8 Final Design

Plans and Specifications _____

Construction Schedule _____

Final Biddibility, Constructibility, Operability
and Claims Prevention Review/Report _____

Definitive Construction Cost Estimate _____

Calculations/Worksheets _____

Final Drawings _____

Design Criteria _____

Basis of Design _____

Relevant Correspondence _____

1.9 Design Support Activities

Site Safety Plan Specification _____

Quality Assurance Project Plan _____

Models, Renderings, or Photographs
of Completed Designs _____

Operation and Maintenance Reports _____

Consultants Report _____

Non-Environmental Construction Operating Permits _____

Relevant Correspondence _____

1.10 Value Engineering

Value Engineering Study Documentation

Value Engineering Report

Relevant Correspondence

1.11 Community Relations

On-Site Interviews

Draft Community Relations Plan

Draft Community Relations Plan

Fact Sheets

Records of Telephone Conversations

Relevant Correspondence

WORK ASSIGNMENT FILE INDEX/CHECKLIST
REMEDIAL ACTION

Indicate Present
In file w/Document
Date

1.1 Project Initiation/Closeout

Work Assignment Form(s)

Statement of Work

Work Assignment Amendment

Work Assignment Completion Report

Other

1.2 Quality Assurance

Field Audits

Field Audits Responses

Field Change Requests

Relevant Correspondence

1.3 Background Data

Previous Investigative Reports

Photographs/Historical Imagery

Site Background Data (Geology, Soils, Land Use,
Ecology, etc.)

Depositions

Newspaper Articles

Surveys/Maps

Relevant Correspondence

Other

1.4 Project Planning

Draft Work Plan _____

Final Work Plan _____

Draft Field Operations Plan _____

Final Field Operations Plan _____

Relevant Correspondence _____

1.5 Detailed Inspection

Field Testing Data _____

Performance Test (Site or Factory) Reports _____

Field Logs and Daily Diaries _____

Verification Inspection _____

Routine Site Inspection/Construction _____

Relevant Correspondence _____

1.6 Cleanup Validation

CLP Analysis _____

Sample Management Documentation/Tracking _____

Non-CLP Analysis _____

Data Validation _____

Physical Parameter Testing _____

Relevant Correspondence _____

1.7 Other Engineering Services

Cost Estimates for Contract
Modifications and Claims

Risk and Claim Management

Shop Drawings

Quality Control Guidelines

General Inspections

Relevant Correspondence

1.8 Community Relations

On-Site Interviews

Draft Community Relations Plan

Draft Community Relations Plan

Fact Sheets

Records of Telephone Conversations

Relevant Correspondence

1.9 Remedial Action Implementation

Site Specific Remedial Action Plans

Construction Chart of Accounts

Relevant Correspondence

1.10 Project Completion

Prefinal Construction Conference Notes

As-Built Drawings

Prefinal Inspection

Final Inspection and Certification

Relevant Correspondence

1.11 Project Performance

O&M Manual

Operator Training Manual

Relevant Correspondence

FINAL

REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN

VOLUME III. HEALTH AND SAFETY PLAN
NAVAL AIR STATION WHITING FIELD
MILTON, FLORIDA

UIC: N60508

PREPARED FOR

SOUTHERN DIVISION
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1.0 GENERAL

1.1 SCOPE AND PURPOSE

This Health and Safety Plan (HASP) was prepared in conformance with the C-E Environmental/E.C. Jordan Health and Safety Program and is intended to meet the requirements found in 29CFR 1910.120. As such, the HASP addresses all of the activities associated with the remedial investigation/feasibility study at the NAS Whiting in Milton, Florida. Compliance with this HASP is required of all E.C. Jordan (Jordan) personnel, contractor personnel or third parties entering the site.

1.2 HEALTH AND SAFETY PERSONNEL

The following subsections briefly describe the health and safety designations and general responsibilities which will be employed for the NAS Whiting project.

1.2.1 Health and Safety Manager

The Health and Safety Manager (HSM) for C-E Environmental, J.A. Reynolds, can be reached at (201) 992-2323 x264, in Roseland, New Jersey. The HSM has final authority to resolve health and safety issues that are not resolved at the site or through the Health and Safety Supervisor (HSS), and has overall responsibility for ensuring that the policies and procedures of this HASP are implemented by the Health and Safety Officer (HSO). In the various regions, the HSM may delegate additional functions to the Regional HSS.

1.2.2 Health and Safety Supervisor

The HSS for Jordan in the southeast region, Jack Davis may be reached at (904) 656-1293, in Tallahassee, Florida. The HSS is the health and safety professional serving as the C-E Environmental HSM's designee for this project. As such, the HSS will be responsible for (1) approval of the individual chosen to serve as the site HSO for this field operation; (2) review and approval of site specific HASPs developed by the HSO, as well as any significant changes made over time to the site HASP; (3) oversight of the daily efforts of the HSO; (4) resolution of site disputes involving health and safety issues; (5) implementation of the HASP by the HSO. The HSS will notify the HSM of any Stop Work Orders issued by an HSO.

1.2.3 Health and Safety Officer

Janet Burris has been approved as the HSO for the NAS Whiting site by the Jordan HSS. The HSO is responsible for developing and implementing this site-specific HASP in accordance with the C-E Environmental/E.C. Jordan Health and Safety Program. The HSO will conduct safety inspections and investigate all accidents, illnesses, and incidents occurring on-site. The HSO will also conduct safety briefings and site-specific training for on-site personnel. As necessary, the HSO will accompany all U.S. Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), or other governmental agency personnel visiting the site in response to health and safety issues. The HSO, in consultation with the HSS, is responsible for updating and modifying this HASP as site or environmental conditions change.

The HSO is vested with the authority to stop site operations (STOP WORK AUTHORITY) if he/she determines that an imminent health or safety hazard or other potentially dangerous situation exists. The HSO is to immediately notify the HSS of any Stop Work Orders issued. The HSO may also recommend to the HSS or HSM that the downrange authorization of individual site personnel be revoked for health and/or safety reasons.

The HSO, through the HSS, ensures that all personnel entering the NAS Whiting site are qualified for downrange deployment, in accordance with the C-E Environmental/E.C. Jordan Health and Safety Program requirements.

1.3 TRAINING

Training, as defined under the C-E Environmental/E.C. Jordan Health and Safety Program Section 4.0, and meeting the requirements of 29 CFR 1910.120, is required for all personnel entering potentially contaminated areas of this site. Personnel without the required training will not be permitted in a downrange position.

1.4 MEDICAL SURVEILLANCE

All personnel entering potentially contaminated areas of this site must be medically qualified for site assignment as determined by a medical surveillance program, such as that outlined in the C-E Environmental/E.C. Jordan Health and Safety Program, Section 3.0. Personnel without medical clearance will not be permitted in a downrange position.

2.0 SITE CHARACTERIZATION AND ANALYSIS

2.1 SITE NAME, LOCATION AND SIZE. NAS Whiting Field is located in Florida's northwest coastal area approximately seven miles north of Milton and 20 miles northeast of Pensacola. It is divided into two field. The North Field is used for fixed-wing training, while the South Field is used for helicopter training. NAS Whiting Field provides support services and facilities for flight and academic training (Figure 2-1).

2.2 SCOPE OF WORK

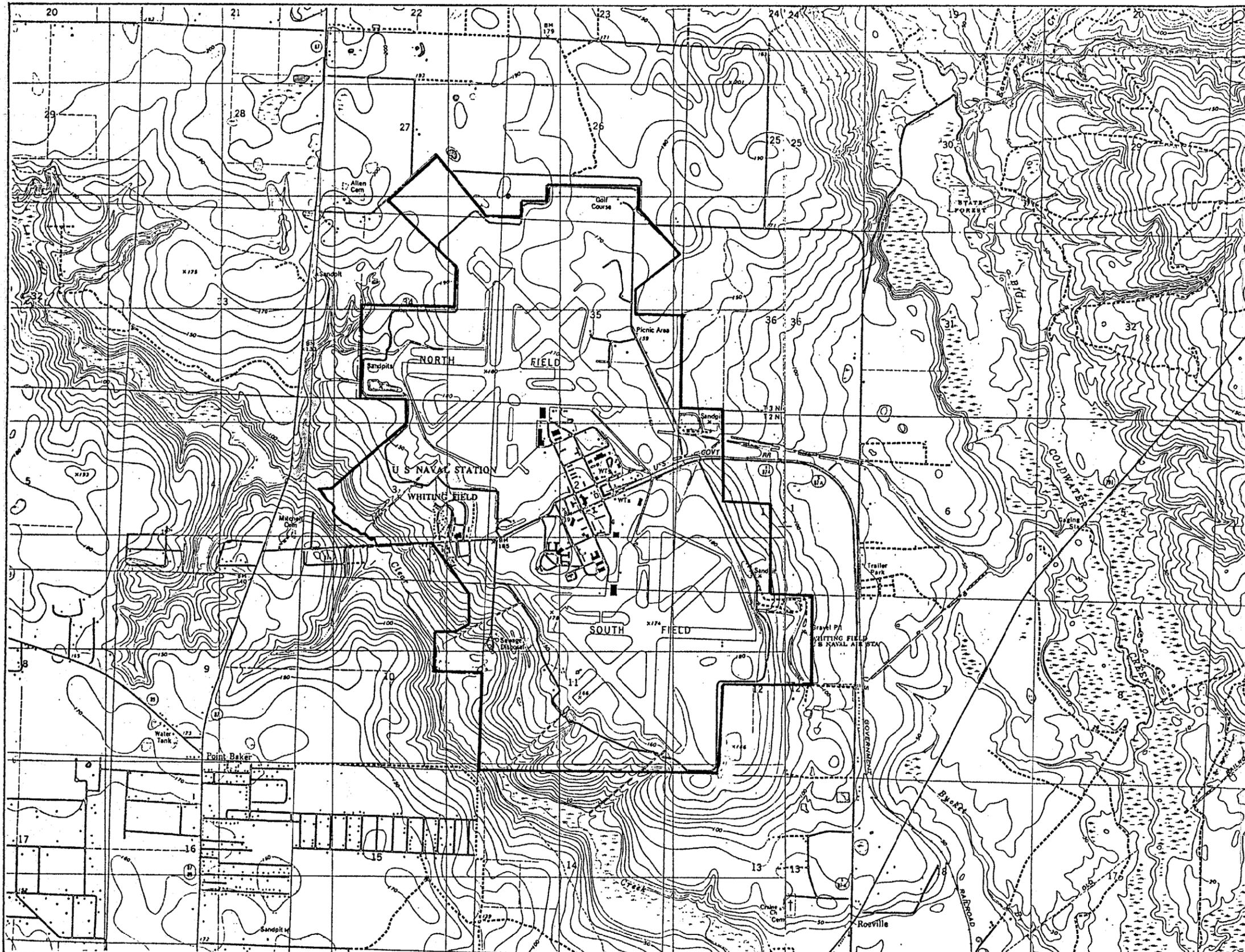
The field investigations at NAS Whiting will consist of geophysical investigations, geotechnical investigations, monitoring well installation, well development and purging, soil and groundwater sampling, and general field data collection.

2.3 SITE HISTORY

Since its commission in 1943, NAS Whiting Field has generated a variety of wastes related to pilot training, the operation and maintenance of aircraft along with ground support equipment, and the station's facility maintenance activities. Both liquid and solid wastes from these sources have been disposed of a various places on the base. Most of the operations and activities at the station are now provided by private contractors.

An Initial Assessment Study (Envirodyne Engineers, 1985) identified 16 past waste-disposal sites at NAS Whiting Field. Based on this study, 15 sites were recommended for further evaluation; Site 2 (Northwest Open Disposal Area) was judged to not warrant further consideration. In November 1986, Geraghty & Miller, Inc. prepared for the Navy a Work Plan for a Verification Study which was subsequently submitted to the Florida Department of Environmental Regulation (FDER). After discussions with the FDER during a meeting on 17 December 1985, changes to the Work Plan were made and two more sites (17 and 18) were added. Both of these sites are active sites where waste oils and fuel are burned in firefighting-training exercises. A summary of activities at each site is presented in Table 1-1.

Of the 18 sites identified to date, 15 are scheduled for an RI/FS. Site 2, the Northwest Open Disposal Area, was judged to warrant no further consideration early in the IR Program. Site 5, the Battery Acid Seepage Pit, was extensively studied in 1985 (Geraghty and Miller, 1985) in response to a Florida Department of Environmental Regulation (FDER) entered Consent Order. Results indicated no significant contamination resulting from past activities at the Battery Acid Ship. However, the presence of benzene in the existing monitoring wells surrounding the seepage pit does warrant further consideration. As such the investigation of benzene contamination around Site 5 will be coupled with the field and laboratory investigation proposed for production well W-S2.



SOURCE:
 USGS QUADRANGLE MILTON NORTH, FLORIDA
 PHOTOREVISED 1987
 AND USGS QUADRANGLE HAROLD, FLORIDA 1973.

FIGURE 2-1
NAS WHITING FIELD



**RI/FS HEALTH & SAFETY
 PLAN**
**NAS WHITING FIELD
 MILTON, FLORIDA**

TABLE 1-1
SUMMARY OF DISPOSAL SITES AT NAS WHITING FIELD

SITE NO.	SITE NAME	LOCATION	PERIOD OF OPERATION	TYPES OF MATERIAL DISPOSED	COMMENTS
Sites recommended for Confirmation Studies:					
1	Northwest Disposal Area	North Field, West Side	1943-1965	Refuse, waste paints, thinners, solvents, waste oils, hydraulic fluids	Secondary disposal area during this period; site covers 5 acres
2	Northwest Open Disposal Area	North Field, West Side	1976-1984	Construction and demolition debris, tires, furniture	Former borrow pit location, commonly referred to as the "Wood Dump"
3	Underground Waste Solvent Storage Area	North Field, South of Building 2941	1980-1984	Waste solvents, paint stripping residue	Wastes generated by point stripping operations
4	North AVGAS Tank Sludge Disposal Area	North Field, North of Tow Lane	1943-1968	Tank bottom sludge containing tetraethyl lead	Sludge disposal in shallow holes near tanks
5	Battery Acid Seepage Pit	South Field, near Building 1478	1964-1984	Waste electrolyte solution containing heavy metal	Pits located 110 feet from potable supply well (W-S2)
6	South Transformer Oil Disposal Area	South Field Building 1478	1940s-1964	PCB-contaminated dielectric fluid	Disposal in "0-2" drainage ditch
7	South AVGAS Tank Sludge Disposal Area	South Field, west of Building 1406	1943-1968	Tank bottom sludge containing tetraethyl area	Sludge disposed in shallow holes near tanks
8	AVGAS Fuel Spill Area	South Field, south of Building 1406	Summer 1972	AVGAS containing tetraethyl lead	Fuel spill of about 25,000 gallons on an area of about 2 acres

TABLE 1-1 (Cont.)
SUMMARY OF DISPOSAL SITES AT NAS WHITING FIELD

SITE NO.	SITE NAME	LOCATION	PERIOD OF OPERATION	TYPES OF MATERIAL DISPOSED	COMMENTS
9	Waste Fuel Disposal Pit	South Field, East Side	1950s-1960s	Waste AVGAS containing tetraethyl lead	Fuel disposed in former borrow pit
10	Southeast Open Disposal Area (A)	South Field, Southeast Area	1965-1973	Construction and demolition debris, waste solvents, paint, oils, hydraulic fluid, PCBs, pesticides, herbicides	Secondary disposal area during this period; site covers about 4 acres
11	Southeast Open Disposal Area (B)	South Field Southeast Area	1943-1970	Construction and demolition debris, waste solvents, paint, oils, hydraulic fluid, PCBs	Secondary disposal area during this period; site covers about 3 acres
12	Tetraethyl lead Disposal Area	South Field Southeast Area	May 1, 1968	Tank bottom sludge and fuel filters contaminated with tetraethyl lead	Disposal area posted with date warning, site consists of two earth covered mounds, 25 ft. x 25 ft. area
13	Sanitary Landfill	South Field, Southeast Area	1979-1984	Refuse, waste solvent, paint hydraulic fluids	Primary sanitary landfill, potentially received hazardous wastes the first year of operation
14	Short-Term Sanitary Landfill	South Field Southeast Area	1978-1979	Refuse, waste solvent, oils paint, hydraulic fluids	Primary sanitary landfill for brief period; relocated due to drainage problems
15	Southwest Landfill	South Field, Southwest Area	1965-1979	Refuse, waste paint, oils, solvents, thinners, asbestos, hydraulic fluid	Primary landfill for this time period; covers about 15 acres
16	Open Disposal and Burning Area	South Field, Southwest Area	1943-1965	Refuse, waste paint, oils, solvents, thinners, PCBs hydraulic fluid	Primary disposal area for this time period; covers about 10 acres

Site 8, the AVGAS Fuel Spill Area, is slated for investigation and possible remediation under the Navy's Underground Storage Tank (UST) Program and will not be investigated under the Navy's IR Program. Although encompassed in part under the IR Program, Sites 4 and 7, the south and north AVGAS Waste Sludge Disposal Areas, have also been transferred over the UST Program and will be extensively studied under that program.

The 18 sites identified under the IR Program are shown on Figure 2-1. A brief discussion of the sites to undergo a Remedial Investigation is presented in the following sections. A more detailed description of the sites is provided in the NAS Whiting Field Work Plan.

2.4 HAZARDOUS SUBSTANCES/CONDITIONS

Hazardous substances which are known to have been stored or used at NAS Whiting include numerous solvents, waste oil, lubricating oil, penetrating oil, diesel, kerosene, aviation gasoline, automobile gasoline, heating oil and mineral spirits. Chemical constituents of these listed hazardous substances include: lead; benzene, ethylbenzene, toluene, total xylene (BETX); ethylene dibromide (EDB); polynuclear aromatic hydrocarbons (PAHs); tetrachloroethylene (PCE); trichloroethylene (TCE); carbon tetrachloride; trichloroethane (TCA) and trans-1,2-dichloroethylene (trans-1,2-DCE). Table 2-1 contains general physical characteristics of the above listed chemicals as well as the odor threshold, threshold limit value and other remarks. The following information is a brief summary of the physical characteristics and health risks associated with each of the substances (where information could be found).

Benzene is a watery, colorless liquid with a pleasant aromatic odor. It is a moderate irritant in small amounts both as a gas and as a liquid. If inhaled in large amounts it attacks the central nervous system, possibly resulting in coma and/or respiratory arrest. Chronic poisoning causes leukemia.

Ethylbenzene is a colorless aromatic liquid. It is a moderate skin irritant in gaseous form. Inhalation of high concentrations of the gas may cause temporary irritation of the nose, dizziness, and depression. The liquid form can blister the skin if not washed off immediately.

Toluene is a watery, colorless liquid with a pleasant aromatic odor. It is a mild skin irritant. Inhalation of high concentrations of the gas can cause temporary irritation of the eyes or respiratory system. If the liquid form is allowed to remain on the skin for a long period of time irritation and reddening of the skin may occur. Ingestion or aspiration of the liquid causes depressed respiration and pulmonary edema, and can result in kidney or liver damage.

Xylene is a colorless, watery liquid with a sweet odor. It is a moderate skin irritant. When present as a gas in high concentrations it can cause temporary irritation of the eyes or respiratory system, headache, and dizziness. The liquid form may cause irritation or reddening of the skin if not washed off for a prolonged period. If the liquid is aspirated into lungs it can result in severe coughing, distress, and rapidly developing pulmonary edema. If ingested, nausea, vomiting, cramps, headache, coma and even death can occur. Ingestion may also result in kidney and liver damage.

TABLE 2-1
CONTAMINANTS OF CONCERN

CHEMICAL	APPROXIMATE ODOR THRESHOLD (ppm)	TLV (ppm)	PHYSICAL CHARACTERISTICS	DERMAL TOXICITY	REMARKS
Benzene	4.7	1	Colorless liquid, pleasant aromatic odor	Moderate skin irritant	Inhalation of large amounts attacks central nervous system; chronic poisoning causes leukemia.
Ethylbenzene	140	100	Colorless liquid, aromatic odor	Moderate skin irritant	Liquid blisters skin; inhalation results in dizziness, depression.
Toluene	0.17	100	Colorless liquid, pleasant aromatic odor	Mild skin irritant	Ingestion or aspiration can cause pulmonary edema, depressed respiration.
Xylene	0.05	200	Colorless liquid, aromatic odor	Moderate skin irritant	Inhalation causes headache and dizziness; vapors irritate eyes; can be fatal if ingested.
Lead	--	--	Soft, ductile, gray metal, soluble in water containing a weak acid	--	Lead poisoning may cause fatigue, anemia, abdominal pains, and neurological damage.
Ethylene Dibromide	--	20	Clear liquid, mild sweet odor	--	--

TABLE 2-1 (Cont.)
CONTAMINANTS OF CONCERN

CHEMICAL	APPROXIMATE ODOR THRESHOLD (ppm)	TLV (ppm)	PHYSICAL CHARACTERISTICS	DERMAL TOXICITY	REMARKS
Tetrachloroethylene	--	100	Colorless liquid; ether-like odor	Moderate skin and eye irritant	Inhalation, ingestion or contact may irritate eyes, nose or throat; flush face or neck; vertigo, dizziness, incoordination and headache.
Trichloroethylene	--	100	Colorless liquid; sweet odor like chloroform	Toxic by inhalation; moderate skin and eye irritant	Inhalation, ingestion or contact may cause headache, vertigo, visual disturbance, tremors, sommolence, nausea and vomiting; cardiac arrhythmias; paresthesias.
Carbon tetrachloride	--	* 5	Colorless liquid with an ether-like odor (sweetish)	Moderate skin and eye irritant; moderately toxic	Inhalation, absorption, ingestion or contact may cause CNS depression, liver and/or kidney damage, and skin irritation; suspected carcinogen.
Trichloroethane	--	10	Colorless liquid; sweet odor like chloroform	Toxic; eye and skin irritant; absorbed by skin	Inhalation, skin absorption, ingestion or contact may cause CNS depression, liver and kidney damage; eye and nose irritation.
Trans-1,2-Dichloro- ethylene	--	200	Colorless liquid; pleasant odor	Moderately toxic by ingestion, inhalation and skin contact	Inhalation, ingestion or contact may cause irritation of eyes and respiratory system; CNS depression; flammable.

Notes: CNS - Central Nervous System

Tetraethyl lead is a colorless, oily liquid with a pleasant characteristic odor. It can cause intoxication by absorption through the skin or by inhalation. Ingestion causes fatigue, anemia, abdominal pains, constipation, and neurological damage.

EDB is a colorless, nonflammable liquid with a sweetish odor. It is a strong irritant to eyes and skin and is toxic by inhalation, ingestion and skin absorption. Laboratory test have shown it to be carcinogenic in test animals.

Polynuclear Aromatic Hydrocarbons (PAHs) for the purposes of this plan and study include those listed as parameters for EPA Method 610. Some of the more notable PAHs from this method include acenaphthene, anthracene, chrysene, fluorene, naphthalene, phenathrene and pyrene.

2.5 INITIAL SITE ENTRY

2.5.1 Initial Levels of Protection

Based on the available historical site information and current site conditions, the level of protection planned for initial site activities at the NAS Whiting site is Level D. It should be noted however that this HASP allows for the upgrading of protection levels to conservatively preclude any potential for contamination to on-site personnel while not sacrificing protection on efficiency. During the initial reconnaissance, the team will perform various monitoring techniques to identify the presence of contaminants, as well as to assess the integrity of the site in consideration of safety for the proposed site investigation and sampling operations.

2.5.2 Initial Monitoring

Where the site information either shows the potential for ionizing radiation or "immediately dangerous to life or health" (IDLH) conditions, initial monitoring will consist (at a minimum) of an ionizing radiation survey and air monitoring using devices such as a combustible gas indicator, oxygen meter, and photoionization detectors (PID). It is intended that real-time monitoring instrumentation will be used to assist in the determination of the appropriate level of protection for the initial site entry team.

2.6 SITE RISKS

2.6.1 Health Hazards

The potential for exposure to site contaminants as described in Section 2.4, by field personnel working at the NAS Whiting site does exist. However, at this time it is thought that the contamination associated with the site is mainly limited to groundwater and subsurface soils. Therefore, the health hazards associated with all non-intrusive on-site activities is considered to be low. The potential for exposure to site contaminants does however, increase during activities such as soil boring/soil sampling and groundwater sampling. Based on the types of materials that were used at the facility, the types of contaminants that could be found in the soils and groundwater can be divided into three categories: volatile organics, base/neutral and acid

extractables and metals. The basis of classifying these materials is solely on their chemical properties. At one end of the spectrum are volatile organics which are fairly mobile, thereby increasing the risk of exposure. Metals, on the other hand, are fairly inert, resulting in a lesser chance of exposure based on current site condition. The actual health hazards associated with the site contaminants have been provided in Section 2.4 and Appendix B.

2.6.2 Safety Hazards

Safety hazards include those hazards which personnel may be exposed to that are unrelated to hazardous wastes. These include hazards such as heat stress, operation and presence around heavy equipment, lifting of objects, vehicle traffic and snake bites. Extreme caution should be exhibited by all personnel while conducting work around drill rigs, backhoes and other heavy equipment. During hot days personnel should take time to drink fluids and cool off to avoid overheating and symptoms related to heat stress (see Appendix E).

Lifting of heavy objects should be done with caution. Personnel should assist one another with moving heavy objects or use the appropriate equipment to accomplish these tasks. During all site activities personnel should be aware of the possibility of an encounter with poisonous snakes, particularly rattlesnakes.

2.6.3 Conclusion/Risk Assessment

The degree and associated risk of exposure to contaminants at the site are dependent on the chemical, its concentration, route of entry, and duration of exposure. The chemicals that are most likely to be present at the site based on historical site records have been identified. The major route of entry for the materials at this site during intrusive activities is thought to be through inhalation (volatiles, dust-containing metals), and dermal contact with soils, sludges, and groundwater. Therefore, based on all available information (site conditions, potential on-site chemicals and their properties, exposure limits, etc.), hazards associated with working in the presence of these materials under present site conditions are considered moderately low, assuming appropriate health and safety practices are maintained.

3.0 SITE CONTROL

3.1 ZONATION

The site itself will normally be divided into three zones: the majority of the work area will be considered the Exclusion Zone, with limited areas serving as the Support Zone, and an area for decontamination called the Contamination Reduction Zone (CRZ). Figure 3-1 presents a schematic diagram of a typical site zonation and the associated equipment.

3.1.1 Exclusion Zone

The Exclusion Zone isolates the area of contaminant generation and restricts (to the extent possible) the spread of contamination from active areas of the site to support areas and off site locations. The Exclusion Zone is demarcated from the remainder of the site by the Hot Line (i.e., a tape line or physical barrier). Personnel entering into the Exclusion Zone must: (1) enter through the CRZ; (2) wear the prescribed level of protection (see: Section 4.3.1); and (3) be otherwise authorized to enter the Exclusion Zone (see: Section 1.3, 1.4, and 9.1). Any personnel, equipment or materials exiting the Exclusion Zone will be considered contaminated and will be subject to either decontamination, or will be containerized in uncontaminated devices.

Within the Exclusion Zone, specific locations or restricted areas (clearly marked or identified) will be established as necessary for particular locations or around specific site operations. In the case of well drilling or excavation operations, a restricted area will be established which includes a minimum thirty 30-foot radius from the drill rig or excavation operation. Other restricted areas may include drum areas, active site areas, sources of combustible gases or air contaminants or other dangerous areas as they are identified. Specific access for emergency services to areas for specific site operations will be established.

3.1.2 Contamination Reduction Zone

Moving out from the Exclusion Zone, starting at the Hot Line and continuing to the Contamination Control Line, is the CRZ. The CRZ is a transition zone between contaminated and uncontaminated areas of the site. When "hot" or contaminated personnel, equipment, or materials cross the Hot Line, they are assumed to be as "hot" or contaminated as they are going to be from site operations. Being subjected to the decontamination processes, they become less contaminated; when they reach the Contamination Control Line, they are clean and can exit this zone without spreading contamination.

Within the CRZ is the Contamination Reduction Corridor (CRC), where materials necessary for full personnel and portable equipment decontamination are kept. A separate facility will be established for heavy equipment decontamination. In addition, certain safety equipment such as emergency eye wash, fire extinguisher, stretcher and first aid kit are to be staged in this zone.

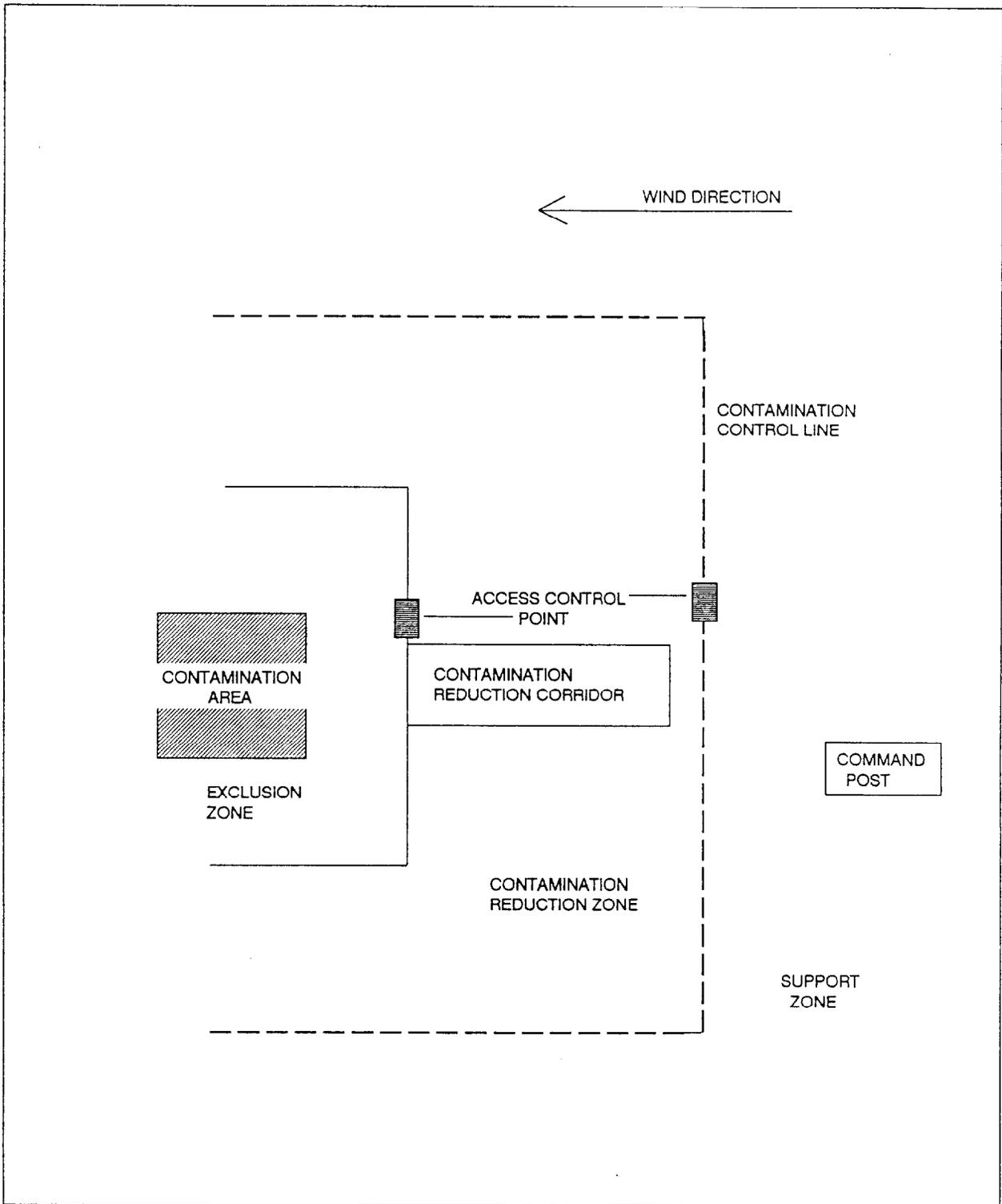


FIGURE 3-1
DIAGRAM OF SITE WORK ZONES



HEALTH AND
SAFETY PLAN
NAS WHITING FIELD
MILTON, FLORIDA

3.1.3 Support Zone

The Support Zone is the outermost zone of the site, separated from the CRZ by the Contamination Control Line and is considered a clean area. Movement of personnel and materials from this zone into the CRZ is generally unrestricted except as required through access points controlled for administrative purposes. However, only uncontaminated/decontaminated personnel or materials may enter this zone from the CRZ.

The Support Zone will contain the necessary support facilities (including personal hygiene facilities) for site operations and will serve as the communications center and source of emergency assistance to operations occurring in the Exclusion Zone and CRZ. A log of all persons entering the site will be maintained by the HSO, the field operations leader or site designee.

3.2 MEDICAL ASSISTANCE

The primary source of medical assistance for the NAS Whiting project is:

Santa Rosa Medical Center
1450 Berry Hill Road
Milton, Florida 32570
(904) 623-9741

The alternate source of medical assistance is:

West Florida Regional Medical Center
8383 N. Davis Highway
Pensacola, Florida 32514
(904) 478-4460

4.0 ENGINEERING CONTROLS, WORK PRACTICES AND PERSONAL PROTECTIVE EQUIPMENT

4.1 ENGINEERING CONTROLS

Whenever needed, engineering controls (i.e., fans to blow volatilized chemicals away from the work area) will be used. Where possible, all site activities will be conducted upwind of areas which may be sources of contaminants that may volatilize into the breathing zone.

4.2 WORK PRACTICES

Workers will be expected to adhere to the established safe work practices for their respective specialties (e.g., drilling, laboratory analysis, construction). The need to exercise caution in the performance of specific work tasks is made more acute due to (1) weather conditions; (2) restricted mobility and reduced peripheral vision caused by the protective gear itself; (3) the need to maintain the integrity of the protective gear; and (4) the increased difficulty in communicating caused by respirators. Work at the site will be conducted according to established protocol and guidelines for the safety and health of all involved. Among the most important of these principles for working at a hazardous waste site are the following:

- o In any unknown situation, always assume the worst conditions and plan responses accordingly.
- o Employ the buddy system. Under no conditions will any person be permitted to enter into the exclusion zone of a site alone. Establish and maintain communication. In addition to radio communications, it is advisable to develop a set of hand signals as conditions may greatly impair verbal communications.
- o Because no personal protective equipment is 100 percent effective, all personnel must minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas and procedures accordingly. Do not place equipment on drums or on the ground. Do not sit on drums or other materials. Do not sit or kneel on the ground in the Exclusion Zone or CRZ. Avoid standing in or walking through puddles or stained soil.
- o Smoking, eating, or drinking in the work area and before decontamination will not be allowed. Oral ingestion of contaminants is the second most likely means of introducing toxic substances into the body (inhalation is the first).
- o Avoid heat and other work stresses related to wearing the protective gear. Work breaks should be planned to prevent stress-related accidents or fatigue.
- o To the extent feasible, handling of contaminated materials should be done remotely, particularly when drummed or other containerized hazardous waste materials are found on-site. Every effort is to be made to identify the contents of any containers found on-site before they are subject to material-handling applications.

- o Personnel must be observant of not only one's own immediate surroundings but also that of others. Everyone will be working under constraints; therefore, a team effort is needed to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment and while utilizing personnel protective gear as vision, hearing and communication can be restricted.
- o Contact lenses are not allowed to be worn on-site; if corrosive or lachrymous substances enter the eyes, proper flushing is impeded.
- o All facial hair that interferes with the face piece fit, must be removed prior to donning a respirator at all sites requiring Level C or B protection.
- o Rigorous contingency planning and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.
- o Personnel must be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess use of alcohol or working with an illness during field investigation assignments.
- o The site leader, HSO and sampling personnel shall maintain project records in a bound notebook (e.g., daily activities, meetings, incidents, and data). Notebooks will remain on-site for the duration of the project so that replacement personnel may add information in the same record book, maintaining continuity. These notebooks and daily records will become part of the permanent project file.

4.3 PERSONAL PROTECTIVE EQUIPMENT

4.3.1 Levels of Protection

The following descriptions provide the basic composition of the generally recognized protective ensembles that are to be used for site operations. Specific components for any level of protection will be selected based upon hazard assessment; additional elements will be added as necessary. Disposable protective clothing, gloves and other equipment, exclusive of respirators, should be used when feasible to minimize exposure risks during decontamination and possible cross-contamination during sample handling.

Level "A"

- o Pressure demand full-facepiece Atmosphere Suppling Respirator (ASR)(if ASR is an airline respirator, it must have an escape self-contained breathing apparatus [SCBA]).
- o Fully-encapsulating, chemical-resistant suit.
- o Inner chemical-resistant gloves.

- o Chemical-resistant safety boot/shoes.
- o Two-way radio communications.
- o Cooling unit*.
- o Coveralls*.
- o Hard Hat*.
- o Disposable gloves and boot covers*.

Level "B"

- o Pressure demand full-facepiece Atmosphere Suppling Respirator (if ASR is an airline respirator, it must have escape SCBA).
- o Chemical-resistant clothing (coveralls and long-sleeved jacket; hooded, one- or two-piece chemical splash suit; disposable chemical-resistant one-piece suit).
- o Inner and outer chemical-resistant gloves.
- o Chemical-resistant safety boot/shoes.
- o Hard hat.
- o Two-way radio communications.
- o Coveralls*.
- o Disposable boot covers*.
- o Face shield*.
- o Long cotton underwear*.

Level "C"

- o full-facepiece, air-purifying respirator with appropriate sorbents.
- o Chemical-resistant clothing (coveralls and long-sleeved jacket; hooded, one-or two-piece chemical splash suit; disposable chemical-resistant one-piece suit).
- o Inner and outer chemical-resistant gloves.
- o Chemical-resistant safety boot/shoes.
- o Hard hat.

- o Two-way radio communications.
- o Coveralls*.
- o Disposable boot covers*.
- o Face shield*.
- o Escape mask*.
- o Long cotton underwear*.

Level "D"

- o Coveralls.
- o Safety boot/shoes.
- o Safety glasses or chemical splash goggles.
- o Hard hat.
- o Gloves*.
- o Escape mask*.
- o Face shield*.

* optional

4.3.2 Other Protective Equipment

Work boots should be constructed with steel toe-steel shank construction for added safety. In addition, protective ear equipment will be available on-site for personnel who should desire such because of excess noise during drilling or other activities.

4.3.3 Operational Levels of Protection

The proposed level of protection to be worn by field personnel for all site activities is Level D. However, should it become apparent during any phase of the field activities that conditions are different from those anticipated, the HSO will immediately withdraw all personnel from the site until health and safety conditions at the site are reevaluated.

5.0 MONITORING

The work environment will be monitored to ensure that Immediately Dangerous to Life or Health (IDLH) or other dangerous conditions are identified. At a minimum, this monitoring will include evaluations for combustible atmospheres, oxygen deficient environments, hazardous concentrations of airborne contaminants and radioactivity.

5.1 AIR SAMPLING

To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being employed at the site, and may be used as the basis for upgrading or downgrading the levels of protection, at the discretion of the site HSO.

The Photovac TIP photoionization detector (PID) will be used during on-site activities to monitor the ambient air quality in the breathing zone. The PID will be used primarily during drilling and sampling operations. During drilling the PID will be used continuously while auger advancement is taking place and intermittently during well placement and well development. During both soil and groundwater sampling activities the PID will be used intermittently to monitor the breathing zone. Examples of the PID and other types of air monitoring equipment are presented below.

- o HNU IS101 and Photovac Tip photoionization detectors (PID). Like the OVA, the PID operates on the basis of ionization of the contaminant which results in a meter deflection proportional to the concentration of the contaminant. In the PID, the ionization is also caused by an ultraviolet (UV) light source. The strength of the UV (measured in electron volts or eV) determines what contaminants can be ionized. The Hnu can use three different strength UV sources including 9.6eV, 10.2eV and 11.7eV. Only the 10.2 and 11.7eV probes are currently available for field use. The TIP operates using a UV light source of 10.6eV. Calibration and maintenance will be performed in accordance with the manufacturers instructions.
- o ISD Dual Detector. This meter monitors for combustible gases and oxygen. It would be used to determine (1) if an area contains concentrations of combustible gases in percentage of the lower explosive limit and (2) the percentage of oxygen. The equipment will be done in accordance with the manufacturer's instructions.
- o NMS MX-241 (Explosimeter). This instrument is calibrated to methane and monitors combustible gases in the percentage of the lower explosive limit. The instrument will be calibrated in accordance with manufacturer's instructions.
- o ISD HS267. This instrument is capable of monitoring for the presence of hydrogen sulfide in parts per million. The calibration of this instrument will be done in accordance with the manufacturer's instructions.

- o Photovac Organic Vapor Analyzer (OVA) 10S50. The OVA is a total organic vapor analyzer that is capable of detecting volatile organics that can be ionized by ultraviolet light. The model 10S50 is commonly used on site to estimate the presence of volatile organics for purposes of crew protection, well screen placement and selection of samples for further analysis. The principle of operation is twofold: (1) the ambient temperature gas chromatograph (GC) which resolves mixtures of VOCs into individual components identified by retention time; and (2) detection accomplished by ionization in ultraviolet light. The charged component then moves to an electrode which in turn results in a meter deflection proportional to the concentration of the contaminant. Care must be exercised with interpreting the results of this instrument as it does not read out directly in parts per million (ppm) unless it is calibrated against the material being measured; therefore, results must be interpreted with care and conservatively. Calibration and maintenance will be performed in accordance with the manufacturers instructions.

- o Detector tubes (MSA and Draeger). A colorimetric detector tube is a direct-reading instrument that consists of a glass tube impregnated with an indicating chemical, which is connected to a piston cylinder or bellows-type pump. A known volume of air is drawn through the glass tube. The contaminant in the air reacts with the indicator chemical, producing a stain the length of which is proportional to the contaminant's concentration. Care must be taken when using the detector tubes as the reliability of the results depends on proper calibration, the degree of stability of the reacting chemical, and the ambient temperature. Interfering gases or vapors can also positively or negatively affect the measured results. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

5.2 PERSONAL MONITORING: EQUIPMENT, MAINTENANCE, AND CALIBRATION

Personal monitoring will be undertaken to characterize the personal exposure of high risk employees to the hazardous substances encountered on-site. The types of personal monitoring equipment that will be used at the NAS Whiting site will be dependent on conditions encountered during the field investigation. Examples of personal monitoring equipment that are available are presented below.

- o Personal Sampling Pumps. These devices are capable of being worn by an employee and drawing an air sample through appropriate collection media. The units can be used to draw volumes from 0.2 to 3.0 liters per minute. Calibration is to be conducted using standard industrial hygiene protocols before and after each sampling session (i.e. each day's use).

- o Passive Dosimeters or Gas Badges. These devices are nonmechanical collection devices for monitoring for organic vapor and various gases. They are worn by an employee and sent to an industrial hygiene laboratory for analysis.

- o Thermoluminescent Dosimetry (TLD) Body Badges. These devices are nonmechanical collection devices used to monitor for x-ray, beta, and gamma radiation exposure. They are worn by an employee and sent to Tech/Ops Landauer, Inc., for analysis on a quarterly basis.

At this time, Jordan's on-site personnel will be required to wear their personal thermoluminescent dosimetry (TLD) body badges. Other personal monitoring equipment is not scheduled for use at this time based on current anticipated site conditions.

5.3 OTHER

As stated above, no other personal monitoring equipment is foreseen for use at NAS Whiting. In the event that additional equipment is found necessary a determination will be made as required.

6.0 DECONTAMINATION/DISPOSAL

All personnel and/or equipment leaving contaminated areas are subject to decontamination, which occurs in the CRZ (see Section 3.1). However, since all activities at NAS Whiting are expected to take place in Level D protection, extensive personal decontamination procedures are not anticipated for this site. Procedures that will be used are as follows: Every attempt will be made to minimize physical contact with site soils and groundwater. Disposable gloves will be used and discarded as necessary. All work boots will be cleaned of excess dirt between sites and coveralls will be cleaned as deemed appropriate by field personnel.

6.1 PERSONNEL DECONTAMINATION

Decontamination procedures are carried out by all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination. Generalized procedures for removal of protective clothing are as follows:

1. Drop tools, monitors, samples and trash at designated drop stations. (i.e., plastic containers or drop sheets).
2. Step into designated shuffle pit area and scuff feet to remove gross amounts of dirt from outer boots.
3. Scrub outer boots and outer gloves with decontamination solution or detergent and water. Rinse with water.
4. Remove tape from outer boots and remove boots; discard in disposal container.
5. Remove tape from outer gloves and remove gloves; discard in disposal container.
6. If the worker has left the Exclusion Zone to change the air tank on his/her SCBA, or the canister on his/her air purifying respirator, this is the last step in the decontamination procedure. The tank or cartridge should be exchanged, new outer gloves and boot covers donned, the joints taped, and the worker returns to duty.
7. Remove outer garments and discard in disposal container.
8. Remove respirator and place or hang in the designated area.
9. Remove inner gloves and discard in disposal container.
10. If the site requires use of a decontamination trailer, all personnel must shower before leaving the site at the end of the work day.

Note: Disposable items (i.e., Tyvek coveralls, inner gloves, and latex overboots) will be changed on a daily basis unless there is reason for changing sooner. Dual respirator canisters will be changed daily unless more frequent changes are deemed appropriate by site surveillance data or personnel assessment.

Pressurized sprayers or other designated equipment will be available in the decontamination area for wash down and cleaning of personnel, samples and equipment.

Respirators will be decontaminated daily and taken from the drop area. The masks will be disassembled, the cartridges set aside, and all other parts placed in a cleansing solution. Parts will be precoded (e.g., #1 on all parts of Mask #1). After an appropriate time within the solution, the parts will be removed and rinsed off with tap water. Old cartridges will be marked to indicate length of usage (i.e., if means to evaluate the cartridges' remaining utility are available) or will be discarded into the contaminated trash container for disposal. In the morning, the masks will be reassembled and new cartridges installed, if appropriate. Personnel will inspect their own masks and readjust the straps for proper fit.

Should site conditions warrant a change in level of personal protection, changes in personnel decontamination procedures will also be incorporated into the field investigation program.

6.2 SMALL EQUIPMENT DECONTAMINATION

Small equipment will be protected from contamination as much as possible by draping, masking, or otherwise covering the instruments with plastic (to the extent feasible) without hindering the operation of the unit. For example, the HNU meter can be placed in a clear plastic bag which allows reading of the scale and operating the knobs. The HNU sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed of in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes and dried. The units will be checked, standardized and recharged as necessary for the next day's operation. They will then be prepared with new protective coverings.

6.3 HEAVY EQUIPMENT DECONTAMINATION

It is anticipated that the drilling rigs/backhoes will be contaminated during the borehole/test pitting activities. They will be cleaned with high pressure water or portable high pressure steam, followed by soap and water wash and rinse. Loose material will be removed by brush. The person performing this activity will usually be at least at the level of protection utilized during the personnel and monitoring equipment decontamination.

A decontamination pad will be constructed to allow the collection and storage of contaminated decontamination fluids in Department of Transportation (DOT)-approved 55 gallon drums, if contamination is suspected of needing containerization. Generally drill rig decontamination will take place on-site so that cross-contamination to other sites does not occur.

6.4 DISPOSAL OF DECON MATERIALS

All protective gear, decontamination fluids (both personal and equipment), and other disposable materials will be properly disposed of at each site. Disposable materials (e.g., gloves and Tyveks) will be double bagged and stored as is, or placed in DOT-approved 55 gallon drums.

7.0 EMERGENCY/CONTINGENCY PLAN

This section of the HASP identifies the emergency contingency planning that has been undertaken for operations at this site. Other sections of the HASP also provide information that would be used under emergency conditions. Refer to Appendix I for emergency telephone numbers, routes to emergency medical facilities and emergency signals.

7.1 PERSONNEL ROLES, LINES OF AUTHORITY AND COMMUNICATION

The site HSO is the primary authority for directing operations under emergency conditions. All communications both on- and off-site will be directed through the HSO.

7.2 EVACUATION

In the event that site evacuation is necessary, on-site personnel will move upwind of the site and determine further course of action. In the extremely unlikely event that the situation warrants the evacuation of NAS Whiting and/or the surrounding area, base officials along with city and county emergency response personnel will be notified and the appropriate course of action taken.

7.2.1 Withdrawal Upwind

The work party will continually note general wind directions while on-site. (A simple wind sock may be set up near the work site for visual determinations). Upon noting the conditions warranting movement away from the work site, the crew will move upwind a distance of approximately 100 feet or further as indicated by the site monitoring instruments. Donning SCBA and a safety harness and line, the HSO or a member of the crew may return to the work site to determine if the condition noted was transient or persistent. If persistent, then an alarm should be raised to notify on-site personnel of the situation and the need to leave the site or don an SCBA. An attempt should be made to decrease emissions only if greater respiratory protection is donned. The HSO and client will be notified of conditions. When access to the site is restricted and escape may thus be hindered, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

7.2.2 Site Evacuation

When conditions warrant site evacuation, the work party will proceed upwind of the work site and notify the security force, HSO and the field office of site conditions. If the decontamination area is upwind and greater than 500 feet from the work site, the crew will pass quickly through decontamination to remove contaminated outer suits. If the hazard is toxic gas, respirators will be retained. The crew will proceed to the field office to assess the situation. If instrumentation indicates an acceptable condition, respirators may be removed. As more information is received from the field crew, it will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and carried out by the HSO.

7.2.3 Evacuation of Surrounding Area

When the HSO determines that conditions warrant evacuation of downwind residences and commercial operations, local agencies will be notified and assistance requested. Designated on-site personnel will initiate evacuation of the immediate off-site area without delay.

7.3 EMERGENCY MEDICAL TREATMENT/FIRST AID

First aid will be rendered to any person injured on-site, as appropriate. The injured person will then be transported to medical personnel for further examination and/or treatment. The preferred transport method is a professional emergency transportation service; however, when this is not readily available or would result in excessive delay, other transport is authorized. Under no circumstances will the injured person transport themselves to a medical facility for emergency treatment.

When an injury occurs in a downrange position, provisions for decontamination of the victim will be made. However, life-threatening conditions may preclude normal decontamination procedures. In such cases, arrangements will be made with the medical facility and transporter to provide for the situation

Figure 7-1 presents the appropriate training which each of the potential Jordan field personnel has received up to the date of this HASP.

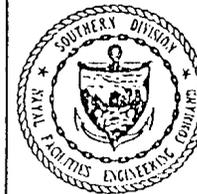
ON-SITE PERSONNEL TRAINING

TOPIC	HRS	T. VAUGHT	M. NUGENT	K. BUSEN	D. CRANE	K. PETERSON	M. DIBLIN	E. BLOMBERG	K. WARNER	R. GONZALEZ	H. HOOPER	M. CLARK	C. DOUSE	J. BURRIS
INTRODUCTION/REFRESHER	4	●	●	●	●	●	●	●	●	●	●	●	●	●
FIRST AID	8	●	●	●	●	●	●	●	●	●	●	●	●	●
CPR	8	●	●	●	●	●	●	●	●	●	●	●	●	●
HUS COURSE OR EQUIVALENT	30	●	●	●	●	●	●	●	●	●	●	●	●	●
OVA	16			●		●								●
PI METER	2			●	●	●								●
SCBA REVIEW	4			●	●									●
SAMPLING	-	●	●	●	●	●	●	●	●	●	●	●	●	●
HEALTH MONITORING	-	●	●	●	●	●	●	●	●	●	●	●	●	●

● INDICATES REQUIRED TRAINING COMPLETED

CERTIFIED BY _____

FIGURE 7-1



NAS WHITING FIELD
MILTON, FLORIDA

8.0 OTHER

8.1 ILLUMINATION

Site operations will not be permitted without adequate lighting. Therefore, unless provisions are made for artificial light, downrange operations must halt in time to permit personnel and equipment to exit the exclusion zone and proceed through decontamination before dusk. Conversely, operations would not be permitted to begin until adequate lighting is adequate.

8.2 SANITATION

Sanitation is not anticipated to be a concern. Facilities are available at NAS Whiting and the field will have transportation readily available.

8.3 EXCAVATION

Site excavations created during site operations shall be shored or sloped to prevent accidental collapse and otherwise conducted in accordance with 29 CFR 1926 (Subpart P). Under no circumstances will site personnel enter into excavations that are not adequately shored or sloped. Where entry into an excavation does occur, and the excavation is considered a confined space, such an entry will be done in accordance with the confined space entry program (see Section 8.4). Site excavation are not planned for NAS Whiting.

8.4 CONFINED SPACE ENTRY

Confined space entry presents special problems and substantial risks to involved personnel (including those who might be called upon to attempt a rescue of initial entrants). Therefore, entry into a confined space is a MEANS OF LAST RESORT, and will only be permitted where no other mechanism is feasible to achieve the desired goal. Confined space entry will not be necessary to conduct field work at NAS Whiting.

9.0 ADMINISTRATIVE

9.1 PERSONNEL AUTHORIZED DOWN RANGE

Personnel authorized to participate in downrange activities at this site have been reviewed and certified for site operations by the Site Manager and the HSS. Certification involves the completion of appropriate training, medical examination and a review of this site-specific HASP. All persons entering the site must utilize the buddy system, and check-in with the Site Manager and/or HSO before going downrange.

Certified E.C. Jordan Team Personnel:

<u>*+R. Gonzalez</u>	<u>*+J. Davis</u>
<u>*+M. Diblin</u>	<u>*+K. Busen</u>
<u>*+E. Blomberg</u>	<u>*+T. Vaught</u>
<u>*+H. Hooper</u>	_____
<u>*+C. Douse</u>	_____
<u>*+K. Warner</u>	_____
<u>*+M. Clark</u>	_____
<u>*+R.M. Nugent</u>	_____
<u>*+D.P. Crane</u>	_____
<u>*+J. Burris</u>	_____

Other Certified Personnel:

<u>T. Allen</u>	_____
_____	_____
_____	_____
_____	_____
_____	_____

* Current First Aid Training
+ Current CPR Training

9.2 HASP APPROVALS

By their signature, the undersigned approved this HASP for applicability in the protection of the health and safety of all persons entering the NAS Whiting site.

Health and Safety Officer

Date

Project Manager

Date

E.C. Jordan Health and Safety Supervisor

Date

9.3 FIELD TEAM REVIEW

I have read and reviewed the HASP for NAS Whiting, understand the information contained, and agree to comply.

NAME: _____ DATE: _____

SITE/PROJECT: NAS Whiting, Milton, Florida

9.4 MEDICAL DATA SHEET

This Medical Data Sheet will be completed by all on-site personnel and will be kept in the Support Zone during site operations. It is in no way a substitute for the Medical Surveillance Program requirements consistent with the C-E Environmental Corporate Health and Safety Program for Hazardous Waste Sites. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required. If more information is required, use the back of this sheet.

Project: _____

Name: _____

Home Address: _____

Home Phone: Area Code () _____

DOB: _____ Height: _____ Weight: _____

In case of emergency, contact: _____ (wife)

Address: _____

Telephone (home): _____

Do you wear contacts? () Yes (X) No

Allergies: _____

List medication taken regularly: _____

Particular sensitivities: _____

Previous/recent illnesses or exposures to hazardous chemicals: _____

Name of Personal Physician: _____

Telephone: Area Code () _____

Project: NAS Whiting, Milton, Florida

Name: Mark Diblin

Home Address: 2001 Old St. Augustine Road Apt. H-110

Tallahassee, Florida 32301

Home Phone: Area Code (904) 656-3162

DOB: 06-27-61 Height: 5'8" Weight: 150 lb

In case of emergency, contact: Melissa Diblin (wife)

Address: Same

Telephone (home): Area Code (904) 656-3162 (work): (904) 877-1978

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: None

Telephone: Area Code ()

Project: NAS Whiting, Milton, Florida

Name: Kevin Warner

Home Address: 285 Whetherbine Way Tallahassee, Florida 32301

Home Phone: Area Code (904) 878-5651

DOB: 11-05-62 Height: 6'0" Weight: 200 lb

In case of emergency, contact: Mary Warner (wife)

Address: Same

Telephone: Same

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: None

Telephone: Area Code ()

Project: NAS Whiting, Milton, Florida

Name: Jack Davis

Home Address: 513 Martin Street Tallahassee, Florida 32308

Home Phone: Area Code (904) 222-7073

DOB: 03-28-52 Height: 5'10" Weight: 165 lb

In case of emergency, contact: Cheryl S. Davis (wife)

Address: Same

Telephone: Same

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: Capital Health Plan

Telephone: Area Code (904) 386-3121

Project: NAS Whiting, Milton, Florida

Name: Eric A. Blomberg

Home Address: 1414-C Shallow Brook Tallahassee, Florida 32301

Home Phone: Area Code (904) 656-7915

DOB: 05-22-63 Height: 6'02" Weight: 180 lb

In case of emergency, contact: John Blomberg (father)

Address: 2900 Brookside Cr., Parkersburg, West Virginia 26104

Telephone: Area Code (304) 428-2074

Do you wear contacts? () Yes () No

Allergies: Bee stings

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: None

Telephone: Area Code (904) 386-3121

Project: NAS Whiting, Milton, Florida

Name: Richard Xavier Gonzalez

Home Address: 1702 Ferndale Place Tallahassee, Florida 32301

Home Phone: Area Code (904) 942-0744

DOB: 09-02-55 Height: 5'10" Weight: 150 lb

In case of emergency, contact: Clara Gonzalez

Address: 1905 North Spring, Pensacola, Florida 32501

Telephone: Area Code (904) 438-4530

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: None

Telephone: Area Code ()

Project: NAS Whiting, Milton, Florida

Name: Michael R. Clark

Home Address: 418 Grail Drive, Tallahassee, Florida 32301

Home Phone: Area Code (904) 878-3278

DOB: 10-10-52 Height: 6'0" Weight: 190 lb

In case of emergency, contact: Lorraine G. Clark (wife)

Address: Same

Telephone: (home) Area Code (904) 878-3278 (work) (904) 488-0300

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: None

Telephone: Area Code ()

Project: NAS Whiting, Milton, Florida

Name: R. Michael Nugent

Home Address: 5375 Water Valley Drive, Tallahassee, Florida 32303

Home Phone: Area Code (904) 562-6454

DOB: 09-12-48 Height: 6'2" Weight: 175 lb

In case of emergency, contact: Julia Nugent (wife)

Address: Same

Telephone: (home) Area Code (904) 562-6454 (work) (904) 893-3181

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: None

Telephone: Area Code ()

Project: NAS Whiting, Milton, Florida

Name: Raymond A. Allen, III

Home Address: 1998-C Larette Drive, Tallahassee, Florida 32301

Home Phone: Area Code (904) 878-2438

DOB: 3-26-59 Height: 5'9" Weight: 180 lb

In case of emergency, contact: Julie Allen (wife)

Address: Same

Telephone: Same

Do you wear contacts? () Yes (X) No

Allergies: Erythromycin

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: Dr. Armour

Telephone: Area Code (904) 681-5435

Project: NAS Whiting, Milton, Florida

Name: Kenneth L. Busen

Home Address: Route 35, Box 2920, Tallahassee, Florida 32310

Home Phone: Area Code (904) 926-6037

DOB: 01-26-50 Height: 6'0" Weight: 172 lb

In case of emergency, contact: Karen Busen (wife)

Address: Same

Telephone: Same

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: Dr. Len Goff

Telephone: Area Code (904) 893-6706

Project: NAS Whiting, Milton, Florida

Name: Harry B. Hooper II

Home Address: 4425 Widgeon Way, Tallahassee, Florida 32303

Home Phone: Area Code (904) 562-5261

DOB: 04-25-48 Height: 5'11" Weight: 225 lb

In case of emergency, contact: Elena M. Hooper (wife)

Address: Same

Telephone: Same

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: lime eg. wet concrete

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: William T. Kepper, M.D.

Telephone: Area Code (904) 877-5143

Project: NAS Whiting, Milton, Florida

Name: Celora Y. Douse

Home Address: 2959 Appalachee parkway, Apt. E-3

Home Phone: Area Code (904) 942-4349

DOB: 07-30-63 Height: 5'03" Weight: 130 lb

In case of emergency, contact: Carolyn E. Douse (mother)

Address: 426 Kingston Street South, St. Petersburg, Florida 33711

Telephone: (813) 323-7004

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: Dr. Robert Steele

Telephone: Area Code (904) 878-5151

Project: NAS Whiting, Milton, Florida

Name: Tracie Lynn Vaught

Home Address: 2001 Old St. Augustine Road Apt M-108

Home Phone: Area Code (904) 942-1949

DOB: 10-07-59 Height: 5'10" Weight: 138 lb

In case of emergency, contact: Kile Fortune (sister)

Address: 5236 Row Trail Pace, Florida 33571

Telephone: (904) 994-6212

Do you wear contacts? () Yes (X) No

Allergies: None

List medication taken regularly: None

Particular sensitivities: bee stings and ant bites

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: Dr. Byrd

Telephone: Area Code (904) 681-5430

Project: NAS Whiting, Milton, Florida

Name: Janet Burris

Home Address: 1617 Springwood Drive, Tallahassee, Florida 32301

Home Phone: Area Code (904) 422-0056

DOB: 02-27-62 Height: 5'01" Weight: 106 lb

In case of emergency, contact: Donald Burris (father)

Address: P.O. Box 217 Beechgrove, Tennessee

Telephone: (615) 394-2483

Do you wear contacts? Yes No

Allergies: None

List medication taken regularly: None

Particular sensitivities: None

Previous/recent illnesses or exposures to hazardous chemicals: None

Name of Personal Physician: _____

Telephone: Area Code _____

9.5 EMERGENCY TELEPHONE NUMBERS

(LOCAL) Police Department	911
(LOCAL) Rescue Service	911
Santa Rosa Medical Center	(904) 623-9741
West Florida Regional Medical Center	(904) 478-4460
(Local) Fire Department	911
Off-site Emergency Services	911
National Poison Control Center	(800) 492-2414
Florida Poison Control Center	(800) 282-3171
National USEPA Emergency Response	(800) 424-8802
Florida Emergency Response	(904) 488-0190
Chemical Manufacturers Association Chemical Referral Center	(800) 262-8200
Site HSO: Janet Burris	(904) 656-1293
Site Manager: R. Michael Nugent	(904) 656-1293
Regional HSS: Jack Davis	(904) 656-1293
C-E Environmental HSM: J.A. Reynolds	(201) 992-2323 x264

9.6 ROUTES TO EMERGENCY MEDICAL FACILITIES

Primary source of medical assistance for the NAS Whiting:

Santa Rosa Medical Center
1450 Berry Hill Road
Milton, Florida 32570
(904) 623-9741

Directions to primary source of medical assistance: (map attached)

Drive 1 mile west from the site on Highway 87A, turn left, drive 5.5 miles south on Highway 89 to Berry Hill Road, turn right, travel 1.7 miles and the hospital will be on the right.

Alternate source of medical assistance:

West Florida Regional Medical Center
8383 N. Davis Highway
Pensacola, Florida 32514
(904) 478-4460

Directions to alternate source of medical assistance:

Drive 1 mile west from the site on Highway 87A, turn left, drive 6 miles south on Highway 89 to Highway 90, turn right and travel 13 miles to Davis Parkway (veer to the left). Travel 2.2 miles and the hospital is on the right side of the parkway.

9.7 EMERGENCY SIGNALS

At NAS Whiting portable radios are not anticipated to be used for communication. In the event they were used, a transmission that indicates it is of an emergency nature will take priority over all other transmissions. All other side radios will yield the frequency to the emergency transmissions

Where radio communication is not available, the following air horn signals shall be used:

- HELP three short blasts (. . .)
- EVACUATION three long blasts (_ _ _)
- ALL CLEAR alternating long and short blasts (_ . _ .)

APPENDIX A

E.C. JORDAN HEALTH AND SAFETY PROGRAM

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1.0 INTRODUCTION

The E.C. Jordan Co. (Jordan) began a formal program of site risk assessment and implementation of mitigative health and safety programs in March 1981. At that time, existing departmental policies/practices were collected and reviewed, additional needs identified and a corporate personnel health and safety plan drafted.

Currently, Jordan's Health and Safety Supervisor (HSS), with the aid of the ten-member Personnel Health and Safety Committee (PHSC) regularly reviews health and safety issues, updates practices as new information becomes available, oversees administration of the Health Monitoring Program and provides guidance for personnel training as appropriate. The PHSC is a corporate entity, effectively precluding any departmental and contract pressures on health and safety policy decisions.

Each project site is classified hazardous or non-hazardous by the HSS after a review of available data. Prior to on-site activities at those sites classified as hazardous, a health and safety plan (Appendix A) must be completed by the project engineer/scientist. This is accomplished by a review of available information on the site to assess the potential risks and provide an initial determination of personal protection requirements. The health and safety plan is subsequently reviewed and must be approved by the HSS. The designated Site Health and Safety Officer (HSO) monitors actual site conditions and may alter these requirements as needed. In all cases, personnel safety is the paramount factor in decision-making.

2.0 HEALTH MONITORING AND SAFETY PROGRAM

To protect the health and safety of employees assigned to work at hazardous waste sites, the Jordan has developed and implemented a Health and Safety Program. This program is administered by the Health and Safety Supervisor with aid from a committee consisting of representatives of Jordan technical department staffs with support from medical advisors. All personnel on-site must be enrolled in the Health Monitoring Program and must receive training appropriate for their assigned function.

In addition to Jordan employees, subcontractors and consultants working on hazardous waste sites will be enrolled in an equivalent Health Monitoring Program and receive health and safety indoctrination prior to commencing work on the site. Indoctrination, training and periodic followup is conducted as appropriate. Indoctrination and training includes:

- o site history;
- o inventory of site chemicals known or suspected (will be updated and reviewed at each stage of the field investigation program);
- o project organization;
- o work plan review;
- o project documentation;
- o review of site safety plan (site safety plans are updated as new information becomes available)
- o review of decontamination procedures;
- o proper use and care of personal protective equipment;
- o proper calibration and use of monitoring equipment;
- o emergency response procedures;
- o accident reporting procedures; and
- o contingency plans.

The site-specific information required to address the areas noted above is presented in summary safety plans prepared for each site. The plans are intended to provide a framework within which information may be updated and ongoing decisions made regarding actual health and safety concerns at the site.

3.0 MEDICAL SURVEILLANCE PROCEDURES

3.1 Health Monitoring Program

All on-site Jordan personnel and laboratory staff must be enrolled in the Health Monitoring Program which is implemented through Executive Health Examiners, New York, NY. Executive Health Examiners consists of a team of physicians and support personnel who specialize in toxicology. This program consists of an initial medical examination to establish the employee's general health profile and provides important baseline laboratory data for later comparative study. The contents of the initial comprehensive physical examination and laboratory testing routine is given in Table 3-1. Follow-up examinations are completed for all personnel enrolled in the health monitoring program on an annual basis, or more frequently if project assignments warrant testing following specific field activities. Followup examinations are tailored to the exposures recorded by the individual.

3.2 Review of Exposure Symptoms

Symptoms of exposure to hazardous materials will be reviewed for each site in order to indicate to personnel the recognized signs of possible exposure to those materials. This information will be supplemented with a discussion of the need for objectivity in the personal health assessment to account for normal reaction to stressful situations. The HSO will be watchful for outward evidences of changes in worker health. These outward symptoms may include skin irritations, skin discoloration, eye irritation, muscular soreness, fatigue, nervousness or irritability, intolerance to heat or cold or loss of appetite. Employees will routinely be asked to assess their general state of health during the project.

Special medical monitoring may be identified for certain sites.

TABLE 3-1
BASELINE HEALTH MONITORING PROGRAM

1. PHYSICAL EXAMINATION

- a. Medical history
- b. Medical examination
- c. Vision:
 - o near/distant
 - o color
- d. Audiometry
- e. Radiology: PA/LAT
- f. Spirometry
- g. Electrocardiogram

2. LABORATORY ANALYSIS

- a. Complete Blood counts and chemistries
 - white blood count
 - differential cell counts
 - methemoglobin
 - uric acid
 - lactic dehydrogenase (LDH)
 - alkaline phosphatase
 - calcium
 - phosphorous
 - cholesterol
 - urea nitrogen (BUN)
 - glucose
 - albumin
 - gobulin
 - total protein
 - total bilirubin
 - serum glutamic oxalacetic transaminase (SGOT)
 - hemoglobin and/or hematocrit

- c. Urine Analysis
 - color and character
 - specific gravity
 - pH
 - protein
 - acetone
 - glucose
 - microscopic examination

4.0 TRAINING

All personnel working on a Jordan site, who may potentially be exposed to toxic substances or hazardous materials, will have participated in an initial and annual refresher and/or supervisory training, as appropriate, as well as site specific training prior to the commencement of their on-site assignment. The initial Health and Safety Training Program consists of the forty (40) hour training required and designated by the OSHA standard 29 CFR 1910.120. In addition to the initial training, Jordan also employs eight (8) hour annual refresher and supervisory training elements. This general personnel training is augmented by site specific training regarding site hazards and specialized problems and protocols.

4.1 Initial Training

All site assigned personnel who are potentially exposed to toxic substances or hazardous materials will be required to participate in a training course on hazardous waste site operations. This training is required under provisions of the OSHA standard and must consist of forty hours covering the following subjects:

- o Familiarity with the regulations and implications of OSHA regulations 29 CFR 1910.120.
- o Familiarity with the organizational structure responsible for site health and safety.
- o Explanation of the medial surveillance requirements including recognition of health hazards.
- o Instruction in the use and maintenance of personal protective equipment.
- o The identification and analysis of site chemical and physical hazards.
- o Instruction regarding monitoring equipment including personnel and environmental sampling instruments.
- o Site control and decontamination procedures.
- o Contingency planning.
- o Confined Space entry procedures.

4.2 Annual Refresher/Supervisory Training

On an annual basis, all personnel required to have participated in the initial training will be provided an eight (8) hour refresher training course. Those personnel with either site supervisory or health and safety responsibilities will also have eight (8) additional hours of training beyond the initial forty

hours. The eight (8) hour supervisory training meets the requirements of the annual refresher.

4.3 Site Specific Training

All personnel assigned to an E.C. Jordan site must participated in the site specific training presentation. The site specific training will cover the major elements of the site Health and Safety Plan (HASP) as well as the health and safety procedures regarding an individual's specific job responsibilities and tasks. The site HSO or H&S designee shall provide this training before an individual is permitted to work in a down range position on any site.

4.4 Other Training

Additional training shall be provided as determined by the Health and Safety Manager (HSM) or the Health and Safety Supervisor (HSS). Such training may include additional refreshers on personal protective equipment, instrumentation, CPR, First Aid or any other pertinent health or safety related subject.

5.0 PERSONAL PROTECTION LEVEL DETERMINATION

The level of personal protective equipment required shall be determined by the type and levels of waste or spill material present at the site where project personnel may be exposed. In situations where the types of waste or spill material on-site are unknown, the hazards are not clearly established or the situation changes during on-site activities, the HSO must make a reasonable determination of the level of protection that will assure the safety of investigators and response personnel until the potential hazards have been determined through monitoring, sampling, informational assessment, laboratory analyses or other reliable methods. Once the hazards have been determined, protective levels commensurate with the hazards will be used. Protection requirements will be evaluated on a continuous basis to reflect new information as it is acquired.

Preparation of site-specific plans will be based on the site-specific information made available through site files, RAMP and FIT reports, as well as any other sources identified.

The levels of protection utilized by E.C. Jordan Co. are presented below:

Level A. Level A protection must be selected when the HSO makes a reasonable determination that the highest available level of respiratory, skin and eye protection is needed. It should be noted that while Level A provides maximum available protection, it does not protect against all possible hazards. Consideration of the heat stress that can arise from wearing Level A protection should also enter into the subtask leaders decision. (Comfort is not a decision factor, but heat stress will influence work rate, scheduling, and other work practices.)

Level B. The HSO must select Level B protection when the highest level of respiratory protection is needed, but hazardous material exposure to the few unprotected areas of the body (e.g., the back of the neck) is unlikely.

Level C. The HSO may select Level C when the required level of respiratory protection is known, or reasonably assumed to be, not greater than the level of protection afforded by full face air purifying respirators; and hazardous materials exposure to the few unprotected areas of the body (e.g., the back of the neck) is unlikely. Level C requires carrying an emergency escape respirator.

Level D. Level D is the basic work uniform, selected when site hazards are judged to be minimal. Investigators and response personnel, however, must not be permitted to work in civilian clothes. Level D often requires carrying an escape respirator.

Fit testing of safety equipment is an important part of establishing adequate respiratory protection (see also Appendix B). Fit testing is accomplished prior to site explorations and each individual is assigned a fitted respirator for the duration of the project. These are tagged for identification. The equipment used for each level of protection is shown in Table 5.1.

TABLE 5-1
Protective Gear

	Level D	Level C	Level B	Level A
Action Level ¹	0	0 to 5	5-500	500-1000
Respirator Type ²	Escape	Full Face & Escape	SCBA	SCBA
Clothing				
o Boots	X	X	X	X
o Safety glasses or equivalent	X	X	X	
o Hard hat	X	X	X	
o Gloves, inner and outer	X	X	X	X
o Booties		X	X	X
o Coveralls	X	X	X	
o Chemical protective coveralls		X	X	
o Totally encapsulated suit				X

¹ Action levels are defined as air quality degradation from background levels, in ppm, by volatile contaminants as measured by a photoionization meter calibrated in the clean (support) zone. The action required is review of contaminants and reassessment of appropriate protective gear by the Site Health and Safety Officer.

² Use of an air purifying respirator is allowed only where identification of constituents has occurred and appropriate respirator cartridges have been obtained. (Refer to Appendix B, Figure 1).

³ It must be recognized that a photoionization meter's relative response varies with each compound. Action levels should be reviewed (when constituents are known) to determine appropriate modifications.

It should be recognized that situations exist where different combinations of respiratory and dermal protective gear are appropriate, e.g., where splash protection is required but no respiratory hazard exists. The HSO may elect a modification of the above specified combinations.

5.1 Potential Hazards On-Site

Table 5-2 includes a typical data summary concerning the toxicity of chemicals that may be found in soil and water on-site. A similar table will be included in the summary site safety plan if appropriate.

A review of physical hazards must also be performed.

TABLE 5-2
CHEMICAL TOXICITY AND OTHER INFORMATION

Chemical	TLV (ppm)	ACC or STEL (ppm)	Physical State	Skin Penetration	Dermal Toxicity	Potency	LD ₅₀ (mg/kg) oral (rat)	Remarks
Phenols carbolic acid monohydroxybenzene	5 skin	10	Colorless to brown-black; solid or thick liquid				414 344(mice)	Absorption from spilling phenolic solution on skin may be very rapid. Death has resulted due to absorption of phenol through skin. Symptoms: irritates eyes, nose, throat. May cause anorexia. Contact: Skin burn, tremor, convulsion Target Organ: liver, kidneys, skin, pancreas <u>First Aid.</u> Swallow: water, vomit. Skin: soap wash. Incompatibilities: Strong oxidizers; calcium hypochlorite Toxicity ¹ : 3; Persistence ² : 1
Acetone [CH ₃ COCH ₃] Dimethyl ketone ketone propane	750	1000	liquid; mint-like odor	+++	local	++	9750 1297(mice)	Symptoms: irritates eyes, nose, throat; narcotic in high concentrations Target Organ: respiratory system, skin <u>First Aid:</u> Swallow: water, vomit Skin: soap wash Incompatibilities: oxidizing materials, acids. Fire hazard when exposed to heat or flame. Toxicity ¹ : 1; Persistence ² : 0
Chloroform* [CHCl ₃] trichloromethane	10	50	colorless liquid sweet odor				800 LC _{LO} (mice) = 28 ppm	Causes irritation of the conjunctiva, dilation of the pupils and reduces reaction to light. Pro- longed inhalation will bring on paralysis accom- panied by cardiac failure. Symptoms: dizziness, mental dullness, nausea, headache, fatigue, eye and skin irritant Target organs: liver, kidneys, heart <u>First Aid:</u> Swallow: Ipecac, vomit Skin: soap wash Incompatibilities: strong caustics; chemically active metals: Al, Mg-powder, Na, K Toxicity ¹ : 2, Persistence ² : 3

TA 2
 CHEMICAL TOXICITY AND OTHER INFORMATION
 (continued)

Chemical	TLV (ppm)	ACC or STEL (ppm)	Physical State	Skin Penetration	Dermal Toxicity	Potency	LD ₅₀ (mg/kg) of rat	Remarks
Benzene* [C ₆ H ₆] benzol	1	25	colorless liquid with aromatic odor	++	local systematic	++ +++		<p>Poisoning occurs most commonly through inhalation; also penetrates through skin.</p> <p>Symptoms: irritates eyes, nose, respiratory system, giddiness, head, nausea, staggered gait; fatigue, depression, abdominal pain Target organ: blood, CNS, skin, bone marrow eyes, respiratory system</p> <p><u>First Aid:</u> Swallow: NO VOMIT Skin: soap wash</p> <p>Incompatibilities: strong oxidizers, chlorine, bromine with iron. Dangerous when exposed to heat or flame.</p> <p>Toxicity¹: 2; Persistence²: 1</p>
Trichloroethylene ethylene trichloride tridene TCE	50	200	colorless liquid, sweet odor				4920 1900(dog)	<p>Symptoms: headache, vertigo, vision distortion, tremors, somnolence, nausea, vomit, irritates eyes, cardiac arrhythmias, paresthesias Target organ: respiratory system, heart, liver, kidneys, CNS, skin.</p> <p><u>First Aid:</u> Swallow: Ipecac, vomit Skin: soap wash immediately</p> <p>Incompatibles: strong caustics; chemically active metals: Ba, Li, Na, Mg, liquid O₂, Al, O₂, KNO₃, Ti</p> <p>Persistence²: 3</p>

TABLE 5-2
CHEMICAL TOXICITY AND OTHER INFORMATION
(continued)

Chemical	TLV (ppm)	ACC or STEL (ppm)	Physical State	Skin Penetration	Dermal Toxicity	Potency	LD ₅₀ (mg/kg) oral (rat)	Remarks
Toluene [C ₆ H ₅ CH ₃] toluol phenyl methane methyl benzene	100 skin	150	liquid	+	local systematic	+	5000 TC _{LO} Human = 200 ppm	Symptoms: fatigue, confusion, euphoria, dizzy, headache, dilated pupils, lack of appetite, nervousness, insomnia Target organ: CNS, liver, kidneys, skin <u>First Aid:</u> Swallow: NO VOMIT Skin: soap wash Incompatibilities: strong oxidizers Toxicity ¹ : 2; Persistence ² : 1
Xylene [C ₆ H ₄ (CH ₃) ₂] xylol 1,2-dimethyl benzene	100	150	liquid, colorless; aromatic odors		local systematic		LD _{LO} = 500 mg/kg	Symptoms: dizziness, excitement, drowsiness incoordination, staggering gait, irritates eyes, nose and throat, corneal vacuolization, nausea, vomit, abdominal pain Target organ: CNS, eyes, GI tract, blood, liver, kidneys, skin <u>First Aid:</u> Swallow: NO VOMIT Skin: soap wash Incompatibilities: strong oxidizers; dangerous when exposed to heat or open flame. Toxicity ¹ : 2; Persistence ² : 1
1,1,2,2-Tetrachloroethylene ethylene tetrachloride Perchloroethylene [CCl ₂ =CCl ₂]	50		colorless liquid; sweet odor				LD _{LO} (dog) = 4000 TC _{LO} Human = 230 ppm	Liquid can cause injuries to eyes, toxic by inhalation. Symptoms: 200 ppm or higher causes irritation of nose, throat, vomiting, nausea, drowsiness Target organ: liver, kidneys, eyes, upper respiratory system, CNS <u>First Aid:</u> Swallow: Ipecac, vomit Skin: soap wash. Incompatibilities: strong oxidizers; chemically active metals such as: Ba, Li, Be.

5-2
CHEMICAL TOXICITY AND OTHER INFORMATION
(continued)

Chemical	TLV (ppm)	ACC or STEL (ppm)	Physical State	Skin Penetration	Dermal Toxicity	Potency	LD ₅₀ oral (rat) (mg/kg)	Remarks
1,2-Dichloroethane* [ClCH ₂ CH ₂ Cl] ethylene chloride glycol dichloride ethylene dichloride	10	15	clear liquid with sweet odor	++	local systematic	++ ++	770	High to moderate toxicity via dermal and oral routes. It has specific effects on the cornea. Dermatitis in man has been observed. Symptoms: irritation of eyes, nose and throat, followed by dizziness, nausea, vomiting, increasing stupor, cyanosis, rapid pulse and loss of consciousness. Target organ: respiratory system, liver, kidneys, skin, eyes. <u>First Aid:</u> Swallow: Ipecac, vomit.
Chlorobenzene [C ₆ H ₅ Cl] monochlorobenzene chlorobenzol	75 (350 mg/m ³)	--	colorless liquid				2910	Symptoms: irritates eyes, nose, causes drowsiness, incoordination, skin irritation, Target organ: respiratory system, eyes, skin, ears, liver <u>First Aid:</u> NO VOMIT Incompatibilities: strong oxidizers, reacts violently with AgClO ₄ Toxicity ¹ : 2; Persistence ² : 2
Ethyl benzene [C ₂ H ₅ C ₆ H ₅] phenyl ethane ethyl benzol	100	125	colorless liquid with aromatic odor	++	local systematic	++ +++	3500 TC _{LO} (Human) = 100 ppm 4 hrs.	Symptoms: irritant to eyes and mucous membrane, headache, narcotic Target organ: eyes, upper respiratory system <u>First Aid:</u> NO VOMIT Incompatibilities: oxidizing materials; dangerous when exposed to heat or flame.
1,2-dichloroethylene [ClCH=CHCl] acetylene dichloride dioform	200	250	colorless liquid slightly acrid odor				770	Has produced liver and kidney injury in experimental animals. Symptoms: irritable to eyes, respiratory system, causes depression. Target organ: respiratory system, eyes, ears

TABLE 5-2
CHEMICAL TOXICITY AND OTHER INFORMATION
(continued)

Chemical	TLV (ppm)	ACC or STEL (ppm)	Physical State	Skin Penetration	Dermal Toxicity	Potency	LD ₅₀ (mg/kg) oral (rat)	Remarks
								<p><u>First Aid:</u> Swallow: Ipecac, vomit</p> <p>Incompatibilities: strong oxidizers, dangerous when exposed to heat or flame. Reacts violently with KOH, Na, NaOH.</p>
Methylene chloride [CH ₂ Cl ₂] dichloromethane methylene dichloride	100	500	colorless liquid	++	local systematic	++ +++	2136 TC _{LO} (Human) -500 ppm 8 hrs.	<p>Dangerous to eyes. It induces narcosis; can cause dermatitis with prolonged exposure, highly volatile. It can decompose by contact with hot surfaces and open flame and produce toxic fumes.</p> <p>Symptoms: fatigue, weak, sleepy; limbs numb or tingling Target organ: skin, CVS, eyes, CNS</p> <p><u>First Aid:</u> Swallow: Ipecac, vomit</p> <p>Incompatibilities: reacts violently with Li, Na, K, tertbutoxide; strong oxidizers and caustics</p>
Mesitylene [(CH ₃) ₃ C ₆ H ₃] 1,3,5-trimethyl benzene			liquid, peculiar odor				LD _{LO} 1500 TC _{LO} (Human) = 10 ppm	<p>Causes CNS disturbances.</p> <p>Incompatibilities: violent with HNO₃</p>
Dioctyl phthalate di-sec-octyl phthalate		5 mg/m ³	light, colored liquid				31,000	<p>Toxicity: low to none via oral and dermal routes produce GI symptoms.</p>
1,1,2-Trichloroethane CHCl ₂ CH ₂ Cl vinyl trichloride beta trichloroethane		10	colorless liquid, sweet odor					<p>Toxicity: high via subcutaneous and intravenous routes; has narcotic properties; low via inhalation, oral or dermal</p> <p>Symptoms: local irritant to eyes, nose and lungs Target organs: CNS, eyes, nose, liver, kidneys</p> <p><u>First Aid:</u> Swallow: Ipecac, vomit Skin: soap wash</p> <p>Incompatibilities: strong oxidizers and caustics; active metals: Al, Mg powder, Na, K.</p>

1 5-2
 CHEMICAL TOXICITY AND OTHER INFORMATION
 (continued)

Chemical	TLV mg/m ³	ACC or STEL mg/m ³	Physical State	Remarks
Cadmium* dust and fumes	.05	0.2	Silver/white/blue tinged metal compounds have different appearances.	<p>Continuous exposure to cadmium may cause irreversible lung injury, abnormal lung function and kidney disease. Increased incidence of prostatic cancer, kidney and and respiratory cancer in cadmium workers has been observed. Dust or powder is flammable, toxic gases may be released in a fire.</p> <p><u>Symptoms:</u> Inhalation: irritation of nose and throat, 0.5 to 2.5 mg/m³ exposure can cause non-fatal lung inflammation. 4 to 10 hours exposure - severe chest pain, persistent cough, and difficulty in breathing. Eye: Irritation Ingestion: A dose of 15-30 mg of metal or soluble salt may cause increased salivation, choking, vomiting, abdominal pain, etc.</p> <p><u>First Aid:</u> Ingestion: Conscious person - give large amounts of water immediately and seek medical advice.</p> <p><u>Incompatibilities:</u> Strong oxidizers, elemental sulfur, selenium, zinc, hydrobenzoic acid, ammonium nitrate.</p>
Chromium (II) and (III) Hexavalent (VI)*	0.5 0.05		Steel gray metal or silver metal powder.	<p>The toxicity of chromium varies with different chromium compounds. Chromic acids and chromates appear to be more toxic than chromium metal dust, insoluble chromium salts, and soluble chromic and chromous salts. Exposure to certain hexavalent chromium compounds is associated with an increased lung cancer incidence in humans.</p> <p><u>Symptoms:</u> Inhalation: Dust may cause irritation of nose, throat, respiratory passages, and lungs. Repeated or prolonged exposure to chromic acid or dust may cause ulceration and perforation of the nasal septum. Skin: Dermatitis, repeated exposure may cause an allergic skin rash. <u>Incompatibilities:</u> Alkalies, dil H₂SO₄ & HCl.</p>
Copper Fume Dust & mist as copper	0.2 1.0		Reddish Lustrous metal	<p><u>Symptoms:</u> Inhalation: Copper and Copper oxide fumes may cause metal fume fever - chills, fever, aching muscles, dry mouth and throat, headache, nausea, vomiting, diarrhea and stomach pains. Skin: May cause irritation - metal solutions can cause swelling and itching. Ingestion: May cause stomach pain, nausea, vomiting and diarrhea from ingestion of 10 mg of copper by an adult and 8.5 mg by a child. Long Term: No long term effects from inhalation or ingestion reported. Copper fragment in cornea may cause cataracts.</p> <p><u>First Aid:</u> Ingestion: Seek medical attention. (Pennillamine or triethylenetetramine dihydrochloride may be beneficial in reducing body burden.)</p>

TABLE 5-2
 CHEMICAL TOXICITY AND OTHER INFORMATION
 (continued)

Chemical	TLV mg/m ³	ACC or STEL mg/m ³	Physical State	Remarks
				<u>Incompatibilities:</u> Acetylene gas, magnesium metal, oxidizing agents.
Cyanide Compounds				
KCN	5		White solids with faint	Cyanide compounds of sodium and potassium can affect the body if inhaled or
NaCN	(Skin)		almond odor	in contact with eyes and skin or ingested. Sufficient cyanide may be absorbed through the skin to cause fatal poisoning.
				<u>Symptoms:</u> Low level of exposure causes weakness, headache, confusion, may cause nausea and vomiting. Irritation to nose and skin. High exposure causes rapid loss of consciousness, stop breathing and death.
				<u>First Aid:</u> Obtain medical advice immediately and follow instruction in first aid kit. A first aid kit should contain minimum of 48 ampules each of 0.3 ml amyl nitrate and complete instructions for use. Trained medical personnel should have physician's kit which includes an addition to amyl nitrate, sterile sodium nitrite solution 3% and sterile sodium thiosulfate solution (25%).
				<u>Incompatibilities:</u> In closed containers it may form toxic concentration of HCN gas. Strong oxidizers such as chlorates, nitrates, acid or acid salts Cyanide salt may react with CO ₂ in air to form HCN
Hydrogen Cyanide (gas or liquid)			Colorless or pale blue liquid or gas, bitter almond odor.	Symptoms and First Aid are similar to cyanide. However, liquid or gas is very toxic and additional precautions are required. (HCN odor should be treated as poor warning. Although odor threshold of 0.1 ppm is below the permissible exposure limit the sense of smell is easily fatigued and wide individual variation in the minimum odor threshold is known.)
				<u>First Aid:</u> Same as cyanide.
				<u>Incompatibilities:</u> Bases - caustic and ammonia may cause violent polymerization and explosion. Liquid HCN will attack some forms of plastics, rubber and coatings.
Lead	0.15	0.45	Bluish white or silvery gray solid.	Lead is a cumulative poison. Increasing amount builds up in the body and eventually a point is reached where symptoms and disability may occur. Lead dust carried home may cause symptoms in other family members.
Lead Chloride*				<u>Symptoms:</u> Long term exposure: decreased physical fitness, fatigue, sleep disturbances headache, aching bones, constipation, decreased appetite, and abdominal pain. Inhalation of large amounts of lead may lead to seizures, coma and death.
Lead Nitrate*				

5-2
 CHEMICAL TOXICITY AND OTHER INFORMATION
 (continued)

Chemical	TLV mg/m ³	ACC or STEL mg/m ³	Physical State	Remarks
				<p><u>First Aid:</u> Get medical attention. Ingestion: If victim is conscious, give water. <u>Incompatibilities:</u> Reacts violently with potassium.</p>
Nickel and Soluble Nickel Compounds	1 0.1		Silvery White workable metal White or colored crystal or powder	<p>Nickel is an insoluble metal, but most common salts are soluble.</p> <p><u>Symptoms:</u> (From nickel dust and salts.) Inhalation: Dust and mists can cause lung irritation, shortness of breath, coughing and wheezing. Skin: Itching, burning and sores referred to as "nickel itch". Eyes: Irritation and damage to cornea. Ingestion: Giddiness and nausea Long term exposure, in addition to symptoms listed above, impairment of sense of smell, chest pain, destruction of nasal tissues and asthmatic lung disease. Dust inhalation has been associated with an increased risk of lung and nasal cancer.</p> <p><u>First Aid:</u> Ingestion: large amounts of water. Seek medical attention. <u>Incompatibilities:</u> Nickel dust is flammable. Reacts violently with fluorine, strong mineral acids; ammonium nitrate, etc.</p>
Zinc Zinc Chloride*			Blue powder	<p>Zinc is considered an essential trace element, necessary for normal growth and development. Most zinc compounds have a relatively low order of toxicity however, occupational exposure to zinc chloride and zinc oxide has been associated with adverse health effects. Spontaneous combustion may occur if zinc dust is stored in a damp place. Zinc dust forms an explosive mixture with air.</p> <p><u>Symptoms:</u> Inhalation: Inhalation of mists of fumes may cause respiratory or gastrointestinal irritation, shortness of breath, a feeling of constriction in the chest and coughing with phlegm and bloody sputum. It may also produce a cyanosis, resulting in a blue color of the skin and lip. Exposure to freshly formed zinc oxide fumes can cause a flu-like illness called metal fume fever, with symptoms similar to those encountered with viral influenza. Skin: Skin contact with zinc chloride may produce dermatitis. Ingestion: 12 grams of zinc metal over two days has caused sluggishness, light headedness; a staggering gait and difficulty in writing.</p> <p><u>Incompatibilities:</u> Acids, strong alkalies, amines, chlorides, chlorates, nitrates, oxides, fluoroine, S, CB₂.</p>

TABLE 5-2
 CHEMICAL TOXICITY AND OTHER INFORMATION
 (continued)

NOTES

TLV - Threshold Limit Value
 ACC - Acceptable Ceiling Concentration
 STEL - Short Term Exposure Limit

* Suspected carcinogens, teratogens or mutagens.

** First Aid: Unless specified, first aid for all of the listed chemicals are as follows:

Eyes: immediately wash with copious quantity of cold water

Skin: Flush with water promptly

Breath: Artificial respiration

Swallow: Water, vomit

+ Slight Hazard

++ Moderate Hazard

+++ Extreme Hazard

¹Toxicity Ratings:

	<u>Toxicity Rating</u>	
No toxicity (none) condition or produces very unusual circumstances or	0	Material causes no harm in any toxic effects on humans in in very large dosage.
Slight toxicity (low)	1	
Moderate toxicity	2	
Severe toxicity	3	

²Persistence or each hazardous substance is evaluated on its biodegradability as follows:

	<u>Assigned Value</u>
Easily biodegradable compounds	0
Straight chain hydrocarbons	1
Substituted and other ring compounds	2
Metals, polycyclic compounds and halogenated hydrocarbons	3

6.0 WORKER SAFETY PROCEDURES

6.1 General

Workers will be expected to adhere to the established safety practices for their respective specialties (e.g., drilling, laboratory analysis, construction, etc.). The need to exercise caution in the performance of specific work tasks is made more acute due to weather conditions, restricted mobility and reduced peripheral vision caused by the protective gear itself, the need to maintain the integrity of the protective gear and the increased difficulty in communicating caused by respirators. Work at the site will be conducted according to established protocol and guidelines for the safety and health of all involved. Among the most important of these principles for working at a hazardous waste site are:

1. In any unknown situation, always assume the worst conditions and plan responses accordingly.
2. Employ the buddy system. Establish and maintain communication. In addition to radio communications, it is advisable to develop a set of hand signals as conditions may greatly impair verbal communications.
3. Minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas and procedures to accomplish this. Do not place equipment on drums or on the ground. Do not sit on drums or other materials.
4. Employ disposable items when possible to minimize risks during decontamination and possible cross-contamination during sample-handling. This will require a common sense approach to potential risks and costs.
5. Smoking, eating, or drinking after entering the work zone and before decontamination will not be allowed. Oral ingestion of contaminants is probably the second most likely means of introduction of the toxic substances into the body (inhalation being first).
6. Avoid heat and other work stresses related to wearing the protective gear. Work breaks should be planned to prevent stress related accidents or fatigue. Section 13.0 of the site plan report provides a summary heat stress casualty prevention plan.
7. Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.
8. Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved rapidly by the HSO to relieve any motivations or pressures to circumvent established safety policy.
9. Unauthorized breaches of specified safety protocol will not be allowed. Personnel unwilling or unable to comply with the established procedures will be replaced. Any changes in established procedure should be

documented on the form provided. The change should have a very specific, valid basis and must be approved by the HSO.

10. Be observant of not only one's own immediate surroundings but also that of others. Everyone will be working under constraints to awareness and it is a team effort to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment while utilizing personnel protective gear. Vision, hearing and communication are restricted by the protective gear.
11. Use of contact lenses will not be allowed on-site. These prevent proper flushing should corrosive or lachrymous substances enter the eyes.
12. Sites potentially requiring Level C or B protection will require the removal of facial hair (except moustaches) to allow a proper facepiece fit.
13. Rigorous contingency planning, and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.
14. Withdrawal from a hazardous situation to reassess procedures is the preferred course of action.
15. Be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess use of alcohol and working with an illness during field investigation assignments.
16. The site leader, the HSO and sampling personnel shall maintain records in a bound notebook recording daily activities, meetings, facts, incidents, data, etc., relating to the project. These record books will remain on the site during the full duration of the project so that replacement personnel may add information in the same record book, maintaining continuity. These notebooks and daily records will become part of the permanent project file.

6.2 Site Entry Procedures

In most cases, Jordan teams are not the first on-site investigators. Considerable knowledge of site history and current status allows the preparation of a HASP with reasonable assurance that personnel are adequately protected. In the event that sufficient site information is not available to perform a summary risk assessment and assign the appropriate level of personal protective equipment, the following procedures should be followed. It must be understood that verification of the level of contamination (even with background information) will always require some of the steps below.

1. Recognize that Jordan's presence on-site implies a perceived contamination potential by the client.
2. Assume that the site is contaminated and conduct a site safety reconnaissance.

- o establish contamination reduction zone (decontamination area);
 - o at the highest level of protection practicable, survey site beginning with a perimeter survey and gradually covering all areas of proposed activity with (as appropriate):
 - HNU photoionizer;
 - organic vapor analyzer;
 - radiation survey meter;
 - personal air sampling pumps;
 - chemically reactive indicating tubes
 - oxygen deficiency meter; and
 - explosive mixture meter.
 - o establish "hot zone"; and
 - o review data, assess risk and select the appropriate level of protection.
3. Prepare summary site HASP and document all data acquired.

7.0 SITE SAFETY EQUIPMENT

In addition to personal protective gear designated for the assigned level, various monitoring and safety equipment is maintained on-site. Minimum on-site equipment will generally include:

- o Photoionization meter;
- o Combustible gas indicator (explosimeter);
- o Oxygen meter or oxygen deficiency alarm;
- o Chemically reactive indicating tubes (specific to the site hazards);
- o Fire extinguishers;
- o First aid kits;
- o Eye wash station;
- o Radiation survey meter or radiation alert; and
- o Transportation suitable for emergency response.
- o Organic vapor analyzer (optional);

Additional equipment may be specified and obtained as field conditions dictate.

8.0 EMERGENCY PLANNING

8.1 Emergency Medical Services

Prior to site investigation or activity on hazardous sites, nearby health facilities will be evaluated to determine their capabilities in relation to the needs of on-site project staff. Criteria such as emergency department physician coverage, decontamination capabilities and available medical specialists are evaluated.

o On-site First Aid:

- An industrial first-aid kit will be provided at the work site and contents of the kit will be checked weekly and restocked as necessary. Other equipment may include: oxygen, backboard and straps, splints, and a cervical collar.
- At least one person qualified to perform first aid will be present on-site at all times during work activity. This person will have earned a certificate in first-aid training from the American Red Cross or will have received equivalent training. Designated first aides will receive regular review training from the American Red Cross or an equivalent session.
- An emergency shower and eye-wash station will be provided at the work site, as well as flushing water for decontamination of boots, gloves, clothing, tools, etc.

o Transportation to Emergency Treatment:

- A vehicle will be available at all times for use in transporting personnel to the hospital (in the event an ambulance is unnecessary or unavailable).
- Personnel stretchers will be located at the work site for use in transporting personnel to the vehicle. Alternate transportation routes to area hospitals will be established prior to on-site activity.

8.2 Contingency Planning

Prior to commencement of on-site activities, field personnel will review safety considerations with the HSO. The HSO is responsible for adherence to the designated safety precautions and assumes the role of on-site coordinator in an emergency response situation.

All on-site personnel will be familiarized with both the primary and secondary route to the nearest hospital (which may be shown on a Figure or local map) as well as the location of the nearest working telephone or radio communication device. Each will receive a list of emergency phone numbers as shown in Appendix F.

The local hospital and emergency response team will be advised in advance by the HSO of the work to be performed. The hospital will also be briefed on the availability of personnel health data and technical support through Executive Health Examiners.

Emergency communication will be required to ensure positive pre-planned notification of emergency authorities in the event of episodes requiring initiation of contingency plans.

- o The communication will be coordinated with local agencies, fire department, police, ambulance and hospital emergency room.
- o Two-way radio communication may need to be established in the field, and a site alarm capable of warning site personnel and summoning assistance will be maintained (air horns).
- o Emergency evacuation for residents of nearby homes is an unlikely event, but a person will be designated on-site to be responsible for implementing the contingency plan. The person will be made aware of the total number of households within a radius of 2,000 feet. Appendix A will provide the emergency contacts that will be required and an additional table will provide a list of residences and identifiable operations in the area in the event that evacuation is judged to be a possibility for a particular site.
- o Prior to any activity, personnel will investigate possible routes of evacuation.

A copy of an accident report form is provided in Section 14.0 of the site plan report. It should be filled out by the HSO and filed with the individual's supervisor and a copy retained in the project records if an accident occurs.

8.3 Potential Hazards

The most common hazards associated with hazardous waste site investigation include: 1) accidents; 2) contact or ingestion of hazardous materials; 3) explosion; and 4) fire.

8.3.1 Accidents. Accidents must be handled on a case by case basis. Minor cuts, bruises, muscle pulls, etc., will still allow the injured person to undergo reasonably normal decontamination procedures prior to receiving direct first aid. More serious injuries may not permit complete decontamination procedures to be undertaken, particularly if the nature of the injury is such that the victim should not be moved. The nature and degree of surface contamination at a site is generally low enough that emergency vehicles could reach the victim on-site without undue hazard. However, in the event that access on-site is limited, accident victims may be transported to a point accessible by an ambulance by Jordan personnel trained for this response.

8.3.2 Contact and/or Ingestion of Hazardous Materials. Properly prescribed and maintained protective clothing and adherence to established safety procedures are designed to minimize this hazard. However, it is still a possibility

that contact or ingestion of materials may occur. One possibility for exposure is the puncture of a buried drum of liquid during drilling operations which might cause the drum contents to contact personnel. Standard first aid procedures should be followed. The drilling rig will have a tank of water which may be useful in some circumstances, particularly to flush contaminants off any exposed skin areas. Eye wash bottles will also be maintained at the site in case of emergencies. In cases of ingestion or other than minor contact with known substances, the local Poison Control Center and hospital should be contacted and the victim brought there immediately for further treatment and observation.

8.3.3 Explosion. The drilling crew should be keenly aware of combustible gas meter readings and withdraw at any indication of imminently hazardous conditions (greater than 20% LEL). The detection of such conditions shall be reported to local agencies for potential execution of the evacuation plan should the situation be assessed as warranting such response.

8.3.4 Fire. The combustible gas meter also warns of imminent fire hazards at borings. The greatest fire hazard at the site should be recognized as handling the fluids (e.g., methanol, acetone) used for certain decontamination procedures. No smoking or open flames are allowed on site. Carbon dioxide fire extinguishers will be kept at the drilling rig, and the decontamination area/field office. The Fire Department, previously informed of site activities, will be called as needed.

8.4 Evacuation Response Levels

Evacuation responses will occur at three levels: (1) withdraw from immediate work area (100+ feet upwind); (2) site evacuation; and (3) evacuation of surrounding area. Anticipated conditions which might require these responses are described below:

Withdrawal Up-Wind (100 or more feet).

- o Sensing ambient air conditions as containing greater contaminant concentrations than guidelines allow for the type of respiratory protection being worn. The work party may return upon donning greater respiratory protection and/or assessing the situation as transient and past.
- o Breach in protective clothing or minor accident. The party may return when tear or other malfunction is repaired and first aid or decontamination has been administered.
- o Respirator malfunctions and must be replaced.

Site Evacuation.

- o Sensing ambient air conditions as containing explosive and persistent levels of combustible gas or excessive levels of toxic gases

- o Fire or major accident
- o Imminent explosion or explosion

Surrounding Area Evacuation.

- o Persistent, unsuppressable release of toxic or explosive vapors from test pits or borings (possible pressure release from punctured drum). Air quality should be monitored at several distances downwind to assess danger to surrounding area before initiating this response.

8.5 Evacuation Procedures

8.5.1 Withdrawal Upwind. The work party will continually note general wind directions while on-site. (A simple wind sock may be set up near the work site for visual determinations.) Upon noting the conditions warranting movement away from the work site, the crew will move upwind a distance of approximately 100 feet or further as indicated by the site monitoring instruments. Donning SCBA and a safety harness and line, the HSO and a member of the crew may return to the work site to determine if the condition noted was transient or persistent. If persistent, then an alarm should be raised to notify on-site personnel of the situation and the need to leave the site or don SCBA. An attempt should be made to decrease emissions only if greater respiratory protection is donned. The Health and Safety Supervisor (HSS) and client will be notified of conditions. When access to the site is restricted and escape may thus be hindered, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

8.5.2 Site Evacuation. Upon determination of conditions warranting site evacuation, the work party will proceed upwind of the work site and notify the security force, HSO and the field office of site conditions. If the decontamination area is upwind and greater than 500 feet from the work site, the crew will pass quickly through decontamination to remove contaminated outer suits. If the hazard is toxic gas, respirators will be retained. The crew will proceed to the field office to assess the situation. There the respirators may be removed (if instrumentation indicates an acceptable condition). As more facts are determined from the field crew, these will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and carried out by the HSO.

8.5.3 Evacuation of Surrounding Area. When the HSO determines that conditions warrant evacuation of downwind residences and commercial operations, the local agencies will be notified and assistance requested. Designated on-site personnel will initiate evacuation of the immediate off-site area without delay.

9.0 DECONTAMINATION

9.1 Personnel Decontamination Procedure

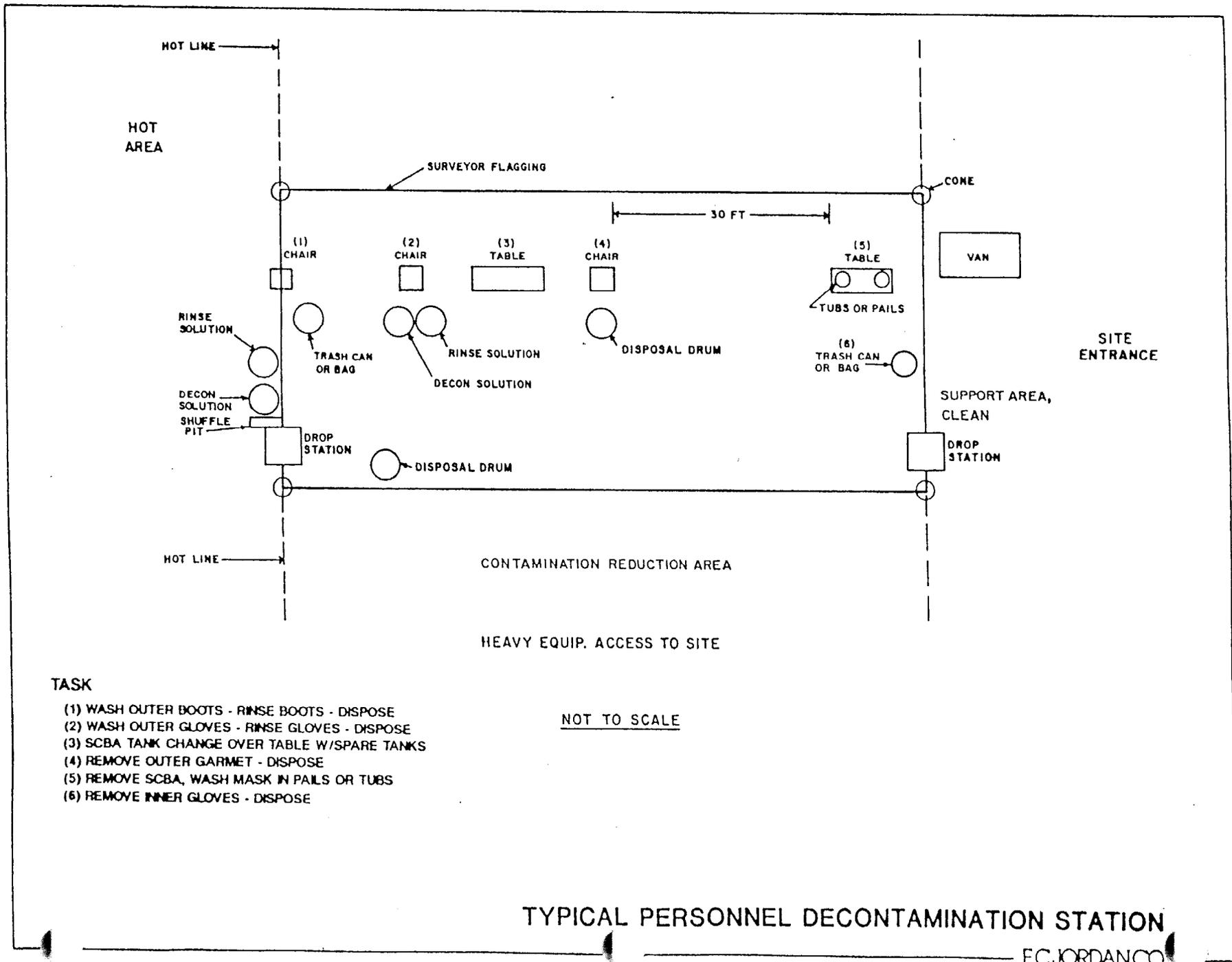
Decontamination procedures are carried out by all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination. Generalized procedures for removal of protective clothing are as follows:

1. Drop tools, monitors, samples, and trash at designated drop stations (i.e. plastic containers or drop sheets).
2. Step into the designated shuffle pit area and scuff feet to remove gross amounts of dirt from outer boots.
3. Scrub outer boots and outer gloves with decon solution or detergent and water. Rinse with water.
4. Remove tape from outer boots and remove boots; discard in disposal container.
5. Remove tape from outer gloves and remove gloves; discard in disposal container.
6. If the worker has left the exclusion zone to change the air tank on his/her SCBA, or the canister on his/her air purifying respirator, this is the last step in the decontamination procedure. The tank or cartridge should be exchanged, new outer gloves and boot covers donned, the joints taped, and the worker returns to duty.
7. Remove outer garments and discard in disposal container.
8. Remove respirator and place or hang in the designated area.
9. Remove inner gloves and discard in disposal container.
10. If the site requires use of a decontamination trailer, all personnel must shower before leaving the site at the end of the work day.

Note: Disposable items (Tyvek coveralls, inner gloves, and latex overboots) will be changed on a daily basis unless there is reason for changing sooner. Dual respirator canisters will be changed daily unless more frequent changes are deemed appropriate by site surveillance data or personnel assessment.

Pressurized sprayers or other designated equipment will be available in the decontamination area for wash down and cleaning of personnel, samples and equipment.

A schematic of a typical decontamination area is shown in Figure 9-1.



9.2 Equipment Decontamination

Equipment to be decontaminated during the project may include: (1) drill rig; (2) tools; (3) monitoring equipment; (4) respirators; (5) sample containers; (6) truck or trailer and (7) laboratory equipment.

All decontamination will be done by personnel in protective gear appropriate for the level of decontamination, determined by the Site Safety Officer. The decontamination work tasks will be split or rotated among support and work crews. Decontamination procedures within the trailer (if used) should take place only after other personnel have cleared the "hot area", moved to the clean area and the door between the two areas closed.

Miscellaneous tools and samplers will be dropped into a plastic pail, tub or other container. They will be brushed off and rinsed (outside, if possible) and transferred into a second pail to be carried to further decontamination stations. They will be washed with a detergent solution, rinsed with methanol or acetone (if required), rinsed with a detergent solution and finally rinsed with clean water.

9.2.1 Drilling Rig and Tools. It is anticipated that the drill rigs will be contaminated during test pit/borehole activities. They will be cleaned with high pressure water or portable high pressure steam followed by soap and water wash and rinse. Loose material will be removed by brush. The person performing this activity will usually be at the level of protection utilized during the personnel and monitoring equipment decontamination.

9.2.2 Sample Containers. Exterior surfaces of sample bottles will be decontaminated prior to packing for transportation to the analytical laboratory. Sample containers will be wiped clean at the sample site, but it will be difficult to keep the sample containers completely clean. The samples will be taken to the decontamination area. Here they will be further cleaned as necessary and transferred to a clean carrier and the sample identities noted and checked off against the chain-of-custody record. The samples, now in a clean carrier, will be stored in a secure area prior to shipment.

9.2.3 Monitoring Equipment. Monitoring equipment will be protected as much as possible from contamination by draping, masking or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The HNU meter, for example, can be placed in a clear plastic bag which allows reading of the scale and operation of the knobs. The HNU sensor can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed of in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes and dried. The units will be checked, standardized and recharged as necessary for the next day's operation. They will then be prepared with new protective coverings.

9.2.4 Respirators. Respirators will be decontaminated daily. Taken from the drop area, the masks will be disassembled, the cartridges set aside and the rest placed in a cleansing solution. (Parts will be precoded, e.g., #1 on all parts of mask #1). After an appropriate time within the solution, the parts will be removed and rinsed off with tap water. The old cartridges will be discarded into the contaminated trash container for disposal. In the morning the masks will be re-assembled and new cartridges installed if appropriate. Personnel will inspect their own masks to be sure of proper readjustment of straps for proper fit (see also Appendix B).

9.2.5 Decontamination Trailer or Truck and Staging Area. The decontamination trailer or truck, if used, will be cleaned daily. This will include vacuuming with a vacuum having a water filter to capture dust particles. The area will be wet mopped with cleanser and again with clean water. Work bench areas will be wiped down. Wash buckets and the cleaning area will be decontaminated and made ready for the next day's use.

9.2.6 Laboratory Equipment. Sample handling areas and equipment will be cleaned/wiped down daily. Disposable wipes will be used and discarded into a plastic bag. These will subsequently be taken to and placed in the disposal drum for final disposition. For final cleanup, all equipment will be disassembled and decontaminated. Any equipment which cannot be satisfactorily decontaminated will be disposed of (e.g., glassware, covers for surfaces) as previously indicated.

10.0 DOCUMENTATION AND RECORDKEEPING

Minimum documentation consists of:

- o daily field records kept by the site technical leader or designee;
- o site surveillance record kept by the Site Safety Officer;
- o sampling - related records kept by sample collection team;
- o chain-of-custody records for each sample collected; and
- o daily exposure record for each person on-site.

11.0 UPDATING OF HEALTH AND SAFETY PLAN

The HSO is responsible for maintaining proper documentation regarding the daily safety log. If any deficiency is encountered in the health and safety plan, a report will be prepared and forwarded to the HSS at Jordan and copies sent to the project manager and technical director. The HSO will immediately initiate necessary changes to improve protection of field staff.

During the remedial investigation process or after initial field investigation, any new chemical hazard encountered will be evaluated and safety plans modified to reflect the effect of that chemical hazard. Similarly, any physical hazards that are discovered will be addressed by the HSO and reported.

12.0 HEALTH AND SAFETY AUDIT PROCEDURES

Regular health and safety audits shall be conducted to assure compliance with health and safety policy and procedures. Auditing may be performed on any Jordan site by the HSS or the Corporate Health and Safety Manager (HSM), and will include health and safety evaluations of all work activities. The audits will be an unannounced evaluation of sites selected at the discretion of the HSS or HSM with a goal of 10 percent of active sites being subject to audits each quarter.

The results of each site health and safety audit will be summarized into an audit report that is provided to the site HSO, the Project Manager and the Operational Group Manager charged with responsibility for the project. Where the audit report identifies deficiencies, it will be the Project Manager's responsibility to promptly implement corrective action. The corrective action undertaken will be outlined in a written report submitted to the HSS and the HSM. The HSM or the HSS shall retain the original audit report which has been signed by the Project Manager and the HSO to acknowledge their receipt of the audit's findings. Any mitigating comments submitted to the HSM or the HSS shall be appended to the original report.

13.0 REFERENCE GUIDES FOR HAZARDOUS MATERIALS

Reference guides for material classification determinations are:

- 1) Chris Hazardous Chemical Data, Manual II, U.S. Department of Transportation and U.S. Coast Guard, 1985.
- 2) Dangerous Properties of Industrial Materials, Sax, N.I., Sixth edition, Van Nostrand Reinhold Co., 1984.
- 3) Documentation of TLV's and BEI's, 5th Edition, American Conference of Governmental Hygienists, 1986.
- 4) Guidelines for the Selection of Chemical Protective Clothing, 3rd Edition, American Conference of Governmental Industrial Hygienists, Inc., 1987.
- 5) Guide to Portable Instrumentation for Assessing Airborne Pollutants Arising from Hazardous Wastes, Draft International Document in, International Organization of Legal Metrology.
- 6) Handbook of Chemistry & Physics, 64th Edition, CRC Press, 1984.
- 7) Hazardous Waste Operations and Emergency Response, Occupational Safety and Health Administration, 29 CFR 1910.120, 1986.
- 8) The Merck Index, 9th Edition, Merck, Sharp & Dohme Ltd., 1980.
- 9) NIOSH/OSHA/OSCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, Public Health Services, Centers for Disease Control, National Institute for Occupational Safety and Health, 1985.
- 10) Pocket Guide to Chemical Hazards, 1980 Edition, NIOSH/OSHA, DHEW (NIOSH) Publication No. 78-120.
- 11) Registry of Toxic Effects of Chemical Substances, 8th edition NIOSH, 1978.
- 12) Threshold Limit Values and Biological Exposure Indices for 1987-1988, American Conference of Governmental Industrial Hygienists, 1987.

APPENDIX B
RESPIRATORY PROTECTION PROGRAM

RESPIRATORY PROTECTION PROGRAM

I. INTRODUCTION

This program has been developed to govern the selection and use of respiratory protective devices by E.C. Jordan Co. (Jordan) personnel. The program is intended to comply with Occupational Safety and Health Administration (OSHA) requirements as set forth in 29 CFR 1910.134(b). The scope of this program is limited to activities related to field investigations of potentially hazardous waste disposal sites.

II. PERSONNEL REQUIREMENTS

All personnel assigned to field activities at hazardous or potentially hazardous locations are currently required by Jordan's Health and Safety policies to be enrolled in the corporate Health Monitoring Program. A portion of this program involves spirometry, a measure of the respiratory system status. No personnel may be assigned to the use of, or withdraw from stock, any respiratory protective device without physician certification that use of such a device will not be injurious to health. Psychological limitations, e.g. claustrophobia, are also considered in personnel assignments. Training in the use of the selected device and fit testing, as described herein, are also required.

No personnel will be assigned duties which require a respirator when facial hair, skullcaps or eye glasses will interfere with a proper fit. No contact lenses may be worn with any respiratory protective device. Eyeglass frames which fit inside the respirator facepiece are provided as necessary.

III. APPLICABLE EQUIPMENT

Jordan maintains the following respiratory protective equipment:

- o full-face chemical/mechanical air purifying respirators
- o self-contained breathing apparatus
- o full-face air line-supplied breathing apparatus
- o 5-minute escape air supply

This equipment is intended for use on an as needed basis, to be determined by an evaluation of on-site conditions. Respiratory protective equipment should not be used arbitrarily by any Jordan personnel.

Selection criteria are presented separately; training is required in the use of each type of equipment prior to drawing from stock.

IV. PERSONNEL TRAINING

Training of personnel in the proper use and care of respiratory protective equipment is considered essential to the success of the program. Training encompasses:

- o respiratory protection principles
- o selection of appropriate equipment
- o use of equipment
- o maintenance of equipment
- o fit testing

Information regarding each topic is presented as standard respiratory protection procedures.

V. STANDARD RESPIRATORY PROTECTION PROCEDURES

The following information has been organized and presented by topic as Standard Respiratory Protection Procedures, to be used both in training and as reference material for field operations.

<u>Standard Respiratory Protection Procedure No.</u>	<u>Topic</u>
1	Respiratory Protection Principles
2	Selection of Respirators
3	Fit Testing
4	Inspection/Maintenance/Storage

These procedures are attached.

VI. PROGRAM ADMINISTRATION AND DOCUMENTATION

The administration of Jordan's Respiratory Protection Program is the responsibility of the Health and Safety Supervisor. Administration includes:

- o respirator selection
- o personnel training
- o fit testing
- o respirator maintenance
- o documentation
- o program evaluation and improvements
- o personnel pulmonary testing and certification

Written HASPs for each site, and site hazard assessments result in respirator selection in accordance with the decision logic set forth in Standard Respiratory Protection Procedure No. 2.

Fit testing and respirator maintenance is performed by the equipment manager of Jordan's Sample Control and Staging Center under the administration of the HSS. Major maintenance is performed by manufacturer certified technicians only. Personnel training in respiratory protection is one aspect of the HSS's ongoing personnel training programs.

Program evaluation is a dynamic process, occurring each time a Project HASP is prepared.

Medical supervision of personnel occurs as part of Jordan's Health Monitoring Program, also administered by the HSS. Medical surveillance is required for all personnel assigned to hazardous or potentially hazardous site activities.

Documentation of the various elements of Jordan's Respiratory Protection Program is achieved through several media:

- o Documentation of respirator selection is included in the hazard assessment of each site's HASP.
- o Documentation of personnel training is maintained in both hard-copy and computerized files.
- o Documentation of medical surveillance is achieved indirectly by maintaining a list of enrolled employees in the Health Monitoring Program and directly through physician certification of personnel allowed to be assigned respiratory protective devices.
- o Documentation of fit-testing is maintained on file with the equipment manager of the Sample Control and Staging Center, utilizing the appropriate form. (Exhibit 1)
- o Documentation of site surveillance is required both by this program and by the HASP for each site. Records of site surveillance are created by the HSO and maintained in project files.
- o Respirator inspection and maintenance records are created and maintained for each respirator, SCBA, and escape respirator by the equipment manager. (Exhibit 2)

Inspection and documentation occurs before each unit is removed from stock and when it is returned, or monthly.

EXHIBIT 1
RESPIRATOR FIT TEST WORKSHEET

EXHIBIT 2

RESPIRATOR USE & MAINTENANCE RECORD

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 1
RESPIRATORY PROTECTION PRINCIPLES

1.0 INTRODUCTION

Since the lungs are not completely effective in protecting the body against respirable chemical hazards, they must be artificially protected from toxic gases, vapors, and particulates. In addition, the body must be supplied with enough oxygen to maintain a normal capacity to perform tasks.

1.1 Routes of Exposure

The volume of air inhaled during "normal" activities is approximately 6 l/min. The volume of air inhaled during brisk activity or during periods of stress can go up to 75 l/min (a 12-fold increase).

Air is inhaled through the nose and mouth and travels an extremely turbulent path to the lungs. This turbulency results in the air impinging on many sites, thus allowing the insoluble particulates to become impacted and soluble particulates, vapors, and gases to become absorbed.

The inhaled air passes through the pharynx, the common passageway for both food and air, and enters the trachea at the larynx. The trachea (or windpipe) divides into two bronchi, which lead to the two lungs. All of these organs are collectively called the conducting tubes, since they lead the air to the alveoli, the site of gaseous exchange with the pulmonary capillaries (i.e., the blood).

Toxic substances may be absorbed at any point in the respiratory tract. The conducting tubes are lined with mucus and cilia. Insoluble contaminants caught in the mucus are swept up to the esophagus by the cilia and swallowed, thus causing an ingestion problem.

1.2 Oxygen Deficiency

1.2.1 Oxygen and the Respiratory Process

The chemical composition of normal air is presented below as Table 1.

Table 1
ATMOSPHERIC COMPOSITION

<u>GAS</u>	<u>VOLUME (%)</u>	<u>PARTIAL PRESSURE (mm Hg AT SEA LEVEL)</u>
Nitrogen	78.9	594
Oxygen	20.95	159
Argon	0.93	7
Carbon dioxide	0.04	0.03

It is not the percentage of oxygen in the air, but rather its partial pressure, that is important in respiration. As one increases in altitude, the percentage of oxygen stays constant, but its partial pressure drops. Additionally, as the percentage of oxygen in the air drops, so does its partial pressure.

The "anatomic dead space volume" of the respiratory tract is about 150 ml. The average breath draws in about 500 ml of air. This air is mixed with the air remaining in the dead space from the previous exhalation, which has been depleted in oxygen due to the normal respiratory process. The overall effect is a lower partial pressure of oxygen in the respiratory tract as compared with the ambient air. The average respirator adds about 100 ml of dead space to the respiratory system, which further lowers the partial pressure of oxygen in the respiratory system, causing a slight oxygen deficiency.

1.2.2 Oxygen Levels/Physiological Effect

The currently accepted National Institute for Occupational Safety and Health (NIOSH) standards specify that if an atmosphere contains less than 19.5 percent by volume oxygen at sea level, then an atmosphere-supplying device must be used.

Note that as altitude increases, the percentage of oxygen stays constant, but the partial pressure drops. There is currently no standard that accounts for the drop in partial pressure with altitude; the problem is currently under study by NIOSH.

The physiological effects of oxygen deficiency are indicated in Table 2.

1.3 Particulate Contaminants - Aerosols

Aerosol is a term used to describe particulates in air without regard to their origin. Particulates are collected on the walls of the respiratory tract depending upon their size as follows:

1. Pharynx - 10-30 m
2. Trachea - 10 m
3. Bronchus - 5-10 m
4. Alveoli - 0.1-1 m

Particulates less than 0.5 m may never be deposited in the respiratory tract and may simply be exhaled.

Particulates affect the human body as follows:

1. Nuisances - inert substances that cause no lung damage but inhibit proper functioning of the lungs.
2. Inert pulmonary reaction causing substances - substances that produce nonspecific pulmonary effects.

Table 2
PHYSIOLOGICAL EFFECTS OF OXYGEN DEFICIENCY

OXYGEN VOLUME PERCENTAGE AT SEA LEVEL	PHYSIOLOGICAL EFFECT
16-12	Increased breathing volume. Accelerated heartbeat. Impaired attention and thinking. Impaired coordination.
14-10	Very faulty judgment. Very poor muscular coordination. Muscular exertion causes rapid fatigue that may cause permanent heart damage. Intermittent respiration.
10-6	Nausea. Vomiting. Inability to perform vigorous movement, or loss of all movement. Unconsciousness, followed by death.
Less than 6	Spasmodic breathing. Convulsive movements. Death in minutes.

3. Pulmonary fibrosis causing substances - substances that produce effects ranging from nodule production to serious diseases such as asbestosis.
4. Irritants - substances that irritate, inflame, or ulcerate lung tissues.
5. Systemic poisons - substances that cause injury to specific organs and body systems.
6. Allergens - substances that produce hypersensitivity.

1.4 Gaseous Contaminants

Gaseous contaminants are "filtered" to a small degree by the respiratory tract before they reach the alveolar spaces. However, if the contaminants are soluble, they can be directly absorbed through the walls of the respiratory tract.

Gaseous contaminants affect the human body as follows:

1. Irritants - corrosive compounds that injure and inflame tissue.
2. Asphyxiants - substances that displace oxygen or prevent the use of oxygen by the body.
3. Anesthetics - substances that depress the central nervous system and cause intoxication or loss of sensation.
4. Systemic poisons - substances that cause diseases.

1.5 Expressing Air Contamination Concentrations

Any substances that are not normal components of breathing air (oxygen, nitrogen, etc.) are considered to be contaminants. The respiratory threat posed by contaminants is a function of the actual contaminant and its concentration in the air. The concentration is expressed in a variety of ways, as listed below.

1. Particulates
 - a. mppcf - millions of particulates per cubic foot.
 - b. ppcc₃ - particles per cubic centimeter.
 - c. mg/m³ - milligrams per cubic meter.
2. Gases and Vapors
 - a. ppm - volumes per million volumes of air (parts per million).
 - b. ppb - volumes per billion volumes of air (parts per billion).

- c. mg/m^3 - milligrams of gas per cubic meter.
- d. Conversion of units. The following equation converts mg/m^3 to ppm, at 24°C and 760 mm Hg.

$$\text{ppm} = \frac{24.45}{\text{molecular weight}} \text{mg}/\text{m}^3,$$

This equation is extremely useful for determining respiratory protection requirements.

1.6 Measures of Respiratory Hazards

Every contaminant contained in breathing air has a limit, above which it becomes a threat to human health. These limits are determined either from animal studies or from epidemiological data. Unfortunately, animal studies can only approximate human response and may vary widely for individual chemicals. Epidemiological studies, although capable of providing a more precise forecast of human response, are limited by a lack of accurate records and a lack of controlled studies. Therefore, the "safe" limits of various chemicals must be viewed only as guidelines. Furthermore, these guidelines are primarily designed for the industrial situation where an individual is being exposed to one or two well-defined substances. These guidelines do not address the problems of synergism, potentiation, or allergic response.

The guidelines used in measuring respiratory hazards are listed below.

1. Threshold Limit Value. The threshold limit value (TLV) is recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) and is derived from consensus review. It is a time-weighted average concentration set for a particular substance that represents a level that almost all workers can be exposed to for an 8-hr day (40-hr week) without suffering adverse health effects. It is assumed that following each 8-hr. exposure there will be a 16-hr. recovery period and that after 5 days there will be a 48-hr. recovery period. The TLV lists are revised on a yearly basis.
2. Permissible Exposure Limits. The permissible exposure limits (PELs) are set forth in the Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910.1000, Tables Z-1, Z-2, and Z-3. These levels were promulgated initially from the ACGIH TLV lists (1968). As part of the law, they represent the legal maximum concentrations for personnel exposure. They are not updated on a yearly basis, as is the TLV list. Therefore, the most current ACGIH TLV is used in determining respiratory protection, rather than the PEL listing.
3. Immediately Dangerous to Life and Health. 30 CFR 11.3 defines conditions that are immediately dangerous to life and health (IDLH) as "conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants such as radioactive materials, which are likely to have an adverse cumulative or delayed effect on health".

OSHA adds these criteria:

- a. The worker must be able to escape without losing his life or suffering permanent health damage within 30 minutes.
 - b. The worker must be able to escape without severe eye or respiratory irritation or other reactions.
4. Lower Flammable Limit. The lower flammable limit (LFL) is the lowest concentration by volume of a gas or vapor in air that will explode when there is an ignition source.

1.7 Respiratory Protection

When it has been determined that the ambient atmosphere is hazardous, it becomes necessary to protect the individual by:

1. avoiding and/or minimizing exposure;
2. applying engineering controls such as ventilation; and
3. using a respirator to either filter the air or supply air.

The legal requirements for respiratory protection are summarized below.

1. Williams and Steiger Occupational Safety and Health Act of 1970 established standards that state that "approved or accepted respirators shall be used when they are available".
2. 29 CFR 1910.134 gives legal requirements for the selection and use of respiratory equipment as promulgated by OSHA and based on American National Standards Institute (ANSI) Standard Z88.2, "American National Standards Practices for Respiratory Protection". Standard Z88.2 was originally a consensus standard, but now has been cited as a Federal regulation.
3. 30 CFR Part 11 describes tests for permissibility of respiratory protective apparatus and updates or deletes approvals. 30 CFR Part 11 also cites ANSI Z88.2 as the basis for respiratory protection.

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 2
SELECTION OF RESPIRATORS

2.0 INTRODUCTION

This text is based on "Joint NIOSH/OSHA Standards Completion Program - Respirator Decision Logic". The text is excerpted for the purpose of covering the major points of the respirator decision logic. For the complete text, see John S. Pritchard's, "A Guide to Industrial Respiratory Protection" (U.S. Department of Health, Education, and Welfare, U.S. Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, Cincinnati, Ohio, June 1976). It is not intended to be all-inclusive in content.

The purpose of the respirator decision logic is to provide technical accuracy and uniformity in the selection of respirators and to provide necessary criteria to support this selection. The decision logic is a step-by-step elimination of inappropriate respirators until only those that are acceptable remain. Judgment by persons knowledgeable of inhalation hazards and respiratory protection equipment is essential to ensure appropriate selection of respirators.

The primary technical criteria for what constitutes a permissible respirator are based on the technical requirements of 30 CFR 11. The health standards will allow only respirators approved under 30 CFR 11. Classes of respirators are only included when at least one device has been approved.

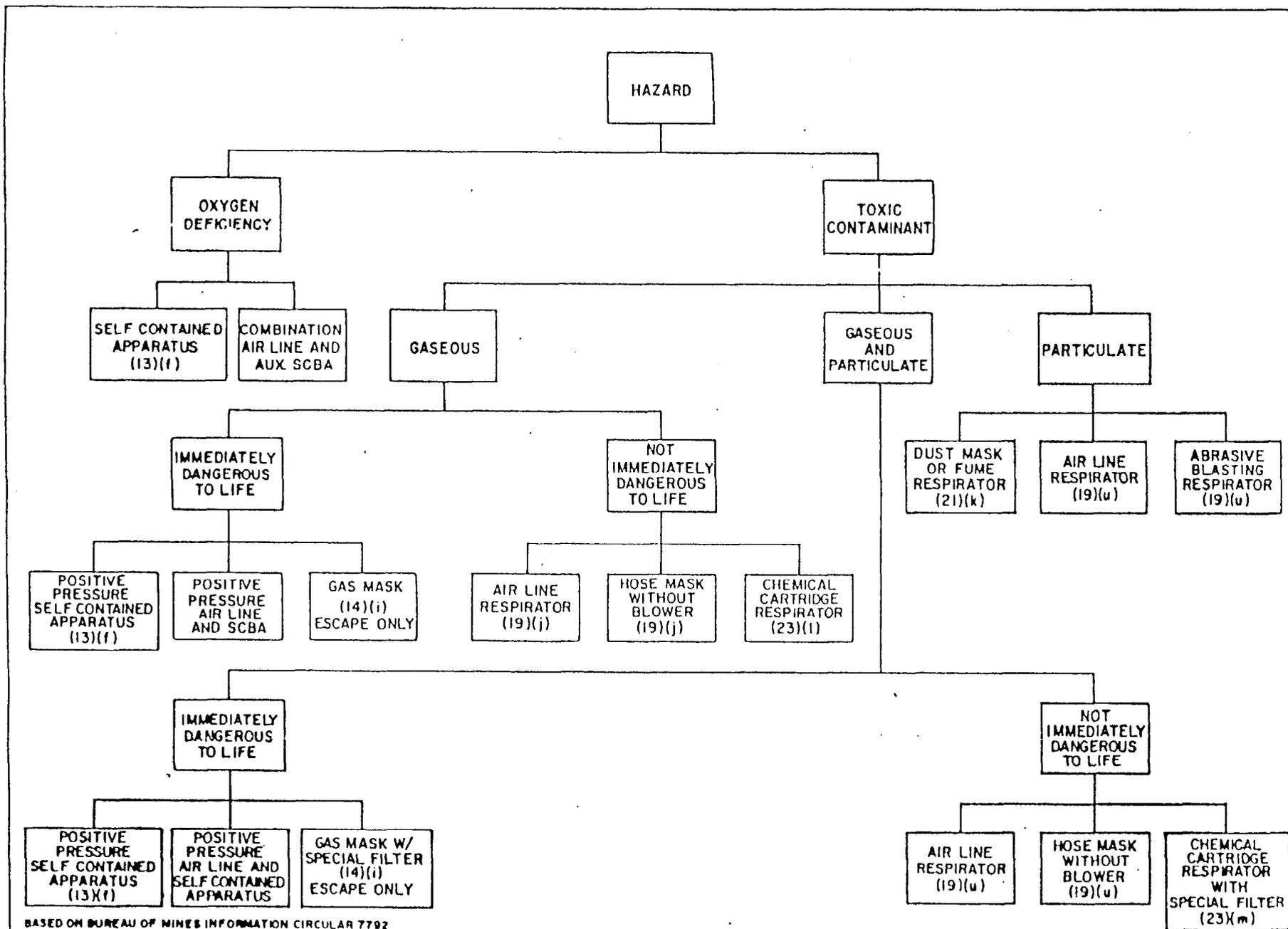
Protection factors are criteria used in determining what limiting concentrations are to be permitted for each respirator type that will afford adequate protection to the wearer. The referenced Subparts of 30 CFR 11 give technical descriptions concerning each type or class of respirators referenced in the decision logic; 30 CFR 11 should be used with the decision logic in order to properly understand the criteria for the specification of allowable respirators.

Throughout this text, reference is made to PELs. Prudent, accepted practice dictates the use of current ACGIH TLVs, which are updated each year, in the place of the PEL, which is only periodically updated.

2.1 General Decision Logic Flowchart

The following material used in concert with the decision logic chart (Figure 1) provides a formalized selection guide for respiratory protection.

1. Step 1 - Assemble Information on Substance. Assemble necessary toxicological, safety, and research information for the particular contaminant. The following are required:
 - a. Permissible exposure limits specified in 29 CFR 1910.1000 (Tables Z-1, Z-2, and Z-3).



BASED ON BUREAU OF MINES INFORMATION CIRCULAR 7792
 NUMBERS IN PARENTHESES REFER TO BUREAU OF MINES SCHEDULES
 LETTERS IN PARENTHESES REFER TO SUBPART OF NIOSH/MESA 30 CFR PART 11

FIGURE 1.
 SELECTION OF RESPIRATORY EQUIPMENT (LUNDIN, A., 1979)

- b. Warning properties if the substance is a gas or a vapor.
 - c. Eye irritation potential of the substance.
 - d. LFL for the substance.
 - e. IDLH concentration for the substance.
 - f. Any possibility of poor sorbent efficiency at IDLH concentration and below.
 - g. Any possibility of systemic injury of death resulting from absorbance of the substance (as a gas or vapor) through the skin.
 - h. Any possibility of severe skin irritation resulting from contact of the skin with corrosive gases, vapors, or particulates.
 - i. The vapor pressure of the substance (and equivalent ppm).
 - j. Any possibility of high heat of reaction with sorbent material in cartridge or canister.
2. Step 2 - Determine Physical State of Substance. Determine the physical state(s) of the substance as it is likely to be encountered in the occupational environment. It will be either (1) gas or vapor; (2) particulate (dust, fume or mist); or (3) combination of (1) and (2).
3. Step 3 - Assemble a Table of Permissible Respiratory Protection for Substance. This is done using the material from Step 1 and the appropriate specific decision logic chart from Section 2.3 below and respirator protection factors. Classes of respirators are only included where at least one device has been approved.
4. IF STEPS 1 THROUGH 3 CANNOT BE COMPLETED, THE ATMOSPHERE IS UNKNOWN AND MUST BE CLASSIFIED IDLH. ONLY POSITIVE PRESSURE SCBA MAY BE SELECTED.

2.2 Specific Decision Logic Charts

A decision logic chart for respiratory protection against gases or vapors and against particulates is shown as Figure 1.

2.3 Decision Logic Criteria

2.3.1 Skin Absorption and Irritation

Respirator selection criteria are based primarily on the inhalation hazard of the substance. A supplied-air suit may protect the skin from extremely toxic substances that may be absorbed through the skin or from substances which may cause severe skin irritation or injury.

Supplied-air suits are not covered in 30 CFR 11. Data are not available upon which to make recommendations for supplied-air suits for all types of exposures.

Where information is available indicating systemic injury or death resulting from absorbance of gas or vapor through the skin or where severe skin irritation or injury may occur from exposure to a gas, corrosive vapor, or particulate, the following statement is included as a footnote to the respirator tables, and both the employee and employer are cautioned in the appendices concerning their use:

Use of supplied-air suit may be necessary to prevent skin contact and respiratory exposure from airborne concentrations of (specific substance). Supplied-air suits should be selected, used, and maintained under the immediate supervision of persons knowledgeable in the limitations and potential life-endangering characteristics of supplied-air suits. Where supplied-air suits are used above a concentration which may be IDLH (concentration), an auxiliary positive-pressure self-contained breathing apparatus must also be worn.

As a guideline for inclusion of the supplied air-suit statement for substances that are sorbed through the skin, a single skin penetration LD_{50} of 2 g/kg for any species is used.

2.3.2 Poor Warning Properties (Refer to Table 1)

It is important to realize that 30 CFR 11 approvals for air-purifying (organic vapor) devices prohibit use against organic vapors with poor warning properties.

Warning properties include odor, eye irritation, and respiratory irritation. Warning properties relying upon human senses are not foolproof. However, they provide some indication to the wearer of possible sorbent exhaustion or of poor facepiece fit or other respirator malfunction.

Adequate warning properties can be assumed when the substance odor, taste, or irritation effects are detectable and persistent at concentrations at or below the permissible exposure limit.

If the odor or irritation threshold of a substance is more than three times greater than the permissible exposure limit, this substance should be considered to have poor warning properties. If the substance odor or irritation threshold is somewhat above the permissible exposure limit (not in excess of three times the limit) and there is no ceiling limit, consideration is given to whether undetected exposure in this concentration range could cause serious or irreversible health effects. If not, the substance is considered to have adequate warning properties. Some substances have extremely low thresholds of odor and irritation in relation to the permissible exposure limit. Because of this, these substances can be detected by a worker within the facepiece of the respirator even when the respirator is functioning properly. These substances are, therefore, considered to have poor warning properties.

TABLE 1
COMPARISON OF ODOR THRESHOLDS AND TLVs
FOR SELECTED CHEMICAL COMPOUNDS

COMPOUNDS	ODOR THRESHOLD (ppm)	TLV (ppm)
Group 1 - Odor Threshold Below or Approximately the Same as the TLV		
Acrolein	0.2	0.1
Carbon tetrachloride	10	5
Carbon disulfide	0.21	10
Cyclohexane	300	300
Cyclohexanol	100	50
Epichlorhydrin	10	2
Ethyl benzene	140	100
Ethylene diamine	11	10
Hydrogen chloride	10	5
Methyl acetate	200	200
Methylamine	10	10
Methyl chloride	25	50
Methyl chloroform	300	350
Nitrogen dioxide	5	3
Propyl alcohol	200	200
Turpentine	200	100
Group 2 - Odor Threshold from 2 to 10 Times the TLV		
Allyl alcohol	7	2
Arsine	0.21	0.05
Crotonaldehyde	7	2
1,2 Dichloroethylene	500	200
Dichloroethyl ether	35	5
Dimethyl acetamide	46	10
Dimethyl formamide	100	10
Hydrogen selenide	0.3	0.05
Isopropyl glycidyl ether (IGE)	300	50
Styrene monomer	200	50
Group 3 - Odor Threshold Equal to or Greater Than 10 Times TLV		
Acrylonitrile	21	2
Bromoform	530	0.5
Camphor (synthetic)	1.6-200	2
Chloroacetophenone	1	0.05
Chloroform	200	10
Chloropicrin	1	0.1
Diglycidyl ether (DGE)	5	0.1

TABLE 1
 COMPARISON OF ODOR THRESHOLDS AND TLVs
 FOR SELECTED CHEMICAL COMPOUNDS (cont.)

COMPOUNDS	ODOR THRESHOLD (ppm)	TLV (ppm)
Group 3 - Odor Threshold Equal to or Greater Than 10 Times TLV (cont.)		
Ethylene oxide	500	1
Mercury vapor	(a)	0.05 mg/m ³
Methyl bromide	(a)	5
Methyl formate	2000	100
Methanol	2000	200
Methyl cyclohexanol	500	50
Phosgene	1.0	0.1
Phosphine	(a)	0.3
Radioactive gases and vapors	(a)	
Toluene 2,4 diisocyanate (TDI)	2	0.005

(a) Information not Available

Though 30 CFR 11 does not specifically eliminate air-purifying respirators for pesticides with poor warning properties, prudent practice dictates that a respirator should not be used to protect against any substance with poor warning properties.

2.3.3 Sorbents

There are certain limitations involved with the use of sorbents in cartridge/canister sorbents. When the following conditions occur, a sorbent cartridge is not recommended:

1. Where supporting evidence exists of immediate (less than 3 min.) breakthrough time at the IDLH concentration and below for a cartridge or canister sorbent, air-purifying devices shall not be allowed for any use, escape or otherwise. See Table 2.
2. Where there is reason to suspect that commonly used sorbents (e.g., activated charcoal) do not provide adequate sorption efficiency against a specific contaminant, use of such sorbents shall not be allowed. However, where another sorbent material has been demonstrated to be effective against a specific contaminant, approved respirators using the effective sorbent material shall be allowed.
3. Where there is reason to suspect that a sorbent has a high heat of reaction with a substance, use of that sorbent is not allowed.
4. Where there is reason to suspect that a substance sorbed on a sorbent of a cartridge or canister is shock sensitive, use of air-purifying respirators is disallowed.

2.3.4 Eye Irritation

In addition to respiratory protection, it is important to consider a chemical's potential for producing eye irritation or damage. The following guidelines deal with eye protection:

1. For routine work operations, any perceptible eye irritation is considered unacceptable. Therefore, only full facepiece respirators are permissible in contaminant concentrations that produce eye irritation. Protection may be required in certain concentrations of gases and vapors. For escape, some eye irritation is permissible if it is determined that such irritation would not inhibit escape and such irritation is reversible.
2. Where quantitative eye irritation data cannot be found in literature references, and theoretical considerations indicate that substance should not be an eye irritant, half-facepiece respirators are allowed.
3. Where a review of the literature indicates a substance causes eye irritation but no eye irritation threshold is specified, the data will be evaluated to determine whether quarter- or half-facepiece respirators can be used.

TABLE 2
EFFECT OF SOLVENT VAPOR ON RESPIRATOR CARTRIDGE EFFICIENCY^a

SOLVENT	TIME TO REACH 1 PERCENT BREAKTHROUGH (10 ppm) (Min)
Aromatics	
Benzene	73
Toluene	94
Ethyl benzene	84
m-Xylene	99
Cumene	81
Mesitylene	86
Alcohols	
Methanol	0.2
Ethanol	28
Isopropanol	54
Allyl alcohol	66
n-Propanol	70
Sec-Butanol	96
Butanol	115
2-Methoxyethanol	116
Isoamyl alcohol	97
4-Methyl-2-pentanol	75
2-Ethoxyethanol	77
Amyl alcohol	102
2-Ethyl-1-butanol	76.5
Monochlorides	
Methyl chloride	0.05
Vinyl chloride	3.8
Ethyl chloride	5.6
Allyl chloride	31
1-Chloropropane	25
1-Chlorobutane	72
Chlorocyclopentane	78
Chlorobenzene	107
1-Chlorohexane	77
o-Chlorotoluene	102
1-Chloroheptane	82
3-Chloromethyl heptane	63

TABLE 2
EFFECT OF SOLVENT VAPOR ON RESPIRATOR CARTRIDGE EFFICIENCY^a (cont.)

SOLVENT	TIME TO REACH 1 PERCENT BREAKTHROUGH (10 ppm) (Min)
Dichlorides	
Dichloromethane	10
Trans-1,2-dichloroethylene	33
1,1-Dichloroethane	23
cis-1,2-Dichloroethylene	30
1,2-Dichloroethane	54
1,2-Dichloropropane	65
1,4-Dichlorobutane	108
o-Dichlorobenzene	109
Trichlorides	
Chloroform	33
Methyl chloroform	40
Trichloroethylene	55
1,1,2-Trichloroethane	72
1,2,3-Trichloropropane	111
Tetra- and Pentachlorides	
Carbon tetrachloride	77
Perchloroethylene	107
1,1,2,2-Tetrachloroethane	104
Pentachloroethane	93
Acetates	
Methyl acetate	33
Vinyl acetate	55
Ethyl acetate	67
Isopropyl acetate	65
Isopropenyl acetate	83
Propyl acetate	79
Allyl acetate	76
sec-Butyl acetate	83
Butyl acetate	77
Isopentyl acetate	71
2-Methoxyethyl acetate	93
1,3-Dimethylbutyl acetate	61
Amyl acetate	73
2-Ethoxyethyl acetate	80
Hexyl acetate	67

TABLE 2
EFFECT OF SOLVENT VAPOR ON RESPIRATOR CARTRIDGE EFFICIENCY^a (cont.)

SOLVENT	TIME TO REACH 1 PERCENT BREAKTHROUGH	
	(10 ppm)	(Min)
Ketones		
Acetone		37
2-Butanone		82
2-Pentanone		104
3-Pentanone		94
4-Methyl-2-pentanone		96
Mesityl oxide		122
Cyclopentanone		141
3-Heptanone		91
2-Heptanone		101
Cyclohexanone		126
5-Methyl-3-heptanone		86
3-Methylcyclohexanone		101
Diisobutyl ketone		71
4-Methylcyclohexanone		111
Alkanes		
Pentane		61
Hexane		52
Methylcyclopentane		62
Cyclohexane		69
Cyclohexene		86
2,2,4-Trimethylpentane		68
Heptane		78
Methylcyclohexane		69
5-Ethylidene-2-norbornene		87
Nonane		76
Decane		71
Amines		
Methyl amine		12
Ethyl amine		40
Isopropyl amine		66
Propyl amine		90
Diethyl amine		88
Butyl amine		110
Triethyl amine		81
Dipropyl amine		93
Diisopropyl amine		77
Cyclohexyl amine		112
Dibutyl amine		76

TABLE 2
EFFECT OF SOLVENT VAPOR ON RESPIRATOR CARTRIDGE EFFICIENCY^a (cont.)

SOLVENT	TIME TO REACH 1 PERCENT BREAKTHROUGH (10 ppm) (Min)
Miscellaneous Materials	
Acrylonitrile	49
Pyridine	119
1-Nitropropane	143
Methyl iodide	12
Dibromomethane	82
1,2-Dibromoethane	141
Acetic anhydride	124
Bromobenzene	142

^a The above cartridge pairs were tested at 1000 ppm, 50 percent relative humidity, 22°C, and 53.3 l/min. (equivalent to a moderately heavy work rate). The time to achieve a 1 percent breakthrough is noted for each cartridge pair. Cartridges were preconditioned at room temperature and 50 percent relative humidity for at least 24 hours prior to testing.

2.3.5 IDLH

The definition of IDLH provided in 30 CFR 11.3(t) is as follows:

"Immediately dangerous to life or health" means conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health.

The purpose of establishing an IDLH exposure concentration is to ensure that the worker can escape without injury or irreversible health effects from an IDLH concentration in the event of failure of the respiratory protective equipment. The IDLH is considered a maximum concentration above which only highly reliable breathing apparatus providing maximum worker protection is permitted. Since IDLH values are conservatively set, any approved respirator may be used up to its maximum use concentration below the IDLH.

In establishing the IDLH concentration the following factors are considered:

1. Escape without loss of life or irreversible health effects. Thirty minutes is considered the maximum permissible exposure time for escape.
2. Severe eye or respiratory irritation or other reactions that would prevent escape without injury.

IDLH should be determined from the following sources:

1. Specific IDLH provided in the literature, such as the AIHA Hygienic Guides.
2. Human exposure data.
3. Acute animal exposure data.

Where such data are lacking, acute toxicological data from analogous substances may be considered.

The following guidelines should be used to interpret toxicological data reported in the literature for animal species:

1. Where acute animal exposure data are available (30 min. to 4-hr. exposures), the lowest exposure concentration causing death or irreversible health effects in any species is determined to be the IDLH concentration.
2. Chronic exposure data may have no relevance to the acute effects and should be used in determining the IDLH concentration only upon competent toxicologic judgment.
3. Where there is no toxicologic evidence of an IDLH concentration, 500 times the permissible exposure limit shall determine the upper limit above which only highly reliable breathing apparatus providing maximum worker protection is used.

2.3.6 Lower Flammable Limit

In addition to toxic chemicals and irritants, it is necessary to consider flammable substances. In any atmosphere where there is a likelihood of a chemical fire, there is the risk of creating toxic vapors in the fire or of asphyxiation cause by reduction of the oxygen content by the products of combustion.

Contaminant concentrations in excess of the LFL are considered to be IDLH. At or above the LFL, the use of respirators is limited to those devices that provide the maximum protection (i.e., positive pressure self-contained breathing apparatus (SCBA) and the combination positive pressure supplied-air respirators with auxiliary positive pressure SCBA).

2.3.7 Protection Factors

The protection factors of respiratory protection devices are a useful numerical tool to assist in the choice of a protective system. Protection factors are a measure of the overall effectiveness of a respirator. Filtering efficiency is a part of the protection factor and becomes a significant consideration for less efficient air-purifying respirators.

The protection factor of a given respirator for a specific user times the PEL (or TLV) for a given substance is the maximum allowable concentration for that substance for which the respirator may be used. For example, say the protection factor for a full-face mask respirator will provide protection up to 1000 ppm. Note that there is a difference between "quantitative" protection factors and "qualitative" protection factors. The correct protection factor must be used in determining the maximum allowable concentration.

2.3.8 Escape

Jordan provides and requires employees to carry an escape respirator where exposure may occur to extremely toxic substances. This escape respirator provides a 5-minute self-contained air supply. (An extremely toxic substance is defined as a gas or vapor having an LC_{50} of less than 10 ppm.)

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 3
RESPIRATOR FIT TESTING - QUALITATIVE

3.0 RESPIRATOR QUALITATIVE FITTING METHODS

Despite the care that goes into respirator design and manufacture to give maximum protection, efficiency will be lost if there is an improper match between the facepiece and the user, or other improper wearing practices. The problem is twofold. Since more than one brand of particular type of facepiece is available, the first problem is to determine which fits best. The second problem is whether the user knows when the respirator fits properly. Both problems can be solved by the use of a fitting test, which is in fact an OSHA requirement. A number of tests and fitting procedures can be performed easily, as outlined below.

Note: During any fitting test, the respirator head straps must be as comfortable as possible. Tightening the straps will sometimes reduce the facepiece leakage, but the user may be unable to tolerate the respirator for any length of time.

3.1 Test 1 - Negative Pressure Test

The user will perform this test alone in the field. It consists of merely closing off the inlets of the canister, cartridge(s), or filter(s) by covering with the palm(s) or replacing the seals over the canister or cartridge inlets, or by squeezing breathing tubes so that air cannot pass; inhaling gently so the facepiece collapses slightly; and holding the breath for ten seconds. If the facepiece remains slightly collapsed and no inward leakage is detected, the respirator is probably tight enough.

Although this test is simple, it has several major drawbacks, primarily that the user must handle the respirator after it has supposedly been positioned on the face. Handling can modify the facepiece-to-face seal. When the respirator is to be used in a relatively toxic atmosphere, this test should be used only as a very gross determination of fit. The user will perform this test just before entering any toxic atmosphere.

3.2 Test 2 - Positive Pressure Test

This test is very much like the negative pressure test; it has the same advantages and limitations. It is conducted by closing off the exhalation valve and exhaling gently into the facepiece. The fit is considered satisfactory if slight positive pressure can be built up inside the facepiece without any evidence of outward leakage. For some respirators, this method requires the user to remove the exhalation valve cover and then carefully replace it after the test, often a most difficult task which can disturb the respirator fit even more than does the negative pressure test. If removing and replacing the valve cover is required, this test should be used sparingly. For respirators whose valve covers have a single small port that can be covered by the palm or finger, this test is easy. Where applicable, this test will be performed just before entering any hazardous atmosphere.

3.3 Test 3 - Isoamyl Acetate Vapor (Banana Oil) Test

The chemical isoamyl acetate has a pleasant, easily detectable odor, so it is used widely in checking respirator fit.

The test gives the user the required opportunity to wear the respirator in a test atmosphere. Generally, it consists of creating an atmosphere containing banana oil around the user of an atmosphere-supplying or air-purifying respirator with an organic vapor removing cartridge(s) or canister. If the hazard is particulate matter or a non-organic vapor or gas, the organic vapor cartridge(s) or canister must be replaced with a particulate filter(s) or proper cartridge(s) or canister after this test. Thus, this test can be used for any facepiece that has the capability of accepting chemical cartridges and particulate filters. It must be emphasized, however, that the correct cartridge, canister or filter must be replaced on the facepiece before the user enters the specific exposure area.

The isoamyl acetate test is performed with single use capsules, or may be performed by saturating a piece of cotton or cloth with the liquid and passing it close to the respirator near the sealing surface, taking care to avoid skin contact.

In general, the isoamyl acetate fitting test will be performed as follows:

1. The user puts on the respirator in a normal manner in an area where he/she cannot smell banana oil and thus not be influenced by the odor while performing the fitting test. If it is an air-purifying device, it must be equipped with a cartridge(s) or canister specifically designed for protection against organic vapors.
2. The capsule or saturated cloth is passed close to the respirator sealing surfaces.
3. If the user smells banana oil, he readjusts the facepiece and/or adjusts the head straps without unduly tightening them.
4. The user repeats step 2. If banana oil is not smelled, there is assumed to be a satisfactory seal. If the wearer smells the vapor, an attempt should be made to find the leakage point. If the leak cannot be located, another respirator of the same type and brand should be tried. If this leaks, another brand of respirator with a facepiece of the same type but slightly different shape or size should be tried.
5. After a fit is obtained, if the respirator is an air-purifying device, it must be equipped with the correct filter(s), cartridge(s) or canister for the anticipated hazard.

During the test, the subject must make movements that approximate a normal working situation. These will include, but not necessarily be limited to, the following:

1. Normal breathing.

2. Deep breathing like during a heavy exertion period: this should not be done long enough to cause hyper ventilation.
3. Slowly performing side-to-side and up-and-down head movements: these movements should be exaggerated, but should approximate those that take place on the job.
4. Talking: this is most easily accomplished by reading prepared text loudly enough to be understood by someone standing nearby.
5. Other exercises may be added depending upon the situation: for example, if users are going to spend a significant part of their time bent over at some task, it will include an exercise approximating this bending.

When the test is used in training workers and selecting the respirators that fit best, they will perform the complete set of exercises. However, the number of exercises may be reduced when the test is used as a quick field check before routine entry into a contaminated atmosphere.

3.4 Test 4 - Irritant Smoke Test

This test is similar to the isoamyl acetate test in concept. It involves exposing the respirator wearer to an irritating aerosol produced by stannic chloride or titanium tetrachloride smoke tubes normally used to check the quality of ventilation systems. (Note: Other types of smoke tubes such as acetic acid are available, but should not be used for respirator fitting.) When the tube ends are broken and air is passed through it, the material inside reacts with the moisture in the air to produce a dense, highly irritating smoke, consisting of hydrochloric acid absorbed in small solid particles. As a qualitative means of determining respirator fit, this test has a distinct advantage in that the user usually reacts involuntarily to leakage by coughing or sneezing. The likelihood of this giving a false indication of proper fit is reduced. On the other hand, the aerosol is very irritating and must be used carefully to avoid injury.

This test can be used for both air-purifying and atmosphere-supplying respirators, but air-purifying respirators must have a high-efficiency filter(s). After the test, it may be necessary to replace the high-efficiency filter(s) on the air-purifying respirator with another type of air-purifying element(s) depending upon the hazard to which the respirator user is to be exposed. This test can be used for worker training or respirator selection.

The irritant smoke test must be performed with proper safeguards because the aerosol is highly irritating. The procedure is as follows:

1. The user puts on the respirator normally, taking care not to tighten the headstrap uncomfortably and stands with his/her back to a source of exhaust ventilation.
2. The tester tells the user to close his/her eyes, even if wearing a full facepiece respirator, and to keep them closed until told to open them.

3. The tester lightly puffs smoke over the respirator, holding the smoke tube at least two feet from it. At this time, the test should keep the amount of smoke minimal and pause between puffs to note the user's reaction.
4. If the user detects no leakage, the tester will increase the smoke density and move the smoke tube progressively closer to the subject, still remaining alert to any reactions.
5. When the smoke tube has been brought to within about 6 inches of the respirator with no leakage detected, the tester will start to direct smoke specifically at potential sources of leakage, around the sealing surfaces and exhalation valve, while the subject's head is still.
6. At this point, if no leakage has been detected, the user may cautiously begin the head movements described in the isoamyl acetate test. The tester should remain especially alert and be prepared to stop producing smoke immediately.
7. If leakage is detected at any time, the tester should stop the smoke and let the user readjust the facepiece or head strap tension. The tester should then start the test at step 2.

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 4
INSPECTION/MAINTENANCE/STORAGE

4.0 INTRODUCTION

Respirator maintenance is an integral part of the overall respirator program. Wearing a poorly maintained or malfunctioning respirator is, in one sense, more dangerous than not wearing a respirator at all. Personnel wearing defective devices think they are protected when, in reality, they are not. Emergency escape and rescue devices are particularly vulnerable to poor maintenance as they generally are used infrequently, and then in the most hazardous and demanding circumstances. Serious injury or death can result from wearing a defective device during emergency escape or rescue.

This program includes:

1. Inspection for defects (including a leak check).
2. Cleaning and disinfecting.
3. Repair as required.
4. Proper and sanitary storage of equipment.

4.1 Inspection For Defects

The most important part of a respirator maintenance program is continual inspection of the devices. If properly performed, inspections will identify damaged or malfunctioning respirators before they can be used. Two types of inspections will be performed.

1. While the respirator is in use.
2. While it is being cleaned.

Since the use and cleaning will, to a large extent, be performed by the same personnel, these inspections may become concurrent.

4.2 Frequency of Inspection

OSHA requires that "All respirators be inspected before and after each use" and that those not used routinely, i.e., emergency escape and rescue devices, "shall be inspected after each use and at least montly..." Obviously, emergency escape and rescue devices do not require inspection before each use. Records of inspections are kept on forms presented in Section VI-Program Administration and Documentation.

4.3 Inspection Procedures

Respirator inspection shall include checking of:

1. Tightness of the connections.
2. Facepiece.
3. Valves.

4. Connecting tubes.
5. Canisters, filters, or cartridges.

In addition, the regulator and warning devices on a SCBA shall be checked for proper functions.

4.4 Field Inspection of Air-Purifying Respirators

Routinely used air-purifying respirators will be checked as follows before and after each use:

1. Examine the facepiece for:
 - a. Excessive dirt.
 - b. Cracks, tears, holes or physical distortion of shape from improper storage.
 - c. Inflexibility of rubber facepiece (stretch and knead to restore flexibility).
 - d. Cracked or badly scratched lenses in full facepieces.
 - e. Incorrectly mounted full facepiece lenses, or broken or missing mounting clips.
 - f. Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s).
2. Examine the head straps or head harness for:
 - a. Breaks.
 - b. Loss of elasticity.
 - c. Broken or malfunctioning buckles and attachments.
 - d. Excessively worn serrations on head harness, which might permit slippage (full facepieces only).
3. Examine the exhalation valve for the following after removing its cover:
 - a. Foreign material, such as detergent residue, dust particles or human hair under valve seat.
 - b. Cracks, tears or distortion in the valve material.
 - c. Improper insertion of the valve body in the facepiece.
 - d. Cracks, breaks or chips in the valve body, particularly the sealing surface.
 - e. Missing or defective valve cover.
 - f. Improper installation of the valve in the valve body.

4. Examine the air-purifying element(s) for:
 - a. Incorrect cartridge, canister or filter for the hazard.
 - b. Incorrect installation, loose connections, missing or worn gasket or cross threading in the holder.
 - c. Expired shelf-life date on the cartridge or canister.
 - d. Cracks or dents in the outside case of the filter, cartridge or canister, indicated by the absence of sealing material, tape, foil, etc. over the inlet.
 - e. Identical cartridges if more than one are used.

4.5 Care and Cleaning of Self-Contained Breathing Apparatus (SCBA)

The proper care of SCBAs involves:

1. Inspection for defects.
2. Cleaning and disinfecting.
3. Repair.
4. Storage.

The following checklist is to be used by personnel whenever they have to check out an SCBA. (Note: Any discrepancy found should be cause to set the unit aside until it can be repaired by a certified repair-person.)

1. Preliminary inspection. Check to ensure that:
 - a. High-pressure hose connector is tight on cylinder fitting.
 - b. Bypass valve is closed.
 - c. Mainline valve is closed.
 - d. There is no cover or obstruction on regulator outlet.
 - e. Pressure in the tank is at least 1800 psi.
2. Backpack and harness assembly.
 - a. Straps
 1. Visually inspect for complete set.
 2. Visually inspect for frayed or damaged straps that may break during use.
 - b. Buckles
 1. Visually inspect for mating ends.
 2. Check locking function.
 - c. Backplate and cylinder lock

1. Visually inspect backplate for cracks and for missing rivets or screws.
 2. Visually inspect cylinder hold-down strap and physically check strap tightener and lock to ensure that it is fully engaged.
3. Cylinder and cylinder valve assembly
- a. Cylinder
 1. Physically check cylinder to ensure that it is tightly fastened to backplate.
 2. Check hydrostatic test date to ensure that it is current.¹
 3. Visually inspect cylinder for large dents or gouges in metal.
 - b. Head and valve assembly
 1. Visually inspect cylinder valve lock for presence.
 2. Visually inspect cylinder gauge for condition of face, needle, and lens.
 3. Open cylinder valve and listen or feel for leakage around packing. (If leakage is noted, do not use until repaired.). Note function of valve lock.
4. Regulator and high-pressure hose
- a. High-pressure hose and connector

Listen or feel for leakage in hose or at hose-to-cylinder connector. (Bubble in outer hose covering may be caused by seepage of air through hose when stored under pressure. This does not necessarily mean a faulty hose.)
 - b. Regulator and low-pressure alarm
 1. Cover outlet of regulator with palm of hand. Open mainline valve and read regulator gauge (must read at least 1800 psi and not more than rated cylinder pressure).
 2. Close cylinder valve and slowly move hand from regulator outlet to allow slow flow of air. Gauge should begin to show immediate loss of pressure as air flows. Low-pressure alarm should sound between 650 and 550 psi. Remove hand completely from outlet and close mainline valve.

¹Monthly inspection only.

3. Place mouth onto or over regulator outlet and blow. A positive pressure should be created and maintained for 5 to 10 seconds without any loss of air. Next, establish a slight negative pressure in regulator and hold for 5 to 10 sec. Vacuum should remain constant. This tests the integrity of the diaphragm. Any loss of pressure or vacuum during this test indicates a leak in the apparatus.
 4. Open cylinder valve.
 5. Place hand over regulator outlet and open mainline valve. Remove hand from outlet and replace in rapid movement. Repeat twice. Air should escape when hand is removed each time, indicating a positive pressure in chamber. Close mainline valve and remove hand from outlet.
 6. Ascertain that no obstruction is in or over the regulator outlet. Open and close the bypass valve momentarily to ensure flow of air through bypass system.
5. Facepiece and corrugated breathing tube.
- a. Facepiece
 1. Visually inspect head harness for damaged serrations and deteriorated rubber. Visually inspect rubber facepiece body for signs of deterioration or extreme distortion.
 2. Visually inspect lens for proper seal in rubber facepiece, retaining clamp properly in place, and cracks or large scratches.
 3. Visually inspect exhalation valve for visible deterioration or foreign materials buildup.
 - b. Breathing tube and connector
 1. Stretch breathing tube and visually inspect for deterioration and holes.
 - (2) Visually inspect connector to ensure good condition of threads and for presence and proper condition of "O" ring or rubber gasket seal.
 - (3) Negative pressure test on facepiece.²
 - (a) Don backpack and facepiece.

For regular monthly inspection, only steps (b) and (c) of procedure are necessary

- (b) With facepiece held tightly to face or facepiece properly donned, stretch breathing tube to open corrugations and place thumb or hand over end of connector.
 - (c) Inhale. Negative pressure should be created inside mask, causing it to pull tightly to face. This negative pressure should be maintained for 5 to 10 sec. If negative pressure leaks down, the facepiece assembly is not adequate and should not be worn.
6. Storage of units. Check that:
- a. Cylinder is refilled as necessary and unit is cleaned and inspected.
 - b. Cylinder valve is closed.
 - c. High-pressure hose connector is tight on cylinder.
 - d. Pressure is bled off high-pressure hose and regulator.
 - e. Bypass valve is closed.
 - f. Mainline valve is closed.
 - g. All straps are completely loosened and laid straight.
 - h. Facepiece is properly stored to protect against dust, sunlight, heat, extreme cold, excess moisture, and damaging chemicals.

4.6 Cleaning and Sanitizing

Any good detergent may be used followed by a disinfecting rinse or a combination disinfectant-detergent for a one step operation. Reliable, effective disinfectants may be made from readily available household solutions, including:

1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately two milliliters of bleach (such as Clorox) to one liter of water, or two tablespoons of bleach per gallon of water. A two-minute immersion disinfects the respirators.
2. Aqueous solution of iodine (50 ppm of iodine) made by adding approximately 0.8 milliliters of tincture of iodine per liter of water, or one teaspoon of tincture of iodine per gallon of water. Again, a two-minute immersion is sufficient.

To prevent damaging the rubber and plastic in the respirator facepieces, the cleaning water should not exceed 140°F, but it should not be less than 120°F to ensure adequate cleaning.

4.7 Rinsing

The cleaned and disinfected respirators should be rinsed thoroughly in water (140°F maximum) to remove all traces of detergent and disinfectant. This is very important for preventing dermatitis.

4.8 Drying

The respirators may be allowed to dry in room air on a clean surface. They may also be hung from a horizontal wire, like drying clothes, but care must be taken not to damage or distort the facepieces.

4.9 Reassembly and Inspection

The clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. The inspection procedures have been discussed; special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking.

The respirator should be thoroughly inspected and all defects corrected. New or retested cartridges and canisters should be installed, and the completely reassembled respirator should be tested for leaks.

For SCBA devices, the facepiece should be combined with the tested regulator and the fully charged cylinder, and an operational check performed.

4.10 Maintenance and Repair

Replacement or repair shall be done only by trained, experienced persons with parts designed for the respirator. Besides being contrary to OSHA requirements, substitution of parts from a different brand or type of respirator invalidates approval of the device.

This restriction applies particularly to maintenance of the more complicated devices, especially SCBA, and more specifically, regulator valves and low pressure warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair.

No problems are anticipated in repairing and maintaining most simple respirators, particularly the commonly used air-purifying type.

4.11 Respirator Storage

Respirators must be stored to protect against:

1. Dust.
2. Sunlight.
3. Heat.
4. Extreme cold.
5. Excessive moisture.
6. Damaging chemicals.
7. Mechanical damage.

Damage and contamination of respirators may take place if they are stored on a workbench, or in a tool cabinet or toolbox, among heavy tools, greases and dirt or in a vehicle.

Freshly cleaned respirators should be placed in reusable plastic bags until reissue. They should be stored in a clean, dry location away from direct sunlight. They should be placed in a single layer with the facepiece and exhalation valve in an undistorted position to prevent rubber or plastic from taking a permanent distorted "set".

APPENDIX C
CONFINED SPACE PROVISIONS

I. CONFINED SPACE CLASSIFICATION

Confined spaces are classified according to their existing or potential chemical and physical hazards. Classification is based on characteristics of the confined space, oxygen level, flammability, and toxicity. Table B-1 defines the parameters of each classification. If any of the hazards present a situation that is immediately dangerous to life and health (IDLH), the confined space is classified as Class A. Classification is determined by the most hazardous condition of entering, working in, and exiting a confined space. Class B confined spaces have the potential for causing injury and illness but are not IDLH. Class C entry is one in which the chemical hazard potential is minimal and does not require any special modification in work procedures.

II. ENTRY PROCEDURES

TEAM SIZE

A minimum of three workers is required for each confined space activity (two entry and one standby; or one entry, one rescue, and one standby). If the former is used, all three must be E.C. Jordan Co. (Jordan) employees. If the latter is used, the standby could be a non-Jordan team member, assuming he/she has comparable training, is proficient in the assigned duties, and is capable of using all safety equipment.

The one entry/one rescue/one standby arrangement should only be used when the confined space is relatively small and/or the entry person will be in the line of sight at all times. In this instance, the rescue person acts as the second person in the "buddy system."

The two entry/one standby arrangement is used when the area of the confined space is larger, and the tasks may take the worker away from the entryway. Again, care must be taken with this arrangement because the standby person cannot enter the confined space and attempt rescue unless adequately protected (i.e., respiratory and dermal) and replaced by another qualified standby person.

This number of workers is the minimum required for these activities and, in most cases, should only be used for relatively nonhazardous confined spaces. Additional crew may be needed if entering a Class A or B confined space. Additional crew could include rescue, decontamination, and line-of-sight personnel.

GENERAL ENTRY PROCEDURES

The following steps must be taken when entering a confined space.

1. Inspect all pieces of equipment to ensure they are in good working order. DO NOT ENTER CONFINED SPACE WITH DEFECTIVE EQUIPMENT.
2. Conduct a background check to identify all potential hazards that may be encountered in the confined space. Determine if there is a potential for

fire/explosion hazards, as well as a potential for a toxic or oxygen-deficient atmosphere.

3. Before entry, the atmosphere inside the confined space must be tested. An attempt should be made to test the atmosphere without opening the entryway (i.e., through a vent line or a small opening). If the entryway must be opened to test and only low levels are expected in the confined space, crack open entryway, test breathing zone first, and then test the confined space. If potentially high levels are expected in the breathing zone, respiratory protection should be worn prior to opening the entryway cover.
4. If explosive, toxic, or oxygen-deficient atmosphere is detected, purge or ventilate the confined space prior to entry. Retest the atmosphere three times at 5-minute intervals. A person can enter the confined space without respiratory protection only if all three test results are below the Permissible Exposure Limit/Threshold Limit Value (PEL/TLV), 10 percent of the LEL, and above 19.5-percent oxygen (all three conditions must be met).

(NOTE: Any downward deflection of the readings on the oxygen meter from background (i.e., 20.9 percent) should be viewed as a potential for an IDLH atmosphere. Unless contaminants are known to be nontoxic, do not enter the confined space without respiratory protection if the oxygen level is below background.)

5. Blank, block, or otherwise isolate, lockout, and tag all chemical, physical, and/or electrical hazards wherever possible.
6. If using an air-purifying respirator or if an IDLH and/or explosive atmosphere exists, air monitoring must be on a continuous basis. If respiratory protection is not used and there is potential for atmospheric conditions to change due to work practices or conditions, air monitoring should be done periodically. In all these cases, a 5-minute escape pack must be used.
7. Record all results of the tests for hazardous conditions including the location, time, date, weather (if applicable), and readings on the PID, combustible gas meter, oxygen deficiency meter, Draeger tubes, and any other equipment used on the "Confined Space Entry Checklist-General Entry" form. Send a copy of the completed form to the Health and Safety Supervisor (HSS).
8. Wear appropriate clothing for site conditions, as determined by the Health and Safety Officer (HSO).
9. A safety belt or harness with lifeline must be worn if hazardous conditions exist, although good safety precautions dictate their use regardless of "existing" conditions. If the diameter of the entryway is less than 18 inches, the wrist-type harness must be used and special provisions made if a supplied air respirator is necessary.

10. One person (standby) must remain at the entryway at all times and must keep continuous contact with the person entering the confined space. Contact can be maintained by line of sight, listening for sounds, the safety line, and/or radio. The standby person must not enter the confined space unless another trained person is available to act as standby, and he/she is equipped with adequate respiratory and dermal protection. (In most cases, respiratory protection would be an airline respirator or SCBA.)
11. Do not smoke when working in or near confined spaces and do not take flash-lighted photographs when explosive gases are known or suspected to be present.
12. Do not rely on permanent ladders because they are often in poor condition. If they must be used, be sure of footing. Inspect permanent ladders for deterioration before entering and while descending. Try each step with one foot, while standing on the step above. When in doubt, use a portable ladder of adequate height to reach 3 feet above opening or a rope ladder, or lower the entry person using the tripod. If a portable ladder is used, it should be tied off, if possible; otherwise, it should be held in place by the standby person.
13. Do not work without adequate lighting. Use only "explosion-proof" lights or hand lamps.
14. The entry person must not remain in the confined space if he/she becomes even slightly drowsy, faint, dizzy, or otherwise uncomfortable. Many of the gases that cause the most problems are odorless, tasteless, and invisible.

MANHOLE/SEWER ENTRY

When preparing to enter a manhole/sewer, the following safety measures must be taken:

1. Inspect all pieces of equipment to ensure they are all in good working order. DO NOT ENTER CONFINED SPACE WITH DEFECTIVE EQUIPMENT.
2. Park the vehicle near the manhole (do NOT leave the vehicle running). If the manhole is in the street, it is best to park so as to detour oncoming traffic around the manhole. The vehicle's emergency flashers and portable yellow warning beacon must be ON. The vehicle serves as protection from oncoming traffic, can be used to store emergency equipment (e.g., SCBA and first aid kit), and can be used in an extreme emergency to slowly pull an injured person from the confined space if a tripod with hoist attachment is unavailable or inoperative.
3. Erect portable barricades or cones around the manhole and in front of the vehicle to see that traffic is adequately diverted and to prevent pedestrians from falling in. Reflective vests should be worn so that workers are visible to approaching traffic.

4. If there are openings large enough to admit sampling tubes, test for the presence of explosive and toxic gases before removing each manhole cover. Otherwise, raise one side of the cover using the cover hook or pick, prop it slightly open, and conduct the tests.
5. If toxic or explosive gases are detected in the sewer, report this immediately to the local Fire Department and/or Department of Public Works.
6. Record the results of tests for hazardous conditions, including location, manhole number (if applicable), time and date, weather (if applicable), and the readings on the PID, combustible gas meter, oxygen deficiency meter, and Draeger tube on the Manhole/Sewer Entry Log Form. Send a completed copy of the form to the HSS.
7. Remove manhole covers with a cover hook or pick; do not improvise. Be careful of fingers and toes; the cover is usually heavy and difficult to handle. Unless the cover is extremely heavy, it is safer for only one worker to handle it.
8. Test the atmosphere; if a toxic, flammable, or oxygen-deficient atmosphere exists, ventilate the sewer. Depending on the hazard, ventilation can be accomplished in a variety of ways: for example, (1) remove and vent the adjoining upstream and downstream manhole covers, as soon as possible, and well in advance of entering the manhole (high hazard); and (2) vent the manhole in which entry will occur (very low hazard). If a blower is used, it is desirable to establish a flow of air in the sewer, in one manhole and out another. Ensure that the air intake is well away from automobile exhaust, and combustible and/or toxic atmospheres. Appropriate traffic control measures must be taken by barricading or otherwise marking the open manholes.
9. After ventilating, test for explosive and toxic gases and oxygen deficiency in the manhole at ground level and at the bottom; record results. If entering the sewer itself, make the same tests at the manholes at either end. If ventilation is necessary, monitor the atmosphere in the manhole while work progresses, or continue operation of the blower. Continuous monitoring (i.e., equipment ON during entire entry) is imperative because conditions within the sewer may change rapidly. Do not enter a manhole while there is an oxygen deficiency without a pressure-demand, air-supplied breathing apparatus. If the oxygen level is lower than 20.9 percent of background, caution must be taken because an IDLH atmosphere may exist.
10. When entering manholes or tanks, wear hardhats, protective clothing, and unless inappropriate, respiratory protection and safety belt or harness with lifeline. If the manhole is less than 18 inches in diameter, a wrist-type harness must be used and special provisions made if air-supplied respirators are necessary. When working in manholes greater than 12 feet deep, in the sewer itself, or where potential exists for gases to appear unexpectedly, a 5-minute emergency egress air supply is

required (unless the time required to don the emergency respirator is greater than what would be needed to exit the manhole).

11. At least one person (i.e., standby) must remain at the manhole at all times and must keep continuous contact with the person entering the sewer. Contact can be maintained by line of sight, listening for sounds, and the safety line and/or radio. The standby person must not enter the manhole unless another trained person is available to act as standby and has adequate respiratory and dermal protection available. (In most cases, respiratory protection will be an airline respirator or SCBA.) The standby/rescue person should be suited up (but not yet on air) before the work crew enters the confined space.
12. Do not smoke when working in or near manholes. Do not take flash-lighted photographs when explosive gases are known or suspected to be present.
13. Do not rely on the manhole ladders because they are often in poor condition. If they must be used, be sure of footing. Inspect manhole ladders for deterioration before entering and while descending. Try each step with one foot, while standing on the step above. When in doubt, use a portable or rope ladder of adequate height to reach 3 feet above the manhole opening, or lower the entry person using the tripod. If a portable ladder is used, it should be tied off if possible; otherwise, it should be held in place by the standby person.
14. Do not work without adequate lighting. Use only "explosion-proof" lights or hand lamps in the manhole or sewer.
15. The entry person must not remain in the manhole or sewer if he/she becomes even slightly drowsy, faint, dizzy, or otherwise uncomfortable. Remember that carbon monoxide, carbon dioxide, methane, and hydrogen sulfide, which cause the most trouble, are odorless (hydrogen sulfide has a distinct odor only during initial exposure), tasteless, and invisible.

APPENDIX D
VAPOR EMISSION RESPONSE PLAN

The vapor emission response plan is divided into three sections, the minor and major emission responses and a borehole location evacuation plan.

Minor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background in the breathing zone at the work zone perimeter (i.e., approximately 3-5 feet from and above borehole), the drilling activities will be halted and monitoring continued. If the organic level decreases below 5 ppm, then drilling activities can resume with increased monitoring.

Drilling activities can also resume (with appropriate personnel protection) if the organic level is above 5 ppm and below 50 ppm at the work zone perimeter, other parameters permitting (e.g., the LEL at the wellhead is below 20%, and the H₂S level is below 10 ppm). However, the organic level 200 feet downwind of the work zone must not exceed 5 ppm above background.

If the organic level is above 50 ppm, or the H₂S level is above 10 ppm at the work zone perimeter, then the Site Safety Officer must be notified and well drilling activities stopped.

If the LEL level exceeds 20% all drilling activities shall be stopped immediately and all engines (ignition sources) will be turned off. Drilling personnel will leave the area and notify the Site Safety Officer.

Major Emission Response Plan

If any of the following levels are identified approximately 200 feet downwind from the work zone perimeter, all drilling activities must stop:

- 1) organic levels greater than 5 ppm above background.
- 2) LEL greater than 20% or
- 3) H₂S levels greater than 10 ppm.

If any of the above levels persist after cessation of drilling activities then the following contingency plan shall be placed into effect.

1. The perimeter of the closest downwind residential or commercial property will be monitored. If organic vapor levels approach 5 ppm, or if H₂S levels approach 10 ppm above background, then the local police authorities will be immediately contacted by the Site Safety Officer.
2. The appropriate personnel listed on the Master Phone List are to be notified by the Site Safety Officer.

In the event of a significant gas release (sudden visual and/or audible release) or excessive volatile emissions (organic level greater than 5 ppm above background located 200 feet downwind) during the well drilling program, the response action described below will be carried out.

Response Action

The well drillers will immediately proceed as follows:

- 1) Break the drill rods at the nearest joint unless the rods can be removed from the hole in one lift.
- 2) As soon as possible, leave the Site and notify the Site Safety Officer. The well drillers shall not proceed with remedial efforts until instructed to do so by the Site Safety Officer.

The Site Safety Officer will determine if a Minor or Major Vapor Emission condition (as defined in the previous Section) exists and will activate the appropriate Vapor Emission Response Plan.

If a major emission response action is warranted, the drillers, wearing the proper level of protection, will then seal off the borehole using a bentonite slurry grout and abandon the hole.

APPENDIX E

HEAT STRESS CASUALTY PREVENTION PLAN

HEAT STRESS CASUALTY PREVENTION PLAN

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically, heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

A. IDENTIFICATION AND TREATMENT

1. Heat Exhaustion

- a) Symptoms: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, breathing is shallow. The victim may faint unless he lies down. This may pass, but sometimes it persists and, while heat exhaustion is generally not considered life threatening, death could occur.
- b) First Aid: Immediately remove the victim to the Decontamination Reduction Zone in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make the victim lie down, raise feet 6-12 inches, maintain body temperature but loosen all clothing.) If the victim is conscious, it may be helpful to give sips of water. Transport victim to a medical facility.

2. Heat Stroke

- a) Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107°- 110°F. The victim will have a red face and will not be sweating. First there is often pain in the head, dizziness, nausea, oppression, and a dryness of the skin and mouth. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly. Heat stroke is always serious.
- b) First Aid: Immediately evacuate the victim to a cool and shady area in the Decontamination Reduction Zone. Remove all protective outer wear and all personal clothing. Lay the victim on his back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head and groin. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place in a tub of cool water. The main objective is to cool without chilling. Give no stimulants. Transport the victim to a medical facility as soon as possible.

B. PREVENTION OF HEAT STRESS

- 1) One of the major causes of heat casualties is the depletion of body fluids. Fluids should be maintained in the support zone. Personnel should replace water and salts loss from sweating. Salts can be replaced by either a 0.1% salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.
- 2) A work schedule will be established during warm weather so that the majority of the work day will be during the morning hours of the day before ambient air temperature levels reach their highs.
- 3) A work/rest schedule will be implemented for personnel required to wear Level B or C protection (i.e. impervious outer garment). A sufficient period will be allowed for personnel to "cool down". This may require shifts of workers during operations in addition to the breaks provided by required air tank changes (Level B). Maximum time between breaks at Level B or C shall be two hours regardless of temperature. At elevated temperatures, breaks should be scheduled as described below.

<u>Ambient Temperatures</u>	<u>Maximum Time Between Cooldown Breaks</u>
Above 90°F	¼ hr.
85°-90°F	½ hr.
80°-85°F	1 hr
70°-80°F	1½ hr.

- 4) Periodic breaks for "cooldown" and liquid replenishment should also be scheduled while wearing any chemical resistant outer wear.

C. HEAT STRESS MONITORING

For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing impervious clothing should commence when the ambient temperature 70°F or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 85°F, workers should be monitored for heat stress after every work period. The following are important considerations:

1. Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. If the pulse rate is 100 beats/minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.
2. Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the

beginning of the rest period should not exceed 99°F. If it does, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the OT exceeds 99.7°F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should be measured again at the end of the rest period to make sure that it has dropped below 99°F.

3. Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

APPENDIX F
PERSONAL FORMS AND LOGS

PERSONAL HAZARDOUS WASTE EXPOSURE RECORD

NAME: _____

SITE: _____

DATE: _____

NUMBER OF HOURS ON SITE: _____

CONDITION OF SITE: _____

AMBIENT AIR/SOIL/WATER INDICATORS:

LABORATORY: G.C. _____

ON-SITE: G.C. _____

P.I. METER _____

P.I. METER _____

OTHER _____

OTHER _____

TYPE OF EXPOSURE (i.e. inhalation, soil/water contact): _____

OPERATION PERFORMED (i.e. test pit inspection, sampling, drilling): _____

CHEMICALS BURIED OR KNOWN PRESENT: _____

PROTECTIVE EQUIPMENT WORN:

SAFETY SHOES (STEEL TOE & SHANK)

INNER LAB GLOVES

CHEMICAL RESISTANT BOOTS, TYPE: _____

OUTER CHEMICAL RESISTANT GLOVES

HALF-FACE RESPIRATOR

TYPE: _____

TYPE OF CARTRIDGE: _____

COVERALLS

FULL-FACE RESPIRATOR

TYPE: _____

TYPE OF CARTRIDGE: _____

DECONTAMINATION MEASURES TAKEN:

CHANGE OF CLOTHES

SHOWER

CHANGE OF PROTECTIVE EQUIPMENT

PERSONAL PROTECTIVE DECONTAMINATION PROCEDURES: _____

UNUSUAL SITE CONDITIONS/OCCURANCES: _____

OBSERVED HEALTH EFFECTS: _____

NOTES: _____

DAILY SAFETY LOG

PROJECT NAME: _____

DATE: _____

PROJECT NUMBER: _____

DAY NO: _____

E.C. JORDAN WORK PARTY: _____

SUBCONTRACTOR (): _____

VISITORS: _____

WORK SITE LOCATION: _____

SUMMARY OF CONDITIONS ENCOUNTERED: _____

FIRST AID ADMINISTERED? _____

INFRACTIONS OBSERVED: _____

BY: _____

SITE SAFETY FOLLOW-UP REPORT

(To be completed for each field change in plan.)

Was the HASP followed as presented? ___yes ___no

DESCRIBE IN DETAIL ANY CHANGES TO THE HASP:

REASON FOR CHANGES:

APPROVED BY SITE MANAGER:
SITE SAFETY OFFICER:

DATE:
DATE:

EVALUATION OF HEALTH AND SAFETY PLAN

Was the HASP adequate? ___yes ___no

WHAT CHANGES WOULD YOU RECOMMEND?

Was weather a factor? How?

Unsafe mechanical/physical/environmental condition at time of accident (be specific):

Unsafe act by injured and/or others contributing to the accident (be specific, must be answered):

Personal factors (improper attitude, lack of knowledge or skill, slow reaction, fatigue, inattention, horseplay):

MODIFICATIONS

Level of personal protective equipment required in site safety plan: _____

Was injured using required equipment? _____

If not, how did actual equipment use differ from plan?

Was personal protective equipment required in site safety plan adequate for site conditions? _____

If no, what additional equipment was needed:

What can be done to prevent a reoccurrence of this type of accident? (modification of machine, mechanical guards, modification of work practices, training):

DETAILED NARRATIVE DESCRIPTION (how did accident occur, why; objects, equipment, tools used, circumstance assigned duties. Be specific.):

Signature of Preparer: _____ Date: _____

Signature of Site Manager: _____ Date: _____

SEND COPIES OF COMPLETED FORM TO HUMAN RESOURCES
AND THE HEALTH AND SAFETY SUPERVISOR.

APPENDIX G

CHRIS DATA SHEETS/MATERIAL SAFETY DATA
SHEETS, FOR CONTAMINANTS OF CONCERN

ANTHRACENE

ATH

Common Synonyms Anthracen Paracanthalene Green oil	Solid White to yellow Weak aromatic odor Sinks in water.	
Keep away from fire. Do not inhale dust. Avoid contact with skin and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible. Dust cloud may explode if ignited in an enclosed area. Extinguish with water, dry chemicals, foam, or carbon dioxide.	
Exposure	CALL FOR MEDICAL AID. DUST Irritating to eyes, nose and throat. It may irritate and cause coughing or difficult breathing. If in nose, rub eyes, nose and throat with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: C ₁₄ H ₁₀ 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: Data not available 3.5 CAS Registry No.: 120-12-7		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to yellow 4.3 Odor: Weak aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask; goggles or face shield; rubber gloves 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Contact with eyes causes irritation. 5.3 Treatment of Exposure: INHALATION: move to fresh air. EYES: flush with water for 15 min. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: 250°F 6.2 Flammable Limits in Air: 0.5% LEL 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: Data not available 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: 1004°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) II								
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Data not available 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available									
11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Not listed 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: <table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Classification</td> </tr> <tr> <td style="text-align: right;">Health Hazard (Blue)</td> <td style="text-align: right;">0</td> </tr> <tr> <td style="text-align: right;">Flammability (Red)</td> <td style="text-align: right;">1</td> </tr> <tr> <td style="text-align: right;">Reactivity (Yellow)</td> <td style="text-align: right;">-</td> </tr> </table>		Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	-
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	-								
8. WATER POLLUTION 8.1 Aquatic Toxicity: 5 ppm/24 hr/trout & bluegill/no effect 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None									
9. SHIPPING INFORMATION 9.1 Grades of Purity: Various fluorescence grades; Scintillation grade; Technical grade, 90-98% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open									
12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 178.23 12.3 Boiling Point at 1 atm: 346.2°F = 341.2°C = 614.4 K 12.4 Freezing Point: 421.7°F = 216.5°C = 489.7 K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.24 at 20°C (solid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: -17,100 Btu/lb = -9,510 cal/g = -398 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 38.70 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available									
NOTES									

BENZENE

BNZ

Common Synonyms Benzol Benzole		Watery liquid Colorless Gasoline-like odor	
Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.			
Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire		<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool expanded containers with water.</p>	
Exposure		<p>CALL FOR MEDICAL AID</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>	
Water Pollution		<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Restrict access		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C ₆ H ₆ 3.3 IMO/UN Designation: 3.2/1114 3.4 DOT ID No: 1114 3.5 CAS Registry No.: 71-43-2		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic; rather pleasant aromatic odor; characteristic odor	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene. 5.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, coma and possible death. 5.3 Treatment of Exposure: 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. 5.4 Threshold Limit Value: 10 ppm 5.5 Short Term Inhalation Limits: 75 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD ₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Leukemia 5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin. 5.10 Odor Threshold: 4.68 ppm 5.11 IDLH Value: 2,000 ppm			

6. FIRE HAZARDS 6.1 Flash Point: 12°F C.C. 6.2 Flammable Limits in Air: 1.0%-7.9% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back 6.7 Ignition Temperature: 1097°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 6.0 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available		10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W																													
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 22		11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>3</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>3</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>		Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	1	Aesthetic Effect	3	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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8. WATER POLLUTION 8.1 Aquatic Toxicity: 5 ppm/6 hr/minnow/ethal/distilled water 20 ppm/24 hr/sunfish/TL ₅₀ /tap water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 1.2 lb/lb, 10 days 8.4 Food Chain Concentration Potential: None		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 78.11 12.3 Boiling Point at 1 atm: 176°F = 80.1°C = 353.3°K 12.4 Freezing Point: 42.0°F = 5.5°C = 278.7°K 12.5 Critical Temperature: 552.0°F = 288.9°C = 562.1°K 12.6 Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m ² 12.7 Specific Gravity: 0.879 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 35.0 dynes/cm = 0.035 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 2.7 12.11 Ratio of Specific Heats of Vapor (Gas): 1.061 12.12 Latent Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94 X 10 ⁴ J/kg 12.13 Heat of Combustion: -17,460 Btu/lb = -9698 cal/g = -406.0 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 20.45 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 3.22 psia																													
9. SHIPPING INFORMATION 9.1 Grades of Purity: Industrial pure 99+ % Thiophene-free 99+ % Nitration 99+ % Industrial 90% 85+ % Reagent 99+ % 9.2 Storage Temperature: Open 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum		NOTES																													

CARBON TETRACHLORIDE

CBT

<p>Common Synonyms</p> <p>Carbon Tet Tetrachloroethane Benzonolom Necatorine Pechuroromethane</p>	<p>Watery liquid Colorless Sweet odor</p> <p>Sinks in water. Poisonous vapor is produced.</p>		
<p>Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Notify local health and pollution control agencies.</p>			
<p>Fire</p>	<p>Not flammable. POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus.</p>		
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR POISONOUS IF INHALED. (Irritating to eyes) Wash to flush out. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID POISONOUS IF SWALLOWED. (Irritating to skin and eyes.) Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water of milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>		
<p>Water Pollution</p>	<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-poison Restrict access Should be removed</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>	
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CCl₄ 3.3 IMO/UN Designation: 6.1/1846 3.4 DOT ID No.: 1846 3.5 CAS Registry No.: 56-23-5</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweetish, aromatic; moderately strong etheral; somewhat resembling that of chloroform.</p>	
<p>5. HEALTH HAZARDS</p>			
<p>5.1 Personal Protective Equipment: Organic vapor canister with full face mask; protective clothing; rubber gloves. 5.2 Symptoms Following Exposure: Dizziness, incoordination, anesthesia; may be accompanied by nausea and liver damage. Kidney damage also occurs, often producing decrease or stopping of urinary output. 5.3 Treatment of Exposure: EYES AND SKIN: flush with plenty of water; for eyes, get medical attention. Remove contaminated clothing and wash before reuse. INHALATION: immediately remove to fresh air, keep patient warm and quiet and get medical attention promptly. Start artificial respiration if breathing stops. INGESTION: induce vomiting and get medical attention promptly. No specific antidote known. 5.4 Threshold Limit Value: 5 ppm 5.5 Short Term Inhalation Limits: 25 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg (rat) 5.7 Late Toxicity: Causes severe liver damage and death if ingested. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin. 5.10 Odor Threshold: Greater than 10 ppm 5.11 IDLH Value: 300 ppm</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Forms poisonous phosgene gas when exposed to open flames. 6.6 Behavior in Fire: Decomposes to form chlorine and phosgene 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X</p>
<p>11. HAZARD CLASSIFICATIONS</p>	
<p>11.1 Code of Federal Regulations: OSHA 11.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating Fire: 0 Health: Vapor Irritant: 2 Liquid or Solid Irritant: 1 Poisons: 4 Water Pollution: Human Toxicity: 2 Aquatic Toxicity: 2 Aesthetic Effect: 2 Reactivity: Other Chemicals: 1 Water: 0 Self Reaction: 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue): 3 Flammability (Red): 0 Reactivity (Yellow): 0</p>	
<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p>	
<p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 153.83 12.3 Boiling Point at 1 atm: 170°F = 76.5°C = 349.7°K 12.4 Freezing Point: -9.4°F = -23.0°C = 250.2°K 12.5 Critical Temperature: 541°F = 283°C = 556°K 12.6 Critical Pressure: 660 psia = 45 atm = 4.6 MN/m² 12.7 Specific Gravity: 1.59 at 20°C (liquid) 12.8 Liquid Surface Tension: 27.0 dynes/cm = 0.027 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 45.0 dynes/cm = 0.045 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 5.3 12.11 Ratio of Specific Heats of Vapor (Gas): 1.111 12.12 Latent Heat of Vaporization: 84.2 Btu/lb = 46.8 cal/g = 1.959 x 10⁴ J/kg 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 5.09 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 3.5 psia</p>	
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None</p>	
<p>9. SHIPPING INFORMATION</p>	
<p>9.1 Grades of Purity: Commercial; technical; USP 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>	
<p>NOTES</p>	

1,2-DICHLOROETHYLENE

DEL

Common Synonyms Acetylene dichloride sym-dichloroethylene Dichorm Ga-1, 2-dichloroethylene trans-1, 2-dichloroethylene	Liquid	Colorless	Sweet pleasant odor
Sinks in water. Flammable, irritating vapor is produced.			
Wear goggles and suit contained breathing apparatus. Shut off ignition sources. Call fire department. Stop discharge if possible. Avoid people away. Isolate and remove discharged material. Notify local health and pollution control agencies			
Fire	<p>FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR If inhaled will cause dizziness, nausea, vomiting, or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>		
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Restrict access Evacuate area Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Not listed 3.2 Formula: C₂H₂Cl₂ 3.3 HAZ/UN Designation: 3.2/1150 3.4 DOT ID No.: 1150 3.5 CAS Registry No.: 540-59-0</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Ethereal, slightly acid; pleasant, chloroform-like</p>	
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Rubber gloves; safety goggles; air supply mask or self-contained breathing apparatus.</p> <p>5.2 Symptoms Following Exposure: Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous depression. Contact with liquid causes irritation of eyes and (on prolonged contact) skin. Ingestion causes slight depression to deep narcosis.</p> <p>5.3 Treatment of Exposure: INHALATION: remove from further exposure; if breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration, preferably mouth-to-mouth; give oxygen when breathing is resumed; call a physician. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give gastric lavage and cathartics.</p> <p>5.4 Threshold Limit Value: 200 ppm</p> <p>5.5 Short Term Inhalation Limits: Data not available</p> <p>5.6 Toxicity by Ingestion: Grade 2; oral LD₅₀ = 770 mg/kg (rat)</p> <p>5.7 Late Toxicity: Produces liver and kidney injury in experimental animals</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Data not available</p> <p>5.9 Liquid or Solid Irritant Characteristics: Data not available</p> <p>5.10 Odor Threshold: Data not available</p> <p>5.11 IDLH Value: 4,000 ppm</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 37°F C.C.</p> <p>6.2 Flammable Limits in Air: 9.7%-12.8%</p> <p>6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.</p> <p>6.5 Special Hazards of Combustion Products: Phosgene and hydrogen chloride fumes may form in fire.</p> <p>6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.</p> <p>6.7 Ignition Temperature: 860°F</p> <p>6.8 Electrical Hazard: Data not available</p> <p>6.9 Burning Rate: 2.8 mm/min.</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p style="text-align: right;">(Continued)</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X-Y</p> <p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 NIOSH Hazard Rating for Bulk Water Transportation: Not listed</p> <p>11.3 NFPA Hazard Classification</p> <table border="0"> <tr> <td>Category</td> <td>Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	2
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	3								
Reactivity (Yellow)	2								
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Will not occur under ordinary conditions of shipment. The reaction is not vigorous.</p> <p>7.6 Inhibitor of Polymerization: None used</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: Data not available</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 97.0</p> <p>12.3 Boiling Point at 1 atm: cis: 140°F = 60°C = 333°K trans: 118°F = 48°C = 321°K</p> <p>12.4 Freezing Point: cis: -114°F = -81°C = 192°K trans: -68°F = -50°C = 223°K</p> <p>12.5 Critical Temperature: Not pertinent</p> <p>12.6 Critical Pressure: Not pertinent</p> <p>12.7 Specific Gravity: 1.27 at 25°C (liquid)</p> <p>12.8 Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension (est.) 30 dynes/cm = 0.030 N/m at 20°C</p> <p>12.10 Vapor (Gas) Specific Gravity: 3.34</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.1488</p> <p>12.12 Latent Heat of Vaporization: 130 Btu/lb = 72 cal/g = 3.0 X 10⁵ J/kg</p> <p>12.13 Heat of Combustion: -1,547.2 Btu/lb = -2,892.9 cal/g = -112.67 X 10³ J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.18 Heat of Fusion: Data not available</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: Data not available</p>								
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): Data not available</p> <p>8.4 Food Chain Concentration Potential: None</p>	<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Commercial</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Pressure-vacuum</p>								
<p>6. FIRE HAZARDS (Continued)</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>									

ETHYLBENZENE

ETB

Common Synonyms Phenyltoluene EB		Liquid	Colorless	Sweet, gasoline-like odor
Floats on water. Flammable, irritating vapor is produced.				
<p>Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Slow discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>				
Fire	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited by an exposed spark. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>			
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, may cause dizziness or difficult breathing. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>			
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Floating to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3		
3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Aromatic hydrocarbon 3.2 Formula: C ₈ H ₁₀ 3.3 IMO/UN Designation: 3.2/1175 3.4 DOT ID No: 1175 3.5 CAB Registry No: 100-41-4		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Self-contained breathing apparatus; safety goggles.				
5.2 Symptoms Following Exposure: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.				
5.3 Treatment of Exposure: INHALATION: If it 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.				
5.4 Threshold Limit Value: 100 ppm				
5.5 Short Term Inhalation Limit: 200 ppm for 30 min.				
5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 5 g/kg (rat)				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.				
5.9 Liquid or Solid Irritant Characteristics: Causes smearing of the skin and first-degree burns on short exposure, may cause secondary burns on long exposure.				
5.10 Odor Threshold: 140 ppm				
5.11 IDLH Value: 2,000 ppm				

6. FIRE HAZARDS		10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U	
6.1 Flash Point: 80°F O.C.; 59°F C.C.		11. HAZARD CLASSIFICATIONS	
6.2 Flammable Limits in Air: 1.0%-8.7%		11.1 Code of Federal Regulations: Flammable liquid	
6.3 Fire Extinguishing Agents: Foam (most effective), water fog, carbon dioxide or dry chemical.		11.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating Fire 3 Health Vapor Irritant 2 Liquid or Solid Irritant 2 Poisons 2 Water Pollution Human Toxicity 1 Aquatic Toxicity 3 Aesthetic Effect 2 Reactivity Other Chemicals 1 Water 0 Self Reaction 0	
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent		11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) 2 Flammability (Red) 3 Reactivity (Yellow) 0	
6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated.		12. PHYSICAL AND CHEMICAL PROPERTIES	
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.		12.1 Physical State at 15°C and 1 atm: Liquid	
6.7 Ignition Temperature: 880°F		12.2 Molecular Weight: 106.17	
6.8 Electrical Hazard: Not pertinent		12.3 Boiling Point at 1 atm: 277.2°F = 136.2°C = 409.4°K	
6.9 Burning Rate: 5.8 mm/min.		12.4 Freezing Point: -139°F = -95°C = 178°K	
6.10 Adiabatic Flame Temperature: Data Not Available		12.5 Critical Temperature: 651.0°F = 343.9°C = 617.1°K	
(Continued)		12.6 Critical Pressure: 523 psia = 35.6 atm = 3.61 MN/m ²	
7. CHEMICAL REACTIVITY		12.7 Specific Gravity: 0.867 at 20°C (liquid)	
7.1 Reactivity With Water: No reaction		12.8 Liquid Surface Tension: 29.2 dynes/cm = 0.0292 N/m at 20°C	
7.2 Reactivity with Common Materials: No reaction		12.9 Liquid Water Interfacial Tension: 35.48 dynes/cm = 0.03548 N/m at 20°C	
7.3 Stability During Transport: Stable		12.10 Vapor (Gas) Specific Gravity: Not pertinent	
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent		12.11 Ratio of Specific Heats of Vapor (Gas): 1.071	
7.5 Polymerization: Not pertinent		12.12 Latent Heat of Vaporization: 144 Btu/lb = 80.1 cal/g = 3.35 X 10 ⁴ J/kg	
7.6 Inhibitor of Polymerization: Not pertinent		12.13 Heat of Combustion: -17,780 Btu/lb = -9877 cal/g = -413.5 X 10 ⁴ J/kg	
7.7 Molar Ratio (Reactant to Product): Data Not Available		12.14 Heat of Decomposition: Not pertinent	
7.8 Reactivity Group: 02		12.15 Heat of Solution: Not pertinent	
8. WATER POLLUTION		12.16 Heat of Polymerization: Not pertinent	
8.1 Aquatic Toxicity: 29 ppm/96 hr/bluegill/fresh water		12.18 Heat of Fusion: Data Not Available	
8.2 Waterfowl Toxicity: Data not available		12.26 Limiting Value: Data Not Available	
8.3 Biological Oxygen Demand (BOD): 2.8% (theor.), 5 days		12.27 Reid Vapor Pressure: 0.4 psia	
8.4 Food Chain Concentration Potential: None		9. SHIPPING INFORMATION	
9.1 Grades of Purity: Research grade: 99.98%; pure grade: 99.5%; technical grade: 99.0%		9.2 Storage Temperature: Ambient	
9.2 Storage Temperature: Ambient		9.3 Inert Atmosphere: No requirement	
9.3 Inert Atmosphere: No requirement		9.4 Venting: Open (flame arrester) or pressure-vacuum	
9.4 Venting: Open (flame arrester) or pressure-vacuum		6. FIRE HAZARDS (Continued)	
6.11 Stoichiometric Air to Fuel Ratio: Data Not Available		6.12 Flame Temperature: Data Not Available	

ETHYLENE DIBROMIDE

EDB

<p>Common Synonyms</p> <p>1, 2-Dibromoethane Ethylene Bromide Bromoethane syn-Dibromoethane Dow-Luna 40, W-10, W-15, W-40 Cyclo dibromide</p>	<p>Liquid</p> <p>Sinks in water. Poisonous vapor is produced. Freezing point is 50°F.</p>	<p>Colorless</p>	<p>Sweet odor</p>
<p>Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
<p>Fire</p>	<p>Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Cool exposed containers with water.</p>		
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>		
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>	<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>		
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: BrCH₂CH₂Br 3.3 IMO/UN Designation: 6.1/1605 3.4 DOT ID No.: 1605 3.5 CAS Registry No.: 106-93-4</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mildly sweet; like chloroform</p>		
<p>5. HEALTH HAZARDS</p>			
<p>5.1 Personal Protective Equipment: Canister type mask or self-contained air mask; neoprene gloves; chemical safety goggles. 5.2 Symptoms Following Exposure: Local inflammation, blisters and ulcers on skin; irritation in lungs and organic injury to liver and kidneys; may be absorbed through skin. 5.3 Treatment of Exposure: Remove from exposure. Remove contaminated clothing. Wash skin with soap and water. Flush eyes with plenty of water. Consult physician. 5.4 Threshold Limit Value: 2 ppm 5.5 Short Term Inhalation Limit: 50 ppm for 5 min. 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 400 ppm</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion: Products: Decomposition gases are toxic and irritating. 6.6 Behavior in Fire: Decomposes into toxic irritating gases. Reacts with hot metals such as aluminum and magnesium. 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data Not Available 6.11 Stoichiometric Air to Fuel Ratio: Data Not Available 6.12 Flame Temperature: Data Not Available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity With Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data Not Available 7.8 Reactivity Group: 3B</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulation: ORM-A 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Category</th> <th style="text-align: center;">Rating</th> </tr> </thead> <tbody> <tr> <td>Flammable</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Poisons</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Aesthetic Effect</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Water</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Self Reaction</td> <td style="text-align: center;">0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Category</th> <th style="text-align: center;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td style="text-align: center;">3</td> </tr> <tr> <td>Flammability (Red)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td style="text-align: center;">0</td> </tr> </tbody> </table>	Category	Rating	Flammable	0	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	0
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Reactivity (Yellow)	0																																				
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 15 mg/L/48 hr/bluegill/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 187.86 12.3 Boiling Point at 1 atm: 268°F = 131°C = 404°K 12.4 Freezing Point: 49.8°F = 9.8°C = 293.0°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 2.180 at 20°C (liquid) 12.8 Liquid Surface Tension: 38.75 dynes/cm = 0.03875 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.54 dynes/cm = 0.03654 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.109 12.12 Latent Heat of Vaporization: 82.1 Btu/lb = 45.8 cal/g = 1.91 X 10⁴ J/kg 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 13.79 cal/g 12.26 Limiting Value: Data Not Available 12.27 Reid Vapor Pressure: 0.4 psia</p>																																				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purty: Commercial 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>																																					
<p>NOTES</p>																																					

GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

GAT

<p>Common Synonyms Motor spirit Petrol</p>	<p>Watery liquid Colorless to pale brown or pink Gasoline odor</p>	<p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "break down" vapor. Bottle and remove decontaminated material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
<p>Water Pollution</p>	<p>HAZARFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Floating to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: (Mixture of hydrocarbons) 3.3 IMO/UN Designation: 3.1/1203 3.4 DOT ID No.: 1203 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to brown 4.3 Odor: Gasoline</p>
<p>5. HEALTH HAZARDS</p>		
<p>5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: Irritation of mucous membranes and stimulation followed by depression of central nervous system. Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest. If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonia. Swallowing may cause irregular heartbeat. 5.3 Treatment of Exposure: INHALATION: maintain respiration and administer oxygen; enforce bed rest if liquid is in lungs. INGESTION: do NOT induce vomiting; stomach should be lavaged (by doctor) if appreciable quantity is swallowed. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg. 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: minimum hazard, if spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.25 ppm 5.11 IDLH Value: Data not available</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: -36°F C.C. 6.2 Flammable Limits in Air: 1.4%-7.4% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 853°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4 mm/min. 6.10 Acidic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p> <p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p> <p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 90 ppm/24 hr/juvenile American shad/TL₅₀/fresh water 91 mg/1124 hr/juvenile American shad/TL₅₀/salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 8%, 5 days 8.4 Food Chain Concentration Potential: None</p> <p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Various octane ratings; military specifications 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p> <p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating Fire..... 3 Health Vapor Irritant..... 1 Liquid or Solid Irritant..... 1 Poisons..... 2 Water Pollution Human Toxicity..... 1 Aquatic Toxicity..... 2 Aesthetic Effect..... 2 Reactivity Other Chemicals..... 0 Water..... 0 Self Reaction..... 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue)..... 1 Flammability (Red)..... 3 Reactivity (Yellow)..... 0</p> <p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 140-190°F = 60-199°C = 333-472°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.721 at 20°C (liquid) 12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049-0.051 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 3.4 12.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.054 12.12 Latent Heat of Vaporization: 100-150 Btu/lb = 71-81 cal/g = 3.0 - 3.4 X 10⁴ J/kg 12.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = 435.1 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 7.4 psia</p> <p style="text-align: center;">NOTES</p>
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GASOLINES: AVIATION (< 4.86g lead/gal)

GAV

Common Synonyms	Watery liquid	Red, blue, green, brown or purple	Gasoline odor
Floats on water. Flammable, irritating vapor is produced.			
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Fight fire with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush</p>		<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Not listed 3.2 Formula: Not pertinent 3.3 IMO/UN Designation: 3.1/1203 3.4 DOT ID No.: 1203 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Red, blue, green, brown, purple 4.3 Odor: Gasoline</p>	
5. HEALTH HAZARDS			
<p>5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonia; acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat. 5.3 Treatment of Exposure: Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: 300 ppm 5.5 Short Term Inhalation Limit: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.25 ppm 5.11 IDLH Value: Data not available</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: -50°F C.C. 6.2 Flammable Limits in Air: 1.2%-7.1% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 824°F 6.8 Electrical Hazard: Class 1, group D 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulation: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>0</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0
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9. SHIPPING INFORMATION																																					
<p>9.1 Grades of Purity: Grades 80/87, 100/130, and 115/145; Specification MIL-G-5572e 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>																																					
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GASOLINES: STRAIGHT RUN

GSR

Common Synonyms	Watery liquid Colorless Gasoline odor
Floats on water. Flammable, irritating vapor is produced.	
Fire	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.</p>
Exposure	<p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting.</p>
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Floating to shoreline. May be dangerous if it enters water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush</p>	<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not pertinent 3.3 IMO/UN Designation: 3.1, 3.2/1203 3.4 DOT ID No.: 1203 3.5 CAS Registry No.: Data not available</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Gasoline</p>
<p style="text-align: center;">5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat. 5.3 Treatment of Exposure: Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: 300 ppm 5.5 Short Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: 0.25 ppm 5.11 IDLH Value: Data not available</p>	

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: (a) <0°F C.C. (b) 0-73°F C.C. 6.2 Flammable Limits in Air: (a) 1.3%-7.1% 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Class I, group 0 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p>																																						
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<p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Composition varies with range of distillation temperatures used. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>																																							
NOTES																																							

KEROSENE

KRS

<p>Common Synonyms</p> <p>Illuminating oil Kerosene Range of Fuel Oil No. 1 Jet Fuel, JP-1</p>	<p>Watery liquid</p> <p>Colorless</p> <p>Fuel of odor</p> <p>Floats on water.</p>	
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
<p>Water Pollution</p>	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook)</p> <p>Mechanical containment Should be removed Chemical and physical treatment</p>	<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>	
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Competibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: C₁₅H₃₂+ 3.3 IMO/UN Designation: 3.3/1229 3.4 DOT ID No.: 1229 3.5 CAS Registry No.: 8008-20-6</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light brown 4.3 Odor: Characteristic</p>	
<p>5. HEALTH HAZARDS</p>		
<p>5.1 Personal Protective Equipment: Protective gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema. 5.3 Treatment of Exposure: ASPIRATION: enforce bed rest; administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: 200 ppm 5.5 Short Term Inhalation Limit: 2500 mg/m³ for 90 min. 5.6 Toxicity by Ingestion: Grade I; LD₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 1 ppm 5.11 IDLH Value: Data not available</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 100°F (min.) (C.C.) 6.2 Flammable Limits in Air: 0.7%-5% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 444°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Combustible liquid 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>2</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>3</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>0</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	2	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	3	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 2990 ppm/24 hr/bluegill/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 53%, 5 days 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 392-500°F = 200-260°C = 473-532°K 12.4 Freezing Point: -50°F = -45.6°C = 227.8°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.80 at 15°C (liquid) 12.8 Liquid Surface Tension: 23-32 dynes/cm = 0.023-0.032 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 47-49 dynes/cm = 0.047-0.049 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: 110 Btu/lb = 60 cal/g = 2.5 X 10⁴ J/kg 12.13 Heat of Combustion: -15,540 Btu/lb = -10,300 cal/g = -431.24 X 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.1 psia</p>																																				
<p>NOTES</p>																																					

Lead (Pb)

Physical and Chemical Description: Pb, soft, ductile, gray metal, insoluble in water but dissolves slowly in water containing a weak acid. Since lead is an element, it will remain indefinitely once released to the environment.

Uses: Lead is used in electroplating, radiation protection devices, plastics, electronic equipment, storage batteries, gasoline anti-knock additives, and pigments.

Toxicity in Water: The hazards of human exposure to lead are well known. Symptoms of lead poisoning include fatigue, anemia, abdominal pains, constipation, and neurological damage. The Florida Primary Drinking Water Standard (F.A.C. 17-22) for lead is 50 ug/l.

The toxic effects of lead on aquatic organisms is strongly dependent on the water hardness. To protect freshwater aquatic life at hardnesses of 50, 100, and 200 mg/l as CaCO₃, the concentrations of lead should not exceed 0.75, 3.8, and 20 ug/l, respectively. To protect saltwater life, lead should not exceed 25 ug/l (EPA, 1979).

Classification: Hazardous Substance (EPA).

Hazardous Waste Constituent (EPA)

Priority Toxic Pollutant (EPA)

MINERAL SPIRITS

MNS

<p>Common Synonyms</p> <p>Petroleum spirits Naphtha</p>	<p>Watery liquid</p> <p>Floats on water.</p>	<p>Colorless</p>	<p>Gasoline-like odor</p>
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>Combustible. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed.</p> <p>Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook)</p> <p>Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>	
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/IUN Designation: 2.3/1300 3.4 DOT ID No.: 1300 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline</p>	
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Plastic gloves; goggles or face shield (as for gasoline). 5.2 Symptoms Following Exposure: INHALATION: mild irritation of respiratory tract. ASPIRATION: severe lung irritation and rapidly developing pulmonary edema; central nervous system excitement followed by depression. INGESTION: Irritation of stomach. 5.3 Treatment of Exposure: INHALATION: remove victim to fresh air. ASPIRATION: enforce bed rest; give oxygen; call a doctor. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: 4000-7000 ppm for 60 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 105—140°F C.C., depending on grade 6.2 Flammable Limits in Air: 0.8%-5.0% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Do not use straight hose water stream. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 540°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>								
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Combustible liquid 11.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Category</td> <td style="text-align: center;">Classification</td> </tr> <tr> <td style="text-align: center;">Health Hazard (Blue).....</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">Flammability (Red).....</td> <td style="text-align: center;">2</td> </tr> <tr> <td style="text-align: center;">Reactivity (Yellow).....</td> <td style="text-align: center;">0</td> </tr> </table>	Category	Classification	Health Hazard (Blue).....	0	Flammability (Red).....	2	Reactivity (Yellow).....	0
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Health Hazard (Blue).....	0								
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 8%, 5 days 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 310—395°F = 154—202°C = 428—475°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.78 at 20°C (liquid) 12.8 Liquid Surface Tension: Data not available 12.9 Liquid Water Interfacial Tension: Data not available 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas) (est): 1.000 12.12 Latent Heat of Vaporization: Data not available 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.13 psia</p>								
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Various grades available. 70-100% of the materials are derived from petroleum, and 0-30% are aromatic hydrocarbons like benzene and toluene. Flash points vary with the exact composition but are usually above 100°F. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>									
<p>NOTES</p>									

Naphthalene (C₁₀H₈)

Physical and Chemical Description: white crystalline solid with a characteristic "moth ball" odor. Naphthalene is more dense than water (sp. gr. 1.145) and has a solubility of 30,000 - 40,000 ug/l @ 25°C. It melts at 80°C but will sublime (volatilize from a solid) at room temperature. Naphthalene is considered a polynuclear aromatic hydrocarbon (PAH).

Uses: intermediate in dye production and formation of solvents, lubricants, and motor fuels. Used directly as a moth repellent.

Toxicity: Naphthalene may be absorbed by inhalation, ingestion or skin or eye contact. Chronic exposure can cause cataracts, kidney disease and red blood cell breakdown, especially in infants and individuals deficient in the enzyme G6PD. Naphthalene has been shown to be nonmutagenic and noncarcinogenic.

Classification: Hazardous Substance (EPA)

Hazardous Waste (EPA)

Priority Toxic Pollutant (EPA)

Persistence: Naphthalene can oxidize in the presence of light and air, 50% after 14 days in one study. Microbial degradation has also been demonstrated in the laboratory in solutions as concentrated as 3.3 ug/l. Little breakdown is expected, however, under the dark, anaerobic conditions characteristic of in-situ ground water.

Phenanthrene (C₁₄H₁₀)

Physical and Chemical Description: colorless, monoclinic crystals soluble in water, 1,000-1,300 ug/l @ 2.5°C, specific gravity = 1.179.

Phenanthrene is a PAH.

Uses: dyes, explosives, a natural constituent of coal tar and of diesel oil (0.35%).

Toxicity: Phenanthrene has been identified as a mild allergen and human dermal photosensitizer. Limited acute and chronic animal experiments show it to be of low to moderate toxicity.

Classification: none

Fluorene (C₁₃H₁₀)

Physical and Chemical Description: Combustible white solid having a density of 1.20 and a water solubility of 1980 ug/l.

Uses: Manufacture of dyestuffs.

Toxicity: Little specific information is available about the toxicity of fluorene but it is a polynuclear aromatic hydrocarbon (PAH), a group which contains known human carcinogens.

Classification: None

OILS: DIESEL

ODS

<p>Common Synonyms</p> <p>Fuel oil 1-D Fuel oil 2-D</p>	<p>Oil; liquid</p> <p>Yellow-brown</p> <p>Lube or fuel oil odor</p>	<p>Floats on water.</p>	
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>Combustion: Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>	
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.1/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Light brown 4.3 Odor: Like fuel oil</p>	
<p>5. HEALTH HAZARDS</p>			
<p>5.1 Personal Protective Equipment: Goggles or face shield. 5.2 Symptoms Following Exposure: If liquid is ingested, an increased frequency of bowel movements will occur. 5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. SKIN: wipe off, wash with soap and water. EYES: wash with copious amounts of water for at least 15 min. 5.4 Threshold Limit Value: No single TLV applicable. 5.5 Short Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg 5.7 Leta Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: (1-D) 100°F C.C.; (2-D) 125°F C.C. 6.2 Flammable Limits in Air: 1.0-6.0 vol. % 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: (1-D) 350-625°F (2-D) 400-545°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>								
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Combustible liquid 11.2 NAAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border: none;"> <tr> <td style="padding-right: 20px;">Category</td> <td>Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0
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Health Hazard (Blue)	0								
Flammability (Red)	2								
Reactivity (Yellow)	0								
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 204 mg/l/24 hr/acute American shad/T₁₀₀/salt water 8.2 Waterfowl Toxicity: >20 ml/kg /LD₅₀/mallards 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 550-640°F = 288-328°C = 561-612°K 12.4 Freezing Point: 0 to -30°F = -18 to -34°C = 255 to 229°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.841 at 16°C (liquid) 12.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 12.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: = 15,400 Btu/lb = -10,200 cal/g = 429 x 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Varies</p>								
<p>NOTES</p>									

OILS, MISCELLANEOUS: LUBRICATING

OLB

Common Synonyms Crankcase oil Transmission oil Motor oil	Oil liquid Yellow-brown Lube oil odor
Floats on water.	
Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment	2. LABEL 2.1 Category: None 2.2 Class: Not pertinent
3. CHEMICAL DESIGNATIONS 3.1 CO Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.3/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow fluorescent 4.3 Odor: Characteristic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves; goggles or face shield. 5.2 Symptoms Following Exposure: INGESTION: minimal gastrointestinal tract irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure. 5.3 Treatment of Exposure: INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1; LD ₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 300°F C.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water of foam may cause hothing. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 500°F-700°F 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-7-U
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Not listed 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) 0 Flammability (Red) 1 Reactivity (Yellow) 0
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: Very high 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: (est.) 0.902 at 20°C (liquid) 06-37.5 dynes/cm - 0.036-0.0275 N/m at 20°C 12.8 Liquid Surface Tension: 33-54 dynes/cm = 0.033-0.054 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 33-54 dynes/cm = 0.033-0.054 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: -18,486 Btu/lb = -10,270 cal/g = -429.98 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available
9. SHIPPING INFORMATION 9.1 Grades of Purity: Various viscosities 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)	NOTES

OILS, MISCELLANEOUS: PENETRATING

OPT

<p>Common Synonyms</p> <p>Preservative of Water displacing oil</p>	<p>Oil; liquid</p> <p>Yellow</p> <p>Motor oil-like odor</p>	<p>Floats on water.</p>
<p>Spill discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
<p>Water Pollution</p>	<p>Effect of low concentrations on aquatic life is unknown. Foaming to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/IUN Designation: 3.0/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Yellowish 4.3 Odor: Like motor oil</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Protective gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Liquid may irritate stomach and increase frequency of bowel movements. 5.3 Treatment of Exposure: INGESTION: have victim drink water or milk; do NOT induce vomiting. ASPIRATION: check for delayed development of pulmonary irritation by serial x-rays. EYES: wash with copious amounts of water. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If applied on clothing and allowed to remain, may cause smarting and reddening of skin. 5.10 Odor Threshold: Data not available 5.11 OELM Value: Data not available</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 205°F 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	
<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Not listed 11.2 KAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>	
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Watertow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Commercial 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>	
<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: Very high 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.8961 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.8 dynes/cm = 0.0298 N/m at 24°C 12.9 Liquid Water Interfacial Tension: 5.5 dynes/cm = 0.0055 N/m at 22°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion (est.): -18,000 Btu/lb = -10,000 cal/g = -42 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: Data not available 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: Data not available</p>	
<p style="text-align: center;">NOTES</p>	

The World Health Organization has established an international standard for PAH's in drinking water of less than 0.2 ug/l. This recommendation is based upon the composite analysis of six PAH's in drinking water: fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)-pyrene. The selection of these six PAH's was not made on the basis of health effects but were selected as useful indicators of PAH pollution. The EPA estimated carcinogenic risk of 10^{-5} for a lifetime consumption of water with a concentration of total carcinogenic PAH's of 0.028 ug/l is not applicable in this study

DATE 2/23/88

MATERIAL SAFETY DATA SHEET

PAGE 1

SECTION I - GENERAL INFORMATION

(REORDER PRODUCT BY THIS NO.)

CATALOG NO 48510

PRODUCT NAME 1,1,1-TRICHLOROETHANE 1G^s

DATA SHEET NO R430110

1,1,1-TRICHLOROETHANE

FORMULA CH3CCl3

FORMULA WEIGHT 133

CAS 71-55-6 NRTECS KJ2975000

SYNONYM METHYLCHLOROFORM

MANUFACTURER SUPELCO INC.

PHONE 814-359-3441

ADDRESS SUPELCO PARK, BELLEFONTE, PA 16823-0048

SECTION II - HAZARDOUS INGREDIENTS OF MIXTURES

MATERIALS - PERCENTAGE - CAS #

(FORMULA) - TLV(UNITS)

LD50 VALUE - CONDITIONS

N/A

SECTION III - PHYSICAL DATA

BOILING POINT 74 C MM MELTING POINT -35 C
VAPOR PRESSURE 104.40 25.0 C SPECIFIC GRAVITY 1.330 25.0 C (WATER=1)
VAPOR DENSITY 4.54 C (AIR=1) PERCENT VOLATILE BY VOLUME 100
WATER SOLUBILITY .7 EVAPORATION RATE 0.35 (ETHER=1)
APPEARANCE CLEAR, COLORLESS LIQUID ETHER-LIKE ODOR

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT F FLAMMABLE LIMITS LEL 7.0 UEL 16

EXTINGUISHING MEDIA

WATER
CO2
DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES

WEAR SELF CONTAINED BREATHING APPARATUS WHEN FIGHTING A CHEMICAL FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS

VAPORS FORM EXPLOSIVE MIXTURES WITH AIR.
THE FOLLOWING TOXIC VAPORS ARE FORMED WHEN THIS MATERIAL IS HEATED TO
DECOMPOSITION.
HYDROGEN CHLORIDE & POSSIBLY TRACES OF PHOSGENE

SECTION V - HEALTH HAZARD DATA

LD50 10300 MG/KG ORAL RAT TLV 350 PPM

EMERGENCY AND FIRST AID PROCEDURES

EYES

FLUSH EYES WITH WATER FOR 15 MINUTES.
CONTACT A PHYSICIAN.

DATE 2/23/88

MATERIAL SAFETY DATA SHEET

PAGE 2

CATALOG NO 48510 (REORDER PRODUCT BY THIS NO.)
PRODUCT NAME 1,1,1-TRICHLOROETHANE 1G
DATA SHEET NO R430110
1,1,1-TRICHLOROETHANE

SECTION V - HEALTH HAZARD DATA

* CONTINUED *

SKIN

PROMPTLY WASH SKIN WITH MILD SOAP AND LARGE VOLUMES OF WATER.
REMOVE CONTAMINATED CLOTHING.

INHALATION

IMMEDIATELY MOVE TO FRESH AIR.
GIVE OXYGEN IF BREATHING IS LABORED
IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION
CONTACT A PHYSICIAN

INGESTION

NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON
NEVER TRY TO MAKE AN UNCONSCIOUS PERSON VOMIT
DO NOT INDUCE VOMITING.
GIVE LARGE AMOUNTS OF WATER
IMMEDIATELY CONTACT A PHYSICIAN.
NEVER ADMINISTER ADRENALIN FOLLOWING METHYLCHLOROFORM OVEREXPOSURE.
INCREASED SENSITIVITY OF THE HEART TO ADRENALIN MAY BE CAUSED BY OVER
EXPOSURE TO METHYLCHLOROFORM.

EFFECTS OF OVEREXPOSURE

MAY IRRITATE EYES AND/OR SKIN
MAY BE FATAL IF INHALED
MAY BE FATAL IF SWALLOWED
BURNS EYES
DERMATITIS
IRRITATES NOSE AND THROAT
HEADACHE
NAUSEA
DIZZINESS
DEPRESSES CENTRAL NERVOUS SYSTEM
LIVER DAMAGE
KIDNEY DAMAGE

THERE IS NO DOCUMENTED EVIDENCE THAT METHYLCHLOROFORM CAUSES AN IN-
CREASED CANCER INCIDENCE IN HUMANS.
DEPRESSION OF THE CIRCULATORY SYSTEM HAS BEEN REPORTED AS A RESULT OF
OVEREXPOSURE TO METHYLCHLOROFORM. THE HEART MAY BE SENSITIZED BY
METHYLCHLOROFORM, & VENTRICULAR ARRHYTHMIA MAY BE INDUCED.

SECTION VI - REACTIVITY DATA

STABILITY STABLE.

CONDITIONS TO AVOID

AVOID MIXING WITH CAUSTIC SODA, CAUSTIC POTASH OR OXIDIZING MATERIALS
SHOCK SENSITIVE EXPLOSIVES MAY FORM.

DATE 2/23/88

MATERIAL SAFETY DATA SHEET

PAGE 3

CATALOG NO 48510 (REORDER PRODUCT BY THIS NO.)
 PRODUCT NAME 1,1,1-TRICHLOROETHANE 1G
 DATA SHEET NO R430110
 1,1,1-TRICHLOROETHANE

SECTION VI - REACTIVITY DATA

* CONTINUED *

INCOMPATIBILITY

STRONG BASES
 OXIDIZING AGENTS
 AVOID USE WITH ALUMINUM AS SOLVENT MAY DECOMPOSE.

HAZARDOUS DECOMPOSITION PRODUCTS

HYDROGEN CHLORIDE & POSSIBLY TRACES OF PHOSGENE

HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

CONDITIONS TO AVOID

N/A

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

TAKE UP WITH ABSORBENT MATERIAL.
 VENTILATE AREA.
 FLUSH AREA WITH WATER.

WASTE DISPOSAL METHOD

COMPLY WITH ALL APPLICABLE FEDERAL, STATE, OR LOCAL REGULATIONS

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFIC TYPE)

WEAR NIOSH/OSHA APPROVED RESPIRATORY PROTECTION.
 WEAR SELF CONTAINED BREATHING APPARATUS.

PROTECTIVE GLOVES

WEAR NEOPRENE GLOVES.

EYE PROTECTION

WEAR PROTECTIVE GLASSES.

VENTILATION

USE ONLY IN WELL VENTILATED AREA.

DATE 2/23/88

MATERIAL SAFETY DATA SHEET

PAGE 4

CATALOG NO 48510

(REORDER PRODUCT BY THIS NO.)

PRODUCT NAME 1,1,1-TRICHLOROETHANE 1G

DATA SHEET NO R430110

1,1,1-TRICHLOROETHANE

SECTION VIII - SPECIAL PROTECTION INFORMATION

* CONTINUED *

SPECIAL

N/A

OTHER PROTECTIVE EQUIPMENT

N/A

SECTION IX PRECAUTIONS

STORAGE AND HANDLING

STORE IN DRY, WELL VENTILATED AREA.

OTHER PRECAUTIONS

AVOID EYE OR SKIN CONTACT.

AVOID BREATHING VAPORS.

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, SUPELCO, INC. MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

LAST REVISED 11/20/86

TETRACHLOROETHYLENE

TTE

Common Synonyms Tetraclo Perchlo Perchloroethylene Para		Watery liquid Colorless Sweet odor Sinks in water. Irritating vapor is produced.			6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic, irritating gases may be generated in fire. 6.8 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available		10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X 11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: OSM-A 11.2 NAS Hazard Rating for Bulk Water Transportation: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: right;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Aesthetic Effect</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Water</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Self Reaction</td> <td style="text-align: right;">1</td> </tr> </tbody> </table> 11.3 MFPA Hazard Classification: Not listed		Category	Rating	Fire	0	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	1
Category	Rating																																			
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Reactivity																																				
Other Chemicals	1																																			
Water	0																																			
Self Reaction	1																																			
Stop discharge if possible. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 185.83 12.3 Boiling Point at 1 atm: 250°F = 121°C = 294°K 12.4 Freezing Point: -8.3°F = -22.4°C = 250.8°K 12.5 Critical Temperature: 857°F = 347°C = 620°K 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.83 at 20°C (liquid) 12.8 Liquid Surface Tension: 31.3 dynes/cm = 0.0313 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 44.4 dynes/cm = 0.0444 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.116 12.12 Latent Heat of Vaporization: 90.2 Btu/lb = 50.1 cal/g = 2.10 X 10 ⁴ J/kg 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available																														
Fire Not flammable. Poisonous gases are produced when heated.								8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None		9. SHIPPING INFORMATION 9.1 Grades of Purity: Dry cleaning and industrial grades: 95-98% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum																										
Exposure CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.				1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed. Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent																														
Water Pollution Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.								1. CHEMICAL DESIGNATIONS 3.1 OQ Competibility Class: Not listed 3.2 Formula: C ₂ Cl ₄ 3.3 IMO/IUN Designation: 9.0/1807 3.4 DOT ID No.: 1887 3.5 CAS Registry No.: 127-18-4		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Ethereal; like chloroform; mildly sweet																										
		5. HEALTH HAZARDS 5.1 Personal Protective Equipment: For high vapor concentrations use approved canister or air-supplied mask; chemical goggles or face shield; plastic gloves. 5.2 Symptoms Following Exposure: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury. 5.3 Treatment of Exposure: INHALATION: If dizziness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention. INGESTION: induce vomiting only on physician's recommendation. EYES AND SKIN: flush with plenty of water and get medical attention if irritation or injury occurs. 5.4 Threshold Limit Value: 50 ppm 5.5 Short Term Inhalation Limit: 100 ppm for 60 min. 5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 5 g/kg 5.7 Lethal Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or throat if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 5 ppm 5.11 NDLH Value: 500 ppm				NOTES																														

TETRAETHYL LEAD

TEL

<p>Common Synonyms TEL Lead tetraethyl</p>	<p>Only liquid Colorless, but generally dyed red Fruity odor</p> <p>Sinks in water. Poisonous, flammable vapor is produced.</p>
<p>Avoid Contact with Liquid and Vapor: Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<p style="text-align: center;">Fire</p>	<p>Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from behind barrier or protected location. Flood discharge area with water. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.</p>
<p style="text-align: center;">Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Flush with contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<p style="text-align: center;">Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook)</p> <p>Issue warning-poison, water contaminant</p> <p>Restrict access</p> <p>Should be removed</p> <p>Chemical and physical treatment</p>	<p>2. LABEL</p> <p>2.1 Category: Poison</p> <p>2.2 Class: 6</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Not listed</p> <p>3.2 Formula: Pb(C₂H₅)₄</p> <p>3.3 IMO/UN Designation: 6.1/1849</p> <p>3.4 DOT ID No.: 1849</p> <p>3.5 CAS Registry No.: 78-00-2</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid</p> <p>4.2 Color: Dyed red or other distinctive color.</p> <p>4.3 Odor: Sweet</p>
<p>5. HEALTH HAZARDS</p>	
<p>5.1 Personal Protective Equipment: Organic vapor type canister face mask for short periods; air line type for longer periods; neoprene-coated, liquid-proof gloves; protective goggles or face shield; white or light-colored clothing; rubber shoes or boots.</p> <p>5.2 Symptoms Following Exposure: Increased urinary output of lead. If a large degree of absorption from inhalation or skin contact, may cause insomnia, excitability, delirium, coma and death. Do not confuse with inorganic lead.</p> <p>5.3 Treatment of Exposure: Remove victim from contaminated area and consult physician immediately. INGESTION: induce vomiting. SKIN: wash immediately with kerosene or similar petroleum distillate followed by soap and water.</p> <p>5.4 Threshold Limit Value: 0.1 mg/m³</p> <p>5.5 Short Term Inhalation Limit: 0.15 mg Pb/m³ for 30 min.</p> <p>5.6 Toxicity by Ingestion: Oral rat LD₅₀ = 17 mg/kg</p> <p>5.7 Late Toxicity: Lead poisoning</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.</p> <p>5.10 Odor Threshold: Data not available</p> <p>5.11 IDLH Value: 40 mg/m³</p>	

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 200°F C.C.; 185°F O.C.</p> <p>6.2 Flammable Limits in Air: Data not available</p> <p>6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Not pertinent</p> <p>6.5 Special Hazards of Combustion: Products: Toxic gases are generated in fires.</p> <p>6.6 Behavior in Fire: May explode in fire.</p> <p>6.7 Ignition Temperature: Decomposes above 230°F</p> <p>6.8 Electrical Hazard: Not pertinent</p> <p>6.9 Burning Rate: Data not available</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p style="text-align: right;"><i>(Continued)</i></p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">A-X-Y</p>								
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: Rust and some metals cause decomposition.</p> <p>7.3 Stability During Transport: Stable below 230°F. At higher temperatures, may detonate or explode when confined.</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: Data not available</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulation: Poison, B</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed</p> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Classification</td> </tr> <tr> <td style="text-align: right;">Health Hazard (Blue)</td> <td style="text-align: right;">3</td> </tr> <tr> <td style="text-align: right;">Flammability (Red)</td> <td style="text-align: right;">2</td> </tr> <tr> <td style="text-align: right;">Reactivity (Yellow)</td> <td style="text-align: right;">3</td> </tr> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	2	Reactivity (Yellow)	3
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	2								
Reactivity (Yellow)	3								
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 0.20 mg/l/96 hr/bluegill/TL₅₀/fresh water</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): Data not available</p> <p>8.4 Food Chain Concentration Potential: Data not available</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 323.44</p> <p>12.3 Boiling Point at 1 atm: Decomposes</p> <p>12.4 Freezing Point: -215°F = -137°C = 136°K</p> <p>12.5 Critical Temperature: Not pertinent</p> <p>12.6 Critical Pressure: Not pertinent</p> <p>12.7 Specific Gravity: 1.633 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 28.5 dynes/cm = 0.0285 N/m at (est.) 25°C</p> <p>12.9 Liquid Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent</p> <p>12.12 Latent Heat of Vaporization: Not pertinent</p> <p>12.13 Heat of Combustion (est.) -7,870 Btu/lb = -4,380 cal/g = -183 X 10³ J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: Data not available</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: Data not available</p>								
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Technical</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Pressure-vacuum</p>									
<p>6. FIRE HAZARDS (Continued)</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>									

TOLUENE

TOL

<p>Common Synonyms</p> <p>Toluol Methylbenzene Methylbenzol</p>	<p>Watery liquid</p> <p>Colorless</p> <p>Pleasant odor</p>	<p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
<p>Water Pollution</p>	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area.</p>		<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C₇H₈ 3.3 IMQ/UN Designation: 3.2/1294 3.4 DOT ID No.: 1294 3.5 CAS Registry No.: 106-66-3</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, aromatic, benzene-like; distinct, pleasant</p>
<p>5. HEALTH HAZARDS</p>		
<p>5.1 Personal Protective Equipment: Air-supplied mask; goggles or face shield; plastic gloves. 5.2 Symptoms Following Exposure: 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, gnping, diarrhea, depressed respiration. 5.3 Treatment of Exposure: 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. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 600 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: Kidney and liver damage may follow ingestion. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.17 ppm 5.11 IDLH Value: 2,000 ppm</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 40°F C.C.; 55°F O.C. 6.2 Flammable Limits in Air: 1.27%-7% 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 997°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.7 mm/min. 6.10 Adiabatic Flame Temperature: Data not available</p> <p style="text-align: right;">(Continued)</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Category</th> <th style="text-align: center;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Health.....</td> <td></td> </tr> <tr> <td>Vapor Irritant.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons.....</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Water Pollution.....</td> <td></td> </tr> <tr> <td>Human Toxicity.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity.....</td> <td></td> </tr> <tr> <td>Other Chemicals.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Water.....</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Self Reaction.....</td> <td style="text-align: right;">0</td> </tr> </tbody> </table> <p>11.3 HFFA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Category</th> <th style="text-align: center;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Flammability (Red).....</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td style="text-align: right;">0</td> </tr> </tbody> </table>	Category	Rating	Fire.....	3	Health.....		Vapor Irritant.....	1	Liquid or Solid Irritant.....	1	Poisons.....	2	Water Pollution.....		Human Toxicity.....	1	Aquatic Toxicity.....	3	Aesthetic Effect.....	2	Reactivity.....		Other Chemicals.....	1	Water.....	0	Self Reaction.....	0	Category	Classification	Health Hazard (Blue).....	2	Flammability (Red).....	3	Reactivity (Yellow).....	0
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 1180 mg/1/96 hr/sunfish/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0%, 5 days; 38% (theor), 8 days 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 92.14 12.3 Boiling Point at 1 atm: 231.1°F = 110.6°C = 383.8°K 12.4 Freezing Point: -109°F = -95.0°C = 178.2°K 12.5 Critical Temperature: 605.4°F = 318.8°C = 591.8°K 12.6 Critical Pressure: 596.1 psia = 40.55 atm = 4.108 MN/m² 12.7 Specific Gravity: 0.867 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.0 dynes/cm = 0.0290 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.1 dynes/cm = 0.0361 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.089 12.12 Latent Heat of Vaporization: 155 Btu/lb = 86.1 cal/g = 3.61 X 10⁶ J/kg 12.13 Heat of Combustion: -17,430 Btu/lb = -9866 cal/g = -405.5 X 10⁶ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 17.17 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 1.1 psia</p>																																				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research, reagent, nitration-all 99.8 + %, industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>																																					
<p>6. FIRE HAZARDS (Continued)</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>																																					

TRICHLOROETHANE

TCE

Common Synonyms 1,1,1-Trichloroethane Methylchloroform Aerthane Chloroform		Watery liquid Colorless Sweet odor
Sinks in water. Irritating vapor is produced.		
Spill discharge if possible. Keep people away. Avoid contact with liquid and vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.	
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, may produce nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CH ₂ Cl ₃ 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 2831 3.5 CAS Registry No.: 71-55-8		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform-like; sweetish
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or polyvinyl-alcohol-type gloves; chemical safety goggles and face shield; neoprene safety shoes (or leather safety shoes plus neoprene footwear); neoprene or polyvinyl alcohol suit or apron for splash protection. 5.2 Symptoms Following Exposure: INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lachrymatory. SKIN: defatting action may cause dermatitis. 5.3 Treatment of Exposure: Get medical attention for all eye exposures and any other serious over-exposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting. EYES: flush thoroughly with water. SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water. 5.4 Threshold Limit Value: 350 ppm 5.5 Short Term Inhalation Limits: 1,000 ppm for 60 min. in man 5.6 Toxicity by Ingestion: Grade 1; LD ₅₀ = 5 to 15 g/kg (rat, mouse, rabbit, guinea pig) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 100 ppm 5.11 IDLH Value: 1,000 ppm		

6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: 7%-16% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and smothering gases are generated in fires. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 932°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: (est.) 2.9 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X-Y 11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: ORM-A 11.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Env.</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aqueous Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Env.	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aqueous Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0
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7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: Reacts slowly, releasing corrosive hydrochloric acid. 7.2 Reactivity with Common Materials: Corrodes aluminum, but reaction is not hazardous. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 3B	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 133.41 12.3 Boiling Point at 1 atm: 165°F = 74°C = 347°K 12.4 Freezing Point: <-38°F = <-39°C = <234°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.31 at 20°C (liquid) 12.8 Liquid Surface Tension: 25.4 dynes/cm = 0.0254 N/m at 20°C 12.9 Liquid Water Interfacial Tension (est.): 45 dynes/cm = 0.045 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 4.8 12.11 Ratio of Specific Heats of Vapor (Gas): 1.104 12.12 Latent Heat of Vaporization: 100 Btu/lb = 58 cal/g = 2.4 X 10 ⁴ J/kg 12.13 Heat of Combustion: (est.) 4700 Btu/lb = 2600 cal/g = 110 X 10 ³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 4.0 psia																																				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 75-150 ppm/100-pinfish/TL ₉₆ /salt water *Time period not specified. 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	9. SHIPPING INFORMATION 9.1 Grades of Purity: Uninhibited; inhibited; Industrial inhibited; white room; cold cleaning 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum																																				
NOTES																																					

TRICHLOROETHYLENE

TCL

<p>Common Synonyms</p> <p>Trichloroethylene Triclene; Axylen Chlorylene Genaigene Tetrylene Trichloran; Trilene</p>		<p>Watery liquid Colorless Sweet odor</p> <p>Sinks in water. Irritating vapor is produced.</p>																																					
<p>Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>																																							
<p>Fire</p>		<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 90°F C.C.; practically nonflammable 6.2 Flammable Limits In Air: 8.0%-10.5% 6.3 Fire Extinguishing Agents: Water fog 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion: Products: Toxic and irritating gases are produced in fire situations. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 770°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>																																					
<p>Exposure</p>		<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X-Y</p> <p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: ORM-A 11.2 NAS Hazard Rating for Bulk Water Transportation</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Salt Reaction</td> <td>1</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>		Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Salt Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0
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<p>Water Pollution</p>		<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36</p>																																					
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>																																					
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: $\text{CHCl}_2\text{=CCl}_2$ 3.3 IMO/UN Designation: 9.0/1710 3.4 DOT ID No.: 1710 3.5 CAS Registry No.: 79-01-6</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform-like; etheral</p>																																					
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or vinyl gloves; chemical safety goggles; face shield; neoprene safety shoes; neoprene suit or apron for splash protection. 5.2 Symptoms Following Exposure: 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: derirating action can cause dermatitis. EYES: slightly irritating sensation and lachrymation. 5.3 Treatment of Exposure: 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. 5.4 Threshold Limit Value: 50 ppm 5.5 Short Term Inhalation Limit: 200 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 50 ppm 5.11 IDLH Value: 1,000 ppm</p>																																							
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 860 mg/l/40 hr/daphnia/km/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>		<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 131.39 12.3 Boiling Point at 1 atm: 189°F = 87°C = 360°K 12.4 Freezing Point: -123.5°F = -88.4°C = 166.8°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.48 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.3 dynes/cm = 0.0293 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 34.5 dynes/cm = 0.0345 N/m at 24°C 12.10 Vapor (Gas) Specific Gravity: 4.5 12.11 Ratio of Specific Heats of Vapor (Gas): 1.116 12.12 Latent Heat of Vaporization: 103 Btu/lb = 57.2 cal/g = 2.4 X 10⁵ J/kg 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 2.5 psia</p>																																					
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Technical; dry cleaning; degreasing; extraction 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>		<p>NOTES</p>																																					

m-XYLENE

XLM

Common Synonyms 3-Dimethylbenzene Toluol	Watery liquid Colorless Sweet odor	Floats on water. Flammable, irritating vapor is produced.
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with inert, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, HOLD EYELIDS OPEN and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment	2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic hydrocarbon 3.2 Formula: m-C ₈ H ₁₀ (CH ₃) ₂ 3.3 IMO/IUN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 108-38-3	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic

5. HEALTH HAZARDS	
5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; 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. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD ₅₀ = 50 to 500 g/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm	

6. FIRE HAZARDS	
6.1 Flash Point: 84°F C.C. 6.2 Flammable Limits in Air: 1.1%-8.4% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 988°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	

7. CHEMICAL REACTIVITY	
7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32	

8. WATER POLLUTION	
8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL ₅₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 0% (theor.), 8 days 8.4 Food Chain Concentration Potential: Data not available	

9. SHIPPING INFORMATION	
9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.2% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum	

10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U																																					
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12. PHYSICAL AND CHEMICAL PROPERTIES	
12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 269.4°F = 131.9°C = 405.1°K 12.4 Freezing Point: -54.2°F = -47.9°C = 225.3°K 12.5 Critical Temperature: 650.8°F = 343.8°C = 617.0°K 12.6 Critical Pressure: 513.8 atm = 34.95 psia = 3.540 MN/m ² 12.7 Specific Gravity: 0.864 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.6 dynes/cm = 0.0256 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.4 dynes/cm = 0.0364 N/m at 30°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.071 12.12 Latent Heat of Vaporization: 147 Btu/lb = 81.9 cal/g = 3.43 X 10 ⁵ J/kg 12.13 Heat of Combustion: -17,554 Btu/lb = -9752.4 cal/g = -408.31 X 10 ³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 26.01 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.34 psia	

NOTES

o-XYLENE

XLO

<p>Common Synonyms 2-Dimethylbenzene <i>Xylol</i></p>	<p>Watery liquid Floats on water. Flammable, irritating vapor is produced.</p>	<p>Colorless</p>	<p>Sweet odor</p>
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wetted self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		

<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>	<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CQ Compatibility Class: Aromatic hydrocarbon 3.2 Formula: C₈H₁₀(CH₃)₂ 3.3 IMO/IUN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 95-47-8</p>	<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Benzene-like; characteristic aromatic</p>

<p>5. HEALTH HAZARDS</p>
<p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; 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.</p> <p>5.4 Threshold Limit Value: 100 ppm</p> <p>5.5 Short Term Inhalation Limit: 300 ppm for 30 min.</p> <p>5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg</p> <p>5.7 Late Toxicity: Kidney and liver damage.</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.</p> <p>5.10 Odor Threshold: 0.05 ppm</p> <p>5.11 IDLH Value: 10,000 ppm</p>

<p>6. FIRE HAZARDS</p>
<p>6.1 Flash Point: 53°F C.C.; 75°F O.C.</p> <p>6.2 Flammable Limits in Air: 1.1%-7.0%</p> <p>6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.</p> <p>6.5 Special Hazards of Combustion Products: Not pertinent</p> <p>6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.</p> <p>6.7 Ignition Temperature: 560°F</p> <p>6.8 Electrical Hazard: Class I, Group D</p> <p>6.9 Burning Rate: 5.8 mm/min.</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>

<p>7. CHEMICAL REACTIVITY</p>
<p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: 32</p>

<p>8. WATER POLLUTION</p>
<p>8.1 Aquatic Toxicity: > 100 mg/l/96 hr/D, magna/T_L/fresh water</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 2.5% (theor.), 8 days</p> <p>8.4 Food Chain Concentration Potential: Data not available</p>

<p>9. SHIPPING INFORMATION</p>
<p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 95+%</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No reaction</p> <p>9.4 Venting: Open (flame arrester) or pressure-vacuum</p>

<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>

<p>11. HAZARD CLASSIFICATIONS</p>																																				
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<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p>
<p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 106.16</p> <p>12.3 Boiling Point at 1 atm: 291.9°F = 144.4°C = 417.8°K</p> <p>12.4 Freezing Point: -13.3°F = -25.2°C = 248.0°K</p> <p>12.5 Critical Temperature: 474.8°F = 257.1°C = 630.3°K</p> <p>12.6 Critical Pressure: 541.5 atm = 36.84 mega = 3.732 MN/m²</p> <p>12.7 Specific Gravity: 0.880 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 30.50 dynes/cm = 0.00305 N/m at 15.5°C</p> <p>12.9 Liquid Water Interfacial Tension: 36.06 dynes/cm = 0.03606 N/m at 20°C</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.068</p> <p>12.12 Latent Heat of Vaporization: 149 Btu/lb = 82.9 cal/g = 3.47 X 10⁵ J/kg</p> <p>12.13 Heat of Combustion: -17,558 Btu/lb = -9754.7 cal/g = -408.41 X 10³ J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: 30.64 cal/g</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: 0.28 mega</p>

NOTES

p-XYLENE

XLP

<p>Common Synonyms 1,4-Dimethylbenzene Xylol</p>	<p>Water liquid Colorless Sweet odor</p>	<p>Floats on water. Flammable, irritating vapor is produced. Freezing point is 56°F.</p>	<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 81°F C.C. 6.2 Flammable Limits in Air: 1.1%-6.5% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 570°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																				
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: right;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Aesthetic Effect</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Water</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Self Reaction</td> <td style="text-align: right;">0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: right;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Flammability (Red)</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td style="text-align: right;">0</td> </tr> </tbody> </table>		Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p>Fire</p>	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear suit-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 2</p>																																					
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 106.16</p> <p>12.3 Boiling Point at 1 atm: 240.9°F = 134.0°C = 411.5°K</p> <p>12.4 Freezing Point: 55.9°F = 13.3°C = 286.5°K</p> <p>12.5 Critical Temperature: 649.4°F = 343.0°C = 616.2°K</p> <p>12.6 Critical Pressure: 509.4 atm = 34.65 psia = 3.510 MN/m²</p> <p>12.7 Specific Gravity: 0.861 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 28.2 dynes/cm = 0.0282 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension: 37.8 dynes/cm = 0.0378 N/m at 20°C</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.071</p> <p>12.12 Latent Heat of Vaporization: 150 Btu/lb = 51 cal/g = 3.4 X 10⁴ J/kg</p> <p>12.13 Heat of Combustion: -17,559 Btu/lb = -9754.7 cal/g = -408.41 X 10⁴ J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: 37.83 cal/g</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: 0.34 psia</p>																																					
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to streams. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL₅₀/fresh water</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days</p> <p>8.4 Food Chain Concentration Potential: Data not available</p>																																					
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>	<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>	<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Aromatic hydrocarbon 3.2 Formula: p-C₆H₄(CH₃)₂ 3.3 IMO/IUM Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-42-3</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic</p>	<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.8%; Technical: 99.0% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>																																				
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; 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. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm</p>			<p style="text-align: center;">NOTES</p>																																					

XYLENOL

XYL

<p>Common Synonyms</p> <p>Dimethylphenol 2, 6-Xylenol Cresylic acid 2-Hydroxy-m-xylene</p>		<p>Solid or liquid</p> <p>Light yellowish brown</p> <p>Sweet tarry odor</p>	<p>May float or sink in water.</p>	
<p>Stop discharge if possible. Keep people away. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>				
<p>Fire</p>		<p>Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.</p>		
<p>Exposure</p>		<p>CALL FOR MEDICAL AID.</p> <p>DUST Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID OR SOLID Irritating to skin and eyes. If swallowed or skin is exposed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>		
<p>Water Pollution</p>		<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook)</p> <p>Issue warning-water contaminant Restrict access Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>		
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Not listed 3.2 Formula: 2, 6-(CH₃)₂C₆H₃OH 3.3 IMO/UM Designation: Not listed 3.4 DOT ID No.: 2261 3.5 CAS Registry No.: 1300-71-6</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Solid or liquid 4.2 Color: Light yellow-brown 4.3 Odor: Sweet tarry</p>		
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Organic canister mask; goggles or face shield; rubber gloves; outer protective clothing to prevent contact with skin.</p> <p>5.2 Symptoms Following Exposure: Vapor irritates eyes, nose, and throat and is readily absorbed through mucous membranes and lungs, producing general toxic symptoms (weakness, dizziness, headache, difficult breathing, twitching). Contact with skin causes (temporary pricking and intense burning, then local anesthesia. Affected areas initially show white discoloration, wrinkling, and softening, then become red, then brown or black (signs of gangrene). Extensive burns may permit absorption of chemical to produce toxic symptoms described above. Ingestion causes irritation of mouth and stomach, nausea, abdominal pain, weakness, dizziness, headache, difficult breathing, and twitching.</p> <p>5.3 Treatment of Exposure: Get medical attention at once following exposure to this compound. INHALATION: remove patient immediately to fresh air, irritation of nose or throat may be somewhat relieved by spraying or gargling with water until all odor is gone; 100% oxygen inhalation is indicated for cyanosis or respiratory distress; keep patient warm, but not hot. EYES: flood with running water for 15 min.; if physician is not immediately available, continue irrigation for another 15 min.; 2-3 drops of 0.5% pantoicaine or equivalent may be instilled after first 15 min.; do not use oils or oily ointments unless ordered by physician. SKIN: wash affected areas with large quantities of water or soapy water until all odor is gone; then wash with alcohol or 20% glycerin solution and more water; keep patient warm, but not hot; cover chemical burns continuously with compresses wet with saturated solution of sodium thiosulfate; apply no salves or ointments for 24 hrs after injury. INGESTION: give large quantities of liquid (salt water, weak sodium bicarbonate solution, milk, or grape) followed by demulcent such as raw egg white or corn starch paste; if profuse vomiting does not follow immediately, give a mild emetic (such as 1 tsp. mustard in glass of water), or tickle back of throat. Repeat procedure until vomitus is free of the odor. Some demulcent should be left in stomach after vomiting. Keep patient comfortably warm.</p> <p>5.4 Threshold Limit Value: 45 ppm 5.5 Short Term Inhalation Limit: Data not available</p>				
<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 186°F C.C. 6.2 Flammable Limits in Air: 1.4% (LFL) 6.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic vapors of unburned material may form in fire. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 1110°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>				
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: (2, 6 isomer) 7-9 ppm/**/lethal/fresh water *Time period not specified. 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 31% of theoretical in 5 days 8.4 Food Chain Concentration Potential: None</p>				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: 99% 2, 6-Xylenol. Other commercial Xylenols include 2, 3-; 2, 4-; 2, 5-; 3, 4-; 3, 5-; and various mixtures of these. Properties are similar to those of the 2, 6- compound. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>				
<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-X-Y</p>				
<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: CHM-A 11.2 NAS Hazard Rating for Bulk Water Transportation: Not Set 11.3 NFPA Hazard Classification: Not Set</p>				
<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Solid or liquid 12.2 Molecular Weight: 122.2 12.3 Boiling Point at 1 atm: 419°F = 212°C = 485°K 12.4 Freezing Point: -40 to +108°F = -40 to +45°C = 233 to 318°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.01 at 20°C (liquid) 12.8 Liquid Surface Tension (sat): 30 dynes/cm = 0.030 N/m at 20°C 12.9 Liquid Water Interfacial Tension (sat): 25 dynes/cm = 0.025 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: 212.74 Btu/lb = 118.19 cal/g = 4.8451 X 10⁴ J/kg at 25°C 12.13 Heat of Combustion: -15,310 Btu/lb = -8,500 cal/g = -356 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>				
<p>5. HEALTH HAZARDS (Continued)</p> <p>5.6 Toxicity by Ingestion: Grade 2; oral LD₅₀ = 1,070 mg/kg (mouse) 5.7 Late Toxicity: Damage to heart muscle, and changes in liver, kidney, and spleen in rats 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>				

(Continued)

APPENDIX H

OSHA JOB SAFETY AND HEALTH PROTECTION POSTER

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm or employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and order issued under the Act that apply to their own actions and conduct on the job

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides the employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to \$1,000 for each serious violation and for optional penalties of up to \$1,000 for each nonserious violation. Penalties of up to \$1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to \$10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than \$10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury, or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for health such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

Augusta Area Office
Federal Bldg. & P.O. Box 40
Western Ave., Rm. 121
Augusta, Maine 04330
Telephone (207) 622-8417

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1985
OSHA 2203

William E. Brock, Secretary of Labor
U.S. Department of Labor
Occupational Safety and Health Administration

APPENDIX I
EMERGENCY INFORMATION

POST IN TRAILER

EMERGENCY TELEPHONE NUMBERS

(LOCAL) Police Department	911
(LOCAL) Rescue Service	911
Santa Rosa Medical Center	(904) 623-9741
West Florida Medical Center	(904) 478-4460
(Local) Fire Department	911
Off-site Emergency Services	911
National Poison Control Center	(800) 492-2414
Florida Poison Control Center	(800) 282-3171
National USEPA Emergency Response	(800) 424-8802
Florida Emergency Response	(904) 488-0190
Chemical Manufacturers Association Chemical Referral Center	(800) 262-8200
Site HSO: Janet Burris	(904) 656-1293
Site Manager: R. Michael Nugent	(904) 656-1293
Regional HSS: Jack Davis	(904) 656-1293
C-E Environmental HSM: J.A. Reynolds	(201) 992-2323 x264

POST IN TRAILER

ROUTES TO EMERGENCY MEDICAL FACILITIES

Primary source of medical assistance for the NAS Whiting:

Santa Rosa Medical Center
1450 Berry Hill Road
Milton, Florida 32570
(904) 623-9741

Directions to primary source of medical assistance: (map attached)

Drive 1 mile west from the site on Highway 87A, turn left, drive 5.5 miles south on Highway 89 to Berry Hill Road, turn right, travel 1.7 miles and the hospital will be on the right.

Alternate source of medical assistance:

West Florida Regional Medical Center
8383 N. Davis Highway
Pensacola, Florida 32514
(904) 478-4460

Directions to alternate source of medical assistance:

Drive 1 mile west from the site on Highway 87A, turn left, drive 6 miles south on Highway 89 to Highway 90, turn right and travel 13 miles to Davis Parkway (veer to the left). Travel 2.2 miles and the hospital is on the right side of the parkway.

EMERGENCY SIGNALS

At NAS Whiting portable radios are not anticipated to be used for communication. In the event they were used, a transmission that indicates it is of an emergency nature will take priority over all other transmissions. All other side radios will yield the frequency to the emergency transmissions

Where radio communication is not available, the following air horn signals shall be used:

HELP	three short blasts	(. . .)
EVACUATION	three long blasts	(_ _ _)
ALL CLEAR	alternating long and short blasts	(_ . _ .)